Taming the Wild (North)West: Guidelines for Energy Savings

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ABSTRACT

The Northwest region, led by the Northwest Power and Conservation Council's Regional Technical Forum (RTF) recently adopted Savings Estimation Guidelines. Although these guidelines are similar to those developed in other areas of the country, the process and results are unique and add to the national body of protocol work. This paper describes the RTF and the reasons for the development of the guidelines. It outlines the key components of the Savings Estimation Guidelines, including the savings estimation methods (i.e., unit energy savings (UES), standard protocol, custom protocol and program impact evaluation) along with the developmental stages leading to approval. The paper will describe the process used to gain regional agreement on the guidelines and discuss the key questions addressed during their development. Finally, the paper will discuss the policy, regulatory and research funding implications of the guidelines for the RTF, regional utilities and regulators.

Background

The Northwest Power and Conservation Council (Council) is an interstate compact between the states of Idaho, Montana, Oregon and Washington authorized by the Northwest Electric Power Planning and Conservation Act of 1980 (PL96-501). The Council's role is to ensure that the Northwest's electric power system will provide adequate and reliable energy at the lowest economic and environmental cost to its citizens. The Congress charged the Council with developing integrated electric power plans for the Northwest. These plans are to rely on cost-effective conservation as their first priority resource.

During the height of electric utility industry restructuring activities in 1996, Congress directed the Bonneville Power Administration, a federal power marketing agency, and the Council to convene a Regional Technical Forum (RTF) to develop standardized protocols for verifying and evaluating conservation savings. Congress, anticipating a more diversified approach to conservation acquisition in a restructured utility environment, identified the need to develop regionally-consistent evaluation standards and protocols for assessing the energy savings. Congress expressed its expectation that by developing standards and protocols of generalized applicability, the RTF could help utilities improve program quality and reduce program costs. Congress further recommended that the RTF's membership include individuals with technical expertise in conservation program planning, implementation, and evaluation and that its services be made available to all utilities in the Northwest.

The Council formed the RTF in April of 1999 as a standing advisory committee after considerable regional discussion on its governance, membership and scope (RTF, 1999). The RTF is a unique organization in the country. It is a technical committee that provides an ongoing public and peer review process of energy savings estimates, savings estimation protocols and impact evaluation guidance. It is composed of volunteers selected based on their technical

background and expertise, not the constituency that they represent. It is funded by voluntary contributions from Bonneville, the region's investor-owned utilities and larger publicly-owned utilities, the Energy Trust of Oregon (Oregon's system benefits charge administrator), and in-kind administrative and technical staff support from the Council. While none of these organizations are required to use the RTF's savings estimates or protocols, they all rely heavily on its work products.

Following its formation in 1999, the primary work products of the RTF were "deemed" savings estimates, which were the result of a large body of program impact evaluations and other research conducted in the Northwest. These deemed measures benefited Northwest utilities because these savings were sufficiently reliable to claim as "ex-post" program impacts, which reduced evaluation costs and regulatory risk.

Over the past several years, three factors led to the region's realization that the RTF needed to formalize its decision-making process and criteria (i.e., develop guidelines). First, from the mid-1990s to mid-2000s, the research and evaluation budgets in the Northwest significantly diminished which reduced the availability of updated savings estimates and other market data. Therefore, by the late 2000s, the requests for new measures were often based on very little or outdated empirical evidence or quantitative data, so the RTF decision-making process was inefficient and frustrating for members. Second, since 2005 there has been a significant ramp-up in energy efficiency goals, investments and activities across the region, prompting regulators and senior utility management to look more closely at savings estimates. This has placed greater demands on the RTF and the stakeholders agreed that a transparent set of decision-making criteria were needed in order for the RTF to increase its throughput while maintaining its voluntary, peer-based nature. Finally, with turnover of key RTF members and staff, the RTF and its stakeholders recognized that codification of the RTF's processes developed over the last ten years was essential so that future RTF members could benefit from lessons learned and the future efforts could be more transparent and systematic.

Process for Guidelines Development

By 2009, the RTF had developed deemed savings values for 60 efficiency measures (most with multiple permutations for climate zone, building type, etc.) that were being used by many regional utilities to substantiate a significant portion of the region's energy efficiency savings. These measures had been developed over many years and each drew on data from many sources. The savings analyses for each measure were contained in complex spreadsheet files that were mostly customized to the nature of the data available and the mechanism by which each measure saves energy. In addition to the complex data analyses, each measure also carried a history of subcommittee and RTF decision-making about critical parameters, analytic methods and data sources. Faced with this complex and growing collection of work, the RTF determined that it needed to impose greater transparency on its work products and the methods by which these work products were developed and approved.

In late 2009, the RTF began working with its consultant and a subcommittee on three interrelated topics:

- Creating and implementing a process for on-going reviews of deemed measures
- Developing guidelines that would govern how the RTF manages this process

- Formulating simplified savings estimation methods for measures that were not suited to being deemed

The RTF prioritized its portfolio of deemed measures; 20 measures were selected for detailed review, which included an assessment of the reliability of the methods and the data sources and the completion of standardized documentation. The detailed review also illuminated the processes by which the RTF had been formulating and approving deemed measures. These processes evolved over time and many lessons could be drawn from that evolution. Using this information, the subcommittee took on its second task: guidelines development. These guidelines were to codify RTF best practices in the preparation, approval and maintenance of deemed savings. In essence, they needed to take a current snapshot of how the RTF was functioning (or how the membership wanted it to work), boil it down to manageable but transparent process and provide a roadmap for how to maintain the legacy portfolio of deemed measures, update those measures in a timely way and manage the introduction and treatment of new measures.

At the same time, a second subcommittee was struggling with the problem of measures not suited to being deemed. These were measures whose savings varied significantly from one site to another and required site-specific data collection and analysis. Members of the RTF believed that significant gains could be made in the treatment of such measures if the data collection and analysis of these measures could be standardized. The trick was to find, for each measure, the simplest reliable method for savings estimation (i.e., standard protocols), which would be proven by comparing to a best practice standard for accuracy and bias. These standard protocols could be applied in a consistent manner across many sites or programs, produce reliable and unbiased site-specific savings estimates and would reduce the cost of custom site-specific monitoring and verification.

The deemed measure and standard protocol efforts came together for the first time in the late fall of 2010 with the development of an early draft of an RTF guidelines focused on savings estimation. This early draft recognized broad classes of measures categorized by the nature of the savings estimation process.

Numerous subcommittee, small group and full RTF meetings occurred over the following six months, focused on the guidelines. On June 1, 2011 the RTF adopted the guidelines as “operative”, recognizing the guidelines as a work-in-progress that are expected to evolve over time as they are tested in the group’s decision making processes. Within the operative version there are direct references to parts of the guidelines that are currently in development, such as measure life, measure costs and non-energy impacts.

Outline of the Guidelines

The focus of the guidelines is to describe how the RTF selects, develops and maintains approved methods for savings estimation. The guidelines define four separate savings estimation methods, which have comparable reliability, defined as:

- Unit Energy Savings (formerly “deemed”)
- Standard protocol
- Custom protocol
- Program impact evaluation

Unit Energy Savings

The guidelines define stages of development for unit energy savings (UES) measures, such as provisional or active, and sets quality standards for savings estimates to achieve certain critical stages: planning, provisional and active and defines documentation requirements for RTF approval.

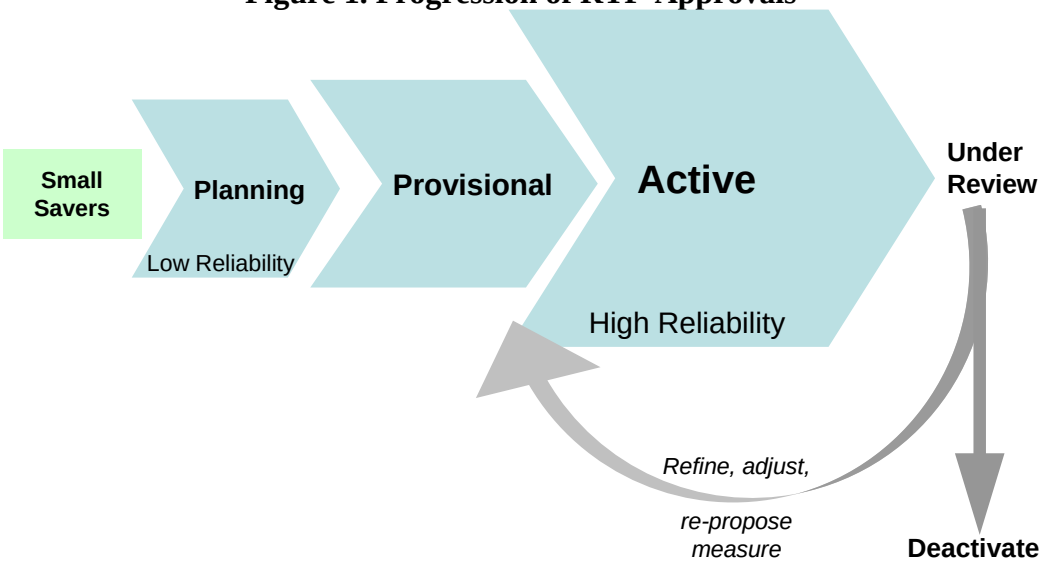
For UES measures, there are four primary developmental stages, which are described below and also shown in Figure 1.

- **Planning measures** are not RTF-approved, but only reviewed. The goal is to promote consistent treatment in the region for planning, incentive setting, cost-effectiveness analysis or regional coordination. The quality standards include: a) Reasonable expectation that data are available or can be collected that will ultimately support RTF approval for measure savings, b) RTF expert panel review has sufficient usefulness and applicability in the region and c) Sound engineering and statistical analyses are performed to develop the planning UES estimate.
- **Small Saver**. Measure is not RTF-approved, only reviewed; goal is to promote consistent treatment in the region. In this case, the RTF determines that the likely savings are too small to warrant the resources needed for provisional or active measure approval. RTF will consider the size of regional end use and magnitude of likely measure savings to categorize it as small savers. There are no defined quality standards.
- **Provisional measures** are RTF-approved and the RTF expects that they will advance to the active stage in the future, based on data from further research. The RTF approves a UES value and a research plan for advancing to the active stage. Quality standards include that reliable data are used, models have been calibrated to baseline energy consumption, sound engineering and statistical analyses performed. Programs delivering the measure should collect data according to research plan.
- **Active measures**. Measures can be RTF-approved as active if they meet the quality standards include: reliable data are used, sound engineering and statistical analyses have been performed and any models have been calibrated to both the baseline and efficient case energy use.

Figure 1 shows a simplified lifecycle of measures, from lowest reliability of a planning estimate to highest of an "active" approval. The figure also shows the "under-review" designation, which allows the RTF to review and improve the measure (often at the sunset date of the measure), and deactivation which removes the measure from the RTF-approval list.

Active measures are those that have the most research, both within the Northwest and externally, including measures such as residential lighting, residential weatherization and appliances. Provisional measures include those where some research exists, but an insufficient level to justify an active status, such as residential ductless heat pumps and residential heat pump water heaters. Although no measures are currently defined as small savers or planning, the authors expect that the RTF will move certain niche measures to these categories, such as irrigation hardware and dairy equipment. The RTF maintains the current status for each measure along with decisions and documentation files on its Website.

Figure 1. Progression of RTF-Approvals



Standard Protocols

A standard protocol method is appropriate when savings from a measure are widely varying but can be determined by a standardized procedure for data collection and analysis that is applicable to many different sites. Standardization of data collection reduces cost by eliminating or minimizing the need for site-specific measurement planning. Standardization of the analysis procedure also ensures uniform quality in the analysis product and reduces the skill level needed to estimate savings and to perform quality assurance activities.

Custom Protocols

The guidelines state that custom protocols are appropriate for measures that require site-specific data collection and analysis in order to develop a reliable estimate of savings. The required knowledge and skills of the practitioner are defined as the RTF recognizes that highly skilled and experienced practitioners are required to design and implement custom protocols. Custom protocols require a site-specific savings estimation plan (including pre-conditions, post-conditions, data collection, data analysis and modeling) and a site-specific savings report (including measure description, commissioning, data collection, sampling procedures and savings estimation).

Program Impact Evaluation

Program impact evaluation is addressed within the guidelines as another category of savings estimation methods that may be used in addition to or in conjunction with other categories. For example, once a UES measure is approved as active status, then impact evaluation is only required to verify the number of units that were delivered and apply the correct RTF-approved UES value to the delivered units. For active standard protocols, impact evaluation is required to verify the measure was delivered and to confirm the program faithfully applied the RTF-approved standard protocol. Program impact evaluation guidelines can also be used for

measures that have no RTF-approval status or to conduct research to move RTF approval (UES or standard protocol) measures from planning or provisional to active status.

Key Issues Decided in the Guidelines Development Process

This section outlines key issues that the RTF discussed and worked through during the process of guidelines development.

RTF No Longer Uses the Term "Deemed"

The RTF decided to move away from the term deemed because it has so many different connotations in the industry and also in the Northwest. The decision was to name this class of measure for its savings estimation method: Unit Energy Savings measures and then specify the level of reliability as the type of UES (e.g., provisional, active, etc.).

Unit Energy Savings Are Reliable for Only Certain Measures

The guidelines specify UES is appropriate for measures whose unitized savings, e.g., savings per lamp or motor, is stable (both the mean and variance) and can be reliably forecast through the period defined by the measure's sunset criteria (see below). These tend to be measures in the residential sector, where unit volumes are high, measured savings estimates are plentiful, baseline and efficient case conditions are consistent, applications are relatively homogenous and the distribution of important performance parameters, like hours of operation are well known.

Standard Protocols Are Appropriate for Many Other Measures

Although UES measures are easier for program implementation, there are many measures for which this method is not appropriate. In some cases, it is because the data has not been collected on sufficiently large or representative samples to provide the basis for the savings estimate. In other cases, there is too much variability in site-to-site savings, or year-to-year program participation to achieve a reliable UES savings estimate. In these cases, a standard protocol can be developed that reduces the cost of preparing site-specific savings estimates while increasing the reliability of the estimate. These types of measures tend to be in non-residential sectors where site-specific data collection is necessary to reliably estimate energy savings, but where a pre-defined (rather than custom) measurement and verification plan can be developed. For example, the RTF is working on several standard protocols for measures such as pump and fan variable frequency drives, commercial rooftop unit optimization and non-residential lighting.

Guidelines Are Independent of Program Design

The RTF has to support the savings estimation methods of many utilities and other parties in the region. These parties utilize different program designs to deliver the same measures. The methods for estimating savings described by the guidelines are intended to be independent of the program design. For example, the standard protocol for fan VFDs provides a tool for estimating savings and describes the required skills needed to achieve this result reliably. However, it does

not specify who should perform this work, e.g. independent 3rd party, utility staff, or program implementation contractor.

Baselines Are Defined and Regionally Consistent

The guidelines define two types of measure baseline conditions: Current Practice and Pre-Conditions. The appropriate baseline is determined by whether there is remaining useful life in the equipment/practice that the measure affects. Current Practice baseline is defined by the recent typical choices of eligible end users in purchasing new equipment and services. Pre-Conditions baseline is appropriate if there is remaining useful life. The definition of baseline in the guidelines varies from the definition used elsewhere in the country. Following these definitions the savings estimate does not need to be de-rated by net-to-gross estimates.[1] The guidelines define how the region can consistently estimate savings, it does not apply labels of net or gross to the result, but simply refers to "savings."

RTF Approval is the Standard of Reliability

The guidelines do not define a standard of reliability (e.g., 90/10 confidence/precision, dollars spent), other than stating the RTF will determine, based on the information presented, if any UES value or standard protocol estimates savings with sufficiently reliability. Two key factors influence reliability: bias and accuracy. Accuracy is compared to empirical data on savings or calibration of models to empirical data. For many savings estimates and protocols, unbiased estimates are relatively more important than confidence intervals around accuracy. The guidelines also state that cost-effectiveness will not be a consideration in determining reliability. For example, if a measure had a benefit to cost ratio of 10 there might be a tendency to allow for less reliable primary data by applying a large discount factor to the UES. By resisting this tendency the RTF ensures that both the absolute magnitude of the savings estimate and the estimate of cost-effectiveness are reliable.

Longevity of Each Savings Estimate is Unique

The RTF decided to have sunset criteria as part of the measure approval. RTF savings estimates can expire because of changes in factors such as baselines or technology obsolescence. Sunset criteria allow the RTF to plan for reviews and revisions of UES and standard protocol measures. These criteria may be as simple as a period of time, or they may involve other considerations such as the adoption of energy codes or standards or expectations of technology change. This allows the RTF to refresh measure savings on a schedule that is appropriate for each measure.

Various Measure Statuses Allow the RTF to Manage Tradeoffs Between Reliability, Cost and Risk

[1] Because this definition of "baseline" is consistent with the Council's load forecast, that direct subtraction of the UES savings results in a load forecast that reflects the total impact of the measure on the need for new supply side resources. This differs from other regions where baselines are based on current codes and standards or "as found" conditions, which then requires a net-to-gross evaluation to determine what the baseline EUI would have been absent the program. In essence, RTF adjusts for this "up front".

The RTF has defined various measure statuses to allow for the size of the savings and the evolving nature of research on savings estimates. For example, if the potential for a measure is quite small, the RTF can use the "small saver" category, using a panel to review the savings estimates, which ensures that the region is not over-spending on estimation of savings for a niche measure. Yet, for measures with larger savings potential in the region, there are three steps toward active status that encourage research to improve estimates over time. For example, a measure may start as a "planning" estimate with a relatively brief review by the RTF with direction on how research should be conducted. After some research is completed, the measure may be eligible for provisional status, and subsequent research may bring the measure to full active status. This step-wise approach to approval allows the RTF to play an advisory role in the research development and implementation. Additionally, these "stage gates" allow for appropriate expenditures on research – some measures may drop out of the process as research is completed.

Impact Evaluation and Custom Protocols Need More Work

Although the savings guidelines included sections on impact evaluations and custom protocols, the RTF recognized that these sections required more effort. Therefore, the RTF is currently conducting work to develop more detailed appendices that expand upon the impact evaluation and custom protocol guidelines.

Guidelines Are Also Needed for Measure Costs, Non-energy Benefits and Measure Life

To estimate cost-effectiveness[2], the RTF must approve estimates of measure costs, non-energy impacts and measure life. The RTF is also currently underway with efforts to develop guidelines in the estimation of these factors.

Known Outcomes of the Guidelines

This section outlines regional outcomes of the guidelines as we have seen through their use over the past six months.

Guidelines Define Consistent and Robust Requirements to Meet RTF Approval

In the past, RTF approval could be variable (i.e., some measures held to a high standard, while others were approved with less reliable estimates). These **guidelines** have defined consistent and transparent rules and in general require a higher level of quality than many measures in the past. Because everyone understands the "rules of the road", the rules save time and effort for the RTF and the proponents of measures. Regulators and utilities can have more confidence in RTF-approved savings estimates. It also has also led to more predictable outcomes from the RTF.

[2] The RTF produces estimates of cost-effectiveness of UES measures as part of its savings estimates. The RTF approach to estimating cost-effectiveness follows principles outlined in a Council paper on the topic published in 2007.

Development of the Guidelines Has Served to Convene Regulatory and Utility Leaders Around Key Issues in Savings Evaluation

Costs savings and reduction in regulator risk have attracted both utilities and their regulators to support the RTF. Emergence of the guidelines highlighted the need for an RTF Policy Advisory Committee to advise the Council regarding policy and governance issues of the RTF. This committee provides policy recommendations to the Council on how best to meet the mutual needs of the RTF's stakeholders, while ensuring that the RTF maintains its role and credibility as the pre-eminent independent technical body on energy efficiency in the Northwest.

Regional Research Strategy is Required

Because the bar has been raised on RTF-approved estimates, and because many of the historic measures rely on data that is 10-30 years old, research will need to increase across the region in order to satisfy these requirements. Because there are approximately 150 utilities in the region and there is not a single regulatory framework, a coordinated regional research strategy will be required.

Standard Protocols Will Experience Increased Development and Use

More stringent guidelines for reliability of active UES measures means that some former UES measures may shift to standard protocols. Additionally, we expect many new measures, such as controls measures, will require site-specific data collection, to be estimated through standard protocols. Therefore, directed research will likely occur in calculator development and programs to use standard protocols, as well as increased use of custom protocols and impact evaluation.

Highest Priority Measures Receive Highest Resource Allocations

Possibly most importantly, the guidelines will help the region to ensure **that** limited resources such as evaluation budgets and RTF time are allocated to those decisions and measures that matter most to the region.

Summary

The process for developing guidelines in the Northwest has codified ten years of efforts conducted by the Regional Technical Forum and has developed transparent and consistent rules for estimating savings. The RTF has defined categories of savings estimation techniques, designed stages of those methods and developed transparent requirements for RTF-approvals. The effort has allowed the region to focus on the aspects of savings estimation that produce high value for the Northwest and reduce the cost of impact evaluation. The guidelines facilitate the systematic and transparent balancing of tradeoffs between reliability and cost. They also help guide impact evaluation research and development of savings estimates to produce results that promise to be valuable for regional stakeholders.

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