Climate Crisis Checkmate: A Strategy for Rapidly Aligning Utility Programs Around 2050 Performance Outcomes

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ABSTRACT

Washington State is enacting complementary policies that target the main pillars of building decarbonization, including clean electricity, grid optimization, large-scale electrification of space and water heating, deep levels of energy efficiency, onsite renewables, and flexible demand. Utility and market transformation programs must align with the state's policies, which include a stringent energy code with carbon compliance metrics and a state building performance standard for large commercial buildings. This paper provides an overview of Washington's building decarbonization policy trajectory and implications for utilities. It includes recommendations for restructuring resource planning, utility program design, and evaluation to deliver whole building energy optimization and performance outcomes aligned with the state's strategy for a low energy, all-electric building stock on a carbon-neutral grid. Key topics include how programs can transition from a siloed energy-efficiency resource planning and program design framework to an inclusive energy optimization framework that holistically addresses efficiency along with electrification, distributed energy resources, demand flexibility, equity, and other social goals such as reducing energy burden. The paper explores how to fundamentally change the function and form of utility programs and evaluation by 2030 to increase building performance and grid integration at the scale required to meet Washington's 2050 economy-wide emission limits. It approaches these challenges from the perspective of a municipal utility in Washington state and the difficult, strategic decisions that must be made regarding the viability of measure-based programs within a policy context that must transition Washington to a carbon-neutral building stock within less than 30 years.

Introduction

Washington State is enacting a series of complementary policies that collectively target the main pillars of building decarbonization, including clean electricity, grid optimization, large-scale electrification of space and water heating, deep levels of energy efficiency, onsite renewables, and flexible demand. Utility and market transformation programs must align with and support the state's nation-leading mandates such as a stringent energy code with carbon-based compliance metrics and a mandatory state building performance standard (BPS) with maximum energy use intensity (EUI) targets. A key question is what this policy trajectory means for utilities and what role they can play in achieving building decarbonization over a short timeframe of less than 30 years. For example, do utilities need to fundamentally change the function and form of their efficiency planning, programs, and evaluation to increase building performance and grid integration at a level required to meet Washington's 2050 economy-wide emission limits? And, if so, how should this transformation be implemented and what are the regulatory barriers within the current regulatory context? To explore these questions, this paper provides an overview of Washington's building decarbonization policy trajectory, discusses implications for Washington's utility programs, and recommends strategies for aligning utility resource planning, program design, and evaluation with the state's overarching policy trajectory. It approaches these challenges from the perspective of the largest municipal utility in Washington, Seattle City Light (City

Light), and the difficult, strategic decisions that must be made regarding the viability of measure-based programs within a policy context structured to transition to a carbon-neutral building stock statewide within less than 30 years.

Policy Context

2021 Washington State Energy Strategy

The Washington State Department of Commerce (Commerce) developed the 2021 Washington State Energy Strategy in 2020 as a comprehensive roadmap to meet economywide statutory greenhouse gas (GHG) emissions limits - these were revised during the 2020 legislative session, which included reducing GHG emissions to 45% below 1990 levels by 2030 and 95% below 1990 levels by 2050 (G.G.E.R. 2020). Washington's greenhouse gas (GHG) emissions have grown by about 10% since 1990, which means that achieving an emissions limit of a 45% reduction by 2030 will require a 53% reduction from 2018 emissions. Importantly, Washington's building sector emissions have increased by 50% since 1990 (Commerce 2020), requiring a significant course correction to meet the state's emissions limits.

The decarbonization analysis conducted for the State Energy Strategy shows that the lowest cost approach to decarbonizing the Washington State economy would require large-scale electrification of buildings, with expensive synthetic fuels and renewable natural gas (RNG) reserved for difficult to electrify loads in other sectors (e.g., in the transportation and industrial sectors). In this scenario, a high fraction of fossil fuel-fired space and water heating in buildings would be electric and highly efficient by 2050. To meet these goals in accordance with natural replacement cycles, high-efficiency electric space and water heating equipment must constitute nearly 100% of the sales share of new and replacement equipment by 2035, and nearly 100% of equipment saturation by 2050. This scale of change implies that a combination of decarbonization-focused state and municipal policies, utility programs, and market forces must deliver 100% market transformation by 2035 to achieve the state's 2050 goals.

State Energy Codes and Standards

For more than ten years, the Washington state legislature has developed the state's clean building laws to advance deeper energy efficiency and building decarbonization across an increasingly broad array of building types. Key aspects of this these laws have targeted the state energy code and the recently developed statewide BPS. Historically, Washington has had one of the most efficient energy codes in the country. Progress in the Washington State Energy Code (WSEC) has largely been driven by 2009 legislation requiring code to deliver homes and buildings that use 70% less energy to help meet the broader goal of zero emission buildings by 2031 (E.R.B.S 2009). Including a specific endpoint and goal for energy use and GHG emissions in the WSEC has helped focus code development cycles and has led to successful incremental achievements toward the overall goals. The BPS is a first step in establishing a similar trajectory of energy and emissions reductions for existing buildings.

The State Building Code Council has made steady progress on the WSEC mandate. However, the savings are more on track for residential buildings than commercial. The code is close to exhausting achievable new construction lighting savings in new construction so additional savings will likely need to come from HVAC, envelope, plug loads, and hot water. As the savings required by code increases, it will become more difficult to meet the code without high-efficiency electric equipment, such as heat pumps. There is an opportunity for Washington utilities to play an increasing role in statewide building decarbonization by aligning with the code's goals and helping the market systematically transition to zero carbon buildings between now and 2030.

In 2019, the Washington State legislature passed the BPS (S.E.P.S. 2020). The BPS applies to commercial buildings above 50,000 square feet and includes initial compliance years in 2026, 2027, and

2028 depending on building size. Commerce developed EUI targets for more than 100 building types. For nearly all building types, the existing building EUI targets were developed as a 15% reduction from the statewide average EUI for the corresponding type. Buildings with a permit application date of July 1, 2016, or later must meet targets 15% lower than the existing building targets, for a total of which is 30% below the EUI average. By including two vintage levels for the EUI targets, the BPS can simultaneously act as a mandate for reducing energy use in existing buildings and as an outcome-based backstop to the energy use reduction targets in the energy code mandate already established for new construction.

City of Seattle Climate Action Plans and Policies

The City of Seattle has a climate action plan and several resolutions that provide additional context for City Light's (the municipal utility) program trajectory. Unlike the state's emissions limits, which are established at the economywide level, Seattle's 2013 Climate Action Plan includes sector-specific energy and emissions reduction targets for commercial and residential emissions and energy use reduction (OSE 2013). The 2013 Climate Action Plan targets for buildings are not at the level of detail, in terms of building type and size, that is typically included in City Light's conservation potential assessments (CPA). However, the targets are focused on achieving a specific endpoint level of energy use performance and emissions reductions by a specific year in alignment with Seattle's climate action commitments. Alternately, the CPAs are currently focused on quantifying bottom-up efficiency using individual measures and technologies that can be achieved within cost-effectiveness constraints that do not consider the City's endpoint energy and emission reduction objectives.

The Seattle Climate Action Strategy released in 2018 includes updated building sector strategies such as developing performance standards for commercial and multifamily buildings and providing programs and incentives to spur improved energy efficiency and reduced carbon emissions, backed by a minimum performance standard beginning in 2030 (OSE 2018). The 2018 update also directs City Light to scale- up pay-for-performance efforts and pilot an Energy Efficiency-as-a-Service program. These proposed actions are focused on accelerating and deepening energy and emissions reductions, and address savings at the whole building level.

In 2019, the Seattle City Council unanimously passed the Seattle Green New Deal (GND 2019) a resolution that, among other things, commits Seattle to aggressive goals such as making Seattle free of climate pollutants by 2030.[1] In addition, Seattle has its own energy code, which supersedes and is a more stringent version of the WSEC. The Seattle Energy Code (SEC) is updated every three years as an amended version of the commercial edition of the WSEC (SDCI 2021). It is typically about 10% more energy efficient than the WSEC and is moving on a more aggressive pace to prohibit inefficient electric resistance and fossil fuel fired space and water heating. With some exceptions, starting June 1, 2021, the 2018 SEC prohibited electric resistance and fossil-fuel fired space heating equipment in commercial and multifamily buildings, as well as central service water heating in hotels and multifamily buildings starting January 1, 2022. With some exceptions, these new provisions apply to both new and existing buildings.

The 2018 WSEC and SEC requirements along with other mandates like the BPS will start to shift combustion and electric resistance equipment to heat pumps in new and existing buildings, which will add some electric load and could greatly increase the lost opportunity risk for heat pumps and other efficiency measures as new and replacement systems are installed. As buildings increasingly centralize their energy loads around electricity due to new energy code and BPS requirements, performance-based whole building compliance pathways and programs will increasingly become the most rational option for reorienting utility incentives toward building decarbonization goals and policies.

[1] The Seattle Green New Deal defines climate pollutants as those that cause shifts in climate patterns, including carbon dioxide, black carbon, methane, nitrogen oxides, and fluorinated gases.

Seattle City Light Plans

As described throughout this section, whole building energy benchmarking, energy management, and performance-based targets are being built into policies at both the state and municipal level. In addition, City Light offers multiple whole building programs for new and existing buildings. However, there is an increasing need to improve alignment across these policies and programs, eliminate redundancy and/or contradictions in requirements, and to best apply the unique capacities of various actors at the state, municipal, and utility level.

The authors of this paper conducted a study for City Light that reviewed the utility's 2018 Integrated Resource Plan (IRP) Update, the 2020 IRP Update, the 2019-2024 City Light Strategic Plan, the 2018 and 2020 CPAs, and the objectives and methodology for the 2022 CPA in progress at the time. The purpose of this review was to identify key trends and gaps in how these planning efforts align with the larger policy context. The recent IRP updates and strategic plan generally acknowledge the changing policy context as well as changes in customer preferences. Although the potential for increased building electrification is identified, it is unclear whether City Light intends to commit to building electrification or only assess the potential impacts of market and policy driven electrification. In the upcoming 2022 IRP, loads may be forecast to increase beyond adequacy depending on the degree to which transportation and building electrification are considered in the forecasts at the level required to meet Seattle emissions limits. If this is the case, the need for predictable levels of efficiency, flexible demand, and other energy optimization strategies may significantly increase, and traditional approaches to demand-side resources and cost-effectiveness, may be inadequate to deliver on emissions limits.

City Light conducts a CPA every two years. Historically, the CPAs have focused mainly on efficiency potential in the commercial, residential, and industrial sectors. The nature, relevance, and value of the CPAs are of particular importance since these assessments reside at the nexus of load forecasting, resource strategy, and program implementation. In this capacity, the CPAs integrate and utilize multiple analytical and planning inputs and outputs at a granular and macro level, all of which hold significant potential value for program planning as well, both in an efficiency paradigm and in a decarbonization paradigm. Our review of the CPA concluded that the CPA objectives and methodology are currently too narrow to assess the full scope of the building decarbonization challenge since they do not address building electrification, deep energy savings, or the full cost savings potential from whole building design strategies. Although the current CPA methodology, including kWh savings estimates and total resource cost (TRC) cost effectiveness, is coherent and analytically sound in relation to meeting load growth and complying with state conservation requirements, it is not designed to deliver a roadmap to achieve the deep efficiency and decarbonization required to meet the complex, cross-sector goal of achieving a carbon-neutral economy.

Statutory emissions limits and associated climate action strategies indicate the need for deep reductions in energy use combined with the near elimination of GHG emissions from buildings by 2050, whereas the 2020 CPA does not account for increased loads due to space and water heating electrification. And it calculates that only 3% of residential baseline electricity sales and 14% of commercial baseline sales can be cost-effectively reduced by 2040. These two future scenarios are incongruent. Until they are reconciled at a structural level in terms of the changing context and required role of electricity and efficiency as decarbonization policy tools, City Light utility programs will become increasingly sandwiched between the narrow "efficiency as a resource" internal ecosystem of its CPA on one hand, and the demands and dynamics of an emerging "decarbonization as an outcome" external policy- and market-driven ecosystem on the other hand.

Utility Program Implications

As state-level clean energy policy creates strong alignment across emissions limits, sales share targets for high-efficiency electric equipment, and comprehensive mandates to regulate energy use and GHG emissions, clear dates emerge to achieve the policy timelines. To meet key milestones by 2035, utilities have less than 15 years before 100% market transformation must be achieved in terms of sales share. This section reviews how utility planning and programmatic efforts are situated in an increasingly ambitious, uniform, and predictable policy context. It will specifically look at how utilities can increase certainty and limit risk by structuring planning and program efforts to directly deliver on these endpoint goals within the required timeframe. The outlined findings can then be used as planning and program design inputs to help shape a more proactive, longer-term plan for how to evolve load forecasting, potential assessments, and program design efforts. A case study of Seattle City Light will be used to discuss the opportunities and barriers in implementation.

Utilities Need to Decide if They Will Play a Fundamental Role in Decarbonization

Despite 20 years of climate commitments, action, and utility programs, Seattle's communitywide emissions have only decreased by less than 5% in the ten-year period between 2008 and 2018. During this time, Seattle has seen a historic amount of new development and increase in population which may contribute to the relatively small emissions reductions which has hampered the city's ability to meet increasing goals. However, in order meet Seattle's 2030 emissions limits, emissions must decrease by over 50% more between 2018 and 2030. Utility programs have been successful at meeting electricity load growth with incremental improvements and a relatively small rate of market penetration and should be used as one of many tools to achieve decarbonization goals; however, the magnitude of reductions in energy use and building sector emissions needed to meet climate goals is massive and urgent so City Light must determine whether it will play a fundamental and central role in decarbonizing Seattle's building stock in alignment with the state-level codes and policies.

It is becoming clear that a critical part of Washington's approach to reduce GHG emissions involves almost 100% electrification of the building sector space. With this clarity at the strategic level, climate action recommendations and proposed policies and mandates toward electrification are a key building decarbonization mechanism, not displacing natural gas with green hydrogen or RNG fuels. These fuels are used in combustion equipment that is not as efficient as high-efficiency electric equipment, are less certain from a market readiness perspective, and more costly at the level of individual buildings and the economywide transition. As a result, policy-driven building electrification is on the cusp of transforming the utility program context over a short 10 to 15-year trajectory. City Light's carbon neutral electricity should be considered a critical part of leveraging this market transformation as will the net-zero-ready and carbon-based compliance metrics in both energy codes and building performance standards. Together, even when policies and mandates do not explicitly forbid fossil fuel equipment, these approaches will ultimately steer building owners away from combustion equipment which, is much less efficient compared to high-efficiency electric equipment.

How the Market Must Transform by 2035

The sales share for key emissions reducing technologies is an important metric to inform mandates like the energy code and the BPS and, in turn, should inform City Light's program trajectory. To achieve a nearly 100% electrified building stock, the market must transform to selling high-efficiency electric equipment exclusively by 2035, and the ratio of electric to gas equipment in sales share must hit 75% as early as 2030. To effectively deliver on the emissions targets in aggregate at the state or city level,

mandates and complementary policies must be structured to drive a shift in market decisions at these levels across the building stock, otherwise it will be physically impossible to meet the limits.[2]

Once the mandates are structured to deliver these sales shares, the programs that are conditioned by the mandates must be geared toward achieving these sales shares so they can stay ahead of the market and accelerate market capacity to meet the mandates. In this sense, the decarbonization policy paradigm is like the energy efficiency paradigm developed in the mid- 1970s, where utility programs were designed to deliver efficiency as a resource and primed the market for new energy codes. While the old paradigm had no defined endpoint or timeline for market transformation, we must now orient mandates, complementary policies, programs, and market transformation efforts to achieve a clear market transformation endpoint in less than 15 years. The need to fund this work and establish clear consequences of not achieving this transformation must be prioritized in policy contexts. In addressing this new reality, City Light, and other Washington utilities, must adapt and restructure the goals and methodologies for its resource planning, potential assessments, and program design and implementation to accelerate market transformation.

Mandates Are at the Core of Climate Action Strategies and Present an Opportunity to Define What Programs and Evaluation Is Needed

There is a trend toward using mandates as comprehensively as possible across the entire building stock, including both new and existing construction for all building types. For example, whereas new construction programs have historically been aligned with new construction mandates in the form of energy codes and appliance standards, existing building programs now must also consider mandates in the form of BPS that will likely be extended to nearly all building types, sizes, and vintage in Washington State by 2030. Syncing utility programs with BPS and other retrofit mandates will be critical as existing infrastructure produces a large share of regional building carbon emissions. The shift to considering decarbonization in addition to conservation is driven by the need to transition the entire building stock at a scale and pace that far exceeds the conservation accomplishments of utilities over the past 30 to 40 years.

While Northwest utility program designs have historically accounted for changes in the character and requirements in energy codes, appliance and materials standards, and utility regulations, the ecosystem of emissions limits and building mandates is on track to change significantly by 2035. Whereas previous mandates were mostly focused on like-for-like, fuel-type efficiency gains and incremental measures that can be aggregated up to help meet load growth, the new ecosystem of policy-driven mandates that will condition utility programs moving forward differ from measure-based planning. The following recommendations demonstrate ways utilities can shift from an energy conservation approach to focusing on more holistic goals in the future:

1. **Commitment to zero carbon end state.** Decarbonization is the end state goal that drives the mandate designs.
2. **Backcasted planning approach.** Policies and mandates are backcasted from a carbon-neutral endpoint, rather than projected as efficiency potential to offset new resources.
3. **Structured around energy optimization.** Based on “energy optimization” required to meet emissions limits on an economywide basis, the mandates draw on and include performance metrics for the optimal mix of efficiency, electrification, fuel decarbonization, demand response, renewables, storage, etc.

[2] The economics of market transformation is an important topic and not covered in this paper.

4. **Focused on whole building and whole sector performance outcomes.** Optimized energy outcomes are to be achieved at the whole building level with granular targets by building type and size segments, and near 100% market penetration across all units.
5. **"Lowest overall/reasonable cost" analysis**. Mandates such as the energy code have reframed the economic criteria from "cost-effective" to the "lowest overall cost" to meet policy goals. Cost analysis based on lowest cost strategies is designed to achieve policy goals at the lowest cost, rather than only if they can be justified through typical resource cost tests.

Utility Planning and Program Recommendations

City Light currently relies mostly on energy efficiency to meet its load growth. However, in a scenario of the future where the state and Seattle must meet emissions reduction limits, the utility may need to significantly increase efficiency as well as renewable electricity supply to power electrification in buildings and transportation. Moreover, to align with the 2035 market transformation imperative described in the State Energy Strategy, City Light would need to transition its planning and programs by 2025 so that they can hit target sales shares by 2035 or earlier.

In 2019, Seattle City Light started studying how they could better orient new construction programs around an energy optimization framework to better align with emerging policies designed to deliver whole building performance and electrification. The current programs have been in operation since the early 1990s and historically provided funding for cutting edge technologies above energy code. With the advancement of energy codes and the introduction of new building sector mandates and policies, the need to change programming goals and objectives was identified, but the changes were met with organizational and programmatic barriers. City Light's work to shift their programming to an energy optimization framework will be an example of the opportunities and challenges in making the difficult strategic decisions regarding the viability of measure-based programs within the state and local policy context.

Strategic Alignment of City Light Planning and Programs with Policy Trajectory

Current City Light energy efficiency programs, integrated resource planning, and conservation assessments are not fully in sync with the emerging policy paradigm. Although, in many instances they acknowledge emerging market and policy trends and account for some aspects of the shift toward decarbonization and behind-the-meter solutions, overall, they remain fundamentally structured within an energy efficiency paradigm designed to meet load growth. The utility is set up to successfully address critical planning considerations such as resource adequacy, infrastructure requirements, equity, rates, etc. But by not backcasting from the statutory emissions limits, planning may not be adequately addressing the specific challenges and opportunities that City Light would face if the emissions limits were to be met. Aligning with decarbonization goals would allow load forecasts to be aligned with the changes required to transition the building stock.

The risk of running programs with out-of-sync program designs is that it can perpetuate a reactive posture, where programs are adjusted to account for recent policy changes but lack an overarching roadmap of their own for how to evolve over time and best account for and fully leverage imminent policy changes. What the programs are currently achieving is a small fraction of what is necessary to meet 2030 and 2050 emissions limits and the energy reductions required to offset electrification. Ultimately, if the endpoint at the city and state level is a carbon neutral economy and building stock within the next 30 years, City Light resource planning, programs, and evaluation must be designed around similar objectives and must significantly accelerate efforts to achieve them.

The strategic change needed to effectively meet the required emission reductions and align with policies and mandates requires institutional and organizational change at multiple levels. Adopting a different framework will require iterative changes to historic institutional practices. This will require that management and key stakeholders, such as City Council members, recognize that it is essential to prioritize a planning and program design trajectory focused on the framework emerging at the state and city level. Existing systems and programming can pivot but sponsorship for the proposed changes will determine the successful adoption of change management objectives. Whether or not policies, such as building electrification, are actively promoted by City Light at a strategic and programmatic level, it will happen at some level in the market and this shift will have several potential implications for City Light's 10- to 15-year planning and program trajectory. Some of the most salient issues and implications of not embracing these changes include:

- Potentially unpredictable and larger electric loads increase the need for a whole building performance approach and support for comprehensive energy optimization to ensure deeper, empirically realized, and persistent savings. Simultaneously, centralizing total building energy load as electricity makes whole building programs more viable for City Light and could help avoid lost savings from hard-to-verify tradeoffs from lighting savings on the electric side and HVAC savings on the gas side. In this sense, increased participation in whole building programs, in part driven by electrification, could also help City Light ensure significant, estimated lighting savings are actually realized.
- Increased uncertainty for Seattle to successfully meet electric loads and emissions limits if City Light does not directly incentivize building electrification and high-efficiency technologies when new electric equipment is installed. For example, , some amount of building electrification is likely to happen with or without City Light's intervention, but it will likely happen in a more haphazard and less predictable way in terms of the timing, volume, efficiency of the new or replacement electric equipment, and other acute considerations such as equity, geographic distribution, and substation impacts. Thus, a decision not to lead the building electrification transition is not a decision to avoid electrification, but rather a decision to not embrace an opportunity to play an instrumental role in the character and outcomes of the electrification that is about to unfold.
- The most critical inflection point for City Light may be that if the utility does not drive building electrification in Seattle, the City likely cannot hit 100% sales share of high-efficiency electric equipment by 2035, and if it does not hit this technology target, it will be more expensive and potentially impossible to meet its emissions limits by 2050. Since electrification is the main viable mechanism for decarbonizing Seattle's building stock, City Light is at a crossroads where the decision around if and when to lead building electrification may be, by default, a decision of whether Seattle as a community will or will not meet emission limits.

Program Changes Needed Now

Other utilities face a similar crossroads of needing to reorient utility programs to achieve a clear market transformation endpoint around mandates. While opportunities to redesign and modernize program goals and objectives arise, so do barriers to enacting changes at the utilities including existing policies and organizational structure of utilities. Legacy structure and resistance to change are two critical pieces to address for a successful transformation. As a municipal utility, no regulatory body sets the required path forward for the utility outside of statewide energy efficiency targets and City Council directives. This can result in greater flexibility to forge strategies and approaches to program design that is customer centric and more inclusive of general mandates and policies. The hinderance of this approach is when it comes to regional scale, specifically for market transformation. If not directed by a regulatory

body, utilities must self-organize in a way that most effectively moves a region. Additionally, if programs are being redesigned and have a legacy, efforts to change them contend with the cultural inertia of the program and stakeholders. Change management, therefore, is a critical component to successfully moving from the old paradigm of energy efficiency programs to the time bound needs of decarbonization. The advocacy and sponsorship of change by management is likewise critical.

The consultant team made the following recommendations to City Light to inform changes at the program level and guide high level sponsorship discussions – these recommendations can be adopted by other states and cities across to reach goals:

1. **Segment programs by type and size.** The energy code and BPS are becoming more targeted by specific building types and sizes. Internalizing this in program designs could help the utility deepen savings for most building stock square feet. Strategies could include:
    - Focus marketing on whole building performance programs to all BPS-covered buildings, including all new and existing buildings greater than 50,000 square feet.
    - Develop a targeted, simplified program for commercial and multifamily buildings under 20,000 square feet.
    - Develop a targeted, high-efficiency, all-electric program for low-rise multifamily
2. **Start to shift to whole building performance-based programs and SEM** to deliver a higher ratio of overall program savings for commercial and multifamily buildings. Whole buildings that rely on integrated design and controls (as well as efficient lighting) can achieve significant EUI reduction within conventional construction budgets. And SEM can be used to sustain the gains from initial performance over time. By 2030, the state BPS will likely be extended to buildings larger than 10,000 square feet for both new and existing construction, and by 2035 the EUI targets for all sizes of new construction will likely be nearly net-zero-ready.
3. **Create a decision diagram with targeted program paths for various sizes and types.** This could embed a strategic direction into program implementation and could also be used to help participants understand their programmatic options, especially in relation to the code and BPS.
4. **Require significantly lower LPDs in lighting programs.** To the degree that City Light does not subsume lighting savings within whole building programs, lighting incentives should require higher savings for incentives. The target LPDs should probably be about 30% lower than the WSEC and 20% lower than the SEC to ensure that the savings exceed naturally occurring and/or easily achievable levels in relation to current market practice, are not used to displace mechanical system savings, and to prepare the market for the 2021 code.
5. **Adapt whole building performance programs with** the BPS structure**.** Savings could be calculated based on the difference between the actual building EUI/GHG Intensity and the state or a Seattle BPS for newer construction by building types. However, the target would need to be set as a significant increment from the BPS requirement toward a 2030 energy code endpoint target EUI. This approach would be a departure from a counterfactual approach to estimating savings using a calculated forecast baseline. Instead, the baselines would be based on average EUIs The savings could be significant enough to override concerns over a lack of a modeled baseline, assuming the EUI targets are set low enough, the mandates provide an incentive for buildings to achieve and/or exceed the BPS targets, and the utility conducts performance-based verification.
6. **Continue to advance utility program staff technical capabilities in delivering deep energy and carbon savings in whole buildings.** Fortifying technical expertise in things like EUI analytics, heat pumps, end use metering, and controllable technologies will help ensure an effective shift from a heavy reliance on lighting measures toward HVAC, water heating, and demand response programs. This effort could be in the form of programmatic expertise as well as expansions into market support, like a heat pump lab.

7. **Explore lower cost tools for estimating EUIs.** Full energy modeling is expensive, but most new commercial buildings will soon need to meet BPS outcome-based performance targets. This is an issue that City Light could address in partnership with the state and regional organizations.
8. **Shift programs upstream.** More focus on market development and transformation will help building owners meet mandates. This effort should ensure that Seattle and surrounding markets are prepared for a full market transition by 2035. It could include continuation and development of midstream and upstream efforts. City Light should develop a market transformation plan for this effort and collaborate with other city departments, other utilities, the state, NEEA, and others to develop and implement it with a combination of programmatic and market interventions, tightly aligned with the energy code and BPS through 2035. For example, City Light could establish market transformation targets and metrics for its service territory to gage the success of program goals and achievements, especially in terms of market penetration by 2035. There is also a building decarbonization research gap at the regional and state level that must be bridged collaboratively to identify the best designs for all-electric new and existing construction. The results of this research could inform how buildings can best meet the energy code and the BPS, at the least cost and with the lowest impact on City Light's grid.

A Fundamental Transition for Evaluation

Building on past decades of experience and success, evaluation practices should evolve as programs transition from siloed energy efficiency and capacity resource planning contexts to a holistic energy optimization and decarbonization context. Evaluations have traditionally been reactive to support existing policies and to ensure programs are effectively achieving efficiency targets and other policy goals. In recent years, policies to decarbonize buildings have accelerated faster than programs and evaluation practices have been able to keep up with, often due to regulatory constraints that are inconsistent with new policies. Not only do evaluation practices need to catch up, but they should also be getting out in front to inform how programs should further evolve from offsetting load growth toward energy optimization driven by carbon emissions targets as well as justice, equity, and workforce development goals. As laid out in the previous sections, rapid transition of energy efficiency programs over the next decade is imperative to meet carbon emission limits. This section lays out ideas for evaluation practices to inform resource planning, appropriate cost-effectiveness tests, and program design in a target-based future. It also presents further questions that need to be addressed.

The following are some suggestions of what should be feasible to do currently in most regions, largely by simply leveraging utility meter data.

- Calculate percent reduction in energy use at the whole building, building size and type segments, and portfolio levels
- Analyze time (of day, week, month, year) of energy savings
- Persistently assess persistence – in addition to current program year being evaluated, select buildings that participated in previous program years to evaluate persistence of savings at the whole building level
- As more granular carbon accounting data becomes available, estimate carbon emissions and percent reductions associated with energy and demand savings

Evaluators should then use these findings to compare portfolio-level achievements to the stated end point goals established by policy. Understanding the outcomes of programs at the portfolio level will serve to shift how CPAs and resource planning are done. For example, evaluations could examine

distribution of energy efficiency spending compared to optimal distribution for greatest impact, by identifying customers who are the biggest energy users and carbon polluters and examining which of those have market-ready solutions. This can be incorporated into market potential research studies to prioritize and optimize program administration. For the high energy use customers without market-ready, emission-reduction solutions, evaluations could recommend emerging technologies that program administrators should study further to possibly accelerate to the market.

Due to the need for rapid transition in the next few years, programs should scale embedded evaluation to monitor programs' performance outcomes (energy and carbon targets) for near real-time feedback and course-correction. This would serve to not only improve programs, but also resource planning and policymaking. If interim targets are not being met, then policies, plans, and programs should adjust to more assertively accelerate reductions in carbon emissions.

There are many non-energy impacts that come with drastically reducing energy use of buildings, such as improved indoor air quality from electric heating and cooking appliances, increased market value of buildings, grid capacity opened up for charging electric vehicles, and local, living wage jobs. Evaluations should increase efforts in collecting and analyzing data on a broader set of metrics than energy use reduction to improve program cost effectiveness.

Evaluations could also seek to inform how to value the accelerated march toward low energy, carbon-neutral buildings. What should the avoided costs be based on? From the building owners' perspective, maybe it means having certainty in what the end goal is and being able to do capital improvement planning in a holistic way, rather than reactive, uncoordinated projects done piecemeal over time (which inevitably costs more). Evaluators could collect data to inform programs about customers' capital improvement planning. From the government and rate-payer perspective, maybe avoided cost means comparing the cost of minimizing catastrophic climate change now to the cost of responding climate disasters in the future. Evaluators could report projections of avoided mitigation and disaster response spending based on carbon emissions reductions caused by the evaluated programs.

Even within the traditional avoided cost approach, evaluations could expand the study of which technologies help to "right-size" centralized and distributed production and storage and grid capacity to avoid the cost of overbuilding infrastructure which has historically been designed to worst-case, peak demand scenarios. What can evaluation do to inform how much additional energy efficiency is needed to offset increased load from electrification of transportation and space and water heating? How can evaluation encourage programs that leverage grid-integrated buildings as Distributed Energy Resources (DERs) and virtual batteries? Do some energy efficiency, electrification, energy storage, and distributed renewable generation measures make more sense than others in this context? Can the decarbonization perspective help prioritize which measures should be implemented where?

Finally, with the scale of energy use and emissions reductions needed over the coming decade, there is a critical need to grow the workforce which brings opportunities to diversify it with local, living wage jobs that improve communities. Accordingly, evaluators should expand efforts to understand and help programs address equity and workforce development challenges. During evaluations, data should be collected to identify which ratepayers are being underserved by their programs, which households and small businesses are experiencing high energy burdens, and which segments of the working population are under-represented in the industry. This data should be collected and analyzed consistently over time to ensure progress toward diversity, equity, and social justice goals along with climate goals. It can also serve to inform non-energy impacts, further boosting the benefits of investment in decarbonization.

Conclusions

The scale and pace of building decarbonization required to meet Washington state emissions limits is proving to be a checkmate on decades of utility program inertia. State and municipal policies, mandates, and market support are aligning around explicit electrification goals and strategies.

Washington's electric utilities are in a position where they will face a high degree of uncertainty and turbulence if they do not actively support this transition and contribute to taking sales share ratios of high-efficiency electric equipment to scale by 2030. Considering the time required to ramp up both policies and programs, they will need to be designed, operational, and on a trajectory toward 2030 by at least 2025. This means that there are very few years left to make large shifts in utility regulation, resource planning, program design, and implementation. Washington state utilities such as City light should develop both 2030 and 2050 strategic building decarbonization plans so they can quickly start addressing the dissonance between their programs and decarbonization-driven market transformation imperatives.

References

Energy-Related Building Standards (E.R.B.S), RCW 19.27A, 2009. (https://app.leg.wa.gov/rcw/default.aspx?cite=19.27A)

Greenhouse Gas Emissions Reductions—Reporting Requirements (G.G.E.R), RCW 70A.45.020, 2020. (https://apps.leg.wa.gov/rcw/default.aspx?cite=70A.45.020).

Seattle Department of Construction and Inspections (SDCI) 2021. "2018 Seattle Energy Code." Seattle: SDCI. (http://www.seattle.gov/sdci/codes/codes-we-enforce-(a-z)/energy-code#2018seattleenergycode)

Seattle Green New Deal (GND), Resolution 31895, 2019. (http://seattle.legistar.com/LegislationDetail.aspx?ID=4078775&GUID=A91E660A-1F3A-4545-8D24-281916F6EDB4&FullText=1)

Seattle Office of Sustainability and Environment (OSE) 2013. "Seattle Climate Action Plan." Seattle: OSE. (http://www.seattle.gov/Documents/Departments/Environment/ClimateChange/2013_CAP_20130612.pdf)

Seattle Office of Sustainability and Environment (OSE) 2018. "Seattle Climate Action Strategy." Seattle: OSE. (http://greenspace.seattle.gov/wp-content/uploads/2018/04/SeaClimateAction_April2018.pdf)

State Energy Performance Standard (S.E.P.S), RCW 19.27A.210, 2020. (https://app.leg.wa.gov/RCW/default.aspx?cite=19.27A.210)

Washington State Department of Commerce (Commerce) 2020. "2021 Washington State Energy Strategy." Olympia, Washington: Commerce. (https://www.commerce.wa.gov/wp-content/uploads/2020/12/Washington-2021-State-Energy-Strategy-December-2020.pdf)