Northwest **Power** and **Conservation** Council

June 7, 2022

MEMORANDUM

TO: Council members

FROM: Annika Roberts, RTF Assistant

SUBJECT: Regional Technical Forum 2021 Annual Report

BACKGROUND:

Presenters: Jennifer Light, RTF Chair, and Annika Roberts, RTF Assistant

Summary: The Regional Technical Forum (RTF) submits its 2021 Annual Report to the Council. This report is intended to inform the Council and stakeholders about the RTF's activities in the previous year and to provide a brief preview of the ongoing work in the current calendar year.

Despite 2021 being another year of meeting and working entirely remotely, the RTF was able to focus on its core efforts of developing consistent and reliable energy savings estimates and methodologies and accomplish a lot over the course of the year. The RTF continued their central work of developing and maintaining conservation measures, including in newer areas like commercial HVAC, as well as improving upon long-standing efficiency measures like manufactured home duct sealing and irrigation hardware. This also included expanding and improving their suite of natural gas measures, building on the groundwork laid in 2020 to develop new measures in natural gas space and water heating. The RTF also worked in 2021 to expand their offerings beyond

unit energy savings, into more complex and nuanced work in hopes of helping programs adapt to the changing energy landscape.

At this meeting, staff will present to the Council on the highlights from 2021 as captured in the Annual Report.

Relevance: The RTF is an advisory committee to the Council. It is funded by Bonneville, Energy Trust of Oregon, and regional utilities. The Council also contributes to the RTF through staff and office and meeting space.

Workplan: B.1.3 Continue to lead the Regional Technical Forum and engage in the development and approval of measure savings estimates and protocols.

Background: Per its charter, the RTF is required to publish an Annual Report by mid-year. The 2021 Annual Report provides work highlights and financials for the 2021 calendar year. It also provides a preview of progress made to date in 2022.

RTF 2021 Annual Report

Jennifer Light and Annika Roberts

June 2022 Council Meeting

Presentation Overview

- Background on the RTF
- 2021 Highlights
  - Expanded measure library & enhanced existing measures
  - Built upon natural gas work
  - Continued to explore ways to expand value
- 2021 Financials

ABOUT THE RTF

Northwest Power and Conservation Council

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Regional Technical Forum

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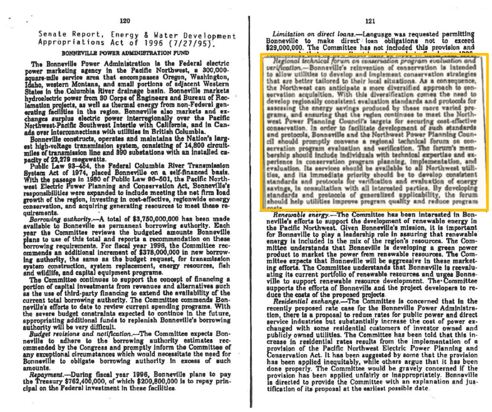
Formation of the RTF

- 1995: BPA shifted responsibility for acquisition of conservation to its utility customers
- 1996: Congress directed Bonneville and Council to convene a Regional Technical Forum* to:
  - Develop standardized protocols for verifying and evaluating conservation savings
  - Ensure region meets Council's conservation targets
  - Include individuals with appropriate technical expertise
  - Ensure services are available to all NW utilities
- 1998: Northwest Governor's Comprehensive Review expanded the mission
- 1999: Council formed the Regional Technical Forum as an advisory committee to the Council



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Senate Report, Energy & Water Development Appropriations Act of 1996 (7/27/95).

BONNEVILLE POWER ADMINISTRATION FUND

The Bonneville Power Administration is the Federal electric power marketing agency in the Pacific Northwest, a 300,000-square-mile service area that encompasses Oregon, Washington, Idaho, western Montana, and small portions of adjacent Western States in the Columbia River drainage basin. Bonneville markets hydroelectric power from 30 Corps of Engineers and Bureau of Reclamation projects, as well as thermal energy from non-Federal generating facilities in the region. Bonneville also markets and exchanges surplus electric power interregionally over the Pacific Northwest-Pacific Southwest Intertie with California, and in Canada over interconnections with utilities in British Columbia.

Bonneville constructs, operates and maintains the Nation's largest high-voltage transmission system, consisting of 14,800 circuit-miles of transmission line and 390 substations with an installed capacity of 22,279 megawatts.

Public Law 93–454, the Federal Columbia River Transmission System Act of 1974, placed Bonneville on a self-financed basis. With the passage in 1980 of Public Law 96–501, the Pacific Northwest Electric Power Planning and Conservation Act, Bonneville's responsibilities were expanded to include meeting the net firm load growth of the region, investing in cost-effective, regionwide energy conservation, and acquiring generating resources to meet these requirements.

Borrowing authority.—A total of $3,750,000,000 has been made available to Bonneville as permanent borrowing authority. Each year the Committee reviews the budgeted amounts Bonneville plans to use of this total and reports a recommendation on these borrowing requirements. For fiscal year 1996, the Committee recommends an additional increment of $378,000,000 in new borrowing authority, the same as the budget request, for transmission system construction, system replacement, energy resources, fish and wildlife, and capital equipment programs.

The Committee continues to support the concept of financing a portion of capital investments from revenues and alternatives such as the use of third-party financing to extend the availability of the current total borrowing authority. The Committee commends Bonneville's efforts to date to review current spending programs. With the severe budget constraints expected to continue in the future, appropriating additional funds to replenish Bonneville's borrowing authority will be very difficult.

Budget revisions and notification.—The Committee expects Bonneville to adhere to the borrowing authority estimates recommended by the Congress and promptly inform the Committee of any exceptional circumstances which would necessitate the need for Bonneville to obligate borrowing authority in excess of such amounts.

Repayment.—During fiscal year 1996, Bonneville plans to pay the Treasury $762,400,000, of which $200,800,000 is to repay principal on the Federal investment in these facilities.

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Limitation on direct loans.—Language was requested permitting Bonneville to make direct loan obligations not to exceed $29,000,000. The Committee has not included this provision and [illegible]

Regional technical forum on conservation program evaluation and verification.—Bonneville's reinvention of conservation is intended to allow utilities to develop and implement conservation strategies that are better tailored to their local situations. As a consequence, the Northwest can anticipate a more diversified approach to conservation acquisition. With this diversification comes the need to develop regionally consistent evaluation standards and protocols for assessing the energy savings produced by these more varied programs, and ensuring that the region continues to meet the Northwest Power Planning Council's targets for securing cost-effective conservation. In order to facilitate development of such standards and protocols, Bonneville and the Northwest Power Planning Council should promptly convene a regional technical forum on conservation program evaluation and verification. The forum's membership should include individuals with technical expertise and experience in conservation program planning, implementation, and evaluation. Its services should be available to all Northwest utilities, and its immediate priority should be to develop consistent standards and protocols for verification and evaluation of energy savings, in consultation with all interested parties. By developing standards and protocols of generalized applicability, the forum should help utilities improve program quality and reduce program costs.

Renewable energy.—The Committee has been interested in Bonneville's efforts to support the development of renewable energy in the Pacific Northwest. Given Bonneville's mission, it is important for Bonneville to play a leadership role in assuring that renewable energy is included in the mix of the region's resources. The Committee understands that Bonneville is developing a green power product to market the power from renewable resources. The Committee expects that Bonneville will be aggressive in these marketing efforts. The Committee understands that Bonneville is reevaluating its current portfolio of renewable resources and urges Bonneville to support renewable resource development. The Committee supports the efforts of Bonneville and the project developers to reduce the costs of the proposed projects.

Residential exchange.—The Committee is concerned that in the recently proposed rate case for the Bonneville Power Administration, there is a proposal to reduce rates for public power and direct service industries but substantially increase the cost of power exchanged with some residential customers of investor owned and publicly owned utilities. The Committee has been told that this increase in residential rates results from the implementation of a provision of the Pacific Northwest Electric Power Planning and Conservation Act. It has been suggested by some that the provision has been applied inequitably, while others argue that it has been done properly. The Committee would be gravely concerned if the provision has been applied unfairly or inappropriately. Bonneville is directed to provide the Committee with an explanation and justification of its proposal at the earliest possible date.

*Senate Report 104-120 – Energy and Water Development Appropriations Bill, 1996

Northwest Power and Conservation Council

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Regional Technical Forum

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Who Actually is the RTF?

- RTF consists of 20-30 individuals representing a range of technical expertise and perspectives
  - Engineers, evaluation experts, program implementers, etc.
  - Public utility, IOUs, national labs, etc.
- Meet monthly to consider analysts' recommendations and make decisions
- Do not represent their organization, but rather individual expertise
- Appointed by the Council every three years

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Who Supports the RTF?

Council Staff


- Manage the day to day of the RTF
- Provide a connecting role between the Council, RTF, and RTF PAC
- Chair the committee
- Provide contracts, administration, finance, and other technical support

Contract Analyst Team






- Competitively bid contract positions
- Provide analytical support, work with subcommittees, and develop recommendations for RTF consideration

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What Does the RTF Do?

Develops and maintains measure library with savings, lifetime costs, and estimated value to power system

Has an established process for updating measures and an appeals process for demonstration of different values

Analyzes the demand response potential of technologies that also provide energy efficiency

Maintains tools that support analysis of EE and DR opportunities for RTF/Council work, as well as utility programs and NEEA

Provides analytical support to the Council in assessing EE measures, DR technologies, technology trends, etc.

Conducts the annual Regional Conservation Progress survey on behalf of the Council to track regional progress against Council goals

Who Uses the RTF Work?

RTF work is publicly available for use by all stakeholders in the NW (and nationally)

- Utility programs use the data to support planning, implementation and evaluators
- Regulators value the wide review and unbiased perspective, and often encourage use of RTF measures where practical
- Evaluators reference RTF measures for understanding analysis assumptions and methods for savings

Open and transparent

Developed through peer review

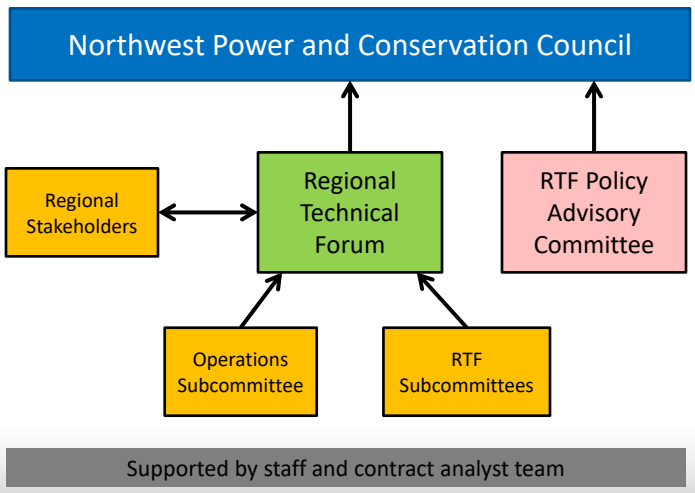
Leverages economies of scale

Where Does the Funding Come From?

- RTF is funded by BPA, Energy Trust of Oregon, and regional utilities
  - Council also supports RTF through staff, office/meeting space, etc.
- RTF Policy Advisory Committee consists of funders and other key organizations to advise the Council on policy and scope considerations around the RTF
- Committee also is responsible for securing funding for RTF

Clark Public Utilities · Chelan County P.U.D. · Avista · Snohomish County PUD · Energy Trust of Oregon · Tacoma Power · Cascade Natural Gas · Bonneville Power Administration · Idaho Power · Public Utility District No 1 Cowlitz County, Wash. · Rocky Mountain Power · Seattle City Light · Portland General Electric · EWEB · NorthWestern Energy · Pacific Power · NW Natural

Organization of RTF and RTF PAC



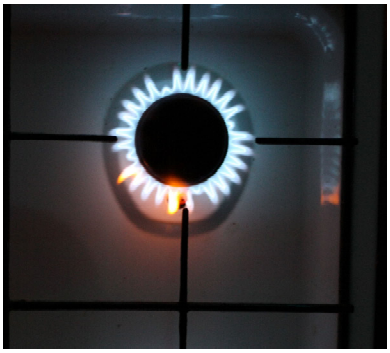
HIGHLIGHTS FROM 2021

Enhancing Existing Measure Portfolio

- Utilizing new data and insight to update existing measures that are important to the region:
  - HPWHs
  - MH duct sealing
  - Irrigation hardware

Expanding the RTF Measure Library

- New Gas measures
  - Gas Water Heaters
  - Gas Furnaces
  - Commercial Cooking Measures
- Commercial HVAC
  - Small Commercial DHPs



Expanding Value for the Region

RTF continues to find paths to expand technical analysis:

- Tool development to enable more sophisticated analysis by the RTF and stakeholders
- Refinement of consideration of analysis uncertainty to support prioritization of research dollars

Looking Ahead

Implementing actions identified in the 2021 Power Plan in support of the region and the Council

- Launched studies to develop methodologies for valuing the resilience and flexibility benefits of energy efficiency
- Planning an incremental cost study to identify areas of improvement in our analysis

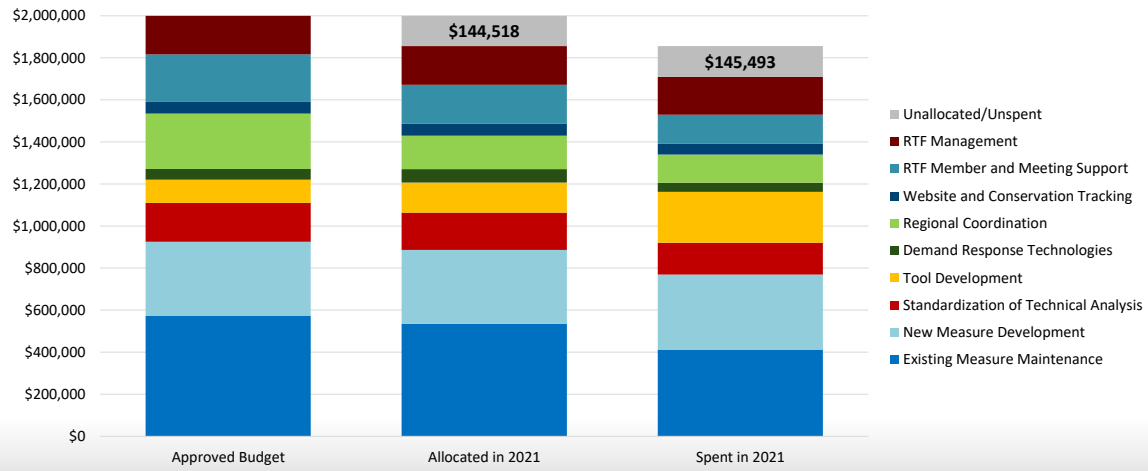
THE 2021 NORTHWEST POWER PLAN
FOR A SECURE & AFFORDABLE ENERGY FUTURE

2021 FINANCIALS

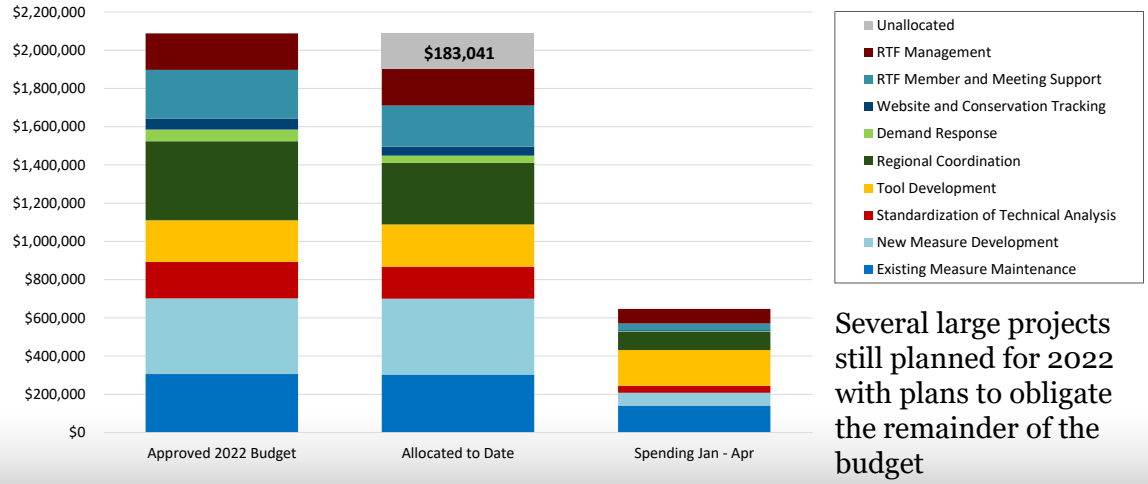
Current Funding for the RTF

- In 2019, the RTF Policy Advisory Committee secured new five-year funding commitments for the RTF
- Added new funding sources:
  - Two new electric utilities
  - Natural gas efficiency programs
  - Portland General for DR activities
- Budget levels were developed based on ensuring core needs of library maintenance and addition of a few projects intended to support regional programs
- Funders agreed to managing the funding as a 5-year budget, allowing unspent funds to rollover to future years within this cycle

2021 Year End Financials



2022 Funding and Spending To Date



Several large projects still planned for 2022 with plans to obligate the remainder of the budget

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Questions

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Regional Technical Forum
2021 Annual Report

Regional Technical Forum

Northwest Power and Conservation Council

Letter from the Council Chair

On behalf of the Council, I'm pleased to present the Regional Technical Forum's 2021 Annual Report.

For over forty years, the region has relied on cost-effective energy efficiency to ensure that our power supply is both reliable and economical. The region's low energy costs is attributable, in large part, to efficiency measures utilities have invested in over the years.

And we can thank the Regional Technical Forum, an advisory committee to the Council, for providing the peer-reviewed analysis of energy efficiency initiatives that proves savings are indeed real. Its work has been indispensable to the region's success in creating a cleaner, low-cost power system.

We know from the Council's recently completed 2021 Power Plan that a major shift is underway as we move toward renewable resources and away from fossil fuel-based resources. As you'll read in the RTF's 2021 Annual Report, energy efficiency will be acquired in new, more innovative ways than in the past. And we will need to better understand the benefits of energy efficiency beyond cost to how it provides capacity, flexibility, and resiliency to the power grid. To be sure, the case for energy efficiency has never been more relevant. It has been, and will continue to be, our best hedge against an uncertain future.

There is much more to learn about what was accomplished and what is ahead in this report, which I encourage you to review. I applaud the RTF's work of the past year, and I look forward to working with them to implement the efficiency goals set forth in the Council's power plan.

Guy Norman, Chair
Northwest Power and Conservation Council


Jennifer Light, RTF Manager/Chair

Letter from the RTF Chair

With the book closed on 2021, it is once again time to reflect on the year we had and all the good work we've done. I look forward to these annual reports for the chance to take a pause and really appreciate all the RTF has been able to get done together, which is always hard to do when you're in the thick of it. 2021 was the last year with our current member class who have been serving in their roles since 2019.

Three years on, they had the RTF running like a well-oiled machine and despite serving through two very difficult years, members adapted smoothly to new formats and ways of doing things remotely and helped the RTF not miss a beat. I've said it a thousand times, but it bears repeating, we're so grateful to our members who have stuck with us and helped the RTF stay effective and productive. They are leaving the RTF a better place than when they joined us, and they will be missed.

In the final year of their term, the members got so much done. We continue to expand and improve our suite of natural gas measures. After laying the groundwork last year, we were able to really dive into developing new measures in gas HVAC and water heating which, as directed by our natural gas subcommittee, are very important to the region. We continued our central work of developing and maintaining conservation measures, including in newer areas like commercial HVAC, as well as improving on old standards like manufactured home duct sealing and irrigation hardware.

As with every year, the RTF has also worked to expand our offerings beyond unit energy savings into more complex and nuanced work in hopes of helping programs adapt to the changing energy landscape. This year, that has been in developing guidance documents for

evaluating programs like industrial strategic energy management and home energy reports and exploring the value of energy efficiency beyond just kilowatt savings.

2021 was also a busy year at the Council. With the approval of the 2021 Power Plan, the region is closing the book on the seventh plan and entering the 2021 Plan world, which paints a picture of a regional energy system that looks very different than the one we're used to.

As chair of the RTF, I've had the privilege of watching RTF members and our many stakeholders take this dramatic shift in stride, working to understand the change and continue our important work under these new circumstances.

Energy efficiency is facing new challenges, the likes of which we haven't faced since the Power Act was adopted and codified conservation as a priority resource. Easy energy efficiency is harder to come by and is having to compete with other resources in a way it never had to before. But this shift is truly a testament to the dedicated work of the Northwest's conservation community that built the resource and industry we have now. We may have done the easy step, but now we get to take the next step and see how the resource can continue to grow.

At the publishing of this report, the RTF's 2022 is already in full swing. We've welcomed a new class of RTF members, and they've jumped in with such enthusiasm that it feels like they've been with us for years. We've already begun the work of incorporating the 2021 Plan into the RTFs work projects and implementing its recommendations to the RTF.

This includes updating cost-effectiveness assumptions consistent with 2021 Plan findings in all our measure workbooks; completing a scoping exercise looking at increasing the granularity of our measure baselines; and starting studies looking at the value of flexibility and resiliency for energy efficiency measures. Otherwise, we've continued with our central work of developing and updating measures and supporting the region's conservation programs as best we can.

Over the following pages of this annual report, we'll review and celebrate everything the RTF accomplished over 2021 and look forward to what we can do in 2022.

Introduction

In 1980, Congress passed the landmark Northwest Power Act, which formed the Northwest Power and Conservation Council, an interstate compact among Washington, Oregon, Idaho, and Montana. The Act charges the Council with ensuring that the region has an adequate, efficient, economical, and reliable power system. It does this by developing a 20-year power plan, reviewed every five years. This regional collaboration has become a model to the rest of the nation for meaningful, effective power planning.

Energy efficiency has been a cornerstone of the Council's work since its inception. The Act defines energy efficiency as a resource and requires the Council to prioritize cost-effective conservation over all other resources in its power planning. Due to this emphasis on energy efficiency, it is now the region's second largest resource after hydropower. Over the past four decades, utilities, program implementers, and countless other engaged stakeholders have been integral to this success, utilizing energy efficiency's potential to help meet regional load, reduce customer costs, cut power sector carbon emissions, and improve system reliability.

The Regional Technical Forum was created as an advisory committee to the Council in 1999 to support these regional efforts by developing and maintaining a list of eligible energy efficiency resources. A primary goal was to create a library of energy efficiency opportunities that outline reliable and consistent ways of estimating energy savings. This is intended to ease the planning and evaluation burden of energy efficiency programs in the region, while allowing flexibility for utilities to pursue those cost-effective efficiency measures that made the most sense for their consumers.

As a technical body, the RTF can objectively generate peer-reviewed energy savings estimates through robust and unbiased analysis in a public forum. The RTF engages stakeholders from across the Pacific Northwest, and from all sectors of the energy efficiency industry, to ensure that the work they produce speaks directly to the region's needs. This commitment to collaboration informs all the RTF's work and results in widely respected technical analysis that is looked to for its accuracy, reliability, and consistency.

The following report details the RTF's many accomplishments in 2021. This includes maintaining and updating its measure library; expanding its natural gas analysis; and looking for opportunities to provide new value to the region beyond the traditional energy savings by unit. With the adoption of the Council's 2021 Power Plan, the RTF spent much of the year supporting that work and incorporating the outcomes of the plan into future work planning. The plan has indicated that the energy system is growing more complex, and energy efficiency along with it. In response to these ongoing developments, the RTF is committed to evolving to continue to fulfil its role of supporting the region's conservation ecosystem.

Accomplishments in 2021

The core of the RTF's work will always be its extensive and detailed measure library. The RTF intends to keep it up to date with the interests of the region's conservation stakeholders to best meet the needs of the region. The existing measures the RTF maintains, and the new measures they develop, are publicly directed, selected by RTF members and stakeholders as those conservation opportunities most meaningful to the region. Below are some highlights from a full year of maintaining and expanding this resource:

Enhancing the Existing Portfolio

The RTF has a full and varied portfolio of existing measures that it updates regularly to ensure they are utilizing the best available data and analysis and that its measures remain reliable and useful to the region. Here are a few important updates the RTF made to its existing measures this year:

Heat Pump Water Heaters

Early in the year, the RTF kicked off a heat pump water heater (HPWH) update that spanned two meetings and fostered a lot of regional discussion. HPWHs save energy by using ambient heat to raise the temperature of the water, rather than relying solely on electric resistance heat the way a conventional electric water heater would. There are a few key distinctions that affect savings.

Knowing where the water heater is installed is important since room temperature can influence savings. A HPWH installed in an air-conditioned space won't have to work as

hard to heat the water as one installed where the surrounding air is warmer. However, to complicate things, the unit puts cooler air back into the space so the HVAC may have to expend energy reheating that air.

Knowing the vintage of the home is also important for understanding savings as there are codes in some states that have made installing HPWHs in new homes common practice, which results in less available potential. This year's update to was based primarily on newly available Northwest Energy Efficiency Alliance (NEEA) data and included adding a more efficient equipment option, in alignment with new NEEA specifications, as well as updating some underlying assumptions the measure is built on, like costs and regional stock.

In a more structural update, the RTF made a change to the "any vintage/any install location" measure application, which had been a source of uncertainty for some time. As part of a previous measure update, the RTF added a suite of measure applications representing the purchase of an efficient HPWH where the install specifics, including both the building vintage and the water heater location within the building are unknown, in hopes of supporting some emerging midstream HPWH programs where little was known about a water heater's ultimate destination.

In the previous iteration of this measure, the assumptions behind the 'any/any' measure about install location and vintage were based purely on staff and member judgement. With new data sources available now, they have proven those assumption to be incorrect.

Working with the heat pump water heater subcommittee, RTF contract analysts came up with two paths for rethinking the applications. After much discussion, the RTF eventually voted to eliminate the vague "any/any" measure and replaced it with measure applications that specify home age and location of install.

The RTF recognized that this update might impose challenges to existing HPWH programs and so it convened a meeting to discuss how the region can effectively and efficiently implement this measure. The meeting provided an opportunity for implementers from across the region to validate challenges and share ideas for working through them.

Manufactured Home Duct Sealing

Duct sealing creates a more tightly sealed envelope around a home making it easier and cheaper to heat or cool. Manufactured home duct sealing is especially important, for equity reasons, as often folks living in these types of homes, especially a leaky one, are particularly energy burdened and/or low income. And, because prefab homes often have common configurations, it should be easier to specify how to seal them.

The manufactured home duct sealing measure has a long history at the RTF, and this year's update saw significant changes. Duct sealing is more complicated than a basic widget, and program design and administration have a significant effect on savings. While it is challenging, the savings potential is real and important to the region. Recognizing the complexity of the program to achieve reliable savings, the RTF created a more complex specification with related guidance for verifying proper delivery.

The measure specifies that to get UES-able savings, programs need to achieve a high level of compliance with the specification, making job quality critical to reliable savings. The RTF approved an accompanying specification and delivery verification guidance document to provide a more thorough description of RTF direction.

Irrigation Hardware

In 2021, the RTF considered updates to the irrigation hardware UES, and ultimately decided to split upgrades and maintenance into two different measures, one concerned with irrigation hardware system upgrades and the other with irrigation hardware maintenance. Irrigation hardware maintenance addresses savings from improving irrigation system components, which reduces water demand and pumping energy use. An irrigation system upgrade improves efficiency by reducing water evaporation and wind-drift losses.

For the upgrades measure, there were no new data for an update at this time, but the RTF has allocated resources to add a measure for pressure reductions during upgrades, which has significantly more potential. If pressure is reduced in the irrigation system by reducing the pump size or speed, the irrigation system can save energy.

The maintenance measure focuses on improving maintenance practices to reduce energy consumption. The RTF updated the savings based on a survey of non-participants and participants. Results indicated smaller differences in irrigation practices than previously assumed by the measure. Many irrigators already had good maintenance

practices that were not influenced by the program, leaving less work for the programs to do and less room to improve efficiency.

Expanding the RTF Measure Library

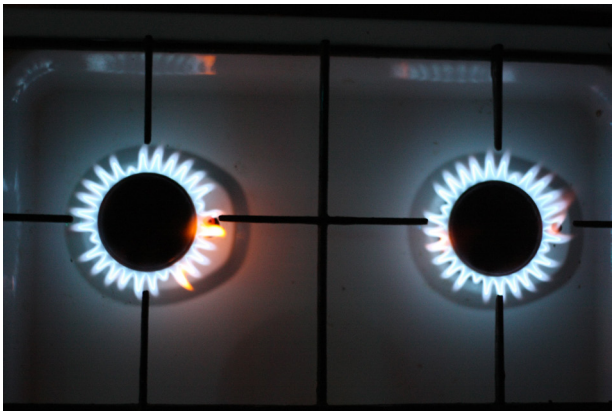
New Gas Measures

2020 was the first year that the RTF expanded its scope to include analysis of natural gas efficiency opportunities. Much of 2020 was spent defining what that work would look like, working closely with the region's natural gas experts on the natural gas subcommittee and updating the RTF's many tools and models to fold that work into the RTF's existing processes.

In 2021, the RTF was able to build upon that framework to create their portfolio of gas measures. This included adding gas identifiers into existing measures that save energy from both fuels and creating standalone gas measures. This is an ongoing project that has been highly informed by the needs of the region's natural gas stakeholders.

Residential Gas Water Heaters

One such gas only measure the RTF developed was for residential gas water heaters. The RBSA II indicates there are about 1.8 million natural gas storage water heaters, representing about 50 percent of single-family homes, in the region. The estimated regional potential is about 45-90 million therms, making this a significant measure for the region. Based on the abundance of available data from existing projects, the RTF deemed the measure savings reliable enough to not require additional research at this time. This measure aims to encourage consumers who need to replace their gas water heater to buy an efficient tank or tankless unit.



Residential Gas Furnace

Another gas only measure that the natural gas subcommittee prioritized and adopted this year was residential gas furnaces. Around 56 percent of the Northwest's single-family homes are heated by natural gas, so getting this measure on the books was important in terms of savings potential for the region. This measure encourages consumers purchasing new furnaces to purchase higher efficiency options, such as those rated to ENERGY STAR or better. Similar to the water heater measure, there was adequate data for the RTF was to develop very robust savings estimates that will enable programs to significantly reduce future evaluation efforts of these programs.

Commercial Cooking Measures

This year, the RTF tackled updating its full suite of commercial cooking measures. Many of these measures had rough estimates for natural gas savings that were fleshed out during this update. The RTF added gas measure identifiers to the following measures: combination ovens, fryers, steamers, hot food holding cabinets, and convections ovens.

The RTF also added two new cooking measures to their collection of commercial cooking offerings: griddles and rack ovens. Both these measures are small in terms of regional potential, but still provide a useful option for some efficiency programs. Looking at the commercial cooking measure suite, there is significant uncertainty around the savings estimates. Better data on hours of operation, energy consumption of non-ENERGY STAR equipment, as well as other data, will help the RTF improve its savings estimate.

Small Commercial Ductless Heat Pumps

There is always regional interest in HVAC measures, and especially expanding those offerings beyond the residential space. Residential HVAC measures have been easier due to tools and available data, while commercial has proven more difficult.

Commercial buildings and their HVAC systems are often more complex than a residential home. The RTF acknowledges this gap and has begun work to address it. In 2021, the RTF adopted a new measure on installing a ductless heat pump (DHP) in a smaller commercial space with electric resistance heating. This measure is like the residential DHP measure in that it applies to the same equipment, but operates in a small

commercial space rather than a residential home.

Such spaces are offices, schools, grocery, retail, restaurant, lodging common areas, and lodging guest rooms. The savings for DHPs in these spaces are uncertain. 'Small commercial' is a broad umbrella and a lot of these spaces are used and conditioned very differently, making data difficult to parse. The RTF adopted an accompanying document describing what research might be needed for these savings to be considered more reliable.

Other Roles for the RTF

As the world of energy efficiency evolves, the RTF is providing valuable technical support to the region outside of its traditional role of measure-style savings. This year, the group took several steps to broaden its analysis and intends to expand this work in the future.

Evaluation Guidance

One way the RTF is doing this is through additional guidance around programs whose savings are not determined by the widget but on a more tailored, project by project basis. The goal is to explore a potential approach for the RTF to provide support of consistent and reliable energy savings estimates for custom projects and address specific measure types. As a first step, this year the RTF developed two new RTF work products to supplement the RTF guidelines and provide specific guidance to evaluate program-level savings, costs, benefits, and lifetime of Industrial Strategic Energy Management programs and Residential Behavior Home Energy Report programs.

Industrial SEM

The first guidance document the RTF adopted addressed industrial Strategic Energy Management (SEM) programs. SEM is a collection of organizational practices, policies, and processes for implementing efficiency measures.

All programs target operations and maintenance improvements, while some pursue capital improvements such as new

Subcommittees

While the RTF makes final decisions on analysis at its monthly RTF meetings, subcommittees provide valuable insight and support along the way. The RTF convenes a variety of subcommittees; those that provide deep technical expertise for a specific measure and those that provide guidance across all measures. Active subcommittees in 2021 are shown below, with more information at **rtf.nwcouncil.org/subcommittees**.

- Air Source Heat Pump Subcommittee
- Connected Thermostats Subcommittee
- Ductless Heat Pump Subcommittee
- HPWH Subcommittee
- Implementers Group
- Irrigation Hardware Subcommittee
- Natural Gas Subcommittee
- Non-Residential Lighting Subcommittee
- Research & Evaluation Subcommittee
- SEM Subcommittee
- Operations Committee
- Small Rural Utilities Subcommittee

HVAC systems. The guidance document outlines what is needed to evaluate savings to be consistent with other measures in the RTF measure suite or in the Council's Power Plan.

It also provides some guidance on which important questions may be impractical to resolve empirically. The document is not intended to duplicate the evaluation guidance from the Efficiency Valuation Organization's International Performance Measurement and Verification Protocol or Bonneville Power Administration, or to offer requirements for site-level savings values used in program engagement.

Residential Behavior Guidance

In early in 2022, the RTF approved a new guidance document on evaluated energy savings for residential behavior home energy report (HER) programs. HER programs involve the delivery of feedback regarding a household's energy consumption, frequently compared to a 'similar' or 'neighboring' household.

They are designed to provide regular information to participating customers to influence household energy use. Like the SEM document, this guidance is not intended to prescribe methods for developing savings estimates used in program tracking, messaging, or contracting. The goal is to expand this type of product for other custom projects.

Updating and Maintaining Modeling Tools

The RTF's annual work also includes ensuring that the tools used to perform its analysis are the best available to achieve the most reliable savings possible. This year, the RTF reviewed its residential building simulation models and did a scoping exercise to explore future RTF building simulation models.

The RTF initiated this work after encountering the limitations of SEEM (the RTF's current residential building model) in analyzing demand response, an increasingly important part of power system planning.

The RTF contracted Cadeo Group, Larson Energy Research, and NREL to interview stakeholders to understand how these tools were used; explore tool options for analyzing demand response; and compare the pros and cons of SEEM versus EnergyPlus.

They produced a report summarizing the results of their stakeholder interviews, as well as the metrics they developed from those interviews to assess and score each tool. The team used the model performance scores to devise and evaluate two potential strategies: a hybrid of SEEM and EnergyPlus or transition all modeling work to EnergyPlus.

The RTF is especially interested in EnergyPlus since it better supports demand response analysis and has a larger user and developer base, providing better long-term maintenance for the tool. However, because SEEM was custom built for the RTF and the Northwest, it generally provides the best view of the region's most important measures, such as heat pump water heaters.

The report has more details on each approach and their trade-offs, as well as more information about the in-depth interviews; the models assessed; the model performance scoring; and final conclusions. The RTF is continuing to work on this complicated decision.

Valuing Uncertainty

As the region has successfully adopted much of the easily achievable measures and is pursuing more nuanced opportunities, the RTF is supporting utilities and stakeholders as they pursue more complex avenues of savings. This year, the RTF considered how it could better value uncertainty in measure development and how to best determine when research on a measure is worth the cost of reducing it.

The goal is to improve uniformity in RTF research asks and funder priorities. When we're considering energy efficiency as a resource and comparing it to other resources, it's important to know that it is similarly available and reliable.

As new, more complex technologies emerge, we want to ensure these measures are reliable. Investing in knowing that reliability is important, but only up to a certain cost. A big part of this work is being able to weigh the risk and uncertainty relative to the larger picture.

Certain assumptions have significant uncertainty but don't affect the reliability of savings very much. On the other hand, there are unknown assumptions that are very impactful. We hope to improve our ability to analyze these differences to get the most from our research dollars. Like the modeling exploration, this work is complex and ongoing, and the RTF will continue to grapple with where to draw the line on the cost of pursuing more certainty.

Regional Conservation Achievements

In its charter, the RTF is tasked with annually surveying the region's utilities, Bonneville Power Administration, NEEA, and system benefit charge administrators like Energy Trust of Oregon on their efficiency achievements. These data are compiled into the Regional Conservation Progress Report and presented to the Council and region to track progress toward the Council's power plan targets.

In the Seventh Power Plan, the Council set a target of 1,400 average megawatts of energy efficiency to be achieved through the first six years of the plan (2016 through 2021).

Over the past five years, the Northwest has saved 1,039 average megawatts from utility program savings, NEEA alliance savings, momentum savings, and savings from codes and standards. This is the first time the region has not met the Seventh Power Plan's energy efficiency acquisition milestone, which for 2020 would have been 1,115 average megawatts. While plan milestones have increased across the action

Figure 1. Regional Energy Efficiency Accomplishments Compared to Plan Milestone (2016-2020)

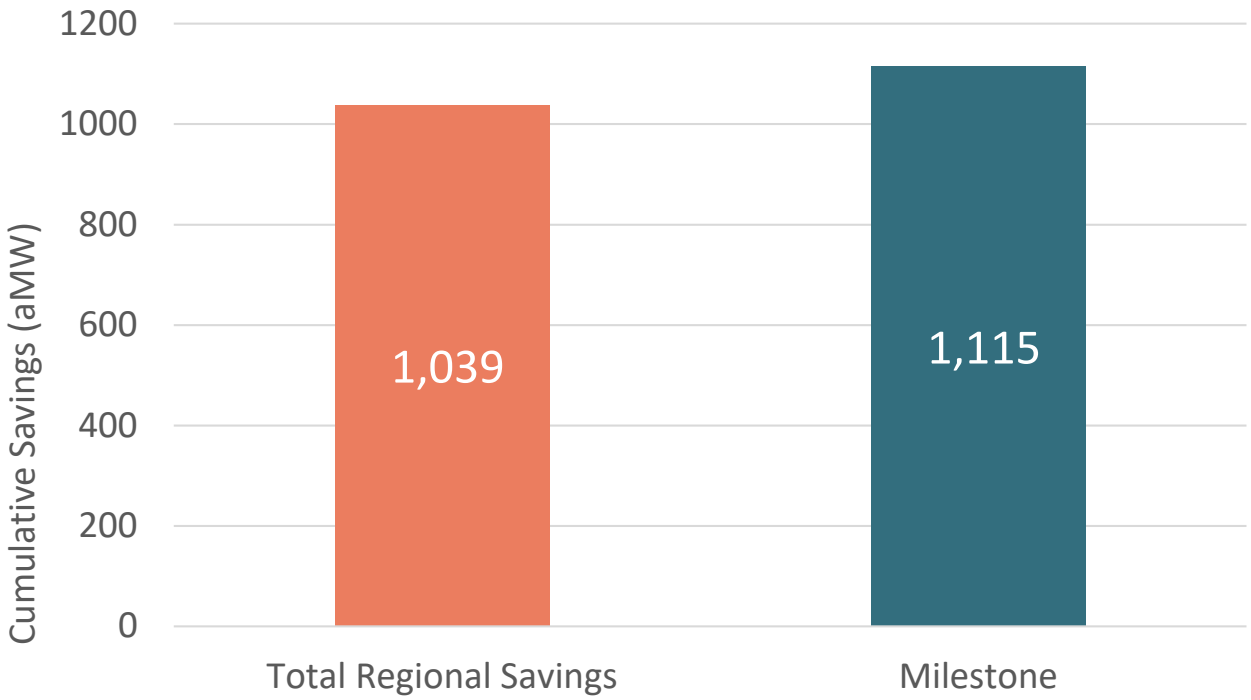
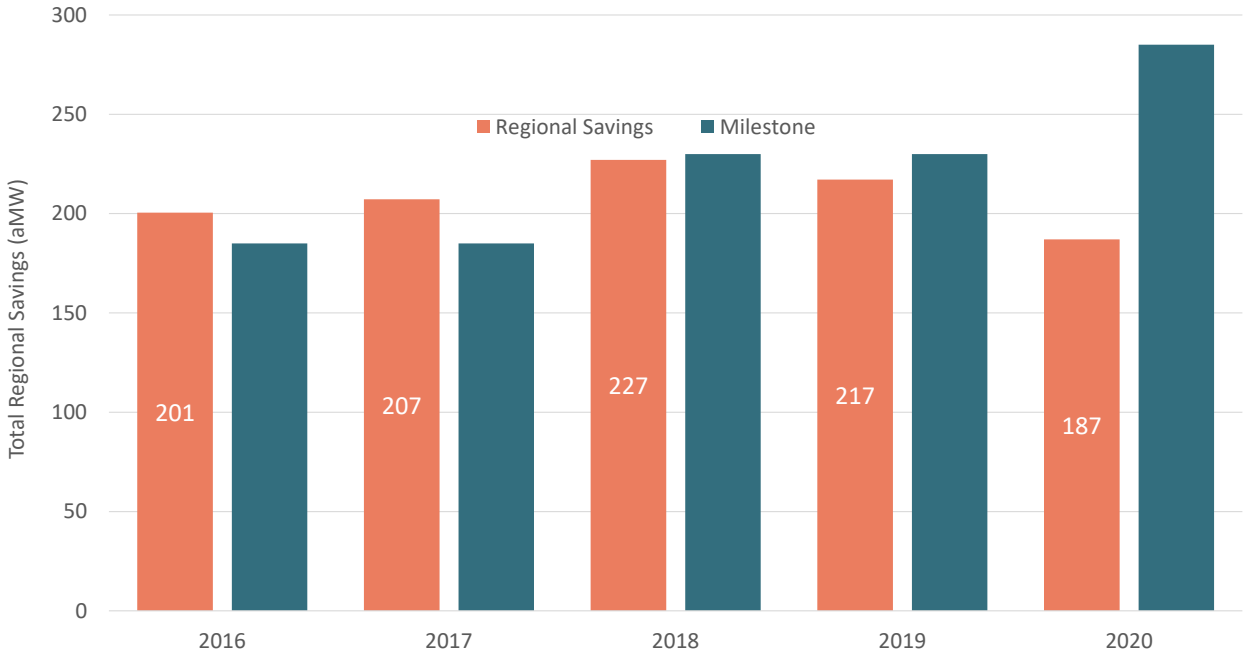


Figure 2. Total Regional Savings Compared to Plan Milestones (2016-2020)



plan period, regional savings have remained flat to declining. To meet the Seventh Plan's action plan goal of 1,400 average megawatts, the region would have needed to achieve significant efficiency in 2021.

Obtaining energy efficiency is getting more complex and expensive. Thanks to the region's strong commitment to developing conservation as a resource, many of the so-called low-hanging fruit markets have been transformed and utilities will need to be creative to continue to achieve efficiency savings. The RTF is interested in identifying those remaining opportunities and helping programs pursue those benefits. However, that's not to say there is no longer a benefit to pursuing energy efficiency. Through this annual tallying of savings exercise, we see that efficiency continues to contribute significant capacity savings to the region, especially in the winter.

Energy efficiency has provided over 7,200 average megawatts of savings since 1978. It has helped the region avoid more than 22.9 million metric tons of CO2 emissions and has saved the equivalent of 5.3 million homes' annual energy consumption. You can see in the following chart, utility efficiency programs have been the key driver of energy savings in the region, with NEEA and their market transformation work emerging in recent years as a significant contributor to regional savings.

Figure 3. Annual Regional Savings (Energy and Capacity)

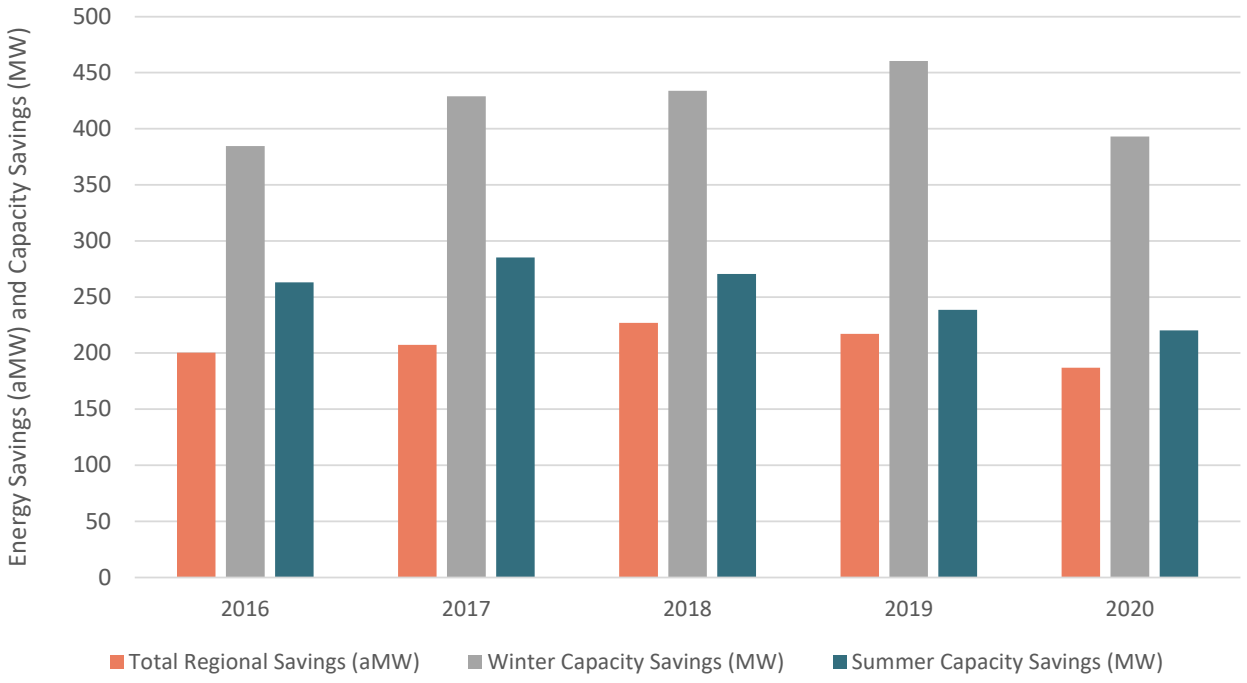
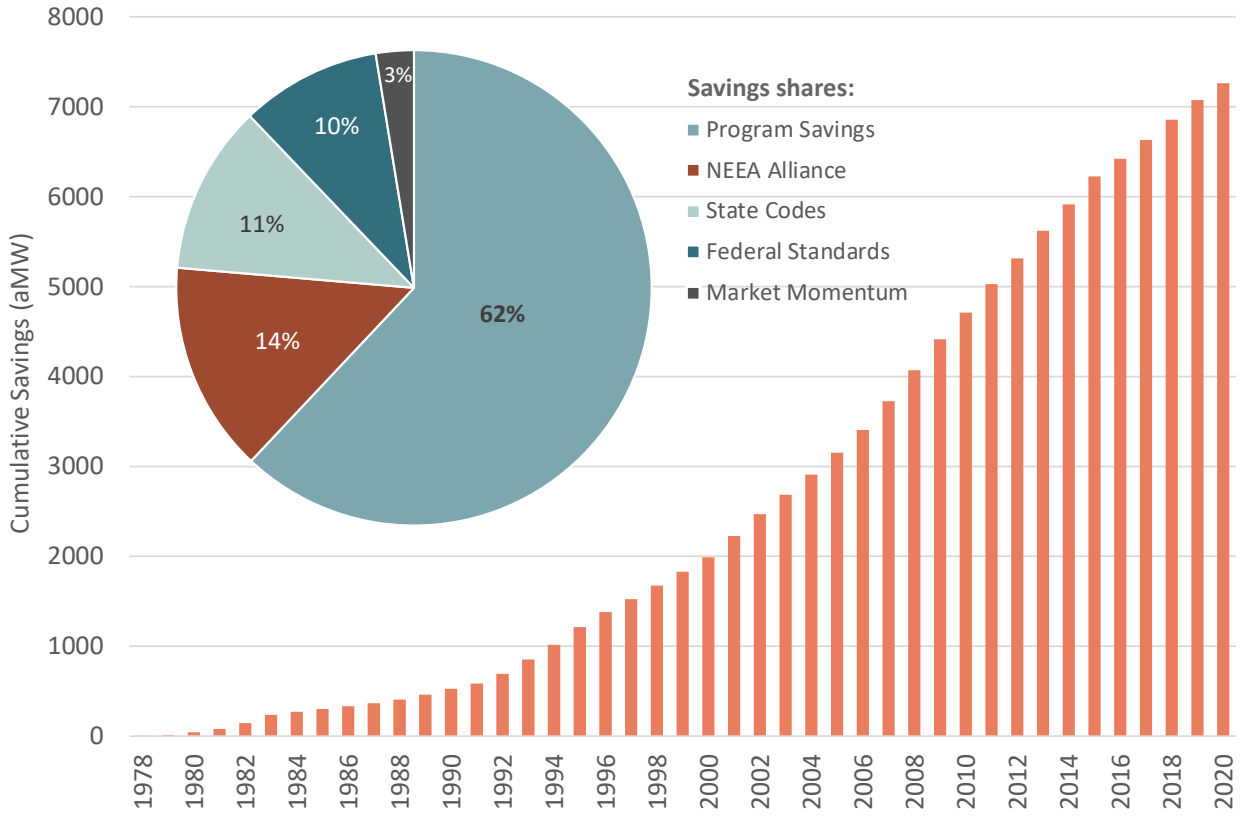


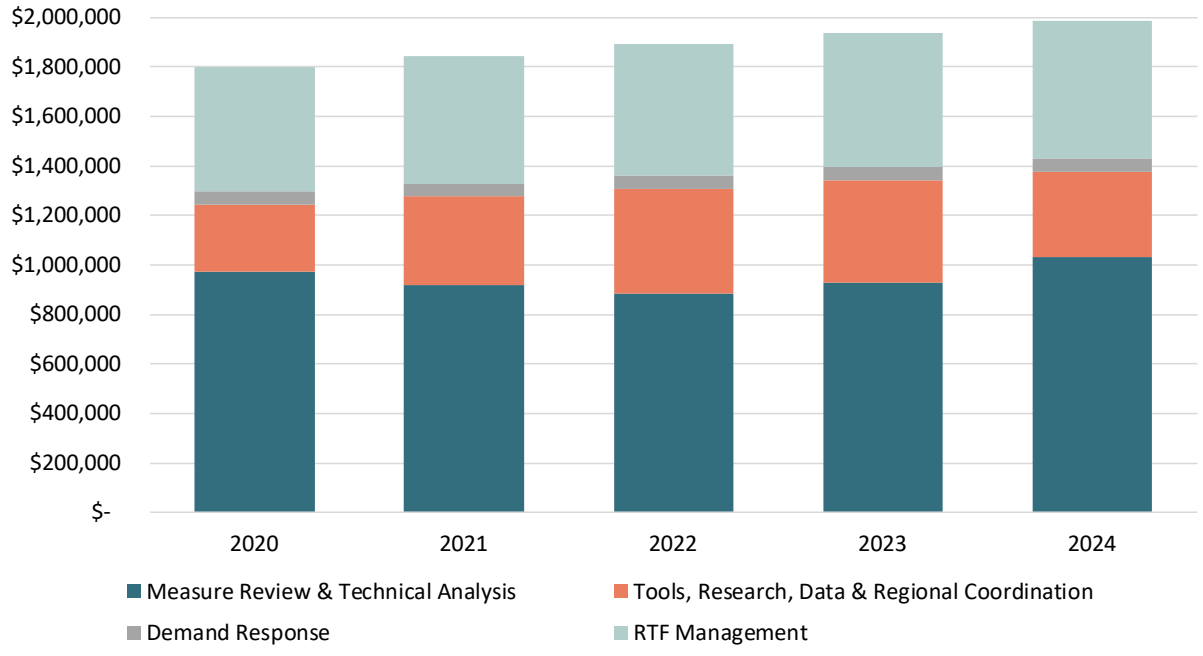
Figure 4. Cumulative Regional Savings, All Mechanisms



Financial Information

In 2019, the RTF Policy Advisory Committee secured new five-year funding commitments for the RTF to cover operations in 2020 through 2024. At the same time, the RTF expanded its funding to support the natural gas analysis added to the charter. The funding commitment for 2020 through 2024 totals $9,461,300, starting out at $1.8 million in 2020 and increasing annually at 2.5 percent to account for inflation. The RTF Policy Advisory Committee agreed to manage the total funding across the five years to allow

Figure 5. 2020-2024 RTF Funding Commitments by Category



flexibility, while also meeting regional needs on an annual basis.

As with previous funding agreements, the RTF Policy Advisory Committee agreed to use the allocation method developed by the Northwest Energy Efficiency Alliance for funding. With the additional natural gas funding, the RTF Policy Advisory Committee agreed to share the costs of work accordingly:

- Electric ratepayer dollars are allocated to work that is solely intended to support electric demand side management programs (electric-only energy efficiency measures and demand response)
- Gas ratepayer dollars are allocated to work that is solely intended to support natural gas programs (gas-only efficiency measures)
- Costs will be shared for work that is intended to support all ratepayers (dual-fuel measures, tool development, and overhead) with 75 percent allocated to electric ratepayer dollars and 25 percent to gas ratepayer dollars

2021 Budget and Spending

The total approved budget for 2021 was $2 million, and 93 percent of the budget was allocated to contracts. Of this budget, the RTF spent approximately 85 percent of its funding. The major driver for underspending in 2021 was delaying a project focused on developing savings shapes that provide details on what time of day and year different efficiency measures save energy.

The RTF thanks these sponsor organizations for providing funding:

Avista Utilities

Bonneville Power Administration

Cascade Natural Gas

Chelan County PUD

Clark County PUD

Cowlitz County PUD

Energy Trust of Oregon

Eugene Water and Electric Board

Idaho Power

NorthWestern Energy

NW Natural

PacifiCorp

Portland General Electric

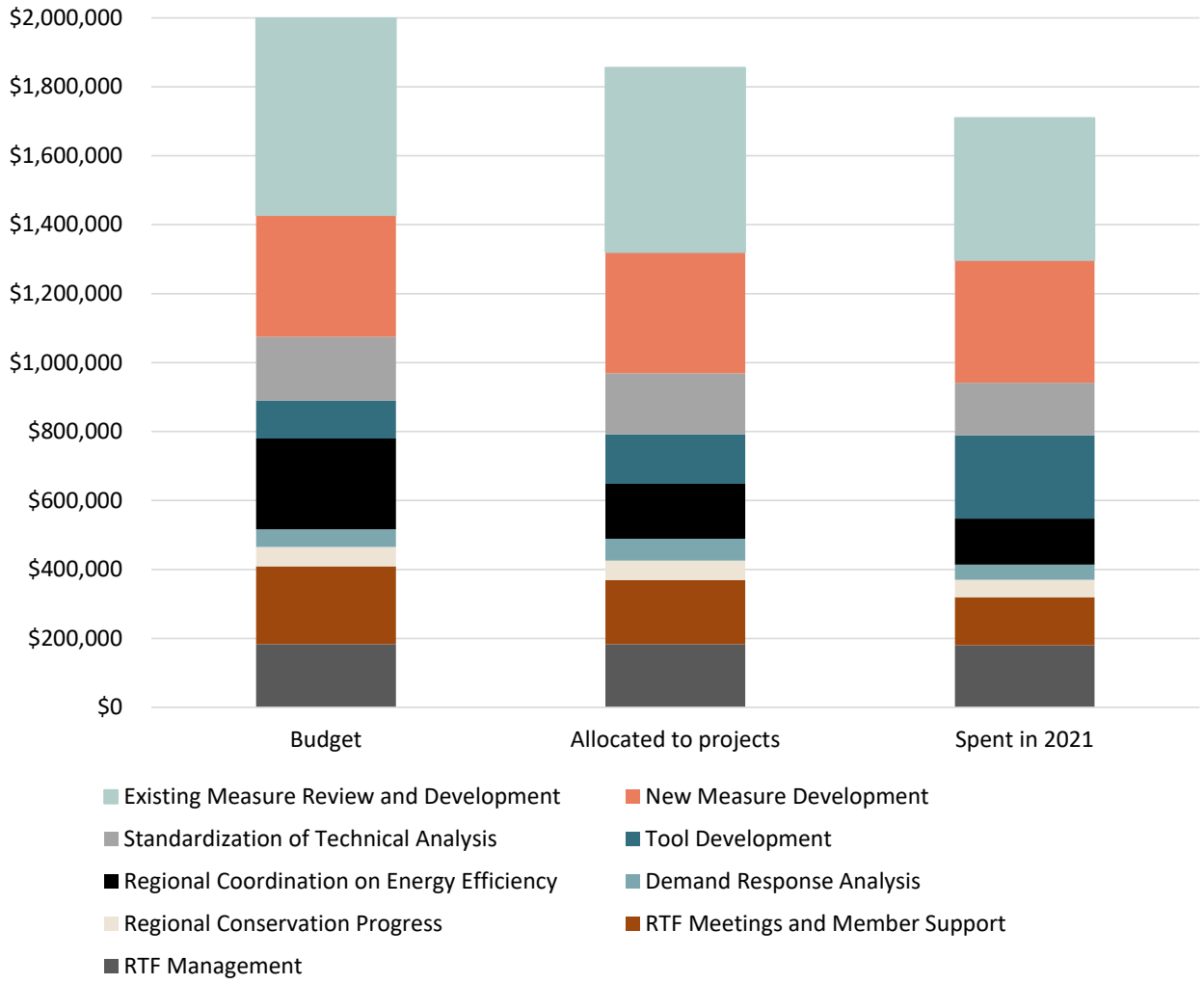
Puget Sound Energy

Seattle City Light

Snohomish County PUD

Tacoma Power

Figure 6. 2021 Workplan and Spending



This work plans to leverage regional research that is currently in the field metering the energy use of a variety of equipment, and the RTF decided that delaying temporarily would ensure more robust long-term shapes reflecting energy use in a post-covid world. The $190,000 of unspent funds will be allocated to future work.

Roughly 54 percent of the budget went toward measure development by the RTF. This included funding to support updates to existing measures that were sunsetting and required RTF review and development of new measures to add to the library of resources.

Part of what makes the RTF work successful is the review of measure analysis. Therefore, a portion of the budget is allocated to the contract analyst team to review each other's work for consistency ("standardization of technical analysis") and RTF member engagement and meeting time ("RTF member and meeting support").

A Look Ahead

The RTF is already well into its work of 2022. As with prior years, this year's work plan focuses on the RTF's core competencies, developing energy efficiency savings estimates and methodologies to support the region's energy efficiency programs.

However, it also identifies several important projects that will enhance our understanding of the energy savings, costs, and benefits of both energy efficiency and demand response, including following up on recommendations identified in the Council's 2021 Power Plan.

Briefly, in 2022 the RTF will take up projects exploring sub-regional baseline; updating RTF workbooks for the 2021 Power Plan findings; exploring climate files for RTF analysis; and studying the valuation of resiliency and flexibility. Much of this work has already begun. Below are a few updates on the year to date.

New Member Class

We're very excited to welcome a whole new class of RTF members for the 2022-2024 service term. As always, this new group brings a high level of technical expertise and a breadth of experience in planning, implementation, evaluation of efficiency programs and demand response products, as well as proficiencies in economic, statistical, and engineering analysis. We are, of course, very grateful for all the hard work of the exiting members who were with us since 2019 and stuck with us through some truly difficult times. They are leaving the RTF a better place than when they joined us and will be missed.

2021 Power Plan

At its February 2022 meeting, the Council voted to approve the 2021 Northwest Power Plan. This culminates years of work by staff, Council members, and many participants from around the region, indicating a very different energy landscape from the past. The Northwest energy system is changing, and the plan identifies those changes and outlines how the region can adapt to continue to provide an affordable and reliable power system.

Energy efficiency has been a central tenant of the Council's Power Plan since it was codified as a priority resource in the Northwest Power Act. But even this first-choice resource is seeing new challenges to how it has been implemented.

These plan's findings prompted several RTF-specific recommendations, including:

- **Improve valuation of flexibility and resiliency:** To capture measure cost effectiveness more accurately, the RTF should investigate methods for quantifying the value of grid flexibility and building resiliency
- **Increase rigor of measure cost analysis:** Due to the increased cost competition of other resources, the RTF should invest more resources into improving its incremental cost analysis for energy efficiency measures
- **Improve measure load profiles:** The RTF should continue to improve its measure load and savings shape profile library for future analysis to understand the timing of various energy efficiency measures and better quantify energy efficiency benefits to the power system

- **Explore the energy efficiency and demand response interface:** The RTF should take a more holistic approach to assessing measures that provide both energy efficiency and demand response, including better understanding the impacts on energy and capacity savings and cost and benefits when considering such measures.
- **Explore potential guidelines for incorporating equity in evaluation:** To support the region and Bonneville's efforts to analyze and understand equity gaps in their service territories, the RTF should explore expanding its guidelines to provide consistent regional guidance on how best to incorporate equity metrics into the established evaluation process.

Over the plan's six-year action plan period, the RTF will be working closely with the Council and the region to further define and pursue that work. In 2022, the RTF has already commissioned two separate resiliency and flexibility studies; completed a contracted exploration of subregional baselines; and explored climate files for RTF analysis.

Cost Effectiveness

Since the plan was approved, the RTF has had discussions about energy efficiency and how the plan's findings will affect the RTF's work going forward, starting with a larger discussion of energy efficiency cost-effectiveness criteria from the 2021 Power Plan.

It is the RTF's role to maintain a portfolio of energy efficiency measures consistent with the Council's plan, making updates to remain consistent when a new plan is adopted.

Since the 2021 Plan's adoption, contract analysts have updated the RTF's cost-effectiveness tool, ProCost, with the new 2021 Plan methodology and assumptions. The RTF also converted all UES workbooks to a new measure template and ran ProCost to update cost-effectiveness assumptions consistent with 2021 Plan findings.

Even in the new landscape that the 2021 Power Plan describes, cost-effective energy efficiency is still the priority resource for the Pacific Northwest, and it still provides significant benefits, beyond cost, to the power system.

It provides benefits in the morning and evening ramp periods, and it provides flexibility, adequacy, and resiliency to the grid. The region is going to have to be adaptive and thoughtful about how we continue to pursue this resource and these benefits. We will likely have to move past the one-size fits all 'peanut butter' approach to developing and implementing measures and get more targeted and intentional about

what remaining savings opportunities to pursue and how.

We will need better data, and perhaps a shift in how we understand energy efficiency's value, to continue to build this resource and support programs. Folks in the region are already getting creative and looking for opportunities to work with stakeholders outside the energy sector who might have interest in energy efficiency and its many benefits. The energy grid is getting increasingly dynamic and complicated, and energy efficiency will not be the same as it has been. Hopefully, we can all be excited about the many opportunities for growth this brings.

RTF Staff

The RTF is an advisory committee to the Northwest Power and Conservation Council and shares several staff members.

- Jennifer Light, RTF Chair/Manager
- Charlie Grist, Vice Chair
- Annika Roberts, RTF Assistant

In addition to RTF staff, several members provide operational and administrative leadership to the forum by serving on the operations subcommittee. For 2021, those members are: Sarah Castor, Jennifer Finnigan, Eric Miller, and Bill Welch.

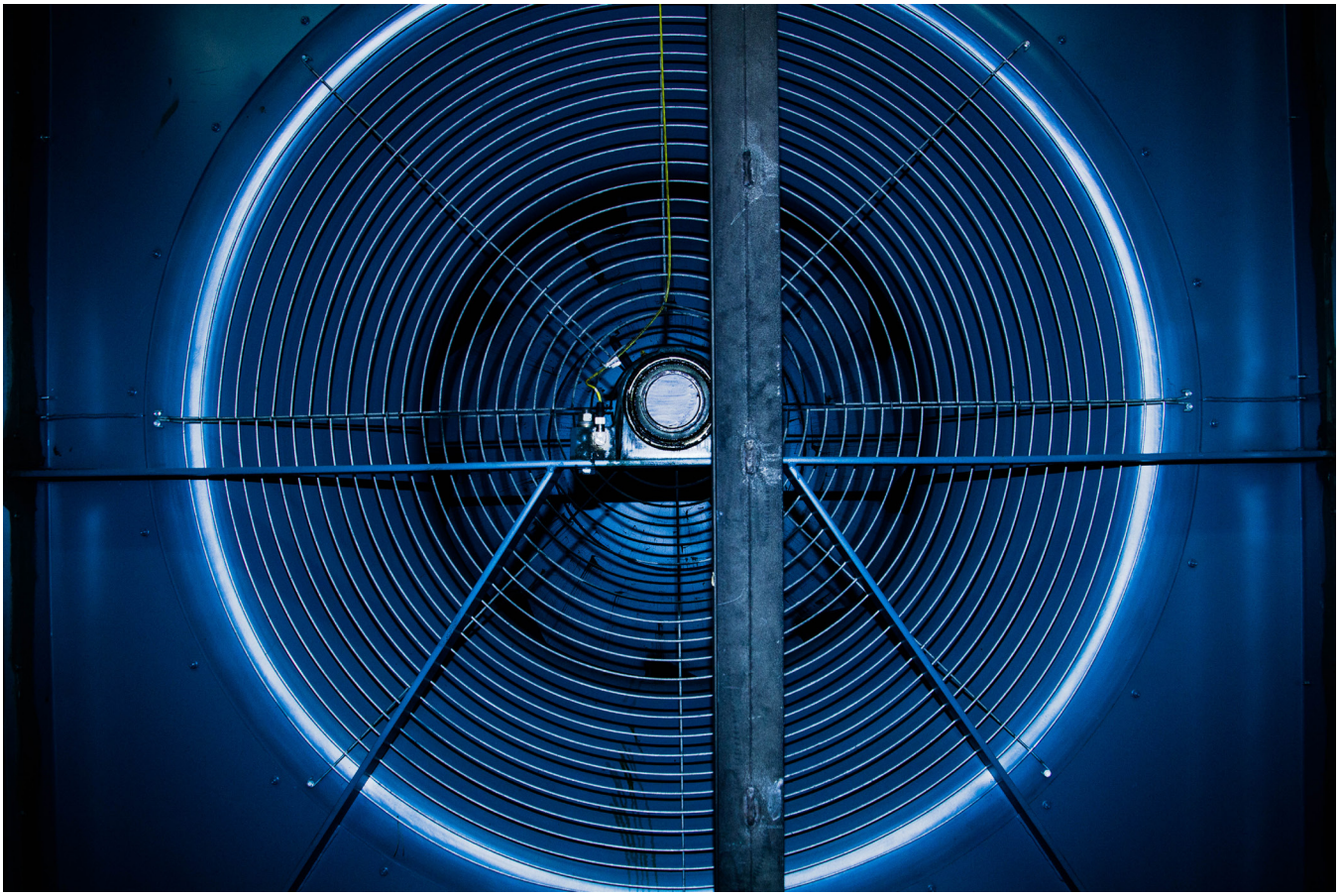
The RTF also contracts a team of analysts who provide dedicated support throughout the year. The 2020 contract analysts include:

- David Bopp
- Gregory Brown
- Christian Douglass
- Ryan Firestone
- Adam Hadley
- Josh Rushton
- Paul Sklar

2019 – 2021 Regional Technical Forum Members

Name	Organization
Jennifer Light (RTF Chair)	Northwest Power and Conservation Council
Charlie Grist (RTF Vice-Chair)	Northwest Power and Conservation Council/Independent*
Rebecca Blanton	Independent
David Baylon	Independent
Sarah Castor	Energy Trust of Oregon
Mohit Chhabra	Natural Resources Defense Council
Rachel Clark	Tacoma Power
BobDavis	Ecotope
Bryce Eschenbacher	Avista Utilities
Jennifer Finnigan	Seattle City Light
Lauren Gage	Apex Analytics
Kevin Geraghty	Independent
Jackie Goss	Energy Trust of Oregon
Mark Jerome	CLEAResult
Don Jones Jr.	PacifiCorp
Josh Keeling	Cadeo Group
Phillip Kelsven	Bonneville Power Administration
Rick Knori	Lower Valley Energy
Eric Miller	Benton REA
Graham Parker	Independent
Janice Peterson	Independent
Jessica Raker	Puget Sound Energy
Cory Read	EcoMetric
Mark Rehley	NEEA
Jes Rivas	Illume Advising
Peter Therkelsen	Lawrence Berkeley Lab
Kevin Watier	Snohomish PUD
Bonnie Watson	Bonneville Power Administration
Bill Welch	Independent
Sarah Widder	Cadeo Group
Jim Woodward	Washington UTC**

* Retired from the Council midway through the year ** Ex officio, non-voting, member



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