No Longer Background Noise:
Resource Planning When Energy Efficiency Really Matters

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ABSTRACT

Energy efficiency has commonly been treated as "background noise" during the resource planning process, particularly when annual energy savings were less than one percent of retail sales. More recently, the advent of energy efficiency resource standards and high, long-term savings goals has positioned energy efficiency to become a significant energy resource. As efficiency becomes a major resource in electric utility portfolios its impacts must be thoroughly understood. From a practical perspective, energy efficiency impacts must be accurately quantified and aligned with energy forecasts so that resource planners can count on efficiency to meet customer needs adequately. For decision-makers evaluating growing demand side management budgets, the impacts and value of energy efficiency investments must be clear. Additionally, achieving annual energy savings in excess of two percent of retail sales and addressing key energy, economic, and environmental policy objectives will require comprehensive programs and new engagement strategies that rely upon a multi-year planning approach. The resource planning process can offer a transparent, integrated framework to help achieve these multi-faceted objectives.

We examine the treatment of electric end-use energy efficiency in resource plans recently issued or under-development in three regions with ambitious electric energy savings targets. Based upon our review, we identify and discuss issues, challenges, and approaches used, and highlight relevant examples. We conclude by offering recommendations on best practices for resource planning in an era of high energy efficiency goals.

Energy Efficiency: A Significant Resource with Growing Importance in the Resource Planning Framework

Twenty-four states have adopted energy savings targets that extend beyond a three-year time horizon (ACEEE 2012). Some of these states have adopted especially ambitious targets, with annual incremental savings that exceed two percent and/or specific energy savings commitments for ten or more years. The advent of these energy efficiency resource standards and high, long-term savings goals has positioned energy efficiency to become a significant energy resource. In some states or regions energy efficiency is the fastest growing energy resource to meet customer needs.

As energy efficiency becomes a major resource in electric utility portfolios (delivering savings greater than one percent of annual retail sales), its impacts must be thoroughly understood. From a practical perspective, energy efficiency impacts must be accurately quantified and aligned with energy forecasts so that customer needs are adequately met. For decision-makers evaluating growing demand side management (DSM) budgets, the public interest benefits delivered by energy efficiency, including reductions in utility system costs and customer costs (e.g. the deferral and lower level of plant investments) must be well documented to make the policy case for sustained and increasing efficiency. Finally, achieving annual energy

savings in excess of two percent of retail sales and addressing key energy, economic, and environmental policy objectives will require comprehensive programs and new engagement strategies that rely upon a multi-year planning approach.

The resource planning process[1] can offer a transparent, integrated framework to help achieve these multi-faceted objectives. The long-term perspective offered by this process, including its emphasis on quantifying loads and resources, cost-benefit considerations, and risk mitigation, can demonstrate the value of energy efficiency in comparison to other resources. It can also show the effects of comprehensive, integrated programs and strategies over time and steer decision-makers toward sufficient levels of energy efficiency investment. Meanwhile, increased commitments to energy efficiency necessitate that resource planning adequately account for energy efficiency. Resource planners must account for efficiency growth as a means to defer or eliminate future investments (and thus adequately capture the benefits of energy efficiency) while ensuring that the energy system is adequately designed to meet customer needs. In sum, resource planning provides the necessary structure for policy-makers to see energy efficiency as a low-cost, stable resource over the long term, thereby engendering more stable political support and funding for additional efficiency investment.

Historically, however, resource plans have treated energy efficiency as "background noise" and have failed to accomplish these aforementioned objectives. For example, some plans purporting to recommend least-cost resource scenarios have largely ignored energy efficiency or have under-invested in efficiency. Others have unduly limited energy efficiency by constraining it to a fixed budget amount, at an artificial level based on approved budgets or limited by concerns regarding short-term rate impacts, without a thorough consideration of its costs and benefits relative to other resources. Plans may identify energy efficiency as the least cost resource, but they do not necessarily pursue all of the efficiency as the least cost resource because of short-term budget concerns. Still other plans have not treated efficiency on an equal basis with other supply side options.

More recently, resource plans have begun to incorporate energy efficiency at greater levels. In 2006, Hopper et al. examined resource plans of fourteen utilities and found that some (but not all) planned to meet a significant fraction of incremental resource needs through energy efficiency. Hopper also identified significant opportunities to improve the treatment of efficiency in resource plans and described several problems:

- Inconsistent treatment and/or lack of reporting of key information, including whether and how energy efficiency impacts were included in load forecasts;
- No or limited information on non-programmatic energy efficiency efforts, including the effects of building energy codes and appliance standards;
- Under-reporting of capacity impacts;
- Limited reporting of program effects, including the exclusion of pre-plan effects; and
- Treatment of efficiency as a fixed resource, without the ability for it to compete with supply-side resources.

Based on these observations, Hopper et al. developed ten recommendations for the incorporation of energy efficiency in the resource planning framework. See Table 1.

[1] For purposes of this paper "resource planning" is inclusive of "integrated resource plans," "default supply plans," "long-term procurement plans," "least-cost resource plans," and "electric supply plans."

Table 1: Recommendations of Hopper et al. to Improve the Treatment of Electric End-Use Energy Efficiency Within a Resource Planning Framework

Recommendation	Description
Provide information on all demand-side resources (energy efficiency and other demand-side resources included in the resource plan, by type or resource).	Provide savings data for energy efficiency, demand response, fuel conversion, load management, and any other resources counted among the broader array of demand-side resources.
Clearly identify which types of energy efficiency strategies are included in the resource plan.	Resource plans should clearly indicate which types of energy efficiency strategies (ratepayer-funded energy efficiency programs, building energy codes, and appliance efficiency standards) are considered and how they are addressed.
Treat energy efficiency as a resource.	Evaluate scenarios with different levels of energy-efficiency resources and assess various supply-side scenarios designed to meet these levels of demand along key resource planning criteria (e.g. cost effectiveness, risk mitigation)
Treat energy efficiency as an explicit, load-modifying resource.	Clearly show energy efficiency impacts on forecast load. Adjust the forecast load to account for reductions in load due to energy-efficiency resources and use this adjusted forecast for the basis for calculating planning margins.
Clearly and separately identify the effects of energy efficiency measures installed during the resource plan analysis period and the pre-plan period.	Clearly document savings during the plan period and the residual effects of measures installed in the pre-plan period.
Describe the relationship between near-term energy-efficiency program plans and long-term goals/targets for energy efficiency.	Document the relationship between energy-efficiency programs and longer-term goals or resources to be acquired.
Provide both energy savings and summer- (winter-) coincident peak demand reductions for energy efficiency resources.	--
Provide annual effects of energy-efficiency resources by program and calendar year.	--
Provide energy-efficiency savings data for all years of the resource plan analysis period.	--
Include key metrics describing the relationship between the energy efficiency resources and key resource issues in the resource plan.	Metrics that should be reported include: energy efficiency effects as a percent of total resource growth; and energy efficiency effects as a percent of total resource requirements.

Source: Hopper et al., 2006.

In 2008, Hopper et al. conducted a follow-up review of sixteen utility resource plans. While this study did not specifically look at the treatment of efficiency vis à vis Hopper et al.'s earlier recommendations, it did find that resource plans continued to incorporate efficiency at increasing levels. In particular, the authors noted that the adoption of multiple, aggressive policies targeting energy efficiency and climate change had a direct impact on the level of energy savings included within resource plans.

Approach: Three Resource Plans as Examples

We examine the treatment of electric end-use energy efficiency in resource plans recently issued or under-development in states or regions with ambitious electric energy saving targets. The scope of this review was broad and meant to identify wide-ranging issues, challenges, and

approaches, and highlight related examples from the following resource plans:

1. Arizona Public Service Company's (APS) 2012 Integrated Resource Plan (IRP) and 2011 Draft IRP (APS 2011, 2012).
   APS' 2012 IRP provides a 15-year outlook. The Plan was filed with the Arizona Corporation Commission, Arizona's regulatory body, in April 2012.

2. Connecticut's 2012 Draft IRP (DEEP 2012).
   The Connecticut Draft IRP was developed by the Connecticut Department of Energy and Environmental Protection (DEEP) in consultation with Connecticut's electric distribution companies and with analytical assistance from The Brattle Group. The Plan identifies opportunities to make the state's electricity "cheaper, cleaner, and more reliable" over the next ten years. It is currently undergoing public and regulatory review.

3. The Northwest Power and Conservation Council's Sixth Northwest Conservation and Electric Power Plan (NWPCC 2010).
   Published in February 2010, the Council Plan identifies an electrical resource strategy for Washington, Oregon, Idaho, and Montana that minimizes the cost of and risks to the regional power system over the next 20 years.

Table 2 summarizes the characteristics of the three resource plans we used as examples.

Table 2: Characteristics of Three Example Resource Plans, With Cumulative Annual Energy Savings in 2017, 2022, and 2027

Resource Plan Characteristics				Cumulative Annual Energy Efficiency Savings (GWh, %)		
Location	**Year of Resource Plan**	**Timeframe**	**Case**	**2017**	**2022**	**2027**
Arizona (Arizona Public Service, APS)	2012	2012-2027	All Cases	4,455 GWh	6,709 GWh	7,641 GWh
				11.9% of TER[1]	15.5% of TER	15.4% of TER
				13.6% of NEL[2]	18.3% of NEL	18.2% of NEL
Connecticut (Statewide)	2012	2012-2022	Base Energy Efficiency	1,305 GWh	2,277 GWh	NA
				3.9% of TER	6.6% of TER	
				4.1% of NEL	7.0% of NEL	
			Expanded Energy Efficiency	3,608 GWh	6,616 GWh	NA
				10.9% of TER	19.1% of TER	
				12.2% of NEL	23.7% of NEL	
Northwest (Sixth Conservation & Power Plan)	2010	2010-2030	Conservation	16,916 GWh	31,667 GWh	45,596 GWh
				8.0% of TER	14.3% of TER	19.2% of TER
				8.7% of NEL	16.7% of NEL	23.7% of NEL

[1] TER (Total Energy Requirements) = total forecasted energy demand, not accounting for the effects of energy efficiency programs. Includes T&D losses, but does not include a reserve margin.

[2] NEL (Net Energy for Load) = Total Energy Requirements minus the impacts of the energy efficiency programs.

Table 2 indicates that the three example resource plans estimate that energy efficiency in the most ambitious planning scenarios with high savings goals is expected to provide cumulative annual energy savings equivalent to 8.0% to 11.9% of Total Energy Requirements in 2017, increasing to 15.4% to 19.2% of Total Energy Requirements in 2027. These 2027 energy savings levels are equivalent to 18.2% to 23.7% of Net Energy for Load in 2027. By 2022, energy

efficiency in these service territories is expected to comprise about 15-20% of the energy resources needed to meet customer needs – which is a significant contribution to resource needs.

IRP Issues, Planning Approaches, and Examples

IRPs can treat energy efficiency as a major resource.

As shown in Table 2, all three plans that we reviewed treat energy efficiency as a major resource. For example, the Council Plan found enough available and cost-effective conservation to meet 85 percent of the region's load growth over the next 20 years. The Connecticut Draft IRP recommends pursuit of an "Expanded Efficiency" scenario that would result in cumulative savings of 4,339GWh savings by 2022 relative to a "Base Case" scenario that would achieve 2,277GWh savings – almost double the Base Case savings. The APS 2012 IRP is fully aligned with Arizona's Electric Energy Efficiency Standard that requires 22 percent cumulative annual energy savings by 2020 (energy savings of 20 percent plus a two percent credit for demand response reductions). All four APS resource scenarios assume achievement of this Standard (APS 2012). As a result, efficiency is the utility's fastest growing resource over the next decade, meeting 54 percent of the utility's growth and becoming 16 percent of the utility's total resource mix by 2020 (APS 2011). See Figure 1.

IRPs can illustrate the historical value of energy efficiency as a means to encourage continued investment.

The Council Plan describes efficiency's impact on the region's historic growth and demand. From 1980 to 2008, efficiency improvements met 48% of the region's load growth with savings exceeding the total electricity use of Idaho and Western Montana combined. This historical outlook establishes energy efficiency as a reliable resource that has increasingly delivered upon the region's needs. Indeed, without the effects of improved efficiency, regional electricity growth would have been 1.5 percent per year instead of the 0.8 percent growth actually experienced. For decision makers, this perspective may help to provide the necessary background and context to support continued efficiency investment.

IRPs can treat energy efficiency as an explicit load-modifying resource[2] to show the underlying value of increased investment. Running one energy efficiency scenario has advantages and disadvantages.

The Connecticut Draft IRP offers an explicit comparison of two energy efficiency scenarios: a "Base Case" and an "Expanded Efficiency" scenario. This comparison elucidates the relative costs and benefits of each of these scenarios and the timing of when the costs and benefits occur.[3] This approach can be used to highlight relative pros and cons of implementing different levels of energy efficiency.

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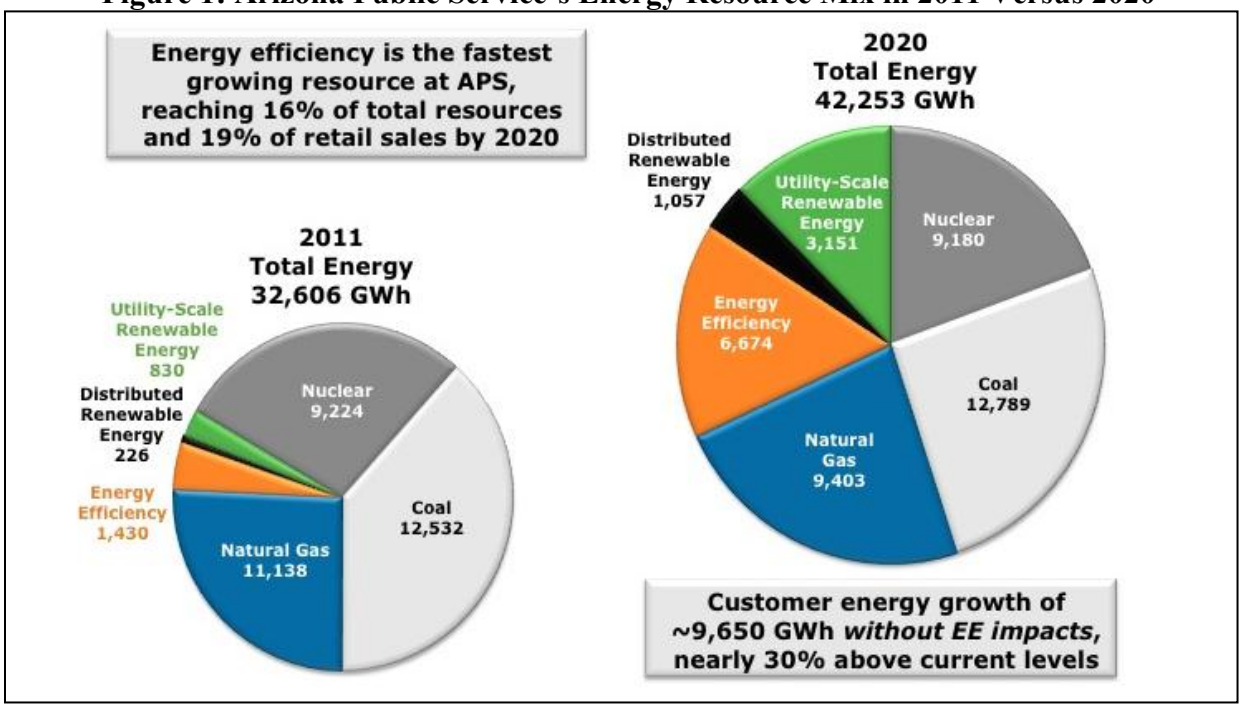
[2] Hopper et al. 2006 explain that treatment of energy efficiency as a load-modifying resource means that resource planners "adjust the forecast load to account for reductions in load due to energy-efficiency resources and use this adjusted forecast as the basis for calculating planning margins." This practice helps contribute to the proper estimation of planning margins rather than their over-estimation if energy efficiency impacts were not used to modify the forecast load.

[3] The data tables in the Connecticut IRP also provide year-by-year data for both the "Base Case"

Figure 1: Arizona Public Service's Energy Resource Mix in 2011 Versus 2020



Source: Guldner, 2011.

The Base Case scenario reflects a continuation of energy efficiency programs at current levels, saving 200 GWh per year. The Expanded Efficiency scenario nearly triples deployment, saving 600 GWh per year. Figure 2 depicts the incremental annual costs and savings of the Expanded Efficiency scenario relative to the Base Case. Initially, the costs of the Expanded Efficiency scenario outweigh the benefits; this is partly because energy efficiency costs are "expensed" with the costs paid upfront rather than being amortized over time. By 2017, however, the cost and benefits of the two scenarios are roughly equal. By 2022, the Expanded Efficiency scenario saves customers $778 million per year in energy, capacity, and renewable portfolio standard costs relative to the Base Case. At an annual incremental cost of approximately $243 million (which includes program costs and participant out-of-pocket costs), customer's annual net savings are more than $530 million by 2022 under the Expanded Efficiency scenario.

The Connecticut Draft IRP also examines other metrics to reveal the relative value of the two scenarios. Those metrics include in-state job creation, rate impacts, and emission reductions. According to the analysis, the Expanded Efficiency scenario (relative to the Base Case) supports 5,500 more in-state jobs per year, results in an overall 0.60¢/kWh rate reduction in 2022, and decreases emissions of NOx and SO_2 by more than 10 percent.

Treating energy efficiency as an explicit, load-modifying resource with more than one scenario enables decision makers to differentiate the value of competing energy efficiency investment scenarios. Ultimately this empowers decision makers to determine the most appropriate level of investment for customers. The Connecticut IRP adheres to this strategy:

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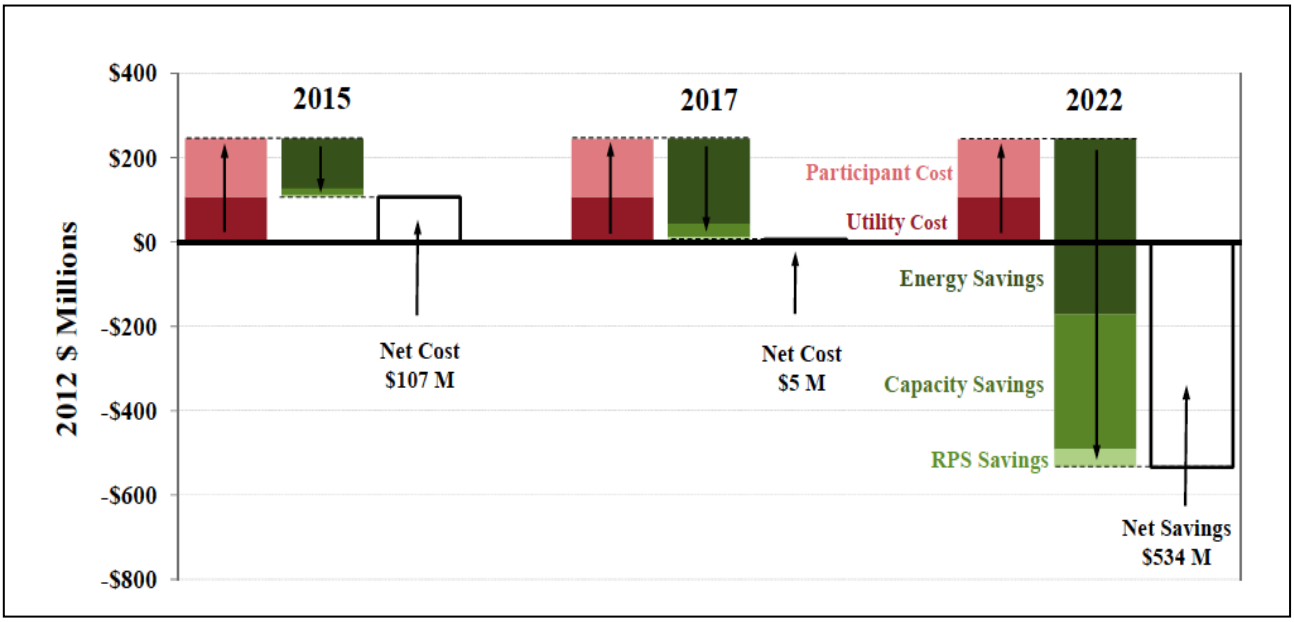
and "Expanded Efficiency" scenarios such that a "No Case" efficiency scenario can be calculated.

citing the aforementioned economic and environmental benefits of achieving all cost-effective energy efficiency, it recommends implementation of the Expanded Energy Efficiency case.

In comparison, the APS 2012 IRP does not treat energy efficiency as a modifying resource. By strictly committing to the achievement of the Arizona Energy Efficiency Standard, APS offers in its plan only one energy efficiency scenario – though an ambitious one. This approach, counter to Hopper et al.'s recommendation, has advantages and disadvantages. On one hand, it provides a clear signal to market actors and decision makers that the utility fully intends to comply with the savings requirements set forth in Arizona's Energy Efficiency Standard. This information may be important for businesses planning investment in the state, particularly a state like Arizona, where regulators are publicly elected and changes to the regulatory landscape can breed uncertainty. On the other hand, because the total contribution of efficiency does not vary over the entirety of the planning horizon, the relative value of efficiency as a low-cost, low-risk resource compared to other resource options is not as clearly delineated or communicated. Consequently, the APS 2012 IRP does not offer a critical comparison of different levels of efficiency investment or validate the underlying value of the Arizona Standard and its 22 percent savings requirement. This validation is crucial in Arizona, where regulators who make decisions in the future may not have been in office when the Efficiency Standard was originally adopted. The value of energy efficiency would become clear if the utility provided a low-energy efficiency base case for comparison.

Figure 2: Incremental Annual Costs and Savings of the Expanded Energy Efficiency Scenario Relative to the Base Case in the Connecticut Draft IRP



Source: DEEP, 2012.

Simultaneous development of the IRP and the DSM program or implementation plan can help to advance the energy vision articulated by the IRP and to garner support for DSM plan approval. Resource planning also offers a multi-year framework to identify and consider forward-looking DSM programs and strategies that cannot be contemplated or fully represented within a single-year or even a three-year DSM plan. Additionally, results

from the IRP can be used to refine the cost-effectiveness analysis of efficiency within the DSM planning process.

Hopper et al. recommended that the relationship between near-term energy-efficiency program or implementation plans and long-term goals for energy efficiency be documented in IRPs. Simultaneous development of an IRP with the development of a DSM plan can facilitate this objective. In addition, it can provide policy-makers with a vision for their region's energy future and an action plan to carry that vision forward. The IRP analysis can also demonstrate the value of energy efficiency to garner support for DSM plan approval and implementation. Notably, the long-term nature of resource planning enables the consideration of DSM programs and strategies that may not "fit" within the short-term outlook of a single- or three-year DSM plan, such as building labeling, longer-term market transformation, building energy code, and appliance standard initiatives. The ability of resource plans to offer a ten-year or more outlook is crucial to the achievement of high, long-term energy savings goals that require programs and initiatives with a multi-year strategic focus. See Table 3 for some example characteristics of programs to achieve high energy savings goals, which benefit from a multi-year focus.

Table 3: Characteristics of Conventional Energy Efficiency Programs Versus Energy Efficiency Programs to Achieve High Energy Savings Goals, Which Benefit from a Multi-Year, Strategic Focus

Conventional Energy Efficiency Programs of the Recent Past	**Energy Efficiency Programs to Achieve High Savings Goals, with a Multi-Year, Strategic Focus**
Shallower savings	Deeper savings first (higher savings per customer), then broader reach (serve more customers)
Single measure	Multiple measures
Single end use (e.g. lighting, HVAC)	Whole facility, all end uses
Single fuel (e.g. electric or gas)	Integrated, all fuels
Easier segments (e.g. homeowners)	All customer segments, including renters and leased space
Rebates to customers	Broad array of financial incentives to customers (and/or upstream)
No financing	Convenient and attractive financing through the energy efficiency program
Single message marketing and single channels	Multiple messages, multiple channels, targeted to segments
Energy efficiency as a unique, extra effort (as perceived by customers)	Energy efficiency infused into all actions and decisions, throughout all market opportunities
Energy efficiency programs only or primarily	Multiple policy strategies, including building energy costs and appliance standards
Single year/short term focus	10 year time horizon (or longer)

Source: Schlegel, 2012.

The Connecticut Draft IRP and the Connecticut 2012 Conservation and Load Management Plan (C&LM) were developed in tandem for these reasons. As discussed earlier, the Connecticut Draft IRP explores two efficiency scenarios, a "Base Case" and an "Expanded Efficiency" scenario. The IRP ultimately recommends pursuit of the latter. Concurrent to the drafting of the Connecticut Draft IRP, two different 2012 C&LM were developed. One C&LM plan describes the programs, strategies, and budgets to continue energy efficiency at current levels, while the second outlines the programs, strategies, and budgets to deliver significantly more savings, proposing approximately double the savings of the base level. The second plan, called the "ramp up" or "increased savings" plan, was explicitly developed to represent a ramp-up year related to the higher levels of energy savings in the IRP's Expanded Efficiency scenario. To that end, if decision makers decide to pursue the Expanded Efficiency scenario, they have a DSM plan that they can approve and implement to begin to deliver higher savings and benefits on that path immediately.

IRPs can make the case for the evolution of the utility business model and other policies supportive of energy efficiency.

The resource planning process provides an opportunity to demonstrate the value of increased efficiency investment and its related societal benefits. It can also show why the traditional utility business model, which is built upon increased utility revenues and earnings from increased energy consumption, is in conflict with increased efficiency. To that end, the resource plan can serve as an avenue to propose implementation of decoupling and other policies supportive of efficiency deployment.

The Connecticut Draft IRP explores this conflict between increased efficiency and the traditional utility business model. It describes the effect of the Expanded Efficiency scenario on Connecticut's energy forecast through 2020, noting that energy consumption in the state would decline by about 0.4 percent per year were the Expanded Efficiency scenario adopted. Citing this finding, the Plan argues that this downward energy outlook may necessitate the consideration of new business models, including the decoupling of transmission and distribution revenues from volumetric sales and the further implementation of shareholder incentives for the successful achievement of energy savings.

The Connecticut Draft IRP also discusses other policy approaches to effectively and efficiently capture the full potential of the Expanded Efficiency scenario. Those approaches include: innovative financing; activities and strategies to accelerate market transformation; information as a means to induce behavioral change; accelerated adoption of building codes and standards; and rate designs that encourage conservation.

IRPs can reveal the source of energy efficiency savings – by strategy, by sector, and within sector. This information can help market actors and decision makers ascertain future trends, prioritize programs and strategies, and understand the policy decisions necessary to deliver significant consumer benefits.

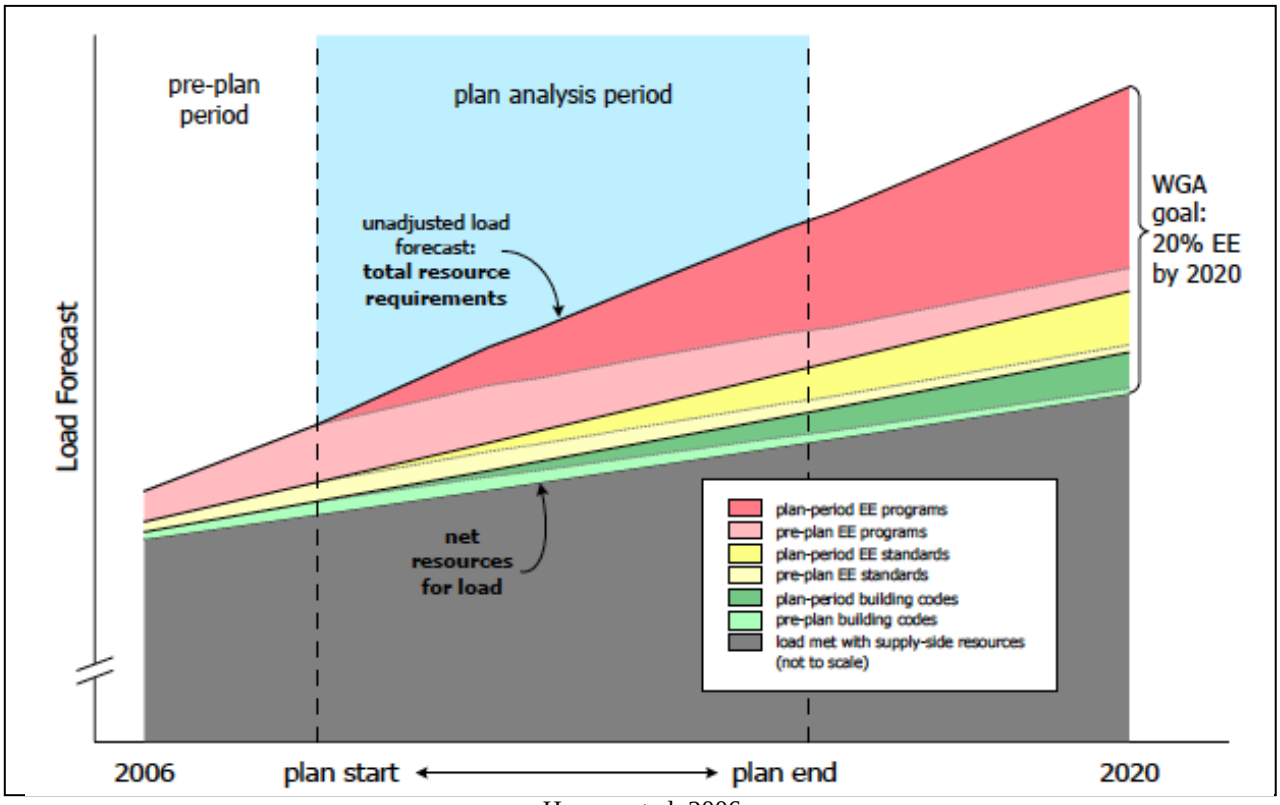
Hopper et al. recommend that resource plans clearly indicate which types of energy efficiency strategies are considered and addressed. Strategies mentioned include ratepayer-funded energy efficiency programs, building energy codes, and appliance efficiency standards. Figure 3 provides a conceptual overview of Hopper et al.'s recommendation.

The Connecticut Draft IRP follows Hopper et al.'s recommendation in that it distinguishes between savings that arise from ratepayer-funded energy efficiency programs, building energy codes, appliance efficiency standards, and naturally occurring savings.

The Council Plan advances this good practice of strategy-differentiation, including accounting for building codes and standards, and goes further by delineating the source of achievable conservation by and within sector. It shows achievable conservation by 2029 by levelized cost for the residential, commercial, agriculture, industrial, utility distribution, and consumer electronics sectors. Additionally, it shows the source of achievable conservation within these sectors. For example, conservation within the residential sector is broken out by major end-use categories (HVAC, building shell, lighting, appliances, water heating, etc.).

Revealing the sources of potential energy savings within the resource planning framework has several advantages. It helps market actors and decision makers to understand the energy efficiency resource and future trends, prioritize investments to achieve the identified potential, and prioritize research, measurement and evaluation needs. In addition, it can alert decision makers to the policy decisions that need to be advanced (e.g., building energy codes and appliance efficiency standards) to deliver consumer benefits and achieve the resource goals.

Figure 3: Hopper et al. Recommendation for Tracking Energy Efficiency Resources in Load Forecasts



Hopper et al. 2006

IRPs can set the pace for energy efficiency investment and present the case for more timely and/or prioritized investments.

The Council Plan differentiates conservation resources by deployment patterns. It recognizes two categories of resources: "non-lost opportunity resources" such as building retrofits, which can be deployed at any time; and "lost-opportunity resources" which are only available during specific time periods associated with a market-driven opportunity (e.g. when a

new building is constructed, an industrial process is upgraded, or an appliance stock turns over). The latter group is time sensitive and can be "lost" if not acquired when available. For example, the Council Plan acknowledges that two-thirds of commercial-sector conservation potential represents "lost-opportunity" conservation. This recognition may help efficiency advocates and decision makers support more aggressive, timely efficiency investments and to prioritize the advancement of certain program strategies or policies accordingly -- to acquire the resource when there is an opportunity in the market.

The Council's Plan also recognizes constraints on the amount of conservation available for deployment, including a constraint on the maximum achievable potential over the Plan's twenty-year horizon and a constraint on the rate of annual deployment. This information informs decision makers and efficiency implementers about the pace of energy efficiency deployment. Should policymakers want to accelerate or decelerate this pace, they can support new research or program strategies accordingly.

Conclusion

The resource plans from three regions with aggressive savings commitments do not treat energy efficiency as "background noise." In fact, all three treat efficiency as a major resource, and in some cases, the fastest growing resource to meet customer needs. Moreover, these plans employ different strategies to steer decision-makers to support sufficient levels of energy efficiency investment and to advance programs, policies, and strategies supportive of efficiency. This is a substantial change from historic plans that largely ignored or unduly limited efficiency investments based largely on the constraints of existing budgets or concerns about short-term rate impacts.

From our review, it is clear that the recommendations elevated by Hopper et al. in 2006 are still relevant and should be employed for effective incorporation and treatment of energy efficiency in the resource planning framework. Depending on the goals of the IRP and the IRP reviewed, we found that Hopper's recommendations may or may not have been followed. For example, APS opted to run only one efficiency scenario rather than treat energy efficiency as a load-modifying resource and include a base or low-efficiency scenario. While this treatment of efficiency underscores the company's commitment to Arizona's Energy Efficiency Standard, which we applaud, it does not allow for a critical comparison of different levels of efficiency investment and therefore does not communicate the value of energy efficiency through the analysis in the IRP.

As energy efficiency continues to grow and the programs and strategies to deliver savings become more integrated and comprehensive, the treatment of energy efficiency in the resource planning process will become only more complex. Additionally, capturing the impacts of energy efficiency will become even more important. We build upon the Hopper et al. recommendations by offering these additional ideas for the treatment of energy efficiency within a more complex resource planning landscape:

- Resource plans should show how the resource mix changes with time for each year of the planning horizon.
- Resource plans should delineate the source of achievable energy efficiency by, and if possible, within each sector and classified by other descriptors such as by end use or lost opportunity/retrofit.
- Resource plans should identify which types of energy efficiency strategies are included in the resource plan *beyond* rate-payer funded energy efficiency programs, building energy

codes, and appliances standards. Other strategies that should be included are building energy labeling and or other policy initiatives that do not fit neatly within the previously identified buckets. The pace of these strategies in delivering energy savings should be explicit.

- Resource plans should systematically quantify the effects of energy efficiency on energy impacts, customer bill impacts, and environmental impacts (including emissions and water). Additional impacts that may be useful for showing the value of energy efficiency include job impacts and reliability impacts.

In conclusion, resource planning is crucial for developing and achieving ambitious, multi-year energy efficiency goals. Consequently, resource planning processes need to evolve and improve to be able to accurately represent energy efficiency as a major resource.

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