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Survey of Western U.S. electric utility resource plans

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HIGHLIGHTS

- Anticipated power plant retirements are split between coal and natural gas.
- By 2030, natural gas-fired generation represents 60% of new capacity followed by wind (15%), solar (7%) and hydropower (7%).
- Utilities anticipate most new solar capacity to come online before 2020 with significant growth in wind capacity after 2020.
- Utilities focus their uncertainty analyses on future demand, fuel prices, and greenhouse gas (GHG) regulations.
- There are significant data collection and reporting inconsistencies within and across electric utility resource plans.

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ABSTRACT

We review long-term electric utility plans representing ~90% of generation within the Western U.S. and Canadian provinces. We address what utility planners assume about future growth of electricity demand and supply; what types of risk they consider in their long-term resource planning; and the consistency in which they report resource planning-related data. The region is anticipated to grow by 2% annually by 2020 – before Demand Side Management. About two-thirds of the utilities that provided an annual energy forecast also reported energy efficiency savings projections; in aggregate, they anticipate an average 6.4% reduction in energy and 8.6% reduction in peak demand by 2020. New natural gas-fired and renewable generation will replace retiring coal plants. Although some utilities anticipate new coal-fired plants, most are planning for steady growth in renewable generation over the next two decades. Most planned solar capacity will come online before 2020, with most wind expansion after 2020. Fuel mix is expected to remain ~55% of total generation. Planners consider a wide range of risks but focus on future demand, fuel prices, and the possibility of GHG regulations. Data collection and reporting inconsistencies within and across electric utility resource plans lead to recommendations on policies to address this issue.

1. Introduction

Electric utility resource planners' decisions affect all residential, commercial, and industrial customers. Planners must decide how to meet future demand with limited information about future fuel prices, economic conditions, technology advancements, and governing policies. Assessing the risk of not meeting demand is essential to the planning process. Not surprisingly, load serving entities[1] (LSEs) typically develop their plans for meeting future demand over the course of several years. The long-term planning process involves many stakeholders and can be computationally intensive. Many utilities are required to publicly-release and defend their integrated resource plans (IRPs) in front of consumer advocates, Public Utility Commissions (PUCs), and other stakeholders.

This study is a broad comparison of resource planning content and an aggregation of the collective forecasts of LSEs operating within the Western Electricity Coordinating Council (WECC) region. We review publicly-available planning information for nearly 40 utilities that, in aggregate, generate ~90% of the electricity in WECC. Since many of the resource plans are more than a year old, we also sent a supplemental survey to resource planning staff to give each an opportunity to update their load and resource projections. Most responded with updated information, including a few for which we could not locate plans. The results presented in the following sections are based on the best available information from LSEs as of August 2012.

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[1] Some entities covered in this study are not technically LSEs, but we refer to them collectively as LSEs for simplicity. They include investor-owned utilities; federal power agencies; rural electric cooperatives; state, municipal and provincial utilities; independent power producers; and power marketers.

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We conducted this analysis in order to gain insight into the following questions: (1) What are Western electric utility planners assuming about the future growth of electricity demand and mix of supply- and demand-side resources? (2) What types of risk do Western electric utilities consider and address in their long-term resource planning? (3) How does the collection and reporting of resource planning-related data differ across this region?

We report aggregate future demand and power plant fuel mix trends, identify the uncertainties LSEs focus on as they develop their IRPs, and report on emerging trends considered by planners. Reporting differences are a reflection of differing state reporting requirements, and these inconsistencies affect our ability to compare some planning assumptions. Accordingly, the availability and consistency of planning information are a focus of this analysis.

This paper is organized as follows. Section 2 provides a brief review of previous IRP surveys. Section 3 describes important steps in the planning process. Section 4 describes the data and methods we use to compare IRPs. In Sections 5–7, we compare planning assumptions as we address the questions above. We conclude with suggestions that could improve intercomparison and ultimately lead to more efficient long-term regional planning.

2. Past utility resource planning surveys

2.1. Brief history of resource planning

Early advocates for integrated resource, or least-cost planning, emphasized the value of improvements in demand-side efficiency. Both the public and private sectors actively searched for cost-effective ways to get more services with less energy (Cavanagh, 1991). The IRP process offered advantages over traditional resource planning, because it included demand side management (DSM) as a resource (e.g., Hill et al., 1992; Sioshansi, 1992; Swisher and Orans, 1995; Vollans, 1994). Successful planning in this manner ensured the reliable production and delivery of energy at the lowest practical cost. Early research defined what an IRP is (e.g., Hirst and Goldman, 1991; King, 1992; Lenssen, 1996), what an IRP should include (e.g., Hirst, 1994; Kahn, 1992), and what types of software tools were available to conduct long-term planning (e.g., Eto, 1990; Hoog and Hobbs, 1993; Rosekrans et al., 1998).

The Federal Energy_Policy_Act (1992) formally defined the term *Integrated Resource Planning* for the U.S. Federal Government and required utilities that purchased electricity from federal power authorities (e.g., Western Area Power Administration) to create an IRP. The Energy Policy Act provides some basic guidelines, but rules and requirements governing long-term electric utility planning activities are mandated by state or local governments and agencies. State-level planning requirements are carried out through legislation, codes, agency requirements, or PUCs who adopt IRP regulations. Today, there are 28 states with formal IRP filing requirements, and 11 other states that have adopted the Long-Term Procurement Plan[2] (LTPP) framework as an alternative to IRP (Wilson and Peterson, 2011).

All of the states with utilities that are members of WECC currently have a formal IRP reporting process, except for California which has an LTPP process. LSEs refer to their plans using a variety of names including IRP, LTPP, Electric Resource Plan (ERP), Expansion Plan (EP), Long-term Transmission Plan (LTP), Resource Procurement Plan (RPP), and Transmission Assessment Plan (TAP). Although each title means something slightly different to each planning department, all effectively accomplish similar tasks. For convenience, we will refer to all of these activities as IRPs throughout this paper. Although many general IRP requirements are similar, the rules governing IRP content are generally defined by the PUCs, so there are significant differences between planning objectives, analysis horizon, and reporting frequency. One consistent theme across all jurisdictions is the requirement to consider all feasible supply-side and demand-side resources.

2.2. Infrequent evaluations of resource planning

The first evaluations and comparative analyses of IRPs occurred before the Energy Policy Act provided resource planning guidelines and definitions. Hirst et al. (1989) evaluated a specific utility's IRP – Puget Sound Power & Light. Hirst (1989) then reported on the internal activities of the same utility as they established an improved planning process. Hirst and Goldman (1991) evaluated regulatory incentives for ~20 PUCs and the utilities under their jurisdiction, outlining key components of a successful IRP process.

However, many early surveys covered specific aspects of resource planning (e.g., DSM) (e.g., Berry, 1993; Esteves, 1989; Goldman and Kito, 1995; Wiel, 1991). Schweitzer et al. (1991) surveyed 24 LSEs for current and future peak power and energy demand, electricity generation, and DSM savings, noting that DSM strategies were underutilized in the past, but utilities had aggressive DSM forecasts. Eto (1990) reviewed modeling software used by resource planners at a few specific utilities. Twenty years later, Foley et al. (2010) discussed modeling approaches and described proprietary software used by the electric industry. Consultants at Aspen/E3 (2008) summarized assumptions, models, and other information used by utilities in their planning, and provided information about regulatory requirements, procurement processes, and planning practices for 16 utilities.

One issue that continues to surface is reporting inconsistencies across LSEs. Hirst (1994) compared ~50 plans and provided guidance on how to conduct planning, but found that there were significant data inconsistencies between plans. Bolinger and Wiser (2005), highlighted the importance of the IRP process as driver of renewable energy but noted plans varied widely in availability and completeness of data which limited the evaluation. Hopper et al. (2006) found that some Western utilities planned to meet a significant fraction of incremental resource needs through energy efficiency, but also identified significant opportunities to improve the treatment of efficiency in resource plans noting inconsistencies in reporting methods and detail. Barbose et al. (2008) evaluated Western utility resource plans to assess how utilities assess carbon regulatory risk within their planning processes and options for mitigating that risk, but also found that methods and assumptions used to analyze this risk and the impact on the selection of a preferred resource portfolio varied considerably across utilities.

Despite recommendations made over 20 years ago (Eto, 1990), intercomparisons of resource planning assumptions, techniques, and outcomes are still uncommon, and if undertaken, do not provide much insight into planning trends across an entire region due mostly to reporting differences among resource plans. In this article, we identify where data is unavailable and inconsistently reported, while providing a summary of WECC loads and resources and highlight risks resource planners consider while developing their IRPs.

3. Important steps in the resource planning process

Long term resource planning involves three fundamental steps: (1) developing a load forecast for the planning horizon; (2) determining portfolios of existing and future resources for meeting that demand; and (3) evaluating the cost and risk of candidate resource portfolios. Each of these topics is the subject of countless papers and textbooks, so we provide only a brief summary here for context.

[2] LTPPs include much of the same information as an IRP, but typically have shorter planning horizons.

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