SEATTLE CITY COUNCIL

Transportation and Utilities Committee

Agenda

Wednesday, March 4, 2020

9:30 AM

Council Chamber, City Hall
600 4th Avenue
Seattle, WA 98104

Alex Pedersen, Chair
Dan Strauss, Vice-Chair
M. Lorena González, Member
Lisa Herbold, Member
Tammy J. Morales, Member
Debora Juarez, Alternate

Chair Info: 206-684-8804; Alex.Pedersen@seattle.gov

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SEATTLE CITY COUNCIL

Transportation and Utilities Committee

Agenda

March 4, 2020 - 9:30 AM

Meeting Location:
Council Chamber, City Hall, 600 4th Avenue, Seattle, WA 98104

Committee Website:
http://www.seattle.gov/council/committees/transportation-and-utilities

This meeting also constitutes a meeting of the City Council, provided that the meeting shall be conducted as a committee meeting under the Council Rules and Procedures, and Council action shall be limited to committee business.

Please Note: Times listed are estimated

A. Call To Order

B. Approval of the Agenda

C. Public Comment

(20 minutes)

D. Items of Business

1. Appt 01564 **Appointment of Brandon Lindsey as member, Community Technology Advisory Board, for a term December 31, 2020.**

Attachments: Appointment Packet

Briefing, Discussion, and Possible Vote (15 minutes for items 1 - 4)

Presenter for items 1 - 4: Tracye Cantrell, Seattle Information Technology Department

2. Appt 01565 **Appointment of Lassana Magassa as member, Community Technology Advisory Board, for a term to December 31, 2020.**

Attachments: Appointment Packet

Briefing, Discussion, and Possible Vote

3. Appt 01566 **Appointment of Camille Malonzo as member, Community Technology Advisory Board, for a term to December 31, 2021.**

Attachments: Appointment Packet

Briefing, Discussion, and Possible Vote

4. Appt 01567 **Reappointment of John C. Krull as member, Community Technology Advisory Board, for a term to December 31, 2021.**

Attachments: Appointment Packet

Briefing, Discussion, and Possible Vote

5. Appt 01569 **Appointment of Connor F. Inslee as member, Seattle Bicycle Advisory Board, for a term to August 31, 2020.**

Attachments: Appointment Packet

Briefing, Discussion, and Possible Vote (10 minutes for items 5 - 7)

Presenter for items 5 - 7: Simon Blenski, Seattle Department of Transportation (SDOT)

6. Appt 01570 **Appointment of Sarah Udelhofen as member, Seattle Bicycle Advisory Board, for a term to August 31, 2020.**

Attachments: Appointment Packet

Briefing, Discussion, and Possible Vote

7. Appt 01571 **Appointment of Pierre Brunelle as member, Seattle Bicycle Advisory Board, for a term to August 31, 2021.**

Attachments: Appointment Packet

Briefing, Discussion, and Possible Vote

8. **Briefing on Street Vacations & Term Permits, Department of Transportation**

Supporting Documents: Presentation

Briefing and Discussion (20 minutes)

Presenters: Beverly Barnett and Amy Gray, SDOT

9. CB 119745 **AN ORDINANCE granting the University of Washington (UW) permission to maintain and operate five existing pedestrian skybridges located around the perimeter of the UW campus as a Campus Pedestrian Skybridge Network, for a ten-year term; specifying the conditions under which this permit is granted; providing for the acceptance of the permit and conditions; and ratifying and confirming certain prior acts.**

Supporting Documents:
Summary and Fiscal Note
Summary Att A – UW Skybridges Map
Summary Att B – UW Skybridges Photos
Summary Att C – UW Skybridge Fee Assessment
Central Staff Memo

Briefing, Discussion, and Possible Vote (15 minutes)

Presenters: Beverly Barnett and Amy Gray, SDOT; Julie Blakeslee, University of Washington

10. CB 119742 **AN ORDINANCE vacating portions of the alleys in Block 3, Norris Addition to West Seattle, in the West Seattle Junction and accepting a Property Use and Development Agreement on the petition of The Whittaker, a Condominium Association, a Washington non-profit corporation (Clerk File 312783).**

Attachments: Ex 1 – Whittaker Alley Vacation PUDA

Supporting Documents: Summary and Fiscal Note
Summary Att A – Whittaker Alley Vacation Map
Central Staff Memo

Briefing, Discussion, and Possible Vote (15 minutes)

Presenter: Beverly Barnett, SDOT

11. Res 31932 **A RESOLUTION relating to the City Light Department; acknowledging and approving City Light's adoption of a biennial energy conservation target for 2020-2021 and ten-year conservation potential.**

Supporting Documents: Summary and Fiscal Note
2020 Conservation Potential Assessment - Volume I
2020 Conservation Potential Assessment - Volume II
Central Staff Memo
Presentation

Briefing, Discussion, and Possible Vote (15 minutes)

Presenters: Jennifer Finnegan and Craig Smith, Seattle City Light (SCL)

E. Adjournment

Legislation Text

File #: Appt 01564, **Version:** 1

Appointment of Brandon Lindsey as member, Community Technology Advisory Board, for a term December 31, 2020.

The Appointment Packet is provided as an attachment.

City of Seattle Boards & Commissions Notice of Appointment

Appointee Name: *Brandon Lindsey*		
Board/Commission Name: *Community Technology Advisory Board*		**Position Title:** *Public Access Member*
☒ **Appointment** ***OR*** ☐ **Reappointment**	**Council Confirmation required?** ☒ Yes ☐ No	
Appointing Authority: ☐ Council ☒ Mayor ☐ Other: *Fill in appointing authority*	**Date Appointed:** 2/12/2020	**Term of Position: *** 1/1/2019 **to** 12/31/2020 ☐ *Serving remaining term of a vacant position*
Residential Neighborhood: Mt. Baker	**Zip Code:** *98144*	**Contact Phone No.:** [redacted]
Background: Brandon manages the Seattle Goodwill's digital literacy initiative and lead the implementation of a culturally appropriate ESL iPad program. Brandon has a passion for digital equity in youth and historically underserved communities.		
Authorizing Signature (original signature): Jenny A. Durkan	**Appointing Signatory:** *Jenny A. Durkan* *Mayor of Seattle*	

**Term begin and end date is fixed and tied to the position and not the appointment date.*

Brandon Lindsey

[redacted]

CAREER PROFILE

- 9 years program planning, development, and project management expertise from analysis, design, development, and implementation through evaluation
- Over 10 years facilitating learning programs in diverse, multicultural environments
- Proven ability to work independently and collaboratively in a project oriented position
- Effectively facilitate projects between multicultural, virtual, cross-departmental and inter-agency teams
- Manage staff to deliver programs and meet internal and external funder expectations
- Data-driven program analysis using Survey Monkey, SQL, Excel, and Tableau

PROFESSIONAL EXPERIENCE

Program Development Manager (2014-present)
Seattle Goodwill, Seattle WA

- Manage staff and consultants to design, develop, and implement job training and education programs for youth, immigrants, job seekers, and Goodwill employees
- Create presentations, reports, dashboards, proposals for internal and external stakeholders related to program design, program outcomes, and potential partnerships
- Collaborate with department staff as a member of the Equity Team to design and implement strategic goals related to cultural responsiveness
- Serve as a member various community groups including the Regional Re- engagement Network, Youth Maritime Collaborative to improve service integration across the region
- Lead staff learning communities and regularly deliver presentations and trainings to over 100 department staff

Key Achievements

- Partnered with United Way, Workforce Development Council, and Kent School District to deliver career connected learning opportunities to opportunity youth
- Partnered with South Seattle College to integrate a 3 quarter certificate into a program serving disengaged youth
- Developed and implemented a cashiering and customer service job training program tailored to meet the work-readiness needs of low level English speakers
- Developed a digital literacy integrated ESOL program serving over 3000 non-native speakers annually

Program and Curriculum Development Coordinator (2011-2014)
Seattle Goodwill, Seattle WA

- Developed curriculum and policies and procedures for Goodwill's youth program portfolio including the Youth Aerospace Program, Youth Year Round Program, and Youth Green Corps
- Led the curriculum redesign of the 160 hour Retail Customer Service Training Program
- Developed workshops on work readiness, job search, financial literacy, college access which served over 1500 community members from partner organizations annually
- Developed and managed the Employee Education program in which participation outcomes exceeded 150% of target in the first year of program operation

Brandon Lindsey

[redacted]

Instructor (2007-2011)
Seattle Goodwill, Shoreline, WA

- Performed training, recruitment, registration, and assessment duties -including ESOL, Computer Literacy, Job Search, Soft Skills and Retail
- Conducted soft skills and workplace readiness trainings for diverse clientele for 12 three month sessions of the Retail Customer Service Training Program
- Conducted outreach to generate partnerships with multiple business, social and educational organizations thereby increasing student enrollment, service access, and job placements

Teacher (2003-2006)
Japanese Exchange and Teaching (JET) Program, Nagano, Japan

- Designed curriculum and lesson plans for high school English classes
- Taught students about cultural differences and world affairs
- Delivered various presentations about English teaching techniques to teachers
- Planned and participated in multi-day English workshops for students

Education

Certificate in Data Analytics
Galvanize (2018)

Certificate in E-Learning Design and Development
University of Washington, Seattle WA (2013)

Master of Arts in Intercultural Service, Leadership, and Management
School for International Training, Brattleboro, VT

Bachelor of Arts in Foreign Affairs
University of Virginia, Charlottesville, VA

Professional Affiliations

Youth Maritime Collaborative (2017-present)
CCER Regional Re-Engagement Network (2014-present)
Community Volunteer Training Planning Group (2014-present)
Central King County WorkFirst Local Planning Area (LPA) (2011-2015)
Society of Intercultural Education Training and Research (SIETAR) Northwest (2011-12)

Community Technology Advisory Board

10 Members: Pursuant to Ordinance 124736, all members subject to City Council confirmation, 2-year terms:

- 4 City Council- appointed
- 6 Mayor- appointed

Roster:

*D	**G	RD	Position No.	Position Title	Name	Term Begin Date	Term End Date	Term #	Appointed By
2	M	7	1.	Member at Large	Steven Maheshwary	1/1/19	12/31/20	2	City Council
	F	3	2.	Member at Large	Camille Malonzo	1/1/20	12/31/21	1	Mayor
6	M	7	3.	Member at Large	John C. Krull	1/1/20	12/31/21	1	Mayor
2	M	3	4.	Member at Large	Rene J. Peters Jr.	1/1/19	12/31/20	1	City Council
	M	7	5.	Education Member	Lassana Magassa	1/1/19	12/31/20	1	Mayor
	F		6.	Get Engaged Member	Kathryn Crimmins	9/1/19	8/31/20	1	Mayor
			7.	Member at Large		1/1/20	12/31/21		City Council
			8.	Member at Large		1/1/20	12/31/21		Mayor
6	M	6	9.	Member at Large	Torgie Madison	1/1/19	12/31/20	2	City Council
	M	3	10.	Public Access Member	Brandon Lindsey	1/1/19	12/31/20	1	Mayor

SELF-IDENTIFIED DIVERSITY CHART

	(1) Male	(2) Female	(3) Transgender	(4) NB/ O/ U	(5) Asian	(6) Black/ African American	(7) Hispanic/ Latino	(8) American Indian/ Alaska Native	(9) Other	Caucasian/ Non-Hispanic	Pacific Islander	Middle Eastern	Multiracial
Mayor	4	1				1	1			3			
Council	2	2			1	1				1			
Other													
Total					1	2	1			4			

Key:

***D** List the corresponding *Diversity Chart* number (1 through 9)
****G** List *gender*, **M**= Male, **F**= Female, **T**= Transgender, **NB**= Non-Binary, **O**= Other, **U**= Unknown
RD Residential Council District number 1 through 7 or N/A
Diversity information is self-identified and is voluntary.

Legislation Text

File #: Appt 01565, **Version:** 1

Appointment of Lassana Magassa as member, Community Technology Advisory Board, for a term to December 31, 2020.

The Appointment Packet is provided as an attachment.

City of Seattle Boards & Commissions Notice of Appointment

Appointee Name: *Lassana Magassa*		
Board/Commission Name: *Community Technology Advisory Board*		**Position Title:** *Education Member*
☒ **Appointment** ***OR*** ☐ **Reappointment**	**Council Confirmation required?** ☒ Yes ☐ No	
Appointing Authority: ☐ Council ☒ Mayor ☐ Other: *Fill in appointing authority*	**Date Appointed:** 2/12/2020	**Term of Position: *** 1/1/2019 **to** 12/31/2020 ☐ *Serving remaining term of a vacant position*
Residential Neighborhood: New Holly	**Zip Code:** *98125*	**Contact Phone No.:** [redacted]
Background: Lassana is a Research Assistant for the Tech Policy Lab at the UW Informatics School. In 2018 Lassagna completed his PHD from the UW in Information Science with a focus in Digital Literacy.		
Authorizing Signature (original signature): Jenny A. Durkan	**Appointing Signatory:** *Jenny A. Durkan* *Mayor of Seattle*	

**Term begin and end date is fixed and tied to the position and not the appointment date.*

Lassana Magassa
[redacted]

SUMMARY OF RESEARCH AND TECHNICAL SKILLS

User research approaches: A/B testing, card sort, data analysis, field study, focus group, persona creation
5+ years managing technical and non-technical projects
10+ years translating ideas between technical and non-technical audiences
Data Analysis: Microsoft Access, SQL, SPSS, Atlas.ti, Dedoose
Data Visualization: Microsoft Excel, PowerPoint, & Publisher; Adobe Illustrator
Web Development: CSS, HTML, PHP, JavaScript

EDUCATION

UNIVERSITY OF WASHINGTON, ***PhD in Information Science*** Seattle, WA 2018
Dissertation: *Develop and validate a framework of digital literacy*
QUEENS COLLEGE, ***Masters in Library and Information Studies*** Queens, NY June 2007
SAINT PAUL'S COLLEGE, ***Bachelor of Science in Computer Science*** Lawrenceville, VA June 2003

RESEARCH

UNIVERSITY OF WASHINGTON TECH POLICY LAB, *Research Assistant* Seattle, WA Oct 2014 – Present

- Analyzed 20+ national technology policies and presented the results of analysis to a team of 4 researchers interested in constructing more robust technology policies.
- Interviewed 20+ people using a method I designed to solicit and incorporate the viewpoints of underrepresented groups into the technology policymaking process
- Used qualitative methods to collect, analyze and synthesize the viewpoints about an augmented reality policy regulation paper from 12 people representing currently and formerly incarcerated people, people with disabilities, and women
- Solicited and examined the opinions of unmanned vehicles policy paper from 9 people stakeholders representing people with extremely low income, non-car owners, and youth.
- Co-published a guide for parties interested in employing a method to investigate and improve current and future technology policies.
- Submitted article for publication describing the method the findings derived from using the method

PROJECT INFORMATION MEDIARIES (InfoMe), *Research Assistant* Seattle, WA Oct 2012 – Sep 2015
Project InfoMe is research effort investigating immigrant and refugee young peoples' information mediaries behaviors.

- Designed 15+ design thinking training modules that are being used the U.S., Europe and the Middle East to conduct user research that increases our understanding about immigrant and refugee youths interactions with information in its various formats.
- Led 100's of youth in research activities led to the development of 25 user journeys that were accompanied with prototypes of information systems to support the immigrant population.
- Developed, administered and analyzed the results of a user questionnaire that revealed youths' technology use patterns.

LEAD PUBLICATIONS

Magassa, L., Young, M., Friedman, B. (2017) *Diverse Voices: A How-To Guide for Facilitating Inclusive Tech Policy Documents.*

Magassa, L. (2011). Applying a Community Informatics Approach as Part of Rehabilitation in US Prisons. *The Journal of Community Informatics*, *6*(3).

For additional publications visit http://www.lassanamagassa.com/research/publications/

Lassana Magassa
[redacted]

WORK EXPERIENCE

DELTA AIR LINES Seattle, WA Jun 2015 – Oct 2016

Cargo Customer Support Agent

- Accepted, checked, and verified 100's freight import and export documentation.
- Performed daily audits of 50+ customer transactions.
- Ensured compliance to WA State and US federal safety and security regulations.

- Assisted over 300 customers every week with completing transactions.
- Audited a fleet of 15 vehicles including tugs and forklifts every evening.
- Carefully transported 100,000lbs of cargo between warehouse and tarmac daily.

UNIVERSITY OF WASHINGTON UPWARD BOUND Seattle, WA Jun 2015 – Aug 2015

Web development Instructor

- Developed 10 week curriculum focusing on HTML5, CSS, and UI design basics.
- Taught 25 students about the basics of web development.
- Educated students about techniques programmers use to overcome hurdles.
- Managed 6 teams of students from the beginning to the end of the web development project.

ASSOCIATION OF NATIONAL ADVERTISERS New York, NY Jul 2007 – Sep 2009

Web Content Specialist

- Led the migration of 1500+ articles into an in-house content management system.
- Employed used-centered design techniques to make incremental website updates used by 1,000s of people every days.
- Established and actively monitored the departments Twitter account.
- Collaborated with the IT Department to develop a dashboard of 10 web analytic reports.
- Used Microsoft Excel to produce weekly and monthly reports that was distributed to 10+ employees.

OTHER WORK EXPERIENCE

NORTHWEST PROTECTIVE SERVICES, Unarmed Patrol Officer Seattle, WA Aug 2011 – May 2015

NEW YORK CITY DEPARTMENT OF EDUCATION, School Library Media Specialist (Intern) New York, NY Sep 2005 – June 2007

CENTER FOR COURT INNOVATION, Web Developer & Mediation Specialist New York, NY Mar 2005 – Aug 2006

COMMUNITY MEMORIAL HOSPITAL, Network Engineer (Intern) South Hill, VA Dec 2002 – May 2003

SKILLS, ACTIVITIES, HOBBIES

- Fluent in English, Bambara and Soninke; Conversational French
- Member of the Value Sensitive Design Lab
- Member of Association of Internet Researchers
- Member of the Aerospace & Info Tech Committee at the French-American Chamber of Commerce
- Former Chair of Diversity with the Special Libraries Association's New York Chapter
- Self-taught crocheter

Community Technology Advisory Board

10 Members: Pursuant to Ordinance 124736, all members subject to City Council confirmation, 2-year terms:

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Roster:

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2	M	3	4.	Member at Large	Rene J. Peters Jr.	1/1/19	12/31/20	1	City Council
	M	7	5.	Education Member	Lassana Magassa	1/1/19	12/31/20	1	Mayor
	F		6.	Get Engaged Member	Kathryn Crimmins	9/1/19	8/31/20	1	Mayor
			7.	Member at Large		1/1/20	12/31/21		City Council
			8.	Member at Large		1/1/20	12/31/21		Mayor
6	M	6	9.	Member at Large	Torgie Madison	1/1/19	12/31/20	2	City Council
	M	3	10.	Public Access Member	Brandon Lindsey	1/1/19	12/31/20	1	Mayor

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Other													
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Diversity information is self-identified and is voluntary.

Legislation Text

File #: Appt 01566, **Version:** 1

Appointment of Camille Malonzo as member, Community Technology Advisory Board, for a term to December 31, 2021.

The Appointment Packet is provided as an attachment.

City of Seattle Boards & Commissions Notice of Appointment

Appointee Name: *Camille Malonzo*		
Board/Commission Name: *Community Technology Advisory Board*		**Position Title:** *Member at Large*
☒ **Appointment** ***OR*** ☐ **Reappointment**	**Council Confirmation required?** ☒ Yes ☐ No	
Appointing Authority: ☐ Council ☒ Mayor ☐ Other: *Fill in appointing authority*	**Date Appointed:** 2/12/2020	**Term of Position: *** 1/1/2020 **to** 12/31/2021 ☐ *Serving remaining term of a vacant position*
Residential Neighborhood: Capitol Hill	**Zip Code:** *98122*	**Contact Phone No.:** [redacted]
Background: Camille is a Software Engineer at Microsoft with a passion in both computer science and urban policy. At Mount Holyoke College she earned her degree in computer science and policy.		
Authorizing Signature (original signature): Jenny A. Durkan	**Appointing Signatory:** *Jenny A. Durkan* *Mayor of Seattle*	

**Term begin and end date is fixed and tied to the position and not the appointment date.*

CAMILLE MALONZO

[redacted]

EDUCATION

Mount Holyoke College, South Hadley, MA — Bachelor of Arts
Computer Science, Critical Social Thought (urban policy concentration) — graduated December 2015

WORK EXPERIENCE

Software Engineer, Sticky Notes, Microsoft Inc., Redmond, WA — September 2018 — Present
• Working full stack to build features for the Microsoft Sticky Notes, working on projects surrounding data analytics, privacy, and shared cross-platform infrastructure like testing and telemetry monitoring

Software Engineer, Windows Shell R&D, Microsoft Inc., Redmond, WA — January 2018 — September 2018
• Develop new end-user experiences for the Windows operating system and state-of-the-art Microsoft hardware
• Active board member of both the Womxn of Windows Shell and Windows Shell Culture initiatives, leading Diversity, Equity, & Inclusion programs focused on recruiting, on-boarding and retention of individuals from underrepresented groups

Software Engineer, SharePoint (OneDrive/SharePoint - ODSP), Microsoft, Inc., Redmond WA — Feb 2016 — Dec 2017
• Developed modern end-user experiences for enterprise publishing scenarios, improved legacy code for key SharePoint and OneDrive users, collaborate across engineering, design, research, and program management teams within ODSP and Office
• Coordinator for ODSP Give Campaign 2017 to organize and advertise org- and company-wide philanthropic giving events; efforts raised over $1 million in charitable giving

Technology, Strategy, and Marketing Fellow, Advancement for Rural Kids, Inc, New York, NY — May 2011 — Aug 2014
• Created organization's visual identity, implemented through new website and brand collateral, which is still used today
• Streamlined digital marketing strategy by implementing key third-party applications, formulating a digital marketing strategy, and training senior leadership on best practices
• Prepared and presented internal economic models for and audits of program operations and fundraising initiatives

LEADERSHIP EXPERIENCE

Trustee, Mount Holyoke College Board of Trustees, South Hadley, MA — September 2018 — Present
• Mount Holyoke College, a private liberals college in western Massachusetts, is the oldest women's college in the United States. The Board of Trustees is the governing board of the College, making decisions on behalf of the institution.
• Attend quarterly meetings, focused particularly on committees surrounding student affairs, advancement, and enrollment
• Voted on issues concerning tuition, operating budgets, endowment, and faculty appointments.
• Advised on issues spanning capital campaigns, constituent engagement,

AnitaB.org 'Hopper x 1 Seattle' Sessions Co-Lead — May 2017 — November 11, 2017
• 'Hopper x 1 Seattle' is a day-long regional conference for women in computing in the Seattle area, with over 800 participants in attendance crossing academia, the non-profit sector, and industry; it is sponsored by the AnitaB organization, which also hosts the Grace Hopper Conference for Women in Computing— the largest annual convention for women in technology
• 2018 Speakers team Co-lead. Review, selection, and production of the conference's schedule of panels, presentations and workshops
• 2019 Sponsorships team Co-lead. Identify, market, and support sponsorship for conference

Mentor, Seattle Central Community College — September 2018 — Present
• Attend engineering mentoring events, like the 2019 Seattle Central College Engineering Mentor Night, to advise and connect with students pursuing pathways to software engineering opportunities
• Continuing mentorship relationships with students, particularly supporting first-generation and women of color STEM students

SKILLS

Programming Languages: C++, C#, TypeScript/JavaScript, Python, Java
Human Languages: English, French (Intermediate), Mandarin (Intermediate), Arabic (Basic), Tagalog (Basic)
Other: non-profit governance, policy research, committee organzing, event programming, graphic design

Community Technology Advisory Board

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- 4 City Council- appointed
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Roster:

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	M	3	10.	Public Access Member	Brandon Lindsey	1/1/19	12/31/20	1	Mayor

SELF-IDENTIFIED DIVERSITY CHART

	(1) Male	(2) Female	(3) Transgender	(4) NB/ O/ U	(5) Asian	(6) Black/ African American	(7) Hispanic/ Latino	(8) American Indian/ Alaska Native	(9) Other	Caucasian/ Non-Hispanic	Pacific Islander	Middle Eastern	Multiracial
Mayor	4	1				1	1			3			
Council	2	2			1	1				1			
Other													
Total					1	2	1			4			

Key:

***D** List the corresponding *Diversity Chart* number (1 through 9)
****G** List *gender*, **M**= Male, **F**= Female, **T**= Transgender, **NB**= Non-Binary, **O**= Other, **U**= Unknown
RD Residential Council District number 1 through 7 or N/A
Diversity information is self-identified and is voluntary.

Legislation Text

File #: Appt 01567, **Version:** 1

Reappointment of John C. Krull as member, Community Technology Advisory Board, for a term to December 31, 2021.

The Appointment Packet is provided as an attachment.

City of Seattle Boards & Commissions Notice of Appointment

Appointee Name: *John C. Krull*		
Board/Commission Name: *Community Technology Advisory Board*		**Position Title:** *Member at Large*
☐ **Appointment** ***OR*** ☒ **Reappointment**	**Council Confirmation required?** ☐ Yes ☒ No	
Appointing Authority: ☐ Council ☒ Mayor ☐ Other: *Fill in appointing authority*	**Date Appointed:** 2/12/2020	**Term of Position: *** 1/1/2020 **to** 12/31/2021 ☐ *Serving remaining term of a vacant position*
Residential Neighborhood: Georgetown	**Zip Code:** *98108*	**Contact Phone No.:** [redacted]

Background:

John Krull is currently the Chief Information Officer (CIO) at Seattle Public Schools. John came to the district in 2016 with Education, technology, and business experience across public, private, and non-profit sectors.

John began his career as a teacher and has over 10 years of classroom experience including a stint as adjunct professor of Education Technology. Afterwards, he moved to the then new public internet industry and on to Microsoft and then to Silicon Valley for a digital video startup.

After a decade in publicly-traded enterprises, John returned to Education with leadership roles in the Bay Area working as chief technology officer in the school districts in Oakland and Fremont as well as helping launch a San Francisco-based charter management organization.

John earned a Bachelor of Arts and a Master of Education degree from the University of Washington. In addition, he holds numerous technical and leadership certifications.

John and his family live in the Georgetown neighborhood of Seattle and he remains a proud Husky.

Authorizing Signature (original signature): Jenny A. Durkan	**Appointing Signatory:** *Jenny A. Durkan* *Mayor of Seattle*

**Term begin and end date is fixed and tied to the position and not the appointment date.*

John C. Krull

[redacted]

jkrull@uw.edu - johnkrull.org - LinkedIn.com/in/krull - twitter.com/johnkrull

OBJECTIVE

To make a positive impact to students, teachers, and staff through Information Technology leadership

SKILLS

Visionary	Using a racial equity lens, capable of creating and transforming organizations to high levels of achievement
Leader	Ability to lead IT teams whether start-up, Fortune 50, or large urban school district
Collaborator	Knowledge of engagement, planning, budgeting, managing operational and capital expenditures with an eye toward equity
Creative	Able to evaluate business and education needs then create and develop new ideas to solve problems with stakeholder buy-in
Communicator	Skilled in delivering presentations, comfortable communicating with diverse teachers, staff, leadership, C-level executives, unions, vendors, community members, and board members; social media savvy

EMPLOYMENT

11/2016 – present — Seattle Public Schools — Seattle, WA

Chief Information Officer

District leader on Superintendent's cabinet in a diverse, urban school district with over 8000 employees, 50,000 students, and 105 schools

- Developed a 5-year technology plan through years long engagement focused on equity and in support of a new strategic plan aimed to end institutional racism by focusing on students of color furthest from educational justice
- Led the passage of tax levy that included $151M in technology funding for 3 years of operations and capital investments
- With skilled team members, upgraded district data capabilities with a new architecture and technologies for public and internal dashboards that reveal annual and incremental data trends to inform strategic decisions and school based multitiered systems of support (MTSS)
- Transforming the Department of Technology Services (DoTS) division to an agile methodology that delivers on requirements of business and education divisions
- Delivering a $20M project to deploy devices districtwide including 1-1 in high schools
- Lead systems support for finance and HR (SAP) student information (PowerSchool), business intelligence (Tableau/MSSQL), and security
- Developed the Digital Learning Specialist, a centralized team to transform instruction with digital tools with a culturally responsive approach that supports the Danielson Framework. Developed Education Technologist roles at schools to liaison with Central Office and lead district and school digital initiatives.

8/2013 – 11/2016 — Oakland Unified School District — Oakland, CA

Chief Technology Officer

Technology officer in a diverse, urban school district with over 6000 employees, 38,000 students, and 87 schools

- Teamed with District and community partners to implement Blended and Personalized Learning and helped win a Next Generation Learning Challenges (NGLC) grant for implementation
- Transformed the Technology Services division to a highly productive group that transcends organizational silos to achieve strategic, operational, and educational objectives focused on the needs of schools

- Developed new board policies on student and staff use of technology focusing on data security and compliance
- Developed a DevOps model of agile development and operations with automated, highly engineered systems responsive to our customers' needs
- Delivered a $5M project to deploy over 15,000 Chromebooks and over 3,500 wireless access points
- Upgraded and optimized network access to a minimum 1 Gb per site and 20 Gb to the internet
- Implemented a hyperconverged virtualized infrastructure revolutionizing end-user computing running Windows on demand on Google ChromeOS
- Deployed and run data systems for finance, HR, student information, business intelligence, and security
- Developed a Technology Plan collaborating closely with stakeholders
- Manage $4.5M operational and $10M capital budgets along with E-rate and grant funding

2/2011 - 8/2013 Fremont Unified School District Fremont, CA

Chief Technology Officer

Information Technology leader for a Silicon Valley K-12 district with over 4000 employees, 32,000 students, and 45 schools and sites

- Transformed the District technology systems including network fiber to all sites, a new parent portal and grade communication system, a centralized identity management system integrated with the student information system and HR system, a District-wide wireless network, and standards for desktop and mobile computing
- Deployed custom applications including the student developed iOS and Android app iFUSD
- Responsible for finance and student data systems
- Developed a Technology Vision and Plan working closely with stakeholders
- Managed a $3M annual budget in addition to E-rate and Microsoft funding

2006 - 2011 Envision Schools San Francisco and Oakland, CA

Vice President, Technology

Executive for a charter management organization (CMO) with five schools, each its own LEA

- Led the migration of the financial system to an online Enterprise Resource Planning (ERP) system (NetSuite)
- Led the development of an online custom teacher application portal and online graduation portfolio system
- Led the deployment of Google Apps organization wide shortly after the platform was released in 2007
- Managed a team responsible for data systems including PowerSchool, Data Director, and NWEA MAP
- Responsible for local and state data reporting
- Managed IT installations in district schools used by the CMO offered under Proposition 39
- Developed key documents including state-approved technology plans, a California Charter School Association (CCCA) adopted security and theft mitigation plan, student and staff Acceptable Use Policies, and a FERPA/HIPPA policy
- Managed technology budget and additional funding through E-rate, EETT, and other grants
- Led Educational Technology with a focus on Project-Based Learning (PBL) and 21st century skills

2000 - 2004 Virage / Autonomy / HP San Francisco, CA

Senior Director, Information Technology, Application Services, and Training

Executive staff member who participated in the IPO and acquisition by Autonomy, Plc. (then acquired by HP)

- Led the Application Services Cloud division with yearly revenue of up to $10 Million
- Directed the IT team responsible for 3 data centers and offices worldwide
- Directed product managers and developers who built custom applications for internet video
- Launched, staffed, and managed the company's professional services and training organizations
- Directed a division of 60 staff members who provided cloud video applications to customers including PBS, Major League Baseball, America Online, and Citibank.
- Led the design and build-out of two data centers and a satellite acquisition and encoding facility
- Developed the organization's mission statement and goals

1997 - 2000 Microsoft Corporation Redmond, WA

Systems Engineer Manager, Worldwide Customer Marketing Group

Manager of the systems engineers responsible for running Microsoft.com

- Managed over 150 Windows servers in an enterprise data center
- Developed policies and processes to achieve 99.999% uptime; helped develop the first software load balancer that was eventually built into Windows Server
- Managed the 24x7 support escalation team overseeing internal service requests for Microsoft.com
- Led internal testing of Active Directory and Windows 2000 on Microsoft.com production servers helping lead to release to the public

- Developed an automated deployment system and a change management system
- Represented Microsoft.com Systems Engineering in working with groups across Microsoft including MSDN, Windows Update, and TechNet

1991 - 1997 Seattle Pacific University Seattle, WA
Adjunct Instructor
Course developer and instructor for teacher professional development
- Developed and taught Education Technology classes including Microsoft Office in the Classroom and Educational Applications of Multimedia

1988 - 1997 Shoreline Schools Shoreline, WA
Teacher, Technology Coordinator
5th & 6th grade teacher
- Led the technology team for projects that included a school remodel, building of computer labs, network installation, and library modernization
- Taught in-service classes at the district level on how to use technology in the classroom
- Led the team that deployed Apple Macintosh computers and district-wide network

1986 - 1988 Everett Schools Everett, WA
Teacher
1st grade teacher
- Led the reading adoption committee

1984 - 1986 Chehalis Schools Chehalis, WA
Teacher
2st - 3rd grade teacher
- Taught using Apple IIe computers

EDUCATION

Haas School of Business, University of California Berkeley, CA
The Executive Certificate of Excellence, in progress

California Educational Technology Professionals Association Sacramento, CA
CTO Certification, November 2010
K-12 Finance, Education Law, Data Systems, HR, Education Technology

Microsoft Corporation Redmond, WA
Microsoft Certified Systems Engineer (MCSE), 1997
Microsoft Management Training Program, 1999

University of Washington Seattle, WA
Certificate, Managing Network Operations, June 1997
Master of Arts, Curriculum and Instruction, June 1987
Certificate, Continuing Elementary and Secondary Teacher, July 1985
Bachelor of Arts, English, June 1983

PRESENTATIONS and PUBLICATIONS

The IT Summit, April 2019	Leading Organizational Change in Technology: What We Can Learn from Education
Seattle Public Schools, March, 2019	Technology Plan 2019-2023
NAACP, Seattle 2018, 2019	Student Data for Parents and Guardians
Seattle Community Technology Advisory Board (CTAB), Panel Discussion Moderator	Digital Equity: Comcast Corporation and Wave Broadband

JohnKrull.org, May 2017	What the heck is a Cloud Access Security Broker? And why do you need one...
Interface, Keynote Speaker, Seattle 2016	Books that Shape a CIO
Council of Great City Schools (CGCS), Annual Conference October 2016	How Do You Measure Return on Investment of EdTech
Edsurge, MC, September 2016	Silicon Valley, Tech for Schools
Council of Great City Schools, June 2016	Creating a Platform for Staff and Student Growth
Council of Great City Schools, June 2016	The Data Program and Portals: Foundation for Improving Schools
Cisco Systems, video, August 4, 2016	The Evolution of the Digital Campus
California Education Technology Professionals Association, (CETPA), Annual Conference November 2015	Using Illuminate for Data and Assessment
Council of Great City Schools (CGCS), Annual Conference October 2015	Enabling the Digital Dividend (Solving the Digital Divide)
Bloomberg Business, TV interview, October 31, 2014	The Challenges of Using Tech in the Classroom
VMworld Conference Keynote, March 2014	EVO:Rail Early Access Program
VMware, webinar, April 2014	The Latest in Innovation in Desktop and Application Virtualization
Oakland Unified School District, 2014	Technology Plan 2014-2018
eSchool News, webinar, August 20, 2014	Oakland Unified School District chooses Google for a personalized learning platform
THE Journal, webinar, August 2014	OUSD Goes Google with Chromebooks and Google Apps
California Education Technology Professionals Association (CETPA), Annual Conference November 2012	Argos to Make Reporting Easy

AFFILIATIONS

Board Member: City of Seattle Community Technology Advisory Board (CTAB)
K-12 Institutional Leadership Board, IMS Global Consortium
Startup Weekend, Mentor, Coach, Judge
Living Computer Museum, Seattle
Seattle Art Museum
Museum of Pop Culture, Seattle
California Educational Technology Professionals Association (CETPA)
Association of Computer Professionals in Education (ACPEnw)
International Society for Technology in Education (ISTE)
University of Washington Alumni Association
Microsoft Alumni Network
Board Member: Georgetown Community Council (GCC – Seattle)

Community Technology Advisory Board

10 Members: Pursuant to Ordinance 124736, all members subject to City Council confirmation, 2-year terms:

- 4 City Council- appointed
- 6 Mayor- appointed

Roster:

*D	**G	RD	Position No.	Position Title	Name	Term Begin Date	Term End Date	Term #	Appointed By
2	M	7	1.	Member at Large	Steven Maheshwary	1/1/19	12/31/20	2	City Council
	F	3	2.	Member at Large	Camille Malonzo	1/1/20	12/31/21	1	Mayor
6	M	7	3.	Member at Large	John C. Krull	1/1/20	12/31/21	1	Mayor
2	M	3	4.	Member at Large	Rene J. Peters Jr.	1/1/19	12/31/20	1	City Council
	M	7	5.	Education Member	Lassana Magassa	1/1/19	12/31/20	1	Mayor
	F		6.	Get Engaged Member	Kathryn Crimmins	9/1/19	8/31/20	1	Mayor
			7.	Member at Large		1/1/20	12/31/21		City Council
			8.	Member at Large		1/1/20	12/31/21		Mayor
6	M	6	9.	Member at Large	Torgie Madison	1/1/19	12/31/20	2	City Council
	M	3	10.	Public Access Member	Brandon Lindsey	1/1/19	12/31/20	1	Mayor

SELF-IDENTIFIED DIVERSITY CHART

	(1) Male	(2) Female	(3) Transgender	(4) NB/ O/ U	(5) Asian	(6) Black/ African American	(7) Hispanic/ Latino	(8) American Indian/ Alaska Native	(9) Other	Caucasian/ Non-Hispanic	Pacific Islander	Middle Eastern	Multiracial
Mayor	4	1				1	1			3			
Council	2	2			1	1				1			
Other													
Total					1	2	1			4			

Key:

***D** List the corresponding *Diversity Chart* number (1 through 9)
****G** List *gender*, **M**= Male, **F**= Female, **T**= Transgender, **NB**= Non-Binary, **O**= Other, **U**= Unknown
RD Residential Council District number 1 through 7 or N/A
Diversity information is self-identified and is voluntary.

Legislation Text

File #: Appt 01569, **Version:** 1

Appointment of Connor F. Inslee as member, Seattle Bicycle Advisory Board, for a term to August 31, 2020.

The Appointment Packet is provided as an attachment.

City of Seattle Boards & Commissions Notice of Appointment

Appointee Name: *Connor Inslee*		
Board/Commission Name: *Seattle Bicycle Advisory Board*		**Position Title:** *Member*
☒ **Appointment** ***OR*** ☐ **Reappointment**	**Council Confirmation required?** ☒ Yes ☐ No	
Appointing Authority: ☐ Council ☒ Mayor ☐ Other: *Fill in appointing authority*	**Date Appointed:** 2/7/2020	**Term of Position: *** 9/1/2018 **to** 8/31/2020 ☐ *Serving remaining term of a vacant position*
Residential Neighborhood: *View Ridge*	**Zip Code:** 98155	**Contact Phone No.:** [redacted]

Background:

A Northwest native Connor has yet to find a better place to live. A lifelong skier, cyclist, sailor, kayaker he enjoys getting outside to enjoy everything Washington has to offer. He has the unique pleasure of combining work and pleasure with his role as Associate Executive Director with the Outdoors for All Foundation were he has the opportunity to cycle, ski and hike on the job. Most recently him and his wife have taken to a new adventure called parenthood, their daughter was born in December 2019 and they now enjoy our time with her and our pup more than anything.

Authorizing Signature (original signature): Jenny A. Durkan	**Appointing Signatory:** *Jenny A. Durkan* *Mayor of Seattle*

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20 FEB -7 PM 3:25
CITY CLERK

**Term begin and end date is fixed and tied to the position and not the appointment date.*

Connor F. Inslee

[redacted]

Skills Summary

- Program Development, Delivery and Evaluation
- Multi-day activity and event logistics
- Tactical Partnership Development
- Positive, solution-oriented team member
- Volunteer Recruitment, Training and Retention
- Grant reporting
- Strategic Planning and Development
- Budget Administration
- Highly Organized with strict attention to detail

Professional Experience

Outdoors for All Foundation, Seattle, WA

- Associate Executive Director 2018-present- Outdoors for All Foundation
- Camp Director 2016-2018- Camp Korey, Carnation Washington
- Program Director/ COO 2010 – 2016; Program Manager 2008 – 2010 Program Coordinator 2008
- Program management and adaptive recreation instruction for estimated 2000 persons with disabilities (ages 4 – 81+), 1500 non-disabled family members and 700 volunteers annually.
- Direction of multi day events and activities for groups sizes up to 40 people including all event logistics, partner resource collaboration, vendor reservations and group management techniques.
- Supervise and lead teams of seasonal staff and volunteers in program delivery, equipment and facilities maintenance through consensus building and accountability management techniques.
- Implement staff, volunteer and participant safety protocols and processes to maintain high safety record.
- Develop non-profit and community partnerships to enhance programming. Highlight: US Paralympics and military partnership leading to approx.$15,000 in grant funding, $14,000 in fundraising and estimated $8,000 in media exposure.
- Lead staff member in the development and management of Outdoors for All vehicle and adaptive equipment fleet. Acquired $120,000 new equipment and vehicles over 2 years.
- Serve as an executive team member in Outdoors for All facility maintenance and acquisition plans leading to the implementation of a new warehouse and work space to meet program and safety demands.
- Coordinate annual training initiatives for staff and volunteers including 1 day training for 300+ volunteers.
- Data collection and coordination for Outdoors for All Board of Directors and Program Committee.

Additional Employment

-SUWS Wilderness Programs, Gooding, Idaho — April 2006- June 2006
Wilderness Therapy Field Instructor

-Stevens Pass Ski Area, Skykomish, WA — December 2001- March 2005
Professional Ski Patroller

-Hudson Company, Bainbridge Island, WA — September 2002- May 2005
General construction and remodel laborer, wooden boat restoration

-REI (Recreational Equipment Incorporated) Seattle, WA — October 1998 - May 1999
Sales Representative

Education

- The Evergreen State College, Bachelor of Arts, Secondary Education — June 2007

- Olympic Community College, Associate of Arts June 2001

Training and Certifications

- WEMT (Wilderness Emergency Medical Technician), WMI of NOLS-2001
- Class AV explosives license-2002
- ACA (American Canoe Association), open water kayak guide/guide trainer certification- 2004
- U.S sailing, basic sailing instructor, 1997
- APP (Association Of Professional Patrollers), endorsements-2003
  - Sled handling, risk management, medical, lift evacuation
- Level 1 Avalanche Certification. 2004
- PSIA Level I instructor
- PSIA level II adaptive instructor

Computer Skills

Microsoft Windows Office including presentation and design software. Database Management: Filemaker, Salesforce and Sportsman.

Personal Interests and Hobbies

- Avid skier, kayaker, climber and sailor
- Most memorable outdoor experience: Sea kayaking with 15 visually impaired high school students in the San Juan Islands of Washington amongst a pod of Orca whales Those in the group that could not see the whales were able to hear them surface, exhale, and submerge again.

References Available Upon Request

12 Members: Pursuant to *Resolution 30995], all* members subject to City Council confirmation, *2*-year terms:

- *5* City Council-appointed
- *7* Mayor-appointed
- *#* Other Appointing Authority-appointed (specify):

Roster:

*D	**G	RD	Position No.	Position Title	Name	Term Begin Date	Term End Date	Term #	Appointed By
	M	3	1.	Member	Pierre Brunelle	9/1/19	8/31/21	1	Mayor
2	F	5	2.	Member	Kashina Groves	9/1/18	8/31/20	2	City Council
1	M	3	3.	Member	Alexander Lew	9/1/19	8/31/21	1	Mayor
1	F	3	4.	Member	Andrea	9/1/17	8/31/21	2	City Council
6	F	6	5.	Member	Emily Paine	9/1/19	8/31/21	1	Mayor
	M	2	6.	Member	Benjamin Estes	9/1/19	8/31/21	1	City Council
6	M	2	7.	Member	Andrew Dannenberg	9/1/18	8/31/20	1	Mayor
6	F	1	8.	Member	Meredith Hall	9/1/18	8/31/20	1	City Council
	F	6	9.	Member	Sarah Udelhofen	9/1/18	8/31/20	1	Mayor
6	M	2	10.	Member	Patrick Taylor	9/1/18	8/31/20	1	City Council
6	M	2	11.	Member	Connor Inslee	9/1/18	8/31/20	1	Mayor
		4	12.	Get Engaged Member	Joseph G. Colleen	9/1/19	8/31/20	1	Mayor

SELF-IDENTIFIED DIVERSITY CHART	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Male	Female	Transgender	NB/ O/ U	Asian	Black/ African American	Hispanic/ Latino	American Indian/ Alaska Native	Other	Caucasian/ Non-Hispanic	Pacific Islander	Middle Eastern	Multiracial
Mayor	4	5			2					5			
Council	2	3				2				2			
Other													
Total	6	8			2	2				7			

Key:

***D** List the corresponding *Diversity Chart* number (1 through 9)
****G** List *gender*, **M**= Male, **F**= Female, **T**= Transgender, **NB=** Non-Binary **O=** Other **U**= Unknown
RD Residential Council District number 1 through 7 or N/A
Diversity information is self-identified and is voluntary.

Legislation Text

File #: Appt 01570, **Version:** 1

Appointment of Sarah Udelhofen as member, Seattle Bicycle Advisory Board, for a term to August 31, 2020.

The Appointment Packet is provided as an attachment.

City of Seattle Boards & Commissions Notice of Appointment

Appointee Name: *Sarah Udelhofen*		
Board/Commission Name: *Seattle Bicycle Advisory Board*		**Position Title:** *Member*
☒ **Appointment** ***OR*** ☐ **Reappointment**	**Council Confirmation required?** ☒ Yes ☐ No	
Appointing Authority: ☐ Council ☒ Mayor ☐ Other: *Fill in appointing authority*	**Date Appointed:** 1/31/2020	**Term of Position: *** 9/1/2018 **to** 8/31/2020 ☐ *Serving remaining term of a vacant position*
Residential Neighborhood: *N/A*	**Zip Code:**	**Contact Phone No.:** [redacted]
Background: *Sarah has lived in Seattle for three years and arrived here by bike from Providence, RI. She currently works at Commute Seattle as a transportation specialist, where she works on Commute Trip Reduction with SDOT, Metro, and our other transportation agencies. Sarah has taken Cascade's Advocacy Leadership training and volunteers with Seattle Neighborhood Greenways. She also participates in group rides with a Women/Trans/Femme group to connect with the bike community.*		
Authorizing Signature (original signature): Jenny A. Durkan	**Appointing Signatory:** *Jenny A. Durkan* *Mayor of Seattle*	

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20 FEB -3 PM 3:52
CITY CLERK

**Term begin and end date is fixed and tied to the position and not the appointment date.*

SARAH UDELHOFEN

Seattle, WA
[redacted]

EXPERIENCE

Commute Seattle, Seattle — *Transportation Specialist*

August 2019 - PRESENT

- Provide support, technical assistance, and best-practice guidance to employers affected by Washington State's Commute Trip Reduction law.
- Plan and execute high quality educational/informational seminars, presentations, one-on-one meetings, and small group presentations about bus, bike, walking, vanpool, and other options.
- Work collaboratively with partner organizations, including The Downtown Seattle Association, King County Metro, Washington State Department of Transportation, and the City of Seattle.

C+C | All About the Good, Seattle — *Program Coordinator*

November 2016 - July 2019

- Drove program success by budgeting, devising work plans, establishing program agreements, and administering feedback surveys.
- Built trust with clients and delivered quality results while providing excellent service every step of the way.
- Onboarded and trained new team members; broke down complex processes into easily understandable stages to ensure understanding of the big picture.
- Utilized principles of community based social marketing to change behaviors related to energy efficiency, transportation, and waste.
- As a member of the DEI team, I collaborated with coworkers to infuse diversity, equity, and inclusion into C+C's culture and client work.

Bike & Build, U.S.A. — *Affordable Housing Advocate*

2016

- Fundraised $11,500 for the affordable housing cause; cycled from Providence, Rhode Island to Seattle to raise awareness about the affordable housing crisis and build homes with local organizations.

Meriéux NutriSciences, Addison, IL — *Research Assistant*

2015 - 2016

- Developed and implemented plans to recruit study participants, meet participation goals, and carry out study protocols with confidentiality.
- Evaluated competing priorities and ensured tasks were completed efficiently and within study parameters.

EDUCATION

Cornell University, Ithaca, NY — *B.S. in Natural Resources, Minor in Design & Environmental Analysis*

2010 - 2014

CORE INTERESTS

Engaging the public through outreach in order to inform and educate.

Advocating for sustainable transportation options for all ages, races, abilities, and economic status.

Building visuals to translate complex processes into easily comprehensible information.

Understanding key players and motivating the team to achieve results and meet deadlines.

Delivering clear communication to manage expectations and drive project timelines.

VOLUNTEERING

Seattle Neighborhood Greenways
Collaborate with community members to advocate for safer, healthier, more effective methods of moving around the city.

Volunteer Park Conservatory
Indulge visitors in the wonders of the natural world and ensure funding is secured to preserve the conservatory for the future.

Seattle Bicycle Advisory Board

12 Members: Pursuant to *Resolution 30995], all* members subject to City Council confirmation, *2*-year terms:

- *5* City Council-appointed
- *7* Mayor-appointed
- *#* Other Appointing Authority-appointed (specify):

Roster:

*D	**G	RD	Position No.	Position Title	Name	Term Begin Date	Term End Date	Term #	Appointed By
	M	3	1.	Member	Pierre Brunelle	9/1/19	8/31/21	1	Mayor
2	F	5	2.	Member	Kashina Groves	9/1/18	8/31/20	2	City Council
1	M	3	3.	Member	Alexander Lew	9/1/19	8/31/21	1	Mayor
1	F	3	4.	Member	Andrea	9/1/17	8/31/21	2	City Council
6	F	6	5.	Member	Emily Paine	9/1/19	8/31/21	1	Mayor
	M	2	6.	Member	Benjamin Estes	9/1/19	8/31/21	1	City Council
6	M	2	7.	Member	Andrew Dannenberg	9/1/18	8/31/20	1	Mayor
6	F	1	8.	Member	Meredith Hall	9/1/18	8/31/20	1	City Council
	F	6	9.	Member	Sarah Udelhofen	9/1/18	8/31/20	1	Mayor
6	M	2	10.	Member	Patrick Taylor	9/1/18	8/31/20	1	City Council
		2	11.	Member		9/1/20	8/31/22	1	Mayor
		4	12.	Get Engaged Member	Joseph G. Colleen	9/1/19	8/31/20	1	Mayor

SELF-IDENTIFIED DIVERSITY CHART

	(1) Male	(2) Female	(3) Transgender	(4) NB/ O/ U	(5) Asian	(6) Black/ African American	(7) Hispanic/ Latino	(8) American Indian/ Alaska Native	(9) Other	Caucasian/ Non-Hispanic	Pacific Islander	Middle Eastern	Multiracial
Mayor	3	5			2					4			
Council	2	3				2				2			
Other													
Total	5	8			2	2				6			

Key:

***D** List the corresponding *Diversity Chart* number (1 through 9)
****G** List *gender*, **M**= Male, **F**= Female, **T**= Transgender, **NB=** Non-Binary **O=** Other **U=** Unknown
RD Residential Council District number 1 through 7 or N/A
Diversity information is self-identified and is voluntary.

Legislation Text

File #: Appt 01571, **Version:** 1

Appointment of Pierre Brunelle as member, Seattle Bicycle Advisory Board, for a term to August 31, 2021.

The Appointment Packet is provided as an attachment.

City of Seattle Boards & Commissions Notice of Appointment

Appointee Name: *Pierre Brunelle*		
Board/Commission Name: *Seattle Bicycle Advisory Board*		**Position Title:** *Member*
☒ **Appointment** ***OR*** ☐ **Reappointment**	**Council Confirmation required?** ☒ Yes ☐ No	
Appointing Authority: ☐ Council ☒ Mayor ☐ Other: *Fill in appointing authority*	**Date Appointed:** 1/31/2020	**Term of Position: *** 9/1/2019 **to** 8/31/2021 ☐ *Serving remaining term of a vacant position*
Residential Neighborhood: *N/A*	**Zip Code:**	**Contact Phone No.:** [redacted]
Background: *Pierre is a new Seattle resident and recent French immigrant to the city. He is a homeowner in Fremont and bike commutes to his job in South Lake Union as a civil engineer and decision scientist. While he is new to Seattle, he has experience working with public officials – including prior work facilitating public debates for the European Space Agenda regarding future investment plans based on public funding.*		
Authorizing Signature (original signature): Jenny A. Durkan	**Appointing Signatory:** *Jenny A. Durkan* *Mayor of Seattle*	

**Term begin and end date is fixed and tied to the position and not the appointment date.*

Pierre Brunelle

[redacted]

Current Position

Amazon – *Product Management Technical | Core AI* — **Seattle, USA**, *Nov. 2019 – Present*

Core AI is an interdisciplinary team on the cutting edge of economics, statistical analysis, and machine learning whose mission is to solve AI and ML problems that have high risk with abnormally high returns. More concretely, I understand and design Amazon's complex systems, and leverage our engineers and scientists to build solutions for some of the toughest business problems. With a strong background in decision sciences, machine learning, and product management I excel at leveraging academic research to create business impact. This broadly includes alignment across teams, goal setting/prioritization, cross-team commitments, management of execution, scoping and measurement, and managing relationships with the top American research universities.

Global Design Distribution SARL – Home Furnishing Company – *Founder & Owner* — **Paris, FR**, *May 2014 – Present*

- Managed a business generating extra cash flow for architects without requiring additional workload
- Performed corporate governance practices for tax optimization strategies

Past Experience

Amazon Web Services (AWS) – *Product Management Technical – AI/ML | SageMaker* — **Seattle, USA**, *Sep. 2019 – Nov. 2019*

AWS SageMaker takes care of abstracting a ton of software development skills necessary to accomplish ML-related tasks while still being highly effective, flexible, and cost-effective. More concretely, I:

- Owned critical RE:INVENT feature launch planning, execution, and overall User Experience that enhances our core product through value-adds
- Managed prioritization and trade-offs between CX, Host Experience, Business Requirements, Performance, and Operational Support
- Gathered and analyzed large amounts of information expeditiously representing the Voice of the Customer

Amazon – *Product Management Technical | Core AI Tooling & Search* — **Seattle, USA**, *Oct. 2018 – Aug. 2019*

Fields of work: Data Science, Data Quality Services, Open Source Web Apps, Notebooks, DNN
Featured in Seattle Times, at NeurIPS (formerly NIPS) 2018, and SIGMOD/PODS 2019

Core AI Tooling initiatives span numerous organizations, e.g., Amazon.com, Alexa, AWS. I have enjoyed being at the intersection of product, software, and science navigating machine learning, front-end, and back-end systems and owning the end-to-end experience. I had full autonomy to develop a vision leading a team of 12 Engineers, 2 User Experience Designers, and 6 Applied Scientists based in Berlin, Seattle, and New York on executing on the above vision and roadmap. More concretely, I:

- Managed project deliverables as to project teams, time, cost and quality requirements
- Defined product roadmap by leading the development of customer-focused product strategy and vision
- Spearheaded the development, communication, and implementation of effective growth strategies and processes throughout the organization
- Directed the development of variance analyses to determine the difference between projected versus actual results and oversaw the implementation of COEs
- Managed critical functions responsible for delivering business objectives and maintaining forecast & reports
- Integrate usability studies, and research into product requirements

Amazon – *Product Management | EU Automotive* — **Luxembourg, LU**, *Feb. 2017 – Sep. 2018*

Fields of work: SEO, Search, CX, ML (Prediction, IDQ, NLP, i-DSS), DBMS, B2B Services

- Engaged closely with engineering teams on feature specifications making decisions about the best technical implementation and resource trade-offs while gathering product requirements
- Drove initiatives to improve the efficiency of internal search engines by identifying domain-specific room for improvement using data to make arguments based on both research and industry knowledge proving my expertise in quantitative and qualitative research
- Set clear goals ensuring deadlines are met while leading cross-team projects
- Built consensus among cross-functional teams and influence decision-making within senior-level audiences; lead execution against recommendations quickly and with flawless accuracy
- Contributed as a Data Scientist for prototyping when necessary before allocating resources
- Wrote SQL queries and VBA Macros to perform big data analytics (Excel, Access, MySQL...)
- Managed Redshift Clusters and IT Architecture Change Management processes for Business teams
- Bridged online and offline domains for full customer journey impact

TruerenT Ltd. – Proprietary Real Estate Automated Valuations – *Co-Founder, CPO* — **London, UK**, *Jun. 2017 – Jun. 2018*

- Originated new products in concert with customer needs and business model
- Led the ideation, strategy, technical development, and delivery of business solutions
- Planned and formulated aspects of research and development proposals
- Conceptualized agile platforms dedicated to real estate that provides invaluable proprietary market data
- Developed a Decision-making Support Systems (i-DSS) based on our own proprietary ML-powered technologies

The French Association for the United Nations (AFNU) – *Digital Advisor* — **Paris, FR**, *Jun. 2017 – Oct. 2018*

- Shaped the AFNU's position on Technology and Innovation Policy

Siemens AG – Power & Gas – *Business Development Strategist* — **Huizingen, BE**
Apr. 2016 – Aug. 2016

- Performed Asian & African country profiles, industry analysis, and energy-oriented research Presented findings and actionable recommendations. Produced business development material for leading African summits that requires competences with tailor-made analysis tools
- Led technical processes for a coal-quality management project in Mexico. Gained a deep understanding of the business and developed a network of potential suppliers, empowering the team and making them more productive and relevant to the requirements of the project
- Designed Balanced Scorecard to enable a plant manager to monitor its power plant performances
- Assisted in developing a Decision Support System for portfolio selection by providing macros and suggestions on how to automate the update process of the database
- Delivered strategic benchmarking and market valuation conducting prospective portfolio investments of the "Digital Solutions" department

CSC (Computer Science Corporation) – *Consultant* — **Paris, FR**
Oct. 2015 – Mar. 2016

Bouygues Construction – RFP: €60 million contract – collaborated with SAP

- Contributed to team efforts in the preparation of proposals. Congratulated by the SAP Team for my contribution combining my breath of knowledge in Information Technology along with my expertise in civil engineering
- Performed an external benchmarking allowing my management to highlight the weakness of their proposal
- Learned how to implement adaptive Agile/Scrum development processes

EIFFAGE – Implementation Phase

- Initiated and clarified IT solution assessments and client's software specifications
- Coordinated and managed workshops. Conveyed quickly a feeling of expertise and gained the trust of the client easing the day-to-day tasks and the interactions between the different stakeholders
- Designed and submitted a specific procurement workflow leading to best fit with the client's needs

Saudi Oger Ltd. – *Site Engineer* — **Jeddah, KSA**
Jun. 2015 – Sept. 2015

'Al Salam Palace': €1.4 billion – Assigned for 2 months

- Planned the work and organized site facilities
- Attended regular meetings with the project director to discuss supplier issues

'Haramain High Speed Ralway Station Station': €690 million – Assigned for 2 months

- Supervised approximately 300 workers
- Acted as the main technical adviser for subcontractors

Demathieu & Bard – *Site Foreman (Internship)* — **Paris, FR**
Jul. 2014 – Aug. 2014

'Tram Express Nord' – €1.5 billion

- Organized construction site
- Contributed to the team efforts by working along with workers

Innov2b – *Founder & Chair (Company sold in August 2016)* — **Paris, FR**
Mar. 2015 – Aug. 2016

- Played several roles from web developer and designer to growth hacker and chair
- Delegated writing and editing tasks to professionals and students. Wrote and edited 60+ article
- Interviewed senior-level executives, e.g., CEO France Tekla Structure and AutoCAD representatives
- Gained 6,700+ real followers (@Innov2b) and attracted 54,100+ unique visitors (innov2b.com) in six months
- Sold to a new entrant to the sector with a total return of seven times my original investment

Self-employment – 'Auto-entrepreneur' — **Sceaux, FR**
Sept. 2014 – Nov. 2015

- Developed and/or revised 6 websites, resulting in a significant increase in site ranking and traffic reports
- Shaped the digital strategy of the 'Cercle Santé Société' – a Healthcare Think Tank including former ministers, C-level executives, and notable French speakers
- Wrote 15+ articles for 'guidebeton.com' to guide people in their self-construction

ESTP Student Entrepreneurship Association – 'Entrepreneur ESTP' – *Chair* — **Sceaux, FR**
May 2014 – Apr. 2015

- Raised €25,000 in funds and ensured a long-term partnership for the forthcoming years
- Revamped a committee of students to improve the collaboration between student associations
- Planned, organized and animated conferences on diverse entrepreneurial subjects allowing students to find second-year internships and develop entrepreneurial spirits

Education

Arts & Métiers ParisTech – Joint diploma with Sorbonne Graduate Business school (IAE Paris) — **Paris, FR**
Master of Research in Decision Sciences and Risk Management — *2016 – 2017*
Relevant Coursework: Decision Analysis, Decision Theory, Economics of Uncertainty and Information, Organization Theory, Risk Management, Human Resources Management

École Spéciale des Travaux Publics, du bâtiment et de l'industrie (ESTP) — **Cachan, FR**
Master of Science in Civil Engineering – 'Diplôme d'Ingénieur' — *2013 – 2015*
Relevant Electives: Risk Management, M&A, Project Finance, Procurement Management, Manager & Entrepreneur

- Managed a file-hosting platform to help students to access course material. Thanks to the success, the school administration officially took over the project the following year to spread this idea to the whole campus
- Developed two entrepreneurial and research projects. Summarized results for talks and poster presentations.

Intensive course preparing for the highly competitive entrance examinations to the 'French Grandes Ecoles' — **Paris, FR**
PCSI – PSI: Advanced mathematics, physics, chemistry and engineering science — *2010 – 2013*

Honors & Activities

Call for Ideas:

- National Student Call for Ideas: "In a World of Turmoil, what is a Nation For?" organized by "Le Cercle des Economistes" – *"Une capacité d'innovation, de créativité et d'anticipation plutôt que de réaction" (1,500 words)* — *2016*
- 'McKinsey Global Institute "Opportunity for Europe" Essay Prize' – *"Europe Reforming Europe: A Pluralistic and Pragmatic 'Modus Operandi'" (5,000 words)* — *2016*

Certification & Skills

Computer: Proficient in (X)HTML, CSS, SQL. Familiar with R and Python

Software:

- Proficient in Microsoft Office, AutoCAD, RStudio, Jupyter(Lab), Maple, WordPress, and Adobe Illustrator
- Experience with Visio, Sketch, Balsamiq Mockups, and Tableau

MOOCs: *2013 – Present*

- Strategic Management & Management for a Competitive Edge (Open2Study)
- IIBA®'s Certified Business Analysis Professional™ (CSC University)
- Strategic Organizational Design (MIT OpenCourseWare)
- CS50x3 - Introduction to Computer Sciences (HarvardX)
- Organizational Analysis 'Self-Paced' (Stanford Online University)

Languages: French (Native), English (Bilingual), Spanish (Conversant)

Research & Writing

Research Interests: Time in Organization Studies, Organizational Design, Public Policy, and JDM

Book: "Déchiffrer le Big Data: Acquérir les outils pour agir" – Facilitated management approach of the technical architecture and streamlined methods required to efficiently leverage the value of data — *2016*

Paper: *2017-2019*

- Schelter, S., Biessmann, F., Lange, D., Rukat, T., Schmidt, P., Seufert, S., Brunelle, P. and Taptunov, A., 2019, June. Unit Testing Data with Deequ. In Proceedings of the 2019 International Conference on Management of Data (pp. 1993-1996). ACM.

Working Paper:

- Time in Organization Studies: An Overview of the Literature on the State of Theory, Research and Practice – DOI: 10.13140/RG.2.2.12835.45602
- In Search of Time and Temporality: The Process of Temporal Reflexivity – DOI: 10.13140/RG.2.2.23725.79849

Seattle Bicycle Advisory Board

12 Members: Pursuant to *Resolution 30995], all* members subject to City Council confirmation, *2*-year terms:

- *5* City Council-appointed
- *7* Mayor-appointed
- *#* Other Appointing Authority-appointed (specify):

Roster:

*D	**G	RD	Position No.	Position Title	Name	Term Begin Date	Term End Date	Term #	Appointed By
	M	3	1.	Member	Pierre Brunelle	9/1/19	8/31/21	1	Mayor
2	F	5	2.	Member	Kashina Groves	9/1/18	8/31/20	2	City Council
1	M	3	3.	Member	Alexander Lew	9/1/19	8/31/21	1	Mayor
1	F	3	4.	Member	Andrea	9/1/17	8/31/21	2	City Council
6	F	6	5.	Member	Emily Paine	9/1/19	8/31/21	1	Mayor
	M	2	6.	Member	Benjamin Estes	9/1/19	8/31/21	1	City Council
6	M	2	7.	Member	Andrew Dannenberg	9/1/18	8/31/20	1	Mayor
6	F	1	8.	Member	Meredith Hall	9/1/18	8/31/20	1	City Council
	F	6	9.	Member	Sarah Udelhofen	9/1/20	8/31/22	1	Mayor
6	M	2	10.	Member	Patrick Taylor	9/1/18	8/31/20	1	City Council
		2	11.	Member		9/1/20	8/31/22	1	Mayor
		4	12.	Get Engaged Member	Joseph G. Colleen	9/1/19	8/31/20	1	Mayor

SELF-IDENTIFIED DIVERSITY CHART

	(1) Male	(2) Female	(3) Transgender	(4) NB/ O/ U	(5) Asian	(6) Black/ African American	(7) Hispanic/ Latino	(8) American Indian/ Alaska Native	(9) Other	Caucasian/ Non-Hispanic	Pacific Islander	Middle Eastern	Multiracial
Mayor	3	5			2					4			
Council	2	3				2				2			
Other													
Total	5	8			2	2				6			

Key:

***D** List the corresponding *Diversity Chart* number (1 through 9)
****G** List *gender*, **M**= Male, **F**= Female, **T**= Transgender, **NB=** Non-Binary **O=** Other **U**= Unknown
RD Residential Council District number 1 through 7 or N/A

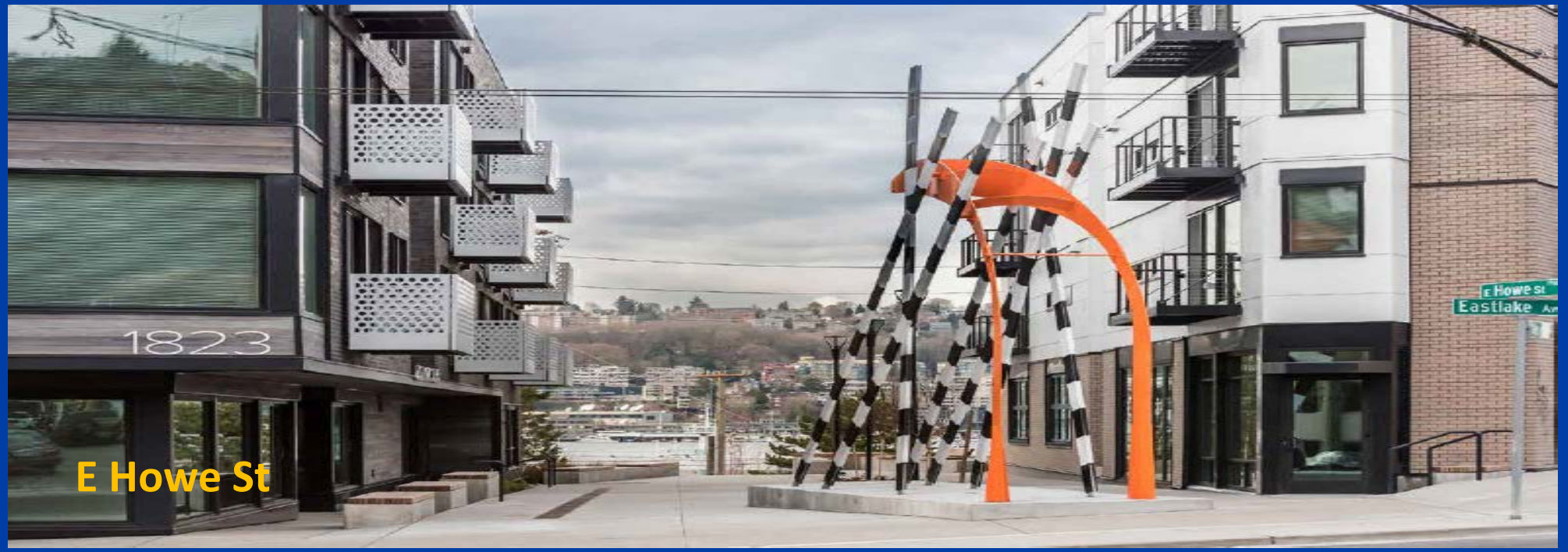
Diversity information is self-identified and is voluntary.

Legislation Text

File #: Inf 1620, **Version:** 1

Briefing on Street Vacations & Term Permits, Department of Transportation

Street Vacations & Term Permits



Council Transportation and Utilities Committee
Beverly Barnett
Amy Gray

City of Seattle

Our vision, mission, and core values

Vision: Seattle is a thriving equitable community powered by dependable transportation

Mission: to deliver a transportation system that provides safe and affordable access to places and opportunities

Committed to **6 core values**:

- Equity
- Safety
- Mobility
- Sustainability
- Livability
- Excellence

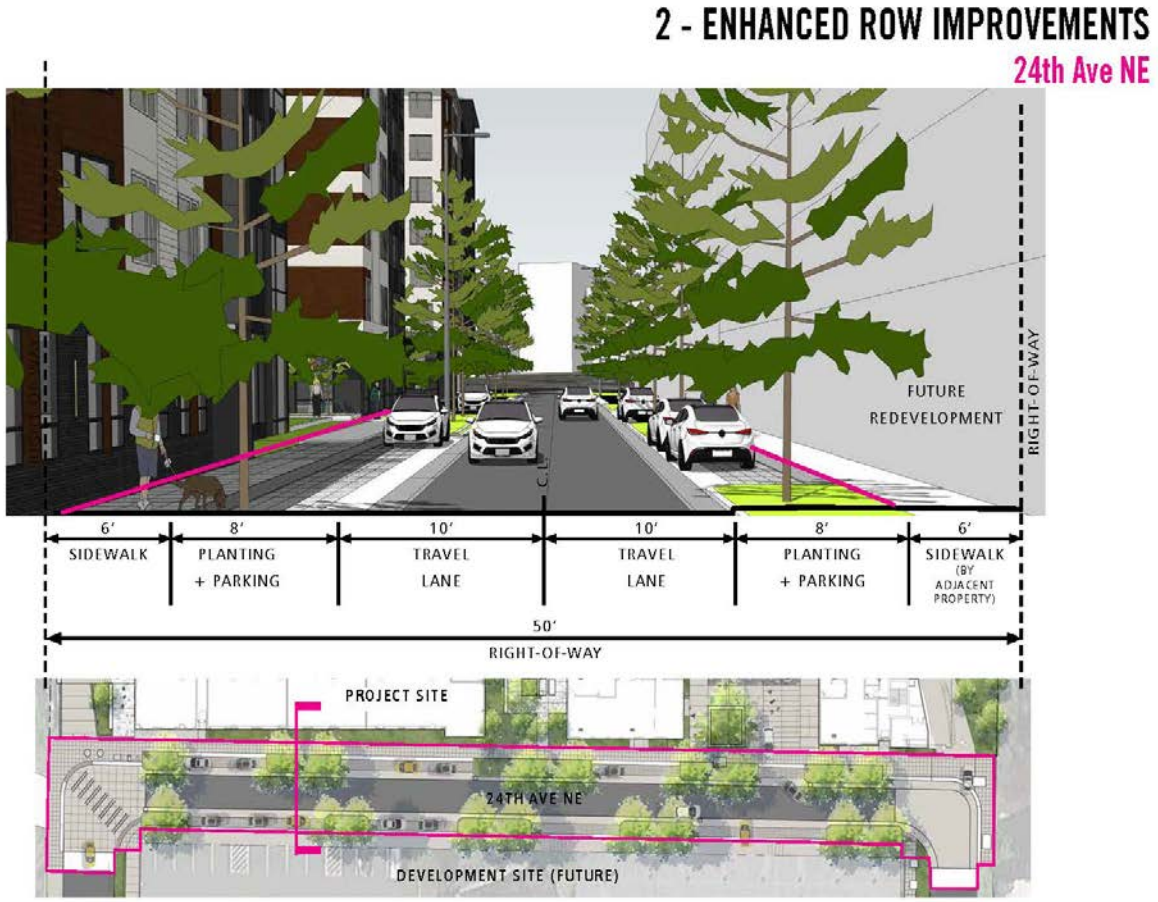
Presentation overview

- What is right-of-way (ROW)
- Street Vacations
  - Background
  - Process
  - 2018 Policy Revisions
    - Public trust/benefit analysis
    - Project examples
  - How vacations change Seattle
- Term Permits
  - Background
  - Project examples

What is right-of-way

Right of way is property that has been dedicated or acquired for public transportation and utility use

SDOT manages the right of way for the public interest through the Street Vacation and Term permit programs



Vacation background

City Council decision per State law

Policies affirm City's goal to retain ROW; promotes consistency; and balances public trust, land use, mitigation & public benefit

Streets held in public trust

City acts as trustee

No rights to vacate

No right to acquire ROW

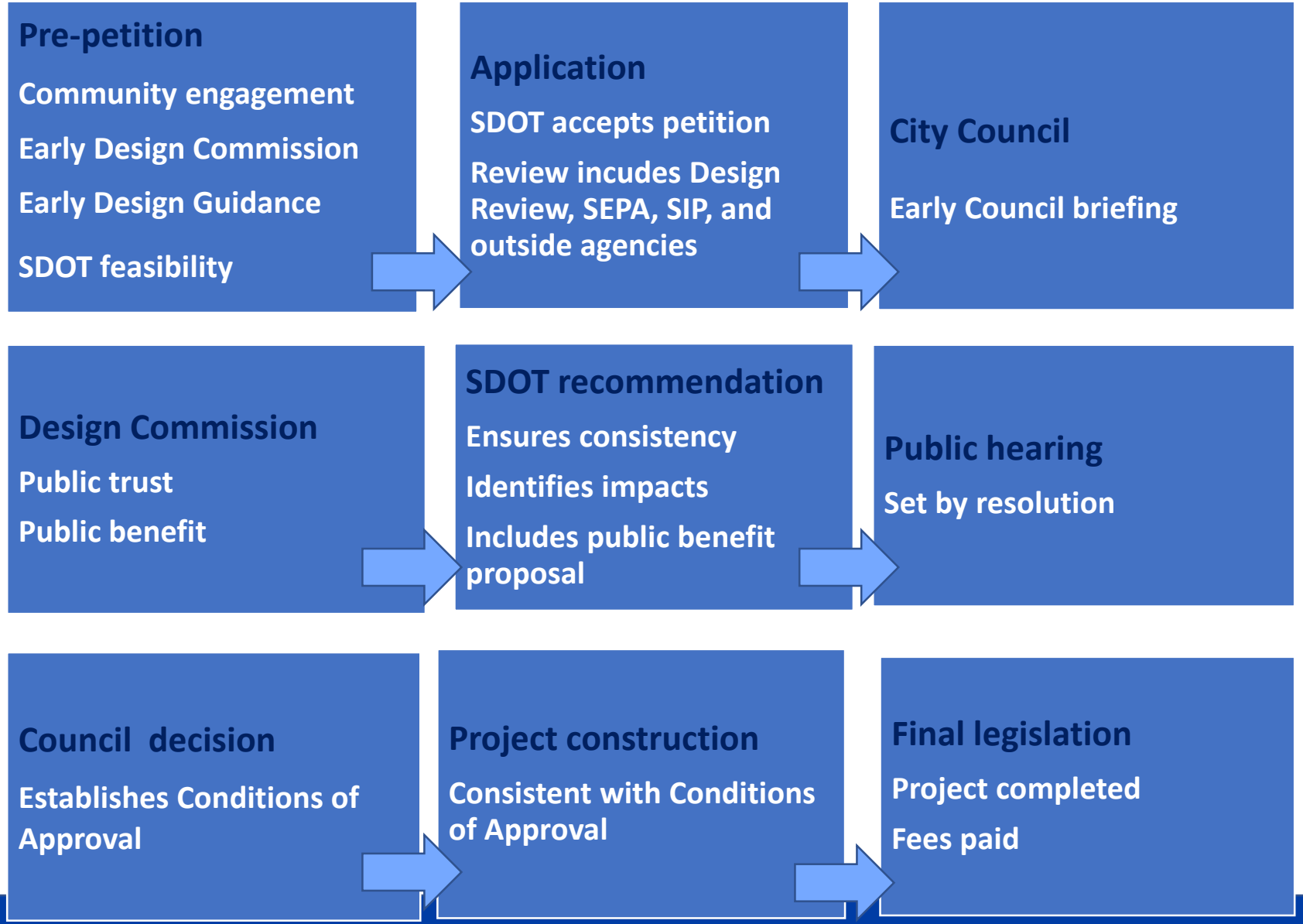
Vacation process

Adjacent property owners request ROW for private development

Developer obligations

Address transportation & land use impacts; provide public benefit; pay fair market value

Process


Pre-petition
Community engagement
Early Design Commission
Early Design Guidance
SDOT feasibility
Application
SDOT accepts petition
Review incudes Design Review, SEPA, SIP, and outside agencies
City Council
Early Council briefing
Design Commission
Public trust
Public benefit
SDOT recommendation
Ensures consistency
Identifies impacts
Includes public benefit proposal
Public hearing
Set by resolution
Council decision
Establishes Conditions of Approval
Project construction
Consistent with Conditions of Approval
Final legislation
Project completed
Fees paid

2018 Key vacation policy revisions

Community engagement

Required community engagement plans; early Design Commission review; early Council review

Process updates

Ties public trust to both transportation & land use

Expands public benefit menu

Job training, human services; community agreements; addressing social equity

Analysis

Effects on disadvantaged communities; increased protection for free speech & freedom of assembly; public benefit must consider race & social equity

Public trust analysis

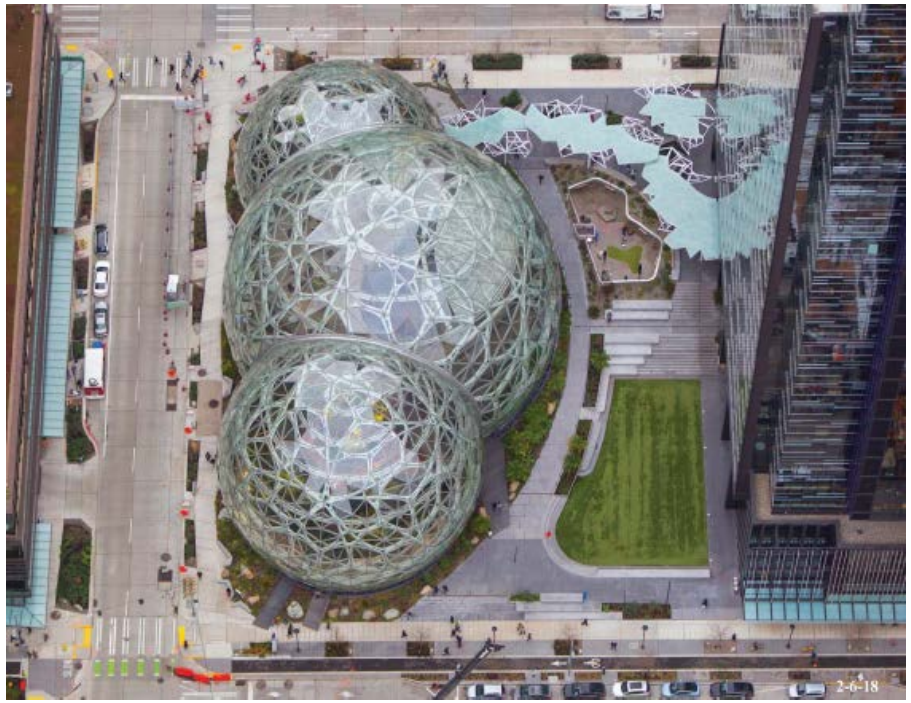
Based on role of streets and alleys:

1. Circulation
2. Access
3. Utilities
4. Free Speech
5. Public Assembly
6. Open Space
7. Light and Air
8. Views
9. Land Use and Urban Form

Project example

Before vacation

After development



Amazon spheres on 7th Avenue

Public benefit analysis

The intent of the public benefit analysis is to ensure that adequate public benefits will be provided to offset the loss to the public of the public trust functions. Public benefits include:

✓Creating or enhancing public spaces,

✓Public art,

✓Enhancing the pedestrian or bicycle environment,

✓Support City goals for race and social equity,

✓View easements or corridors,

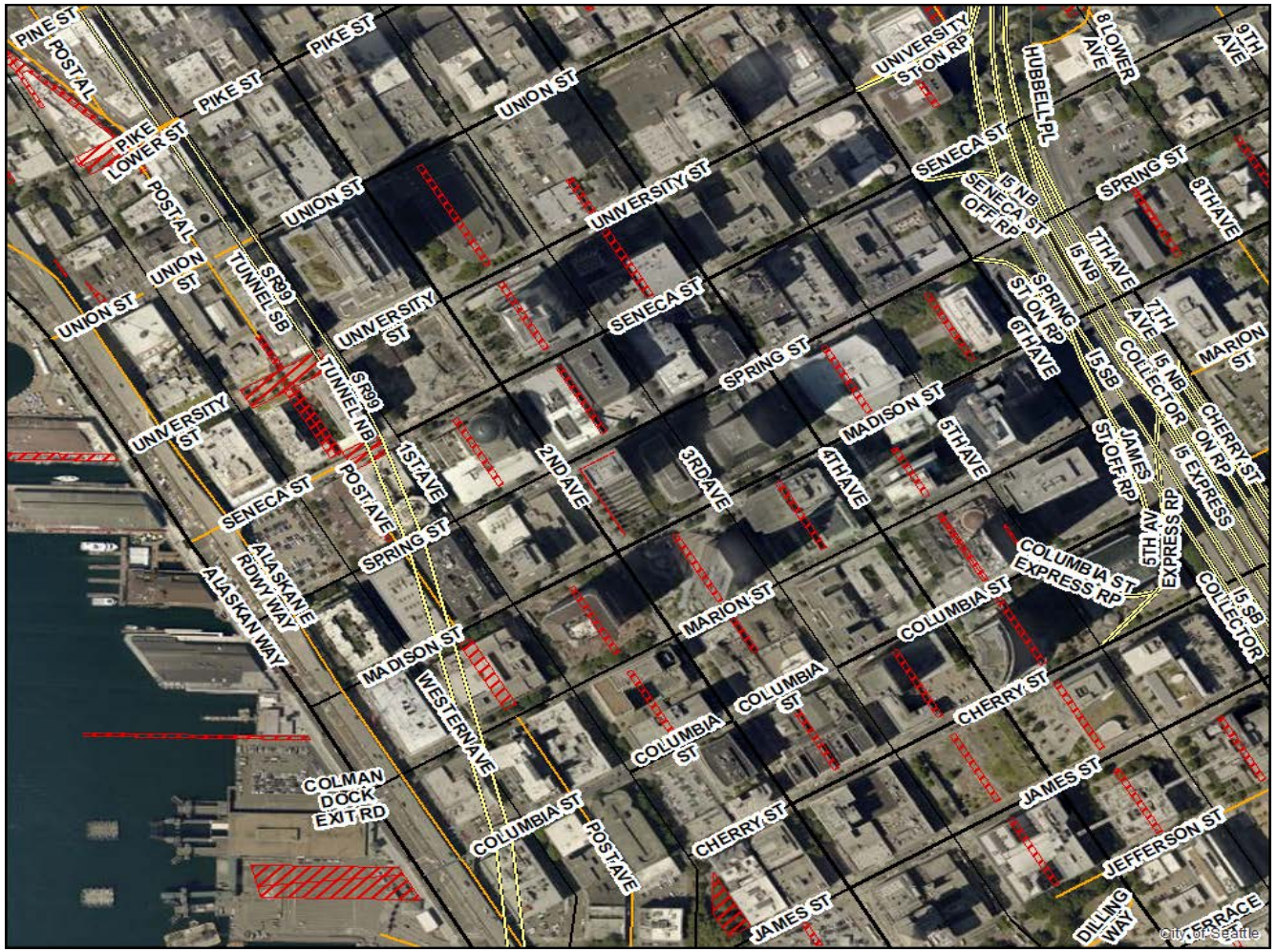
✓Preserving landmarks, or

✓Implementing an element from an adopted Neighborhood Plan or other City Plan.

Public benefit example

Public plaza at Lennar development on Seneca Street

How vacations changed downtown Seattle



Term Permit Background

What are term permits?

- Term permits are Council-approved ordinances for significant private structures in the ROW (e.g. skybridges, pedestrian tunnels, private utility/data conduits)
  - Ordinance sets term length, annual fee, insurance/bond and other public benefit conditions

- Seattle Municipal Code (SMC) Chapters 15.64 (skybridge) and 15.65 (significant structures) describe process and review criteria
  - 15.64 states that the City shall limit the proliferation of skybridges

Background

SDOT reviews and transmits legislation and recommendation to City Council

Legislation may include:

- Resolution – early conceptual approval
- Term Permit Ordinance – conditions and owner obligations
  - New structures
  - Existing structures
    - Term permit expiration – review as new term permit ordinance
    - Term permit renewal – may amend existing term permit ordinance or SDOT may renew administratively

City Council reviews and decides whether to approve, deny or modify legislation

Examples of term permit projects

Virginia Mason Skybridge

Ivar's Patio

China Gate

Questions?

beverly.barnett@seattle.gov | (206)-684-7564
amy.gray@seattle.gov | (206) 386-4638

www.seattle.gov/transportation

File #: CB 119745, **Version:** 1

CITY OF SEATTLE

ORDINANCE _____

COUNCIL BILL _____

AN ORDINANCE granting the University of Washington (UW) permission to maintain and operate five existing pedestrian skybridges located around the perimeter of the UW campus as a Campus Pedestrian Skybridge Network, for a ten-year term; specifying the conditions under which this permit is granted; providing for the acceptance of the permit and conditions; and ratifying and confirming certain prior acts.

WHEREAS, the University of Washington (UW) has applied for permission to maintain and operate five existing skybridges located over and across 15th Avenue Northeast, Montlake Boulevard, and Northeast Pacific Street as a "Campus Pedestrian Skybridge Network"; and

WHEREAS, the five existing skybridges were previously approved by Ordinance 109007, Ordinance 111250, Ordinance 118346, and Ordinance 118347; and

WHEREAS, the University of Washington is obligated to meet all of the terms and conditions in each approved ordinance, including payment of annual fees, maintenance, and bonding obligations until such time as the permits are renewed by ordinance, the skybridges are removed or the Seattle Department of Transportation Director certifies that the University of Washington is no longer obligated by the conditions contained in this or any other authorizing ordinance; and

WHEREAS, the permission granted in Ordinance 109007 expired in 2010, the permission granted in Ordinance 111250 expired in 2013, the permission granted in Ordinance 118346 expired in 2014, and the permission granted in Ordinance 118347 expired in 2013; and

WHEREAS, the City supports a joint permit for the Campus Pedestrian Skybridge Network and the least impactful installations in the public place, including the removal of the Campus Pedestrian Skybridge

Network, or any individual pedestrian skybridge, in the future, if feasible; and

WHEREAS, currently the 15th Avenue Northeast Skybridge provides an east-west connection over 15th Avenue Northeast between the central campus and the Henry Art Gallery on the east and the UW Administration Building, Campus Parkway transit center, and adjacent businesses and residence halls on the west; the Pacific/Hitchcock Skybridge provides a north-south connection over Northeast Pacific Street between the Burke-Gilman Trail, central campus, and Kincaid Hall to the north and Hitchcock Hall on the south campus; the Pacific/T-Wing Skybridge provides a north-south connection over Northeast Pacific Street between the Burke-Gilman Trail and Garfield Lane of the central campus and the Magnuson Health Sciences Center on the south campus; and the Montlake/Wahkiakum Skybridge and Montlake/Whatcom Skybridge provide east-west connections over Montlake Boulevard Northeast between the Burke-Gilman Trail on the central campus and the parking lots at the UW athletic complex; and

WHEREAS, the University of Washington presented the Campus Pedestrian Skybridge Network and proposed public benefit to the Seattle Design Commission on January 21, 2016. The Seattle Design Commission recommended approval of the Campus Pedestrian Skybridge Network and proposed public benefit mitigation, including the improvements to the Burke-Gilman Trail; and

WHEREAS, the adoption of this ordinance is the culmination of the approval process for the five existing skybridges described above to legally occupy a portion of the public place; NOW, THEREFORE,

BE IT ORDAINED BY THE CITY OF SEATTLE AS FOLLOWS:

Section 1. **Permission.** Subject to the terms and conditions of this ordinance, The City of Seattle ("City") grants permission (also referred to in this ordinance as a permit) to the University of Washington, and its successors and assigns as approved by the Director of the Seattle Department of Transportation ("Director") according to Section 14 of this ordinance (the party named above and each such approved successor and assign are referred to as "Permittee"), to maintain and operate five existing pedestrian skybridges and related

appurtenances, collectively referred to as the "Campus Pedestrian Skybridge Network," specifically limited to the following:

(a) 15th Avenue Northeast skybridge located over and across 15th Avenue Northeast, approximately 84 feet north of the centerline of Northeast Campus Parkway;

(b) Pacific/Hitchcock skybridge located over and across Northeast Pacific Street, north of the Hitchcock Building, approximately 450 feet east of 15th Avenue Northeast;

(c) Pacific/T-Wing skybridge located over and across Northeast Pacific Street, north of the Magnuson Health Sciences Center, approximately 1,250 feet west of Montlake Boulevard Northeast;

(d) Montlake/Wahkiakum skybridge located over and across Montlake Boulevard Northeast, north of the University of Washington track facilities, between Northeast Pacific Street and Northeast 45th Street; and

(e) Montlake/Whatcom skybridge located over and across Montlake Boulevard Northeast, north of the University of Washington sports fields, between Northeast Pacific Street and Northeast 45th Street.

Conditions of this ordinance shall apply retroactively to the expiration of the expired authorizing ordinances.

Section 2. **Term.** The permission granted to Permittee is for a term of ten years starting on the effective date of this ordinance and ending at 11:59 p.m. on the last day of the tenth year. Upon written application made by the Permittee at least 180 days before expiration of the term, the Director or City Council may, as set forth in Section 3, renew the permit twice, each for a successive ten-year term, subject to the right of the City to require the removal of the Campus Pedestrian Skybridge Network, or any individual skybridge, or to revise by ordinance any of the terms and conditions of the permission granted by this ordinance. The total term of the permission as originally granted, including renewals, shall not exceed 30 years.

Section 3. **Basis for renewal**. The Permittee shall provide to the City, by the end of the eighth year of the initial term, an analysis and evaluation of the necessity of all skybridge campus connections, with specific attention to the 15th Avenue Northeast and Pacific/Hitchcock bridge crossings; an evaluation and analysis of

any feasible at-grade crossing alternatives to the Campus Pedestrian Skybridge Network; an evaluation and analysis of combining the Montlake/Wahkiakum and Montlake/Whatcom skybridges located over and across Montlake Boulevard Northeast into one pedestrian crossing; identify means to address Americans with Disabilities Act (ADA) compliance standards for all skybridges; and include a recommended timeline for addressing any proposed work. The Director, in reviewing the application for renewal, shall make the application decision based on the Permittee's evaluation, analysis, and recommendations. If the Director accepts the recommendation, or determines that additional modifications to or removal of the Campus Pedestrian Skybridge Network or any individual skybridge is required, the Permittee will be provided with a written determination and given a timeline for making the modifications or removals. Nothing in this section impairs the rights of the City Council and the Director under other sections of this ordinance, including to require removal of the Campus Pedestrian Skybridge Network, or any individual skybridge, pursuant to Section 5 of this ordinance.

Section 4. **Protection of utilities.** The permission granted is subject to the Permittee bearing the expense of any protection, support, or relocation of existing utilities deemed necessary by the owners of the utilities, and the Permittee being responsible for any damage to the utilities due to the construction, repair, reconstruction, maintenance, operation, or removal of the Campus Pedestrian Skybridge Network, or any individual skybridge, and for any consequential damages that may result from any damage to utilities or interruption in service caused by any of the foregoing.

Section 5. **Removal for public use or for cause.** The permission granted is subject to use of the street right-of-way or other public place (collectively, "public place") by the City and the public for travel, utility purposes, and other public uses or benefits. The City expressly reserves the right to deny renewal, or terminate the permission at any time prior to expiration of the initial term or any renewal term, and require the Permittee to remove the Campus Pedestrian Skybridge Network, or any individual skybridge, or any part thereof or installation on the public place, at the Permittee's sole cost and expense, in the event that:

(a) The City Council determines by ordinance that the space occupied by the Campus Pedestrian Skybridge Network, or any individual skybridge, or any portion of the entire Campus Pedestrian Skybridge Network is necessary for any public use or benefit or that any portion of the Campus Pedestrian Skybridge Network, or any individual skybridge, interferes with any public use or benefit; or

(b) The Director determines that use of the Campus Pedestrian Skybridge Network, or any individual skybridge, has been abandoned; or

(c) The Director determines that any term or condition of this ordinance has been violated, and the violation has not been corrected by the Permittee by the compliance date after a written request by the City to correct the violation (unless a notice to correct is not required due to an immediate threat to the health or safety of the public).

Should the City Council determine that the Campus Pedestrian Skybridge Network, or any individual skybridge, in whole or any portion thereof, is needed for or interferes with a public use or benefit, this determination is conclusive and final without any right of the Permittee to resort to the courts to adjudicate the matter.

Section 6. **Permittee's obligation to remove and restore.** If the permission granted expires without an application for a new permission being granted, or if the City terminates the permission, then within 90 days after the expiration or termination of the permission, or prior to any earlier date stated in an ordinance or order requiring removal of the entire Campus Pedestrian Skybridge Network or any portion, or any individual skybridge, the Permittee shall, at its own expense, remove any portion, in whole or in part, of the Campus Pedestrian Skybridge Network, or any individual skybridge, and all of the Permittee's equipment and property from the public place and replace and restore all portions of the public place that may have been disturbed for any part of the Campus Pedestrian Skybridge Network, or any individual skybridge, in as good condition for public use as existed prior to construction of the Campus Pedestrian Skybridge Network and in at least as good condition in all respects as the abutting portions of the public place as required by Seattle Department of

Transportation (SDOT) right-of-way restoration standards.

Failure to remove the Campus Pedestrian Skybridge Network, or any individual skybridge, as required by this section is a violation of Chapter 15.90 of the Seattle Municipal Code (SMC) or successor provision; however, applicability of Chapter 15.90 does not eliminate any remedies available to the City under this ordinance or any other authority. If the Permittee does not timely fulfill its obligations under this section, the City may in its sole discretion remove the Campus Pedestrian Skybridge Network, or any individual skybridge, and restore the public place at the Permittee's expense, and collect such expense in any manner provided by law.

Upon the Permittee's completion of removal and restoration in accordance with this section, or upon the City's completion of the removal and restoration and the Permittee's payment to the City for the City's removal and restoration costs, the Director shall then issue a certification that the Permittee has fulfilled its removal and restoration obligations under this ordinance. Upon prior notice to the Permittee and entry of written findings that it is in the public interest, the Director may, in the Director's sole discretion, conditionally or absolutely excuse the Permittee from compliance with all or any of the Permittee's obligations under this section.

Section 7. **Repair or reconstruction.** The Campus Pedestrian Skybridge Network shall remain the exclusive responsibility of the Permittee and the Permittee shall maintain the Campus Pedestrian Skybridge Network in good and safe condition for the protection of the public. The Permittee shall not reconstruct or repair any portion of the Campus Pedestrian Skybridge Network, or any individual skybridge, except in strict accordance with plans and specifications approved by the Director. The Director may, in the Director's judgment, order any portion of the Campus Pedestrian Skybridge Network, or any individual skybridge, reconstructed or repaired at the Permittee's cost and expense because of: the deterioration or unsafe condition of any portion of the Campus Pedestrian Skybridge Network; the installation, construction, reconstruction, maintenance, operation, or repair of any municipally owned public utilities; or any other cause.

Section 8. **Failure to correct unsafe condition.** After written notice to the Permittee and failure of the

Permittee to correct an unsafe condition within the time stated in the notice, the Director may order any portion of the Campus Pedestrian Skybridge Network, or any individual skybridge, be closed or removed at the Permittee's expense if the Director deems that any portion of the Campus Pedestrian Skybridge Network, or any individual skybridge, has become unsafe or creates a risk of injury to the public. If there is an immediate threat to the health or safety of the public, a notice to correct is not required.

Section 9. **Continuing obligations.** Notwithstanding termination or expiration of the permission granted, or closure or removal of the Campus Pedestrian Skybridge Network, or any individual skybridge, the Permittee shall remain bound by all of its obligations under this ordinance until the Director has issued a certification that the Permittee has fulfilled its removal and restoration obligations under Section 6 of this ordinance. Notwithstanding the issuance of that certification, the Permittee shall continue to be bound by the obligations in Section 10 of this ordinance and shall remain liable for any unpaid fees assessed under Section 15 or Section 17 of this ordinance.

Section 10. **Release, hold harmless, indemnification, and duty to defend.** The Permittee, by accepting the terms of this ordinance, releases the City, its officials, officers, employees, and agents from any and all claims, actions, suits, liability, loss, costs, expense, attorneys' fees, or damages of every kind and description arising out of or by reason of any portion of the Campus Pedestrian Skybridge Network, or any individual skybridge, or this ordinance, including but not limited to claims resulting from injury, damage, or loss to the Permittee or the Permittee's property.

The Permittee agrees to at all times defend, indemnify, and hold harmless the City, its officials, officers, employees, and agents from and against all claims, actions, suits, liability, loss, costs, expense, attorneys' fees, or damages of every kind and description, excepting only damages that may result from the sole negligence of the City, that may accrue to, be asserted by, or be suffered by any person or property including, without limitation, damage, death, or injury to members of the public or to the Permittee's officers, agents, employees, contractors, invitees, tenants, tenants' invitees, licensees, or successors and assigns, arising out of or by reason

of:

(a) The existence, condition, construction, reconstruction, modification, maintenance, operation, use, or removal of the Campus Pedestrian Skybridge Network or any portion thereof, or the use, occupation, or restoration of the public place or any portion thereof by the Permittee or any other person or entity;

(b) Anything that has been done or may at any time be done by the Permittee by reason of this ordinance; or

(c) The Permittee failing or refusing to strictly comply with every provision of this ordinance; or arising out of or by reason of any portion of the Campus Pedestrian Skybridge Network or this ordinance in any other way.

If any suit, action, or claim of the nature described above is filed, instituted, or begun against the City, the Permittee shall upon notice from the City defend the City, with counsel acceptable to the City, at the sole cost and expense of the Permittee, and if a judgment is rendered against the City in any suit or action, the Permittee shall fully satisfy the judgment within 90 days after the action or suit has been finally determined, if determined adversely to the City. If it is determined by a court of competent jurisdiction that Revised Code of Washington (RCW) 4.24.115 applies to this ordinance, then in the event claims or damages are caused by or result from the concurrent negligence of the City, its agents, contractors, or employees, and the Permittee, its agents, contractors, or employees, this indemnity provision shall be valid and enforceable only to the extent of the negligence of the Permittee or the Permittee's agents, contractors, or employees.

Section 11. **Insurance.** For as long as the Permittee exercises any permission granted by this ordinance and until the Director has issued a certification that the Permittee has fulfilled its removal and restoration obligations under Section 6 of this ordinance, the Permittee shall obtain and maintain in full force and effect, at its own expense, insurance and/or self-insurance that protects the Permittee and the City from claims and risks of loss from perils that can be insured against under commercial general liability (CGL) insurance policies in conjunction with:

(a) Construction, reconstruction, modification, operation, maintenance, use, existence, or removal of the Campus Pedestrian Skybridge Network or any portion thereof, as well as restoration of any disturbed areas of the public place in connection with removal of any portion of the Campus Pedestrian Skybridge Network;

(b) The Permittee's activity upon or the use or occupation of the public place described in Section 1 of this ordinance; and

(c) Claims and risks in connection with activities performed by the Permittee by virtue of the permission granted by this ordinance.

Minimum insurance requirements are CGL insurance written on an occurrence form at least as broad as the Insurance Services Office (ISO) CG 00 01. The City requires insurance coverage to be placed with an insurer admitted and licensed to conduct business in Washington State or with a surplus lines carrier pursuant to chapter 48.15 RCW. If coverage is placed with any other insurer or is partially or wholly self-insured, such insurer(s) or self-insurance is subject to approval by the City's Risk Manager.

Minimum limits of liability shall be $2,000,000 per Occurrence; $4,000,000 General Aggregate; $2,000,000 Products/Completed Operations Aggregate, including Premises Operations; Personal/Advertising Injury; Contractual Liability. Coverage shall include "The City of Seattle, its officers, officials, employees, and agents" as additional insureds for primary and non-contributory limits of liability subject to a Separation of Insureds clause.

Within 60 days after the effective date of this ordinance, the Permittee shall provide to the City, or cause to be provided, certification of insurance coverage including an actual copy of the blanket or designated additional insured policy provision per the ISO CG 20 12 endorsement or equivalent. The insurance coverage certification shall be delivered or sent to the Director or to SDOT at an address as the Director may specify in writing from time to time. The Permittee shall provide a certified complete copy of the insurance policy to the City promptly upon request.

If the Permittee is self-insured, a letter of certification from the Corporate Risk Manager may be

submitted in lieu of the insurance coverage certification required by this ordinance, if approved in writing by the City's Risk Manager. The letter of certification must provide all information required by the City's Risk Manager and document, to the satisfaction of the City's Risk Manager, that self-insurance equivalent to the insurance requirements of this ordinance is in force. After a self-insurance certification is approved, the City may from time to time subsequently require updated or additional information. The approved self-insured Permittee must provide 30 days' prior notice of any cancellation or material adverse financial condition of its self-insurance program. The City may at any time revoke approval of self-insurance and require the Permittee to obtain and maintain insurance as specified in this ordinance.

In the event that the Permittee assigns or transfers the permission granted by this ordinance, the Permittee shall maintain in effect the insurance required under this section until the Director has approved the assignment or transfer pursuant to Section 14 of this ordinance.

Section 12. **Contractor insurance.** The Permittee shall contractually require that any and all of its contractors performing work on any premises contemplated by this permit name "The City of Seattle, its officers, officials, employees and agents" as additional insureds for primary and non-contributory limits of liability on all CGL, Automobile and Pollution liability insurance and/or self-insurance. The Permittee shall also include in all contract documents with its contractors a third-party beneficiary provision extending to the City construction indemnities and warranties granted to the Permittee.

Section 13. **Adjustment of insurance and bond requirements.** The Director may adjust minimum liability insurance levels and surety bond requirements during the term of this permission. If the Director determines that an adjustment is necessary to fully protect the interests of the City, the Director shall notify the Permittee of the new requirements in writing. The Permittee shall, within 60 days of the date of the notice, provide proof of the adjusted insurance and surety bond levels to the Director.

Section 14. **Consent for and conditions of assignment or transfer.** The permission granted by this ordinance shall not be assignable or transferable by operation of law; nor shall the Permittee transfer, assign,

mortgage, pledge, or encumber the same without the Director's consent, which the Director shall not unreasonably refuse. The Director may approve assignment or transfer of the permission granted by this ordinance to a successor entity only if the successor or assignee has accepted in writing all of the terms and conditions of the permission granted by this ordinance; has provided, at the time of the acceptance, the bond and certification of insurance coverage required under this ordinance; and has paid any fees due under Section 17 of this ordinance. Upon the Director's approval of an assignment or transfer, the rights and obligations conferred on the Permittee by this ordinance shall be conferred on the successors and assigns. Any person or entity seeking approval for an assignment or transfer of the permission granted by this ordinance shall provide the Director with a description of the current and anticipated use of the Campus Pedestrian Skybridge Network, or any individual skybridge.

Section 15. **Inspection fees.** The Permittee shall, as provided by SMC Chapter 15.76 or successor provision, pay the City the amounts charged by the City to inspect the Campus Pedestrian Skybridge Network or any portion thereof during reconstruction, repair, annual safety inspections, and at other times deemed necessary by the City. An inspection or approval of the Campus Pedestrian Skybridge Network, or any individual skybridge, by the City shall not be construed as a representation, warranty, or assurance to the Permittee or any other person as to the safety, soundness, or condition of the Campus Pedestrian Skybridge Network, or any individual skybridge. Any failure by the City to require correction of any defect or condition shall not in any way limit the responsibility or liability of the Permittee.

Section 16. **Inspection reports.** The Permittee shall submit to the Director, or to SDOT at an address specified by the Director, an inspection report that:

(a) Describes the physical dimensions and condition of all load-bearing elements;

(b) Describes any damages or possible repairs to any element of the Campus Pedestrian Skybridge Network, or any individual skybridge;

(c) Prioritizes all repairs and establishes a timeframe for making repairs; and

(d) Is stamped by a professional structural engineer licensed in the State of Washington.

A report meeting the foregoing requirements shall be submitted within 60 days after the effective date of this ordinance; subsequent reports shall be submitted every two years, within 30 days prior to the anniversary date of the last inspection report; provided that, in the event of a natural disaster or other event that may have damaged the Campus Pedestrian Skybridge Network, or any individual skybridge, the Director may require that additional reports be submitted by a date established by the Director. The Permittee has the duty of inspecting and maintaining the Campus Pedestrian Skybridge Network, or any individual skybridge. The responsibility to submit structural inspection reports periodically or as required by the Director does not waive or alter any of the Permittee's other obligations under this ordinance. The receipt of any reports by the Director shall not create any duties on the part of the Director. Any failure by the Director to require a report, or to require action after receipt of any report, shall not waive or limit the obligations of the Permittee.

Section 17. **Annual fee.** Beginning on the effective date of this ordinance, and annually thereafter, the Permittee shall promptly pay to the City, upon statements or invoices issued by the Director, an annual fee consistent with the Street Use fee schedule. This includes an issuance fee, annual renewal fee, and $36,816.40 occupation fee, or as adjusted annually thereafter, for the privileges granted by this ordinance. The first year Annual Occupation Fee is for all five of the existing skybridges that currently comprise the Campus Pedestrian Skybridge Network. Individually, the first annual Occupation Fee for each skybridge is:

(a) 15th Avenue Northeast skybridge is $2,193.60;

(b) Pacific/Hitchcock skybridge is $3,345.60;

(c) Pacific/T-Wing skybridge is $26,254.80;

(d) Montlake/Wahkiakum skybridge is $2,803.20; and

(e) Montlake/Whatcom skybridge is $2,219.20.

If any of the existing skybridges are removed, the Annual Occupation Fee shall be adjusted accordingly.

Adjustments to the Annual Renewal and Occupation fees shall be made in accordance with a term

permit fee schedule adopted by the City Council and may be made every year. In the absence of a schedule, the Director may only increase or decrease the previous year's fee to reflect any inflationary changes so as to charge the fee in constant dollar terms. This adjustment will be calculated by adjusting the previous year's fee by the percentage change between the two most recent year-end values available for the Consumer Price Index for the Seattle-Tacoma-Bellevue Area, All Urban Consumers, All Products, Not Seasonally Adjusted. All payments shall be made to the City Finance Director for credit to the Transportation Fund.

Section 18. **Compliance with other laws.** Permittee shall construct, maintain, and operate the Campus Pedestrian Skybridge Network, and any individual skybridge, in compliance with all applicable federal, state, County, and City laws and regulations. Without limitation, in all matters pertaining to the Campus Pedestrian Skybridge Network, or any individual skybridge, the Permittee shall comply with the City's laws prohibiting discrimination in employment and contracting including the Seattle Fair Employment Practices Ordinance, SMC Chapter 14.04, and the Fair Contracting Practices Code, SMC Chapter 14.10 (or successor provisions).

Section 19. **Acceptance of terms and conditions.** The Permittee shall deliver to the Director its written signed acceptance of the terms of this ordinance within 60 days after the effective date of this ordinance. The Director shall file the written acceptance with the City Clerk. If no such acceptance is received within that 60-day period, the privileges conferred by this ordinance shall be deemed declined or abandoned and the permission granted deemed lapsed and forfeited and the Permittee shall, at its own expense, remove the Campus Pedestrian Skybridge Network, or any individual skybridge, and all of the Permittee's equipment and property and replace and restore all portions of the public place as provided in Section 6 of this ordinance.

Section 20. **Public benefit mitigation.** In consideration of this ordinance, Permittee constructed improvements of a 1.8-mile segment of the Burke-Gilman Trail located between Pacific Street and Rainier Vista as the public benefit mitigation. These improvements include:

1. Widening the trail width from 14 feet to 21 feet;
2. Separating pedestrians and bike users;

3. Providing bicycle shelters and new trail furnishings;

4. Creating "mixing zones" to consolidate intersection points on the trail, including bicycle parking;

5. Replacing non-ADA compliant connections with universal access infrastructure, including ADA improvements at the Pacific/Hitchcock and Pacific/T-Wing skybridges;

6. Installing new transit plaza on Northeast Pacific Street, with improved security features;

7. Installing new vertical circulation between the trail and the overpass of Pacific Street and transit plaza;

8. Installing signalization and crosswalk improvements on 15th Avenue Northeast; and

9. Improving sightlines, lighting levels, and other principles of "Crime Prevention Through Environmental Design."

Permittee shall maintain these elements in good and safe condition for as long as the Campus Pedestrian Skybridge Network, or any individual skybridge, is in place.

Section 21. **Ratify and confirm.** Any act taken by the City or the Permittee pursuant to the authority and in compliance with the conditions of this ordinance but prior to the effective date of the ordinance is ratified and confirmed.

Section 22. This ordinance shall take effect and be in force 30 days after its approval by the Mayor, but if not approved and returned by the Mayor within ten days after presentation, it shall take effect as provided by Seattle Municipal Code Section 1.04.020.

Passed by the City Council the _____ day of _____, 2020, and signed by me in open session in authentication of its passage this _____ day of _____, 2020.

_____

President _____ of the City Council

Approved by me this _____ day of _____, 2020.

_____

Jenny A. Durkan, Mayor

Filed by me this _____ day of _____, 2020.

_____

Monica Martinez Simmons, City Clerk

(Seal)

SUMMARY and FISCAL NOTE*

Department:	Dept. Contact/Phone:	CBO Contact/Phone:
Seattle Department of Transportation	Amy Gray/206-386-4638	Christie Parker/206-684-5211

1. BILL SUMMARY

Legislation Title:
AN ORDINANCE granting the University of Washington (UW) permission to maintain and operate five existing pedestrian skybridges located around the perimeter of the UW campus as a Campus Pedestrian Skybridge Network, for a ten-year term; specifying the conditions under which this permit is granted; providing for the acceptance of the permit and conditions; and ratifying and confirming certain prior acts.

Summary and background of the Legislation:
This legislation will allow the University of Washington to continue maintaining and operating the five existing pedestrian skybridges: the 15th Ave NE skybridge, the Pacific/Hitchcock skybridge, the Pacific/T-Wing skybridge, the Montlake Wahkiakum skybridge, and the Montlake Whatcom skybridge. The five skybridges are permitted through separate term permit ordinances and this legislation would bring all of them under one permit for a "Campus Pedestrian Skybridge Network."

The Campus Pedestrian Skybridge Network permit is for a period of ten years, commencing on the effective date of the ordinance. The permit may be extended for two successive 10-year terms provided that the University of Washington complete an analysis of the necessity of all the campus skybridge connections. This analysis shall include an evaluation of removing the 15th Avenue NE and Pacific/Hitchcock bridge crossings. It shall also include an evaluation of combining the two bridges that cross Montlake Boulevard NE and identify means to address Americans with Disabilities Act compliance standards for all the skybridges.

The legislation specifies the conditions under which permission is granted, including its obligation to maintain improvements to a 1.8-mile segment of the Burke Gilman Trail.

2. CAPITAL IMPROVEMENT PROGRAM

Does this legislation create, fund, or amend a CIP Project? ___ Yes _X_ No

3. SUMMARY OF FINANCIAL IMPLICATIONS

Does this legislation amend the Adopted Budget? _X_ Yes ___ No

Appropriation change ($):	**General Fund $**		**Other $**	
	2020	**2021**	**2020**	**2021**
Estimated revenue change ($):	**Revenue to General Fund**		**Revenue to Other Funds**	
	2020	**2021**	**2020**	**2021**
			$36,816.40	**TBD**
Positions affected:	**No. of Positions**		**Total FTE Change**	
	2020	**2021**	**2020**	**2021**

Does the legislation have other financial impacts to the City of Seattle that are not reflected in the above, including direct or indirect, short-term or long-term costs?
No.

Is there financial cost or other impacts of *not* implementing the legislation?
If the legislation is not enacted by the City Council, the City of Seattle will not receive the 2020 annual fee of $36,816.40

3.a. Appropriations

___ **This legislation adds, changes, or deletes appropriations.**

3.b. Revenues/Reimbursements

_X_ **This legislation adds, changes, or deletes revenues or reimbursements.**

Anticipated Revenue/Reimbursement Resulting from this Legislation:

Fund Name and Number	Dept	Revenue Source	2020 Revenue	2021 Estimated Revenue
Transportation Fund	SDOT	Annual Fee	$36,816.40	TBBD
TOTAL			**$36,816.40**	

Is this change one-time or ongoing?
Ongoing

Revenue/Reimbursement Notes:
The 2020 fee is based on the 2020 land value as assessed by King County.

3.c. Positions

____ **This legislation adds, changes, or deletes positions.**

4. OTHER IMPLICATIONS

a. Does this legislation affect any departments besides the originating department?
No.

b. Is a public hearing required for this legislation?
No.

c. Does this legislation require landlords or sellers of real property to provide information regarding the property to a buyer or tenant?
No.

d. Is publication of notice with *The Daily Journal of Commerce* and/or *The Seattle Times* required for this legislation?
No,

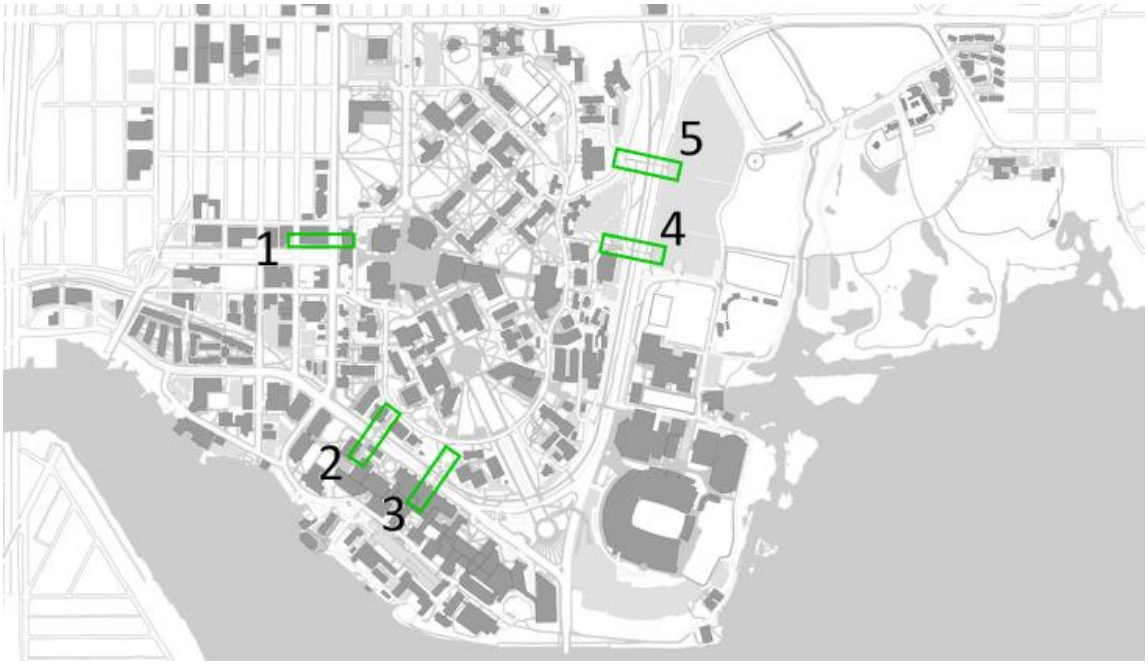
e. Does this legislation affect a piece of property?
Yes, the property legally described in Section 1 of the Council Bill.

f. Please describe any perceived implication for the principles of the Race and Social Justice Initiative. Does this legislation impact vulnerable or historically disadvantaged communities? What is the Language Access plan for any communications to the public?
There are no perceived implications for the principles of the Race and Social Justice Initiative. This legislation does not impact vulnerable or historically disadvantaged communities.

g. If this legislation includes a new initiative or a major programmatic expansion: What are the specific long-term and measurable goal(s) of the program? How will this legislation help achieve the program's desired goal(s).
N/A

List attachments/exhibits below:
Summary Attachment A – University of Washington Skybridges Area Map
Summary Attachment B – University of Washington Skybridges Photos
Summary Attachment C – University of Washington Skybridges Annual Fee Assessment Summary

Attachment A – University of Washington Skybridges Area Map



1. 15th Ave Skybridge
2. Pacific/Hitchcock Skybridge
3. Pacific/T-Wing Skybridge
4. Montlake Wahkiakum Skybridge
5. Montlake Whatcom Skybridge

Map is for informational purposes only and is not intended to modify or supplement the legal description(s).

Attachment B – University of Washington Skybridges Photos

15th Ave NE

Pacific/Hitchcock

Pacific/T-Wing

Montlake/Wahkiakum

Montlake/Whatcom

Attachment C – UW Skybridge Annual Fee Assessment Summary

STREET USE ANNUAL FEE ASSESSMENT

Date: 12/3/19

Summary:

Combined 2020 Permit Fee: $36,816.40

I. Property Description:

Five existing at-grade pedestrian skybridges:

1. 15th Ave – over and across 15th Ave. The pedestrian skybridge area is **914 sq. ft.**

2. Pacific/Hitchcock – over and across NE Pacific St. The pedestrian skybridge area is **1,384 sq. ft.**

3. Pacific/T-Wing – over and across NE Pacific St. The pedestrian skybridge area is **1,683 sq. ft**

4. Montlake Wahkiakum – over and across Montlake Boulevard. The pedestrian skybridge area is **1,460 sq. ft.**

5. Montlake Whatcom – over and across Montlake Boulevard. The pedestrian skybridge area is **1,460 sq. ft.**

Applicant:
University of Washington

II. Closest Similarly Zoned Parcels, Property Size, Assessed Value:

1. 15th Ave NE Skybridge

   Parcel 4092301725; Lot size: 5,000 square feet

   Tax year 2020 Appraised Land Value: $1,500,000 ($300/square foot)

   Fee Calculation: 914 X $300 X 10% X 8% = $**2,193.60**

   10% is the degree of alienation for public use skybridge

2. Pacific/Hitchcock Skybridge

   Parcel 4092301725; Lot size: 5,000 square feet

   Tax year 2020 Appraised Land Value: $1,500,000 ($300/square foot)

Fee Calculation: 1,394 X $300 X 10% X 8% = $**3,345.60**

10% is the degree of alienation for public use skybridge

3. Pacific/T-Wing Skybridge

Parcel 40923017255; Lot size: 5,000 square feet

Tax year 2020 Appraised Land Value: $1,500,000 ($300/square foot)

Parcel 8823902760; Lot size: 8,640

Tax year 2020 Appraised Land Value: $1,900,800 ($220/square foot)

Average Lot Value by Square Foot - $260

Fee Calculation: 1,683 X $260 X 75% X 8% = **$26,254.80**

75% is the degree of alienation for semi-public use skybridge

4. Montlake Wahkiakum Skybridge

Parcel 4092301725; Lot size: 5,000 square feet

Tax year 2020 Appraised Land Value: $1,500,000 ($300/square foot)

Parcel 7174800710; Lot size: 4,700

Tax year 2020 Appraised Land Value: $846,000 ($180/square foot)

Average Lot Value by Square Foot: $240

Fee Calculation: 1,460 X $240 X 10% X 8% = **$2,803.20**

10% is the degree of alienation for public use skybridge

5. Montlake Whatcom Skybridge

Parcel 0925049435; Lot size: 18,147 square feet

Tax year 2020 Appraised Land Value: $3,629,400 ($200/square foot)

Parcel 7174800710; Lot size: 4,700

Tax year 2020 Appraised Land Value: $846,000 ($180/square foot)

Average Lot Value by Square Foot: $190

Fee Calculation: 1,460 X $190 X 10% X 8% = **$2,219.20**

10% is the degree of alienation for public use skybridge

III. Annual Fee Assessment:

The 2020 permit fee is calculated as follows:

15th Ave Skybridge	$2,193.60
Pacific/Hitchcock Skybridge	$3,345.60
Pacific/T-Wing Skybridge	$26.254.80
Montlake Wahkiakum Skybridge	$2,803.20
Montlake Whatcom Skybridge	$2,219.20
Total Fee	**$36,816.40**

Fee methodology authorized under Ordinance 123485, as amended by Ordinances 123585, 123907, 124532, 125185 and 125452.

March 2, 2020

M E M O R A N D U M

To: Transportation and Utilities Committee Members
From: Lish Whitson, Analyst
Subject: Council Bill 119745: University of Washington Skybridges

On Wednesday, March 4, 2020 the Transportation and Utilities Committee will consider Council Bill (CB) 119745, which would grant approval to maintain five skybridges linking the University of Washington's central campus to other parts of the campus. The CB would grant approval for an initial 10-year term, which can be renewed for two subsequent 10-year terms, up to a total of 30 years. The skybridges are located as follows:

1. One skybridge, the 15th Avenue Bridge, crossing 15th Avenue NE north of NE Campus Parkway, connecting Schmitz Hall to the Henry Art Gallery;
2. Two skybridges, the Pacific/Hitchcock and Pacific/T-Wing bridges, crossing NE Pacific Street, between 15th Avenue Northeast and Northeast Pacific Place, connecting the UW's Medical Center and Health Sciences buildings to the central campus; and
3. Two skybridges, the Montlake/Wahkiakum and Montlake/Whatcom bridges, crossing Montlake Boulevard NE, connecting the central campus to the athletic facilities and parking lots in the east campus.

Because these skybridges each cross a city street, approval must be granted by the City Council pursuant to Seattle Municipal Code (SMC) Chapter 15.64 "Term Permits". Each skybridge was approved under four previous ordinances, whose terms have expired. CB 119745 grants approval for the skybridges for a new term and consolidates all University of Washington skybridge approvals under one bill.

This memorandum summarizes the skybridge approval process and describes the effect of CB 119745, including the terms in CB 119745 that are intended to protect the public's interest.

Skybridge Term Permits

A skybridge is a structure that provides for pedestrian access over a City street or right-of-way. SMC Chapter 15.64 establishes the procedures and criteria for approval of skybridges. The City's general policy is to limit the proliferation of skybridges. When the City grants approval for a skybridge, the City's approval is for a fixed length of time. Generally, the City grants approval for a ten-year term, renewable two times for a total term of thirty years.

SMC 15.64.086.C identifies thirteen considerations for the renewal of skybridge term permits upon the expiration of a term:

1. Adequacy of horizontal and vertical clearance;
2. Any known conflicts with existing or proposed utilities, street lighting, traffic control devices, or other upcoming transportation projects;
3. View blockage;
4. Interruption or interference with existing streetscape or other street amenities;
5. Impacts due to reduction of natural light;
6. Reduction of and effect on pedestrian activity at street level;
7. Number of pedestrians that currently use the skybridge;
8. Effect on commerce and enjoyment of neighboring land uses;
9. Availability of reasonable alternatives;
10. Changed conditions in the vicinity since original installation;
11. Effect on traffic and pedestrian safety;
12. Accessibility for the elderly and handicapped; and
13. The public benefit mitigation elements, or changes to the existing public benefit mitigation elements, provided by the proposal.

Once the Director of the Seattle Department of Transportation (SDOT Director) reviews the term permit renewal petition, the SDOT Director transmits a recommendation to the City Council. The Council's review of the proposal considers the thirteen items noted above. SMC 15.64.087.A describes the conditions under which the Council can approve an application for a skybridge:

> "The City Council shall not approve an application to continue to maintain and operate an existing skybridge upon term expiration unless it finds that continued maintenance and operation of the skybridge is in the public interest and no reasonable alternative to the skybridge exists."

If it determines that it is appropriate to grant a new term for an existing skybridge, the Council may impose terms and conditions on the renewal. The Council must, in its approval of a skybridge term permit, "preserve the right to require the permittee to remove the skybridge at the permittee's sole cost and expense if necessary."

University of Washington Skybridges

There are eight skybridges that connect the University of Washington's central campus to the other parts of the campus. CB 119745 would grant approval of a new term for five of those

skybridges.[1] These skybridges provide pedestrians and bicyclists with connections between the central campus and facilities, dormitories and businesses to the west, south and east of the campus. They allow pedestrians to navigate significant grade changes between the central campus and the surrounding area. And they separate pedestrian activity from principal arterials. The need for each of these skybridges was described in a presentation given to the Seattle Design Commission in 2016.

In 2016, skybridges collectively carried almost 28,000 pedestrians a day, over arterials used by 88,000 vehicles a day. The bridges each provide vertical clearances to accommodate Washington State's tallest vehicles. They do not interfere with view corridors, or interrupt or interfere with existing streetscape or street amenities. Generally, they are located in areas without significant street-level uses. The 15th Avenue bridge provides a connection between the University and the Ave. Of the five skybridges that are the subject of CB 119745, three include stairs. Only the bridges that cross NE Pacific Street are Americans with Disabilities Act (ADA) compliant.

As a public benefit, the University has made improvements to a 1.8-mile segment of the Burke-Gilman Trail located between Pacific Street and Rainier Vista. It will maintain these improvements for the life of the skybridges. These improvements include:

1. Widening the trail width from 14 feet to 21 feet;
2. Separating pedestrians and bike users;
3. Providing bicycle shelters and new trail furnishings;
4. Creating "mixing zones" to consolidate intersection points on the trail, including bicycle parking;
5. Replacing non-ADA compliant connections with universal access infrastructure, including ADA improvements at the Pacific/Hitchcock and Pacific/T-Wing skybridges;
6. Installing new transit plaza on Northeast Pacific Street, with improved security features;
7. Installing new vertical circulation between the trail and the overpass of Pacific Street and transit plaza;
8. Installing signalization and crosswalk improvements on 15th Avenue Northeast; and
9. Improving sightlines, lighting levels, and other principles of "Crime Prevention Through Environmental Design."[2]

[1] The other three skybridges are the Hec Ed Bridge, the Rainier Vista bridge, and a set of bridges owned and operated by Sound Transit that connect to the University of Washington Light Rail Station. These bridges are not affected by this legislation.
[2] Crime Prevention Through Environmental Design is defined as a multi-disciplinary approach for reducing crime through urban and environmental design and the management and use of built environments.

Conditions of Approval

CB 119745 contains several conditions in order to protect the public interest. These conditions include:

1. Requiring removal of the skybridges at the University's expense if the term permit is not renewed (Section 2).
2. Requiring that the University provide the City with information supporting the renewal of the skybridges prior to the completion of the term (Section 3).
3. Requiring that the University provide an evaluation and analysis of the feasibility and potential timeline for:
    a. providing at grade crossings instead of skybridges;
    b. replacing the two Montlake skybridges with one new skybridge; and
    c. making all skybridges compliant with the Americans with Disabilities Act (ADA) (Section 3).
4. Protecting utilities from any damage resulting from activity related to the skybridges (Section 4).
5. Reserving the right to terminate approval if:
    a. Council determines that space occupied by a skybridge is needed for a public use or benefit;
    b. Use of a skybridge is abandoned;
    c. Any term of the ordinance is violated and not corrected (Section 5).
6. Requiring the removal of a skybridge if a term expires and is not renewed (Section 6).
7. Requiring the University to maintain the skybridges in a good and safe condition (Section 7).
8. Requiring closure or removal of a skybridge if it becomes unsafe (Section 8).
9. Releasing, defending, holding harmless and indemnifying the City in case of any legal action (Section 10).
10. Maintaining insurance (Sections 11-13).
11. Allowing inspections of the skybridges and paying fees to cover the costs of inspections (Sections 15 and 16).
12. Paying an annual fee of $36,816.40, adjusted annually (Section 17).
13. Providing and maintaining the public benefits listed above. (Section 20).

CB 119745, if adopted, would be in effect for ten years. The SDOT Director or the City Council would have the authority to renew the permission for up to two additional 10-year periods.

cc: Kirstan Arestad, Executive Director
Aly Pennucci, Supervising Analyst

File #: CB 119742, **Version:** 1

CITY OF SEATTLE

ORDINANCE _____

COUNCIL BILL _____

AN ORDINANCE vacating portions of the alleys in Block 3, Norris Addition to West Seattle, in the West Seattle Junction and accepting a Property Use and Development Agreement on the petition of The Whittaker, a Condominium Association, a Washington non-profit corporation (Clerk File 312783).

WHEREAS, West Seattle Project X, LLC filed a petition under Clerk File 312783 to vacate a portion of the alleys in Block 3, Norris Addition to West Seattle; and

WHEREAS, LMI West Seattle Holdings, LLC succeeded West Seattle Project X, LLC in interest; and

WHEREAS, The Whittaker, a Condominium Association, a Washington non-profit corporation is the successor in interest and the current petitioner (Petitioner); and

WHEREAS, after a March 11, 2014 public hearing on the petition, the City Council (Council) conditionally granted the petition on April 21, 2014; and

WHEREAS, a Property Use and Development Agreement recorded on June 24, 2019 with the King County Recorder's Office under Recording No. 20190624000710 commits the Petitioner and their successors to fulfill ongoing public-benefit obligations required by the vacation; and

WHEREAS, as provided for in Revised Code of Washington Section 35.79.030 and Seattle Municipal Code Chapter 15.62, on October 30, 2018, the Petitioner paid the City a vacation fee of $2,310,000, which is the full appraised value of the property; and

WHEREAS, the Petitioner has met all conditions imposed by the Council in connection with the vacation petition; and

WHEREAS, vacating the described portions of the alleys in Block 3, Norris Addition to West Seattle is in the

public interest; NOW, THEREFORE,

BE IT ORDAINED BY THE CITY OF SEATTLE AS FOLLOWS:

Section 1. The portions of the alleys in Block 3, Norris Addition, in the West Seattle neighborhood of Seattle and described below are vacated:

Those portions of the public alleys lying within Block 3, Norris Addition to West Seattle, according to the plat thereof recorded in Volume 14 of Plats, Page 93, Records of King County, together with that property conveyed to the City of Seattle for street purposes as recorded under Recording Number 6689470 and 6689471, Records of King County Washington; Lying northerly of the southerly boundary, and its easterly and westerly extension thereof, of Lot 39, in said Block 3, Norris Addition to West Seattle. Excepting therefrom, any portion of said public alleys lying within said Block 3, Norris Addition to West Seattle, previously vacated by City of Seattle Ordinance Number 99278.

Section 2. The Property Use and Development Agreement, King County Recording Number 20190624000710, attached as Exhibit 1 to this ordinance, is accepted.

Section 3. This ordinance shall take effect and be in force 30 days after its approval by the Mayor, but if not approved and returned by the Mayor within ten days after presentation, it shall take effect as provided by Seattle Municipal Code Section 1.04.020.

Passed by the City Council the _____ day of _____, 2020, and signed by me in open session in authentication of its passage this _____ day of _____, 2020.

_____

President _____ of the City Council

Approved by me this _____ day of _____, 2020.

_____

Jenny A. Durkan, Mayor

Filed by me this _____ day of _____, 2020.

_____

Monica Martinez Simmons, City Clerk

(Seal)

Attachments:
Exhibit 1 - Property Use and Development Agreement

When Recorded, Return to:
McCullough Hill Leary, P.S.
Attn: Jessie Clawson
701 5th Avenue, Suite 6600
Seattle, WA 98104

20190624000710
AGREEMENT Rec: $108.00
6/24/2019 1:36 PM
KING COUNTY, WA

PROPERTY USE AND DEVELOPMENT AGREEMENT

Grantor:	The Whittaker, a Condominium Association, a Washington nonprofit corporation
☐ Additional on page ____	
Grantee:	City of Seattle
☐ Additional on page ____	
Legal Description (abbreviated):	ALL UNITS, THE WHITTAKER, A CONDOMINIUM, DECLARATION REC. NO. 20141218000344, VOL. 281, PAGES 89-102
☒ Additional on:	Exhibit A
Assessor's Tax Parcel ID #:	9379700000
Reference Nos. of Documents Released or Assigned:	N/A

PROPERTY USE AND DEVELOPMENT AGREEMENT

THIS AGREEMENT is executed this date in favor of the City of Seattle, a municipal corporation ("City"), by The Whittaker, a Condominium Association, a Washington nonprofit corporation (the "Association").

WHEREAS, the Association has the authority, pursuant to RCW 64.34.304, to represent all Owners (the "Owners") vested in fee simple title of all Units in The Whittaker, a Condominium (the "Condominium") situated in King County, Washington, described in Exhibit A and incorporated into this Agreement (the "Property") with regard to matters affecting the Condominium; and

WHEREAS, West Seattle Project X, LLC, a predecessor in interest to the Association, filed a petition in Clerk File 312783 for the vacation of the portions of the public alleys in Block 3, Norris Addition to West Seattle, according to the plat thereof recorded in Volume 14 of Plats, Page 93, Records of King County; Together with that property conveyed to the City of Seattle for street purposes as recorded under Recording Numbers 6689470 and 6689471, Records of King County, Washington; Lying northerly of the southerly boundary, and its easterly and westerly extension thereof, of Lot 39, in Block 3, Norris Addition to West Seattle. Excepting therefrom, any portion of said public alleys lying within said Block 3, Norris Addition to West Seattle, previously vacated by City of Seattle Ordinance Number 99278, which petition was considered under Chapter 35.79 of the Revised Code of Washington and Chapter 15.62 of the Seattle Municipal Code; and

WHEREAS, on March 11, 2014, Transportation Committee of the Seattle City Council held a public hearing on the vacation petition; and

WHEREAS, on April 21, 2014, the Seattle City Council granted preliminary approval of the vacation petition, subject to conditions; and

WHEREAS, the Association completed development activity authorized under the alley vacation approval before April 21, 2019; and

WHEREAS, executing this Property Use and Development Agreement (the "Agreement" or "PUDA") is desired to ensure compliance with any on-going conditions of the vacation approval subsequent to passage of the vacation ordinance; and

NOW, THEREFORE, the Association, on behalf of the Owners, covenants, bargains, and agrees on behalf of themselves, their successors, and assigns as follows:

Section 1. The conditions passed by the City Council on April 21, 2014 specified the following conditions of approval:

A. The vacation is granted to allow the Petitioner to build a project substantially in conformity with the project presented to the City Council and for no other purpose. The project must be substantially in conformity with the proposal reviewed by the Transportation Committee in March of 2014.

B. All street improvements shall be designed to City standards, as modified by these conditions to implement the Public benefit requirements, and be reviewed and approved by the Seattle Department of Transportation; elements of the street improvement plan and required street improvements to be reviewed include:

- The mid-block connector shall include the following elements:
  - The total width shall be no less than 44 feet in width to 50 feet in width;
  - Two-way traffic is required;
  - The drive lane for vehicles is 20 to 25 feet in width;
  - An 8-foot wide elevated, pedestrian sidewalk shall be located on the south side of the mid-block connector;
  - The pedestrian sidewalk shall be separated from the drive lane by a 3-foot landscaping strip;
  - The pedestrian sidewalk shall have continuous overhead weather protection;
  - The northwest side of the mid-block connector shall have landscaping to discourage pedestrians;
  - No pedestrian crossing north/south may be provided in the mid-block connector;
  - Pedestrian lighting shall be provided in the mid-block connector;
  - The northeast side of the mid-block connector will provide a sidewalk and landscaping at the residential entry;
  - Vehicles may turn right only when existing at Fauntleroy Way SW;
  - Roll-up doors shall be added to the loading bay area; and
  - A drive-up window may not be provided.
- Street improvement plan showing sidewalks, street trees, bike racks, street furniture, lighting, art or artist-made elements, paving or special materials, wayfinding, and landscaping around the site;
- The design on the new alley segment, including the geometry of the turns and the connection at 40th Avenue SW, SW Edmunds Street, and Fauntleroy Way SW; and
- Agreement between all property owners on the alley that protect use and access for all owners.

C. The utility issues shall be resolved to the full satisfaction of the affected utility prior to the approval of the final vacation ordinance. Prior to the commencement of any development activity on the site, Petitioner shall work with the affected utilities and provide for the protection of the utility facilities. This may include easements, restrictive covenants, relocation agreements, or acquisition of the utilities, which shall be at the sole expense of the Petitioner. Utilities impacted include:
   - Seattle Public Utilities
   - Seattle City Light
   - CenturyLink Communications

D. It is expected that development activity will commence within 18 months of this approval and that development activity will be completed within 5 years. In order to insure timely compliance with the conditions imposed by the City Council the Petitioner shall provide SDOT with Quarterly Reports, following Council approval of the vacation, providing an update on the development activity, schedule, and progress on meeting the conditions. The Petitioner shall not request or be issued a Final Certificate of Occupancy (C of O) for the project until SDOT has determined that all conditions have been satisfied and all fees have been paid.

E. In addition to the conditions imposed through the vacation process, the project, as it proceeds through the permitting process, is subject to SEPA review and to conditioning pursuant to various City codes and through regulatory review processes including SEPA.

F. Within one year after the completion of the public park planned on 40th Avenue SW, the Seattle Department of Transportation shall review the pedestrian and traffic volumes on 40th Avenue SW to determine whether a crosswalk from the Whittaker development to the park, midblock on 40th Avenue SW, is warranted. Should the Seattle Department of Transportation determine that a pedestrian crosswalk is warranted in the above-stated location, Project X, LLC shall pay for the installation of a pedestrian crosswalk. The installation of a pedestrian signal or other pedestrian actuated traffic controls is not required. The maximum amount to be paid for the crosswalk shall be $24,000 and shall include ADA ramps and landings on both sides with ladder striping across the roadway per City standards. Such payment shall be made to the Seattle Department of Transportation within 120 days after the Seattle Department of Transportation determines that the pedestrian crosswalk is necessary in the above-stated location.

G. The Petitioner shall develop and maintain the public benefit elements as defined by the City Council. A Property Use and Development (PUDA)

or other binding mechanism shall be required to ensure that the public benefit elements remain open and accessible to the public and to outline future maintenance obligations of the improvements. The final design of the public benefit elements shall require the review and approval of SDOT Street Vacations. SDOT will request additional Design Commission review when the design is further developed to the 60% level and 90% level and may request additional review as necessary. The public benefit requirement includes the following features as well as corresponding development standards, including approximate square footage dimensions, which shall be outlined in the PUDA:

Public benefit chart:

Description	Existing	Required	Quantity	Cost
1. Voluntary Street Level Building Setback	No	No	5,134 s.f.	n/a
2. Gateway Plaza at Fauntleroy & Alaska	No	No	542 s.f.	$37,820
3. Linear Plaza and 40th Ave. Streetscape	No	No	1,356 s.f.	$147,140
4. Public "Outdoor Rooms" on Fauntleroy	No	No	1,088 s.f.	$85,120
5. 40th Avenue Off-Site Improvement	No	No	2,550 s.f.	$93,260
6. Pedestrian Crosswalk and Signal Modification at Fauntleroy & Alaska	No	No	n/a	$15,000
7. Cash Contribution for Public Outreach and Schematic Design (to 30% complete) for new City Park	No	No	n/a	$25,000
8. Mid-Block pedestrian sidewalk	No	No	n/a	$25,000
9. Art: Inclusion of commission art	No	No	27 pieces	$50,000

pieces in public plazas and relocation/				
10. Pedestrian overhead weather protection & new bike lane	No	No	5,666 s.f.	$853,680
11. Expanded public amenities along Fauntleroy & Alaska	No	No	1,300 s.f.	$1,100,000
			Total:	**$2,417,050**

H. The replacement of any of the Public Benefits shall be of similar quality in design and materials as the original. Significant changes to the streetscape or the required public Benefits shall require prior approval by the Seattle Department of Transportation. Modified features shall maintain a substantially similar quality and character to the existing required design features.

Section 2. The development project currently on-site, as implemented by Master Use Permit number 3013803-LU, as amended, and building permits 6327328-PH and 6365657-PH, has constructed the "Public Benefits" outlined in Section 1 in the following manner:

A. The buildings were voluntarily setback 5,134 s.f. on the frontages of Alaska Street, 40th Avenue, Edmunds Street, and Fauntleroy Way, as depicted to the City Council.
B. The 542 square foot public plaza at the corner of Alaska and Fauntleroy was constructed as depicted to the City Council; this feature includes four art sculptures, 4 benches, a water feature, pedestrian lighting, and bike parking.
C. The 40th Avenue linear plaza and streetscape was constructed as depicted to the City Council and includes art elements, rain gardens, and upgraded landscape and hardscape elements.
D. The public outdoor rooms on Fauntleroy have been constructed and include seating and benches, art pieces, pedestrian lighting and bike parking.
E. The 40th Avenue off-site street improvement was installed and includes SDOT standard planting strips and a tapering of the road edge for traffic calming purposes in front of the future West Seattle Junction Park.
F. The pedestrian crosswalk and signal modification has been installed and is operational at Fauntleroy and Alaska.
G. The cash contribution of $25,000 for design of the new West Seattle Junction Park was paid to the Seattle Parks Department. Three design options to the public have been presented by the Parks Department as of Fall 2018.

H. 27 pieces of art, coordinated and constructed by the same local artist as presented to the City Council, were installed in the right-of-way. The historic mural was relocated and recreated on site and can be seen in the midblock connector today.
I. The overhead weather protection as depicted to the City Council was installed. The new bike lane on Fauntleroy was installed.
J. The expanded public amenities along Fauntleroy and Alaska were installed as depicted to City Council, made possible by the undergrounding of the overhead power lines on the projects' frontages by the project.
K. Regarding the mid-block crosswalk across 40th Avenue to serve the new future park, the public park on 40th Avenue (also known as the West Seattle Junction Park) is not yet finished. In Fall 2018 the Seattle Parks and Recreation Department presented three design options to the public and gathered community feedback. Design and construction of the park is fully budgeted and construction is scheduled to begin in 2019. At the time of park completion, Condition F in Section 1, and Line Item 8 in the Public Benefit Matrix will be completed.

Section 3. The Association shall have the reasonable right to temporarily close, obstruct, limit access, or establish temporary hours of Public Benefits public access to the Public Benefits for: (1) construction, provided that any removed or closed shall be replaced by the developer to the satisfaction of the City; (2) maintenance and repair; (3) temporary use for private functions directly related to the development; (4) the maintenance of or security for the development or persons using the development; or (5) other circumstances beyond the Association's control.

Section 4. The Association may adopt reasonable rules and regulations regarding the use of and access to the Public Benefits and the development. The rules and regulations shall be consistent with this Agreement. A summary of the current rules and regulations, if rules are adopted, shall be posted in several visible locations.

Section 5. Free speech activities such as hand billing, signature gathering, and holding sign, all without obstructing access to the Property, the Condominium, or other adjacent amenity features, and without unreasonably interfering with the use and enjoyment of the Property or the Condominium, shall be allowed within the Public Benefit areas described in this Agreement. While lawfully engaged in allowed activities that do not interfere with use and enjoyment of the Property by others, members of the public may not be asked to leave because of their involvement with the allowed activities. Any violation of this Section may be enforced through Chapter 23.90 of the Seattle Municipal Code.

Section 6. This Agreement may be amended or modified by agreement between the Association and the City; provided any such amendment shall be subject to approval by the City Council by ordinance. Nothing in this Agreement shall be construed as a surrender of the City's governmental powers.

Section 7. The Association reserves the right to use the Public Benefits for any purpose which does not interfere with the public's use rights established hereunder, including but not limited to the right to use the areas as described in this Agreement for the Association's purposes, and the right to grant easements, provided the easements are consistent with the public's use rights established hereunder.

Section 8. Nothing in this Agreement shall constitute a public dedication of any portion of the Property.

Section 9. The legal description of the Property is set forth in Exhibit A to this Agreement, which is incorporated to this Agreement. An executed copy of this Agreement shall be recorded in the records of King County and the covenants contained herein shall to attach to and run with the Property.

Section 10. This PUDA is made for the benefit of the City and the public. The City may institute and prosecute any proceeding at law or in equity to enforce this PUDA.

Section 11. If any covenant, condition, or restriction in this instrument or any portion is invalidated or voided, the invalidity or voidness shall in no way affect any other covenant, condition, or restriction.

Section 12. Upon the effective date of the vacation ordinance, the Association shall provide and thereafter maintain in full force and effect, commercial general liability insurance providing for a limit of not less than $1,000,000 per occurrence for damages arising out of bodily injuries or death. The insurance policies obtained shall be issued by companies authorized to conduct business in Washington State and shall name the City as an additional insured. The Association shall provide evidence of insurance to the City Risk Manager at the City's reasonable request.

Section 13. The Association covenants and agrees to defend, indemnify, and hold harmless the City of Seattle, its officials, officers, employees, and agents from all liabilities, claims, causes of action, judgments, or expenses, including reasonable attorney fees and necessary litigation expenses, resulting from any actual or alleged bodily injury including death or actual or alleged damage to property arising out of or in connection with the use or occupation of the Public Benefits during the term of its ownership. Upon any transfer of ownership, this obligation shall be binding on all successors and assigns. The indemnification obligations under this Agreement do not apply to any liabilities, claims, causes of action, judgments or expenses resulting from bodily injury or property damage caused by the negligence or intentional acts of the public or the City, or the City's officers, employees, elected officials, agents, or subcontractors.

Section 14. This Agreement shall be binding on the Association's successors and assigns.

DATED this 6th day of June, 2019.

ASSOCIATION (ON BEHALF OF THE OWNERS):

THE WHITTAKER, A CONDOMINIUM ASSOCIATION,
a Washington non-profit corporation

By:_____
Name: Philip J. Carmody
Its: President

COMMONWEALTH OF MASSACHUSETTS)
) ss.
COUNTY OF SUFFOLK)

On this day personally appeared before me Philip J. Carmody, to me known to be the President of THE WHITTAKER, A CONDOMINIUM ASSOCIATION, a Washington non-profit corporation, the corporation that executed the within and foregoing instrument, and acknowledged the instrument to be the free and voluntary act and deed of said corporation for the uses and purposes therein mentioned, and on oath stated that s/he was duly authorized to execute said instrument on behalf of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and seal this 6th day of June, 2019.

Maria L. DeAndrade
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
September 6, 2024

_____
MARIA L. DEANDRADE
(print or type name)

NOTARY PUBLIC in and for the
Commonwealth of Massachusetts, residing
at Boston, Massachusetts
My Commission expires: September 6, 2024

EXHIBIT A

Legal Description of the Property

PARCEL A:
ALL UNITS, THE WHITTAKER, A CONDOMINIUM, ACCORDING TO THE DECLARATION THEREOF, RECORDED UNDER RECORDING NO. 20141218000344, AND ANY AMENDMENTS THERETO, SAID UNITS ARE LOCATED ON SURVEY MAPS AND PLANS FILED IN VOLUME 281 OF CONDOMINIUMS, PAGE(S) 89 – 102, AND ANY AMENDMENTS THERETO;
EXCEPT THAT PORTION CONVEYED TO THE CITY OF SEATTLE AS DESCRIBED IN DEED FOR ALLEY PURPOSES RECORDED DECEMBER 22, 2014, UNDER RECORDING NO. 201412222000866.

PARCEL B:
NON-EXCLUSIVE TEMPORARY EASEMENTS AS DESCRIBED AND GRANTED IN THAT CERTAIN "CONSTRUCTION EASEMENT AGREEMENT" RECORDED SEPTEMBER 19, 2014 UNDER RECORDING NO. 20140919000028, IN THE RECORDS OF KING COUNTY, WASHINGTON.

PARCEL C:
PERPETUAL AND NON-EXCLUSIVE EASEMENTS AS DISCLOSED IN THE "DECLARATION AND COVENANTS, CONDITIONS AND RESTRICTIONS FOR THE WHITTAKER, A CONDOMINIUM" RECORDED DECEMBER 18, 2014 UNDER RECORDING NO. 20141218000344, IN THE RECORDS OF KING COUNTY, WASHINGTON.

SITUATE IN THE COUNTY OF KING, STATE OF WASHINGTON.

SUMMARY and FISCAL NOTE*

Department:	Dept. Contact/Phone:	CBO Contact/Phone:
Seattle Department of Transportation	Amy Gray/206-386-4638	Christie Parker/204-684-5211

1. BILL SUMMARY

Legislation Title:
AN ORDINANCE vacating portions of the alleys in Block 3, Norris Addition to West Seattle, in the West Seattle Junction and accepting a Property Use and Development Agreement on the petition of The Whittaker, a Condominium Association, a Washington non-profit corporation (Clerk File 312783).

Summary and background of the Legislation:
This Council Bill completes the vacation process for portions of the alleys in Block 3, Norris Addition to West Seattle in the block bounded by SW Alaska Street, Fauntleroy Way SW, SW Edmunds Street and 40th Avenue SW in the West Seattle neighborhood, on the petition of The Whittaker, a Condominium Association, a Washington non-profit corporation.

The Petitioner sought the vacation for the development of a residential and retail project. After a March 11, 2014 public hearing on the petition, the City Council conditionally granted the petition.

2. CAPITAL IMPROVEMENT PROGRAM

Does this legislation create, fund, or amend a CIP Project? ___ Yes _X_ No

3. SUMMARY OF FINANCIAL IMPLICATIONS

Does this legislation amend the Adopted Budget? ___ Yes _X_ No

Does the legislation have other financial impacts to the City of Seattle that are not reflected in the above, including direct or indirect, short-term or long-term costs?
No.

Is there financial cost or other impacts of *not* implementing the legislation?
This legislation will complete the vacation process. The Petitioner has met all the conditions imposed by the City Council. By not implementing this legislation, the City could be in violation of its obligations, which could have financial implications.

4. OTHER IMPLICATIONS

a. Does this legislation affect any departments besides the originating department?
No.

b. Is a public hearing required for this legislation?
No.

c. Does this legislation require landlords or sellers of real property to provide information regarding the property to a buyer or tenant?
No.

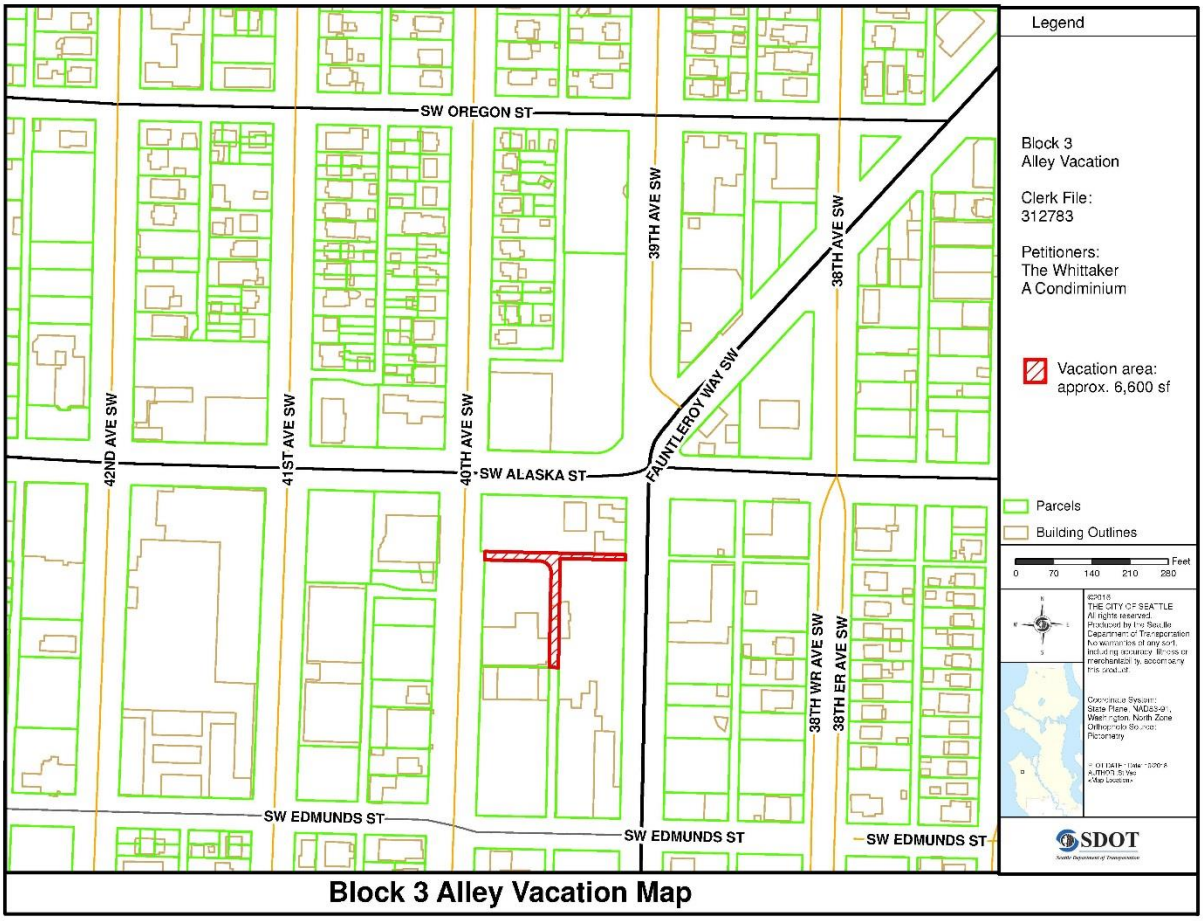
d. Is publication of notice with *The Daily Journal of Commerce* and/or *The Seattle Times* required for this legislation?
No.

e. Does this legislation affect a piece of property?
Yes, is completes the vacation of portions of the alleys in Block 3, Norris Addition to West Seattle.

f. Please describe any perceived implication for the principles of the Race and Social Justice Initiative. Does this legislation impact vulnerable or historically disadvantaged communities? What is the Language Access plan for any communications to the public?
SDOT has not identified any Race and Social Justice Initiative implications related to the legislation.

g. If this legislation includes a new initiative or a major programmatic expansion: What are the specific long-term and measurable goal(s) of the program? How will this legislation help achieve the program's desired goal(s).
N/A

List attachments/exhibits below:
Summary Attachment A – Whittaker Alley Vacation Map



This map is intended for illustrative or informational purposes only and is not intended to modify anything in the legislation.

SEATTLE CITY COUNCIL
CENTRAL STAFF

March 2, 2020

M E M O R A N D U M

To: Transportation and Utilities Committee Members
From: Lish Whitson, Analyst
Subject: Council Bill 119742: The Whittaker Alley Vacation

On Wednesday, March 4, 2020 the Transportation and Utilities Committee will consider Council Bill (CB) 119742, which would grant final approval to vacate an alley at the southwest corner of SW Alaska Street and Fauntleroy Way SW in the West Seattle Junction. Conditional approval of the vacation was granted through Clerk File (CF) 312783 on April 14, 2014. The vacation facilitated the development of The Whittaker mixed-use development project, including 389 apartments, a Whole Foods grocery store and 18,000 square feet of additional retail space. The Whittaker project has satisfied the conditions of CF 312783.

This memorandum summarizes the Street Vacation process as it relates to CB 119742, describes the effect of CB 119742, and describes the features incorporated into The Whittaker in order to meet the conditions of CF 312783.

Street Vacation Process

The City's Street Vacation Policies (Policies) guide the City's review of petitions by private property owners to vacate (or remove) right-of-way.[1],[2] Under Washington State law, property owners have the right to petition the City Council to vacate a street or alley abutting their property.[3] Vacate, in this sense, means to give up the public use of the street or alley. In order to approve a street vacation, the Council must determine that the vacation will significantly serve the public's interest. The Policies identify two components of the public's interest:

1. Protection of the "public trust" functions of the right-of-way. Public trust functions include circulation, access, utilities, light, air, open space, and views,[4] and
2. Proposed public benefits. A petitioner must provide long-term or permanent public benefits that (a) benefit the general public, not any individual or organization; and (b) are on top of any requirements placed on the project through the Seattle Municipal Code or other obligations.

[1] "Right-of-way" includes streets and alleys, whether improved or not, and other public land that the public has a right to use for street purposes.
[2] The Whittaker alley vacation petition was filed under the previous version of the street vacation policies. In amending the policies in 2018, the Council made substantive changes to the early consultation process, the process for reviewing street vacation petitions, and the street vacation policies. The process and considerations during the Council's consideration of the final street vacation ordinance remained substantively the same between the previous and the current policies.
[3] See Revised Code of Washington (RCW) https://app.leg.wa.gov/RCW/default.aspx?cite=35.79.010.
[4] The 2018 update to the street vacation policies recognized the following additional public trust functions: free speech, public assembly, and land use and urban form.

After a property owner files a petition to vacate a street or alley, City departments, coordinated by the Seattle Department of Transportation (SDOT), and the Seattle Design Commission (Commission) review the petition to determine whether it is appropriate to vacate the right-of-way, and whether the public benefits that the petitioner proposes will appropriately balance what the public loses through the vacation with what the public will gain from the project.

Once this review is complete, the SDOT Director provides a recommendation on the vacation to the Council. The Council holds a public hearing and decides whether to conditionally approve the vacation. If the Council agrees to vacate the right-of-way, the Director's recommended conditions will form the basis of the Council's conditions on the vacation.

Conditional approval of the vacation enables closure of the right-of-way. Once a project has been built, and the Council's conditions have been met, SDOT prepares a final vacation ordinance for Council consideration. The final Ordinance provides for the permanent transfer of the right-of-way to the petitioner. CB 119742 is the final ordinance for the street vacation that was conditionally approved under Clerk File 312783.

The Whittaker Alley Vacation

The petition for the Whittaker alley vacation was filed with the City in January 2013 and approved in April 2014. The final vote was five to three in support of conditional approval of the vacation. Pursuant to this conditional approval, the Whittaker project has been built, and the developer provided the required public benefits. CB 119742 would grant final approval of the Whittaker alley vacation, vacating the alley and accepting a property use and development agreement that requires ongoing maintenance of the public benefit features of the project.

The Whittaker vacation affected the alleys in the block at the southwest corner of SW Alaska Street and SW Fauntleroy Way, as shown in Figure 1.

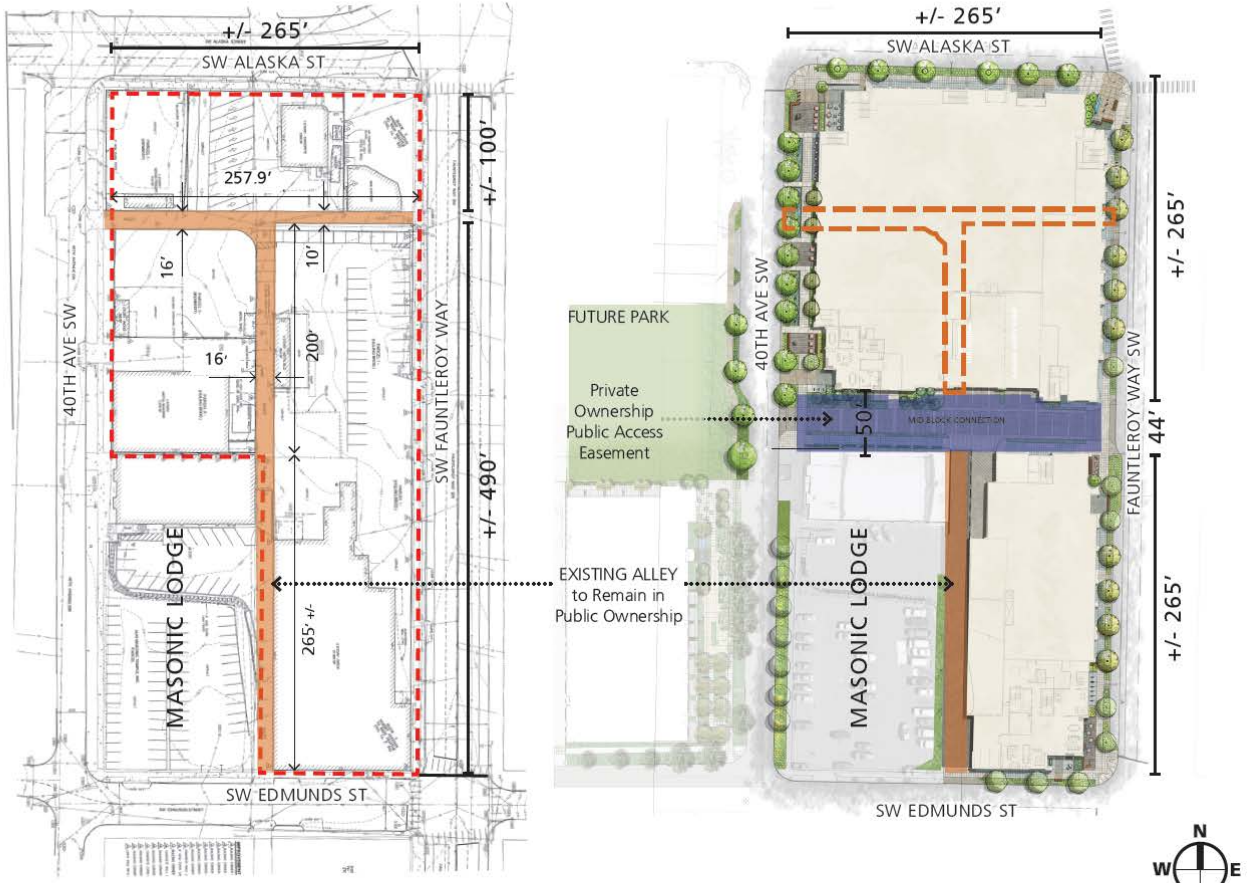
Figure 1. Whittaker Alley Vacation

ALLEY VACATION

- Approximate Area of Alley to be Vacated: 6,600 SF
- Approximate Area of Publicly Accessible Mid-Block Connection: 11,100 SF

LEGEND

- ALLEY AREA
- NEW MID-BLOCK CONNECTOR
- VACATED ALLEY



The block contained a T-shaped alley, the east-west section of which was located 100 feet south of SW Alaska Street. The development has closed that east-west alley and the north 200 feet of the north-south alley segment.

The vacation allowed for (1) a larger development site at the north end of the property to accommodate a grocery store as part of the development, (2) development of two apartment structures, rather than three, (3) a connected parking garage below the two structures, and (4) a mid-block pedestrian crossing located 295 feet south of SW Alaska Street. Public benefits provided in exchange for the vacation included:

1. Widened sidewalks;
2. Public plazas and public "outdoor rooms;"
3. Off-site improvements along 40th Avenue SW;
4. A pedestrian crosswalk and signal improvements at the intersection of Fauntleroy and Alaska;
5. A mid-block pedestrian sidewalk providing an east-west connection through the block;
6. Public art pieces in the plazas;
7. Overhead weather protection along the sidewalks;
8. A new bike lane along Fauntleroy Way SW;
9. Additional public amenities along Fauntleroy and Alaska, such as landscaping, on-street parking and a new bus pull-out; and
10. Funding for public outreach and schematic design for a new park to be built across 40th Ave SW from the project.

Review of the petition took approximately one and a half years:

- West Seattle Project X, LLC filed a vacation petition in January 2013.
- In June 2013, after four meetings on the petition, the Seattle Design Commission recommended approval of the vacation.
- In March 2014, SDOT Interim Director Goran Spearman returned the vacation petition to the City Council but declined to make a recommendation on the petition.
- On March 11, 2014, the Transportation Committee held a public hearing on the vacation petition.
- On April 8, 2014, the Transportation Committee voted 5 to 3 to recommend granting the vacation as conditioned.
- On April 21, 2014, the Full Council voted to grant the vacation as conditioned.

Conditions applied to the vacation are:

1. Approval is only for the project described to the City Council.
2. Street improvements must be designed to City standards.
3. Project must include a mid-block connector that includes the following features:
    a. Connecting Fauntleroy Way SW and 40th Avenue SW;
    b. 44- to 50-feet wide;
    c. Allowing two-way traffic with a drive lane that is 20 to 25 feet wide;
    d. Providing an 8-foot wide elevated pedestrian sidewalk along the south side of connector that is separated from drive lanes by a 3-foot landscaping strip with continuous overhead weather protection and pedestrian lighting;
    e. Prohibiting north-south pedestrian crossings within the connector;
    f. Containing a sidewalk and landscaping on the northeast side of the mid-block connector;
    g. Limiting vehicular turns onto Fauntleroy Way SW to right turns only;
    h. Including a loading bay with roll-up doors; and
    i. Not including a drive-up window.
4. Utility issues shall be resolved to the satisfaction of the affected utilities: Seattle Public Utilities, Seattle City Light and CenturyLink.
5. Development must start within 18 months of conceptual approval and be completed within five years.
6. Developer must provide quarterly reports to SDOT.
7. Developer must build and maintain public benefit elements as follows:
    a. Voluntary street level setbacks;
    b. A gateway plaza at Fauntleroy and Alaska;
    c. A linear plaza along 40th Avenue;
    d. 40th Avenue streetscape improvements on-site and off-site;
    e. New pedestrian crosswalk and traffic signal at Fauntleroy and Alaska;
    f. A cash contribution totaling not less than $25,000 for public outreach and schematic design for a new park on 40th Avenue S.W.;
    g. Pedestrian sidewalk with landscaping and overhead weather protection through mid-block connector;
    h. Inclusion of 27 art pieces and relocation of existing mural on-site;
    i. Continuous pedestrian overhead weather protection on Fauntleroy Way SW, S.W. Alaska and 40th Avenue S.W.
    j. New bike lane along Fauntleroy Way SW;
    k. Widened sidewalks, landscaping, on-street parking and new bus pull-out along Fauntleroy Way SW; and
    l. Underground utilities.

8. Developer must work with the Seattle Design Commission (SDC) to redesign and replace them with comparable benefits of equal or greater value, if the public benefit items are infeasible.
9. Developer must provide an art plan to SDC for review and approval.
10. Developer must provide the design of the gateway corner of Fauntleroy and Alaska to SDC for review and approval.
11. Developer must provide the design of the green wall along the north side of the Masonic Lodge to SDC for review and approval.

SDOT has confirmed that all conditions have been met and has prepared CB 119742 for Council consideration. This Council Bill completes the vacation process for portions of the alleys in Block 3, Norris Addition to West Seattle in the block bounded by SW Alaska Street, Fauntleroy Way SW, SW Edmunds Street and 40th Avenue SW in the West Seattle neighborhood, on the petition of The Whittaker, a Condominium Association, a Washington non-profit corporation.

cc: Kirstan Arestad, Executive Director
Aly Pennucci, Supervising Analyst

File #: Res 31932, **Version:** 1

CITY OF SEATTLE

RESOLUTION _____

A RESOLUTION relating to the City Light Department; acknowledging and approving City Light's adoption of a biennial energy conservation target for 2020-2021 and ten-year conservation potential.

WHEREAS, Ballot Initiative 937 (I-937), also known as the Energy Independence Act, was passed by Washington state voters on November 7, 2006, which requires qualifying electric utilities to obtain new renewable resources and undertake cost-effective energy conservation; and

WHEREAS, I-937 was codified in chapter 19.285 of the Revised Code of Washington (RCW); and

WHEREAS, RCW 19.285.040 calls for each qualifying utility to pursue all available conservation that is cost-effective, reliable, and feasible, including requiring of the development of conservation potential and biennial conservation targets; and

WHEREAS, WAC 194-37-070 requires that each qualifying utility must document the methodologies and inputs used in the development of its ten-year potential and biennial target and must document that its ten-year potential and biennial target are consistent with the requirements of RCW 19.285.040; and

WHEREAS, the City Light Department undertook a Conservation Potential Assessment study to develop its ten -year potential and biennial target, which was consistent with the methodologies set forth in RCW 19.285.040 and WAC 194-37-070; and

WHEREAS, the Conservation Potential Assessment identifies a ten-year conservation potential of 82.67 annual megawatts (aMW) starting in 2020, and a biennial energy conservation target of 21.27 aMW for City Light in 2020-2021; and

WHEREAS, City Light anticipates meeting or exceeding the energy conservation target for 2020 and 2021, and updating its Conservation Potential Assessment by 2021; and

WHEREAS, WAC 194-37-070 requires that each utility must establish its ten-year potential and biennial target by action of the utility's governing board, after public notice and opportunity for comment; NOW, THEREFORE,

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SEATTLE, THE MAYOR CONCURRING, THAT:

Section 1. Pursuant to chapter 19.285 RCW et. seq. and corresponding WAC 194-37-070 regulations, and after public hearing, the City Council acknowledges and approves the City Light Department's (City Light) adoption of a biennial energy conservation target of 21.27 aMW for 2020-2021 and a ten-year conservation potential of 82.67 aMW starting in 2020. City Light's biennial energy conservation target and ten-year conservation potential are based upon a Conservation Potential Assessment conducted using methodologies consistent with those used by the Pacific Northwest Electric Power and Conservation Planning Council in order for City Light to pursue all available conservation that is cost-effective, reliable, and feasible.

Section 2. The City Council further acknowledges that City Light anticipates meeting or exceeding the biennial energy conservation target with its adopted 2020 budget and the spending plan adopted in the Strategic Plan's rate path for the 2021 budget.

Adopted by the City Council the _____ day of _____, 2020, and signed by me in open session in authentication of its adoption this _____ day of _____, 2020.

_____

President _____ of the City Council

The Mayor concurred the _____ day of _____, 2020.

_____

Jenny A. Durkan, Mayor

Filed by me this _____ day of _____, 2020.

_____

Monica Martinez Simmons, City Clerk

(Seal)

SUMMARY and FISCAL NOTE*

Department:	Dept. Contact/Phone:	CBO Contact/Phone:
Seattle City Light	Jennifer Finnigan/6-9153	Greg Shiring/6-4085

** Note that the Summary and Fiscal Note describes the version of the bill or resolution as introduced; final legislation including amendments may not be fully described.*

1. BILL SUMMARY

Legislation Title: A RESOLUTION relating to the City Light Department; acknowledging and approving City Light's adoption of a biennial energy conservation target for 2020-2021 and a ten-year conservation potential.

Summary and background of the Legislation: To comply with RCW 19.285 (also known as I-937 or the Energy Independence Act), City Light must establish and make publicly available a biennial acquisition target for cost-effective conservation and a ten-year conservation potential. This Resolution establishes a 21.27 average megawatt (aMW) conservation target for 2020-2021 and a ten-year conservation potential of 82.67 aMW.

Initiative 937 was passed by Washington state voters in November 2006 to establish renewable and energy efficiency targets for electric utilities serving more than 25,000 retail customers. In complying with RCW 19.285.040, each qualifying utility shall pursue all available conservation that is cost-effective, reliable, and feasible. RCW 19.285.040 (1)(a) states: "By January 1, 2010, using methodologies consistent with those used by the Pacific Northwest electric power and conservation planning council in the most recently published regional power plan as it existed on June 12, 2014, or a subsequent date as may be provided by the department or the commission by rule, each qualifying utility shall identify its achievable cost-effective conservation potential through 2019. Nothing in the rule adopted under this subsection precludes a qualifying utility from using its utility specific conservation measures, values, and assumptions in identifying its achievable cost-effective conservation potential. At least every two years thereafter, the qualifying utility shall review and update this assessment for the subsequent ten-year period."

And, RCW 19.285.040 (1)(b) states: "Beginning January 2010, each qualifying utility shall establish and make publicly available a biennial acquisition target for cost-effective conservation consistent with its identification of achievable opportunities in section (a) of this subsection, and meet that target during the subsequent two-year period. At a minimum, each biennial target must be no lower than the qualifying utility's pro rata share for that two-year period of its cost-effective conservation potential for the subsequent ten-year period;"

WAC 194-37-070 Section (5) provides further guidance that the development of the biennial target and the ten-year potential should follow the methodologies used by the Northwest Power and Conservation Council (NWPPC) and this section offers a series of methodical details to ensure consistency with this regional effort. Section (4) also calls for electric utilities to "establish its ten-year potential and biennial target by action of the utility's governing board, after public notice and opportunity for public comment."

City Light initiated a Conservation Potential Assessment (CPA) to identify the biennial acquisition target and the ten-year potential for the service territory. City Light hired the consulting firm Cadmus to complete the CPA that is consistent with the methodology outlined in both RCW 19.285.040 and WAC 194-37-070 and is also consistent with the Northwest Power and Conservation Council's methodology used for their Seventh Power Plan. This CPA has identified a total of 21.27 aMW being achievable within the City Light service territory for 2020-2021 and a total conservation potential of 82.67 aMW for the ten-year period starting in 2020.

City Light anticipates meeting or exceeding the 21.27 aMW biennial target for 2020-2021. It is anticipated that City Light's proposed 2020 budget and the spending plan adopted in the Strategic Plan's rate path for the 2021 budget will be sufficient to meet the biennial acquisition targets. No increase in budget levels for either 2020 or 2021 is expected to be necessary as a result of this legislation.

This Resolution is necessary as outlined in WAC 194-37-070 section (4) which states "Each utility must establish its ten-year potential and biennial target by action of the utility's governing board, after public notice and opportunity for public comment."

As a point of reference, this is the sixth Resolution to establish the biennial target and ten-year potential for the utility. The most recent legislation, Resolution #31765 established the 2018-2019 conservation target of 24.5 aMW and ten-year potential of 90.3 aMW. The 2020-2021 target of 21.27 aMW is a decrease from the 2018-2019 conservation target of approximately 13%. The decrease is due to lower avoided energy costs, increased stringency in energy codes, and forty years of conservation program achievement that has captured much of the easy-to-attain conservation such as LED lighting. Other than the energy savings target and ten-year potential, this Resolution is nearly identical to Resolution #31765 in its language and intent.

2. CAPITAL IMPROVEMENT PROGRAM

Does this legislation create, fund, or amend a CIP Project? ___ Yes __X__ No

3. SUMMARY OF FINANCIAL IMPLICATIONS

Does this legislation amend the Adopted Budget? ___ Yes __X__ No

Does the legislation have other financial impacts to the City of Seattle that are not reflected in the above, including direct or indirect, short-term or long-term costs?
There is no direct financial impact of implementing this legislation; the adoption of this Resolution is an administrative formality designed to comply with state law. However, failing to meet the biennial conservation targets may result in an administrative penalty outlined in RCW 19.285.060: "(1) Except as provided in subsection (2) of this section, a qualifying utility that fails to comply with the energy conservation or renewable energy targets established in RCW 19.285.040 shall pay an administrative penalty to the state of

Washington in the amount of fifty dollars for each megawatt-hour of shortfall. Beginning in 2007, this penalty shall be adjusted annually according to the rate of change of the inflation indicator, gross domestic product-implicit price deflator, as published by the bureau of economic analysis of the United States department of commerce or its successor."

City Light's proposed 2020 budget and the spending plan adopted in the Strategic Plan's rate path for the 2021 budget provide the resources necessary to meet the target and it is anticipated that adequate resources will be available to meet the biennial acquisition targets for 2020-2021. City Light does not expect to propose any significant increase in budget levels to implement this legislation.

Is there financial cost or other impacts of *not* implementing the legislation?
There is no direct financial cost of not implementing this legislation. However, City Light is required by state law to set the conservation targets as outlined in RCW 19.285.040. City Light anticipates meeting the conservation targets with anticipated budgets.

4. OTHER IMPLICATIONS

a. Does this legislation affect any departments besides the originating department?
No

b. Is a public hearing required for this legislation?
Yes. Consistent with WAC 194-37-070 section (4), the utility must establish its ten-year potential and biennial target by action of the utility's governing board, after public notice and opportunity for comment.

c. Does this legislation require landlords or sellers of real property to provide information regarding the property to a buyer or tenant?
No

d. Is publication of notice with *The Daily Journal of Commerce* and/or *The Seattle Times* required for this legislation?
No

e. Does this legislation affect a piece of property?
No

f. Please describe any perceived implication for the principles of the Race and Social Justice Initiative. Does this legislation impact vulnerable or historically disadvantaged communities? What is the Language Access plan for any communications to the public?
No, this resolution sets an overall savings target for Seattle City Light, but does not alter the way the organization offers services to vulnerable or historically disadvantaged communities.

g. If this legislation includes a new initiative or a major programmatic expansion: What are the specific long-term and measurable goal(s) of the program? How will this legislation help achieve the program's desired goal(s).

This is not a new initiative or major programmatic expansion; this effort is consistent with Seattle City Light's commitment to energy efficiency.

List attachments/exhibits below:
None

Seattle City Light

2020 Conservation Potential Assessment—Volume I

Project Lead/By: Jennifer Finnigan
Prepared by: Lakin Garth, Cadmus
11/26/2019

Table of Contents

Definition of Terms

aMW	Average Megawatt
AC	Air Conditioning
C&I	Commercial and Industrial
CBSA	Commercial Building Stock Assessment
CFL	Compact Fluorescent Lamp
CPA	Conservation Potential Assessment
Council	Northwest Power and Conservation Council
DOE	Department of Energy
ECM	Energy Conservation Measure
EISA	Energy Independence and Security Act of 2007
EUIs	Energy Use Intensities
EUL	Effective Useful Life
HVAC	Heating Ventilation and Air Conditioning
I-937	Initiative 937
IRP	Integrated Resource Plan
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light-emitting diode
MW	Megawatt
MWh	Megawatt-hour
NEEA	Northwest Energy Efficiency Alliance
O&M	Operations and Maintenance
RBSA	Residential Building Stock Assessment
RCW	Revised Code of Washington
REC	Renewable Energy Credit
RECS	Residential Energy Consumption Survey
RTF	Regional Technical Forum
RUL	Remaining Useful Life
SCL	Seattle City Light

T&D	Transmission and Distribution
TRC	Total Resource Cost
UCT	Utility Cost Test
UEC	Unit Energy Consumption
UES	Unit energy savings
WAC	Washington Administrative Code

Acknowledgements

The authors would like to thank the Seattle City Light staff who provided invaluable guidance and support, especially Jennifer Finnigan, John Rudolph, and Villamor Gamponia. The study required a compilation of a large amount of data from many sources, including several departments at City Light. The authors thank Kali Hollenhorst, Carsten Croff, Aliza Seelig, Mike Hamilton, and Saul Villareal for their guidance on load forecasting, avoided costs and economic assumptions.

1. Executive Summary

1.1. Overview

Seattle City Light (City Light) engaged Cadmus to complete a Conservation Potential Assessment (CPA) to produce rigorous estimates of the magnitude, timing, and costs of conservation resources within City Light's service territory over the next 21 years, beginning in 2020, which aligned with City Light's Integrated Resource Plan (IRP) timeline. This study identifies all cost-effective conservation potential in each of City Light's major customer sectors, including residential, commercial, and industrial. This study did not estimate street lighting potential as these have all been converted to LED.[1]

This study accomplishes the following objectives:

- Fulfills statutory requirements of Chapter 194-37 of the Washington Administrative Code (WAC), Energy Independence Act. This WAC requires City Light to identify all achievable, cost-effective, conservation potential for the upcoming 10 years.[2] City Light's public biennial conservation target should be no less than the *pro rata* share of conservation potential over the first 10 years. The study estimates will inform City Light's targets for the 2020-2021 biennium.
- Provides adjustments to the final load forecasts for customers' energy savings from City Light's programs.
- Provides inputs into City Light's Integrated Resource Plan (IRP). Completed every two years, City Light's IRP determines the mixture of supply-side and conservation resources required over the next 20 years to meet customer demand. The IRP requires a thorough analysis of conservation potential to properly assess the reliability, cost, risk, and environmental impact of different power generation resource portfolios.

This study relies on City Light-specific data, compiled from their oversample of the 2017 Residential Building Stock Assessment (RBSA),[3] the 2014 Commercial Building Stock Assessment (CBSA),[4] and other regional data sources. This study uses a methodology consistent with the Northwest Power and Conservation Council's Seventh Power Plan. It incorporates savings and costs for all energy conservation

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1 City Light's 2018 CPA did estimate streetlighting potential and, therefore, some figures and graphs in this report show those results for comparison to the 2020 CPA results

2 Washington State Legislature. *Energy Independence Act.* Washington Administrative Code Chapter 194-37.

3 Northwest Energy Efficiency Alliance. 2017 Residential Building Stock Assessment.

4 Northwest Energy Efficiency Alliance. 2014. Commercial Building Stock Assessment.

measures (ECMs) in the Council's final Seventh Plan workbooks and the active Regional Technical Forum's (RTF) unit energy savings (UES) workbooks.[5]

This study also anticipates upcoming requirements of Washington State's Clean Energy Transformation Act (CETA) which was passed as Senate Bill 5116 in April 2019 as the conservation potential assessment study analysis was being completed. Several CETA requirements, such as the inclusion of the social cost of carbon in avoided energy costs and estimates of demand response and solar photovoltaic (PV) potential were analyzed by this study.

1.2. Scope of Analysis

This study includes analysis of three sectors. In most of these sectors, Cadmus considered multiple market segments, construction vintages—new and existing—and end uses. Specifically, the analysis addressed the following sectors:

- Residential: Single-family and three types of multifamily homes, including low-rise, mid-rise and high-rise
- Commercial: 19 major commercial segments, including offices, retail and other segments;
- Industrial: Energy-intensive manufacturing and primarily process-driven customers

For each sector, Cadmus developed a baseline end-use load forecast that assumed no new future programmatic conservation. The baseline forecast largely captured savings from building energy codes, equipment standards, and other naturally occurring market forces. Cadmus calculated energy efficiency potential estimates by assessing each ECM's impact on this baseline forecast. Therefore, conservation potential estimates presented in this report represent savings beyond codes and standards, and naturally occurring savings.

Consistent with the Washington Administrative Code (WAC) requirements, this study considers three types of energy efficiency potential, as shown in Figure 1.1.

[5] RCW 19.285.040 requires CPAs to use methodologies consistent with those used by the Council's most recent regional power plan.

Figure 1.1. Incremental Achievable Economic Potential

EPA- National Action Plan for Energy Efficiency

This study defines the three types of potential as follows:

- **Technical potential** includes all technically feasible conservation measures, regardless of costs and market barriers. This is the theoretical upper bound of available conservation potential, estimated after accounting for technical constraints. The Methodology section of this report includes a description of the data sources Cadmus used to estimate these technical constraints for individual measures.
- **Economic potential** represents a subset of technical potential, consisting only of measures meeting cost-effectiveness criteria, based on City Light's avoided supply costs for delivering electricity. Adherent to WAC 194-37-070, Cadmus used the total resource cost (TRC) to identify cost-effective measures using a method consistent with the Council. The report's Economic Potential section includes a detailed description of benefits and costs considered.
- **Achievable economic potential** represents the portion of economic potential that might be reasonably achievable during the 21-year study horizon, given the possibility of market barriers impeding customer adoption such as initial first cost, awareness and understanding of energy efficient technologies, and sufficient contractor base for installing efficient technologies. Ramp rates—defined as the acquisition rates for specific technologies—also determine the amount of economic potential considered achievable on an annual basis, beginning in 2020. The Achievable Economic Potential section discusses Cadmus' approach to estimating achievable potential.

1.3. Summary of Results

Study results indicate a 10-year achievable conservation potential of 82.7 average megawatts (aMW) (cumulative in 2029) within City Light's service territory. Two-year conservation potential equals 21.3 aMW, and the *pro rata* share (20 percent of 10-year conservation potential) which represents City

Light's minimum biennial target equals 16.5 aMW. Table 1.1 summarizes achievable economic conservation potential for each sector; all values include line losses at the generator.

1.3.1. Achievable Economic Potential

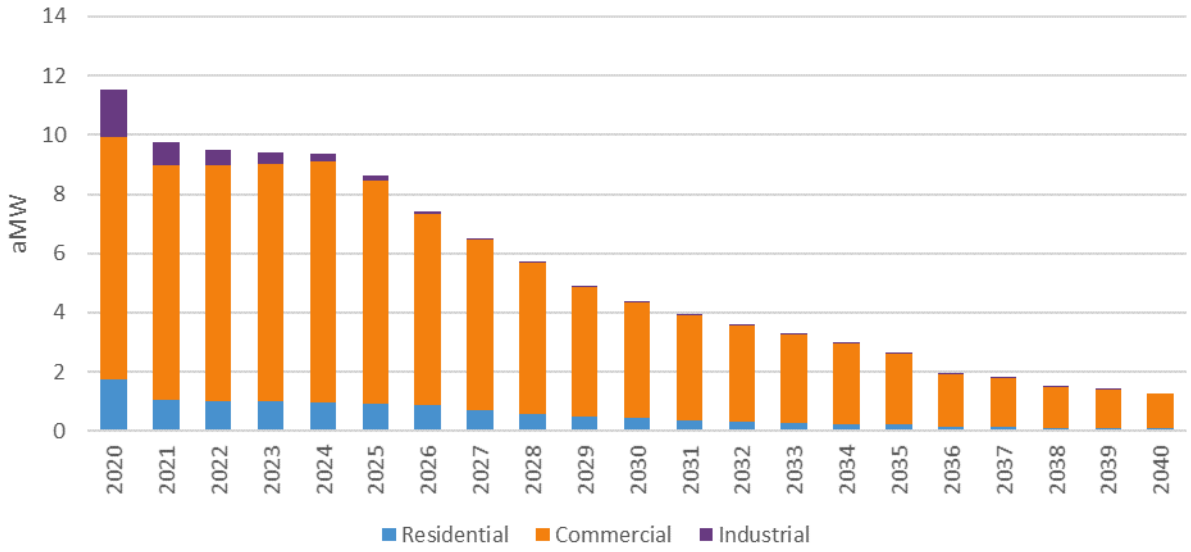
TABLE 1.1. CUMULATIVE ACHIEVABLE POTENTIAL BY SECTOR

Sector	Achievable Economic Potential (aMW)			
	Two Year (2020-2021)	Ten Year (2020-2029)	21 Year (2020-2040)	20% of 10-Year Potential
Residential	2.77	9.27	11.70	1.85
Commercial	16.10	69.43	95.54	13.89
Industrial	2.40	3.96	4.04	0.79
Street Lighting	0	0	0	0
Total	21.27	82.67	111.28	16.53

The commercial sector accounts for approximately 86 percent of cumulative, 21-year achievable potential, while the residential and industrial sectors account for roughly 11 percent and 3 percent of the 21-year potential, respectively. The study did not estimate street lighting potential, unlike the 2018 CPA because all streetlights have been upgraded to LED. This report's Energy Efficiency Potential section provides detailed estimates of achievable economic potential for each sector.

Figure 1.2 shows incremental achievable potential over the study horizon. Approximately 72 percent of the 21 year conservation potential will be achieved within the first 10 years, partly due to the mixture of measures with high conservation potential. This acceleration becomes particularly pronounced in the residential and industrial sectors, where 77 percent and 96 percent, respectively, of potential is acquired within the first 10 years. Cadmus determined the acquisition rate of incremental achievable potential using each measure's ramp rate, applying ramp rates developed by the Council for the Seventh Power Plan, and accelerating the application of ramp rates based on Seattle's historic conservation achievements. Historically, City Light has achieved energy savings greater than both its I-937 targets and its share of the regional savings on a percent of sales basis. Therefore, some ramp rates have been adjusted to reflect the greater pace of achievement, particularly with respect to commercial lighting technologies.

Figure 1.2. Incremental Achievable Economic Potential

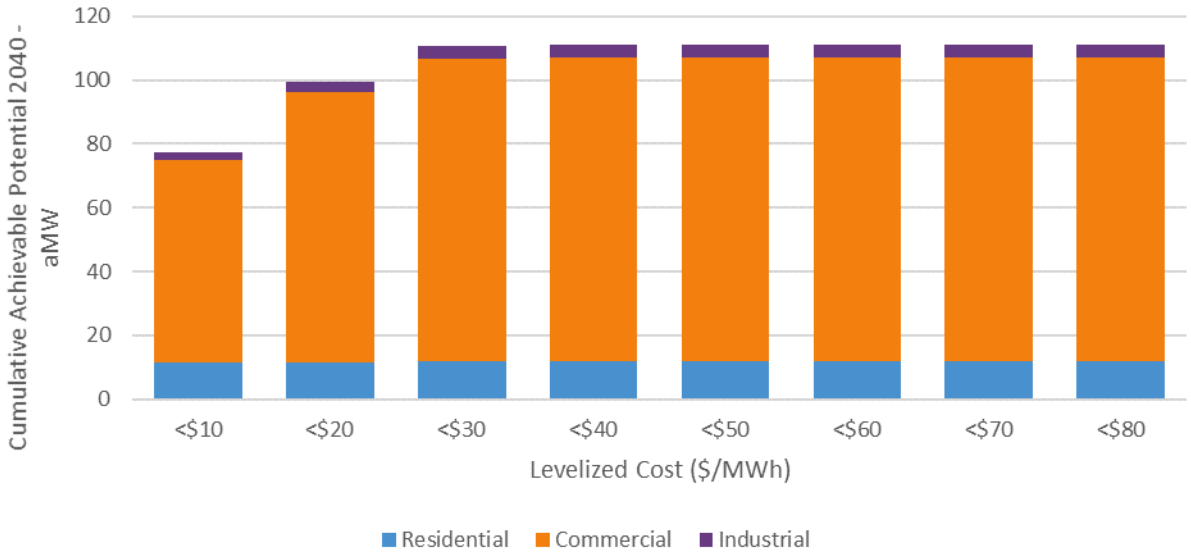


Lighting measures in the commercial sector account for a large portion of savings, and many of these measures have relatively aggressive ramp rates, based on the measures' availability and City Light's' program accomplishments. The Achievable Economic Potential section discusses Cadmus' ramp-rate application rates to determine incremental achievable potential; the Energy Efficiency Potential section includes descriptions of the top-saving measures in each sector.

Figure 1.3 shows the amount of 21-year cumulative achievable potential at different, levelized cost thresholds. Levelized costs (expressed in 2018 dollars) represent the present value of the incremental measure cost, including reinstallations over the course of the study horizon, divided by the net present value of energy savings over the study's horizon.[6] Levelized costs of conserved energy often are used to compare the cost of conservation to supply-side resources.

[6] The report's Economic Potential section includes a detailed discussion of levelized cost calculation, including the methodology and components.

Figure 1.3. Conservation Supply Curves



Potential conservation remains a low-cost resource: study results indicate roughly 78 aMW of conservation is achievable at a cost of less than $10 per megawatt-hour (MWh). This roughly accounts for 70 percent of the 21-year cumulative achievable potential. Approximately 89 percent of the 21-year, cumulative, achievable potential costs less than $20/MWh when levelized.

1.3.2. Technical and Economic Potential

1.3.2.1 Technical Potential

Table 1.2 shows the cumulative technical potential for each sector in 2040. Overall, study results identify 282 aMW of technically feasible conservation potential by 2040—the equivalent of 23 percent of forecasted baseline sales. Study results are presented as a percent of forecasted baseline sales which provides a useful benchmark for comparison against previous CPAs and the Council's 7th Power Plan.

TABLE 1.2. TECHNICAL POTENTIAL

Sector	Baseline Sales– 21 Year (aMW)	Technical Potential– 21 Year (aMW)	Technical Potential as % of Baseline Sales
Residential	440	100	23%
Commercial	693	173	25%
Industrial	88	9	10%
Street Lighting	5	0	0%
Total	1,226	282	23%

The commercial, residential, and industrial sectors account for 61 percent, 36 percent, and 3 percent of the 21-year technical potential, respectively.

1.3.2.2 Economic Potential

According to WAC 194-37-070, City Light must consider conservation potential estimates using avoided costs equal to a forecast of regional market prices. Regional market price forecasts, however, do not necessarily reflect all the costs associated with City Light's preferred portfolio of generation resources. To assess impacts of avoided cost uncertainty, Cadmus prepared estimates of economic and achievable potential, using an avoided energy cost forecast that assumes continued purchases and delivery from Bonneville Power Administration after City Light's 20-year contract ends in 2028, inclusion of the social cost of carbon based on Washington's Clean Energy Transformation Act (ESSSB 5116), additions for renewable energy credits, market purchases during the month of June since the monthly shaping of the BPA contract assumes no BPA purchases in June so energy efficiency displaces market purchases in June, and a 10 percent conservation credit.[7]

The study also accounted for forecasts of deferred transmission and distribution (T&D) costs. The 2020 CPA updated these values to align with the Council's recently updated assumptions for its upcoming 2021 Power Plan.[8] Cadmus used forecast values from the Council's presentation in March of 2019, which reflected values of $3.08/kW-year and $6.85/kW-year for transmission and distribution, respectively, which were converted from 2016 to 2018 dollars.[9] As City Light does not face constrained generation capacity, these scenarios do not include costs associated with adding generation capacity.

In the 2020 CPA, total levelized avoided costs for the 2020 to 2040 period are approximately $38/MWh, compared to $52/MWh in the 2018 CPA, or nearly 27 percent lower, as shown in Figure 1.4.[10] These lower avoided energy and capacity costs contributed to a decrease in economic potential in the residential, commercial, and industrial sectors, in addition to factors contributing to lower technical potential.

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7 The Northwest Power Act requires the Bonneville Power Administration to provide a 10 percent benefit to conservation over other sources of electric generation. Northwest Power Act, Section 3(4)(D), 94 Stat. 2699.

8 https://www.nwcouncil.org/sites/default/files/2019_0312_p3.pdf

9 The Council's values were presented in its March 2019 meeting and reflect weighted average values from several regional utilities and are expressed in $2016, levelized. https://www.nwcouncil.org/sites/default/files/2019_0312_p3.pdf

10 Both the 2018 CPA and 2020 CPA levelized cost values are expressed in 2018 dollars for comparison purposes

Figure 1.4. Economic Potential as a Fraction of Baseline Sales – 2040 Cumulative

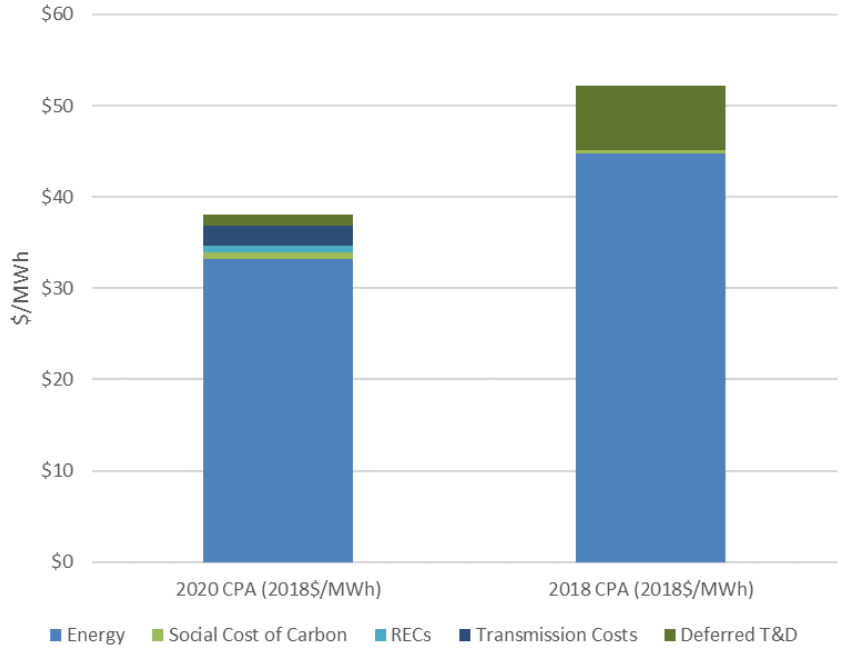


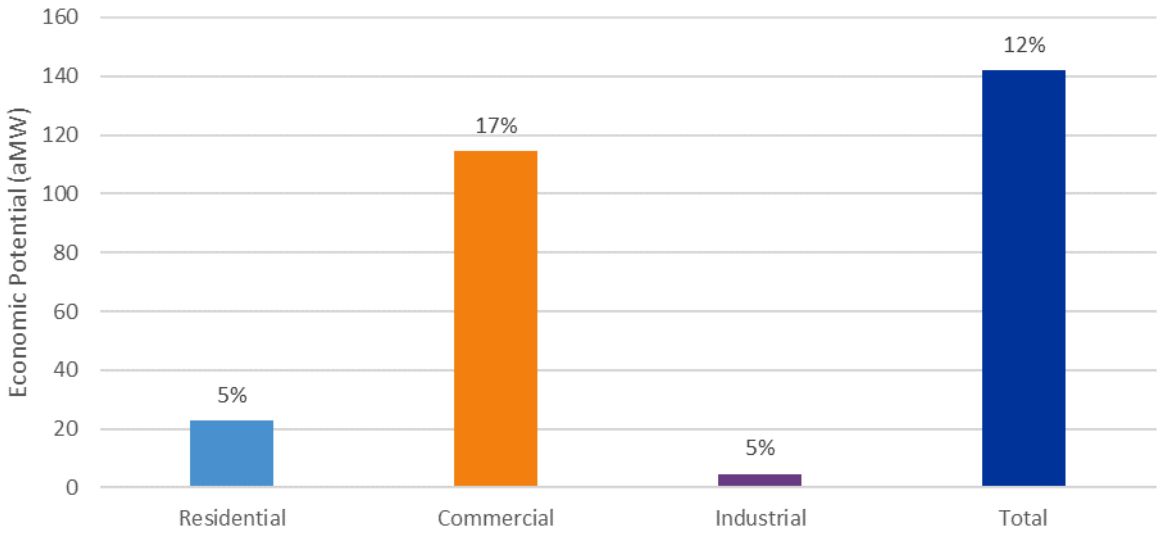
Table 1.3 summarizes cumulative economic potential in 2040 for each avoided-cost scenario. Using updated avoided costs, approximately 23 percent of technical potential proves cost-effective in the residential sector, compared to 66 percent in the commercial sector and 56 percent in the industrial sector. Substantial differences in the percent of technical potential that is economic exist between sectors, particularly for the residential sector, which is much lower than commercial and industrial. The primary reason for this discrepancy is that, relatively speaking, residential measures are typically less cost-effective than commercial and industrial, as unit energy savings are lower due to the relative magnitude of energy consumption between homes, businesses, and industries.

TABLE 1.3. ECONOMIC POTENTIAL

Sector	Economic Potential—21 Year (aMW)	Economic Potential as a % of Baseline Sales	Economic Potential as a % of Technical Potential
Residential	23	5%	23%
Commercial	115	17%	66%
Industrial	5	5%	56%
Total	142	12%	50%

Figure 1.5 shows the cumulative economic potential in 2040, relative to forecasted baseline sales, by sector.

Figure 1.5. Economic Potential as a Fraction of Baseline Sales – 2040 Cumulative



WAC 194-070 requires City Light to test multiple scenarios and incorporate risk into estimates of achievable potential. By using a higher or lower IRP avoided-cost scenario based on the relative change in avoided costs from the last CPA instead of a scenario based on avoided costs that reflect market prices, Cadmus accounted for risk associated with market price forecasts.

1.3.3. Comparison to the 2018 CPA

TABLE 1.4. TECHNICAL POTENTIAL COMPARISON						
Sector	2020 CPA			2018 CPA		
	Baseline Sales—21 Year (aMW)	Technical Potential—21 Year (aMW)	Technical Potential as % of Baseline Sales	Baseline Sales—20 Year (aMW)	Technical Potential—20 Year (aMW)	Technical Potential as % of Baseline Sales
Residential	440	100	23%	336	85	25%
Commercial	693	173	25%	747	180	24%
Industrial	88	9	10%	150	13	9%
Street Lighting	5	0	0%	10	1	12%
Total	1,226	282	23%	1,242	279	22%

The 2020 CPA identified 282 aMW of technical potential, compared to 279 in the 2018 CPA. This very slight increase affects changes in both the economic and achievable potential. Changes contributing to the difference in technical potential include the following:

- Higher residential baseline load forecasts
- New residential measures not previously considered in the 2018 CPA
- Additional commercial measures not previously included in the 2018 CPA
- Lower industrial baseline load forecasts due to the re-classification of some industrial customer premise loads in the commercial sector

This report's Comparison to 2018 CPA section discusses each factor in detail. Table 1.5 compares economic potential for the 2020 and 2018 CPAs.

TABLE 1.5. ECONOMIC POTENTIAL COMPARISON						
Sector	2020 CPA (Market Avoided Costs)			2018 CPA (IRP Avoided Costs)		
	Economic Potential—21 Year (aMW)	Economic Potential as % of Baseline Sales	Economic as a % of Technical Potential	Economic Potential—20 Year (aMW)	Economic Potential as % of Baseline Sales	Economic as a % of Technical Potential
Residential	23	5%	23%	21	6%	25%
Commercial	115	17%	66%	131	17%	72%
Industrial	5	5%	56%	10	7%	77%
Street Lighting	0	0%	0%	1	12%	100%
Total	142	12%	50%	163	13%	58%

The 2020 CPA identified 142 aMW of economic potential, compared to 163 aMW of economic potential in the 2018 CPA. Lower avoided energy and deferred T&D capacity costs contributed to decreases in the residential, commercial, and industrial sectors, in addition to factors contributing to lower technical potential for the commercial and industrial sectors only (see Table 1.4).

As with technical and economic potential assessment, Cadmus identified lower 20-year, cumulative achievable economic potential. As 20-year cumulative achievable potential represents a subset of economic potential, factors contributing to lower cumulative achievable potential were the same as those previously discussed for economic potential. Figure 1.5 shows incremental achievable economic potential for the 2020 and 2018 CPAs.

Figure 1.6. Incremental Achievable Economic Potential 2020 and 2018 CPAs

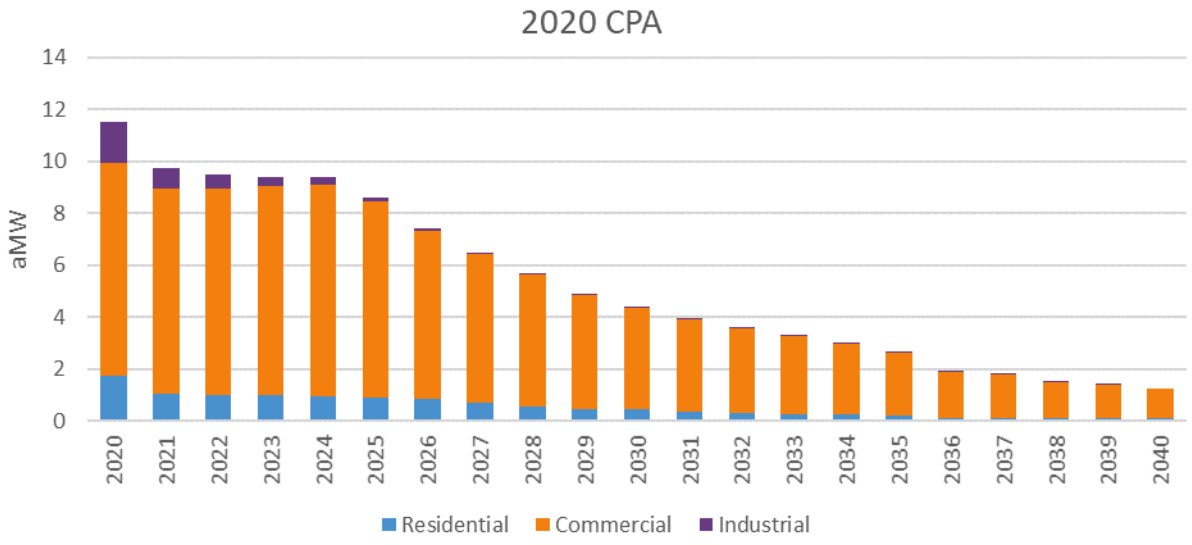


Figure 1.6. Incremental Achievable Economic Potential 2020 and 2018 CPAs

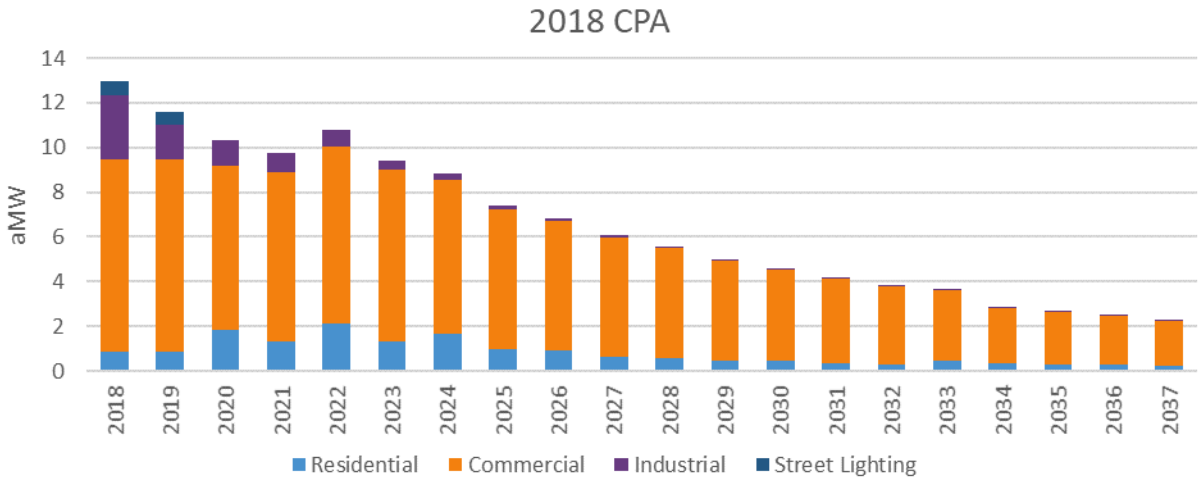


Figure 1.7 illustrates, compared to the 2018 CPA, the 2020 CPA determines a higher proportion of total achievable potential will be realized in the study's early years. This change results from multiple factors:

- The shift in the study horizon (moving from a 2018 start year to 2020)
- The application of faster ramp rates for lost opportunity measures to account for the difference in the 2020 CPA start year (2020) and 7th Plan start year (2016), which is also consistent with the approach taken by BPA's CPA.[11]

As illustrated in Figure 1.7, the cumulative achievable potential as a percent of 21-year achievable potential in the 2020 CPA is comparable to the 2018 CPA.

[11] Bonneville Power Administration. *BPA Conservation Potential Assessment, 2020-2039.* Prepared by The Cadmus Group and EES Consulting, July 2018. Available online: https://www.bpa.gov/EE/Utility/research-archive/Documents/BPA_Conservation_Potential_Assessment_2020-2039.pdf

Figure 1.7. Cumulative Achievable Potential as a Percent of Total Achievable Potential

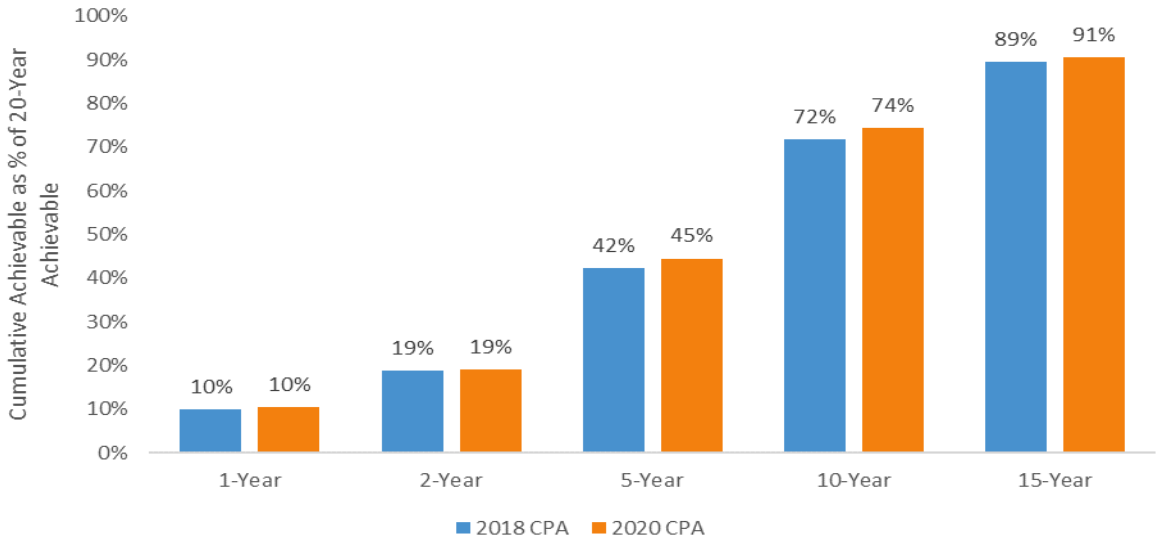


Table 1.6 provides a summary of the technical, economic, and achievable capacity savings from energy efficiency by sector, in 2040. The commercial sector accounts for 87% and 91% of the total, cumulative winter and summer capacity achievable potential, respectively.

TABLE 1.6. CUMULATIVE 21-YEAR WINTER AND SUMMER CAPACITY SAVINGS BY SECTOR, IN 2040

Sector	Technical Potential		Economic Potential		Achievable Potential	
	Winter MW	Summer MW	Winter MW	Summer MW	Winter MW	Summer MW
Residential	189	69	26	23	15	11
Commercial	243	317	162	189	135	158
Industrial	10	11	6	6	5	5
Total	**441**	**398**	**193**	**218**	**155**	**174**

The residential sector accounts for nearly 43% of the winter capacity technical potential but only 17% of the summer capacity technical potential, reflecting the relatively higher saturation of residential electric space heating loads compared with residential cooling loads. The residential sector's share of winter and summer economic and achievable capacity potential declines compared to its share of technical potential, as many of the highest capacity-savings measures are not cost-effective, including efficiency air source and ductless heat pumps and weatherization measures.

1.4. Organization of this Report

This report presents the study's findings in two volumes. Volume I—this document—presents the methodologies and findings. Volume II contains the appendices, and it provides detailed study results, supplemental materials, and summaries of demand response and solar photovoltaic potential.

Volume I includes the following sections:

- The methodology overview provides an overview of the methodology Cadmus used to estimate technical, economic, and achievable economic potential.
- Developing Baseline Forecasts provides an overview of Cadmus' approach to produce baseline end-use forecasts for each sector.
- Measure Characterization describes Cadmus' approach for developing a database of ECMs, deriving from this estimates of conservation potential. This section discusses how Cadmus adapted measure data from the Seventh Power Plan, RTF, and other sources for this study.
- Estimating Conservation Potential discusses assumptions and underlying equations used to calculate technical, economic, and achievable economic potential.
- Baseline Forecasts provides detailed sector-level results for Cadmus' baseline end-use forecasts.
- Energy Efficiency Potential provides detailed sector, segment and end-use specific estimates of conservation potential as well as discussion of top-saving measures in each sector.
- Comparison to 2018 CPA shows how this study's results (the 2020 CPA) compare to City Light's prior CPA.

Volume II includes the following sections:

- Appendix A. Washington Initiative 937 (I-937) Compliance Documentation
- Appendix B. Baseline Data
- Appendix C. Energy Efficiency Measure Descriptions
- Appendix D. Detailed Assumptions and Energy Efficiency Potential
- Appendix E. Measure Details

2. Methodology

2.1. Methodology Overview

Estimating conservation potential draws upon a sequential analysis of various ECMs in terms of technical feasibility (technical potential), cost-effectiveness (economic potential), expected market acceptance, and considered normal barriers possibly impeding measure implementation (achievable economic potential).

Cadmus' assessment took the following primary steps:

- Baseline forecasting, which involved determining 21-year future energy consumption by sector, market segment, and end use. The study calibrated the base year (2019) to City Light's sector-load forecasts produced in 2018. Baseline forecasts in this report include Cadmus' estimated impacts of naturally occurring potential and codes and standards.
- Estimation of technical potential, based on alternative forecasts reflecting the technical impacts of specific energy efficiency measures.
- Estimation of economic potential, based on alternative forecasts reflecting technical impacts of cost-effective ECMs.
- Estimation of achievable economic potential, calculated by applying ramp rates and on the achievability percentage to economic potential, which this section describes in detail.

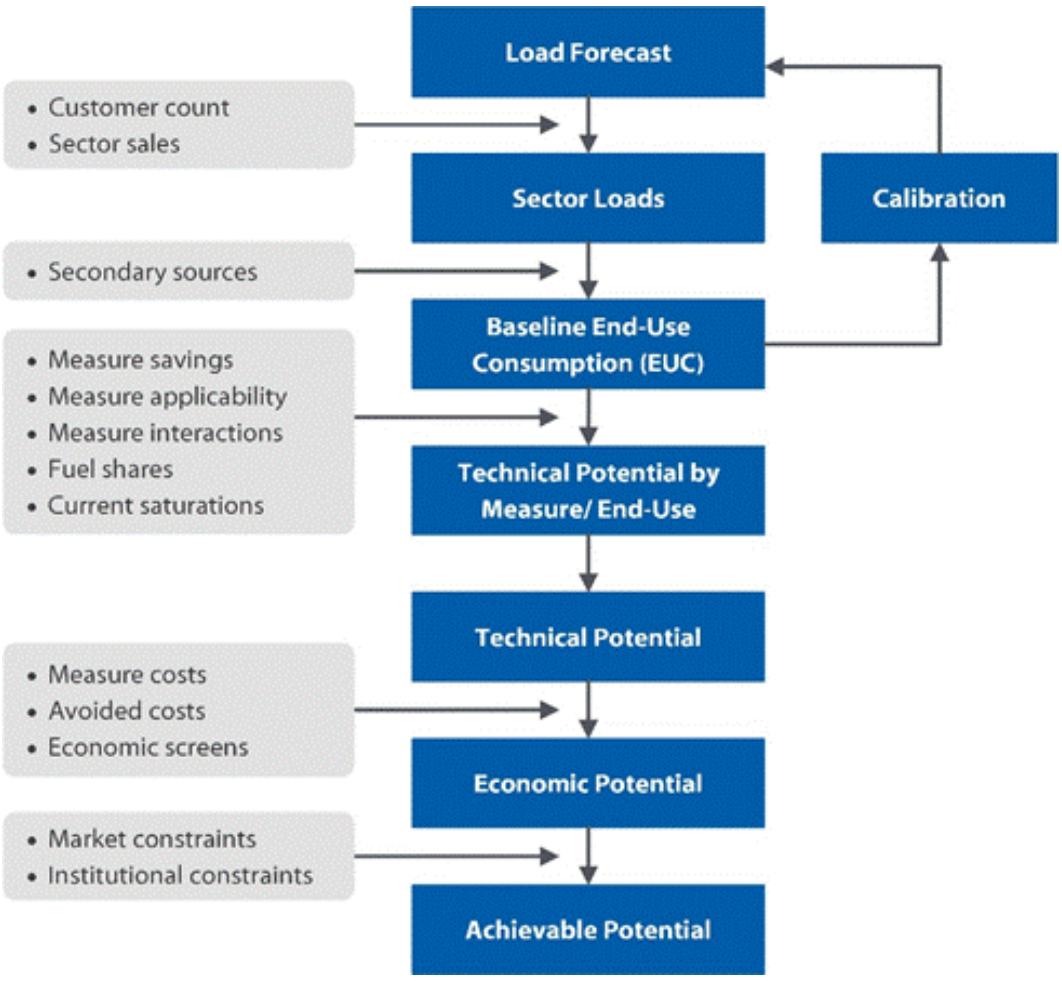
This approach offered two advantages:

- First, savings estimates would be driven by a baseline calibrated to City Light's.
- Second, the approach maintained consistency among all assumptions underlying the baseline and alternative forecasts—technical, economic, and achievable technical. The alternative forecasts changed relevant inputs at the end-use level to reflect ECM impacts. As estimated savings represented the difference between baseline and alternative forecasts, they could be directly attributed to specific changes made to analysis inputs.

Cadmus' general methodology can be best described as a combined top-down/bottom-up approach. As shown in Figure 2.1, the top-down component began with the most current load forecast, adjusting for building codes, equipment efficiency standards, and market trends not accounted for through the forecast. It then disaggregated this load forecast into its constituent customer sectors, customer segments, and end-use components.

The bottom-up component considered potential technical impacts of various ECMs and practices on each end use. Impacts could then be estimated, based on engineering calculations, and accounting for fuel shares, current market saturations, technical feasibility, and costs.

Figure 2.1. General Methodology for Assessment of Conservation Potential



2.2. Developing Baseline Forecasts

City Light's sector-level sales and customer forecasts provided the basis for assessing energy efficiency potential. Prior to estimating potential, the study disaggregated sector-level load forecasts by customer segment (business, dwelling, or facility types), building vintage (existing structures and new construction), and end uses (all applicable end uses in each customer sector and segment).

The first step in developing baseline forecasts determined the appropriate customer segments within each sector. Designations drew upon categories available in the study's key data sources—primarily City Light's nonresidential customer database (for the C&I sectors), and the U.S. Census Bureau's American Community Survey (for the residential sector), followed by mapping appropriate end uses to relevant customer segments.

Upon determining appropriate customer segments and end uses for each sector, the study produced the baseline end-use forecasts, based on integration of current and forecasted customer counts with key market and equipment usage data.

For the commercial and residential sectors, calculating total baseline annual consumption for each end use in each customer segment used the following equation:

$$EUSE_{ij} = \Sigma_e \, ACCTS_i * UPA_i * SAT_{ij} * FSH_{ij} * ESH_{ije} * EUI_{ije}$$

Where:

$EUSE_{ij}$	=	total energy consumption for end use j in customer segment i
$ACCTS_i$	=	the number of accounts/customers in customer segment i
UPA_i	=	units per account in customer segment i (UPAi generally equals the average square feet per customer in commercial segments, and 1.0 in residential dwellings, assessed at the whole-home level)
SAT_{ij}	=	the share of customers in customer segment i with end use j
FSH_{ij}	=	the share of end use j of customer segment i served by electricity
ESH_{ije}	=	the market share of efficiency level in equipment for customer segment and end use ij
EUI_{ije}	=	end-use intensity: energy consumption per unit (per square foot for commercial) for the electric equipment configuration ije

For each sector, total annual consumption could be determined as the sum of $EUSE_{ij}$ across the end uses and customer segments.

Consistent with other conservation potential studies, and commensurate with industrial end-use consumption data (which varied widely in quality), allocating the industrial sector's loads to end uses in various segments and drawing upon data available from the U.S. Department of Energy (DOE) Energy Information Administration.[12]

2.2.1. Derivation of End-Use Consumption

End-use energy consumption estimates by segment, end use, and efficiency level *(EUI_{ije})* provided one of the most important components in developing a baseline forecast. In the residential sector, the study used estimates on unit energy consumption (UEC), representing annual energy consumption associated with an end use and represented by a specific type of equipment (e.g., a central air conditioner or heat pump).

For the commercial sector, the study treated consumption estimates as end-use intensities, representing annual energy consumption per square foot served. The accuracy of these estimates proved critical. They accounted for weather and other factors (described below) that drove differences among various segments.

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[12] Energy Information Administration. *Manufacturing Energy Consumption Survey.* U.S. Department of Energy. *2010.*

For the industrial sector, end-use energy consumption represented total annual industry consumption by end use, as allocated by the secondary data described above.

2.3. Measure Characterization

As technical potential drew upon an alternative forecast, reflecting installations of all technically feasible measures, selecting appropriate ECMs to include in this study posed a central concern. To alleviate this concern and to arrive at the most robust set of appropriate measures, Cadmus developed a comprehensive database of technical and market data for ECMs; these applied to all end uses in various market segments. The database included the following measures:

- All measures included in the Council's final Seventh Power Plan conservation supply curve workbooks
- Active RTF UES measures
- Particular technologies of interest to City Light, as identified for the study (e.g., residential and commercial central cooling and room cooling measures)

Cadmus only included Council and RTF measures applicable to sectors and market segments within City Light's service territory. For example, the study did not characterize measures for the agriculture sector or the residential manufactured home segment as these represented a small fraction of City Light's customer mix.

Cadmus added measures if the RTF developed UES workbooks not included in the Seventh Power Plan. For the residential sector, these included the following:

- ENERGY STAR room air conditioners
- Residential refrigerator and freezer decommissioning
- Interior fluorescent high-performance T8 lamps

In the commercial sector, additional RTF measures included the following:

- Commercial refrigerator and freezer decommissioning
- Efficient commercial ice makers

After creating a list of electric energy efficiency measures applicable to City Light's service territories, Cadmus classified the measures into two categories:

- **High-efficiency equipment measures** directly affecting end-use equipment (e.g., high-efficiency domestic water heaters), which follow normal replacement patterns based on expected lifetimes.
- **Non-equipment (retrofit) measures** affecting end-use consumption without replacing end-use equipment (e.g., insulation). Such measures do not include timing constraints from equipment turnover—except for new construction—and should be considered discretionary, given that savings can be acquired at any point over the planning horizon.

Each measure type's relevant inputs include the following:

Equipment and non-equipment measures:

- Energy savings: average annual savings attributable to installing the measure, in absolute and/or percentage terms.
- Equipment cost: full or incremental, depending on the nature of the measure and the application.
- Labor cost: the expense of installing the measure, accounting for differences in labor rates by region, urban versus rural areas, and other variables.
- Technical feasibility: the percentage of buildings where customers can install this measure, accounting for physical constraints.
- Measure life: the expected life of the measure equipment.

Non-equipment measures only:

- Technical feasibility: the percentage of buildings where customers can install this measure, accounting for physical constraints.
- Percentage incomplete: the percentage of buildings where customers have not installed the measure, but where its installation is technically feasible. This equals 1.0 minus the measure's current saturation.
- Measure competition: for mutually exclusive measures, accounting for the percentage of each measure likely installed to avoid double-counting savings.
- Measure interaction: accounting for end-use interactions (e.g., a decrease in lighting power density causing heating loads to increase).

Cadmus derived these inputs from various sources, though primarily through the following:

- Northwest Energy Efficiency Alliance's (NEEA) CBSA, including City Light's oversample
- NEEA's RBSA
- The Council's Seventh Power Plan supply curve workbooks
- The RTF's UES measure workbooks

For many equipment and non-equipment inputs, Cadmus reviewed a variety of sources. To determine which source to use for this study, Cadmus developed the following hierarchy for costs and savings:

- The Council's Seventh Power Plan supply curve workbooks
- RTF UES measure workbooks
- Various secondary sources, such as American Council for an Energy-Efficient Economy work papers, Simple Energy and Enthalpy Model building simulations, or various technical reference manuals

Cadmus also developed a hierarchy to determine the source for various applicability factors, such as the technical feasibility and the percentage incomplete. This hierarchy differed slightly for residential and commercial measure lists. Generally, the study sought to achieve 90 percent confidence with a ±10 percent precision for each estimate.

For residential estimates, Cadmus relied on City Light's oversample in NEEA's 2016 RBSA. If City Light's subset included an insufficient sample to achieve 90 percent confidence with a ±10 percent precision for a given estimate, estimates were derived from the sample of Puget Sound-area customers (e.g., City Light, Puget Sound Energy, Snohomish County Public Utility District, Tacoma Power) or for the broader Northwest, as found in the RBSA. If Cadmus could not calculate applicability factors from NEEA's RBSA, the study used applicability factors from the Council's Seventh Power Plan workbooks. The resulting estimates reflected averages for the Northwest region and were not necessarily specific to City Light's service territory.

For the commercial sector, Cadmus first used the subset of City Light's customers, including City Light's and the Bonneville Power Administration's oversample in NEEA's CBSA. If NEEA's CBSA had an insufficient number of customers to achieve estimates with 80 percent confidence with a ± 20 percent precision for a given building type, Cadmus developed estimates from the sample of urban buildings in the regional CBSA data. If NEEA's CBSA did not include sufficient data to estimate an applicability factor for a given measure, Cadmus relied on factors from the Council's Seventh Power Plan supply curve workbooks.

By data input, Table 2.1 lists the primary sources referenced in the study.

TABLE 2.1. KEY MEASURE DATA SOURCES			
Data	**Residential Source**	**Commercial Source**	**Industrial Source**
Energy savings	Seventh Power Plan supply curve workbooks; RTF; Cadmus research	Seventh Power Plan supply curve workbooks; RTF; Cadmus research	Seventh Power Plan supply curve workbooks; RTF; DOE Industrial Assessment Center database; Cadmus research
Equipment and labor costs	Seventh Power Plan supply curve workbooks; RTF; Cadmus research	Seventh Power Plan supply curve workbooks; RTF; Cadmus research	Seventh Power Plan supply curve workbooks; RTF; DOE Industrial Assessment Center database; Cadmus research
Measure life	Seventh Power Plan supply curve workbooks; RTF; Cadmus research	Seventh Power Plan supply curve workbooks; RTF; Cadmus research	Seventh Power Plan supply curve workbooks; RTF; DOE Industrial Assessment Center database; Cadmus research
Technical feasibility	NEEA RBSA; Cadmus research	NEEA CBSA; Cadmus research	Cadmus research; Industrial Council data; NEEA Industrial Facilities Site Assessment (IFSA)
Percentage incomplete	NEEA RBSA; City Lights program accomplishments; Cadmus research	NEEA CBSA; City Lights program accomplishments; Cadmus research	Cadmus research; Industrial Council data; NEEA IFSA
Measure interaction	Seventh Power Plan supply curve workbooks; RTF; Cadmus research	Seventh Power Plan supply curve workbooks; RTF; Cadmus research	Cadmus research

2.3.1. Incorporating Codes and Standards

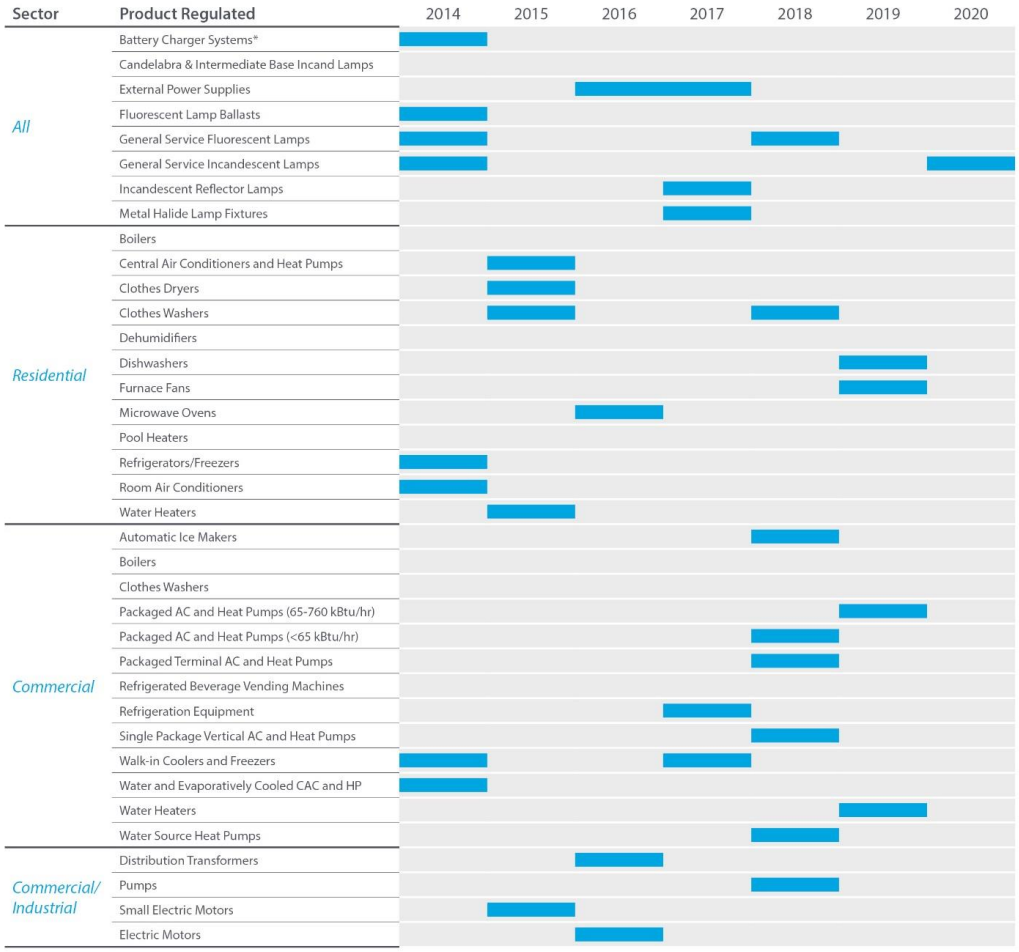
Cadmus' assessment accounted for changes in codes and standards over the planning horizon. These changes not only affected customers' energy-consumption patterns and behaviors; they also determined which energy efficiency measures would continue to produce savings over minimum requirements. Cadmus captured current efficiency requirements, including those enacted but not yet in effect.

Cadmus did not attempt to predict how energy codes and standards might change in the future. Rather, the study only factored in legislation already enacted—notably, the Energy Independence and Security Act of 2007 (EISA) provisions slated to take effect over the course of the analysis. EISA requires that

general service lighting becomes approximately 30 percent more efficient than current incandescent technology, with standards phased in by wattage from 2012 to 2014. In addition, EISA includes a backstop provision that requires even higher-efficiency technologies beginning in 2020.

Cadmus explicitly accounted for several other pending federal codes and standards. For the residential sector, these included appliance, HVAC, and water-heating standards. For the commercial sector, these included appliance, HVAC, lighting, motor, and water-heating standards. Figure 2.2 provides a comprehensive list of equipment standards considered in the study. Bars indicate the year in which a new equipment standard will be enacted. Some products will be subject to multiple standards over the planning horizon.

Figure 2.2. Equipment Standards Considered



** Battery chargers are an Oregon state standard, not a federal standard*

The study considered four codes and standards sources in addition to federal standards:

1. 2015 Washington State Energy Code (WSEC)
2. 2015 City of Seattle Energy Code

3. City of Seattle Office of Sustainability Benchmarking Code
4. Washington State House Bill 1444 Appliance Standards

The study incorporated the WSEC in its baseline development of residential and new construction measures. After reviewing the City of Seattle Energy Code, one small adjustment was made to single family heat pump measures in new construction applications; however, none of these measures passed cost-effectiveness testing. Other measures affected by the City of Seattle Energy Code were either not cost-effective (new construction interior lighting controls) or offered relatively low amounts of technical and economic potential and the code applied to only a portion of measure applications (commercial direct digital control energy management in new construction). Similarly, Cadmus reviewed both the City of Seattle OSE Benchmarking Code and the Washington State HB 1444 appliance standards and concluded the study had either sufficiently considered the standards (in the case of HB 1444) and that, since the effects of the new benchmarking code were still unknown, no additional adjustments were required.

2.3.2. Adapting Measures from the RTF and Seventh Power Plan

To ensure consistency with methodologies employed by the Council and to fulfill requirements of WAC 194-37-070, Cadmus relied on ECM workbooks developed by the RTF and the Council to estimate measure savings, costs, and interactions. In adapting these ECMs for this study, Cadmus adhered to the following principles:

- **Deemed ECM savings in RTF or Council Workbooks must be preserved:** As City Light relies on deemed savings estimates provided by the Bonneville Power Administration that largely remain consistent with savings in RTF workbooks in demonstrating compliance with I-937 targets, Cadmus sought to preserve these deemed savings in the potential study. Doing so avoided possible inconsistencies between estimates of potential, targets, and reported savings.
- **Use inputs specific to City Light's service territory:** Some Council and RTF workbooks relied on regional estimates of saturations, equipment characteristics, and building characteristics derived from RBSA and CBSA. Cadmus updated regional inputs with estimates, calculated either from City Light's oversample of CBSA and RBSA or from estimates affecting the broader Puget Sound area. This approach preserved consistency with Council methodologies while incorporating Seattle-specific data.

Cadmus' approach for adapting Council and Seventh Plan workbooks varied by sector, as described in the following sections.

2.3.2.1 Residential and Commercial

Cadmus reviewed each residential Council workbook and extracted savings, costs, and measure lives for inclusion in this study. Applicability factors (such as the current saturation of an ECM) largely derived from City Light's oversample of RBSA, adjusted for City Lights program accomplishments. If Cadmus could not develop a City Light-specific applicability factor from RBSA, it used the Council's regional value.

In addition to extracting key measure characteristics, Cadmus identified each measure as an equipment replacement measure or a retrofit measure. Key distinctions between these two types of measures included the following:

- Savings for equipment replacement measures were calculated as the difference between the measure consumption and baseline consumption. For instance, concerning the heat pump water heater measure, Cadmus estimated the baseline consumption of an average market water heater and used deemed Council savings to calculate the consumption for a heat pump water heater. This approach preserved deemed savings found in Council workbooks.
- Savings for retrofit measures were calculated in percentage terms relative to the baseline end-use consumption yet reflected deemed Council and RTF values. For instance, if the Council deemed savings of 1,000 kilowatt-hour (kWh) per home for a given retrofit measure and Cadmus estimated the baseline consumption for the end use to which this measure was applicable as 10,000 kWh, relative savings for the measure were 10 percent. Cadmus did not apply relative savings from the Council's workbooks to baseline end-use consumption; doing so would lead to per-unit estimates that differed from Council and RTF values.

Cadmus also accounted for interactive effects included in Council and RTF workbooks. For instance, the Council estimated water heating, heating and cooling savings for residential heat pump water heaters—with the heating and cooling savings as the interactive savings. Because installation of a heat pump water heater represented a single installation, Cadmus employed a stock accounting model, which combined interactive and primary end-use effects into one savings estimate. Though Cadmus recognized this approach could lead to overstating or understating savings in end use, in aggregate—across end uses—savings matched deemed Council values.

Cadmus generally followed the same approach with the commercial sector; however, because of the mixture of measures considered in the Seventh Power Plan, Cadmus chose to model all commercial measures as retrofits and none as equipment replacements. Although many commercial measures represent equipment improvements, commercial building operators often replace these measures before the end of their effective useful life (EUL). Savings and costs for these measures reflected this decision.

2.3.2.2 Industrial

Cadmus adapted measures from the Council's Industrial_tool_7thPlan_v09 workbook for inclusion in this study; the workbook defined values for the following key industrial measure inputs:

- Measure savings (expressed as end-use percentage savings)
- Measure costs (expressed in dollar per kWh saved)
- Measure lifetimes (expressed in years)
- Measure applicability (percentage)

Cadmus mapped each Council industry type to industries found in City Light's service territory. These included foundries, miscellaneous manufacturing, stone and glass, transportation equipment manufacturing, other food, frozen food, water, and wastewater. Cadmus identified applicable end uses

using the Council's assumed distribution of end-use consumption in each industry. Table 2.2 shows the distribution of end-use consumption and the list of industries considered in this study.

TABLE 2.2. DISTRIBUTION OF END USE CONSUMPTION BY SEGMENT

Cadmus Segment	Process Air Comp	Lighting	Fans	Pumps	Motors Other	Process Other	Process Heat	HVAC	Other	Process Electro-Chemical	Process Refrigeration
Foundries	7%	9%	10%	18%	6%	0%	21%	9%	1%	6%	14%
Frozen Food	4%	9%	4%	8%	16%	0%	4%	8%	6%	3%	39%
Other Food	6%	5%	28%	5%	16%	0%	0%	1%	6%	19%	15%
Transportation Equip	6%	15%	6%	8%	14%	0%	11%	19%	12%	4%	5%
Misc. Manufacturing	7%	11%	7%	10%	16%	0%	12%	17%	9%	5%	5%
Water	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%
Wastewater	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%
Stone and Glass	9%	5%	8%	14%	22%	3%	22%	6%	3%	0%	7%

To incorporate broader secondary data, Cadmus aggregated some Council end uses into broader end uses. Table 2.3 shows the mapping of Council end uses to Cadmus end uses.

TABLE 2.3. COUNCIL AND CADMUS END USES	
Council End Use	**Cadmus End Use**
Pumps	Pumps
Fans and Blowers	Fans
Compressed Air	Process Air Compressor
Material Handling	Process Electro Chemical
Material Processing	Motors Other
Low Temp Refer	Process Refrigeration
Pollution Control	Other
Other Motors	Motors Other
Drying and Curing	Process Heat
Heat Treating	Process Heat
Heating	Process Heat
Melting and Casting	Process Heat
HVAC	HVAC
Lighting	Lighting
Other	Other

2.4. Estimating Conservation Potential

As discussed, Cadmus estimated three types of conservation potential, as shown in Figure 2.3.

Figure 2.3. Types of Conservation Potential

EPA- National Action Plan for Energy Efficiency

The following sections describe Cadmus' approach to estimating each type of potential.

2.4.1. Technical Potential

Technical potential includes all technically feasible ECMs, regardless of costs or market barriers. Technical potential divides into two classes: discretionary (retrofit); and lost opportunity (new construction and replacement of equipment on burnout).

Another important aspect in assessing technical potential is, wherever possible, to assume installations of the highest-efficiency equipment that are commercially available. For example, this study examined CFL and LED general-service lighting in residential applications. In assessing technical potential, Cadmus assumed that, as equipment fails or new homes are built, customers will install LED lighting wherever technically feasible, regardless of cost. Where applicable, CFLs would be assumed as installed in sockets ineligible for LEDs. This study treated competing non-equipment measures in the same way, assuming installation of the highest-saving measures where technically feasible.

In estimating technical potential, it is inappropriate to merely sum up savings from individual measure installations. Significant interactive effects can result from installations of complementary measures. For example, upgrading a heat pump in a home where insulation measures have already been installed can produce fewer savings than upgrades in an uninsulated home. Analysis of technical potential accounts for two types of interactions:

- **Interactions between equipment and non-equipment measures:** As equipment burns out, technical potential assumes it will be replaced with higher-efficiency equipment, reducing average consumption across all customers. Reduced consumption causes non-equipment measures to save less than they would if had the equipment remained at a constant average efficiency. Similarly, savings realized by replacing equipment decrease upon installation of non-equipment measures.
- **Interactions between non-equipment measures:** Two non-equipment measures applying to the same end use may not affect each other's savings. For example, installing a low-flow shower head does not affect savings realized from installing a faucet aerator. Insulating hot water pipes, however, causes water heaters to operate more efficiently, thus reducing savings from either measure. This study accounted for such interactions by stacking interactive measures, iteratively reducing baseline consumption as measures were installed, thus lowering savings from subsequent measures.

Although, theoretically, all retrofit opportunities in existing construction—often called discretionary resources—could be acquired in the study's first year, this would skew the potential for equipment measures and provide an inaccurate picture of measure-level potential. Therefore, the study assumed these opportunities would be realized in equal, annual amounts, over the 21-year planning horizon. By applying this assumption, natural equipment turnover rates, and other adjustments described above, annual incremental and cumulative potential could be estimated by sector, segment, construction vintage, end use, and measure.

This study's technical potential estimates drew upon best-practice research methods and standard utility industry analytic techniques. Such techniques remained consistent with the conceptual approaches and

methodologies used by other planning entities (such as the Council in developing regional energy-efficiency potential) and remained consistent with methods used in City Light's previous CPAs.

2.4.2. Economic Potential

Economic potential represents a subset of technical potential, consisting only of measures meeting cost-effectiveness criteria, based on City Light's avoided supply costs for delivering electricity. Adherent to WAC 194-37-070, Cadmus used the TRC to identify cost-effective measures in a manner consistent with the Council. Table 2.4 summarizes benefits and costs considered in calculating benefit-cost ratios.

TABLE 2.4. TRC BENEFITS AND COSTS

Type	Component
Costs	Incremental Measure Equipment and Labor Cost
	Incremental O&M Cost
	Administrative Adder
Benefits	Avoided supply costs ($/kWh)
	Present Value of Non-Energy Benefits
	Present Value of T&D Deferrals ($/kW)
	10% Conservation Credit
	Secondary Energy Benefits

- **Incremental measure cost:** This study considered costs required to sustain savings over a 20-year horizon, including reinstallation costs for measures with useful lives less than 20 years. If a measure's useful life extended beyond the end of the 20-year study, Cadmus incorporated an end effect that treated the measure's cost over its EUL[13] as an annual reinstallation cost for the remainder of the 20-year period.[14]
- **Incremental operations and maintenance (O&M) costs or benefits:** As with incremental measure costs, O&M costs were considered annually over the 20-year horizon. Cadmus used the present value to adjust the levelized cost upward for measures with costs above baseline technologies and downward for measures that decreased O&M costs.
- **Administrative adder:** Cadmus assumed program administrative costs of 20 percent in the residential sector and 23 percent in the C&I sectors, basing these on City Light's actual 2015 program expenditures.

[13] This refers to levelizing over the measure's useful life, equivalent to spreading incremental measure costs in equal payments, assuming a discount rate of City Light's weighted average cost of capital.

[14] This method is applied to measures with a useful life of greater than 20 years and those with a useful life extending beyond the 20th year at the time of reinstallation.

- **Avoided supply costs**: City Light's portfolio from the 2018 IRP includes the continuation of the BPA block contract in the next 20 years using the net requirement product from BPA. This means that reductions in loads due to conservation displaces the amount of energy City Light can rely from BPA. As a result, the forecast of BPA energy and delivery rates is a major component in the avoided energy costs of conservation. However, the monthly shape of BPA block is such that City Light does not take any BPA power in June based on City light's portfolio shaping. Thus, conservation displaces market purchases in June. In addition, City Light reduces its purchase of RECs when loads are reduced due to conservation. Finally, the social cost of carbon based on the recently passed Clean Energy Transformation Act is applied to determine the avoided carbon cost due to conservation.
- **Non-energy benefits** were treated as a reduction in levelized costs for measures that saved resources (such as water or detergent). For example, the value of reduced water consumption from installing a low-flow shower head would reduce that measure's levelized cost.
- **The regional 10 percent conservation credit and T&D deferrals** were similarly treated as reductions in levelized cost for electric measures. The addition of this credit, per the Northwest Power Act, was consistent with the Council methodology and effectively served as an adder to account for unquantified external benefits from conservation when compared to other resources.[15]
- **Secondary energy benefits** were treated as a reduction in levelized costs for measures saving energy on secondary fuels. This treatment was necessitated by Cadmus' end-use approach to estimating technical potential. For example, consider R-60 ceiling insulation costs for a home with a gas furnace and an electric cooling system. For the gas furnace end use, Cadmus classified energy savings that R-60 insulation produced for electric cooling systems, conditioned on the presence of a gas furnace, as a secondary benefit that reduced the measure's levelized cost. This adjustment affected only the measure's levelized costs; the R-60's magnitude of energy savings on the gas supply curve was not affected by considering secondary energy benefits.

2.4.2.1 About Levelized Costs of Conserved Energy

In addition to benefit-cost ratios, the levelized cost of conserved energy had to be determined to characterize each measure-in-conservation supply curves. Where possible, the study aligned its approach for calculating each measure's levelized costs to the Council's levelized-cost methodology; levelized costs include all costs and benefits described above.

The approach adopted in calculating a measure's levelized cost of conserved energy aligned with that of the Council, considering the costs required to sustain savings over a 21-year study horizon (including reinstallation costs for measures with useful lives less than 21 years). If a measure's useful life extended

[15] Northwest Power & Conservation Council. Northwest Power Act. Available online: http://www.nwcouncil.org/library/poweract/default.htm

beyond the end of the 21-year study, Cadmus incorporated an end effect, treating the measure's levelized cost over its useful life as an annual reinstallation cost for the remainder of the 21-year period.

For example, Figure 2.4 shows the timing of initial and reinstallation costs for a measure with an eight-year lifetime, in context with the 21-year study. As a measure's lifetime in this study ends after the study horizon, the final five years (Year 17 through Year 21) were treated differently, levelizing measure costs over the measure's eight-year life and treating these as annual reinstallation costs.

Figure 2.4. Illustration of Capital and Reinstallation Cost Treatment

	Year																				
Component	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Initial Capital Cost																					
Reinstallation Cost																	End Effect				

As with incremental measure costs, Cadmus considered O&M costs annually over the 21-year horizon. The present value was used to adjust the levelized cost upward for measures with costs above baseline technologies and downward for measures that decreased O&M costs.

2.4.3. Achievable Economic Potential

Achievable economic potential can be defined as the portion of technical potential expected to be reasonably achievable during a planning horizon. The quantity of energy efficiency potential realistically achievable depends on multiple factors, including the following: the customers' willingness to participate in energy efficiency programs (partially as a function of incentive levels); retail energy rates and various market barriers that historically have impeded adoption of energy efficiency measures and practices by consumers. These barriers tend to vary, depending on a customer's sector, local energy market conditions, and other difficult-to-quantify factors.

However, calculation of achievable economic potential must assume a central tenet—that the amount of achievable technical potential is ultimately a function of customers' willingness and ability to adopt energy efficiency measures. This information can best be ascertained through direct intelligence from potential participants.

Although methods for estimating achievable economic potential vary across potential assessment efforts, two dominant approaches appear to be most widely utilized:

- Option 1. This approach assumes a hypothesized relationship between incentive levels and market penetration of energy efficiency programs. This achievable potential generally can be defined as that achieved solely through utility incentive programs. Often, it is based on an incentive level at 50 percent of the incremental cost.
- Option 2. This approach generally relies on a fixed percentage of technical potential, based on past experiences with similar programs. In the Northwest, for example, the Council has historically assumed that, by the end of a 20-year assessment horizon, 85 percent of the economic potential could be achieved and would include savings from utility programs, evolving market structures, and changes in codes and standards.

Consistent with the Council, this study used option two, assuming that up to 85 percent of economic potential could be acquired over the 21-year planning horizon. In addition to applying a fixed percentage, this study incorporated ramp rates to estimate annual achievable technical potential.

Developing sound utility IRPs requires knowledge of alternative resource options and reliable information on the long-run resource potential of achievable technologies. CPAs principally seek to develop reasonably reliable estimates of the magnitude, costs, and timing of resources likely available over the planning horizon's course; they do not, however, provide guidance regarding how (or by what means) identified resources might be acquired. For example, identified potential for electrical equipment or building shell measures might be attained through utility incentives, legislative action instituting more stringent efficiency codes and standards, or other means.

2.4.3.1 About Measure Ramp Rates

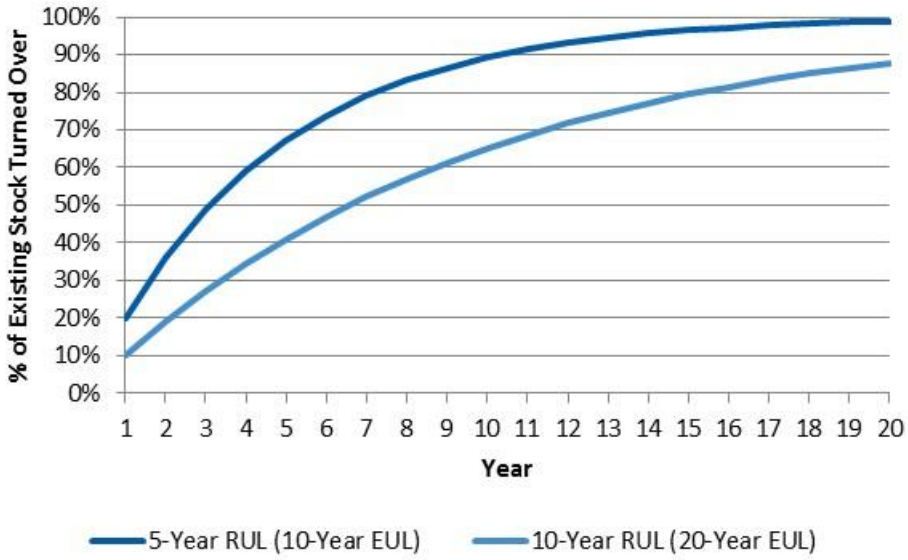
The study applied measure ramp rates to lost opportunity and discretionary resources, although interpretation and application of these rates differed for each class, as described below. Measure ramp rates generally matched those proposed for the Council's Seventh Power Plan. For measures not specified in the Seventh Power Plan, the study assigned a ramp rate considered appropriate for that technology—i.e., the same ramp rate as a similar measure in Sixth Power Plan or Seventh Power Plan.

Lost Opportunity Resources

Quantifying achievable economic potential for lost opportunity resources in each year required determining amounts technically available through new construction and natural equipment turnover. New construction rates drew directly from City Light's customer forecast. The study developed equipment turnover rates by dividing units into each year by the measure life. For example, if 100 units initially had a 10-year life, one-tenth of units (10) would be replaced. The following year, 90 units would remain, and one-tenth of these (9) would be replaced and so on over the study's course.

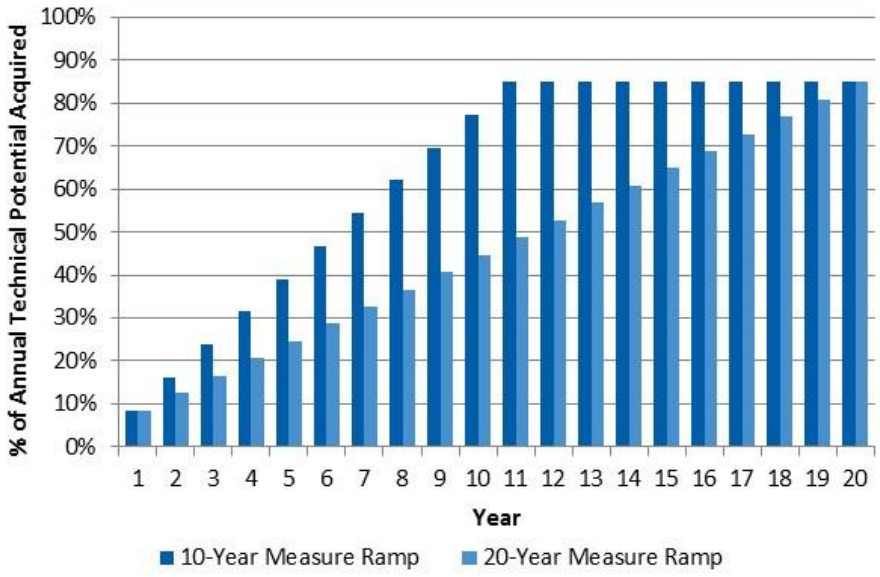
As the mix of existing equipment stock ages, the remaining useful life (RUL) would equal—on average—one-half of the EUL. The fraction of equipment turning over each year would be a function of this RUL; thus, economic potential for lost opportunity measures would have an annual shape before applying ramp rates, as shown in Figure 2.5. The same concept applied to new construction, where resource acquisition opportunities became available only during home or building construction. In addition to showing an annual shape, Figure 2.5 demonstrates that amounts of equipment turning over during the study period were a function of the RUL: the shorter the RUL, the higher the percentage of equipment assumed to turn over.

Figure 2.5. Existing Equipment Turnover for Varying RULs



In addition to natural timing constraints of equipment turnover and new construction rates, Cadmus applied measure ramp rates to reflect other resource acquisition limitations (such as market availability over the study's horizon). These measure ramp rates had a maximum value of 85 percent, reflecting the Council's assumption that, on average across all measures, up to 85 percent of technical potential could be achieved over a 20-year planning horizon. As shown in Figure 2.6, a measure that ramps up over 10 years would reach full market maturity—85 percent of annual technical potential—by the end of that period, while another measure might take 20 years to reach full maturity. Measures that were ramped over 21 years within this CPA included some newer technologies – such as advanced rooftop controllers or variable refrigerant flow – whereas measures that were ramped over a shorter time period included more mature and accepted technologies, such as various LED lighting technologies.

Figure 2.6. Examples of Lost Opportunity Ramp Rates



To calculate annual achievable economic potential for each lost opportunity measure, Cadmus multiplied technical resource availability and measure ramping effects together, consistent with the Council's methodology. In the early years of the study horizon, a gap occurs between assumed acquisition and 85 percent maximum achievability. These lost resources can be considered unavailable until the measure's EUL elapses. Therefore, depending on EUL and measure ramp rate assumptions, some potential may be pushed beyond the 20th year, and the total lost opportunity, achievable economic potential may be less than 85 percent of economic potential.

Figure 2.7 shows a case for a measure with a five-year RUL/10-year EUL. The spike in achievable economic potential, starting in year 11—after the measure's EUL—results from acquisition of opportunities missed at the beginning of the study period.

Figure 2.7. Example of Combined Effects of Resource Availability and Measure Ramping Based on 10-Year EUL

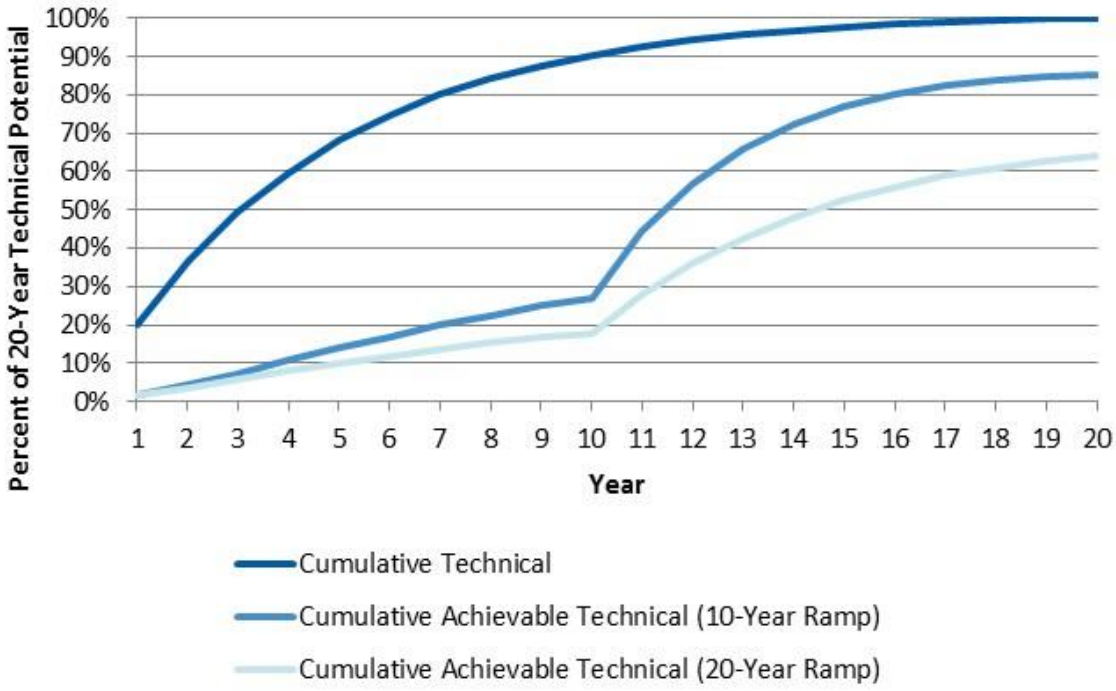


Table 2.5 illustrates this method, based on the same five-year RUL/10-year EUL measures on a 10-year ramp rate (the light blue line in Figure 2.7), assuming 1,000 inefficient units would be in place by Year One. In the first 10 years, lost opportunities would accumulate as the measure ramp-up rate caps availability of high-efficiency equipment. Starting in the 11th year, the opportunities lost 10 years previously become available again. Table 2.5 also shows this EUL and measure ramp rate combination results in 85 percent of technical potential achieved by the close of the study period.

As described, amounts of achievable potential are a function of the EUL and measure ramp rate. The same 10-yearyar EUL measure, on a slower 20-year ramp rate, would achieve less of its 20-year technical potential—also shown in Figure 2.7. Across all lost opportunity measures in this study, approximately 80 percent of technical potential appears achievable over the 20-year study period, a finding consistent with the Council's assumption that less than 85 percent of lost opportunity resources can be achieved.

TABLE 2.5. EXAMPLE OF LOST OPPORTUNITY TREATMENT: 10-YEAR EUL MEASURE ON A 10-YEAR RAMP								
Year	Incremental Stock Equipment Turnover (Units)	Cumulative Stock Equipment Turnover (Units)	Measure Ramp Rate	Installed High-Efficiency Units	Missed Opportunities for Acquisition in Later Years (Units)	Missed Opportunities Acquired (Units)	Cumulative Units Installed	Cumulative Percent of Technical Achieved
1	200	200	9%	17	180	0	17	9%
2	160	360	16%	26	130	0	43	12%
3	128	488	24%	30	92	0	73	15%
4	102	590	31%	32	65	0	106	18%
5	82	672	39%	32	44	0	138	20%
6	66	738	47%	31	29	0	168	23%
7	52	790	54%	29	19	0	197	25%
8	42	832	62%	26	11	0	223	27%
9	34	866	70%	23	6	0	246	28%
10	27	893	77%	21	2	0	267	30%
11	21	914	85%	18	0	153	438	48%
12	17	931	85%	15	0	110	563	60%
13	14	945	85%	12	0	78	653	69%
14	11	956	85%	9	0	55	717	75%
15	9	965	85%	7	0	38	762	79%
16	7	972	85%	6	0	25	793	82%
17	6	977	85%	5	0	16	814	83%
18	5	982	85%	4	0	10	828	84%
19	4	986	85%	3	0	5	836	85%
20	3	988	85%	2	0	2	840	85%

Discretionary Resources

Discretionary resources differ from lost opportunity resources due to their acquisition availability at any point within the study horizon. From a theoretical perspective, this suggests that all achievable economic potential for discretionary resources could be acquired in the study's first year. From a practical perspective, however, this outcome is realistically impossible due to infrastructure and budgetary constraints and customer considerations.

Furthermore, due to interactive effects between discretionary and lost opportunity resources, immediate acquisition distorts the potential for lost opportunity resources. For example, if one assumes that all homes would be weatherized in the program's first year, potentially available high-efficiency HVAC equipment would decrease significantly (i.e., a high-efficiency heat pump would save less energy in a fully weatherized home).

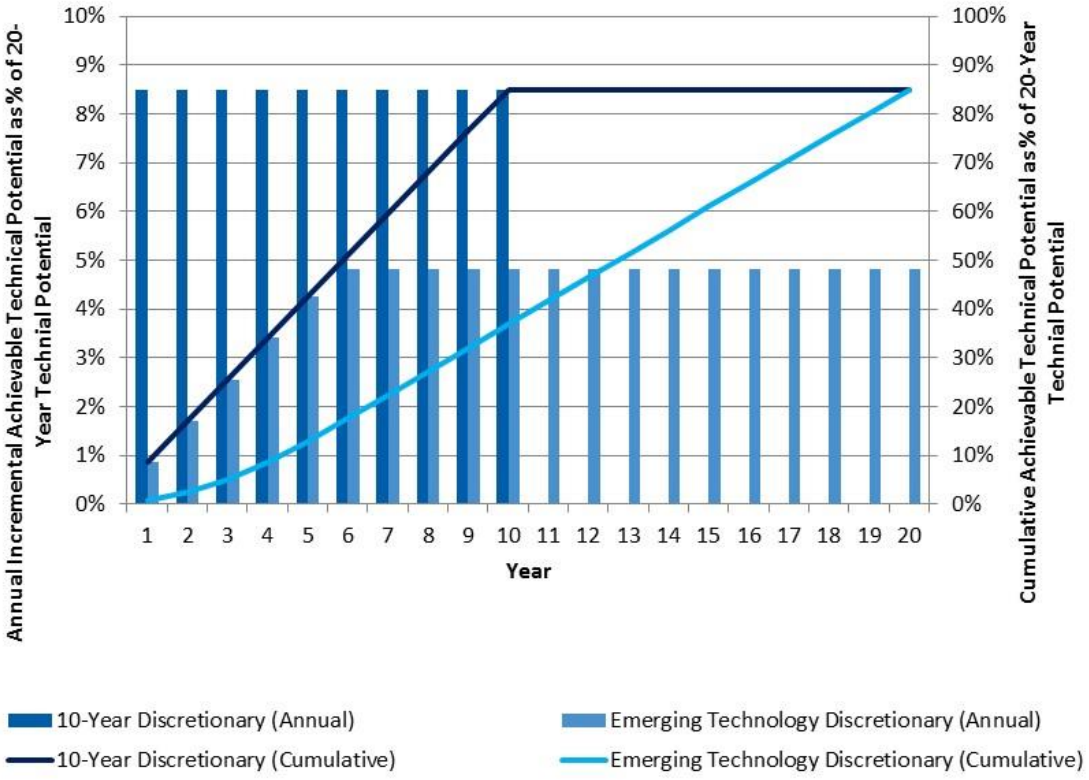
Consequently, the study addressed discretionary resources in two steps:

1. Developing a 20-year estimate of discretionary resource economic potential, assuming technically feasible and cost-effective measure installations would occur equally (at 5 percent of the total available) for each year of the study, avoiding the distortion of interactions between discretionary and lost opportunity resources previously described.
2. Overlaying a measure ramp rate to specify the timing of achievable discretionary resource potential, thus transforming a 20-year cumulative technical value into annual, incremental, achievable values.

The discretionary measure ramp rates only specify the timing of resource acquisition and do not affect the portion of the 20-year economic potential achievable over the study period.

Figure 2.8 shows incremental (bars) and cumulative (lines) acquisitions for two different discretionary ramp rates. A measure on the 10-year discretionary ramp rate reaches full maturity—85 percent of its total economic potential—in 10 years, with market penetration increasing in equal increments each year. A measure on the emerging technology discretionary ramp rate would take longer to reach full maturity, though also gaining 85 percent of the total economic potential. Ultimately, it would arrive at the same cumulative savings as the measure on the 10-year ramp rate.

Figure 2.8. Examples of Discretionary Measure Ramp Rates



3. Baseline Forecast

3.1. Scope of Analysis

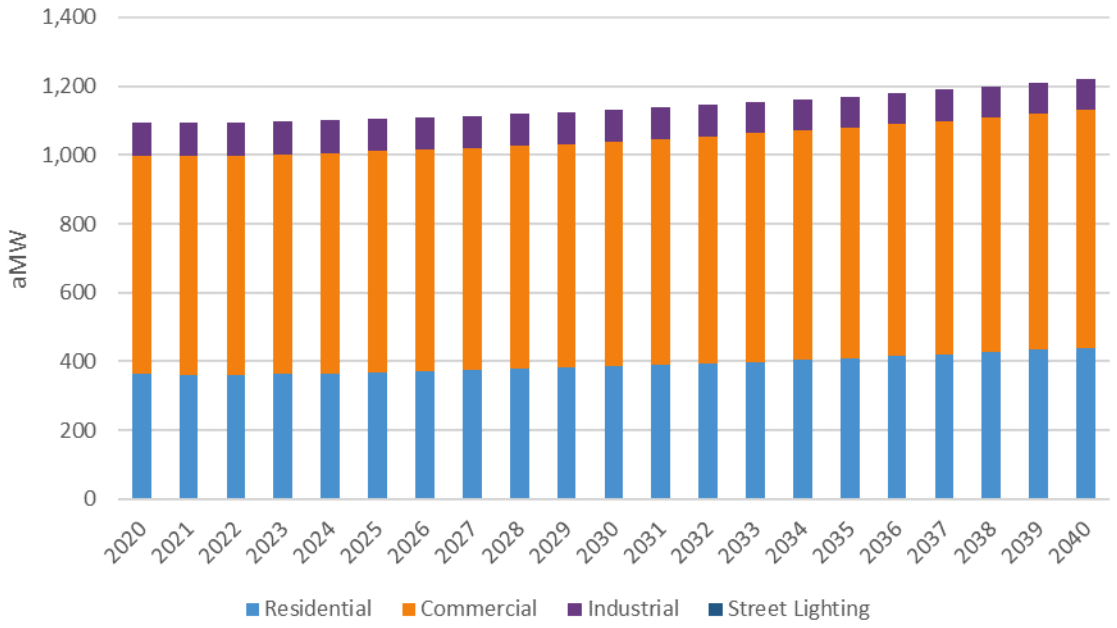
Assessing conservation potential starts with development of baseline end-use load forecasts over a 21-year (2020 to 2040) planning horizon. These forecasts are calibrated to City Light's load forecast in the base year (2019); they are not adjusted for future programmatic conservation, but they do account for enacted equipment standards and building energy codes. The study separately considers residential, commercial, industrial, and street lighting sectors.

Within each sector-level assessment, the study further distinguished customer segments, facility types, and their respective, applicable end uses. The analysis addressed the following:

- Eight residential segments of existing and new construction for single-family, multifamily low-rise, multifamily mid-rise, and multifamily high-rise. Multifamily low-rise is defined as multifamily buildings with one to three floors; mid-rise is defined as buildings with four to six floors; and high-rise is defined as buildings with more than six floors.
- Thirty-eight commercial segments. These include new and existing construction for 19 standard commercial segments.
- Eight industrial segments (existing construction only).
- Street lighting. Although the study included estimates of street lighting in the overall baseline sales forecast, Cadmus did not estimate street lighting potential.

Figure 3.1 shows the distribution of 2040's projected sales by sector. The commercial sector will account for roughly 56 percent of projected sales, while the residential and industrial sectors account for 36 percent, 7 percent respectively.

Figure 3.1. Baseline Sales by Sector



3.2. Residential

Cadmus considered four residential segments and 34 end uses within these segments. Table 3.1 lists each residential segment and end uses considered as well as broad end-use groups used in this study. Overall, the residential sector accounted for approximately 36 percent of total baseline sales.

TABLE 3.1. RESIDENTIAL SEGMENT AND END USES

Segments	End Uses	
	End-Use Group	End Use
Single-Family Multifamily – High-Rise Multifamily – Mid-Rise Multifamily – Low-Rise	Appliances	Cooking Oven Cooking Range Dryer Freezer Refrigerator
	Electric Vehicles	Electric Vehicles
	Cooling	Cool Central Cool Room
	Electronics	Computer – Desktop Computer – Laptop Copier

TABLE 3.1. RESIDENTIAL SEGMENT AND END USES		
		DVD Player Home Audio System Microwave Monitor Multifunction Device Plug Load Other Printer Set Top Box Television Television – Big Screen
	Exterior Lighting	Lighting Exterior Standard
	Heating	Heat Central Heat Pump Heat Room Ventilation and Circulation
	Interior Lighting	Lighting Interior Linear Fluorescent Lighting Interior Specialty Lighting Interior Standard
	Miscellaneous	Air Purifier Other Waste Water Pool Pump
	Water Heating	Water Heat GT 55 Gal Water Heat LE 55 Gal

City Light produces separate forecasts of single-family and multifamily households. Cadmus' directly used City Light's single-family household forecast in the baseline forecast. Cadmus disaggregated multifamily household forecasts based on the distribution of the estimated number of households for the following multifamily segments:

- Multifamily low-rise: up to three floors
- Multifamily mid-rise: four to six floors
- Multifamily high-rise: more than six floors

Cadmus relied on three-year American Community Survey (ACS) estimates of the number of households for each multifamily segment to determine the distribution used to disaggregate City Light's multifamily forecast. Using the approach described in the Developing Baseline Forecasts section, Cadmus combined

residential household forecasts, estimates of end-use saturations, fuel shares, efficiency shares, and end-use consumption to produce a sales forecast through 2040.

Figure 3.2 shows residential sales by segment for each year of the study. City Light projects to add 98,000 new housing units by 2040. New multi-family units account for about 90 percent of new residential construction. As a result multi-family sector baseline sales are expected to increase at a faster rate than single family as shown in Table 3.2.

Figure 3.2. Residential Baseline Sales by Segment

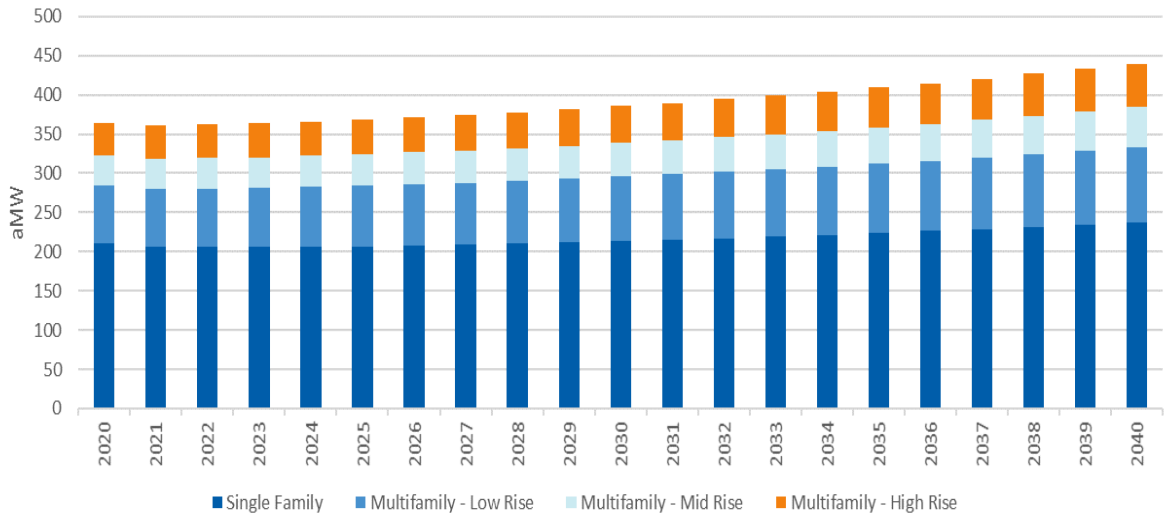


TABLE 3.2. RESIDENTIAL BASELINE SALES AND HOUSING UNITS BY SEGMENT

Sector	Sales (aMW)		Housing Units	
	2020 Sales (aMW)	2040 Sales (aMW)	2020 Housing Units	2040 Housing Units
Single Family	211	238	195,057	206,208
Multifamily	73	96	91,286	128,111
Multifamily	38	51	59,476	83,469
Multifamily	42	56	64,585	90,639
Total	364	440	410,403	508,428

In the base year (2019), Cadmus calibrated baseline forecasts to City Light's load forecast, ensuring that the study's starting point aligned with City Light's starting point forecasts. Cadmus then produced a residential forecast that explicitly accounted for federal lighting standards enacted under EISA, as this standard had little impact on City Light's sales history and was not explicitly accounted for in City Light's forecast.

Figure 3.3 shows the residential baseline forecast by end use. Overall, City Light's residential forecast increases by approximately 21 percent over the 21-year horizon. This primarily due to an increased customer forecast and the addition of new load from electric vehicles.

Figure 3.3 also shows that heating and electronics are the top two consuming end uses, accounting for over one-half (54 percent) of residential consumption, combined. The next three highest forecasted end uses were water heating (14 percent), appliances (15 percent), and electric vehicles (9 percent).

Figure 3.3. Residential Baseline Forecast by End Use

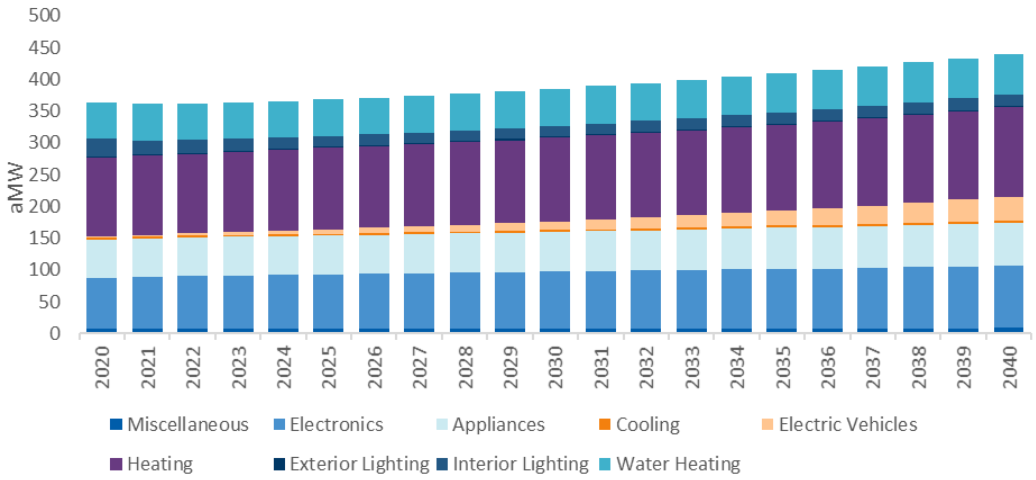


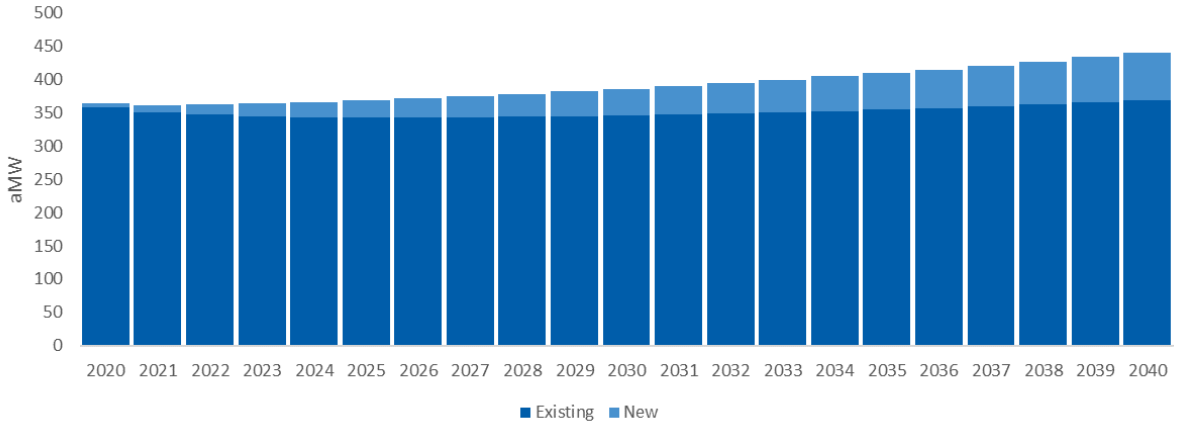
Table 3.3 shows the assumed average consumption per household for each residential segment in 2040. Differences in average consumption for each segment drive either differences in end-use consumption, saturations, fuel shares,[16] or any combination of differences. Appendix C includes detailed baseline data for the residential sector.

[16] Fuel shares refer to the percentage of end use equipment that is electric for end uses where customers have at least the option of electricity or another fuel. Residential end uses where multiple fuels are an option include central furnace space heat, water heating, cooking, and dryers.

TABLE 3.3. PER HOUSEHOLD BASELINE SALES (KWH/HOME) - 2040				
End Use	**Single-Family**	**Multifamily – Low-Rise**	**Multifamily – Mid-Rise**	**Multifamily – High-Rise**
Heating	2,120	2,744	2,113	2,165
Electronics	2,455	1,022	976	976
Water Heating	1,667	951	346	346
Appliances	1,631	670	788	788
Interior Lighting	535	140	137	137
Miscellaneous	209	100	83	83
Exterior Lighting	82	1	1	1
Cooling	111	29	24	24
Total	**9,540**	**6,207**	**5,018**	**5,070**

Figure 3.4 shows forecasted residential sales by construction vintage over the study horizon. Study results indicate approximately 16 percent of sales will derive from homes constructed after 2019 (new construction). Use per customer for existing homes will decrease over the 20-year study timeframe, partly due to equipment standards and other naturally occurring efficiency.

Figure 3.4. Residential Baseline Sales by Construction Vintage



3.3. Commercial

Cadmus considered 19 commercial segments and up to 15 segments within these end uses. Table 3.4 shows each commercial segment and end use considered in this study as well as the broad segment and end-use groups presented in this report. Segments are largely based on those included in the Council's Seventh Power Plan. Overall, the commercial sector accounts for 693 aMW, or 57 percent of total baseline sales in 2040.

TABLE 3.4. COMMERCIAL SEGMENTS AND END USES			
Segments		**End Uses**	
Segment Group	**Segment**	**End Use Group**	**End Use**
Assembly	Assembly	Cooking	Cooking
Hospital	Hospital	Cooling	Cool Central
Large Grocery	Supermarket	Data Center	Data Center
Large Office	Large Office Medium Office	Heat Pump	Heat Pump
Lodging	Lodging	Heating	Heat Central
MF Common Area	Multifamily Common Area	Lighting	Exterior Lighting Interior Lighting
Miscellaneous	Other	Miscellaneous	Compressed Air Other Plug Load Other Waste Water
Other Health	Residential Care	Refrigeration	Refrigeration
Restaurant	Restaurant	Ventilation	Ventilation
Retail	Large Retail Medium Retail Small Retail Extra Large Retail	Water Heat	Water Heat GT 55 Gal Water Heat LE 55 Gal
School	School K-12		
Small Grocery	Mini Mart		
Small Office	Small Office		
University	University		
Warehouse	Warehouse		

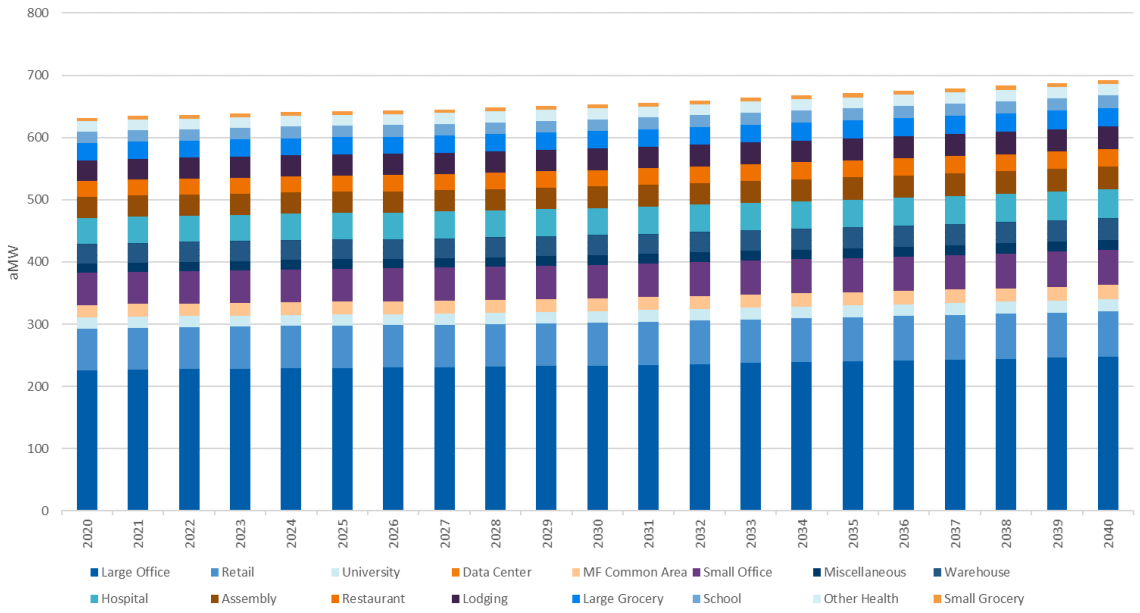
TABLE 3.4. COMMERCIAL SEGMENTS AND END USES			
University	University		
Warehouse	Warehouse		

Cadmus used City Light's nonresidential database to identify sales and the number of customers for each commercial market segment. The database combined City Light's billing data with the King County assessor, as well as other secondary data source, to identify the customer segment and consumption for each nonresidential customer. These data served as the basis for Cadmus' commercial sector segmentation.

In addition, Cadmus classified customers as commercial or industrial based on City Light's premise-level nonresidential customer database. Commercial customers included those identified in a segment listed in Table 3.4, while industrial customers mapped to segments listed in Table 3.5, following in the industrial section.

Cadmus chose commercial segments for consistency with the Seventh Power Plan, except for multifamily common area, which was not a standalone segment in the Seventh Power Plan. Figure 3.5 shows the distribution of baseline commercial energy consumption by segment for each year of the study.

Figure 3.5. Commercial Baseline Sales by Segment



Large offices accounted for over one-third (36 percent) of commercial baseline sales. Retail, small offices, and hospitals accounted for 11 percent, 8 percent, and 7 percent, respectively, of baseline sales. Collectively, these segments represent over one-half (61 percent) of all commercial sector sales.

Cadmus developed whole-building energy intensities using consumption and floor space estimates from City Light's nonresidential customer database. We further disaggregated these energy intensities into end-use intensities, based on end-use saturations and fuel shares derived from City Light's CBSA oversample and building simulations. Specifically, Cadmus determined the expected distribution of end-use consumption for each building type, based on City Light-specific saturations and building simulations and on disaggregated energy intensities—derived from City Light's customer data—using these distributions. Figure 3.6 shows energy intensities for each building type and end use.

Figure 3.6. Commercial EUIs by Building Type

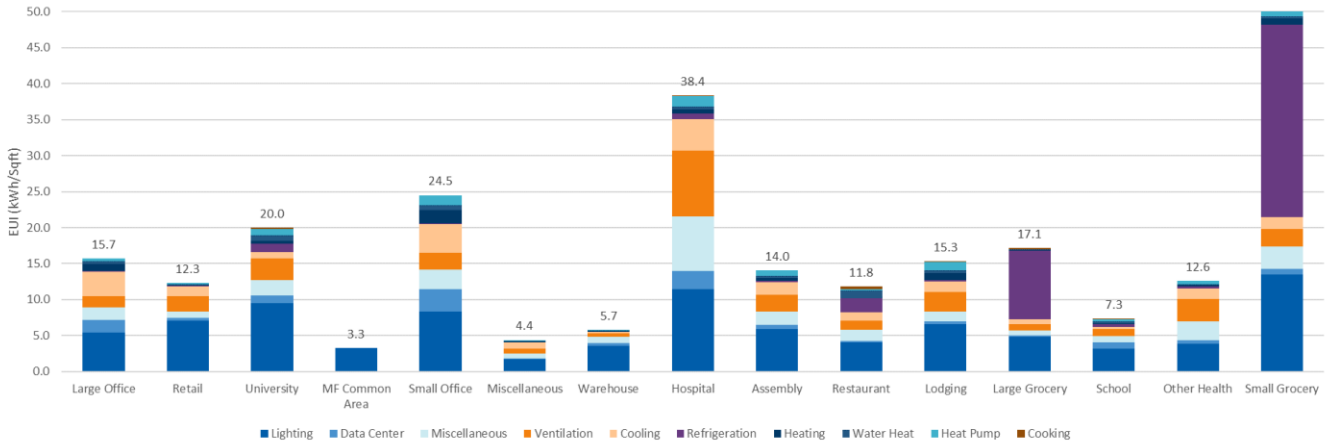
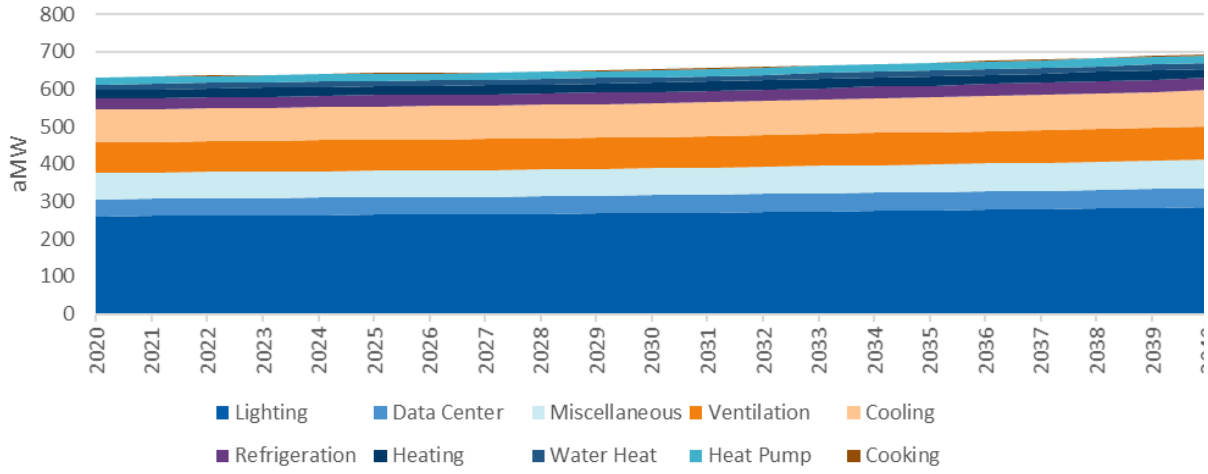


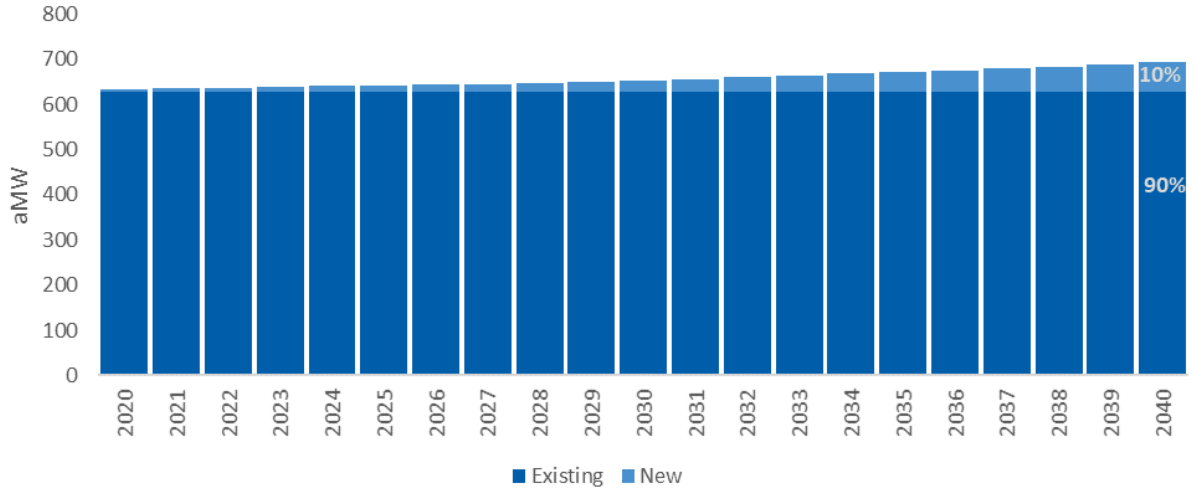
Figure 3.7 shows the commercial baseline forecast by end use. Cadmus' commercial baseline forecast includes moderate load growth; commercial sales increase by roughly 0.5 percent per year over the study's horizon. The highest-consuming end use was lighting, accounting for 41 percent of projected commercial consumption in 2040. The miscellaneous, ventilation, and cooling end uses also account for a large share of consumption, representing 11 percent, 13 percent, and 14 percent of projected commercial sales, respectively.

Figure 3.7. Commercial Forecast by End Use



New Commercial floorspace is a significant contributor to load growth in the commercial sector. By 2040, 10 percent of the forecasted load will come from buildings constructed after 2019. Figure 3.8 shows the commercial baseline forecast by construction vintage.

Figure 3.8. Commercial Forecast by Construction Vintage



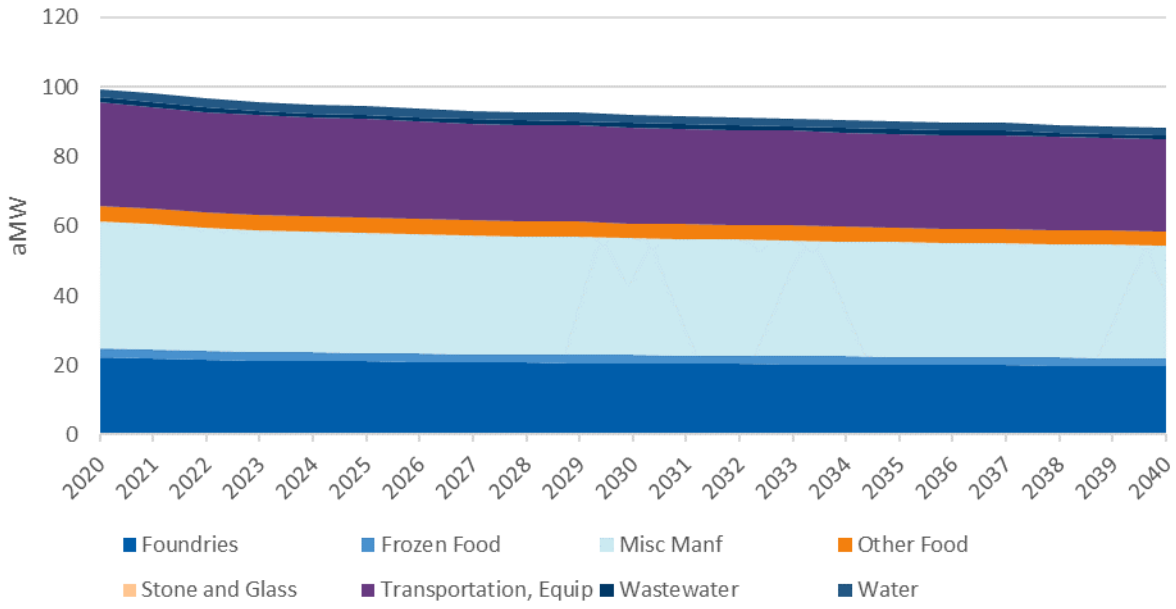
3.4. Industrial

Cadmus disaggregated City Light's forecasted industrial sales into eight facility types/segments and 10 end uses, as shown in Table 3.4. Overall, the industrial sector accounted for 88 aMW, or 7 percent of City Light's overall forecasted baseline sales in 2040. The industrial sector included about ten of City Light's largest customers with known Industrial processes in addition to wastewater and water treatment loads.

TABLE 3.2. INDUSTRIAL SEGMENTS AND END USES	
Segments	**End Uses**
Foundries	Fans
Frozen Food	HVAC
Miscellaneous Manufacturing	Lighting
Other Food	Other Motors
Stone and Glass	Other
Transportation, Equipment	Process Air Compressors
Wastewater	Process Electro Chemical
Water	Process Heat
	Process Other
	Process Refrigeration
	Pumps

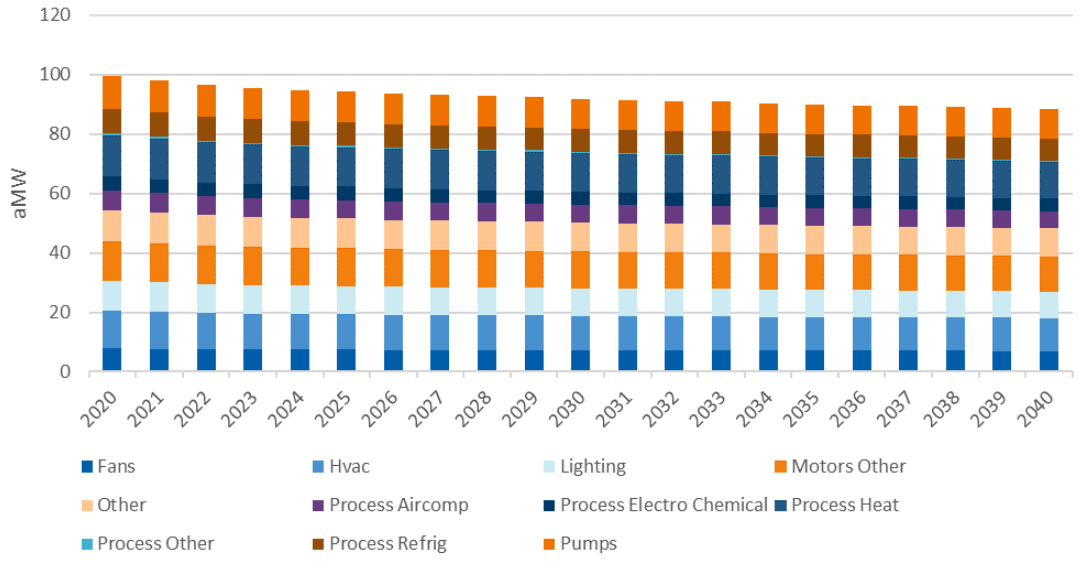
Like the commercial sector, Cadmus relied on City Light's nonresidential customer database to determine the distribution of baseline sales by segment. Figure 3.9 shows the distribution of industrial sales by segment in 2040. Miscellaneous manufacturing accounts for 37 percent of industrial baseline sales; the next largest segments are foundries (22 percent) and transportation equipment (30 percent).

Figure 3.9. Industrial Baseline Sales by Segment



Cadmus relied on end-use distributions provided in the Seventh Plan's industrial tool to disaggregate segment-specific consumption into end uses. Figure 3.10 shows industrial baseline sales forecast by end use.

Figure 3.10. Industrial Baseline Sales by End Use



4. Energy Efficiency Potential

4.1. Overview

4.1.1. Scope of the Analysis

This study included a comprehensive set of conservation measures, incorporating measures assessed by the Council in the 7th Power Plan and the RTF. Analysis began by assessing the technical potential of hundreds of unique conservation measures, considering these measures for each applicable sector, segment, and construction vintage discussed in the Baseline Forecast section. In total, Cadmus considered over 6399 permutations of conservation measures including, for example, a total of 969 lighting measures across 19 segments representing a wide range of technologies and applications within the commercial sector. Table 4.1 lists counts and numbers of permutations of conservation measures considered in this study.

TABLE 4.1. MEASURE AND PERMUTATIONS

Sector	Measures	Permutations
Residential	249	1050
Commercial	2109	4944
Industrial	38	405
Total	2396	6399

4.1.2. Summary of Results

Table 4.2 shows baseline sales and cumulative potential by sector.[17] Study results indicate 282 aMW of technically feasible conservation potential—23 percent of baseline sales—will be available by 2040, the end of the 21-year study horizon, with an estimated 142 aMW—12 percent of baseline sales—both cost-effective and technically feasible; this is economic potential. Cumulative achievable economic potential equals 111 aMW in 2040—9 percent of baseline sales. These results account for line losses and represent cumulative energy savings at generator.

These savings draw upon future sales forecasts, absent future City Light conservation program activities. Although these consumption forecasts accounted for past City Light-funded conservation, the estimated potential identified is inclusive of—not in addition to—forecasted program savings. In other words, the forecast excludes future, planned energy efficiency program efforts but the savings estimates include energy efficiency program savings.

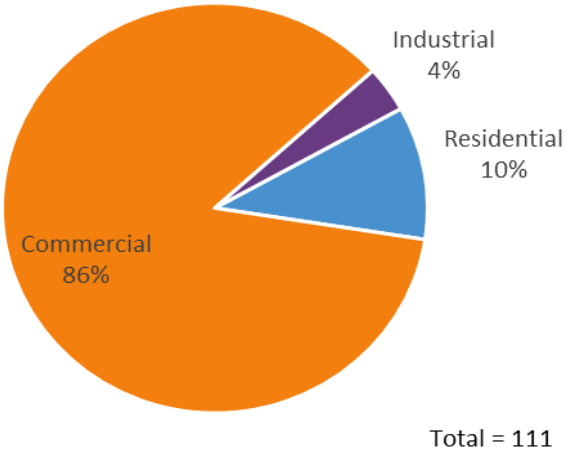
[17] Economic potential and achievable economics potential reflect the IRP avoided-cost scenario.

TABLE 4.2. TECHNICAL, ECONOMIC, AND ACHIEVABLE POTENTIAL BY SECTOR - 2040							
Sector	**Baseline Sales**	**Technical Potential**		**Economic Potential—IRP**		**Achievable Potential**	
		aMW	**Percent of Baseline**	**aMW**	**Percent of Baseline**	**aMW**	**Percent of Baseline**
Residential	440	100	23%	23	5%	12	3%
Commercial	693	173	25%	115	17%	96	14%
Industrial	88	9	10%	5	5%	4	5%
Street Lighting	5	0	0%	0	0%	0	0%
Total	**1,226**	**282**	**23%**	**142**	**12%**	**111**	**9%**

The commercial sector, representing 57 percent of baseline energy use, accounts for approximately 86 percent of achievable economic conservation potential. The commercial sector represents a much higher proportion of total achievable economic potential relative to its baseline sales because, compared with the residential sector, commercial measures are more cost effective and the percent of total commercial technical potential that is cost effective is also a lot higher.

The residential and industrial sectors account for 10 percent and 4 percent, respectively, as shown in Figure 4.1. Although the residential sector's share of baseline energy consumption is higher than its share of achievable economic potential, the industrial sector's share of total achievable economic potential (4 percent) is much lower than its share of baseline energy consumption (7 percent). The 2020 CPA did not estimate potential for streetlighting.

Figure 4.1. Achievable Economic Potential by Sector—2040



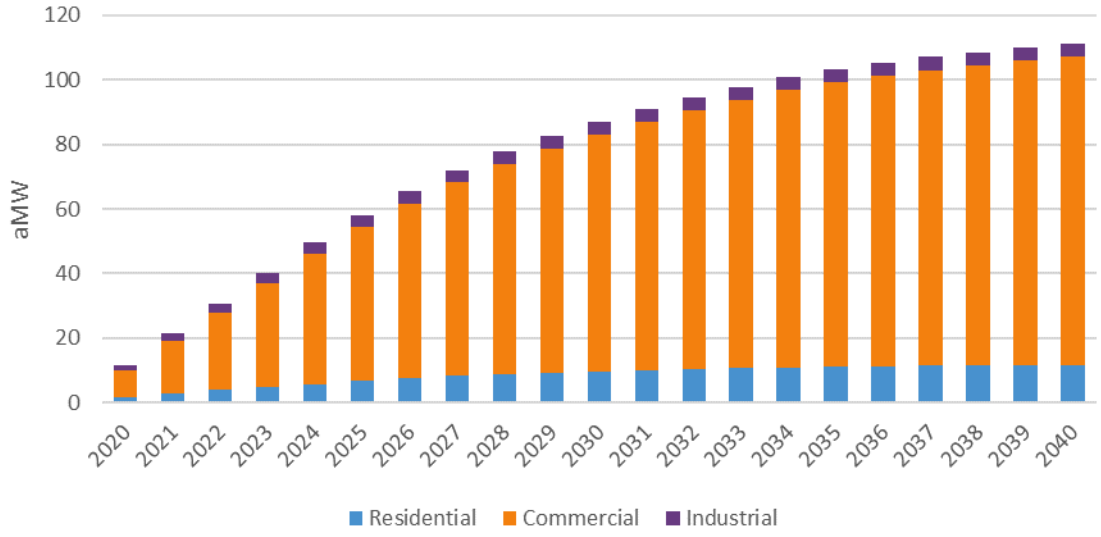
Cadmus determined incremental achievable potential in each year of the study horizon, using the rate at which equipment naturally turns over and measure-specific ramp rates (as discussed in the About Measure Ramp Rates section of this report). Table 4.3 shows cumulative 2-year, 10-year, and 21-year achievable potential by sector, as well as 20 percent of the 10-year achievable potential—the equivalent of City Light's *pro rata* share of 10-year potential for the 2020-2021 biennium.

TABLE 4.3. ACHIEVABLE POTENTIAL BY SECTOR

Sector	Achievable Economic Potential - aMW			
	2 Year (2020-2021)	10 Year (2020-2029)	21 Year (2020-2040)	20% of 10-Year Potential
Residential	2.77	9.27	11.70	1.85
Commercial	16.10	69.43	95.54	13.89
Industrial	2.40	3.96	4.04	0.79
Street Lighting	0	0	0	0
Total	**21.27**	**82.67**	**111.28**	**16.53**

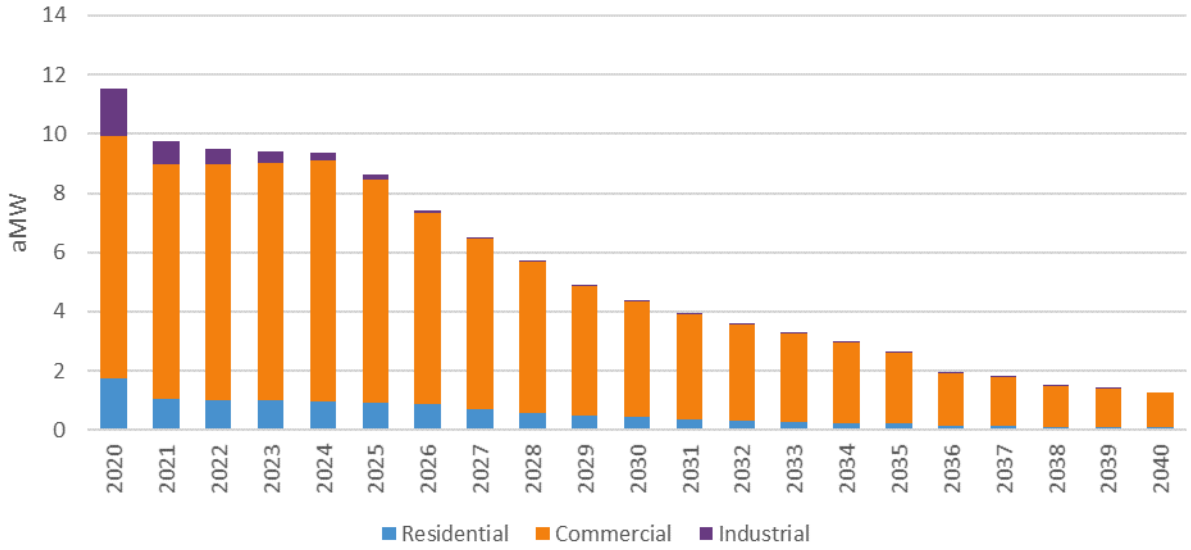
Figure 4.2 presents the cumulative achievable economic potential across the study horizon.

Figure 4.2. Cumulative Achievable Economic Potential



Approximately 45 percent of 21-year achievable potential is acquired in the first five years, and 74 percent of 21-year achievable potential is acquired in the first 10 years. This acquisition rate reflects the measure mixture offering high savings potential and aligning with City Light's prior program accomplishments. The About Measure Ramp Rates section of this report provides more information on how Cadmus performed this calculation.

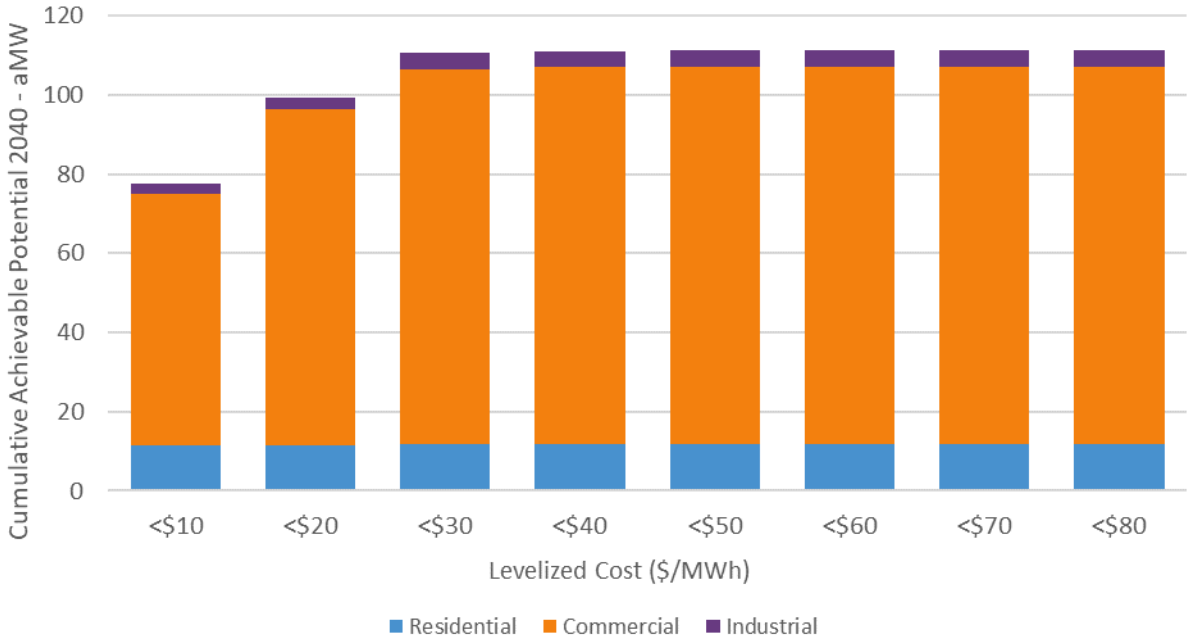
Figure 4.3. Incremental Achievable Economic Potential



Study results indicate that conservation serves as a low-cost resource, with roughly 99 aMW of achievable economic potential at a cost of less than $20/MWh levelized, representing 89 percent of total cumulative 21-year achievable potential. The conservation supply curve in Figure 4.4 shows cumulative achievable

potential in $10/MWh levelized cost increments. Cadmus identified cost-effective potential up to $30/MWh.

Figure 4.4. Supply Curve – Achievable Economic Potential (All Sectors)



Appendix F shows detailed measure-level results, including levelized costs and technical and achievable economic conservation potential for each measure. The remainder of this section provides detailed results by sector.

4.2. Residential

Residential customers in City Light's service territory account for 36 percent of 2040 total baseline sales. The sector, divided into single-family, multifamily low-rise, multifamily mid-rise, and multifamily high-rise homes, present of variety of potential savings sources, including equipment efficiency upgrades (e.g., water heaters and appliances), improvements to building shells (e.g., windows, insulation, and air sealing), and increases in lighting efficiency.

Based on resources included in this assessment, Cadmus estimated residential, cumulative, achievable potential of 11.7 aMW over 21 years, corresponding to nearly a 3 percent reduction in the residential baseline sales forecast by 2040, or approximately 15% of the forecast residential load growth. Table 4.4 shows cumulative 21-year residential conservation potential by segment.

TABLE 4.4. RESIDENTIAL POTENTIAL BY SEGMENT								
Segment	Baseline Sales	Cumulative 2040 - aMW						
		Technical Potential (TP)	TP % of Baseline	Economic Potential (EP)	EP % of Baseline	EP % of TP	Achievable Potential (AP)	AP % of EP
Single-Family	237.6	57.9	24.4%	17.5	7.3%	30.1%	8.7	49.6%
Multifamily – High-Rise	55.5	7.0	12.6%	1.5	2.8%	22.1%	0.8	50.1%
Multifamily – Mid-Rise	50.6	11.8	23.3%	1.4	2.8%	12.0%	0.7	50.1%
Multifamily – Low-Rise	96.1	23.6	24.6%	2.4	2.5%	10.3%	1.6	63.9%
Total	**439.8**	**100.3**	**22.8%**	**22.8**	**5.2%**	**22.8%**	**11.7**	**51.2%**

As shown in Table 4.4 and Figure 4.5, single-family homes account for 74 percent (9 aMW) of total achievable economic potential, followed by multifamily low-rise (2 aMW), multifamily high-rise (1 aMW), and multifamily mid-rise (1 aMW). Each home type's proportion of baseline sales drive this distribution, but segment-specific end-use saturations and fuel shares have a role as well. Appendix A includes detailed data on saturations and fuel shares for each segment.

Figure 4.5. Residential Cumulative Achievable Economic Potential by Segment

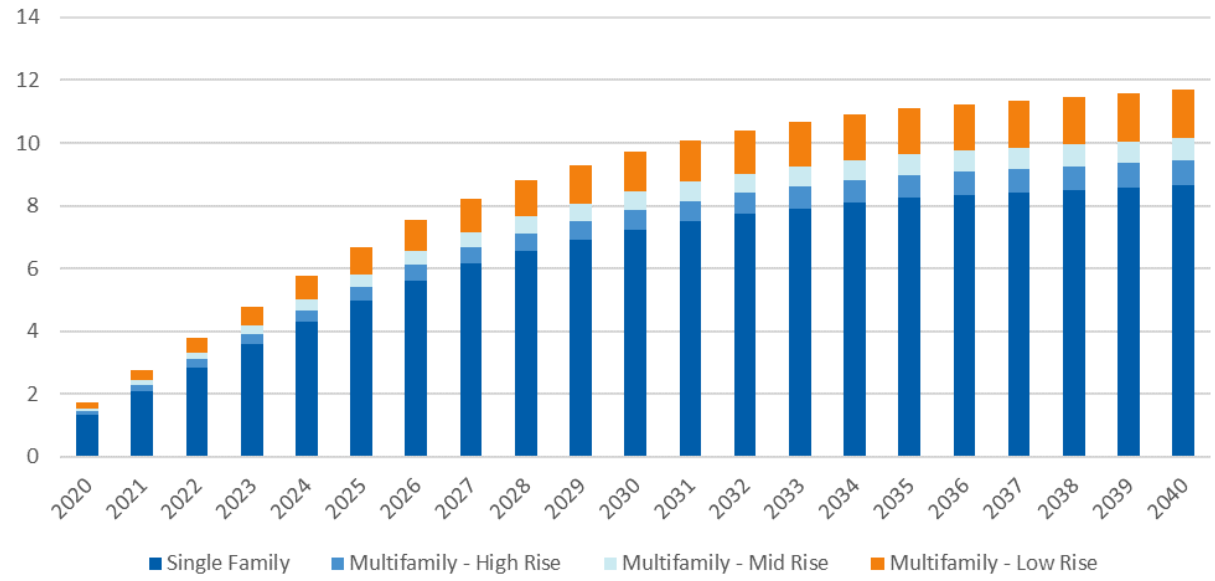


Figure 4.6 presents the cumulative achievable economic potential by construction type for the residential sector. Existing construction represents the majority of achievable economic potential, particularly in the early years of the study, as it accounts for 92.5% of the potential in the first two years of the study (2020-2021). However, by the final year of the study period (2040), new construction accounts for 22% of the total cumulative residential achievable economic potential.

Figure 4.6. Residential Cumulative Achievable Economic Potential by Construction Type

Lighting accounts for approximately 6 percent of total cumulative achievable economic potential by end use (as shown in Table 4.5); these savings almost entirely derive from installations of LED lighting in fixtures. Efficient upgrades to linear fluorescent fixtures in homes account for a small portion of total residential lighting savings. Cadmus modeled the residential lighting potential using the following assumptions:

- The baseline for general service lamp potential in the first year of the study (2020) is equivalent to the EISA 2020 backstop standard and the Washington State standard passed by the legislature in 2019.
- Inefficient lamps will sell through retail locations on one year.
- Achievable economic potential in 2020 is reduced by one-half to reflect City Light's plans to discontinue savings claims for residential lighting.

Weatherization savings appear primarily within the heating end use group but also within the cooling group as well. Savings from weatherization – the installation of which reduces both heating and cooling loads – represent only a small fraction (i.e. < 1%) of total residential achievable economic potential. The study determined that behavioral savings, such as home energy reports, were not cost effective and, therefore, these measures do not have any achievable economic potential.

TABLE 4.5. RESIDENTIAL POTENTIAL BY END USE

End Use	Baseline Sales	Cumulative 2040 - aMW						
		Technical Potential (TP)	TP % of Baseline	Economic Potential (EP)	EP % of Baseline	EP % of TP	Achievable Potential (AP)	AP % of EP
Miscellaneous	8.5	0.6	7.4%	0.5	5.5%	74.6%	0.4	85.0%
Electronics	97.5	8.1	8.3%	3.0	3.1%	37.1%	2.5	85.0%
Appliances	67.6	11.6	17.2%	0.0	0.0%	0.0%	0.0	0%
Cooling	3.7	0.7	19.4%	0.0	0.1%	0.3%	0.0	85.0%
Electric Vehicles	38.2	1.0	2.7%	0.0	0.0%	0.0%	0.0	0%
Heating	140.3	36.4	25.9%	0.1	0.1%	0.2%	0.1	84.9%
Exterior Lighting	2.1	0.8	37.2%	0.8	37.2%	100.0%	0.1	17.9%
Interior Lighting	18.4	9.8	53.3%	9.1	49.6%	93.0%	0.6	6.0%
Water Heating	63.5	31.3	49.2%	9.4	14.8%	30.1%	8.0	84.9%
Total	**439.8**	**100.3**	**22.8%**	**22.8**	**5.2%**	**22.8%**	**11.7**	**51.2%**

Incremental and cumulative potential over the 21-year study horizon varies by end use due to the application of ramp rates, which were assigned to each measure based on multiple factors, including availability, existing program activity, and market trends. Cadmus used the same ramp rates for each measure, as assigned by the Council in the Seventh Power Plan, with some adjustments as discussed in the Achievable Potential and Ramping in section 5 of this report. Figure 4.7 and Figure 4.8 show cumulative and incremental residential achievable potential, respectively.

Figure 4.7. Residential Cumulative Achievable Economic Potential

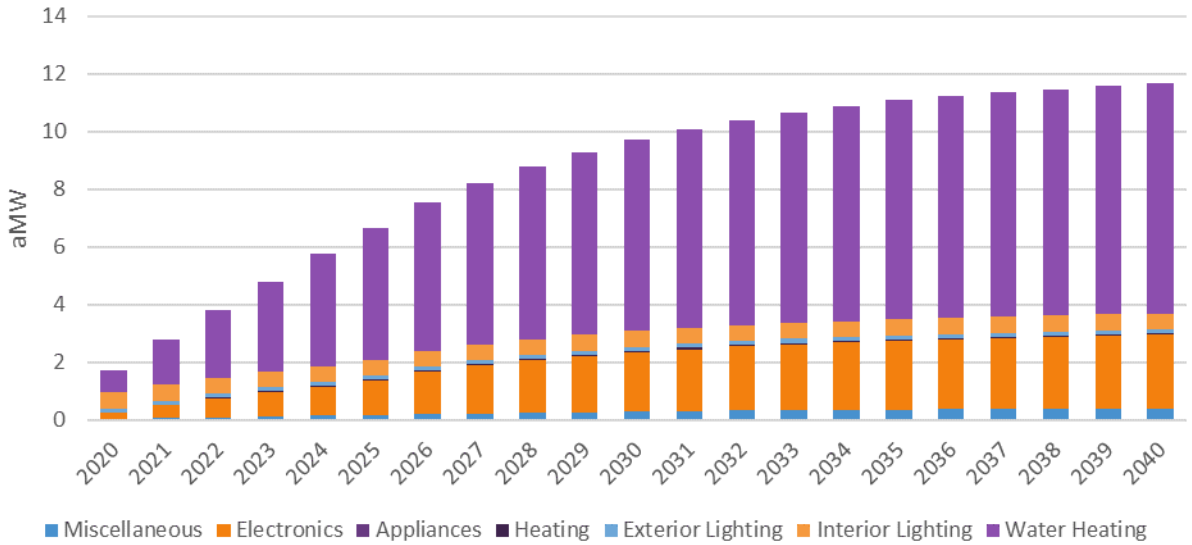
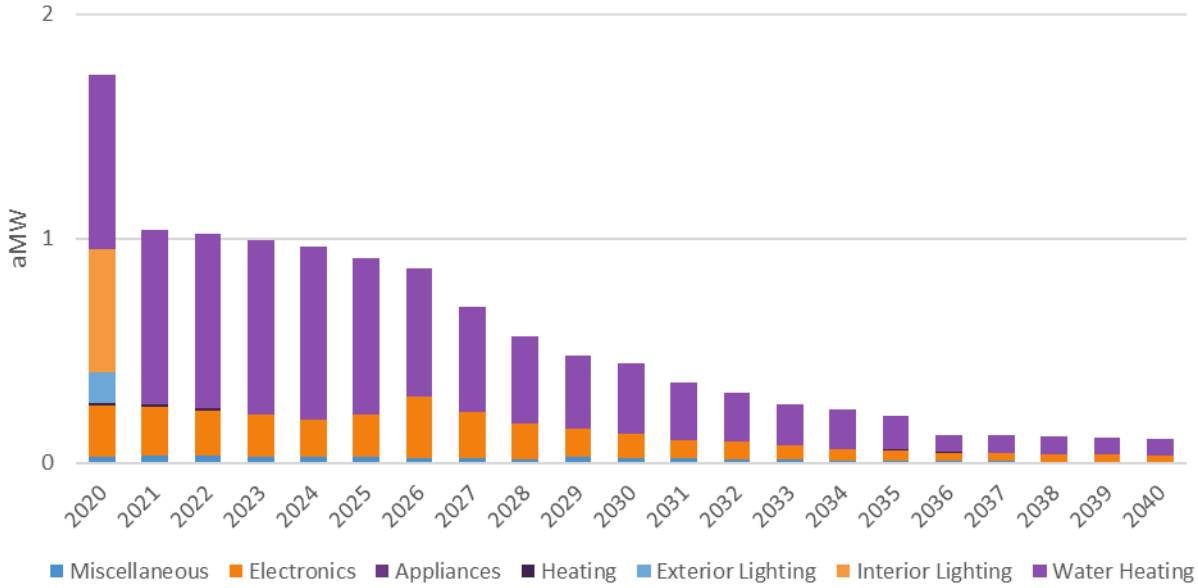


Figure 4.8. Residential Cumulative Achievable Economic Potential

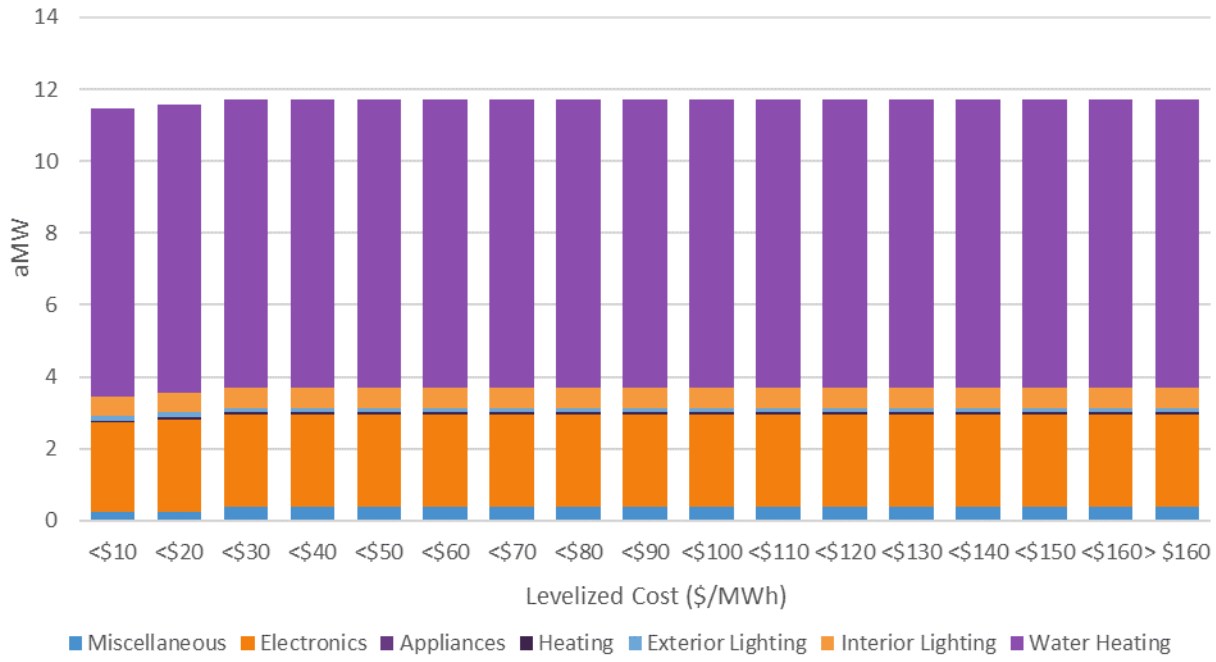


Measure ramp rates and effective useful lives (only for equipment replacement measures) determine the timing of savings shown in Figure 4.8. The spike in 2020 lighting savings results from interactions between lighting ramp rates and relatively short baseline measure lives for standard and specialty lighting measures (two years).

Overall, most (79 percent) of residential conservation potential is achievable within the first 10 years. Approximately 49 percent of 21-year residential achievable economic potential comes in the first five years, and 10 percent of this five-year potential comes from interior lighting.

Figure 4.9 shows 21-year cumulative residential potential by levelized cost (in $10/MWh increments).

Figure 4.9. Residential Supply Curve



Nearly 98 percent of total residential achievable economic potential comes from measures with a levelized cost of conserved energy of $10/MWh or less. Few cost-effective measures have levelized costs above $10/MWh. Clothes washers and SF showerheads are the top two saving residential measures, respectively. Table 4.6 lists the 15 top-saving residential measures.

TABLE 4.6. TOP-SAVING RESIDENTIAL MEASURES				
Measure Name	Achievable Economic Potential - aMW			Percent of Total (21-Year)
	2-Year	10-Year	21-Year	
Clothes Washer	0.59	2.39	2.99	26%
SF Showerhead	0.53	2.15	2.74	23%
LED	0.36	0.36	0.36	3%
LED - Specialty	0.33	0.33	0.33	3%
TV LCD - ENERGY STAR	0.31	1.39	1.84	16%
MF Showerhead	0.28	1.15	1.48	13%
Set Top Box	0.12	0.51	0.64	5%
SF Aerator	0.12	0.47	0.58	5%
MF Aerator	0.07	0.27	0.34	3%
ENERGY STAR Air Purifier	0.03	0.16	0.26	2%
Heat Pump - Federal Standard 2023	0.02	0.02	0.04	0%
Engine Block Heater Controls	0.01	0.05	0.06	1%
Wall Insulation	<0.01	0.02	0.02	<1%
Attic Insulation	<0.01	<0.01	<0.01	<1%
Multifunction Device	<0.01	<0.01	<0.01	<1%

Note that Table 4.6 *only* includes measures that pass the benefit-cost screen. Multifamily ductless heat pump (DHP) upgrades, for example, have the highest technical potential of any residential measure, but they are not cost-effective from a TRC perspective, as the present value of the TRC costs outweigh the TRC benefits for this measure by a factor of almost five-to-one. Additional residential measures with high technical potential savings that did not pass the benefit-cost test include tier 3 heat pump water heaters, single family zonal-to-DHP measures, and high efficiency class-22 window replacements.

4.3. Commercial

City Light's commercial sector accounts for 57 percent of City Light's baseline sales in 2040 and 86 percent of total achievable economic potential. The commercial sector makes up a higher proportion of potential compared to its share of baseline sales as commercial measures generally prove more cost-effective and offer more savings potential than measures found in other sectors. Cadmus estimated potential for the 22 commercial segments included in Table 3. (grouped into 15 segments for this report). Table 4.7 summarizes 21-year cumulative technical, economic, and achievable economic potential by commercial segment.

TABLE 4.7. COMMERCIAL POTENTIAL BY SEGMENT

Segment	Baseline Sales	Cumulative 2040 - aMW						
		Technical Potential (TP)	TP % of Baseline	Economic Potential (EP)	EP % of Baseline	EP % of TP	Achievable Potential (AP)	AP % of EP
Assembly	37	8	22%	5	14%	64%	4	82%
Hospital	46	9	19%	6	14%	74%	5	85%
Large Grocery	30	7	25%	5	18%	73%	5	85%
Large Office	248	64	26%	40	16%	63%	34	84%
Lodging	37	8	22%	5	14%	63%	4	84%
MF Common Area	22	9	40%	8	36%	91%	7	83%
Miscellaneous	16	8	48%	5	32%	67%	4	84%
Other Health	19	5	26%	4	19%	74%	3	85%
Restaurant	28	6	21%	3	11%	53%	3	85%
Retail	73	16	21%	10	14%	67%	9	83%
School	20	8	39%	6	28%	71%	5	82%
Small Grocery	6	2	25%	1	18%	73%	1	85%
Small Office	57	15	26%	8	14%	55%	7	81%
University	20	4	20%	3	14%	71%	2	84%
Warehouse	34	6	16%	4	12%	75%	3	80%
Total	**693**	**173**	**25%**	**115**	**17%**	**66%**	**96**	**83%**

Approximately 36 percent of 21-year commercial achievable potential arises within the large office segment, as shown in Figure 4.8. Collectively, large and small offices account for 44 percent of commercial achievable economic potential. The miscellaneous segment has the highest technical potential savings relative to baseline sales. The Multifamily Common Area segment has the highest economic potential relative to baseline sales due to high savings potential for interior, exterior, and parking lighting upgrades.

Figure 4.8. Cumulative Commercial Achievable Economic Potential by Segment

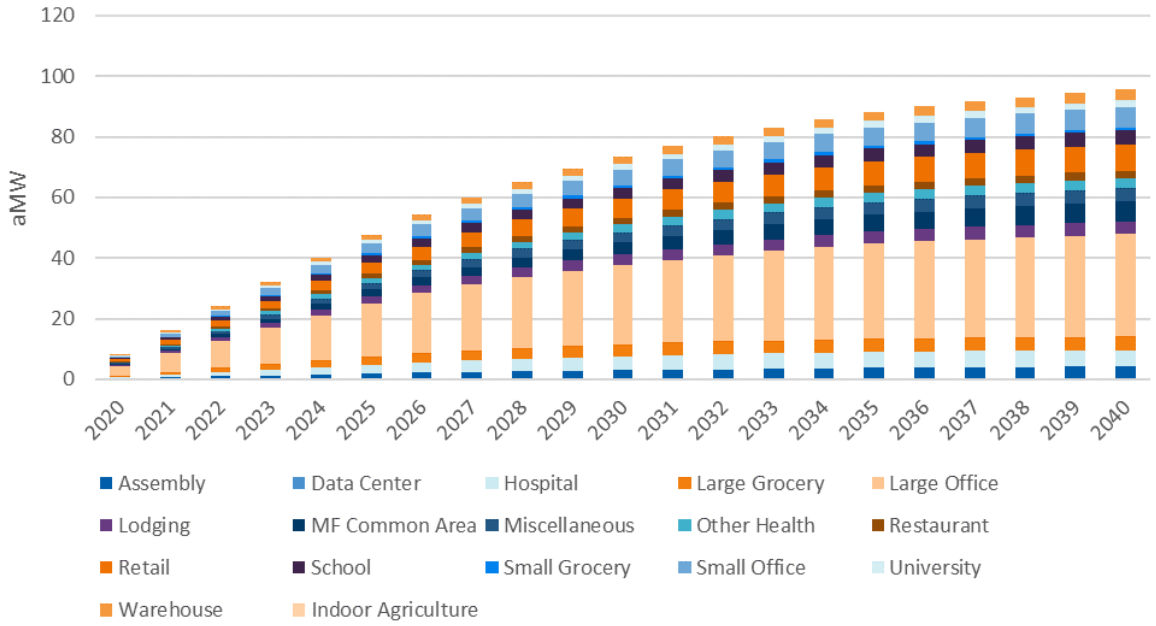
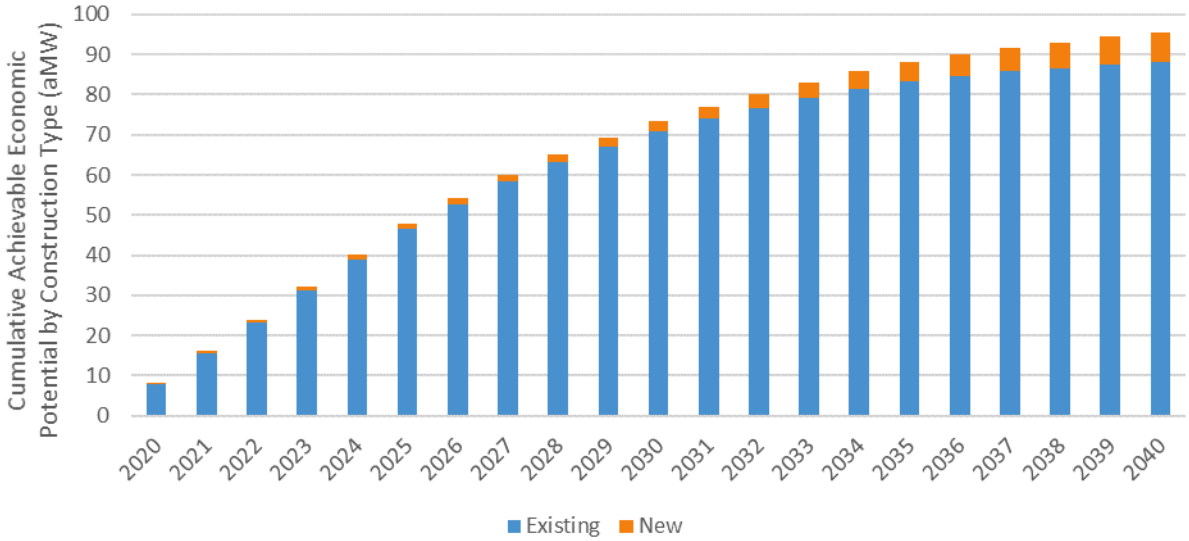


Figure 4.11 presents the cumulative achievable economic potential by construction type for the commercial sector. Existing construction represents the majority of achievable economic potential, particularly in the early years of the study, as it accounts for 96.7% of the potential in the first two years of the study (2020-2021). However, by the final year of the study period (2040), new construction accounts for 9.5% of the total cumulative commercial achievable economic potential.

Figure 4.11. Cumulative Commercial Achievable Economic Potential by Segment



Across each of these segments, lighting accounts for a high portion of total achievable economic potential. Table 4.8 shows 21-year cumulative commercial potential by end use.

TABLE 4.8. COMMERCIAL POTENTIAL BY END USE

End Use	Baseline Sales	Cumulative 2040 - aMW						
		Technical Potential (TP)	TP % of Baseline	Economic Potential (EP)	EP % of Baseline	EP % of TP	Achievable Potential (AP)	AP % of EP
Cooking	2	1	29%	0	20%	67%	0	85%
Cooling	96	22	22%	7	8%	34%	6	85%
Data Center	51	20	39%	18	35%	91%	15	85%
Heat Pump	20	5	22%	2	8%	35%	1	85%
Heating	25	8	31%	4	14%	46%	3	85%
Lighting	285	89	31%	74	26%	83%	61	83%
Miscellaneous	76	6	8%	2	3%	41%	2	85%
Refrigeration	32	5	15%	3	9%	61%	3	85%
Ventilation	89	19	21%	4	5%	24%	4	85%
Water Heat	16	1	5%	0	3%	61%	0	85%
Total	**693**	**173**	**25%**	**115**	**17%**	**66%**	**96**	**83%**

Over one-half (63 percent) of commercial achievable potential comes from interior lighting equipment upgrades, exterior lighting equipment upgrades, and controls. Lighting's 21-year technical potential is equivalent to a 31 percent reduction in baseline lighting consumption. Overall, 83 percent of lighting technical potential proves cost-effective. Only 83 percent of lighting potential is achievable over the study's horizon as a high portion of the end-use savings comes from natural replacement measures, which do not always reach 85 percent achievability, depending on the measure's lifetime and the ramp rate.

As with the residential sector, a large portion commercial potential is achieved within the first 10 years of the study horizon. Figure 4.9 and Figure 4.10 show cumulative and incremental achievable potential for the commercial sector, respectively.

Figure 4.9. Commercial Cumulative Achievable Economic Potential

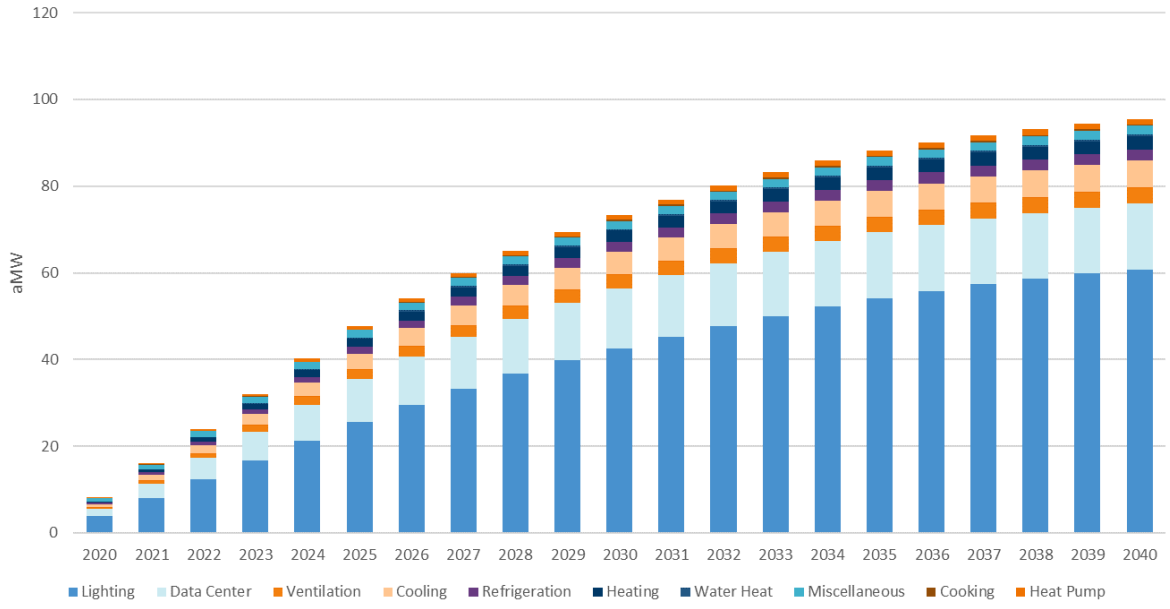
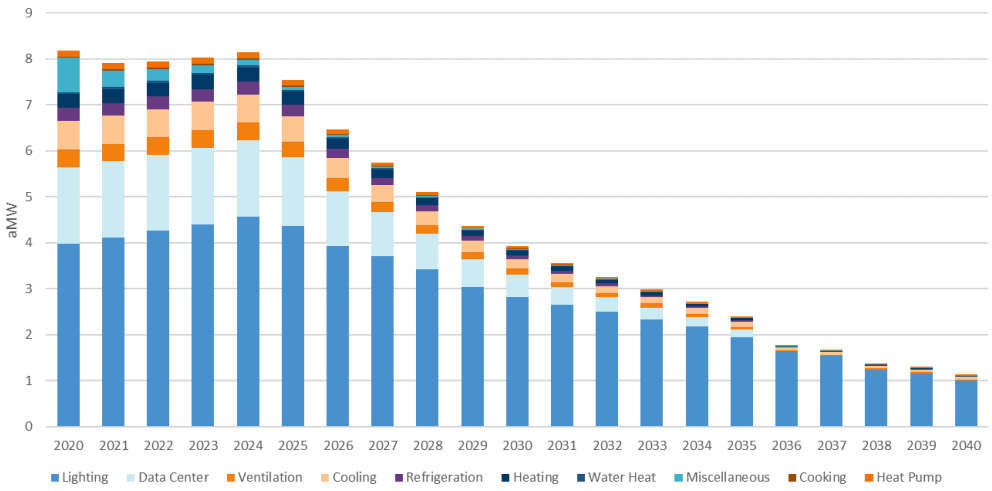


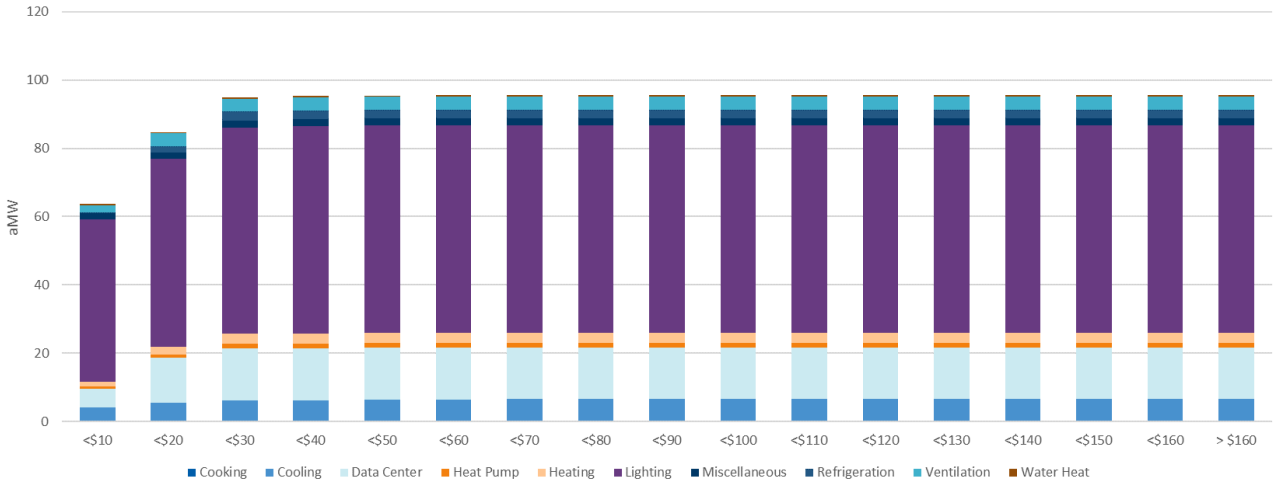
Figure 4.10. Commercial Incremental Achievable Economic Potential



Approximately 73 percent of 21-year commercial achievable economic potential falls within the first 10 years of the study horizon. Much commercial retrofit potential for existing buildings becomes exhausted within the first 10 years. Most savings within the last 10 years of the study's horizon come from natural turnover and replacement of inefficient lighting fixtures with LEDs.

Commercial savings are not only abundant—they are inexpensive. Figure 4.11 shows cumulative 2040 achievable economic for the commercial sector by end use and levelized cost.

Figure 4.11. Commercial Supply Curve by End Use



Most cumulative achievable economic potential by 2040 costs less than $10/MWh from a TRC perspective; 75 percent of these savings come from lighting measures. Although LED technologies remain more expensive than their incandescent, halogen, and fluorescent counterparts, the technology often has a much longer measure life, meaning that installing it defers future replacements of the baseline technology. For some measures, these deferred replacement costs exceed the incremental measure cost, producing negative levelized costs.

Lighting, server virtualization, and direct digital controls have significant conservation potential. Table 4.9 shows the top 15 commercial measures, sorted by 20-year achievable economic potential.

TABLE 4.9. TOP-SAVING COMMERCIAL MEASURES

Measure Name	Achievable Economic Potential - aMW			Percent of Total (21-Year)
	2-Year	10-Year	21-Year	
LED - Linear Fluorescent	2.79	16.75	30.13	32%
Server virtualization/consolidation	1.63	6.54	7.43	8%
Direct Digital Controls Energy Management	0.86	3.44	4.21	4%
LED - Other	0.71	2.86	3.25	3%
LED - Recessed Can	0.64	3.61	5.90	6%
ENERGY STAR Desktop	0.64	0.99	1.05	1%
Commercial HVAC and DHW Pump	0.63	2.53	3.07	3%
Exterior Lighting: Parking Lot - HPS 250W - NR	0.59	2.36	2.68	3%
LED Parking Garage Lighting	0.52	2.08	2.37	2%

TABLE 4.9. TOP-SAVING COMMERCIAL MEASURES				
Commercial Strategic Energy Management	0.50	2.06	2.85	3%
Market Average HP Low Power T8 Shift	0.44	1.79	2.16	2%
Decommissioning of unused servers	0.41	1.63	1.85	2%
Economizer	0.38	1.54	1.75	2%
ENERGY STAR Display	0.38	0.58	0.62	1%
LED - Display or Track	0.37	1.59	2.04	2%

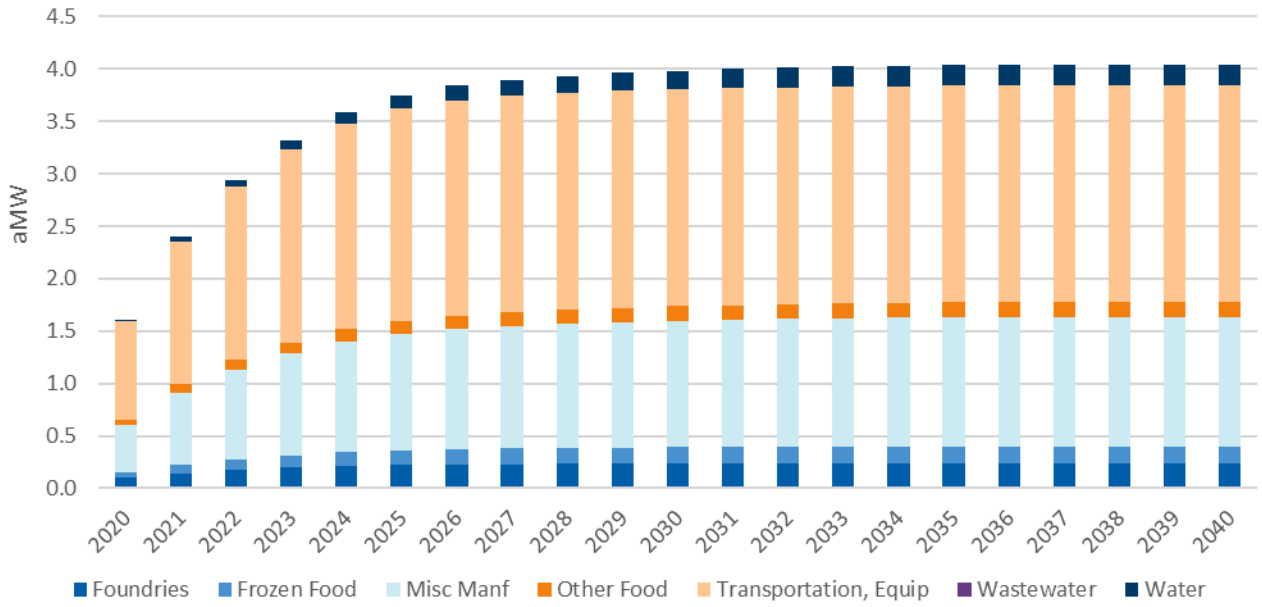
The highest savings measure is LED tube replacements of linear fluorescent lighting, accounting for 30.1 aMW by 2040—32 percent of total commercial potential.

4.4. Industrial

Cadmus estimated conservation potential for the industrial sector using the Council's Seventh Power Plan analysis tool. The conservation potential addressed eight industrial segments in City Light's service territory, based on allocations developed from City Light's nonresidential database. The assessment identified approximately 4 aMW of achievable economic potential by 2040. Table 4.10 shows cumulative industrial potential by segment in 2040, and Figure 4.12 shows industrial achievable economic potential by segment.

TABLE 4.10. INDUSTRIAL POTENTIAL BY SEGMENT								
Segment	Baseline Sales	Cumulative 2040 - aMW						
		Technical Potential (TP)	TP % of Baseline	Economic Potential (EP)	EP % of Baseline	EP % of TP	Achievable Potential (AP)	AP % of EP
Foundries	19.7	0.8	4%	0.3	1%	36%	0.2	85%
Frozen Food	2.3	0.6	28%	0.2	8%	30%	0.2	85%
Miscellaneous Manufacturing	32.4	2.3	7%	1.4	4%	64%	1.2	85%
Other Food	4.0	0.9	22%	0.2	4%	18%	0.1	85%
Transportation, Equipment	26.4	3.1	12%	2.4	9%	78%	2.1	85%
Wastewater	1.3	0.6	47%	0.0	0%	0%	0.0	85%
Water	2.2	0.2	11%	0.2	11%	100%	0.2	85%
Total	**88.4**	**8.5**	**10%**	**4.8**	**5%**	**56%**	**4.0**	**85%**

Figure 4.12. Industrial Achievable Economic Potential by Segment



The distribution of industrial achievable economic potential by segment is very similar to the distribution of baseline sales. Transportation equipment manufacturing accounts for 51 percent of 21-year industrial achievable economic potential—2.1 aMW. Table 4.11 shows 21-year potential by industrial end use.

TABLE 4.11. INDUSTRIAL POTENTIAL BY END USE								
End Use	Baseline Sales	Cumulative 2040 - aMW						
		Technical Potential (TP)	TP % of Baseline	Economic Potential (EP)	EP % of Baseline	EP % of TP	Achievable Potential (AP)	AP % of EP
Fans	7.0	1.1	16%	0.0	0%	0%	0.0	0%
HVAC	11.1	0.3	3%	0.3	3%	100%	0.3	85%
Lighting	8.9	4.0	45%	4.0	45%	100%	3.4	85%
Motors Other	11.9	0.4	4%	0.0	0%	0%	0.0	0%
Other	9.4	0.8	9%	0.2	2%	27%	0.2	85%
Process Air Compressor	5.9	0.5	9%	0.0	0%	0%	0.0	0%
Process Electro Chemical	4.2	0.1	1%	0.1	1%	100%	0.0	85%
Process Heat	12.4	0.0	0%	0.0	0%	0%	0.0	0%
Process Other	0.5	0.0	0%	0.0	0%	0%	0.0	0%
Process Refrigeration	7.4	0.6	8%	0.1	2%	20%	0.1	85%
Pumps	9.8	0.6	6%	0.0	0%	0%	0.0	0%
Total	**88.4**	**8.5**	**10%**	**4.8**	**5%**	**0%**	**4.0**	**85%**

Over three-fourths (85 percent) of industrial, achievable, economic potential comes from lighting measures, followed by HVAC (7 percent) and other (5 percent).

Figure 4.13 and Figure 4.14 show cumulative and incremental, achievable, economic potential over the 21-year study horizon, respectively.

Figure 4.13. Industrial Cumulative Achievable Economic Potential

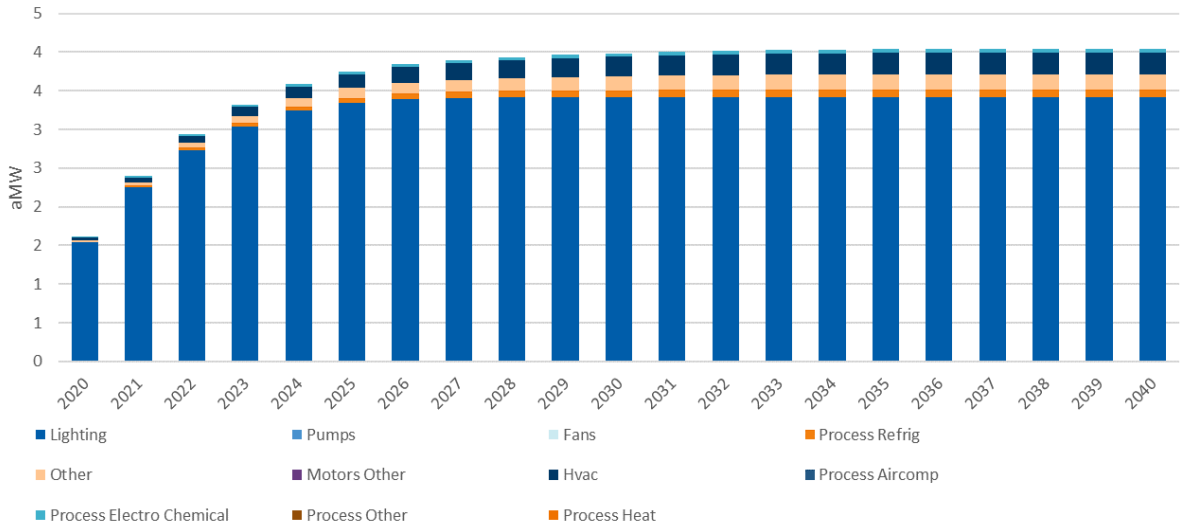
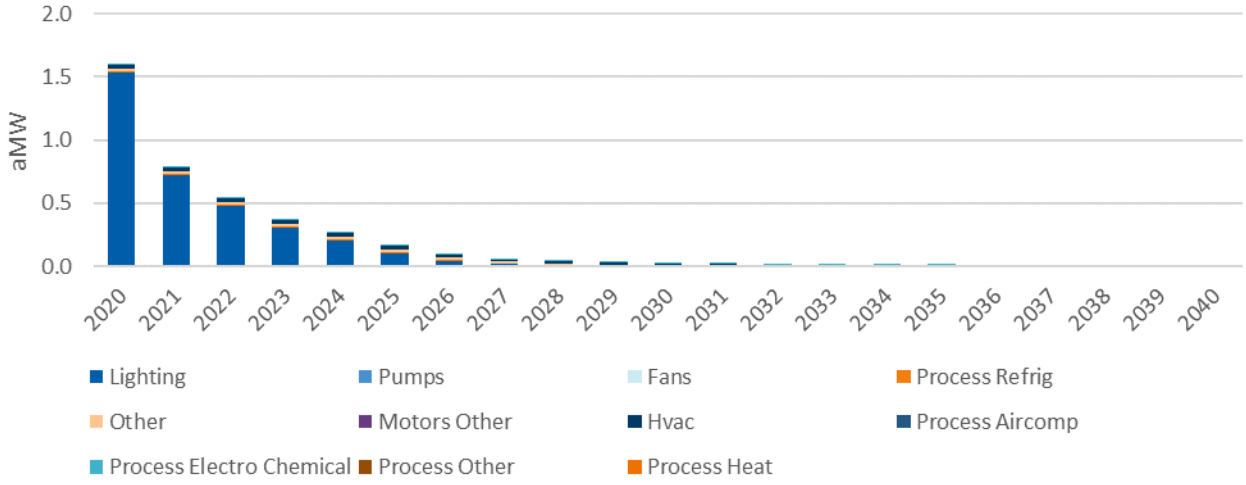


Figure 4.14. Industrial Incremental Achievable Economic Potential



Consistent with the Council's approach to the industrial sector, Cadmus modeled all industrial measures as retrofits and did not distinguish between new and existing construction. After applying ramp rates, approximately 98 percent of 21-year achievable economic potential is realized within the first 10 years.

Industrial measures are generally low cost; however, the 2020 CPA's lower avoided cost forecast resulted in estimates of economic potential equivalent to 56% of technical potential, compared with 97 percent in the 2018 CPA. Figure 4.15 shows cumulative achievable economic potential in 2040 for different levelized cost thresholds.

Figure 4.15. Industrial Supply Curve—Cumulative Achievable Economic Potential in 2040 by Levelized Cost

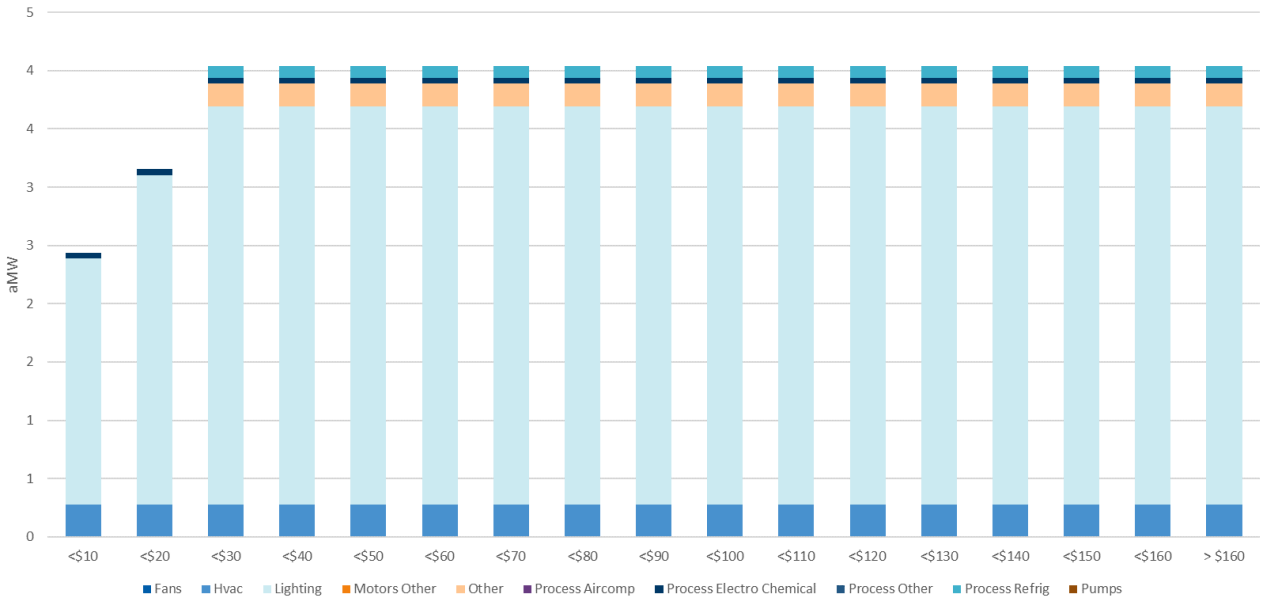


Table 4.12 shows the top saving industrial measures; collectively, these represent 90 percent of 21-year cumulative, achievable, economic potential.

TABLE 4.12. TOP-SAVING INDUSTRIAL MEASURES

Measure Name	Achievable Economic Potential - aMW			Percent of Total (21-Year)
	2-Year	10-Year	21-Year	
High Bay Lighting 2 Shift	0.57	0.86	0.86	21%
High Bay Lighting 1 Shift	0.47	0.72	0.72	18%
Lighting Controls	0.40	0.61	0.61	15%
High Bay Lighting 3 Shift	0.30	0.45	0.45	11%
Efficient Lighting 2 Shift	0.22	0.33	0.33	8%
Efficient Lighting 1 Shift	0.17	0.26	0.26	6%
Efficient Lighting 3 Shift	0.12	0.19	0.19	5%
Municipal Water Supply-Retro	0.04	0.17	0.20	5%
Fan Equipment Upgrade	<0.01	<0.01	<0.01	<1%

5. Comparison to 2018 CPA

5.1. Overview

Overall, the 2020 CPA identified higher technical potential and lower economic and achievable potential than the 2018 CPA. This section compares results from the two assessments and identifies reasons for the change in potential. The study focused on 21-year cumulative estimates of technical and economic potential and incremental estimates of achievable economic potential.

Table 5.1 compares cumulative technical potential, by sector, from the 2018 and 2020 CPAs.

TABLE 5.1. TECHNICAL POTENTIAL COMPARISON

Sector	2020 CPA			2018 CPA		
	Baseline Sales – 21 Year (aMW)	Technical Potential – 21 Year (aMW)	Technical Potential as % of Baseline Sales	Baseline Sales – 21 Year (aMW)	Technical Potential – 20 Year (aMW)	Technical Potential as % of Baseline Sales
Residential	440	100	23%	336	85	25%
Commercial	693	173	25%	747	180	24%
Industrial	88	9	10%	150	13	9%
Street Lighting	5	0	0%	10	1	12%
Total	**1,226**	**282**	**23%**	**1,242**	**279**	**22%**

5.1.1. Technical Potential

The 2020 CPA identified 282 aMW of technical potential, compared to 279 aMW in the 2018 CPA. This slight increase is due to changes in the residential and commercial sectors. Changes that contribute to higher technical potential include:

- Higher residential baseline load forecasts
- New residential measures not previously considered in the 2018 CPA
- Additional commercial measures not previously included in the 2018 CPA
- Lower industrial baseline load forecasts due to the re-classification of some industrial customer premise loads in the commercial sector

Each of these factors are discussed in following sections.

5.1.2. Economic Potential and Avoided Costs

Table 5.2 compares economic potential for IRP-preferred, avoided cost scenario in the 2018 CPA and the market, avoided cost scenario in the 2020 CPA.

TABLE 5.2. ECONOMIC POTENTIAL COMPARISON						
Sector	2020 CPA (Market Avoided Costs)			2018 CPA (IRP Avoided Costs)		
	Economic Potential – 21 Year (aMW)	Economic Potential as % of Baseline Sales	Economic as a % of Technical Potential	Economic Potential – 20 Year (aMW)	Economic Potential as % of Baseline Sales	Economic as a % of Technical Potential
Residential	23	5%	23%	21	6%	25%
Commercial	115	17%	66%	131	17%	72%
Industrial	5	5%	56%	10	7%	77%
Street Lighting	0	0%	0%	1	12%	100%
Total	**142**	**12%**	**50%**	**163**	**13%**	**58%**

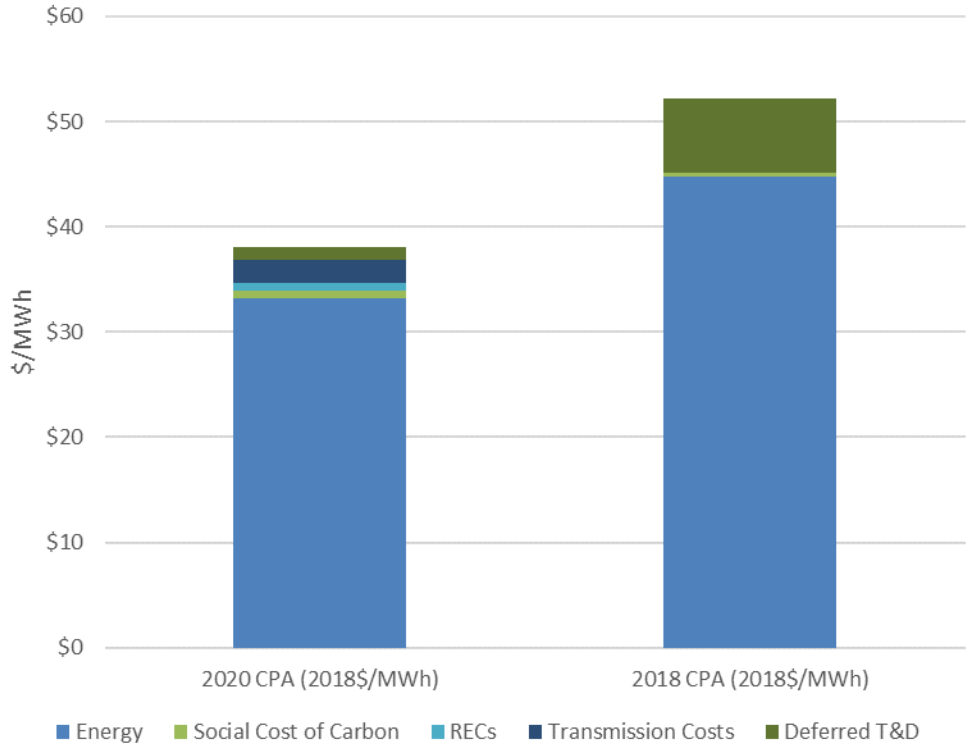
The 2020 CPA identified 142 aMW of economic potential, compared to 163 aMW in the 2018 CPA. Lower avoided energy and capacity costs contributed to a decrease in economic potential in the residential, commercial, and industrial sectors, in addition to factors contributing to lower technical potential. In the 2020 CPA, levelized avoided costs for the 2020 to 2040 period are approximately $38/MWh, compared to $52/MWh in the 2018 CPA, or nearly 27 percent lower.[18]

In addition to lower avoided energy costs, the 2020 CPA also updated assumptions regarding deferred transmission and distribution costs. Cadmus used forecast values from the Council's presentation in March of 2019, which reflected values of $3.08/kW-year and $6.85/kW-year for transmission and distribution, respectively, which were converted from 2016 to 2018 dollars.[19]

[18] Both the 2018 CPA and 2020 CPA levelized cost values are expressed in 2018 dollars for comparison purposes

[19] The Council's values were presented in its March 2019 meeting and reflect weighted average values from several regional utilities and are expressed in $2016, levelized. https://www.nwcouncil.org/sites/default/files/2019_0312_p3.pdf

Figure 5.1. Change in Residential Economic Potential by End Use



The lower avoided costs in the 2020 CPA contribute to the lower economic potential in each sector. The industrial sector had the most pronounced decline in economic potential, as illustrated in Table 5.3, which shows economic potential expressed as a fraction of technical potential. The industrial sector experienced a decline in the percent of technical potential that is economic due to the lower avoided energy and deferred T&D costs, as several large savings measures that were marginally cost effective in the 2018 CPA were not cost effective in the 2020 CPA, including plant energy management. The residential and commercial sectors also exhibited declines in the economic potential as a percent of technical.

TABLE 5.3. COMPARISON OF CUMULATIVE ECONOMIC POTENTIAL AS A PERCENT OF TECHNICAL POTENTIAL

Sector	2020 CPA	2018 CPA
Residential	23%	25%
Commercial	66%	72%
Industrial	56%	77%
Street Lighting	0%	100%
Total	50%	58%

5.2. Residential Sector Changes

The residential sector had increased technical and economic potential and a slight decline in achievable potential. These changes were driven by factors including a higher customer forecast, higher potential in three key end uses, but lower avoided energy and T&D capacity costs. Table 5.4 compares technical and economic potential in the 2018 and 2020 CPA and identifies key reasons for the changes.

TABLE 5.4. RESIDENTIAL TECHNICAL AND ECONOMIC POTENTIAL COMPARISON

Component	2020 CPA	2018 CPA	Reason for Change
Baseline Sales	440	336	Higher customer forecast; baseline forecast calibrated to base year (2019)
Technical Potential	100	85	Higher load forecast; new MF DHP measures
Technical Potential as % of Baseline	23%	25%	
Economic Potential	23	21	Lower avoided energy and T&D capacity cost forecasts
Economic Potential as % of Baseline	5%	5%	
Economic Potential as % of Technical	23%	21%	

5.2.1. Higher Residential Forecast Sales

City Light's forecasted residential final study year (2040) sales were approximately 31 percent higher than the 2018 CPA final year (2037). Several key factors contributed to the increased residential sales forecast:

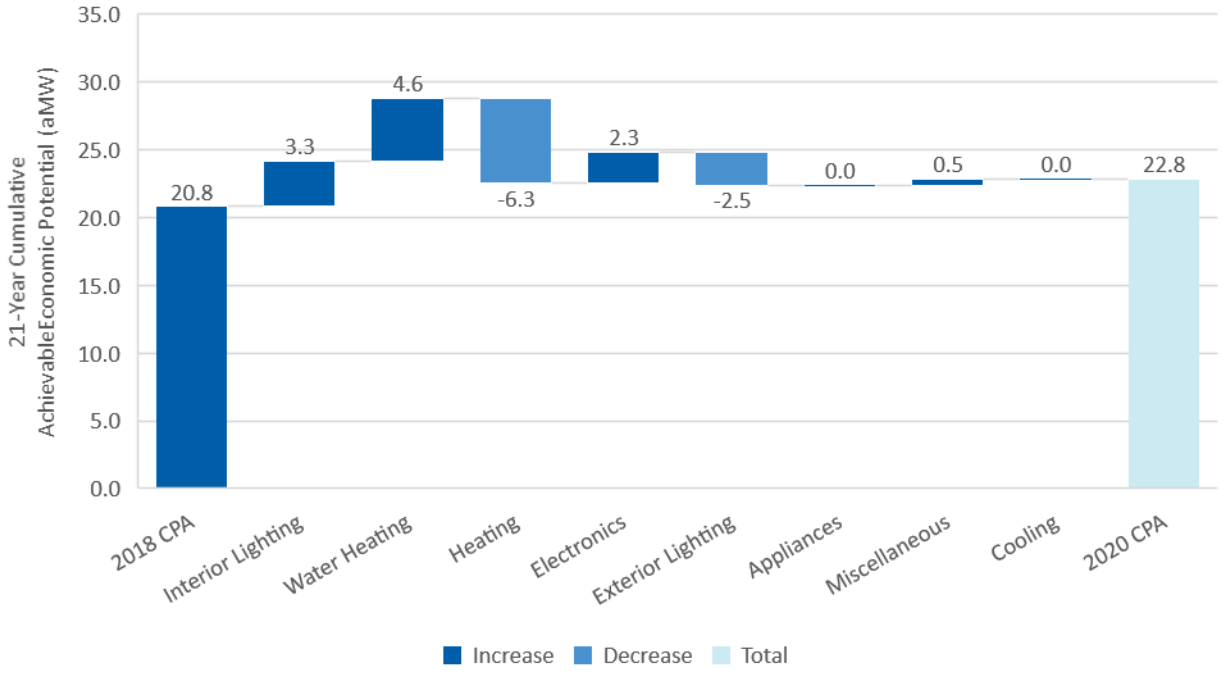
- City Light's underlying residential customer forecast increased from approximately 410,000 residential customers to over 508,000 in 2040. The residential customer forecast used in the 2018 showed residential customer growth from 385,000 in 2017 to 427,000 in 2037.
- The 2020 CPA baseline sales forecast includes additional load from City Light's internal EV forecast; this forecast shows an additional 38 aMW of residential customer EV load in 2040. The 2018 CPA baseline forecast did not explicitly account for EVs.
- The 2020 CPA adjusted end-use equipment saturations and fuel shares for several residential HVAC end uses (central air conditioning, room cooling, and heat pumps) based on discussion and agreement with City Light's load forecast technical team.
- Cadmus calibrated the residential bottom-up forecast in the base year (2019) to City Light's sales forecast but did not otherwise adjust or calibrate any other years. The 2018 CPA calibrated the baseline forecast to City Light's energy sales forecast.
- Furthermore, unlike the 2018 CPA, Cadmus calibrated the baseline sales forecast only in the base year (2019) to City Light's retail sales forecast, rather than for every year of the study.

5.2.2. Higher Interior Lighting and Water Heating Potential and Lower Heating and Exterior Lighting

Figure 5.2 illustrates the change in residential economic potential. Rises in economic potential for the interior lighting, water heating, electronics, and miscellaneous end uses contributed to the overall rise in

residential economic potential; on the other hand, the heating and exterior lighting end uses both experienced declines in economic potential.

Figure 5.2. Change in Residential Economic Potential by End Use



Compared with the 2018 CPA, the heating and exterior lighting end uses experienced significantly lower economic potential of approximately 7.9 aMW combined. The following heating measures exhibited economic potential in the 2018 CPA but not the 2020 CPA:

- Motor – ECM. This measure became federal standard in 2019.
- DHP in existing single family with forced air furnace.
- Floor, wall, and attic insulation.

Conversely, the interior lighting, water heating, electronics, and miscellaneous end uses showed increased economic potential compared with the 2018 CPA. Examples of these measures include clothes washers, showerheads, aerators (not previously considered in the 2018 CPA), and engine block heater controls.

5.3. Commercial Sector Changes

The 2020 CPA identified lower 21-year cumulative technical and economic potential than the 2018 CPA, with the decrease in technical potential due to a lower commercial baseline energy forecast as City Light expects lower load growth for enterprise data centers compared with the previous CPA. However, the potential technical potential as a percent of baseline sales actually increased, due primarily to the incorporation of additional advanced rooftop controls measures approved by the RTF since the 2018 CPA. Table 5.5 compares technical and economic potential in the commercial sector for the two CPAs.

TABLE 5.5. COMMERCIAL TECHNICAL AND ECONOMIC POTENTIAL COMPARISON			
Component	**2020 CPA**	**2018 CPA**	**Reason for Change**
Baseline Sales	693	747	Lower data center loads; Lower baseline sales forecast; Additional advanced rooftop controller measures
Technical Potential	173	180	
Technical Potential as % of Baseline	25%	24%	
Economic Potential	115	131	Lower avoided capacity and energy costs
Economic Potential as % of Baseline	17%	17%	
Economic Potential as % of Technical	66%	72%	

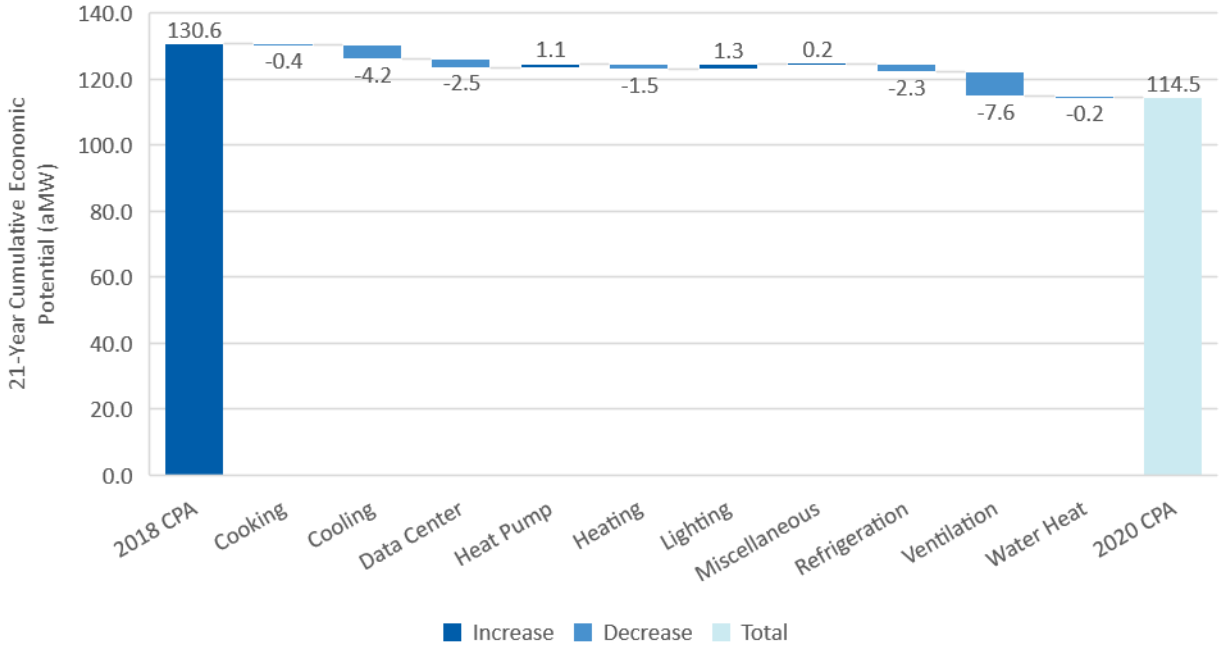
Although the 2018 CPA included an advanced rooftop controller measure from the Seventh Power Plan, the three additional measures in the 2020 CPA from the RTF's recent work include the following:[20]

- Gas Rooftop Unit (RTU) Advanced Rooftop Controls (12.3 aMW technical potential)
- Heat Pump RTU Advanced Rooftop Controls (3.6 aMW)
- Gas RTU Supply Fan VFD and Controller (3.3 aMW)

Despite the increase in technical potential from these measures, the economic potential remains relatively consistent with the 2018 CPA, at least in terms of economic potential as a percent of baseline sales. Figure 5.3 illustrates the change in commercial economic potential between the 2018 and 2020 CPAs by end use. End uses exhibiting decreased economic include cooling, data center, heating, refrigeration, and ventilation.

[20] https://rtf.nwcouncil.org/measure/advanced-rooftop-controls

Figure 5.3. Change in Commercial Economic Potential by End Use



5.4. Achievable Potential and Ramping

As with assessments of economic potential, Cadmus identified lower, cumulative, achievable economic potential. As 20-year cumulative achievable potential is a subset of economic potential, factors contributing to lower cumulative achievable potential are the same as those previously discussed for economic potential. Incremental achievable potential in the first two years of the 2020 CPA is about 13% lower than the first two years of the 2018 CPA . Figure 5.4 shows incremental achievable economic potential from the 2020 CPA, and Figure 5.5 shows incremental achievable economic potential from the 2018 CPA.

Figure 5.4. Incremental Achievable Potential—2020 CPA

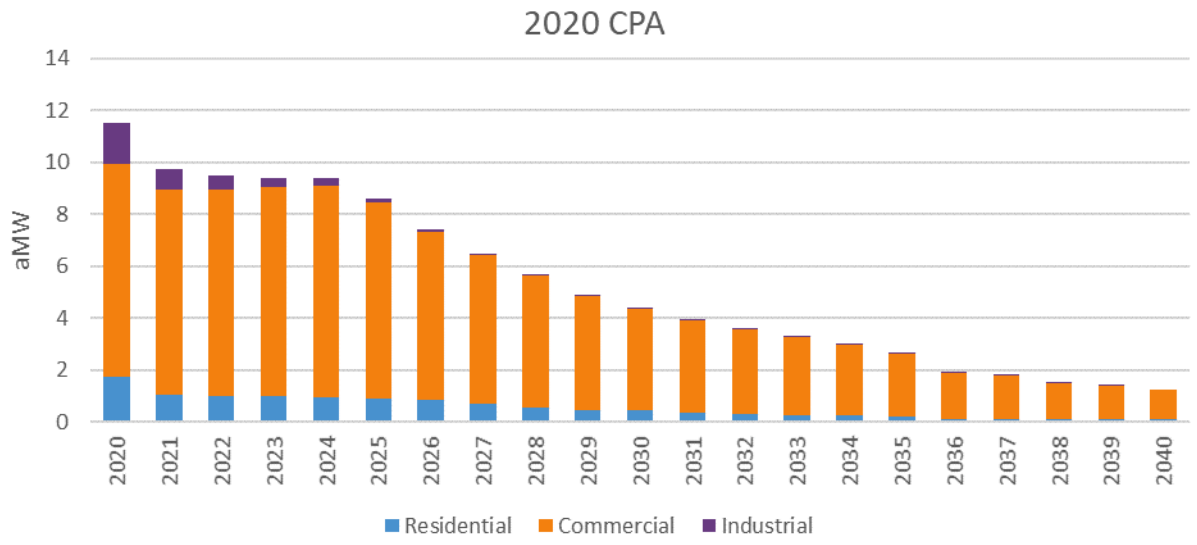


Figure 5.5. Incremental Achievable Potential—2018 CPA

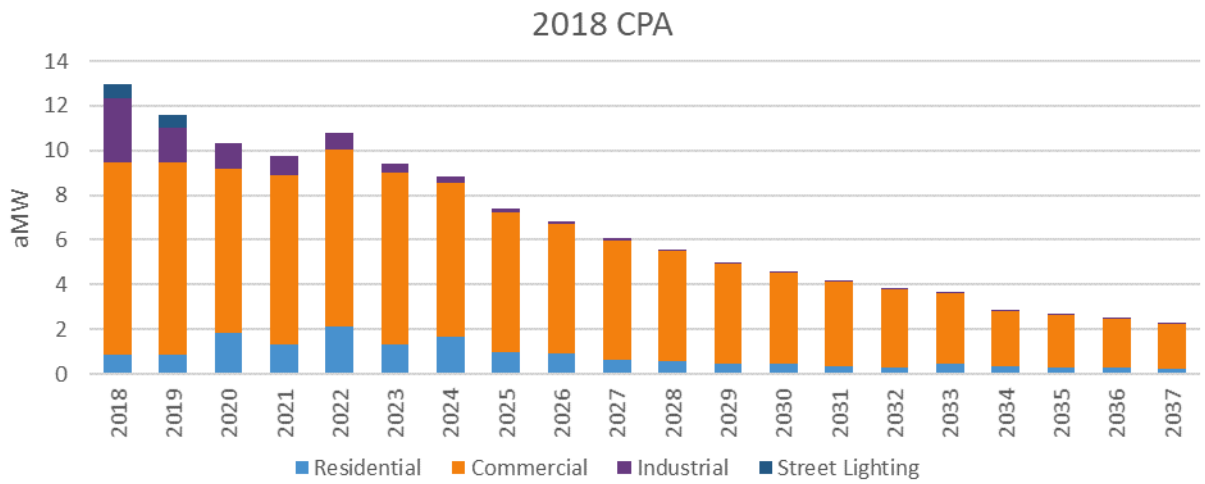


Figure 5.4 shows that the 2020 CPA determines that a higher proportion of total available potential will be realized in the study's early years. The two-year achievable potential is equal to approximately 19% of the total 21-year achievable economic potential, which is relatively consistent with the 2018 CPA, despite the lower total available achievable potential in the 2020 CPA. This change results from one key factor: the shift in the timing of lost opportunity ramp rates. For lost opportunity measures, we used the same ramp rates as those used in the Seventh Power Plan; however, we aligned the first year of this study (2020) with the fifth year of the Seventh Plan (2020) for each lost opportunity ramp rate. The result is that a greater percentage of each lost opportunity measure's potential is achieved.

6. Glossary of Terms

These definitions draw heavily from the NAPEE Guide for Conducting Energy Efficiency Potential Studies and the State and Local Energy Efficiency Action Network.[21]

Achievable potential: The amount of energy use that efficiency can realistically be expected to displace.

Benefit-cost ratio: The ratio (as determined by the Total Resource Cost test) of discounted total benefits of the program to discounted total costs over some specified time period.

Conservation Potential Assessment: A quantitative analysis of the amount of energy savings that exists, proves cost-effective, or could potentially be realized through implementation of energy-efficient programs and policies.

Cost-effectiveness: A measure of relevant economic effects resulting from implementation of an energy efficiency measure. If the benefits of this selection outweigh its costs, the measure is considered cost-effective.

Economic potential: Refers to the subset of technical potential that is economically cost-effective compared to conventional supply-side energy resources.

End use: A category of equipment or service that consumes energy (e.g., lighting, refrigeration, heating, process heat).

End Use Consumption: Used for the residential sector, this represents per-UEC consumption for a given end use, expressed in annual kWh per unit. (Also called unit energy consumption [UEC]).

End-use intensities: Used in the commercial and institution sectors, energy consumption per square foot for a given end use, expressed in annual kWh per square foot per unit.

Energy efficiency: The use of less energy to provide the same or an improved service level to an energy consumer in an economically efficient way.

Effective useful life: An estimate of the duration of savings from a measure. EUL is estimated through various means, including the median number of years that energy efficiency measures installed under a program remain in place and operable. EUL also is sometimes defined as the date at which 50 percent of installed units remain in place and operational.

Levelized cost: The result of a computational approach used to compare the cost of different projects or technologies. The stream of each project's net costs is discounted to a single year using a discount rate (creating a net present value) and divided by the project's expected lifetime output (MWhs).

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[21] SEEAction. Energy Efficiency Program Impact Evaluation Guide. NAPEE Guide for Conducting Energy Efficiency Potential Studies and the State and Local Energy Efficiency Action Network. 2012. Prepared by Steven R. Schiller, Schiller Consulting, Inc. Available online: www.seeaction.energy.gov

Lost opportunity: Refers to an efficiency measure or efficiency program seeking to encourage selection of higher-efficiency equipment or building practices than that typically chosen at the time of a purchase or design decision.

Measure: Installation of equipment, subsystems, or systems, or modifications of equipment, subsystems, systems, or operations on the customer side of the meter, designed to improve energy efficiency.

Portfolio: Either (a) a collection of similar programs addressing the same market, technology, or mechanisms; or (b) the set of all programs conducted by one organization.

Program: A group of projects with similar characteristics and installed in similar applications.

Retrofit: An efficiency measure or efficiency program intended to encourage replacement of functional equipment before the end of its operating life with higher-efficiency units (also called "early-retirement"), or the installation of additional controls, equipment, or materials in existing facilities for reducing energy consumption (e.g., increased insulation, lighting occupancy controls, economizer ventilation systems).

Technical potential: The theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints (such as cost-effectiveness or the willingness of end-users to adopt the efficiency measures).

Total resource cost (TRC) test: A cost-effectiveness test that assesses the impacts of a portfolio of energy efficiency initiatives on the economy at large. The test compares the present value of efficiency costs for all members of society (including costs to participants and program administrators) compared to the present value of benefits, including avoided energy supply and demand costs.

Utility cost test (UCT): A cost-effectiveness test that evaluates impacts of efficiency initiatives on an administrator or an energy system. It compares administrator costs (e.g., incentives paid, staff labor, marketing, printing, data tracking, reporting) to accrued benefits, including avoided energy and demand supply costs. Also called the Program Administrator Cost Test (PACT).

Seattle City Light

2020 Conservation Potential Assessment—Volume II

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Prepared by: Lakin Garth, Cadmus
11/26/2019

Washington Initiative 937 (I-937) Compliance Documentation

The Washington Administrative Code chapter 194-37-070 says CPAs must use methodologies consistent with the most recently published regional power plan and satisfy the 15 criteria. Table 1 lists these items and describes how City Light's 2020 CPA satisfies the criteria.

Following Table 1 the "Methodology Comparison" section discusses key parts of the Council's methodology for assessing conservation potential and explains how Cadmus' approach for City Light's 2020 CPA is consistent.

TABLE-1 WAC 194-37-070 DOCUMENTATION	
Northwest Power and Conservation Council Methodology	**Cadmus Methodology**
(a) Analyze a broad range of energy efficiency measures considered technically feasible;	Cadmus analyzed all of the most up-do-date, active measures from the Regional Technical Forum (RTF) and measures from the Northwest Power and Conservation Council's (Council) Seventh Power Plan. This study considered over 4,200 measure permutations.
(b) Perform a life-cycle cost analysis of measures or programs, including the incremental savings and incremental costs of measures and replacement measures where resources or measures have different measure lifetimes;	Cadmus performed life-cycle cost analysis in a manner consistent with the Council's PROCOST model. As a basis, the analysis used incremental costs, energy savings, and measure lives from the Seventh Power Plan and RTF workbooks.
(c) Set avoided costs equal to a forecast of regional market prices, which represents the cost of the next increment of available and reliable power supply available to the utility for the life of the energy efficiency measures to which it is compared;	City Light provided avoided-cost forecasts, consistent with City Light's IRP. Cadmus estimated potential for two avoided cost scenarios—one based on regional market prices; and the other based on City Light's preferred portfolio, selected by City Light's previous IRP. Conservation potential and targets were based on City Light's "IRP preferred" avoided costs.
(d) Calculate the value of the energy saved based on when it is saved. In performing this calculation, use time differentiated avoided costs to conduct the analysis that determines the financial value of energy saved through conservation;	Cadmus used measure load shapes to calculate time of day and year usage, and weighting of measure values was based upon peak and off-peak pricing, performed in a manner consistent with the Council's PROCOST model.
(e) Conduct a total resource cost analysis that assesses all costs and all benefits of conservation measures regardless of who pays the costs or receives the benefits. The NWPCC identifies conservation measures that pass the total resource cost test as economically achievable;	Cadmus conducted benefit-cost analysis according to the Council's methodology. The cost side considered capital costs, administrative costs, annual O&M costs and periodic replacement costs. The benefits side included energy, non-energy, operations and maintenance (O&M), and all other quantifiable benefits. The Total Resource Cost (TRC) benefit-cost ratio served to screen measures for cost-effectiveness (i.e., those greater than one were considered cost-effective).
(f) Identify conservation measures that pass the total resource cost test, by having a benefit/cost ratio of one or greater as economically achievable;	Cadmus considered measures achieving a BCR ratio (on a TRC basis) greater than or equal to one as achievable and cost-effective.
(g) Include the increase or decrease in annual or periodic operations and maintenance costs due to conservation measures;	Cadmus accounted for each measure's O&M costs in the total resource cost, according to the Council's assumptions.

TABLE-1 WAC 194-37-070 DOCUMENTATION	
(h) Include deferred capacity expansion benefits for transmission and distribution systems in its cost-effectiveness analysis;	Cost-benefit ratios and levelized costs incorporated City Light's avoided transmission and distribution cost forecasts.
(i) Include all non-power benefits that a resource or measure may provide that can be quantified and monetized;	Cadmus included quantifiable non-energy benefits for the appropriate measures. For example, non-energy benefits included water savings from clothes washers. The source of these benefits derived either the RTF or the Seventh Plan, depending upon the measure.
(j) Include an estimate of program administrative costs;	This study used a 20% residential and 23% commercial and industrial administrative cost (percent of incremental cost). Cadmus derived these cost adders from City Light's 2015 program expenditures.
(k) Discount future costs and benefits at a discount rate based on a weighted, after-tax, cost of capital for utilities and their customers for the measure lifetime;	Cadmus applied discount rates to each measure in the study, using the Council's methodology (with a 3% real discount rate used).
(l) Include estimates of the achievable conservation penetration rates for conservation measures;	Cadmus determined achievable potential estimates for each measure by applying the Council's 85% achievability factor and ramp rates, consistent with the Council's methodology.
(m) Include a ten percent bonus for conservation measures as defined in 16 U.S.C. § 839a of the Pacific Northwest Electric Power Planning and Conservation Act;	Cadmus applied the 10% bonus for conservation measures, as defined in 16 U.S.C. § 839a of the Pacific Northwest Electric Power Planning and Conservation Act to all measures in the study. This adder was included in avoided cost forecasts for cost-benefit analysis and in the calculation of levelized costs.
(n) Analyze the results of multiple scenarios. This includes testing scenarios that accelerate the rate of conservation acquisition in the earlier years; and	Cadmus considered two scenarios reflecting different avoided cost forecast, testing scenarios with accelerated ramp rates, increasing conservation in early years.
(o) Analyze the costs of estimated future environmental externalities in the multiple scenarios that estimate costs and risks.	The study considered two avoided cost scenarios to capture price uncertainty. Both forecasts included the value of avoided CO2 offsets, and the market price forecast included the value of avoided renewable energy credit purchases.

1.1. Methodology Comparison

To facilitate comparisons with the 7th Power Plan, the Council prepared an overview of the methodology used in developing the 7th Power Plan's conservation potential estimates. This appendix compares the methodology used in SCL's 2020 CPA to benchmarks established by the Council.

Italics denote descriptions of methodologies used in this study.

1.1.1. Technical Resource Potential Assessment

The assessment reviewed a wide array of energy efficiency technologies and practices, across all sectors and major end uses.

The study considered measures from a variety of sources, including the 7th Plan and RTF. Appendix D provides descriptions of all measures analyzed.

1.1.1.1 Methodology

- Technically feasibility savings = Number of applicable units * incremental savings/applicable units
- "Applicable" units accounted for:
  - Fuel saturations (e.g., electric vs. gas DHW).

    Whenever possible, fuel saturations were based on data specific to City Light's service territory. City Light's oversamples for the 2014 Commercial Building Stock Assessment (CBSA) and the 2017 Residential Building Stock Assessment (RBSA) served as the primary sources of this information.
  - Building characteristics (e.g., single-family vs. mobile homes, basement/non-basement).

    Data derived from NEEA's 2017 Residential Building Stock Assessment (RBSA), CBSA, and City Light's customer database.
  - System saturations (e.g., heat pump vs. zonal, central AC vs. window AC).

    Whenever possible, system saturations were based on data specific to City Light's service territory. City Light's oversamples for the 2014 Commercial Building Stock Assessment (CBSA) and the 2017 Residential Building Stock Assessment (RBSA) served as the primary sources of this information.
  - Current measure saturations.

    Current saturations were incorporated into the applicability, based on information from RBSA, CBSA, the 7th Plan, and RTF.
  - New and existing units.

    Existing and new units were calculated based on current and forecasted customers, respectively.
  - Measure life (stock turnover cycle).

Measure decay rates were applied to lost opportunity measures, based on measure life. Discretionary measures were assumed to be reinstalled at the end of their useful life.

- Measure substitutions (e.g., duct sealing of homes with forced-air resistance furnaces vs. conversion of homes to heat pumps with sealed ducts).

  The measure share applicability factor accounted for competition between measures to avoid double-counting.

- "Incremental" savings/applicable unit accounted for:
  - Expected kW and kWh savings, shaped by time-of-day, day of week, and month of year.

    Energy and demand savings were either based on deemed values or calculated as a percent reduction in baseline end-use consumption.

  - Savings over baseline efficiency. Baseline set by codes/standards or current practices.

    Baselines were set based on current codes, standards, or current practices. Standards passed but not yet implemented became the baseline at the time mandated in the new standard.

    Not always equivalent to savings over "current use" (e.g., new refrigerator savings measured as a "increment above current federal standards," not the refrigerator being replaced).

    Savings from equipment upgrades were calculated based on the market average efficiency level available at the time of burnout.

  - Climate: heating, cooling degree days, and solar availability.

    Savings were based on the typical climate in City Light's service territory.

  - Measure interactions (e.g., lighting and HVAC, duct sealing and heat pump performance, heat pump conversion, and weatherization savings).

    These interactive effects were treated as a reduction in measure savings (e.g., commercial lighting measures might save less due to increased heating requirements).

1.1.2. Economic Potential: Ranking Based on Resource Valuation

- The TRC served as the criterion for economic screening, and included all measure costs and benefits, regardless of the parties paying for or receiving them.
  - TRC B/C Ratio > = 1.0

    Benefit-cost analysis was conducted according to the Council's methodology. Capital cost, administrative cost, annual O&M cost and periodic replacement costs were all considered on the cost side. Energy, non-energy, O&M, and all other quantifiable benefits were included on the benefits side. The TRC benefit cost ratio was used to screen measures for cost-effectiveness (i.e., those greater than 1 are cost-effective).

- Levelized cost of conserved energy (CCE) < levelized avoided cost for the savings' load shape could substitute for TRC if adjusting "CCE" to account for "non-kWh" benefits, including deferred T&D, non-energy benefits, environmental benefits, and the Act's 10% conservation credit.

  Levelized costs, on a TRC basis, were calculated for each measure in comparison with the Integrated Resource Planning's (IRP) supply-side resources. The levelized cost calculation incorporated deferred T&D (for electric resources), non-energy benefits, secondary fuel benefits, and the Act's 10% conservation credit (for electric resources).

1.1.2.1 Methodology

- The energy and capacity value (i.e., benefit) of savings was based on the avoided cost of future wholesale market purchases (i.e., forward price curves).

  The study considered two avoided cost forecasts—one based on the avoided cost of future wholesale market purchases and a second based on the avoided cost of future market purchases and the construction of new renewable generation
- The energy and capacity values accounted for the savings shape (i.e., used time and seasonally differentiated avoided costs and measure savings).

  The analysis relied time differentiated avoided costs and savings to calculate the value of avoided energy and capacity
- Performing the valuation under a wide range of future market price scenarios during the IRP process accounted for uncertainties in future market prices.

  Two avoided cost scenarios were considered to account for price uncertainty
- Costs inputs (resource cost elements):

  All costs listed below were included in the per-unit measure costs, where appropriate.
  - Full incremental measure costs (material and labor).
  - Applicable ongoing O&M expenses (plus or minus).
  - Applicable periodic O&M expenses (plus or minus).
  - Utility administrative costs (e.g., program planning, marketing, delivery, ongoing administration, evaluation).
- Benefit inputs (resource value elements):

  All benefits listed below were assessed in calculating the levelized CCE and benefit-cost ratios, where appropriate.
  - Direct energy savings.
  - Direct capacity savings.
  - Avoided T&D losses.
  - Deferral value of transmission and distribution system expansion (if applicable).
  - Non-energy benefits (e.g., water savings).

- Environmental externalities.

- Discounted presented value inputs:
  - Rate = After-tax average cost of capital, weighted for project participants (real or nominal).

    The analysis used City Light's discount rate of 3.0%.
  - Term = Project life, generally equivalent to life of resources added during the planning period.

    Costs were levelized over each measure's expected useful life. Any reinstallation costs over the 21-year planning period were similarly levelized.
  - Money was discounted, not energy savings.

    The value of energy savings ($) is discounted

1.1.3. Achievable Potential

- Annual acquisition targets, established through the IRP process (i.e., portfolio modeling).

  Acquisition targets were established in accordance to WAC 194-37. The CPA determined conservation targets based on the pro-rata share of ten-year conservation potential and 2-year conservation potential. This level of conservation was included in City Light's IRP modeling.
- Conservation competed against all other resource options in portfolio analysis. Conservation resource supply curves separated into the following:
  - Discretionary (non-lost opportunity).

    Defined as retrofit opportunities in existing facilities.
  - Lost-opportunity.

    Including equipment replacements in existing facilities and all new construction measures.
  - Annual achievable potential, constrained by historic "ramp rates" for discretionary and lost-opportunity resources:

    The maximum ramp-up/ramp-down rate for discretionary was 3x the prior year for discretionary, with an upper limit of 85% over the 21-year planning period.

    Analysis assumed 85% of discretionary resources could be acquired within at least a 20-year timeframe.

    A lost-opportunity used a 15% ramp rate in the first year, growing to 85% by the 12th year.

    Lost opportunity ramp rates varied by measure and were based on City Light's program history.

    Achievable potentials could vary by the type of measure, customer sector, and program design (e.g., measures subject to federal standards could have 100% "achievable" potential).

While the analysis removed savings from known standards, it did not attempt to predict which savings would be acquired from future codes or standards.

- Revised technical, economic, and achievable potential were based on changes in market conditions (e.g., revised codes or standards), program accomplishments, evaluations, and experience.

  Changes taking effect after the finalization of the 2018 CPA are reflected in the 2020 CPA.
- All programs should incorporate Measurement and Verification (M&V) plans that, at a minimum, track administrative and measure costs and savings.
- The International Performance Measurement and Verification Protocols (IPMVP) should be used as a guide.

Baseline Data

Appendix B includes summaries of baseline forecasts for the residential, commercial, and industrial sectors. Cadmus calibrated these forecasts to City Light's load forecasts, though individual sector forecasts may differ from City Light's due to adjustments for future equipment standards. This appendix also includes detailed baseline inputs for the residential and commercial sectors, such as end-use saturations, fuel shares, and unit energy consumption (UEC) or end-use energy-use intensities (EUIs). UECs, applying to the residential sector, are expressed in kWh per unit. EUIs, applying to the commercial sector, are expressed in kWh per square foot.

B.1. Residential Baseline Data

Figure B-1. Residential Baseline Forecast by Segment

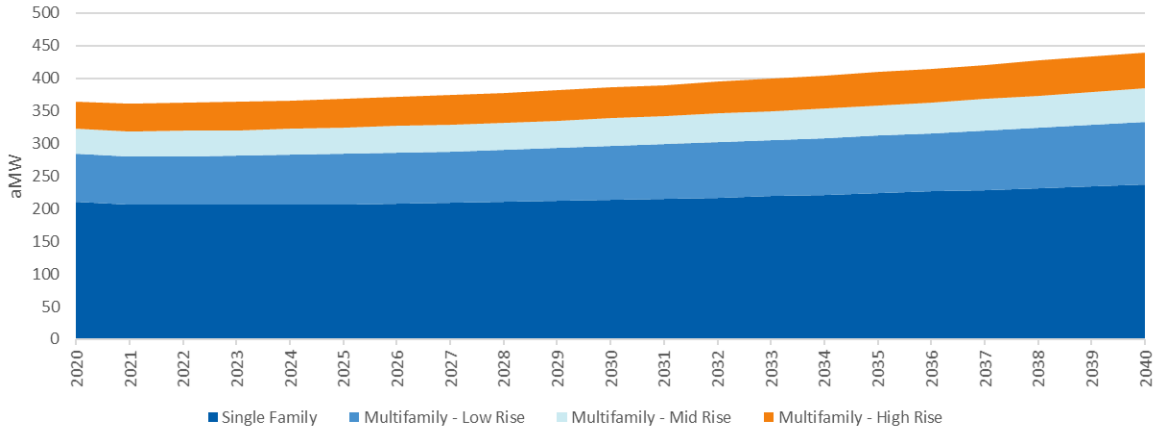


Figure B-2. Residential Baseline Forecast by End Use

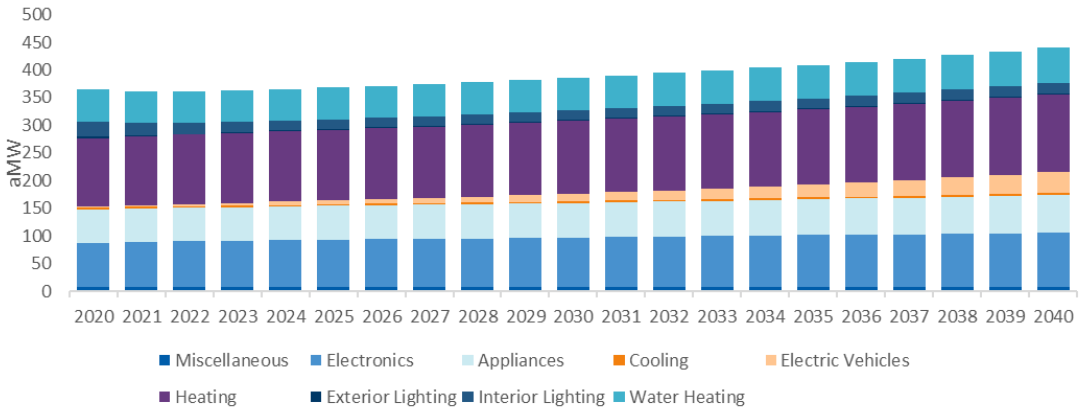


TABLE B-1. RESIDENTIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Multifamily - High Rise	Air Purifier	0.0	100%	233.50	224.46
Multifamily - High Rise	Computer - Desktop	0.4	100%	65.01	65.01
Multifamily - High Rise	Computer - Laptop	0.4	100%	18.91	18.91
Multifamily - High Rise	Cooking Oven	1.0	93%	73.42	73.42
Multifamily - High Rise	Cooking Range	1.0	93%	49.95	49.95
Multifamily - High Rise	Cool Central	0.0	100%	41.81	12.22
Multifamily - High Rise	Cool Room	0.2	100%	13.43	12.97
Multifamily - High Rise	Copier	0.0	100%	225.54	224.51
Multifamily - High Rise	Dryer	0.4	100%	185.31	139.32
Multifamily - High Rise	DVD Player	1.2	100%	10.19	10.19
Multifamily - High Rise	Electric Vehicles	0.0	100%	1895.44	1895.44
Multifamily - High Rise	Freezer	0.0	100%	97.62	87.47
Multifamily - High Rise	Heat Central	0.0	0%	7269.04	3531.37
Multifamily - High Rise	Heat Pump	0.0	100%	562.97	248.40
Multifamily - High Rise	Heat Room	0.8	97%	957.93	957.93
Multifamily - High Rise	Home Audio System	0.5	100%	50.64	50.64
Multifamily - High Rise	Lighting Exterior Standard	0.1	100%	8.16	2.83
Multifamily - High Rise	Lighting Interior Linear Fluorescent	1.6	100%	4.93	4.93
Multifamily - High Rise	Lighting Interior Specialty	6.5	100%	7.54	7.54
Multifamily - High Rise	Lighting Interior Standard	9.2	100%	3.40	1.50
Multifamily - High Rise	Microwave	0.7	100%	40.61	40.61
Multifamily - High Rise	Monitor	0.3	100%	30.44	30.44
Multifamily - High Rise	Multifunction Device	0.9	100%	79.06	77.75

TABLE B-1. RESIDENTIAL SATURATION FUEL SHARES AND UECS					
Multifamily - High Rise	Other	1.0	100%	0.00	0.00
Multifamily - High Rise	Plug Load Other	1.0	100%	302.63	302.63
Multifamily - High Rise	Printer	0.3	100%	57.79	57.79
Multifamily - High Rise	Refrigerator	1.0	100%	80.78	79.01
Multifamily - High Rise	Set Top Box	0.3	100%	73.35	73.35
Multifamily - High Rise	Television	0.7	100%	102.79	102.79
Multifamily - High Rise	Television - Big Screen	0.4	100%	219.99	219.99
Multifamily - High Rise	Ventilation and Circulation	0.0	100%	248.40	155.90
Multifamily - High Rise	Waste Water	1.0	100%	82.55	82.55
Multifamily - High Rise	Water Heat GT 55 Gal	0.0	100%	187.83	92.05
Multifamily - High Rise	Water Heat LE 55 Gal	0.3	100%	173.82	169.82
Multifamily - Low Rise	Air Purifier	0.0	100%	233.50	224.46
Multifamily - Low Rise	Computer - Desktop	0.2	100%	65.01	65.01
Multifamily - Low Rise	Computer - Laptop	0.6	100%	18.91	18.91
Multifamily - Low Rise	Cooking Oven	1.0	89%	73.42	73.42
Multifamily - Low Rise	Cooking Range	1.0	89%	49.95	49.95
Multifamily - Low Rise	Cool Central	0.0	100%	50.06	14.63
Multifamily - Low Rise	Cool Room	0.2	100%	13.43	12.97
Multifamily - Low Rise	Copier	0.0	100%	225.54	224.51
Multifamily - Low Rise	Dryer	0.1	100%	173.81	139.32
Multifamily - Low Rise	DVD Player	1.2	100%	10.19	10.19
Multifamily - Low Rise	Electric Vehicles	0.0	100%	1895.44	1895.44
Multifamily - Low Rise	Freezer	0.1	100%	97.62	87.47
Multifamily - Low Rise	Heat Central	0.0	0%	8703.25	4228.13
Multifamily - Low Rise	Heat Pump	0.0	100%	674.05	297.41
Multifamily - Low Rise	Heat Room	0.9	100%	1123.31	1123.31
Multifamily - Low Rise	Home Audio System	0.5	100%	50.04	50.04

TABLE B-1. RESIDENTIAL SATURATION FUEL SHARES AND UECS					
Multifamily - Low Rise	Lighting Exterior Standard	0.0	100%	8.16	2.83
Multifamily - Low Rise	Lighting Interior Linear Fluorescent	1.6	100%	4.93	4.93
Multifamily - Low Rise	Lighting Interior Specialty	3.5	100%	7.54	7.54
Multifamily - Low Rise	Lighting Interior Standard	12.5	100%	3.40	1.50
Multifamily - Low Rise	Microwave	0.7	100%	40.61	40.61
Multifamily - Low Rise	Monitor	0.4	100%	30.44	30.44
Multifamily - Low Rise	Multifunction Device	0.9	100%	79.06	77.75
Multifamily - Low Rise	Other	1.0	100%	0.00	0.00
Multifamily - Low Rise	Plug Load Other	1.0	100%	302.63	302.63
Multifamily - Low Rise	Printer	0.3	100%	57.79	57.79
Multifamily - Low Rise	Refrigerator	1.0	100%	80.06	78.65
Multifamily - Low Rise	Set Top Box	0.8	100%	62.84	62.84
Multifamily - Low Rise	Television	1.0	100%	92.11	92.11
Multifamily - Low Rise	Television - Big Screen	0.4	100%	200.31	200.31
Multifamily - Low Rise	Ventilation and Circulation	0.0	100%	248.40	155.90
Multifamily - Low Rise	Waste Water	1.0	100%	101.80	101.80
Multifamily - Low Rise	Water Heat GT 55 Gal	0.0	0%	231.64	113.52
Multifamily - Low Rise	Water Heat LE 55 Gal	0.6	100%	214.36	209.42
Multifamily - Mid Rise	Air Purifier	0.0	100%	233.50	224.46
Multifamily - Mid Rise	Computer - Desktop	0.4	100%	65.01	65.01
Multifamily - Mid Rise	Computer - Laptop	0.4	100%	18.91	18.91
Multifamily - Mid Rise	Cooking Oven	1.0	93%	73.42	73.42
Multifamily - Mid Rise	Cooking Range	1.0	93%	49.95	49.95
Multifamily - Mid Rise	Cool Central	0.0	100%	41.81	12.22

TABLE B-1. RESIDENTIAL SATURATION FUEL SHARES AND UECS					
Multifamily - Mid Rise	Cool Room	0.2	100%	13.43	12.97
Multifamily - Mid Rise	Copier	0.0	100%	225.54	224.51
Multifamily - Mid Rise	Dryer	0.4	100%	185.31	139.32
Multifamily - Mid Rise	DVD Player	1.2	100%	10.19	10.19
Multifamily - Mid Rise	Electric Vehicles	0.0	100%	1895.44	1895.44
Multifamily - Mid Rise	Freezer	0.0	100%	97.62	87.47
Multifamily - Mid Rise	Heat Central	0.0	0%	7269.04	3531.37
Multifamily - Mid Rise	Heat Pump	0.0	100%	562.97	248.40
Multifamily - Mid Rise	Heat Room	0.8	97%	934.30	934.30
Multifamily - Mid Rise	Home Audio System	0.5	100%	50.64	50.64
Multifamily - Mid Rise	Lighting Exterior Standard	0.1	100%	8.16	2.83
Multifamily - Mid Rise	Lighting Interior Linear Fluorescent	1.6	100%	4.93	4.93
Multifamily - Mid Rise	Lighting Interior Specialty	6.5	100%	7.54	7.54
Multifamily - Mid Rise	Lighting Interior Standard	9.2	100%	3.40	1.50
Multifamily - Mid Rise	Microwave	0.7	100%	40.61	40.61
Multifamily - Mid Rise	Monitor	0.3	100%	30.44	30.44
Multifamily - Mid Rise	Multifunction Device	0.9	100%	79.06	77.75
Multifamily - Mid Rise	Other	1.0	100%	0.00	0.00
Multifamily - Mid Rise	Plug Load Other	1.0	100%	302.63	302.63
Multifamily - Mid Rise	Printer	0.3	100%	57.79	57.79
Multifamily - Mid Rise	Refrigerator	1.0	100%	80.78	79.01
Multifamily - Mid Rise	Set Top Box	0.3	100%	73.35	73.35
Multifamily - Mid Rise	Television	0.7	100%	102.79	102.79
Multifamily - Mid Rise	Television - Big Screen	0.4	100%	219.99	219.99
Multifamily - Mid Rise	Ventilation and Circulation	0.0	100%	248.40	155.90
Multifamily - Mid Rise	Waste Water	1.0	100%	82.55	82.55

TABLE B-1. RESIDENTIAL SATURATION FUEL SHARES AND UECS					
Multifamily - Mid Rise	Water Heat GT 55 Gal	0.0	100%	187.83	92.05
Multifamily - Mid Rise	Water Heat LE 55 Gal	0.3	100%	173.82	169.82
Single Family	Air Purifier	0.0	100%	233.50	224.46
Single Family	Computer - Desktop	0.8	100%	69.69	69.69
Single Family	Computer - Laptop	0.7	100%	19.74	19.74
Single Family	Cooking Oven	1.1	81%	73.90	73.90
Single Family	Cooking Range	1.1	76%	49.95	49.95
Single Family	Cool Central	0.1	100%	105.81	30.92
Single Family	Cool Room	0.1	100%	13.43	12.97
Single Family	Copier	0.0	100%	225.54	224.51
Single Family	Dryer	1.0	86%	185.90	139.32
Single Family	DVD Player	1.6	100%	10.19	10.19
Single Family	Electric Vehicles	0.0	100%	1895.44	1895.44
Single Family	Freezer	0.3	100%	97.62	87.47
Single Family	Heat Central	0.6	2%	9198.06	4468.51
Single Family	Heat Pump	0.0	100%	1214.18	532.97
Single Family	Heat Room	0.3	70%	1431.75	1431.75
Single Family	Home Audio System	0.9	100%	51.70	51.70
Single Family	Lighting Exterior Standard	4.7	100%	8.16	2.83
Single Family	Lighting Interior Linear Fluorescent	4.4	100%	4.93	4.93
Single Family	Lighting Interior Specialty	24.2	100%	7.54	7.54
Single Family	Lighting Interior Standard	24.2	100%	3.40	1.50
Single Family	Microwave	0.8	100%	40.61	40.61
Single Family	Monitor	0.7	100%	31.01	31.01
Single Family	Multifunction Device	1.2	100%	79.06	77.75

TABLE B-1. RESIDENTIAL SATURATION FUEL SHARES AND UECS					
Single Family	Other	1.0	100%	0.00	0.00
Single Family	Plug Load Other	1.0	100%	720.38	720.38
Single Family	Pool Pump	0.0	100%	266.54	266.54
Single Family	Printer	0.7	100%	57.79	57.79
Single Family	Refrigerator	1.4	100%	80.48	78.77
Single Family	Set Top Box	0.9	100%	85.70	85.70
Single Family	Television	1.2	100%	113.53	113.53
Single Family	Television - Big Screen	0.6	100%	238.23	238.23
Single Family	Ventilation and Circulation	0.6	100%	248.40	155.90
Single Family	Waste Water	1.0	100%	153.00	153.00
Single Family	Water Heat GT 55 Gal	0.2	88%	348.14	170.61
Single Family	Water Heat LE 55 Gal	0.8	64%	322.17	314.74

B.2. Commercial Baseline Data

Figure B-3. Commercial Baseline Forecast by Sector

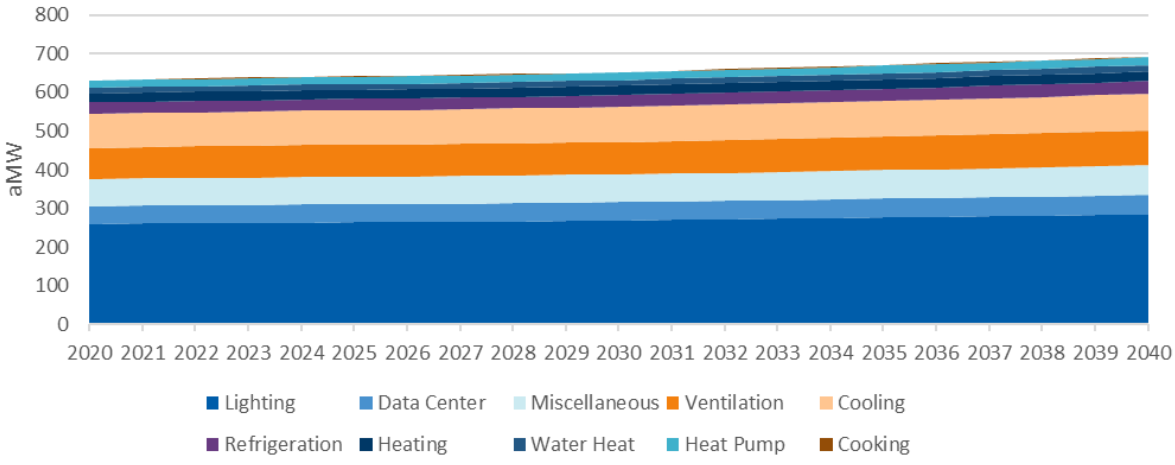


Figure B-4. Commercial Baseline Forecast by End Use

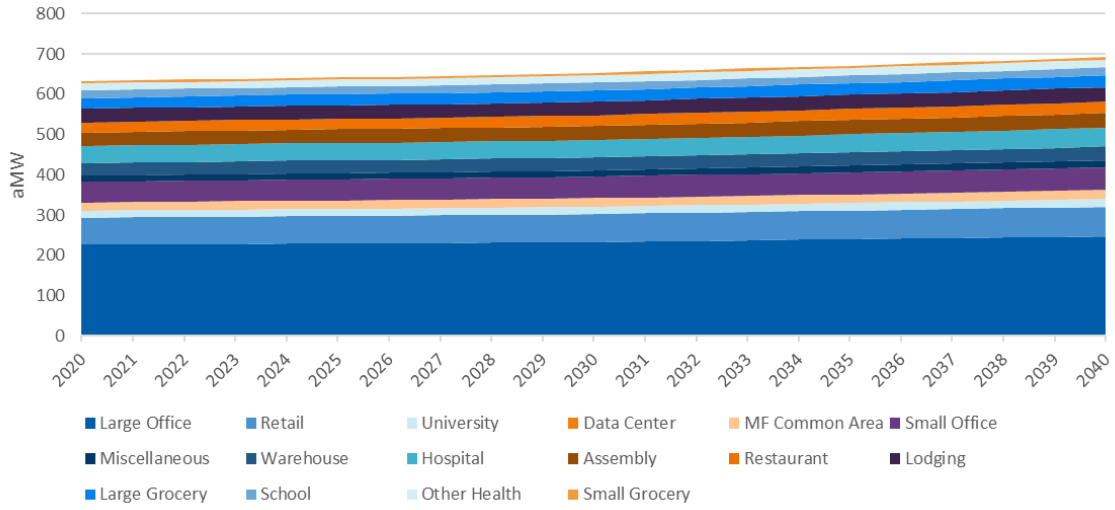


TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Assembly	Compressed Air	3%	100%	0.71	0.71
Assembly	Cooking	0%	0%	0.00	0.00
Assembly	Cool Central	41%	100%	3.32	3.32
Assembly	Data Center	100%	100%	0.44	0.44
Assembly	Exterior Lighting	100%	100%	1.12	1.12
Assembly	Heat Central	75%	13%	2.37	2.37
Assembly	Heat Pump	22%	100%	2.73	2.73
Assembly	Interior Lighting	100%	100%	3.56	3.56
Assembly	Other	100%	100%	0.00	0.00
Assembly	Plug Load Other	100%	100%	1.30	1.30
Assembly	Refrigeration	100%	100%	0.17	0.17
Assembly	Ventilation	97%	100%	1.93	1.93
Assembly	Waste Water	100%	100%	0.12	0.12
Assembly	Water Heat GT 55 Gal	35%	63%	0.35	0.35
Assembly	Water Heat LE 55 Gal	65%	85%	0.32	0.32
Hospital	Compressed Air	0%	100%	0.00	0.00
Hospital	Cooking	100%	13%	0.65	0.65
Hospital	Cool Central	65%	100%	4.56	4.56
Hospital	Data Center	100%	100%	1.75	1.75
Hospital	Exterior Lighting	100%	100%	0.70	0.70
Hospital	Heat Central	76%	34%	1.52	1.52
Hospital	Heat Pump	23%	100%	4.36	4.36
Hospital	Interior Lighting	100%	100%	7.26	7.26
Hospital	Other	100%	100%	0.00	0.00
Hospital	Plug Load Other	100%	100%	5.05	5.05
Hospital	Refrigeration	100%	100%	0.59	0.59

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Hospital	Ventilation	99%	100%	6.46	6.46
Hospital	Waste Water	100%	100%	0.26	0.26
Hospital	Water Heat GT 55 Gal	79%	4%	1.70	1.70
Hospital	Water Heat LE 55 Gal	21%	67%	1.59	1.59
Large Off	Compressed Air	0%	100%	0.00	0.00
Large Off	Cooking	0%	0%	0.00	0.00
Large Off	Cool Central	87%	100%	3.86	3.86
Large Off	Data Center	100%	100%	1.75	1.75
Large Off	Exterior Lighting	100%	100%	0.54	0.54
Large Off	Heat Central	85%	31%	3.39	3.39
Large Off	Heat Pump	14%	100%	3.16	3.16
Large Off	Interior Lighting	100%	100%	4.81	4.81
Large Off	Other	100%	100%	0.00	0.00
Large Off	Plug Load Other	100%	100%	1.47	1.47
Large Off	Refrigeration	100%	100%	0.09	0.09
Large Off	Ventilation	98%	100%	1.62	1.62
Large Off	Waste Water	100%	100%	0.21	0.21
Large Off	Water Heat GT 55 Gal	41%	53%	0.50	0.50
Large Off	Water Heat LE 55 Gal	59%	100%	0.47	0.47
Large Ret	Compressed Air	48%	100%	0.15	0.15
Large Ret	Cooking	0%	0%	0.00	0.00
Large Ret	Cool Central	97%	100%	1.94	1.94
Large Ret	Data Center	100%	100%	0.44	0.44
Large Ret	Exterior Lighting	100%	100%	1.14	1.14
Large Ret	Heat Central	98%	6%	2.07	2.07

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Large Ret	Heat Pump	0%	100%	2.98	2.98
Large Ret	Interior Lighting	100%	100%	7.53	7.53
Large Ret	Other	100%	100%	0.00	0.00
Large Ret	Plug Load Other	100%	100%	0.83	0.83
Large Ret	Refrigeration	100%	100%	0.08	0.08
Large Ret	Ventilation	98%	100%	2.79	2.79
Large Ret	Waste Water	100%	100%	0.13	0.13
Large Ret	Water Heat GT 55 Gal	43%	11%	0.30	0.30
Large Ret	Water Heat LE 55 Gal	57%	50%	0.28	0.28
Lodging	Compressed Air	0%	100%	0.00	0.00
Lodging	Cooking	100%	11%	0.53	0.53
Lodging	Cool Central	50%	100%	2.71	2.71
Lodging	Data Center	100%	100%	0.44	0.44
Lodging	Exterior Lighting	100%	100%	0.54	0.54
Lodging	Heat Central	63%	46%	3.25	3.25
Lodging	Heat Pump	35%	100%	3.08	3.08
Lodging	Interior Lighting	100%	100%	5.65	5.65
Lodging	Other	100%	100%	0.00	0.00
Lodging	Plug Load Other	100%	100%	0.92	0.92
Lodging	Refrigeration	100%	100%	0.22	0.22
Lodging	Ventilation	98%	100%	2.63	2.63
Lodging	Waste Water	100%	100%	0.32	0.32
Lodging	Water Heat GT 55 Gal	87%	12%	1.41	1.41
Lodging	Water Heat LE 55 Gal	13%	100%	1.32	1.32
Medium Off	Compressed Air	0%	100%	0.00	0.00

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Medium Off	Cooking	0%	0%	0.00	0.00
Medium Off	Cool Central	87%	100%	4.08	4.08
Medium Off	Data Center	100%	100%	1.75	1.75
Medium Off	Exterior Lighting	100%	100%	0.57	0.57
Medium Off	Heat Central	85%	31%	3.57	3.57
Medium Off	Heat Pump	14%	100%	3.34	3.34
Medium Off	Interior Lighting	100%	100%	5.07	5.07
Medium Off	Other	100%	100%	0.00	0.00
Medium Off	Plug Load Other	100%	100%	1.55	1.55
Medium Off	Refrigeration	100%	100%	0.10	0.10
Medium Off	Ventilation	98%	100%	1.70	1.70
Medium Off	Waste Water	100%	100%	0.21	0.21
Medium Off	Water Heat GT 55 Gal	41%	53%	0.52	0.52
Medium Off	Water Heat LE 55 Gal	59%	100%	0.49	0.49
Medium Ret	Compressed Air	48%	100%	0.15	0.15
Medium Ret	Cooking	0%	0%	0.00	0.00
Medium Ret	Cool Central	97%	100%	1.67	1.67
Medium Ret	Data Center	100%	100%	0.44	0.44
Medium Ret	Exterior Lighting	100%	100%	0.98	0.98
Medium Ret	Heat Central	98%	6%	1.79	1.79
Medium Ret	Heat Pump	0%	100%	2.57	2.57
Medium Ret	Interior Lighting	100%	100%	6.50	6.50
Medium Ret	Other	100%	100%	0.00	0.00
Medium Ret	Plug Load Other	100%	100%	0.72	0.72
Medium Ret	Refrigeration	100%	100%	0.07	0.07
Medium Ret	Ventilation	98%	100%	2.41	2.41

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Medium Ret	Waste Water	100%	100%	0.13	0.13
Medium Ret	Water Heat GT 55 Gal	43%	11%	0.26	0.26
Medium Ret	Water Heat LE 55 Gal	57%	50%	0.24	0.24
MiniMart	Compressed Air	29%	100%	2.62	2.62
MiniMart	Cooking	100%	9%	1.98	1.98
MiniMart	Cool Central	71%	100%	1.27	1.27
MiniMart	Data Center	100%	100%	0.44	0.44
MiniMart	Exterior Lighting	100%	100%	0.78	0.78
MiniMart	Heat Central	74%	45%	1.59	1.59
MiniMart	Heat Pump	13%	100%	3.39	3.39
MiniMart	Interior Lighting	100%	100%	6.86	6.86
MiniMart	Other	100%	100%	0.00	0.00
MiniMart	Plug Load Other	100%	100%	0.91	0.91
MiniMart	Refrigeration	100%	100%	15.11	15.11
MiniMart	Ventilation	87%	100%	1.59	1.59
MiniMart	Waste Water	100%	100%	0.09	0.09
MiniMart	Water Heat GT 55 Gal	1%	33%	0.23	0.23
MiniMart	Water Heat LE 55 Gal	99%	71%	0.21	0.21
Multi Family Common Area	Compressed Air	100%	100%	0.00	0.00
Multi Family Common Area	Cooking	100%	100%	0.00	0.00
Multi Family Common Area	Cool Central	100%	100%	0.00	0.00
Multi Family Common Area	Data Center	100%	100%	0.00	0.00
Multi Family Common	Exterior Lighting	100%	100%	0.00	0.00

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Area					
Multi Family Common Area	Heat Central	100%	100%	0.00	0.00
Multi Family Common Area	Heat Pump	100%	100%	0.00	0.00
Multi Family Common Area	Interior Lighting	100%	100%	2.75	2.75
Multi Family Common Area	Other	100%	100%	0.00	0.00
Multi Family Common Area	Plug Load Other	100%	100%	0.00	0.00
Multi Family Common Area	Refrigeration	100%	100%	0.00	0.00
Multi Family Common Area	Ventilation	100%	100%	0.00	0.00
Multi Family Common Area	Waste Water	100%	100%	0.00	0.00
Multi Family Common Area	Water Heat GT 55 Gal	100%	100%	0.00	0.00
Multi Family Common Area	Water Heat LE 55 Gal	100%	100%	0.00	0.00
Other	Compressed Air	23%	100%	0.29	0.29
Other	Cooking	0%	0%	0.00	0.00
Other	Cool Central	70%	100%	1.59	1.59
Other	Data Center	100%	100%	0.18	0.18
Other	Exterior Lighting	100%	100%	0.53	0.53
Other	Heat Central	87%	21%	1.13	1.13
Other	Heat Pump	10%	100%	1.30	1.30
Other	Interior Lighting	100%	100%	1.70	1.70
Other	Other	100%	100%	0.00	0.00
Other	Plug Load Other	100%	100%	0.62	0.62
Other	Refrigeration	100%	100%	0.08	0.08

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Other	Ventilation	97%	100%	0.92	0.92
Other	Waste Water	100%	100%	0.11	0.11
Other	Water Heat GT 55 Gal	49%	16%	0.16	0.16
Other	Water Heat LE 55 Gal	51%	72%	0.15	0.15
Residential Care	Compressed Air	0%	100%	0.00	0.00
Residential Care	Cooking	0%	0%	0.00	0.00
Residential Care	Cool Central	65%	100%	2.01	2.01
Residential Care	Data Center	100%	100%	0.44	0.44
Residential Care	Exterior Lighting	100%	100%	0.31	0.31
Residential Care	Heat Central	76%	34%	0.67	0.67
Residential Care	Heat Pump	23%	100%	1.92	1.92
Residential Care	Interior Lighting	100%	100%	3.21	3.21
Residential Care	Other	100%	100%	0.00	0.00
Residential Care	Plug Load Other	100%	100%	2.23	2.23
Residential Care	Refrigeration	100%	100%	0.26	0.26
Residential Care	Ventilation	99%	100%	2.85	2.85
Residential Care	Waste Water	100%	100%	0.26	0.26
Residential Care	Water Heat GT 55 Gal	79%	4%	0.75	0.75
Residential Care	Water Heat LE 55 Gal	21%	67%	0.70	0.70
Restaurant	Compressed Air	0%	100%	0.00	0.00
Restaurant	Cooking	100%	11%	7.08	7.08
Restaurant	Cool Central	73%	100%	3.09	3.09
Restaurant	Data Center	100%	100%	0.44	0.44
Restaurant	Exterior Lighting	100%	100%	1.77	1.77
Restaurant	Heat Central	88%	9%	1.02	1.02

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Restaurant	Heat Pump	7%	100%	3.66	3.66
Restaurant	Interior Lighting	100%	100%	6.44	6.44
Restaurant	Other	100%	100%	0.00	0.00
Restaurant	Plug Load Other	100%	100%	1.21	1.21
Restaurant	Refrigeration	100%	100%	4.01	4.01
Restaurant	Ventilation	96%	100%	2.68	2.68
Restaurant	Waste Water	100%	100%	1.92	1.92
Restaurant	Water Heat GT 55 Gal	53%	26%	6.65	6.65
Restaurant	Water Heat LE 55 Gal	47%	43%	6.24	6.24
School K-12	Compressed Air	0%	100%	0.00	0.00
School K-12	Cooking	100%	14%	0.17	0.17
School K-12	Cool Central	53%	100%	0.54	0.54
School K-12	Data Center	100%	100%	0.88	0.88
School K-12	Exterior Lighting	100%	100%	0.57	0.57
School K-12	Heat Central	85%	3%	4.29	4.29
School K-12	Heat Pump	14%	100%	2.04	2.04
School K-12	Interior Lighting	100%	100%	2.58	2.58
School K-12	Other	100%	100%	0.00	0.00
School K-12	Plug Load Other	100%	100%	0.62	0.62
School K-12	Refrigeration	100%	100%	0.37	0.37
School K-12	Ventilation	100%	100%	1.00	1.00
School K-12	Waste Water	100%	100%	0.25	0.25
School K-12	Water Heat GT 55 Gal	63%	21%	1.14	1.14
School K-12	Water Heat LE 55 Gal	37%	35%	1.07	1.07
Small Off	Compressed Air	0%	100%	0.00	0.00

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Small Off	Cooking	0%	0%	0.00	0.00
Small Off	Cool Central	65%	100%	3.35	3.35
Small Off	Data Center	100%	100%	1.75	1.75
Small Off	Exterior Lighting	100%	100%	0.47	0.47
Small Off	Heat Central	67%	51%	2.93	2.93
Small Off	Heat Pump	29%	100%	2.74	2.74
Small Off	Interior Lighting	100%	100%	4.17	4.17
Small Off	Other	100%	100%	0.00	0.00
Small Off	Plug Load Other	100%	100%	1.27	1.27
Small Off	Refrigeration	100%	100%	0.08	0.08
Small Off	Ventilation	96%	100%	1.40	1.40
Small Off	Waste Water	100%	100%	0.21	0.21
Small Off	Water Heat GT 55 Gal	20%	83%	0.43	0.43
Small Off	Water Heat LE 55 Gal	80%	93%	0.40	0.40
Small Ret	Compressed Air	23%	100%	0.52	0.52
Small Ret	Cooking	0%	0%	0.00	0.00
Small Ret	Cool Central	54%	100%	2.05	2.05
Small Ret	Data Center	100%	100%	0.44	0.44
Small Ret	Exterior Lighting	100%	100%	1.20	1.20
Small Ret	Heat Central	79%	18%	2.19	2.19
Small Ret	Heat Pump	15%	100%	3.15	3.15
Small Ret	Interior Lighting	100%	100%	7.96	7.96
Small Ret	Other	100%	100%	0.00	0.00
Small Ret	Plug Load Other	100%	100%	0.88	0.88
Small Ret	Refrigeration	100%	100%	0.08	0.08
Small Ret	Ventilation	94%	100%	2.95	2.95

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Small Ret	Waste Water	100%	100%	0.06	0.06
Small Ret	Water Heat GT 55 Gal	4%	100%	0.31	0.31
Small Ret	Water Heat LE 55 Gal	96%	73%	0.29	0.29
Supermarket	Compressed Air	7%	100%	0.06	0.06
Supermarket	Cooking	100%	15%	2.55	2.55
Supermarket	Cool Central	81%	100%	1.64	1.64
Supermarket	Data Center	100%	100%	0.44	0.44
Supermarket	Exterior Lighting	100%	100%	1.00	1.00
Supermarket	Heat Central	92%	10%	2.04	2.04
Supermarket	Heat Pump	0%	100%	4.36	4.36
Supermarket	Interior Lighting	100%	100%	8.81	8.81
Supermarket	Other	100%	100%	0.00	0.00
Supermarket	Plug Load Other	100%	100%	1.17	1.17
Supermarket	Refrigeration	100%	100%	19.42	19.42
Supermarket	Ventilation	92%	100%	2.04	2.04
Supermarket	Waste Water	100%	100%	0.06	0.06
Supermarket	Water Heat GT 55 Gal	40%	27%	0.29	0.29
Supermarket	Water Heat LE 55 Gal	60%	54%	0.27	0.27
University	Compressed Air	0%	100%	0.00	0.00
University	Cooking	100%	14%	0.77	0.77
University	Cool Central	53%	100%	1.30	1.30
University	Data Center	100%	100%	0.88	0.88
University	Exterior Lighting	100%	100%	1.39	1.39
University	Heat Central	85%	3%	10.36	10.36
University	Heat Pump	14%	100%	4.92	4.92

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
University	Interior Lighting	100%	100%	6.20	6.20
University	Other	100%	100%	0.00	0.00
University	Plug Load Other	100%	100%	1.50	1.50
University	Refrigeration	100%	100%	0.90	0.90
University	Ventilation	100%	100%	2.42	2.42
University	Waste Water	100%	100%	0.26	0.26
University	Water Heat GT 55 Gal	63%	21%	2.76	2.76
University	Water Heat LE 55 Gal	37%	35%	2.59	2.59
Warehouse	Compressed Air	21%	100%	1.52	1.52
Warehouse	Cooking	0%	0%	0.00	0.00
Warehouse	Cool Central	37%	100%	0.52	0.52
Warehouse	Data Center	100%	100%	0.44	0.44
Warehouse	Exterior Lighting	100%	100%	0.39	0.39
Warehouse	Heat Central	82%	3%	1.56	1.56
Warehouse	Heat Pump	0%	100%	1.00	1.00
Warehouse	Interior Lighting	100%	100%	4.03	4.03
Warehouse	Other	100%	100%	0.00	0.00
Warehouse	Plug Load Other	100%	100%	0.61	0.61
Warehouse	Refrigeration	100%	100%	0.04	0.04
Warehouse	Ventilation	83%	100%	0.80	0.80
Warehouse	Waste Water	100%	100%	0.19	0.19
Warehouse	Water Heat GT 55 Gal	11%	55%	0.27	0.27
Warehouse	Water Heat LE 55 Gal	89%	80%	0.26	0.26
Xlarge Ret	Compressed Air	48%	100%	0.15	0.15
Xlarge Ret	Cooking	0%	0%	0.00	0.00

TABLE B-2. COMMERCIAL SATURATION FUEL SHARES AND UECS					
Segment	**End Use**	**Saturation**	**Fuel Share**	**Weighted Average UEC Existing (kWh/Unit)**	**Weighted Average UEC New (kWh/Unit)**
Xlarge Ret	Cool Central	97%	100%	1.57	1.57
Xlarge Ret	Data Center	100%	100%	0.44	0.44
Xlarge Ret	Exterior Lighting	100%	100%	0.93	0.93
Xlarge Ret	Heat Central	98%	6%	1.68	1.68
Xlarge Ret	Heat Pump	0%	100%	2.42	2.42
Xlarge Ret	Interior Lighting	100%	100%	6.11	6.11
Xlarge Ret	Other	100%	100%	0.00	0.00
Xlarge Ret	Plug Load Other	100%	100%	0.68	0.68
Xlarge Ret	Refrigeration	100%	100%	0.06	0.06
Xlarge Ret	Ventilation	98%	100%	2.26	2.26
Xlarge Ret	Waste Water	100%	100%	0.13	0.13
Xlarge Ret	Water Heat GT 55 Gal	43%	11%	0.24	0.24
Xlarge Ret	Water Heat LE 55 Gal	57%	50%	0.23	0.23

B.3. Industrial Baseline Data

Figure B-5. Industrial Baseline Forecast by Industry

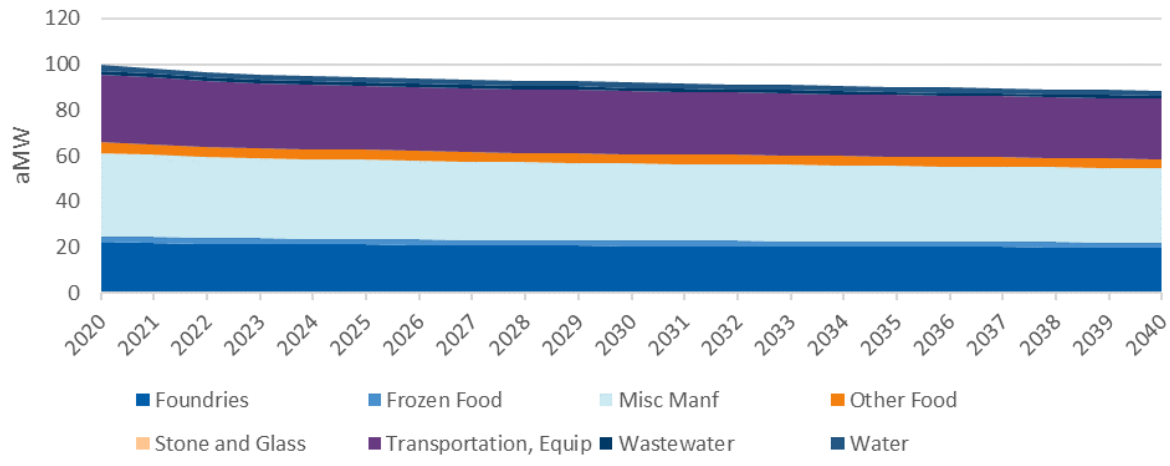
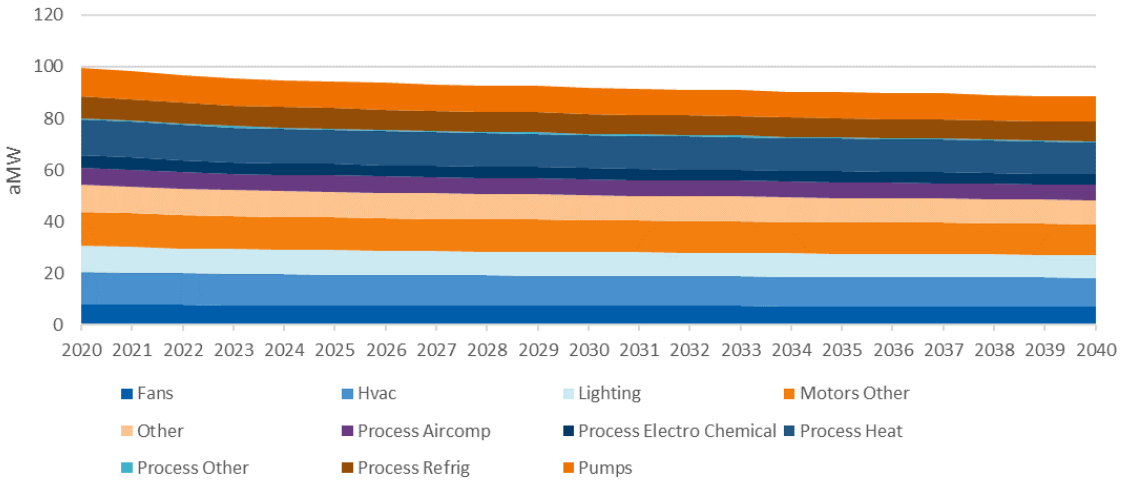


Figure B-6. Industrial Baseline Forecast by End Use



Measure Descriptions

This section presents a brief description of each measure used in the energy efficiency potential.

C.1. Residential Electric Retrofit Measure Descriptions

C.1.1. Heating and Cooling

Controlled Optimization Program. This measure represents a suite of behavioral measures, including the following:

- Water heater setback thermostat
- Lighting hours-of-use reduction
- HVAC usage reduction

Based on the 7th Plan workbook "res-cop-7p_v2".

Measure Name	Measure Efficiency
Controlled Optimization Program—Lighting	Controlled Optimization Program—Lighting
Controlled Optimization Program—HVAC	Controlled Optimization Program—HVAC
Controlled Optimization Program—Water Heat	Controlled Optimization Program—Water Heat

Controls Commissioning and Sizing. The installation of a heat pump with the proper sizing and commissioning of control setpoint temperatures can save energy through enhanced performance. Correctly sized HVAC systems operate for longer periods of time (instead of cycling on and off frequently), resulting in optimum equipment operating efficiencies and better control. Based on the 7th Plan workbook "res-ccs-7p_v4".

Measure Name	Measure Efficiency
SF CC&S + HZ1	Heating Savings
SF CC&S + HZ1	Cooling Savings

Duct Sealing. Duct sealing cost-effectively saves energy, improves air and thermal distribution (comfort and ventilation), and reduces cross contamination between different zones in a building (such as smoking vs. non-smoking, bio-aerosols, and localized indoor air pollutants). Based on the 7th Plan workbook "res-duct_seal-7p_v4".

Measure Name	Measure Efficiency
SF Performance-based Duct Sealing—Heat Pump + HZ1	SF Performance-based Duct Sealing—Heat Pump + HZ1
New SF Performance-based Duct Sealing—Heat Pump + HZ1	New SF Performance-based Duct Sealing—Heat Pump + HZ1

Heat Pump—Single-Family. This measure represents a suite of measures, including the following:

- Converting an electric furnace to a heat pump
- Converting an electric furnace and a central air conditioner to a heat pump
- Replace an existing heat pump with a more efficient, variable-capacity heat pump
- Replace zonal heating and cooling with a ductless heat pump

Based on the 7th Plan workbook "res-sf_hp-7p_v5".

Measure Name	Measure Efficiency
Existing Single-Family Home HVAC Conversion—Convert FAF w/CAC to Heat Pump—House with "Good Insulation" + HZ1	Heating Savings
Existing Single-Family Home HVAC Conversion—Convert FAF w/o CAC to Heat Pump—House with "Good Insulation" + HZ1CZ1	Heating Savings
Existing Single-Family Home HVAC Conversion—Convert FAF w/CAC to Heat Pump—House with "Good Insulation" + HZ1	Cooling Savings
Existing Single-Family Home HVAC Conversion—Convert FAF w/o CAC to Heat Pump—House with "Good Insulation" + HZ1CZ1	Cooling Savings

Heat Recovery Ventilation (HRV). This measure mechanically ventilates homes in cold climates. During the winter, it transfers heat from exhausted air to outside air entering the home, with between 50% and 80% of the heat normally lost in exhausted air returned to the house. Air-to-air heat exchangers can be installed as part of a central heating and cooling system or in walls or windows. Wall- and window-mounted units, resembling air conditioners, ventilate one room or area. Based on the 7th Plan workbook "res-hrv-7p_v1".

Measure Name	Measure Efficiency
SF RNC HRV ACH3 HZ1CZ1	Heating Savings
SF RNC HRV ACH3 HZ1CZ1	Cooling Savings

Weatherization—Multifamily. This measure represents a suite of measures, including the following:

- Attic insulation R-value improvement
- Floor insulation R-value improvement
- Wall insulation R-value improvement
- Window U-value improvement

Based on the 7th Plan workbook "res-mf_wx-7p_v7".

Measure Name	Measure Efficiency
WALL R0—R11_Electric Zonal	WALL R0—R11
FLOOR R0—R19_Electric Zonal	FLOOR R0—R19
FLOOR R0—R30_Electric Zonal	FLOOR R0—R30
ATTIC R0—R19_Electric Zonal	ATTIC R0—R19
ATTIC R0—R38_Electric Zonal	ATTIC R0—R38
ATTIC R0—R49_Electric Zonal	ATTIC R0—R49
ATTIC R19—R30_Electric Zonal	ATTIC R19—R30
ATTIC R19—R38_Electric Zonal	ATTIC R19—R38
ATTIC R19—R49_Electric Zonal	ATTIC R19—R49
WINDOW CL22 Prime Window Replacement of Single-Pane Base_Electric Zonal	WINDOW CL22 Prime Window Replacement of Single-Pane Base
WINDOW CL22 Prime Window Replacement of Double-Pane Base_Electric Zonal	WINDOW CL22 Prime Window Replacement of Double-Pane Base
WINDOW CL30 Prime Window Replacement of Single-Pane Base_Electric Zonal	WINDOW CL30 Prime Window Replacement of Single-Pane Base
WINDOW CL30 Prime Window Replacement of Double-Pane Base_Electric Zonal	WINDOW CL30 Prime Window Replacement of Double-Pane Base
WALL R0—R11_Electric FAF	WALL R0—R11
FLOOR R0—R19_Electric FAF	FLOOR R0—R19
FLOOR R0—R30_Electric FAF	FLOOR R0—R30
ATTIC R0—R19_Electric FAF	ATTIC R0—R19
ATTIC R0—R38_Electric FAF	ATTIC R0—R38
ATTIC R0—R49_Electric FAF	ATTIC R0—R49
ATTIC R19—R30_Electric FAF	ATTIC R19—R30
ATTIC R19—R38_Electric FAF	ATTIC R19—R38
ATTIC R19—R49_Electric FAF	ATTIC R19—R49
WINDOW CL22 Prime Window Replacement of Single-Pane Base_Electric FAF	WINDOW CL22 Prime Window Replacement of Single-Pane Base
WINDOW CL22 Prime Window Replacement of Double-Pane Base_Electric FAF	WINDOW CL22 Prime Window Replacement of Double-Pane Base
WINDOW CL30 Prime Window Replacement of Single-Pane Base_Electric FAF	WINDOW CL30 Prime Window Replacement of Single-Pane Base
WINDOW CL30 Prime Window Replacement of Double-Pane Base_Electric FAF	WINDOW CL30 Prime Window Replacement of Double-Pane Base
WALL R0—R11_Heat Pump	WALL R0—R11
FLOOR R0—R19_Heat Pump	FLOOR R0—R19
FLOOR R0—R30_Heat Pump	FLOOR R0—R30

Measure Name	Measure Efficiency
ATTIC R0—R19_Heat Pump	ATTIC R0—R19
ATTIC R0—R38_Heat Pump	ATTIC R0—R38
ATTIC R0—R49_Heat Pump	ATTIC R0—R49
ATTIC R19—R30_Heat Pump	ATTIC R19—R30
ATTIC R19—R38_Heat Pump	ATTIC R19—R38
ATTIC R19—R49_Heat Pump	ATTIC R19—R49
WINDOW CL22 Prime Window Replacement of Single-Pane Base_Heat Pump	WINDOW CL22 Prime Window Replacement of Single-Pane Base
WINDOW CL22 Prime Window Replacement of Double-Pane Base_Heat Pump	WINDOW CL22 Prime Window Replacement of Double-Pane Base
WINDOW CL30 Prime Window Replacement of Single-Pane Base_Heat Pump	WINDOW CL30 Prime Window Replacement of Single-Pane Base
WINDOW CL30 Prime Window Replacement of Double-Pane Base_Heat Pump	WINDOW CL30 Prime Window Replacement of Double-Pane Base

Weatherization — Single-Family. This measure represents a suite of measures including the following:

- Attic insulation R-value improvement
- Floor insulation R-value improvement
- Wall insulation R-value improvement
- Window U-value improvement
- Infiltration reduction

Based on the 7th Plan workbook "res-sf_wx-7p_v7".

Measure Name	Measure Efficiency
ATTIC R0—R38_Electric FAF	ATTIC R0—R38
ATTIC R0—R49_Electric FAF	ATTIC R0—R49
ATTIC R11—R38_Electric FAF	ATTIC R11—R38
ATTIC R11—R49_Electric FAF	ATTIC R11—R49
ATTIC R19—R38_Electric FAF	ATTIC R19—R38
ATTIC R19—R49_Electric FAF	ATTIC R19—R49
WALL R0—R11_Electric FAF	WALL R0—R11
FLOOR R0—R19_Electric FAF	FLOOR R0—R19
FLOOR R0—R25_Electric FAF	FLOOR R0—R25
FLOOR R0—R30_Electric FAF	FLOOR R0—R30
WINDOW CL30 Prime Window Replacement of Single-Pane Base_Electric FAF	WINDOW CL30 Prime Window Replacement of Single-Pane Base
WINDOW CL30 Prime Window Replacement of Double-Pane Base_Electric FAF	WINDOW CL30 Prime Window Replacement of Double-Pane Base
WINDOW CL22 Prime Window Replacement of Single-Pane Base_Electric FAF	WINDOW CL22 Prime Window Replacement of Single-Pane Base
WINDOW CL22 Prime Window Replacement of Double-Pane Base_Electric FAF	WINDOW CL22 Prime Window Replacement of Double-Pane Base
CFM50 Infiltration Reduction_Electric FAF	CFM50 Infiltration Reduction
ATTIC R0—R38_Electric Zonal	ATTIC R0—R38
ATTIC R0—R49_Electric Zonal	ATTIC R0—R49
ATTIC R11—R38_Electric Zonal	ATTIC R11—R38
ATTIC R11—R49_Electric Zonal	ATTIC R11—R49
ATTIC R19—R38_Electric Zonal	ATTIC R19—R38
ATTIC R19—R49_Electric Zonal	ATTIC R19—R49
WALL R0—R11_Electric Zonal	WALL R0—R11
FLOOR R0—R19_Electric Zonal	FLOOR R0—R19
FLOOR R0—R25_Electric Zonal	FLOOR R0—R25
FLOOR R0—R30_Electric Zonal	FLOOR R0—R30
WINDOW CL30 Prime Window Replacement of Single-Pane Base_Electric Zonal	WINDOW CL30 Prime Window Replacement of Single-Pane Base
WINDOW CL30 Prime Window Replacement of Double-Pane Base_Electric Zonal	WINDOW CL30 Prime Window Replacement of Double-Pane Base
WINDOW CL22 Prime Window Replacement of Single-Pane Base_Electric Zonal	WINDOW CL22 Prime Window Replacement of Single-Pane Base
WINDOW CL22 Prime Window Replacement of Double-Pane Base_Electric Zonal	WINDOW CL22 Prime Window Replacement of Double-Pane Base

Measure Name	Measure Efficiency
CFM50 Infiltration Reduction_Electric Zonal	CFM50 Infiltration Reduction
ATTIC R0—R38_Heat Pump	ATTIC R0—R38_Heat Pump
ATTIC R0—R49_Heat Pump	ATTIC R0—R49_Heat Pump
ATTIC R11—R38_Heat Pump	ATTIC R11—R38_Heat Pump
ATTIC R11—R49_Heat Pump	ATTIC R11—R49_Heat Pump
ATTIC R19—R38_Heat Pump	ATTIC R19—R38_Heat Pump
ATTIC R19—R49_Heat Pump	ATTIC R19—R49_Heat Pump
WALL R0—R11_Heat Pump	WALL R0—R11_Heat Pump
FLOOR R0—R19_Heat Pump	FLOOR R0—R19_Heat Pump
FLOOR R0—R25_Heat Pump	FLOOR R0—R25_Heat Pump
FLOOR R0—R30_Heat Pump	FLOOR R0—R30_Heat Pump
WINDOW CL30 Prime Window Replacement of Single-Pane Base_Heat Pump	WINDOW CL30 Prime Window Replacement of Single-Pane Base_Heat Pump
WINDOW CL30 Prime Window Replacement of Double-Pane Base_Heat Pump	WINDOW CL30 Prime Window Replacement of Double-Pane Base_Heat Pump
WINDOW CL22 Prime Window Replacement of Single-Pane Base_Heat Pump	WINDOW CL22 Prime Window Replacement of Single-Pane Base_Heat Pump
WINDOW CL22 Prime Window Replacement of Double-Pane Base_Heat Pump	WINDOW CL22 Prime Window Replacement of Double-Pane Base_Heat Pump
CFM50 Infiltration Reduction_Heat Pump	CFM50 Infiltration Reduction_Heat Pump
ATTIC R0—R38_DHP	ATTIC R0—R38
ATTIC R0—R49_DHP	ATTIC R0—R49
ATTIC R11—R38_DHP	ATTIC R11—R38
ATTIC R11—R49_DHP	ATTIC R11—R49
ATTIC R19—R38_DHP	ATTIC R19—R38
ATTIC R19—R49_DHP	ATTIC R19—R49
WALL R0—R11_DHP	WALL R0—R11
FLOOR R0—R19_DHP	FLOOR R0—R19
FLOOR R0—R25_DHP	FLOOR R0—R25
FLOOR R0—R30_DHP	FLOOR R0—R30
WINDOW CL30 Prime Window Replacement of Single-Pane Base_DHP	WINDOW CL30 Prime Window Replacement of Single-Pane Base
WINDOW CL30 Prime Window Replacement of Double-Pane Base_DHP	WINDOW CL30 Prime Window Replacement of Double-Pane Base
WINDOW CL22 Prime Window Replacement of Single-Pane Base_DHP	WINDOW CL22 Prime Window Replacement of Single-Pane Base

Measure Name	Measure Efficiency
WINDOW CL22 Prime Window Replacement of Double-Pane Base_DHP	WINDOW CL22 Prime Window Replacement of Double-Pane Base
CFM50 Infiltration Reduction_DHP	CFM50 Infiltration Reduction

Wi-Fi Thermostat. Thermostats connected to the Internet can be controlled from any location with an Internet connection and follow occupants' schedules for heating and cooling, decreasing run times for heating and cooling. Based on the 7th Plan workbook "res-wifitstat-7p_v3".

Measure Name	Measure Efficiency
Single-Family WIFI Enabled Thermostat HZ1	WIFI HZ1

C.1.2. Water Heat

Clothes Washer. High-efficiency clothes washer that meet CEE efficiency level tiers[1] use less energy and water than regular washers. Cadmus compared three efficiency levels in units of the corresponding Integrated Modified Energy Factor (IMEF) —for this measure. The baseline IMEF represents the average IMEF of non-ENERGY STAR and ENERGY STAR-qualified models below the CEE efficiency tiers. Based on the 7th Plan workbook "res-clotheswasher-7p_v4".

[1] http://library.cee1.org/sites/default/files/library/12282/CEE_ResidentialClothesWasherSpec_07Mar2015.pdf

Measure Name	Measure Efficiency
Single-Family CEE Tier 1 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Washer Savings
Single-Family CEE Tier 2 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Washer Savings
Single-Family CEE Tier 3 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Washer Savings
Single-Family CEE Tier 1 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Dryer Savings
Single-Family CEE Tier 2 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Dryer Savings
Single-Family CEE Tier 3 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Dryer Savings
Single-Family CEE Tier 1 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Waste Water Energy
Single-Family CEE Tier 2 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Waste Water Energy
Single-Family CEE Tier 3 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Waste Water Energy
Multifamily—Low-Rise CEE Tier 1 Clothes Washer—Any DHW, Any Dryer—4% ENERGY STAR Baseline	Washer Savings
Multifamily—Low-Rise CEE Tier 2 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Washer Savings
Multifamily—Low-Rise CEE Tier 3 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Washer Savings
Multifamily—Low-Rise CEE Tier 1 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Dryer Savings
Multifamily—Low-Rise CEE Tier 2 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Dryer Savings
Multifamily—Low-Rise CEE Tier 3 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Dryer Savings
Multifamily—Low-Rise CEE Tier 1 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Waste Water Energy
Multifamily—Low-Rise CEE Tier 2 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Waste Water Energy
Multifamily—Low-Rise CEE Tier 3 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Waste Water Energy
Multifamily—High-Rise CEE Tier 1 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Washer Savings
Multifamily—High-Rise CEE Tier 2 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Washer Savings

Measure Name	Measure Efficiency
Multifamily—High-Rise CEE Tier 3 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Washer Savings
Multifamily—High-Rise CEE Tier 1 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Dryer Savings
Multifamily—High-Rise CEE Tier 2 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Dryer Savings
Multifamily—High-Rise CEE Tier 3 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Dryer Savings
Multifamily—High-Rise CEE Tier 1 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Waste Water Energy
Multifamily—High-Rise CEE Tier 2 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Waste Water Energy
Multifamily—High-Rise CEE Tier 3 Clothes Washer—Any DHW, Any Dryer—54% ENERGY STAR Baseline	Waste Water Energy

Dishwasher. This dishwasher uses advanced technology to clean dishes using less water and energy. The efficient model uses less than 295 kWh/year (including standby consumption). The baseline model consumes 307 kWh/year. Based on the 7th Plan workbook "res-dishwasher-7p_v4".

Measure Name	Measure Efficiency
Single-Family ENERGY STAR Dishwasher—Any DHW	All Except Waste Water Energy
Single-Family ENERGY STAR Dishwasher—Any DHW	Waste Water Energy
Multifamily—Low-Rise ENERGY STAR Dishwasher—Any DHW	All Except Waste Water Energy
Multifamily—Low-Rise ENERGY STAR Dishwasher—Any DHW	Waste Water Energy
Multifamily—High-Rise ENERGY STAR Dishwasher—Any DHW	All Except Waste Water Energy
Multifamily—High-Rise ENERGY STAR Dishwasher—Any DHW	Waste Water Energy

Drain Water Heat Recovery. Also called gravity film heat exchanges, this device recovers heat energy from domestic drain water, and then uses this to pre-heat cold water entering the hot water tank. This minimizes the temperature difference between the heating setpoint and the temperature of water entering the system. Based on the 7th Plan workbook "res-gfx-7p_v3".

Measure Name	Measure Efficiency
Single-Family GFHX DHW & Shower Preheat, Electric Resistance	GFHX DHW & Shower Preheat, Electric Resistance
Single-Family GFHX DHW & Shower Preheat, Heat Pump	GFHX DHW & Shower Preheat, Heat Pump
Single-Family GFHX DHW Preheat, Electric Resistance	GFHX DHW Preheat, Electric Resistance
Single-Family GFHX DHW Preheat, Heat Pump	GFHX DHW Preheat, Heat Pump

Measure Name	Measure Efficiency
Multifamily GFHX DHW & Shower Preheat, Electric Resistance	GFHX DHW & Shower Preheat, Electric Resistance
Multifamily GFHX DHW & Shower Preheat, Heat Pump	GFHX DHW & Shower Preheat, Heat Pump
Multifamily GFHX DHW Preheat, Electric Resistance	GFHX DHW Preheat, Electric Resistance
Multifamily GFHX DHW Preheat, Heat Pump	GFHX DHW Preheat, Heat Pump

Faucet Aerators, Bathroom. By mixing water and air, faucet aerators reduce water amounts flowing through faucets. The faucet aerator creates a fine water spray, using a screen inserted in the faucet head. Based on the 7th Plan workbook "res-aerator-7p_v5".

Measure Name	Measure Efficiency
Single-Family Bathroom Aerator 1.0 GPM AnyWH	Aerator 2.48 to 1.0 GPM
Single-Family Bathroom Aerator 1.0 GPM AnyWH	Aerator 2.48 to 1.0 GPM
Multifamily—Low-Rise Bathroom Aerator 1.0 GPM AnyWH	Aerator 2.48 to 1.0 GPM
Multifamily—High-Rise Bathroom Aerator 1.0 GPM AnyWH	Aerator 2.48 to 1.0 GPM
Single-Family Bathroom Aerator 1.0 GPM HPWH	Aerator 2.48 to 1.0 GPM

Low-Flow Showerheads. Low-flow showerheads mix water and air to reduce the amount of water flowing through a showerhead. The showerhead creates a fine water spray through an screen inserted in the showerhead. Based on the 7th Plan workbook "res-showerhead-7p_v5".

Measure Name	Measure Efficiency
SF Showerhead Replace_2_00gpm_Any Shower_ AnyWH	SF Showerhead Replace_2_00gpm_Any Shower_ AnyWH
SF Showerhead Replace_1_75gpm_Any Shower_ AnyWH	SF Showerhead Replace_1_75gpm_Any Shower_ AnyWH
SF Showerhead Replace_1_50gpm_Any Shower_ AnyWH	SF Showerhead Replace_1_50gpm_Any Shower_ AnyWH
SF Showerhead Replace_1_50GPM_any shower_HPWH	SF Showerhead Replace_1_50GPM_any shower_HPWH
MF Showerhead Replace_2_00gpm_Any Shower_ AnyWH	MF Showerhead Replace_2_00gpm_Any Shower_ AnyWH
MF Showerhead Replace_1_75gpm_Any Shower_ AnyWH	MF Showerhead Replace_1_75gpm_Any Shower_ AnyWH
MF Showerhead Replace_1_50gpm_Any Shower_ AnyWH	MF Showerhead Replace_1_50gpm_Any Shower_ AnyWH

C.1.3. Appliances

Fridge and Freezer Decommissioning. This refers to environmentally friendly disposal of unneeded or inefficient appliances (e.g., refrigerators, standalone freezers). Based on the RTF workbook "ResFridgeFreezeDecommissioning_v4_4".

Measure Name	Measure Efficiency
Refrigerator Decommissioning and Recycling	Refrigerator Decommissioning and Recycling
Freezer Decommissioning and Recycling	Freezer Decommissioning and Recycling

C.1.4. Plug Load

Advanced Power Strip. Advanced power strips turn off power to all devices plugged into the strip (e.g., computers, desk lights, entertainment equipment), based on occupancy within the area, reduced load below a certain wattage threshold, or lack of infrared activity within a set timeframe. Based on the 7th Plan workbook "res-powerstrips-7p_v6".

Measure Name	Measure Efficiency
Load-sensing advanced power strip	Load-sensing advanced power strip
Occupancy-sensing advanced power strip	Occupancy-sensing advanced power strip
Infrared-sensing advanced power strip	Infrared-sensing advanced power strip

C.1.5. Other (Pool)

Advanced Power Strip. Advanced power strips turn off power to all devices plugged into the strip (e.g., computers, desk lights, entertainment equipment), based on occupancy within the area, reduced load below a certain wattage threshold, or lack of infrared activity within a set timeframe. Based on the 7th Plan workbook "res-powerstrips-7p_v6".

Measure Name	Measure Efficiency
Load-sensing advanced power strip	Load-sensing advanced power strip
Occupancy-sensing advanced power strip	Occupancy-sensing advanced power strip
Infrared-sensing advanced power strip	Infrared-sensing advanced power strip

C.2. Residential Electric Equipment Measure Descriptions

C.2.1. Heating and Cooling

Air or Ground Source Heat Pump (ASHP or GSHP). Electric heat pumps move heat to or from the air or the ground to cool and heat a home. Based on the 7th Plan workbooks "res-sf_hp-7p_v5" and "res-gshp-7p_v2".

Measure Name	Measure Efficiency	Baseline Efficiency
Existing Single-Family Home HVAC Upgrade + HZ1	Existing Single-Family Home HVAC Upgrade + HZ1	Market Average Heat Pump
New SF HVAC Upgrade—Heat Pump Upgrade to 9.0 HSPF/14 SEER	New SF HVAC Upgrade — Heat Pump Upgrade to 9.0 HSPF/14 SEER	Market Average Heat Pump
Existing Single-Family Home HVAC Upgrade—Central Heat Pump Upgrade to Variable Capacity Central Heat Pump + HZ1CZ1	Existing Single-Family Home HVAC Upgrade—Central Heat Pump Upgrade to Variable Capacity Central Heat Pump + HZ1CZ1	Market Average Heat Pump
New SF HVAC Upgrade—Central Heat Pump Upgrade to Variable Capacity Central Heat Pump	New SF HVAC Upgrade—Central Heat Pump Upgrade to Variable Capacity Central Heat Pump	Market Average Heat Pump
GSHP Upgrade from ASHP—With Desuperheater—Existing House less than 4,000 square feet	GSHP Upgrade from ASHP—With Desuperheater—Existing House less than 4,000 square feet	Market Average Heat Pump
GSHP Upgrade from ASHP—With Desuperheater—New House less than 4,000 square feet	GSHP Upgrade from ASHP—With Desuperheater—New House less than 4,000 square feet	Market Average Heat Pump

Central Air Conditioner. This measure consists of two different air conditioner technology/efficiency levels. The baseline size is the same as the measure size.

Measure Name	Measure Efficiency	Baseline Efficiency
Central Air Conditioner—ENERGY STAR	ENERGY STAR Central Air Conditioner SEER/EER 14.5/12 (Split System)	Market Average Central Air Conditioner SEER/EER 13/11.2 (Split System)
Central Air Conditioner—CEE Tier 3	CEE Tier 3 Central Air Conditioner SEER/EER 16/13 (Split System)	Market Average Central Air Conditioner SEER/EER 13/11.2 (Split System)

Conversion Baseboard Heating to Ductless Heat Pump (DHP). DHPs move heat to or from the air to cool and heat a home without the need for costly ductwork. This method of heating has a HSPF value of 9.5, consuming less energy than baseboard heating that has a HSPF value of 3.412. Based on the 7th Plan workbook "res-sf_hp-7p_v5".

Measure Name	Measure Efficiency	Baseline Efficiency
Zonal to DHP No Screen + HZ1CZ1	Heating Savings	Market Average Zonal Heating
New SF Zonal to DHP	Heating Savings	Market Average Zonal Heating

Conversion Forced Air Furnace to DHP. DHPs move heat to or from the air to cool and heat a home without the need for costly ductwork. This heating method has a HSPF value of 9.5, consuming less energy than a forced air furnace with a HSPF value of 3.412. Based on the 7th Plan workbook "res-faf_to_dhp-7p_v2".

Measure Name	Measure Efficiency	Baseline Efficiency
Install DHP in House with Existing FAF—Single-Family Home + HZ1	Install DHP in House with Existing FAF—Single-Family Home—HZ1	Standard Electric Furnace HSPF = 3.412

Room AC Conversion to DHP. DHPs use less energy than room ACs while producing less noise and requiring no costly ductwork. Based on the 7th Plan workbook "res-sf_hp-7p_v5".

Measure Name	Measure Efficiency	Baseline Efficiency
New SF Zonal to DHP	Cooling Savings	Room AC—Market Average (8,000–13,999 Btuh)

Motor—ECM. Electronically commutated motors (ECMs) consume less power than standard motors used in ventilation and circulation systems.

Measure Name	Measure Efficiency	Baseline Efficiency
Motor—ECM	ECM Motor	Standard Motor

C.2.2. Lighting

Lighting Exterior. This measure represents improvements to exterior lighting technologies by replacing existing lamps with more efficient lighting technologies: CFLs and LEDs. Based on the 7th Plan workbooks "res-lighting-7p_v5" and "res-lighting_ppa-7p_v5".

Measure Name	Measure Efficiency	Baseline Efficiency
Incandescent—2020 EISA* Backstop Provisions	Incandescent—2020 EISA Backstop Provisions	Market Average Lighting Exterior Standard
CFL	CFL	Market Average Lighting Exterior Standard
LED—Exterior	LED—Exterior	CFL

**Energy Independence and Security Act*

- **CFLs—Exterior.** Standard CFLs use 5% less energy than typical exterior (market average) bulbs.
- **General Service Lamp—2020 EISA Backstop Provisions.** EISA contains a backstop provision that requires a minimum efficacy of 45 lumens-per-watt lighting technologies, beginning in 2020.
- **LEDs—Exterior.** Standard LEDs use 21% less energy than CFL bulbs.

Lighting Interior Linear Fluorescent. Represents improvements to interior lighting with linear fluorescent technologies that replace existing T12 f-foot and 8-foot fixtures with the more efficient, high-performance T8 (T8HP) 4-foot fixtures. Based on the RTF workbook "ResLightingHPT8Lamps_v1_3".

Measure Name	Measure Efficiency	Baseline Efficiency
Linear Fluorescent—T8HP	T8HP Linear Fluorescent	Market Average Linear Fluorescent

Lighting Interior Specialty. Represents improvements to interior lighting technologies not impacted by EISA by replacing existing lamps with more efficient lighting technologies: CFLs and LEDs. Based on the 7th Plan workbook "res-lighting-7p_v5".

Measure Name	Measure Efficiency	Baseline Efficiency
CFL—Specialty	CFL—Specialty	Incandescent—Specialty
LED—Specialty	LED—Specialty	Incandescent—Specialty

- **CFLs—Specialty.** Specialty (or EISA exempt) bulbs include three-way, candelabra, some globes, and some reflectors. CFLs use up to 77% less energy and have a longer life than incandescent specialty light bulb.

- **LEDs—Specialty.** Specialty LEDs are solid-state devices that convert electricity to light, use 84% less energy, and have a long life.

Lighting Interior Standard. Represents improvements to interior lighting technologies impacted by EISA by replacing existing lamps with more efficient lighting technologies: CFLs and LEDs. Based on the 7th Plan workbooks "res-lighting-7p_v5" and "res-lighting_ppa-7p_v5".

Measure Name	Measure Efficiency	Baseline Efficiency
EISA 2020 Backstop	EISA 2020 Backstop Interior General-Purpose Bulb	Market Average Lighting Interior Standard
CFL	CFL	Market Average Lighting Interior Standard
LED Interior General Purpose Bulb	LED Interior General-Purpose Bulb	CFL

- **CFLs—Standard.** Standard CFLs use 14% less energy than the typical interior (market average) bulbs.
- **General Service Lamp—2020 EISA Backstop Provisions.** EISA contains a backstop provision requiring a minimum efficacy of 45 lumens per watt lighting technologies, beginning in 2020.
- **LEDs—Standard.** Standard LEDs use 25% less energy than the CFL bulbs.

C.2.3. Water Heat

Water Heater, Heat Pump and Solar. This measure represents two end uses: Water Heat LE 55 Gal (less than 55 gallons) and Water Heat GT 55 Gal (greater than 55 gallons). A high-efficiency heat pump water heater measure moves heat from a warm reservoir (such as air) into the hot water system, reducing the heat amount needed from electric resistance heating. Solar Water Heaters use thermal energy to heat water without use of electricity, gas, or heating oil. Based on the 7th Plan workbooks "res-hpwh-7p_v3p" and "res-swh-7p_v1p".

End Use	Measure Efficiency	Baseline Efficiency
Water Heat LE 55 Gal	Single-Family Tier1_buffered	Market Standard Storage Water Heater
Water Heat LE 55 Gal	Single-Family Tier1_indor2	Market Standard Storage Water Heater
Water Heat LE 55 Gal	Single-Family Tier2_buffered	Market Standard Storage Water Heater
Water Heat LE 55 Gal	Single-Family Tier2_indor2	Market Standard Storage Water Heater
Water Heat LE 55 Gal	SHW Solar Zone 1	Market Standard Storage Water Heater
Water Heat GT 55 Gal	SHW Solar Zone 1	Market Standard Water Heater

C.2.4. Appliances

Cooking Oven, High Efficiency. A high-efficiency cooking oven uses fans to circulate heat evenly throughout the oven (convection heat), operating at lower temperatures and achieving cooking times

quicker than a standard oven. The baseline is a standard oven. Based on the 7th Plan workbook "res-oven-7p_v3".

Measure Name	Measure Efficiency	Baseline Efficiency
Efficient Oven	Efficient Oven	Federal Standard 2012 Cooking Oven

Dryer, High Efficiency. A high-efficiency dryer incorporates features (such as moisture sensors) that minimize energy usage while retaining performance. A heat pump dryer moves heat from a warm reservoir (such as air) into the dryer, reducing the amount of heat needed from electric resistance heating. Based on the 7th Plan workbook "res-clothesdryer-7p_v2".

Measure Name	Measure Efficiency	Baseline Efficiency
Heat Pump Dryer	Heat Pump Dryer	Market Average Dryer

Freezer, ENERGY STAR. ENERGY STAR-qualified freezers use less energy than standard models due to improvements in insulation and compressors. Based on the 7th Plan workbook "res-refrigfreezer-7p_v3p".

Measure Name	Measure Efficiency	Baseline Efficiency
Std Size Freezer—ENERGY STAR	Std Size Freezer—ENERGY STAR	Market Average Freezer

Microwave, High-Efficiency. High-efficiency microwaves use more efficient power supplies, fans, magnetron, and reflective surfaces that provide energy savings compared to conventional microwaves. Based on the 7th Plan workbook "res-microwave-7p_v3".

Measure Name	Measure Efficiency	Baseline Efficiency
Microwave Top Tier	TSL4 Efficiency	Market Average Microwave

Refrigerator, ***High-Efficiency.*** CEE-qualified refrigerators use less energy than standard models due to improvements in insulation and compressors. Based on the 7th Plan workbook "res-refrigfreezer-7p_v4".

Measure Name	Measure Efficiency	Baseline Efficiency
Std Size Refrig and Refrig-Freezer—CEE Tier 1	Std Size Refrig and Refrig-Freezer—CEE Tier 1	Market Average Refrigerator
Std Size Refrig and Refrig-Freezer—CEE Tier 2	Std Size Refrig and Refrig-Freezer—CEE Tier 2	Market Average Refrigerator
Std Size Refrig and Refrig-Freezer—CEE Tier 3	Std Size Refrig and Refrig-Freezer—CEE Tier 3	Market Average Refrigerator

C.2.5. Plug Load

Air Purifier, ENERGY STAR. **ENERGY STAR certified room air purifiers** are 40% more energy-efficient than standard models.[2]

Measure Name	Measure Efficiency	Baseline Efficiency
Air Purifier—ENERGY STAR	ENERGY STAR Air Purifier	Standard Air Purifier

Computer, ENERGY STAR. ENERGY STAR computers consume less than 2 watts in sleep- and off- modes, and operate more efficiently than conventional units in idle mode, resulting in 40% energy savings. Based on the 7th Plan workbook "res-computers-7p_v4".

Measure Name	Measure Efficiency	Baseline Efficiency
ENERGY STAR Desktops	ENERGY STAR Desktop	Standard Desktop Computer
ENERGY STAR Laptops	ENERGY STAR Notebook	Standard Laptop Computer

DVD, ENERGY STAR. ENERGY STAR-qualified DVD products that meet new requirements use up to 50% less energy than standard models.[3] ENERGY STAR DVD players use as little as one-fourth of the energy of standard models in the off mode. The baseline for this measure is a standard DVD player.

Measure Name	Measure Efficiency	Baseline Efficiency
DVD—ENERGY STAR	ENERGY STAR DVD Player	Standard DVD Player

Home Audio System, ENERGY STAR. ENERGY STAR home audio systems can achieve 20% energy savings over standard home audio systems.

Measure Name	Measure Efficiency	Baseline Efficiency
Home Audio System—ENERGY STAR	ENERGY STAR Home Audio System	Standard Home Audio System

2 https://www.energystar.gov/products/certified-products/detail/air-purifiers-cleaners

3 https://www.energystar.gov/products/certified-products/detail/audiovideo

Monitor, ENERGY STAR. ENERGY STAR monitors feature: (1) on mode, where the maximum allowed power varies based on the computer monitor's resolution; (2) sleep mode, where computer monitors must consume 2 watts or less; and (3) off mode, where computer monitors must consume 1 watt or less. The baseline equipment does not include these features.[4] Based on the 7th Plan workbook "res-computers-7p_v4".

Measure Name	Measure Efficiency	Baseline Efficiency
ENERGY STAR Monitors	ENERGY STAR LCD Display	Standard Monitor

Multifunction Device (All-in-One). ENERGY STAR models meeting the most recent ENERGY STAR requirements are more energy efficient and feature efficient designs that help the equipment run cooler and last longer.

Measure Name	Measure Efficiency	Baseline Efficiency
Multifunction Device (All-in-one)—ENERGY STAR	ENERGY STAR Multifunction Device (All-in-one)	Standard Multifunction Device (All-in-one)

Office Copier, ENERGY STAR. ENERGY STAR copy machines operate more efficiently and use less energy than standard office copy machines.

Measure Name	Measure Efficiency	Baseline Efficiency
Office Copier—ENERGY STAR	ENERGY STAR Office Copier	Standard Office Copier

Office Printer, ENERGY STAR. Printers earning the ENERGY STAR rating operate at least 30% more efficiently than conventional models.[5] The baseline measure is a standard printer.

Measure Name	Measure Efficiency	Baseline Efficiency
Office Printer—ENERGY STAR	ENERGY STAR Office Printer	Standard Office Printer

Set Top Box, ENERGY STAR. Set top boxes earning the ENERGY STAR rating operate at least 35% more efficiently than conventional models.[6] The baseline measure is a standard set top box.

Measure Name	Measure Efficiency	Baseline Efficiency
Set Top Box—ENERGY STAR	ENERGY STAR Set Top Box	Standard Set Top Box

4 https://www.energystar.gov/products/certified-products/detail/displays
5 https://www.energystar.gov/products/certified-products/detail/imaging-equipment
6 https://www.energystar.gov/products/certified-products/detail/set-top-boxes-cable-boxes

TV, ENERGY STAR. ENERGY STAR-qualified TVs use roughly 25% less energy than standard units.[7] ENERGY STAR models are required to consume no more than 1 watt while in sleep mode. The baseline is a standard television, which generally consumes more than 3 watts when turned off.

Measure Name	Measure Efficiency	Baseline Efficiency
TV LCD—ENERGY STAR	ENERGY STAR LED-LCD TV (0-40in.)	Standard LCD TV (0-40in.)
TV LCD—ENERGY STAR	ENERGY STAR LED-LCD TV (40+in.)	Standard LCD TV (40+in.)

C.2.6. Other (Pool)

Pool Pumps, VSD. This measure enables a pool pump motor to operate at variable speeds as opposed to running constantly at full power. This measure's baseline is a standard two-speed motor

Measure Name	Measure Efficiency	Baseline Efficiency
Pool Pump—VSD	VSD Pool Pump	Two-Speed Pool Pump

C.3. Commercial Electric Measure Description

C.3.1. HVAC (and Envelope)

Advanced Rooftop Controller. Advanced controllers for rooftop units with single-zone, ducted systems. Retrofitting existing packaged rooftop units with advanced control strategies not ordinarily used for packaged units. Savings come primarily from fan energy savings through using advanced controls with a variable-speed drive. Applied only to systems with constant speed fans. Based on the 7th Plan workbook "com-rooftopcontroller-7p_v6".

Commercial Energy Management. Energy management measures for commercial buildings, excluding single-zone ducted systems. A suite of measures, most of which focus on making HVAC systems work better through control changes. Based on the 7th Plan workbook "com-em-7p_v5".

DCV Hood and DCV Hood w/ MUA. Utilizing sensors and two-speed or variable speed fans, hood controls reduce exhaust (and makeup) airflow when appliances do not run at capacity (or have been turned off). The baseline for this measure is a unit without hood controls. Based on the 7th Plan workbook "com-dcv-kitchenvent-7p_v3".

DCV Parking Garage. Where the ventilation system automatically adjusts air flow when CO_2 rises above a specified level. CO_2 controls maintain a minimum ventilation rate at all times to control non-occupant contaminants (e.g., off-gassing from furniture, equipment, building components). This measure's baseline is an existing ventilation system that runs constantly. Based on the 7th Plan workbook "com-dcv-garage-7p_v3".

[7] https://www.energystar.gov/products/certified-products/detail/televisions

Demand Controlled Ventilation (DCV). Evaluates retrofit DCV and Dedicated Outdoor Air Supply (DOAS). Both DVC and the DOAS measures reduce the amount of ventilation air required to be conditioned and the amount of distribution fan energy used to move cooling or heating to occupants. The single-zone DOAS measures uses a fleet strategy, which involves designating some HVAC fleet units as ventilation units, while letting other units cycle on call for heating, cooling, or additional, required ventilation. The designated units can be standalone HRV units or rooftop units with added HRV/ERVs, where only a small fraction of units operate, or standard rooftops with one-half of units operating to provide ventilation. Based on the 7th Plan workbook "com-dcv-7p_v5".

Ductless Heat Pumps (DHP). DHPs move heat to or from the air, cooling and heating buildings without costly ductwork. This measure provides savings compared to electric resistance heating. Based on the 7th Plan workbook "com-dhp-7p_v2".

ECM VAV. High-efficiency, electronically commutated, permanent magnet (ECM or ECPM) motors with built-in variable speed controls for VAV fans. Based on the 7th Plan workbook "com-ecm-vav-7p_v4".

Economizer. An air-side economizer mixes return air with outside air to cool indoor spaces, saving energy as less air must be cooled. This measure reflects optimizing economizers, coil cleaning, and adjusting refrigerant charges. Based on the 7th Plan workbook "com-economizer-7p_v2".

Motors Rewind. This measure follows the Green Motors Practices Group™ recommendations for best practices in maintaining original efficiencies, commonly called a Green Rewind.[8] A failed motor can be rewound to a lower efficiency, rewound to maintain the original efficiency, or replaced. Based on the 7th Plan workbook "com-motorsrewind-7p_v3".

VRF. A variable refrigerant flow (VRF) system is an energy-efficient heating and cooling system using inverter-driven compressor technology without ducting. Baseline technology is assumed to be a typical VAV rooftop HVAC system. Based on the 7th Plan workbook "com-vrf-7p_v6".

WEPT. Web-enabled programmable thermostats (WEPT) control setpoint temperatures automatically, ensuring HVAC system do not run during low-occupancy hours. Based on the 7th Plan workbook "com-wept-7p_v2".

Windows—Secondary Glazing Systems. A permanent window unit is installed on the inside of an existing primary window. Based on the 7th Plan workbook "com-windowsgs-7p_v5".

C.3.2. Lighting

Bi-Level Stairway Lighting. This measure allows an occupancy sensor to reduce light loads in an unoccupied stairwell by 50% for a set period of time. The baseline is continuous operation at full power. Based on the 7th Plan workbook "com-bi-level-stairwell-7p_v4".

Exterior Lighting Improvements. Measures going from existing technology to LED technology. Based on the 7th Plan workbook "com-exteriorlighting-7p_v14".

8 http://www.bpa.gov/energy/n/industrial/Green_motors/

Measure Group
Exterior Lighting: Façade—LED
Exterior Lighting: Parking Lot—LED
Exterior Lighting: Walkway—LED

Interior Lighting Improvements. The measures go from existing technology to LED technology, or other high-performance lighting, fixtures, or redesign elements. Based on the 7th Plan workbook "com-lightinginterior-7p_v41".

Measure Group
CFL—Other
LED—Display or Track
LED—High-Bay
LED—Linear Fluorescent
LED—Recessed Can
LED—Other
Linear Fluorescent—High-Bay
Linear Fluorescent RDX—Linear Fluorescent
Metal Halide—Display or Track

LEC Exit Sign. Light Emitting Capacitor (LEC) exit signs consume less than one watt, resulting in energy savings over traditional exit signs. The assumed baseline is a LED exit sign. Based on the 7th Plan workbook "com-exitsign-7p_v3".

LED Case Lighting. LEDs are highly efficient bulbs that can be used for refrigeration case lights, resulting in energy savings over standard fluorescent case lights. Based on the 7th Plan workbook "com-grocery-7p_v7".

LED Motion Sensors on Display Case. Savings result from direct reductions in lighting runtimes, and reduced cooling loads from addition of display case motion sensors. Based on the 7th Plan workbook "com-grocery-7p_v7".

LED Parking Garage Lighting. Replacing inefficient metal halide lamps with LED fixtures and bi-level occupancy controls, reducing energy use of covered parking garages. Based on the 7th Plan workbook "com-parkinggaragelighting-7p_v7".

Lighting Controls. This represents two measures: 1) Embedded unitary controls for occupancy, daylight harvest, and personal dimming; and 2) Integrated controls where a control module is addressable remotely and can log conditions data. Based on the 7th Plan workbook "com-interiorlightingcontrols-7p_v10".

Market Average HP Low-Power T8 Shift. Shifting a mix of T8 Fluorescent lamps from 32W to 28W and 25W. Based on the 7th Plan workbook "com-hplowpowergsfl-7p_v8".

TLED Over Ballast on SP32WT8. Replacing a two-lamp, four-foot T8 fixture with 21W LED linear tubes (TLED). Based on the 7th Plan workbook "com-hplowpowergsfl-7p_v8".

C.3.3. Water Heat

Efficient Water Tanks. High-efficiency water heaters operate more efficiently than standard electric water heaters due to reduced standby losses. Based on the 7th Plan workbook "com-whtanks-7p_v6"

Pre-Rinse Spray Valve. Low-flow spray valves mix water and air to reduce water amounts flowing through spray heads, creating a fine water spray through an inserted screen in the spray head. Based on the 7th Plan workbook "com-prerinsespray-7p_v3".

Showerheads. Low-flow showerheads mix water and air to reduce amounts of water flowing through the showerhead, which creates a fine water spray using an inserted screen in the showerhead. The assumed efficiency of the installed showerhead is 1.5 GPM. Based on the 7th Plan workbook "com-showerhead-7p_v5".

C.3.4. Refrigeration

Anti-Sweat Heater Controls. This measure enables users to turn refrigeration display case, anti-sweat heaters off when the ambient relative humidity become low enough to prevent sweating. Without controls, heaters generally run continuously. Based on the 7th Plan workbook "com-grocery-7p_v7".

ECM Controllers on Walk-In Evaporator Motors. A walk-in fan is a component of refrigeration systems. ECMs typically have small horsepower motors (less than 1 HP), factory programmed to run at certain speeds. ECMs operate from a single-phase power source, with an electronic controller in or on the motor. The baseline measure is a standard efficiency motor. Based on the 7th Plan workbook "com-grocery-7p_v7".

Floating Head Pressure Control. This measure adds controls to floating head pressure temperatures down during periods of low load. The base case is a standard multiplex system with a fixed condensing setpoint. Based on the 7th Plan workbook "com-grocery-7p_v7".

Freezer Decommissioning and Recycling. This refers to environmentally friendly disposal of unneeded appliances, such as standalone freezers. Based on the RTF workbook "ComRefrigeratorFreezerDecommissioning_v2_4".

Refrigerator Decommissioning and Recycling. This refers to environmentally friendly disposal of unneeded appliances, such as secondary refrigerators. Based on the RTF workbook "ComRefrigeratorFreezerDecommissioning_v2_4".

Replace Shaded Pole with ECM in Walk-in Cooler. A walk-in fan is a component of refrigeration systems. ECMs typically have small horsepower motors (less than 1 HP), factory programmed to run at certain speeds. ECMs operate from a single-phase power source, with an electronic controller in or on the

motor. The baseline measure is a standard efficiency motor. Based on the 7th Plan workbook "com-grocery-7p_v7".

Strip Curtains: Walk-In Coolers/ Freezers. This measure reduces infiltration of warm air into the refrigerated space by improving the barrier between refrigerated and ambient air. Based on the 7th Plan workbook "com-grocery-7p_v7".

C.3.5. Cooking

Combi Oven. This measure uses dry heat and steam, injected into the oven when required by cooking food. ENERGY STAR combination ovens use less energy than standard combination ovens. Equipment sizes are based on ENERGY STAR v2.0 eligibility criteria for ≥ 6 pan and ≤ 20 pan. Based on the 7th Plan workbook "com-cooking-7p_v5".

Convection Oven (Wt Average). This measure meets specification requirements of 70% cooking energy efficiency and an idle energy rate of 1.6 kW. Standard electric convection ovens have a 65% cooking energy efficiency and an idle energy rate of 2 kW. Equipment sizes are based on ENERGY STAR v2.0 eligibility criteria. Based on the 7th Plan workbook "com-cooking-7p_v5".

Fryers. ENERGY STAR fryers operate 80% more efficiently, resulting in energy savings when compared to non-ENERGY STAR commercial fryers with a baseline efficiency of 75%. Equipment sizes based on ENERGY STAR v2.0 eligibility criteria. Based on the 7th Plan workbook "com-cooking-7p_v5".

Hot Food Holding Cabinet (Wt Average Size). Installation of a new electric HFHC meeting ENERGY STAR v2.0 requirements. The baseline measure is a conventional holding cabinet. Based on the 7th Plan workbook "com-cooking-7p_v5".

Steamer (Wt Average Size). This measure operates at a cooking efficiency of 68%, with idle energy rates that vary depending upon pan sizes. The baseline efficiency is a standard commercial steam cooker with 26% efficiency. Based on the 7th Plan workbook "com-cooking-7p_v5".

C.3.6. Data Center

Data Center Improvements. A total of 22 efficiency measures, divided into three tiers: Best Practice; Commercial Technology; and Cutting Edge. Based on CBSA's 2014 data on data centers embedded in commercial buildings. Based on the 7th Plan workbook "com-datacenters-7p_v6".

Measure Type	Measure Name
Best Practice	Decommissioning of unused servers
Best Practice	Energy-efficient data storage management
Best Practice	Server power management
Best Practice	Server virtualization/consolidation
Commercial Technology	Air-side economizer
Commercial Technology	Efficient network topology
Commercial Technology	Energy-efficient lighting
Commercial Technology	Energy-efficient power supplies (UPS)
Commercial Technology	Energy-efficient servers
Commercial Technology	Energy-efficient transformers
Commercial Technology	Hot or cold aisle configuration
Commercial Technology	Hot or cold aisle configuration, plus containment (e.g., strip curtains or rigid enclosures)
Commercial Technology	In-row cooling
Commercial Technology	Install misters, foggers, or ultrasonic humidifiers
Commercial Technology	Massive array of idle disks (MAID)
Commercial Technology	Premium efficiency motors
Commercial Technology	Variable-speed drives on pumps/fans
Commercial Technology	Water-side economizer
Cutting Edge	Direct current (as opposed to AC) to the racks
Cutting Edge	Direct liquid cooling of chips
Cutting Edge	Efficient network topology
Cutting Edge	Solid-state storage

C.3.7. Other

Compressed Air Upgrade. A suite of energy-efficient air compressor measures including the following:

- Demand reduction
- VFD controls
- Equipment upgrades

Based on the 7th Plan workbook "com-compressedair-7p_v4".

ENERGY STAR Desktop. ENERGY STAR computers consume less than 2 watts in "sleep" and "off" modes, operating more efficiently than conventional units in "idle" modes, resulting in 42% energy savings. Based on the 7th Plan workbook "com-computers-7p_v3".

ENERGY STAR Display. ENERGY STAR monitors feature the following: (1) an "on" mode, where the maximum allowed power varies, based on the computer monitor's resolution; (2) a "sleep" mode, where computer monitor models must consume 2 watts or less; and (3) an "off" mode, where computer monitor models must consume 1 watt or less. The baseline equipment does not include these features. Based on the 7th Plan workbook "com-computers-7p_v3".

ENERGY STAR Laptop. ENERGY STAR computers consume less than 2 watts in "sleep" and "off" modes, and operate more efficiently than conventional units in "idle" modes, resulting in 42% energy savings. Based on the 7th Plan workbook "com-computers-7p_v3".

Indoor Agriculture. A suite of energy-efficient indoor agriculture measures, including the following:

- **LED Fixture.** Replacing existing metal halide or high-pressure sodium grow lights with LED fixtures results in energy savings due to reduced wattage of LED fixtures. Additionally, LED fixtures produce less heat than metal halide or high-pressure sodium fixtures, resulting in a reduced HVAC cooling load.
- **Premium Air Conditioning Equipment.** Represents installing a 12.0 EER air conditioning system, resulting in energy savings over a federal standard air conditioner. The baseline equipment efficiency is 11.2 EER.
- **High-Efficiency Ventilation System.** Increasing the CFM per watt of the ventilation system saves energy by providing the same amount of ventilation, but at a decreased wattage. Represents savings from replacing room ventilation systems and lighting ventilation systems.
- **Mini-Split Heat Pump.** Represents installing a 12.0 EER and 3.6 COP mini-split heat pump, resulting in energy savings over a federal standard heat pump. The baseline equipment efficiency is 11.2 EER and 3.2 COP.

Premium Fume Hood—NR. A package of high-performance technologies that minimizes energy consumption of laboratory fume hoods. The package would include high-efficiency variable-speed fans and heat recovery to recover some energy in the conditioned air drawn from the laboratory space around the hood. Automatic sash positioning also could be implemented, with an occupancy sensor automatically closing the sash when occupants are not detected and the fume hood is not in use. Based on the 7th Plan workbook "com-fumehood-7p_v2".

Smart Plug Power Strips—Retro. In commercial office spaces, installation of a power strip that turns office equipment off outside of regular office hours, resulting in energy savings. A master outlet controls other outlets, turned off based on the master outlet's load sensor reading. Does not include computer or monitor savings. Occupancy-sensing power strips are also included. Based on the 7th Plan workbook "com-powerstrips-7p_v5".

Water Cooler Timer. This represents two measures: upgrading from a market average cooler to an ENERGY STAR 2.0 cooler; and a timer on the ENERGY STAR 2.0 cooler. The timer turns the cooler off during unoccupied periods. Based on the 7th Plan workbook "com-watercooler-7p_v6".

C.4. Industrial Electric Measure Descriptions

Air Compressor Improvements. These measures improve an overall compressed air system by improved system designs, leak repairs, usage practices, more efficient dryer and storage systems, and compressor upgrades.

Measure Name
Air Compressor Demand Reduction
Air Compressor Equipment1
Air Compressor Equipment2
Air Compressor Optimization

Clean Room Improvements. These measures save energy through improved clean room equipment and practices. Savings can be attributed to optimization of chiller operating parameters, upgrading to more efficient equipment, and improving filter replacement strategies.

Measure Name
Clean Room: Change Filter Strategy
Clean Room: Chiller Optimize
Clean Room: Clean Room HVAC

Efficiency Centrifugal Fan. This measure achieves energy savings through an improved fan design.

Measure Name
Efficient Centrifugal Fan

Fan System Optimization. This measure involves overall optimization of fan systems with improved system designs, enhanced flow designs, better maintenance practices, and adjustments to system parameters.

Measure Name
Fan System Optimization

Food Manufacturing (Cooling and Storage, Refrigerator Storage Tune-up). These measures maintain and enhance cooling equipment for each facility type. Tune-ups may include refrigerant charges, equipment cleaning, general maintenance, and improved practices.

Measure Name
Food: Cooling and Storage
Food: Refrig Storage Tune Up

General Process Improvements. This measure includes upgrading/replacing equipment and using optimum size/capacity equipment.

Measure Name
Metal: New Arc Furnace

High-Efficiency Fans. This measure involves upgrading motors to higher-efficiency units. As NEMA Premium motors are becoming the baseline code requirement in 2010, this measure is based on super-premium motors with efficiency levels at least one efficiency band above NEMA premium.

Measure Name
Fan Equipment Upgrade

LED Street Light Conversions. LED street lights can replace standard high-pressure sodium (HPS) street lights, with similar lumens achieved with less wattage.

Measure Name
LED HPS Replacement—135 W LED
LED HPS Replacement—270 W LED

Lighting Improvements. Changes to overall illumination levels, use of natural lighting, or technology improvements to more efficient bulbs or ballasts can decrease overall lighting energy consumption. These measures include upgrades from T12 to T8 systems, T8 to high-performance T8 systems, HID to fluorescent conversions, standard HID to high-efficiency HID systems, and occupancy and day lighting controls.

Measure Name
Efficient Lighting 1 Shift
Efficient Lighting 2 Shift
Efficient Lighting 3 Shift
High-Bay Lighting 1 Shift
High-Bay Lighting 2 Shift
High-Bay Lighting 3 Shift
Lighting Controls

Motor Rewind. This measure follows the Green Motors Practices Group™ best practices recommendations to maintain original efficiency, commonly called a Green Rewind.[9] A failed motor can be rewound to a lower efficiency, rewound to maintain the original efficiency, or replaced.

Measure Name
Motors: Rewind 20-50 HP
Motors: Rewind 51-100 HP
Motors: Rewind 101-200 HP
Motors: Rewind 201-500 HP
Motors: Rewind 501-5000 HP

Municipal Water Supply. Municipal water supply savings, primarily achieved from reduced pumping energy. Measures include more-efficient pumps/drives, water end-use efficiency improvements, leak reduction, water treatment, and compressed air improvements. Based on the 7th Plan workbook "com-watersupply-7p_v5p".

Measure Name
Municipal Water Supply—Retro

Optimize Municipal Sewage. Measures defined based the size of the treatment plant: <1 MGD, 1 to 10 MGD, and >10 MGD (MGD = Million Gallons per Day). Baseline consumption is defined for each of these three categories in Million kWh/MGD. Electricity saved per flow rate (Million kWh/MGD flow) is based on case studies. Based on the 7th Plan workbook "com-wastewater-7p_v5p".

Measure Name
Optimize Municipal Sewage; <1 MGD Design Capacity
Optimize Municipal Sewage; >10 MGD Design Capacity
Optimize Municipal Sewage; 1 to 10 MGD Design Capacity

Pump Equipment Upgrade. This measure achieves energy savings through improved pump design and sizing.

Measure Name
Pump Equipment Upgrade

[9] http://www.bpa.gov/energy/n/industrial/Green_motors/

Pump Improvements (Pump Energy Management, Pump System Optimization). This measure optimizes overall pump systems with improved system designs, enhanced flow designs, better maintenance practices, and adjustments to system parameters.

Measure Name
Pump Energy Management
Pump System Optimization

Synchronous Belts. This measure contains mating, corresponding grooves in a drive sprocket, preventing slip and reducing energy losses.

Measure Name
Synchronous Belts

Transformers. Energy-efficient transformers provide improved power quality while minimizing losses.

Measure Name
Transformers—Retrofit
Transformers—New

Whole Plant Improvements. These measures include synergistic savings of plantwide energy management and improvements across multiple systems (e.g., compressed air, pumping, fan systems).

Measure Name
Energy Project Management
Fan Energy Management
Integrated Plant Energy Management
Plant Energy Management

Detailed Energy Efficiency Potential

D.1. Detailed Energy Efficiency Potential

Appendix D summarizes total cumulative achievable economic potential in 2040 (21-year cumulative) for the IRP avoided cost scenario by segment, sector, and end use. Note: for end uses for which the share of total potential is less than 1% is expressed as "0%" in the pie charts.

D.2. Energy Efficiency Potential Summary

Figure D-1. Achievable Economic Potential: Residential by Segment

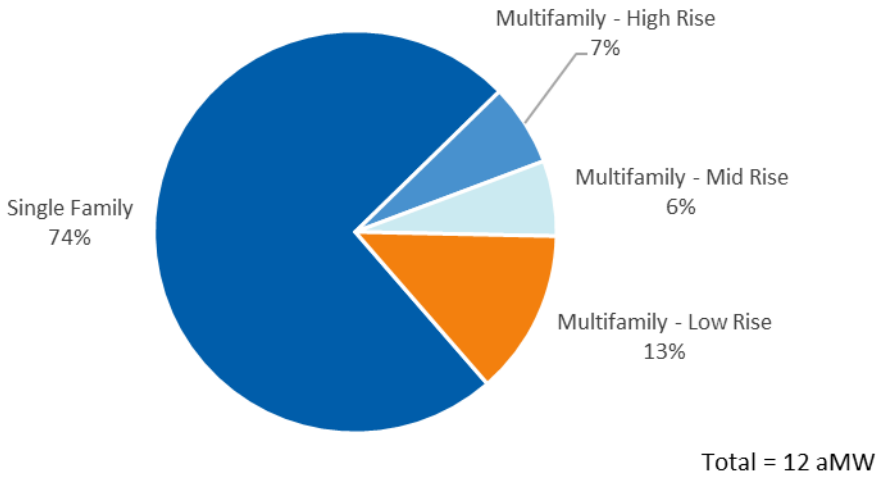


Figure D-2. Achievable Economic Potential: Commercial by Segment

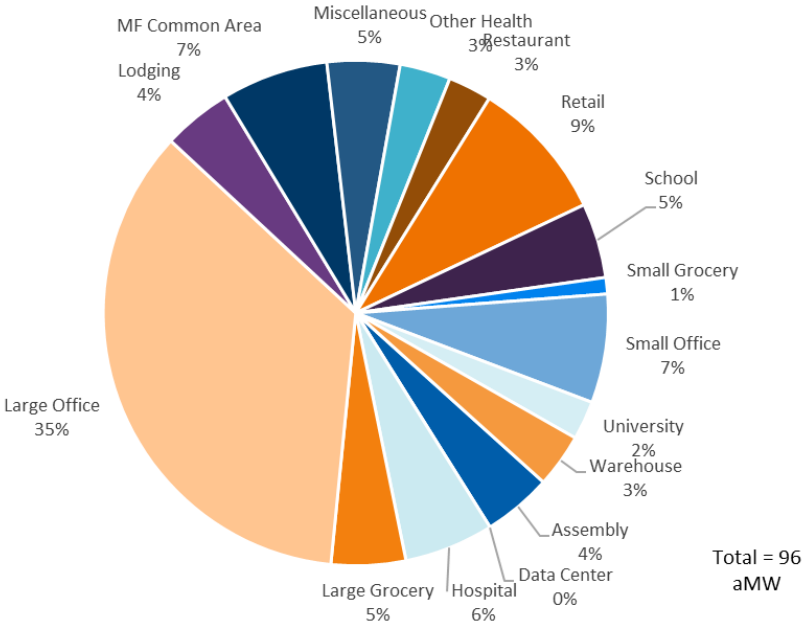


Figure D-3. Achievable Economic Potential: Industrial by Segment

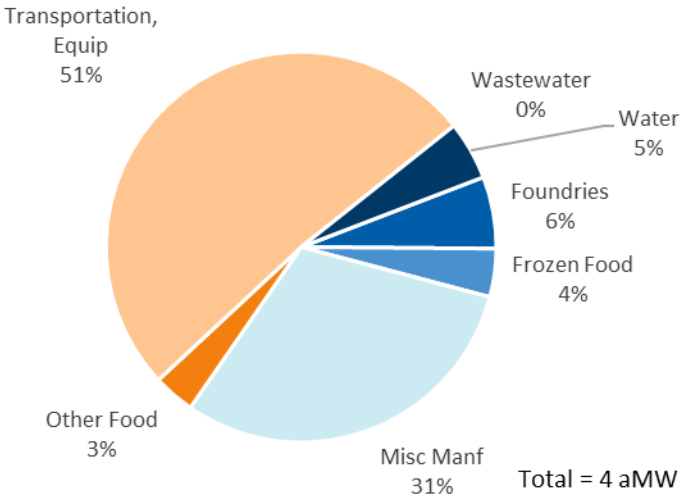


Figure D-4. Achievable Economic Potential: Residential by End Use

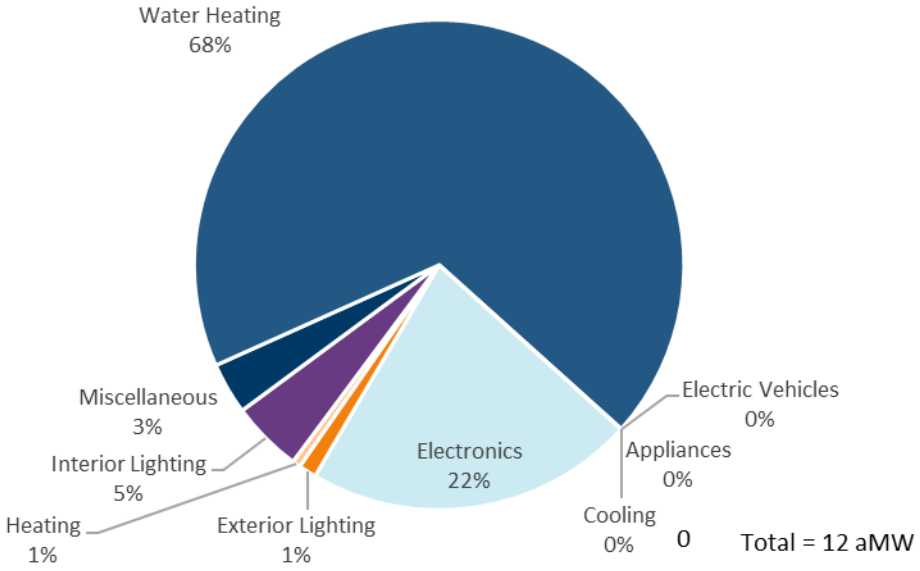


Figure D-5. Achievable Economic Potential: Commercial by End Use

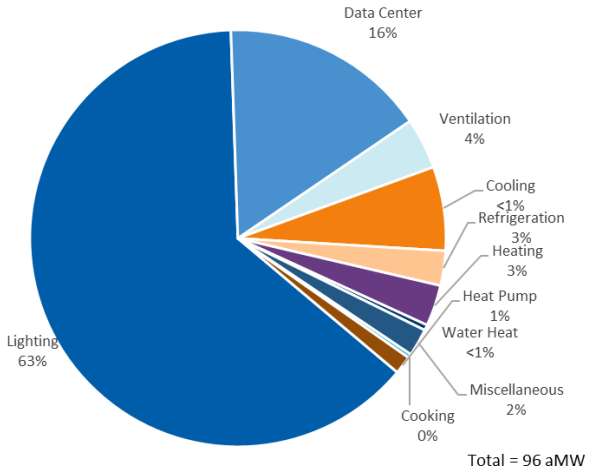
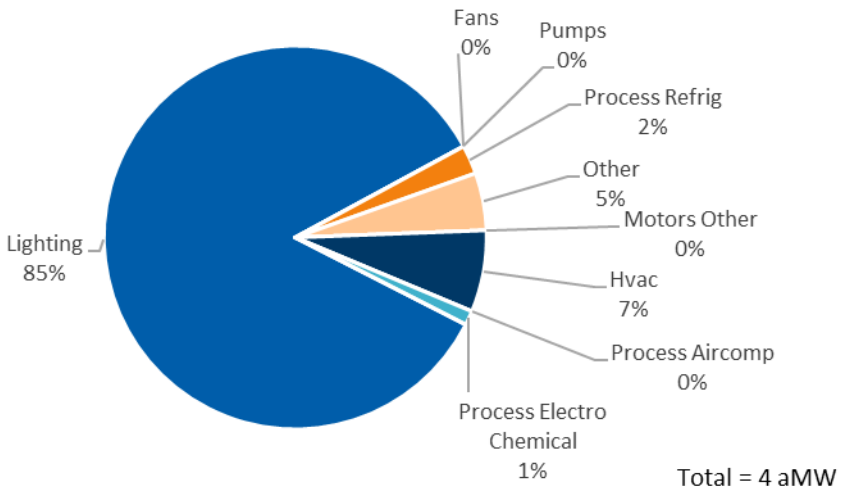


Figure D-6. Achievable Economic Potential: Industrial by End Use



D.3. Residential Segments by End Use

Figure D-7. Achievable Economic Potential: Residential Single Family by End Use

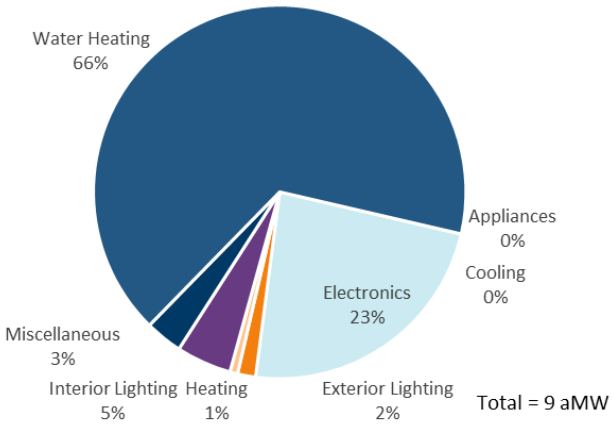


Figure D-8. Achievable Economic Potential: Residential Multifamily – Mid Rise by End Use

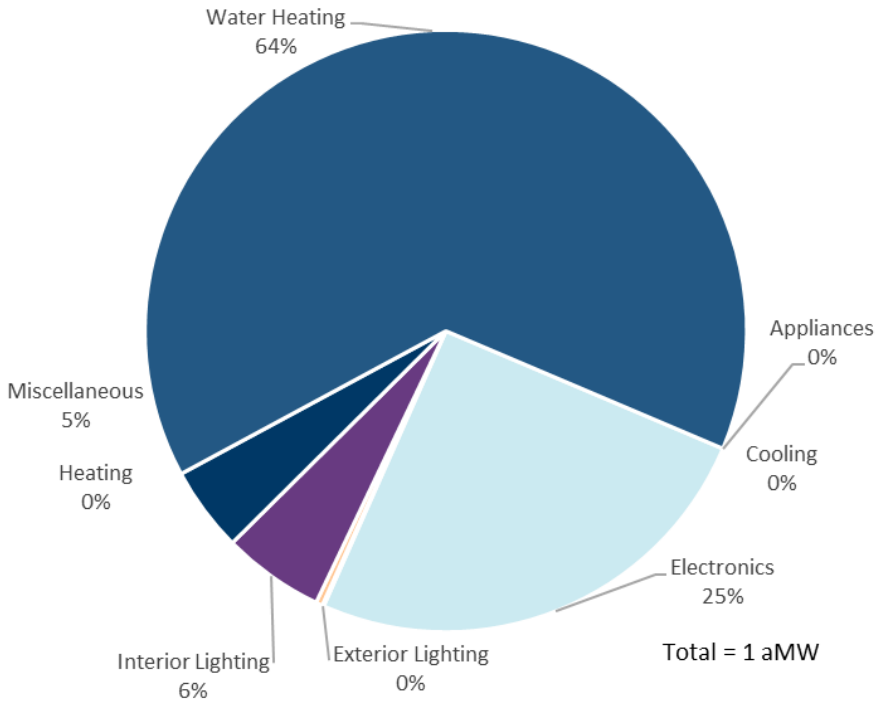


Figure D-9. Achievable Economic Potential: Residential Multifamily – Low Rise by End Use

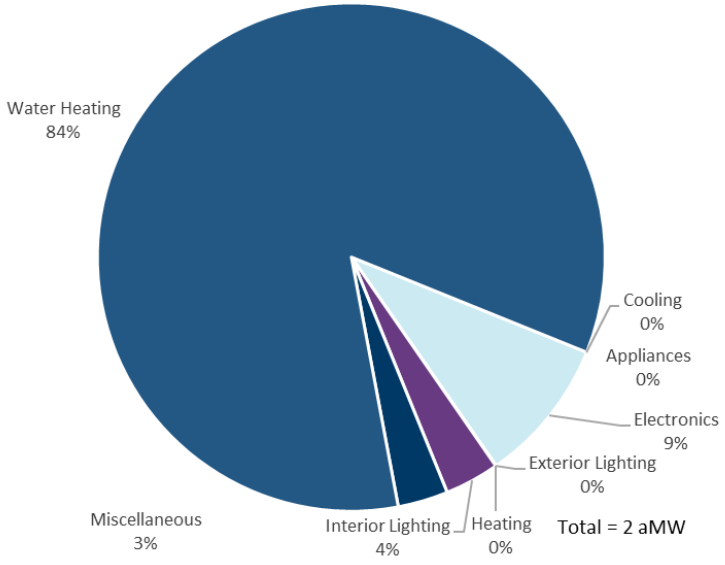
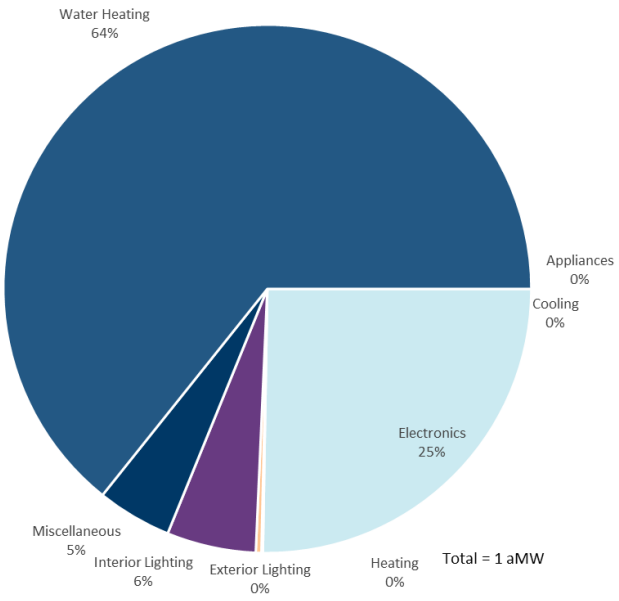


Figure D-10. Achievable Economic Potential: Residential Multifamily – High Rise by End Use



D.4. Commercial Segments by End Use

Figure D-11. Achievable Economic Potential: Commercial Assembly by End Use

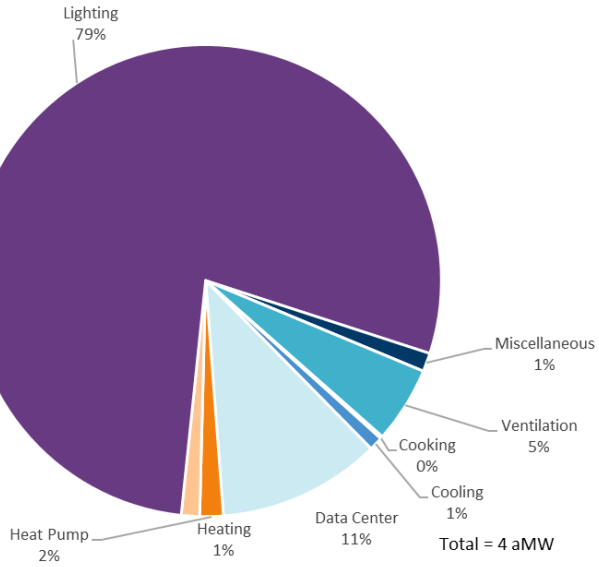


Figure D-12. Achievable Economic Potential: Commercial Hospital by End Use

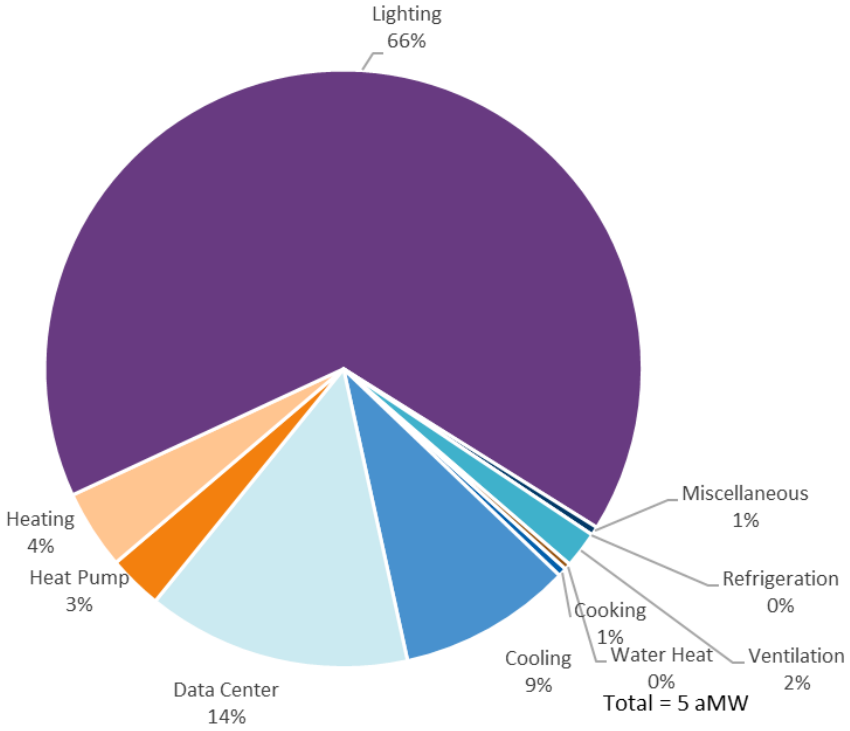


Figure D-13. Achievable Economic Potential: Commercial Large Grocery by End Use

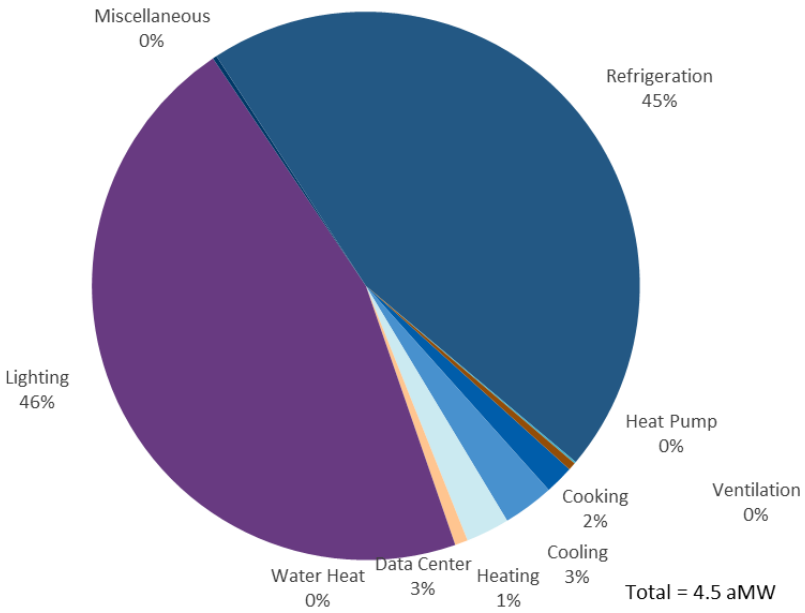


Figure D-14. Achievable Economic Potential: Commercial Large Office by End Use

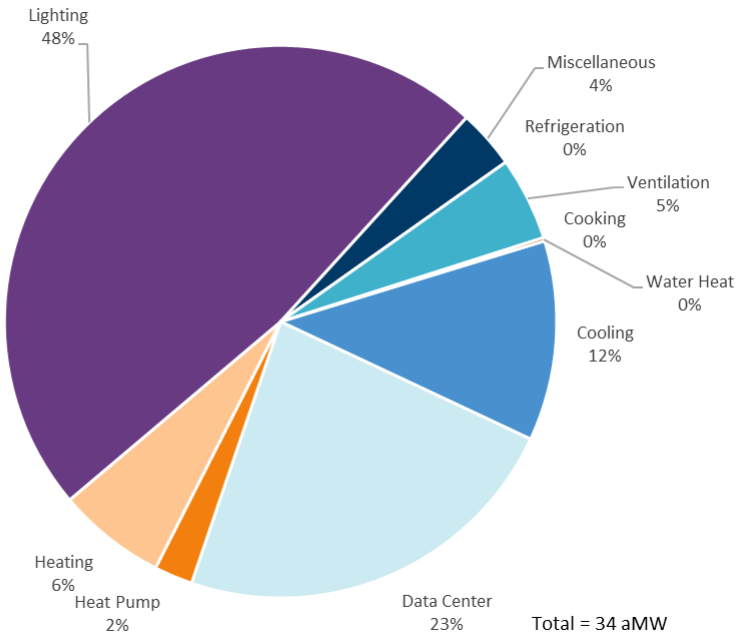


Figure D-15. Achievable Economic Potential: Commercial Lodging by End Use

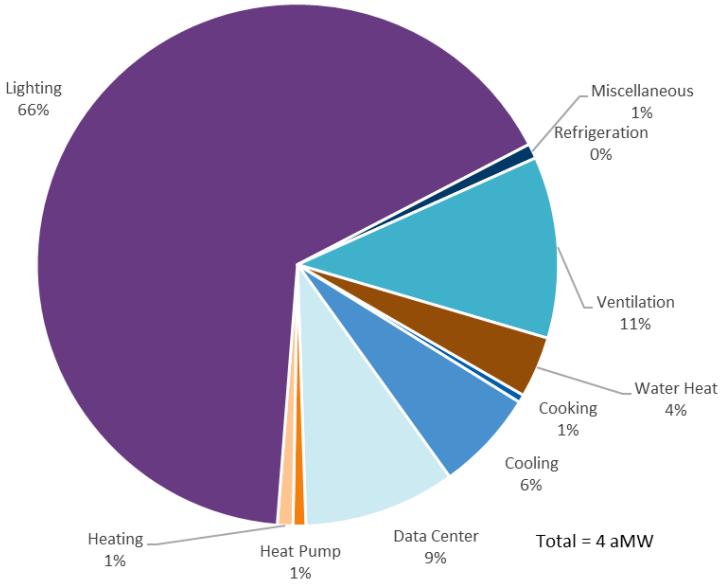


Figure D-16. Achievable Economic Potential: Commercial MF Common Area by End Use

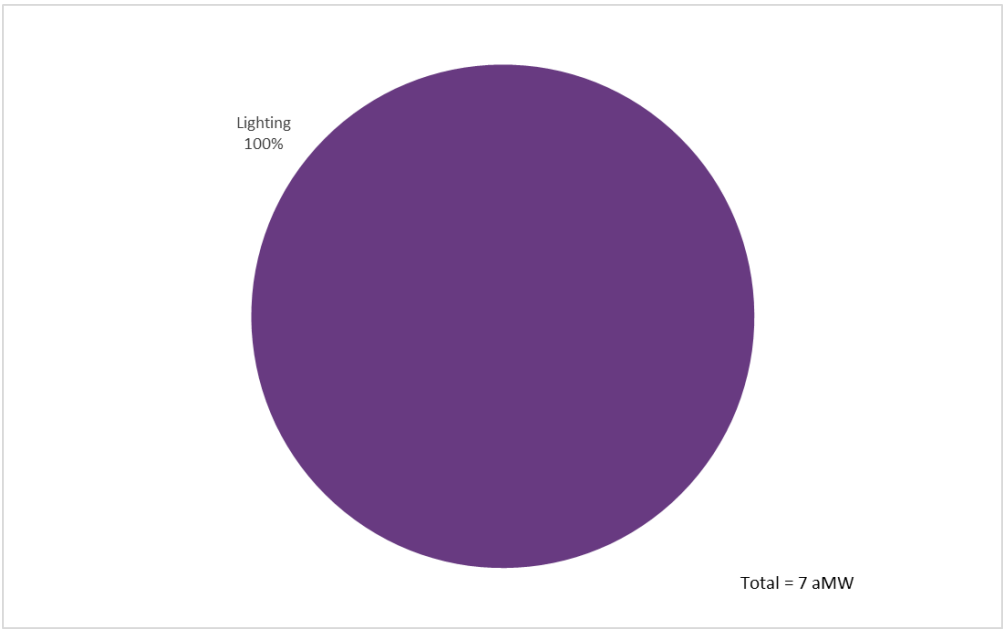


Figure D-17. Achievable Economic Potential: Commercial Miscellaneous by End Use

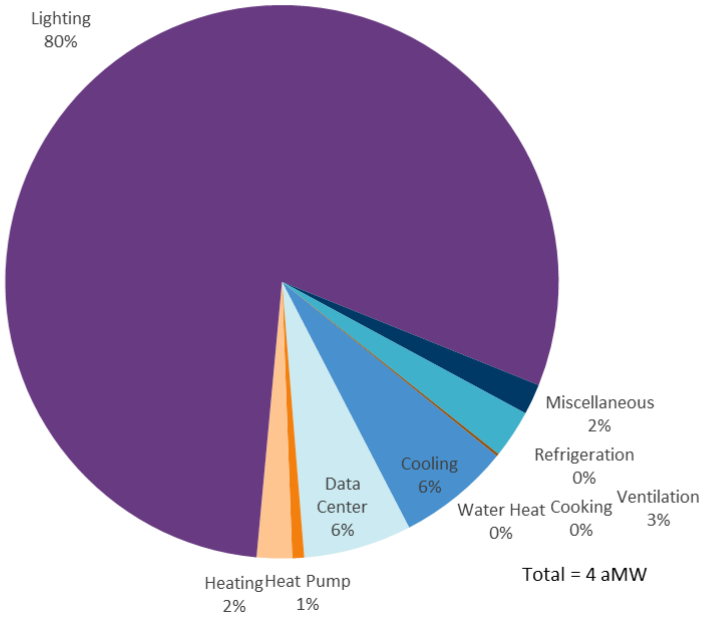


Figure D-18. Achievable Economic Potential: Commercial Other Health by End Use

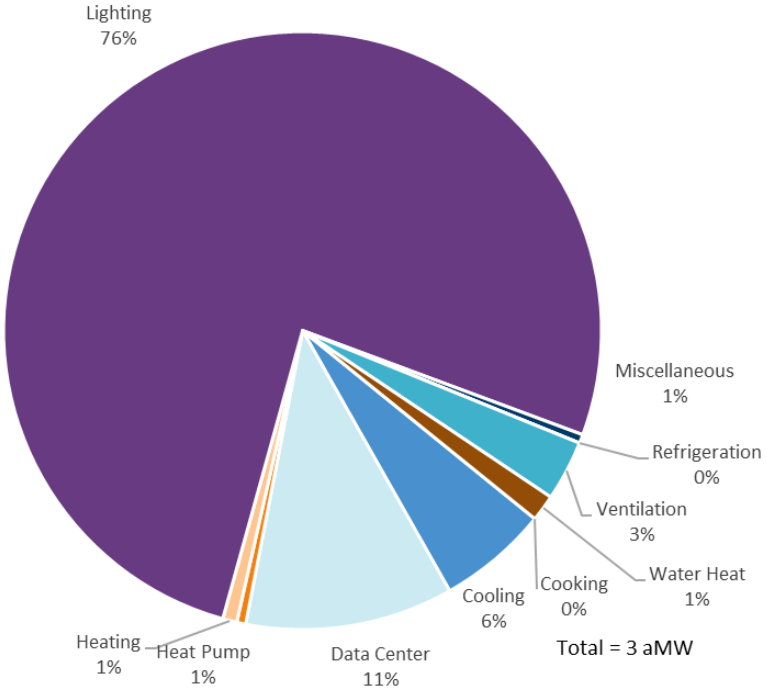


Figure D-19. Achievable Economic Potential: Commercial Restaurant by End Use

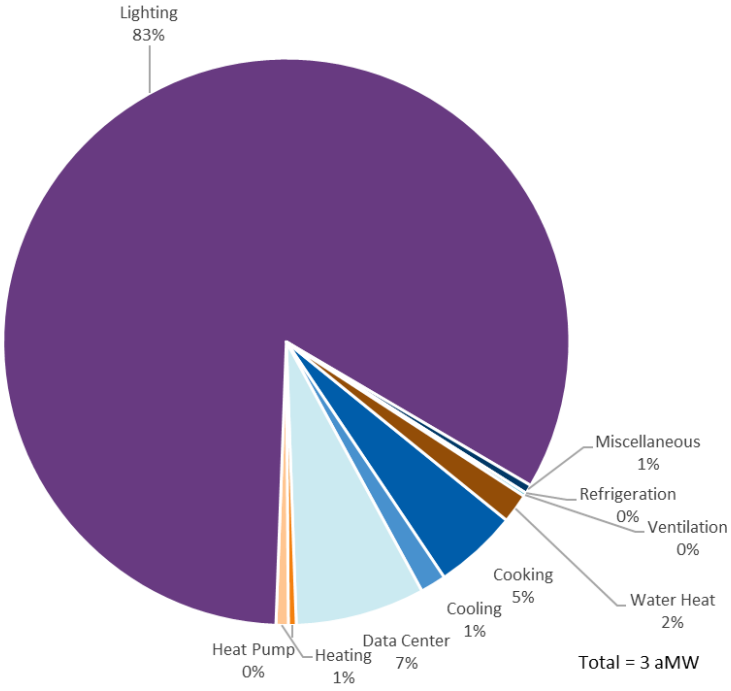


Figure D-20. Achievable Economic Potential: Commercial Retail by End Use

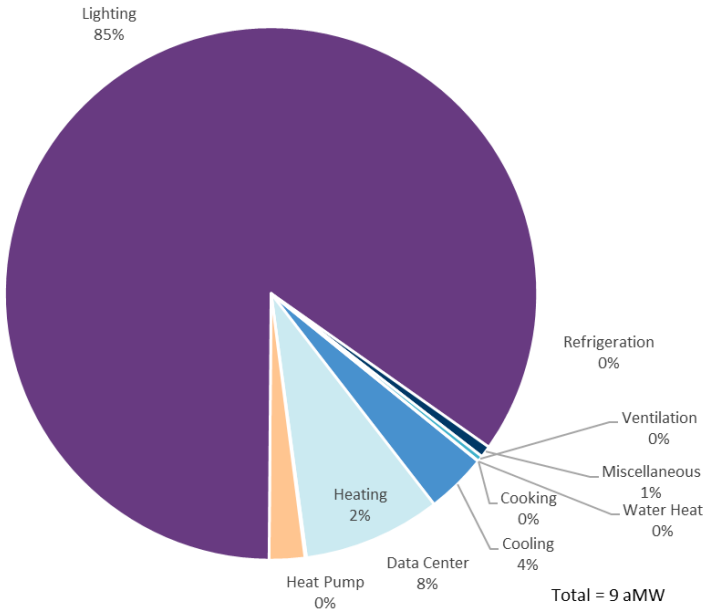


Figure D-21. Achievable Economic Potential: Commercial School by End Use

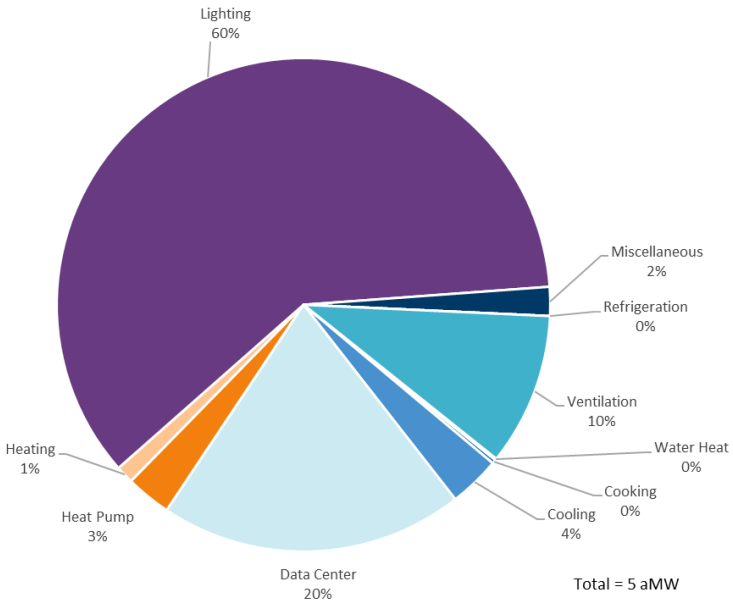


Figure D-22. Achievable Economic Potential: Commercial Small Grocery by End Use

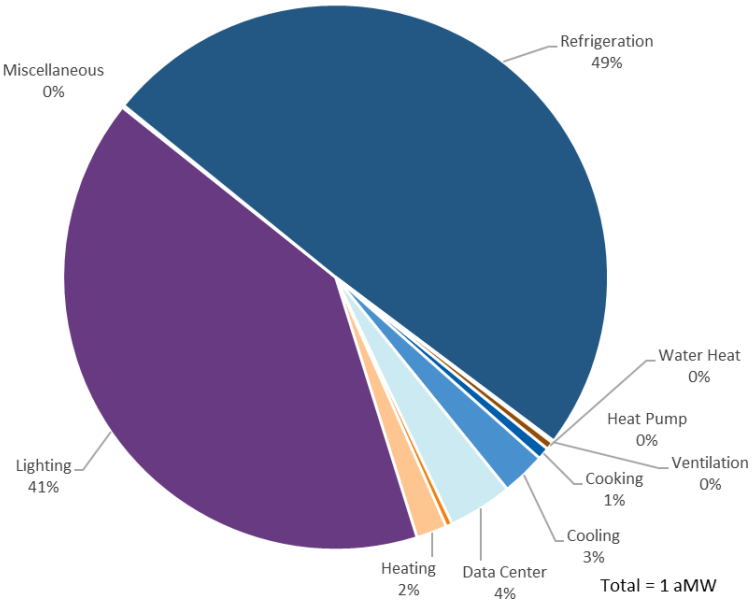


Figure D-23. Achievable Economic Potential: Commercial Small Office by End Use

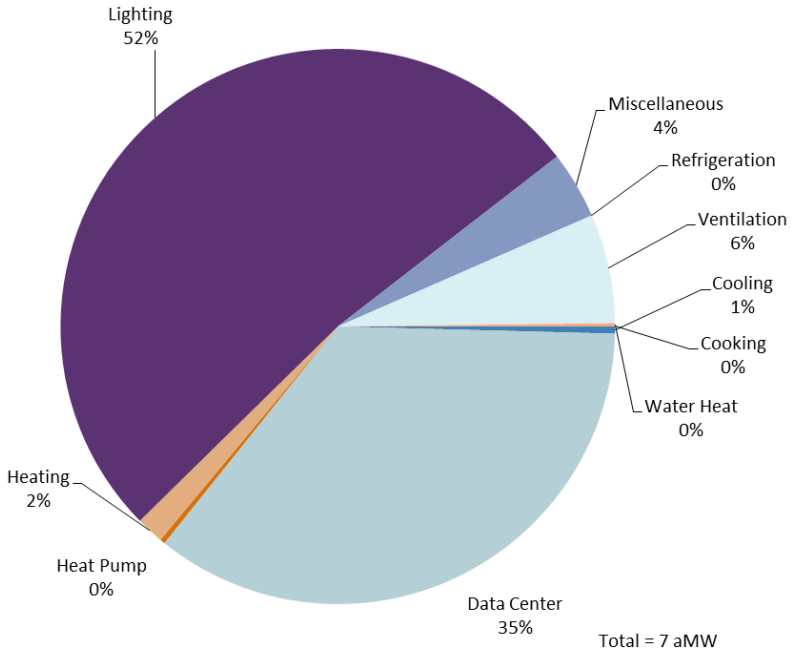


Figure D-24. Achievable Economic Potential: Commercial University by End Use

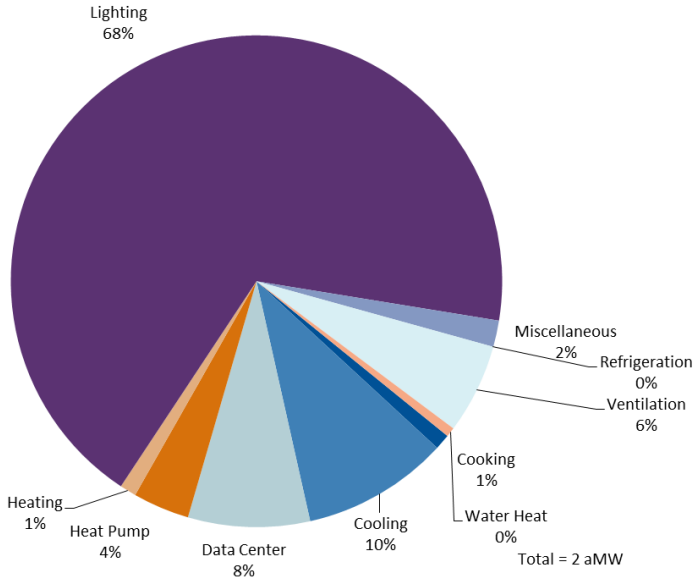
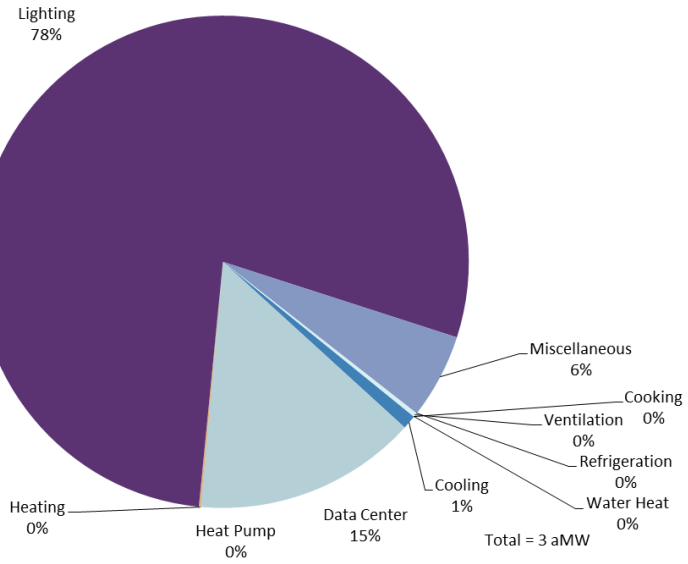


Figure D-25. Achievable Economic Potential: Commercial Warehouse by End Use



D.5. Industrial Segments by End Use

Figure D-26. Achievable Economic Potential: Industrial – Other Food by End Use

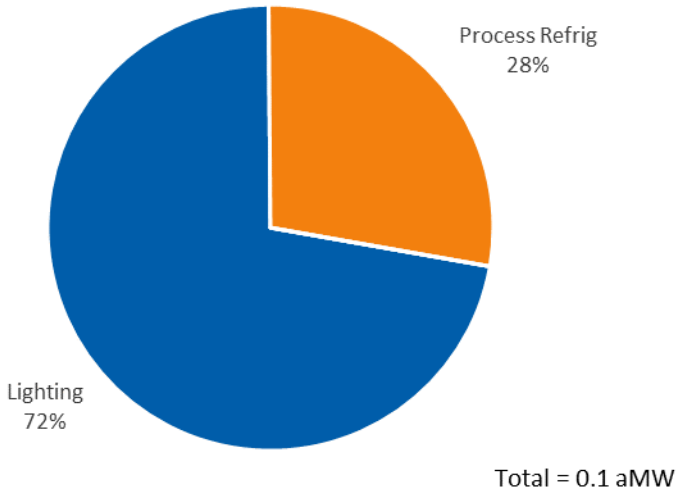


Figure D-27. Achievable Economic Potential: Industrial – Misc. Manufacturing by End Use

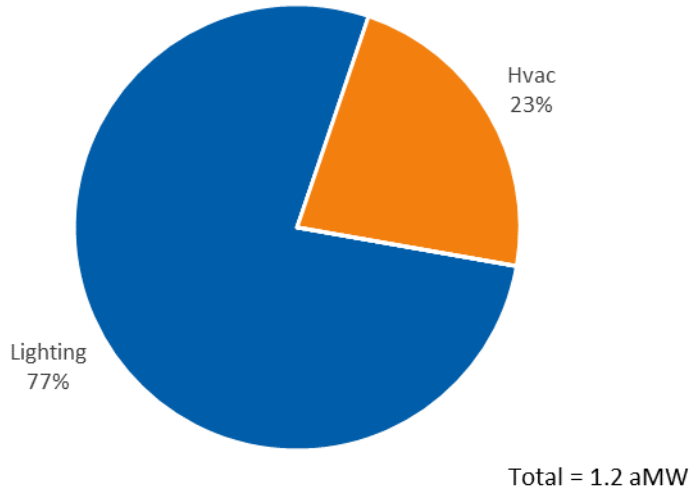


Figure D-28. Achievable Economic Potential: Industrial – Foundries by End Use

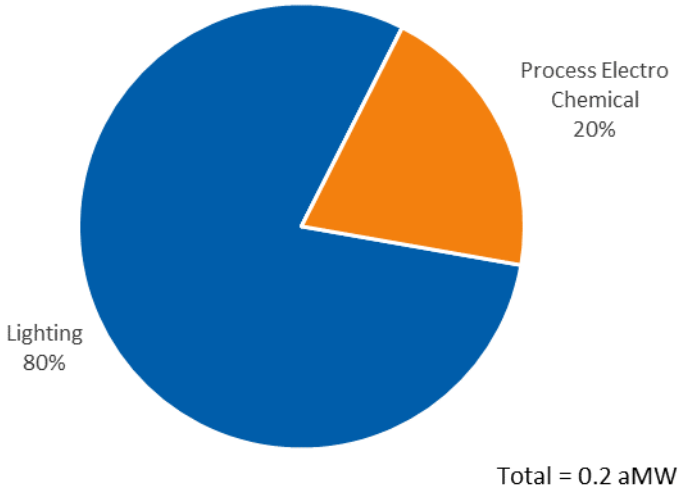


Figure D-29. Achievable Economic Potential: Industrial – Transportation, Equip by End Use

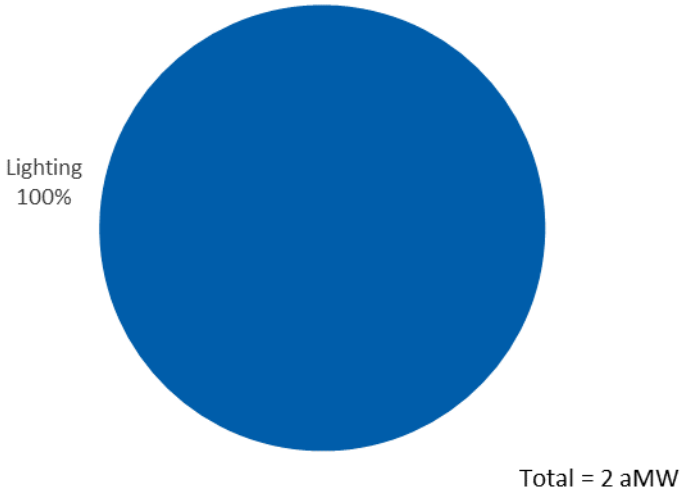


Figure D-30. Achievable Economic Potential: Industrial – Wastewater by End Use

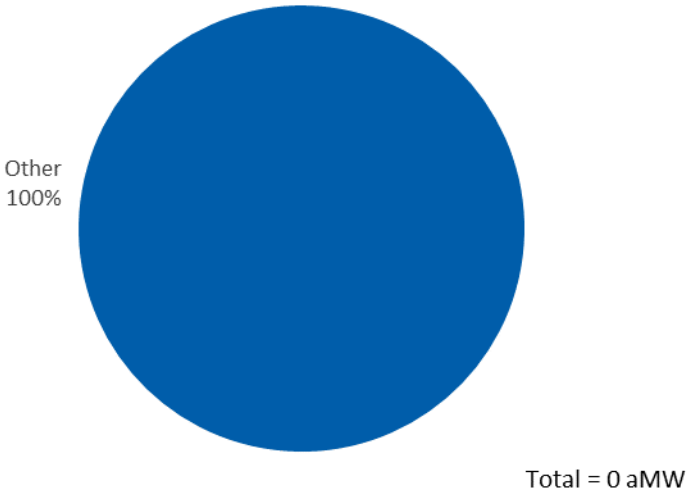


Figure D-31. Achievable Economic Potential: Industrial – Water by End Use

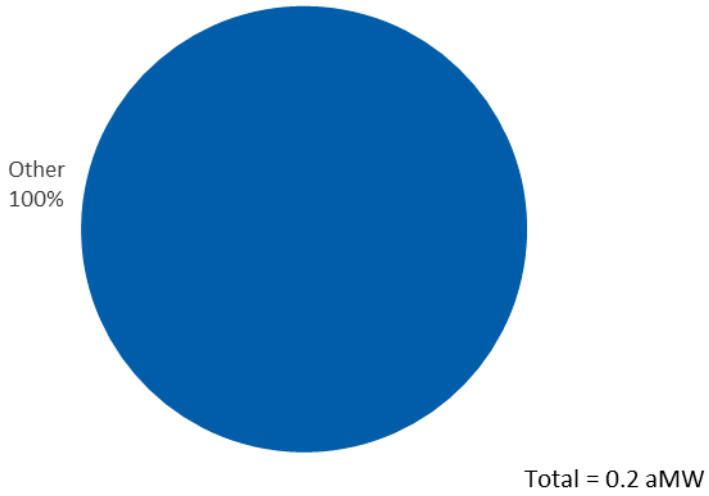
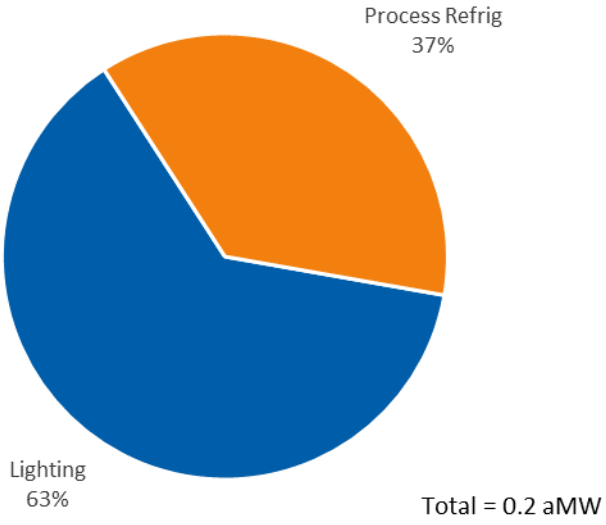


Figure D-32. Achievable Economic Potential: Industrial – Frozen Food by End Use



Measure Details

E.1. Measure Details

Appendix E includes detailed measure costs, savings, and applicability factors for all measure permutations considered in this study. This appendix includes three separate tables for each sector: residential, commercial, and industrial.

- **Segment**
- **End Use**
- **Construction Vintage:** New or Existing
- **Measure Name**
- **Measure Description**
- **Baseline Description**
- **Unit Description**: Units of savings and costs (e.g., per square foot, per unit, per industry).
- **Savings per Unit**: Per-unit standalone savings for the energy efficiency measure.
- **Measure Life**: Expected useful lifetime of a given measure (years).
- **Incremental Cost ($)**: Incremental cost to install an energy efficiency measure (including capital costs, labor, and annual operations and maintenance); industrial costs expressed in thousands of dollars.
- **Levelized Cost**: The total resource cost (TRC), levelized cost of conserved energy, discounted over the 20-year study horizon.
- **TRC Benefit-Cost (B/C) Ratio**: The ratio of net present value TRC benefits to net present value TRC costs.
- **Technical Potential**: Cumulative, 20-year, technically feasible, energy efficiency potential, expressed in MWh.
- **Economic Potential**: Cumulative, 20-year, energy efficiency potential for cost-effective measures, expressed in MWh. Note: due to interactions, economic potential may exceed technical potential for some measures.
- **Achievable Economic Potential**: IRP scenario cumulative, 20-year, achievable potential, expressed in MWh.

Appendix E is included as an attachment to this volume of the report.

SEATTLE CITY COUNCIL
CENTRAL STAFF

February 11, 2020

M E M O R A N D U M

To: Transportation and Utilities Committee
From: Eric McConaghy, Analyst
Subject: Seattle City Light 2020-2021 Energy Conservation Target

On February 19, Seattle City Light (SCL) will brief the Transportation and Utilities Committee (Committee) on Resolution 31932 that would adopt SCL's proposed energy conservation targets for 2020-2021 and 10-year conservation potential. The Committee's agenda also includes a public hearing on these topics.

Background

Initiative 937 (I-937), also known as the Energy Independence Act (EIA), was passed by Washington state voters on November 7, 2006. To comply with the EIA[1], utilities including SCL[2], must pursue all energy conservation that is cost-effective, reliable and feasible. Utilities must identify the conservation potential for the utility over a 10-year period and then establish and make publicly available their two-year, conservation targets. The Washington State Department of Commerce oversees compliance with EIA. The Washington Administrative Code calls for municipal utilities to adopt the EIA-required, two-year conservation targets after public notice and opportunity for public comment.[3]

Energy Conservation Targets

SCL contracted with Cadmus, a technical consulting company, to complete the Conservation Potential Assessment (CPA) to estimate the "magnitude, timing, and costs of conservation resources" with SCL's service territory over the next 21 years. SCL's 131 square-mile service territory includes the City of Seattle, portions of seven adjacent cities, and parts of unincorporated King County. Cadmus completed the CPA for the time period of 21 years to provide inputs to SCL's next Integrated Resource Plan (IRP) covering the next 20 years. Council can expect to review and, if satisfactory, approve by resolution SCL's updated IRP later this year.

The CPA is also the source for SCL's conservation targets and potential over the next two and 10-year periods, respectively. Resolution 31932 would establish a 10-year conservation

[1] Revised Code of Washington (RCW) 19.285.040. https://app.leg.wa.gov/RCW/default.aspx?cite=19.285.040. Last accessed 02/10/2020.
[2] EIA requires electric utilities serving at least 25,000 retail customers to use renewable energy and energy conservation. There are 18 utilities subject to the EIA.
[3] Washington Administrative Code (WAC) 194-37-070. https://apps.leg.wa.gov/WAC/default.aspx?cite=194-37-070. Last accessed 02/10/2020.

potential of 82.67 average megawatts and a conservation target of 21.27 average megawatts[4] for 2020-2021 based on the CPA. The biennial target measures SCL's conservation goal for the first two years of that period; and it is a subset of the 10-year conservation potential that measures the power savings made possible through all achievable, cost-effective measures.

The proposed target and potential for 2020-2021 are both less than the target and potential for the previous period adopted by Resolution 31765. The 2020-2021 target of is a 13 percent decrease from the 2018-2019 conservation target. The 10-year conservation potential proposed to be established in Resolution 31932 is an 8.5 percent decrease compared to the previous iteration.

SCL explains the reduction in the target and potential as resulting from:

(1) lower avoided energy costs;

(2) increased stringency in building energy codes; and

(3) already-attained conservation measures, such as using inexpensive, light-emitting diode (LED) lighting.

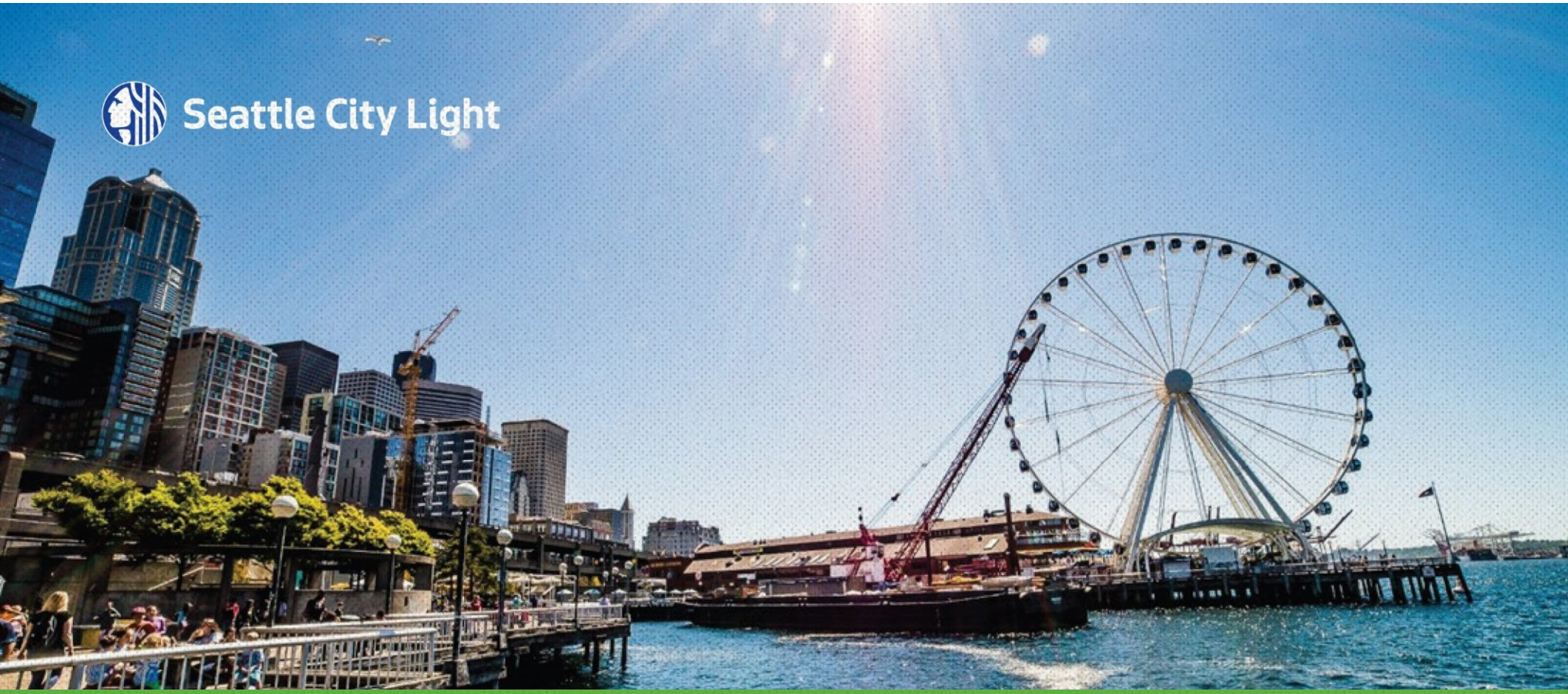
Generally, avoided energy costs are costs SCL would otherwise incur to acquire energy if conservation measures were not implemented. Lower avoided energy costs mean more expensive conservation measures are less cost-effective. Newer building energy codes with increased stringency in energy efficiency means that newly constructed buildings have less room for improvement in conservation compared to older buildings approved under previous energy code requirements. Finally, already-attained conservation is the "low-hanging fruit" of energy conservation that has largely been previously "picked."

Next steps

If the Committee takes action on the resolution during the meeting on February 19, then Council could schedule final action on the resolution as soon as February 24.

cc: Kirstan Arestad, Executive Director
Dan Eder, Deputy Director

[4] An average megawatt (aMW) is defined as one million watts delivered continuously 24 hours a day for a year (8,760 hours). For scale, the CPA estimates SCL's annual 2020 sales of power to all residential customers as 364 aMW.



2020-2021 CONSERVATION TARGET

Presentation to the Transportation and Utilities Committee

Jennifer Finnigan | February 19, 2020

Presentation overview

1. Introduction to conservation

2. Conservation target for 2020-2021

3. What this target means for City Light

Conservation at City Light

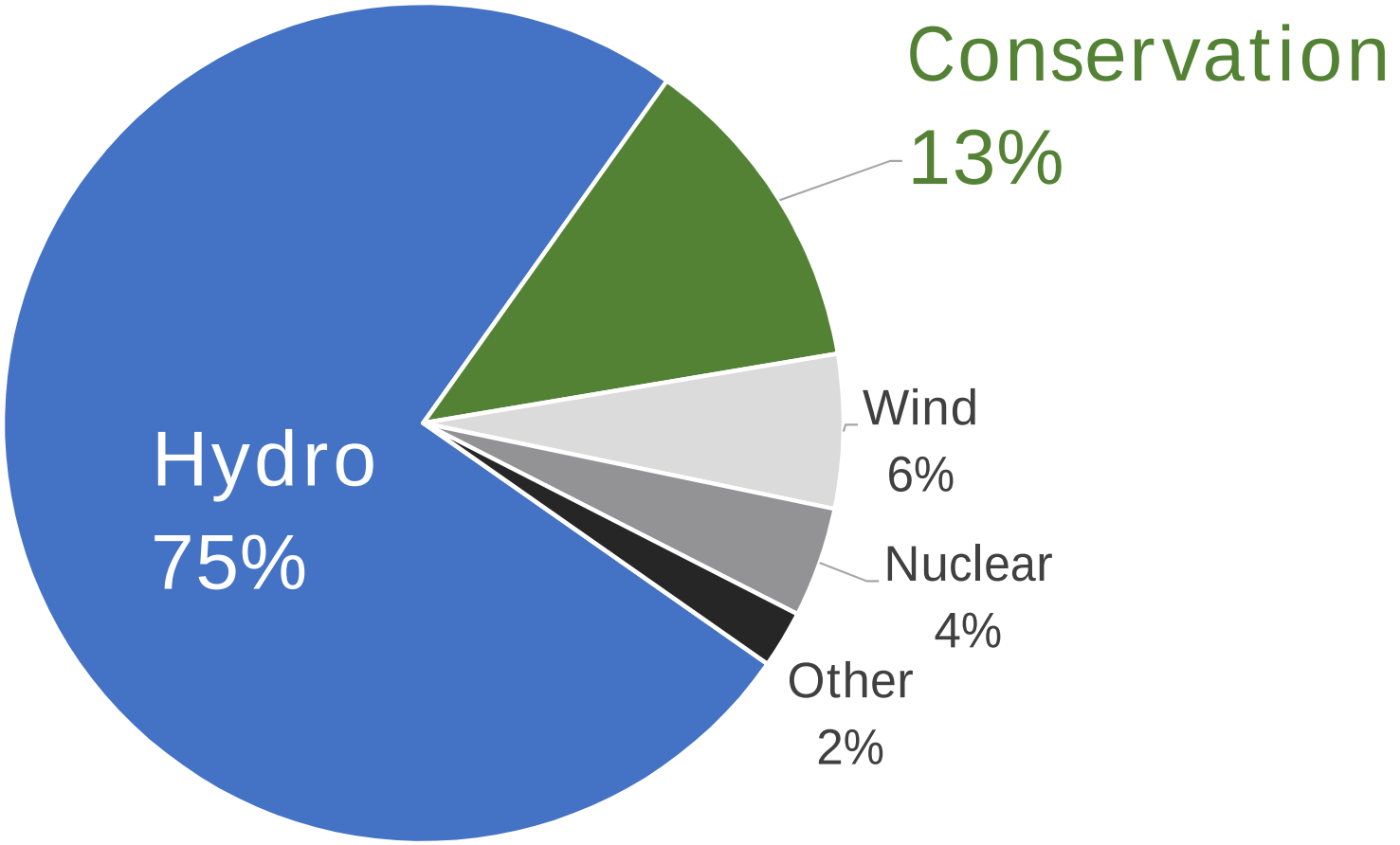
Since 1977 we have saved the equivalent annual electricity use of 190,000 average Seattle homes

In 2018 we saved the equivalent annual electricity use of 17,000 average Seattle homes

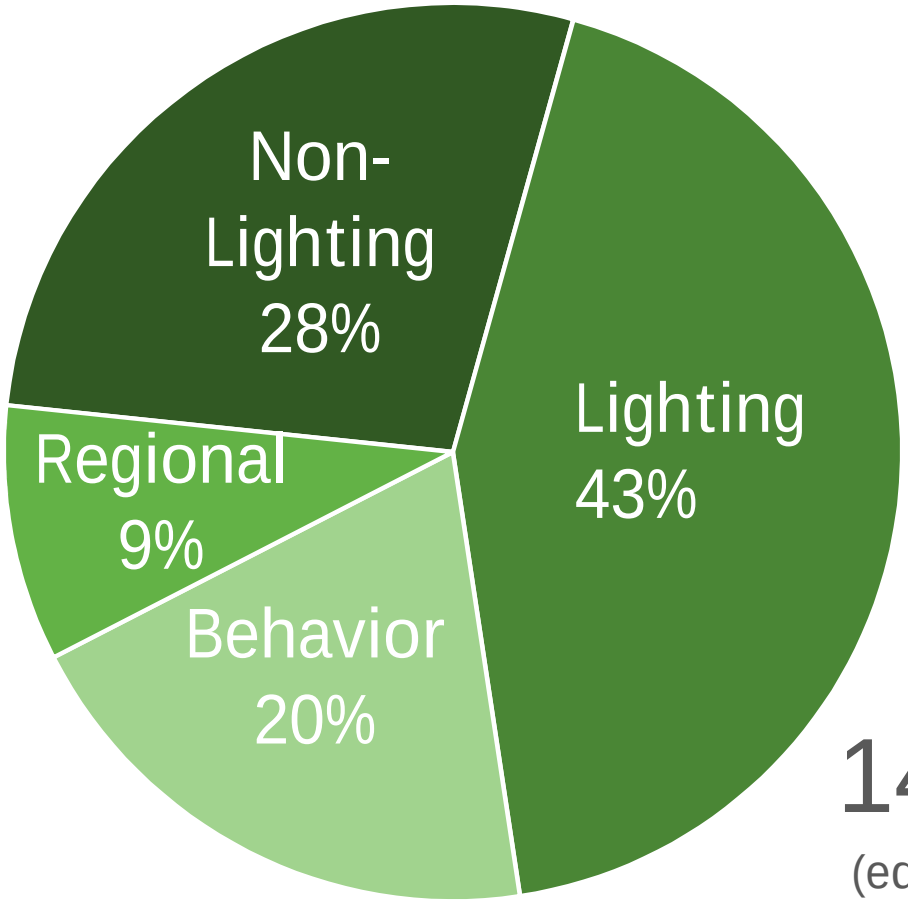
Conservation = energy efficiency

Seattle City Light

Conservation is a clean resource



Conservation is currently dominated by lighting

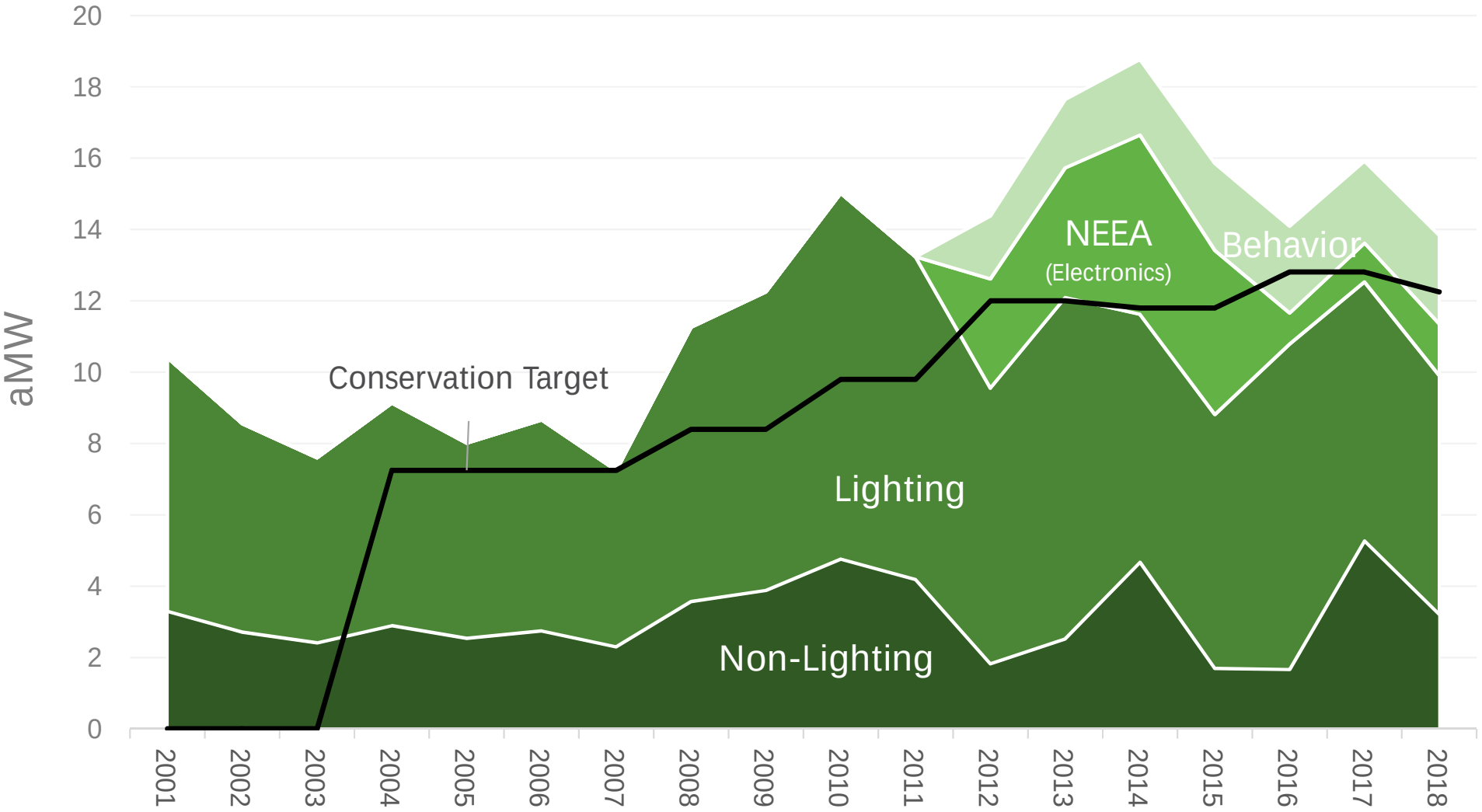


14 aMW

(equivalent to ~17,000 homes)

289

Looking back: annual energy savings



Initiative 937

Approved by voters in 2006

Methodologies consistent with NWPCC's Power Plan

All utilities with >25K customers

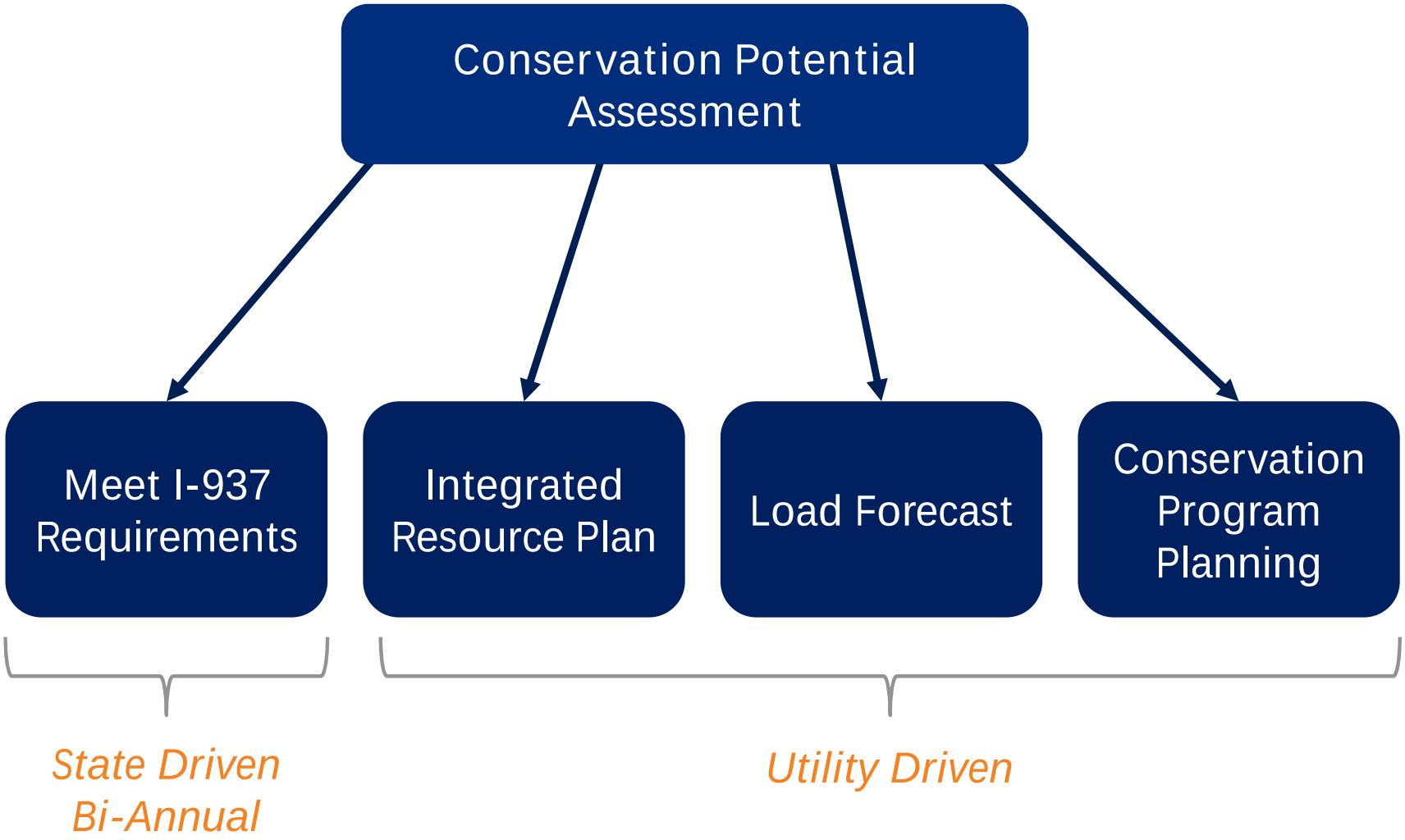
2

Two-year cycles (2016-2017, 2018-19, etc)

Identify and pursue "all available conservation that is cost-effective"

Report savings and targets to the State

How and why we set a conservation target



2020 conservation targets

	2020-2021	2020-2029
Residential	2.8	9.3
Commercial	16.1	69.4
Industrial	2.4	4.0
Total	21.3 aMW (~26,000 homes)	82.7 aMW (~100,000 homes)

How the two-year target compares

	2020-2021	2018-2019
Residential	2.8	1.7
Commercial	16.1	17.2
Industrial	2.4	4.4
Street Lighting (LED Conversion)	--	1.2
Total	21.3 aMW (~26,000 homes)	24.6 aMW (~30,000 homes)

What changed?

Renewable energy costs have decreased

Electricity demand is flat

Due to past program achievement

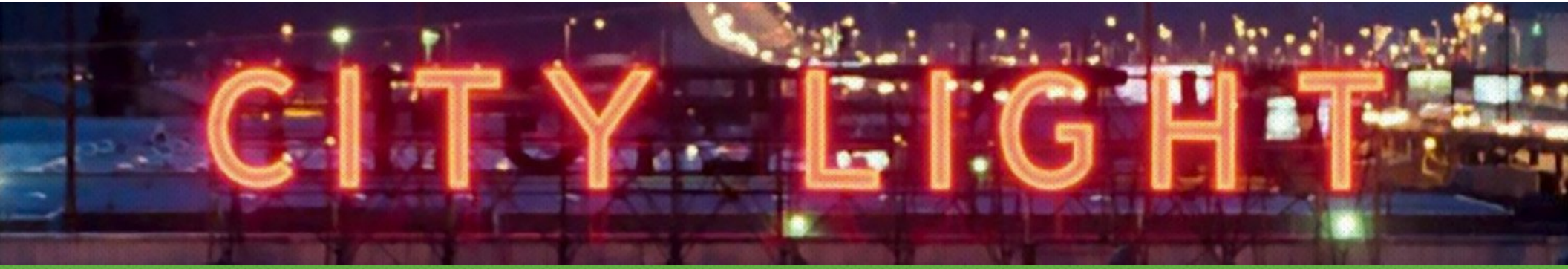
New energy codes

What this means for City Light

We will continue our strong investment in conservation

Our opportunities are evolving

- Pivot to whole building
- More focus on social equity
- Not all conservation is created equal; will consider location and time value
- As we march toward electrification, efficiency in buildings is key



OUR MISSION

Seattle City Light is dedicated to delivering customers affordable, reliable and environmentally responsible electricity services.

OUR VISION

We resolve to provide a positive, fulfilling and engaging experience for our employees. We will expect and reinforce leadership behaviors that contribute to that culture. Our workforce is the foundation upon which we achieve our public service goals and will reflect the diversity of the community we serve.

We strive to improve quality of life by understanding and answering the needs of our customers. We aim to provide more opportunities to those with fewer resources and will protect the well-being and safety of the public.

We aspire to be the nation's greenest utility by fulfilling our mission in an environmentally and socially responsible manner.

OUR VALUES

Safety, Environmental Stewardship, Innovation, Excellence, Customer Care

THE NATION'S GREENEST UTILITY
SINCE 1905
SEATTLE CITY LIGHT

Seattle City Light