April 4, 2023

MEMORANDUM

TO: **Council Members**

FROM: **Jennifer Light, Director of Power Planning**

SUBJECT: **Report out on Regional Technical Forum Assessment into Valuing Resilience from Efficiency**

BACKGROUND:

Presenter: Jennifer Light

Summary: The Council's 2021 Power Plan was developed during a time where extreme weather events – such as Winter Storm Uri and the northwest heat dome – significantly impacted the power system. These events also had negative downstream impacts on consumers, including loss of life and property. Recognizing the role that weatherization of homes and buildings could have played in reducing these downstream impacts, the Council included in the Conservation Program direction to the Regional Technical Forum (RTF) to develop a methodology for quantifying the value of energy efficiency in supporting resilience. The specific focus was on the role that weatherization could play in supporting home and building resilience.

In 2022, the RTF contracted with Apex Analytics to develop a starting point for this analysis. This work included both a literature review and the development of a draft approach for quantifying resilience. The literature review highlighted that while many areas are thinking about resilience, specifically with a focus on grid resilience, no specific approaches have been developed yet to quantify the value that weatherization provides for building resilience. This required Apex to develop a new approach by

identifying data sources and developing a methodology and tool to ultimately provide an initial quantification of the value. This work demonstrated that it is possible to quantify this value to inform power planning.

Staff will share the drivers for this work, as well as an overview of the findings. This project provides an important starting point for continued improvement as we work to address both the grid and buildings in the development of the Council's next power plan.

Relevance: The Council's 2021 Power Plan called on the RTF to develop a methodology for quantifying the resilience value of energy efficiency, with a focus on weatherization. A well-insulated home or building will better maintain comfort during power outages and extreme weather events. This project develops a first of its kind approach to quantifying this value, and it provides a starting place for further analysis. Staff will build off this work as it continues to enhance methods and analysis in advance of the ninth power plan.

Workplan: Preparation of Tools and Data for the Ninth Power Plan – Develop methodologies to quantify flexibility and resilience impacts from energy efficiency

More Info: Documentation on the literature review conducted for this project and the resultant methodology developed are available on the RTF's website at this link: https://rtf.nwcouncil.org/other/energy-efficiency-resilience-valuation-methodology-study/

Valuing Resilience from Weatherization of Buildings

Jennifer Light

April 12, 2023

Presentation Overview

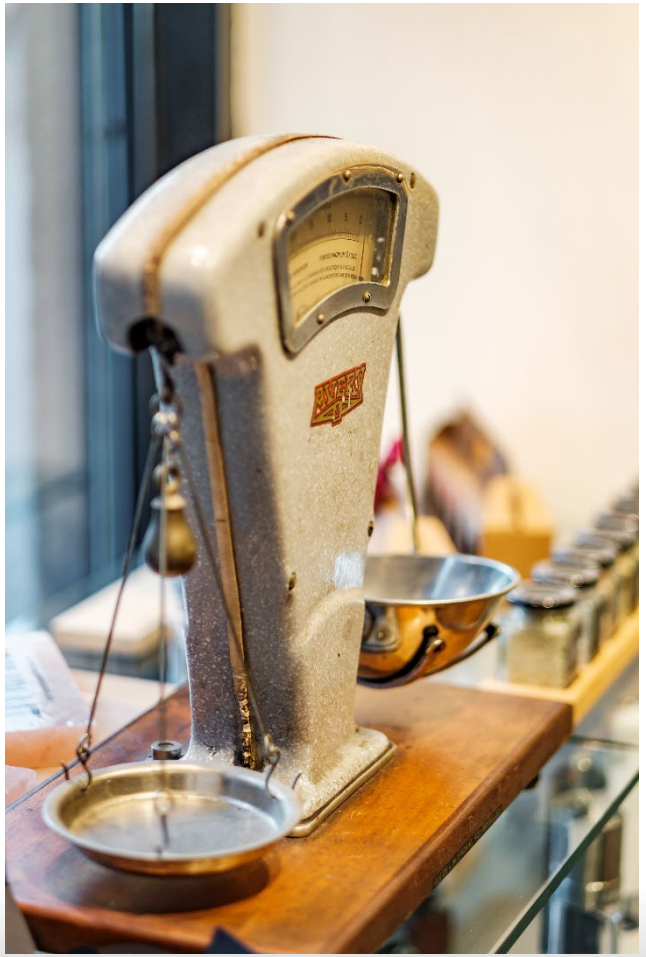
Objective: Share out recent work developing a method for quantifying the "resilience benefit" of certain energy efficiency measures

Topic overview:

- Brief reminder of how we compare resources
- Context for this specific analysis
- Overview of methodology developed
- Next steps for considering resilience in planning

Comparing Resources for Strategy Development

- Seek to compare supply and demand side resources on as much of an “apples to apples” basis as possible
- Includes representing information on:
  - Energy and capacity provided
  - Costs and benefits of resource
  - Shape of the resource
  - Other attributes as it relates to the power system and the Power Act



System Cost Considerations

"System Cost" as defined by the Act:

"… an estimate of all direct costs of a measure or resource over its effective life, including, if applicable, the cost of distribution and transmission to the consumer and, among other factors, waste disposal costs, end-of-cycle costs, and fuel costs (including projected increases), and such quantifiable environmental costs and benefits as the Administrator determines, on the basis of a methodology developed by the Council as part of the plan, or in the absence of the plan by the Administrator, are directly attributable to such measure or resource."

Northwest Power Act, §3(4)(B), 94 Stat. 2698-9.

Resource Cost Framework

- Methodically reviewed potential attributes relative to the Power Act and documented approach
- Not all considerations were fully quantifiable, relying on qualitative consideration when developing resource strategy

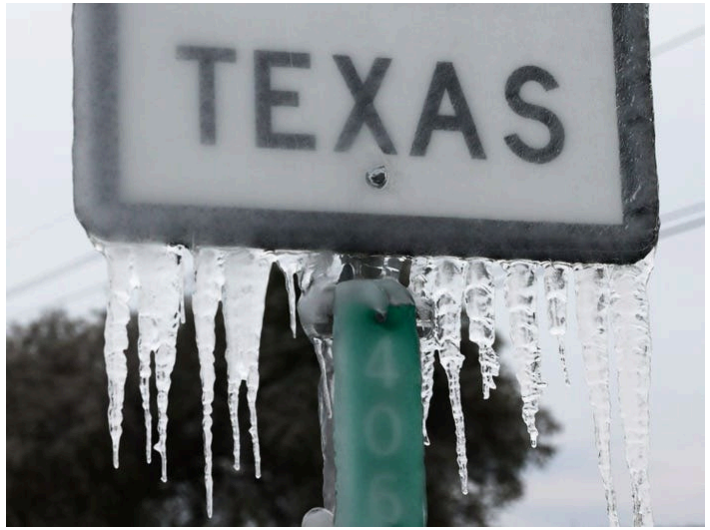
Snapshot of framework documenting 2021 Plan approach:

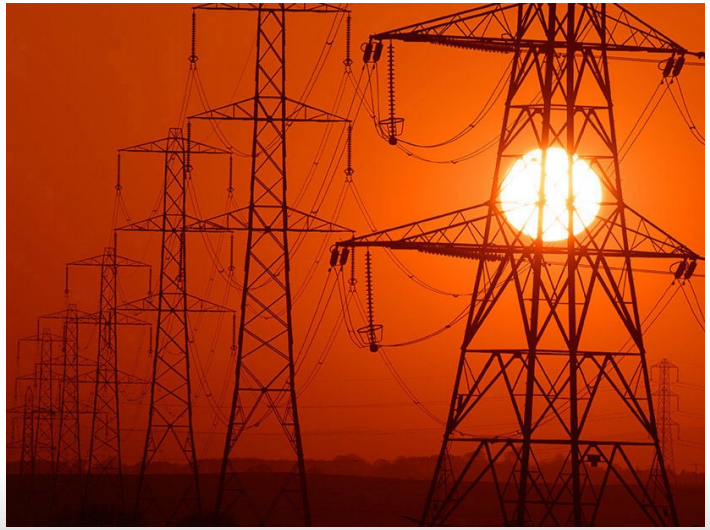
Working Document - Direct Quantifiable Resource Costs

Direction from the Power Act				Council approach to accounting for cost of new resource/technology competing in the power system models			Quantified in power system models
Potential Resource Cost Consideration	**Within the Power Act's definition of "system cost"?**	**Explanation for fit within the Power Act definition**	**Can the cost be quantified within the Council's Power Plan**	**Generating Resources** Supply-side resources, demand-side generating resources (including distributed generation), and energy storage.	**Energy Efficiency**	**Demand Response**	**System** Quantified in Council's power system models - AURORA, Regional Portfolio Model, GENESYS
Capital/incremental cost: Cost of the resource or measure	Yes	The system cost, as defined in the Act, includes the direct cost of the resource. This is a key component of that direct cost.	Yes	Overnight capital cost is estimated for each new reference plant (technology and configuration).	include the cost of the measure. For retrofit measures, it is the full cost of the measure. For lost opportunity, it is the incremental cost of measure over the cost of the assumed baseline	These would be enablement costs, including technology and installation of control device	
Operations and maintenance costs: Cost of operations and ongoing maintenance of the resource or measure, including labor and equipment directly attributable.	Yes	System costs, as defined in the Act, considers the direct cost of the resources over its effective life. O&M costs are needed to estimate lifetime costs.	Yes	Fixed and variable operating and maintenance costs are assigned to each new generating resource reference plant.	These are accounted for directly in the cost of a measure. The O&M costs are estimated as the difference between the costs for maintaining the measure and the costs for the assumed baseline. For retrofit measures, that is full O&M costs. In some cases, the costs may be negative and therefore are considered a benefit for the	Generally includes event notification and verification of savings. These costs would be borne by the utility running the program. There may also be end-use O&M costs due to DR participation for which the incentive would compensate. This could be captured in the determination of what portion of the incentive is included in the costs.	Operating and maintenance costs are calculated for the existing system.
Fuel cost (production): This includes the costs of fuel as part of the lifetime cost of the resource. For example, the cost of gas or coal to fuel production.	Yes	System cost, as defined by the Act, includes fuel costs.	Yes	Not explicitly quantified at the resource level. See system.	Not explicitly quantified at the resource level. See system.	Not explicitly quantified at the resource level. See system.	A set of fuel price forecasts are included in the model and associated with any applicable resource.
Fuel cost (end-use): This accounts for any change in fuel use at the end use as a direct result of the measure.	Yes	System cost, as defined by the Act, includes fuel costs.	Yes	Not currently quantifiable or not applicable	Where a measures results in a reduction (or increase) of a non-electric fuel, that is quantified and value. For wood savings, that is valued at the retail rate of electricity. For gas savings, it values it at the forecasted market price for gas plus carbon	End use fuel switching due to DR could be captured if data existed to do so.	
Transmission (existing, new): The costs paid to reserve or use capacity on the electric transmission system (for all utility scale generating resources) and on the gas transmission system (for resources which combust gas to produce electric power). This may also include the cost of upgrades needed to expand the	Yes	The system cost, as defined in the Act, specifically identifies the cost of distribution and transmission to the consumer to be accounted for in the cost.	Yes	Applicable electric and gas transmission reservation costs are included as fixed costs for each resource. Electric transmission system upgrades or expansion needed to ensure new resource deliverability are allocated across the system and included in the fixed reservation rate; no additional charge or adder is	Not currently quantifiable or not applicable	Not currently quantifiable or not applicable	On/off peak wheeling charge in $/MWh applied to generation on the eastside of the region going to the westside of the region is associated with the equilibrium electricity prices, off which economics of resources and cost of market resources are considered.

What About Resilience?

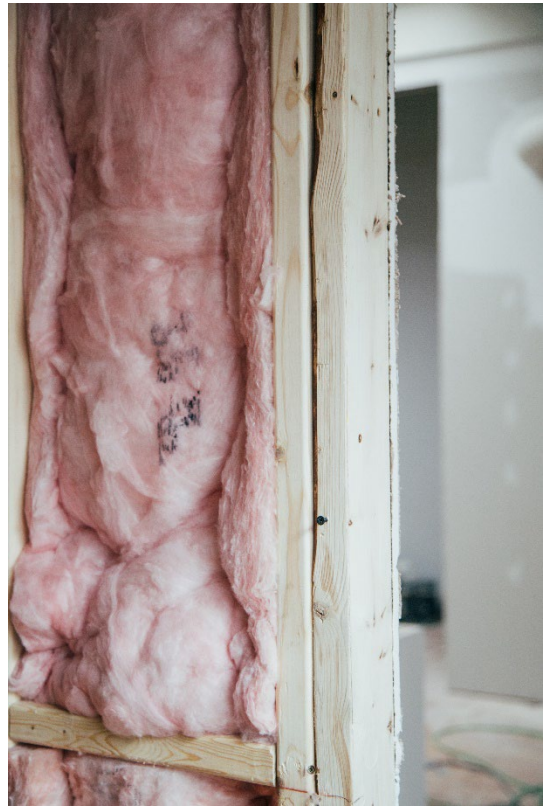
- Power Act seeks an “adequate, efficient, economical, and reliable power supply” and a resilient system is part of this
- Events like Winter Storm Uri and the summer heat dome in the NW highlighted the importance of home and building resilience
- 2021 Power Plan called on the RTF to investigate methods for quantifying the value of resiliency for energy efficiency measures
- Goal was to provide a basis for broader consideration of resilience in next power plan





Focusing on Weatherization

- Conservation Program in the 2021 Power Plan specifically focused on “the building’s ability to withstand a power outage or extreme weather event”
- Weatherization was the key focus as a well-insulated home or building will maintain its conditioned temperature longer during an outage or extreme hot or cold conditions



Key Learnings

- Most current studies focus on grid resilience, with some starting to look at building resilience
- Nobody has formally quantified resilience impacts, but this is an active area of analysis
- Benefits of building resilience from efficiency can be quantified, and this project developed a starting place (more on next slide)

Overview of Methodology

Overlay Weather Data

What was the weather during each of these events (ex: extremely cold, mild, extremely warm)?

Define Outage Events

How frequent are events, how long are the events, and how many customers are impacted by each?

Model Benefits of Adding Weatherization

For each of these events and weather, how much better does a home or building hold its temperature after adding weatherization?

Apply Value of Resiliency

How do we translate that benefit of holding the inside temperature longer to a dollar value?

Resilience Value of Weatherization

What's Next

- Staff will build on this work in preparation for the next power plan, including:
  - Exploring a more granular approach, as resilience impacts are likely to vary based on geography and demographics
  - Considering alternative approaches to improve assumptions, including the event definition and approach to valuing resilience
  - Expanding the approach to other resources, as appropriate, including additional energy efficiency measures (e.g., ventilation, heating and cooling equipment)
- Staff is also continuing to think about the importance of grid resilience for reliability and how to address that in planning of resource needs

Questions