Resource Planning of a Vertically Integrated Utility in the RTO World

A Whitepaper

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The purpose of this whitepaper is to provide an overview of the potential impacts of a regional transmission organization ("RTO") energy market on resource planning of vertically integrated electric utilities. It is not a comprehensive thesis on either resource planning or the RTO energy market. In fact, both electric utility resource planning and RTO energy markets are very complicated with numerous interactions. This whitepaper is a simplistic, yet accurate, high-level view of both. Any views expressed are my own and not necessarily that of the Missouri Office of the Public Counsel.

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Introduction

Prudent resource planning for a stand-alone vertically integrated electric utility places a priority on reliably meeting its customers' needs at a reasonable cost. When planning that balances reliability and cost is conducted by vertically integrated electric utilities that are members of a regional transmission organization ("RTO"), the resources that best achieve this balance also result in a balancing of load costs charged by the RTO and the revenues provided by the RTO for energy generation.

Prudent resource planning treats the RTO as a supplemental resource and does not cede to the RTO the electric utility's responsibility of providing its customers reliable service at a reasonable rate. There are times when a neighboring utility will have excess energy to sell at a lower price but there is risk in counting on electricity being available at a reasonable cost.

A measure of the adequacy of resource planning of a vertically integrated utility (load serving entity or "LSE") that is a member of a RTO with an energy market is a comparison of the cost of the load charged the utility by the RTO and the revenues the utility receives from the RTO for generation for a vertically integrated utility pays for fuel costs regardless of whether it is a member of a RTO or not. However, this comparison of RTO costs and revenues should not be the objective of resource planning. The objective of resource planning should be providing customers with energy services that are safe, reliable, and efficient at just and reasonable rates.

When revenue for generation is near or greater than the cost of the load, this is an indication that the utility can meet the loads of its customers regardless of whether or not it belongs to an RTO. A revenue much larger than the cost is an indication the utility may have overbuilt. While this is sometime necessary due to the bulkiness of adding generation, this continuously occurring over the long-term is an indication the utility is charging its customers for generation resources that are greater than what they need. Consistently overbuilding results in increased bills for customers to recover the capital costs of the generation and the return on that investment for shareholders. While the excess generation may result in additional RTO revenues, a prudent utility does not gamble the size of customers' bills on beating the RTO market.

Costs consistently greater than the revenues indicates that either the utility is relying on the RTO to meet the load requirements of its customers or there is a lot of transmission congestion in getting electricity to the load. A utility that consistently has market costs greater than revenues can meet the planning capacity requirement of the RTO, either with (1) capacity-only purchased power agreements that do not include the provision of energy to sell into the market, or (2) it maintains its old costly generation resources for the capacity value knowing that the cost of energy generated using these old resources will seldom be "in the money" in the energy market. The customers of a utility that relies on the RTO for energy reduces its risks of building generation but subjects its customers to the volatility and uncertainty of the electric market.

When market and fuel costs skyrocket, the prudent utility, incurs high fuel costs, but it has the resources to generate revenues in the RTO market to offset the load cost. With high market prices, the revenues paid for the utility's generation should more than cover the variable cost of the utility's generation. Utilities without resources, either due to unavailability of its resources or a dependence on market energy instead of its own resources, incur high fuel costs for the limited resources that are bid into the market and, while the market revenues should offset any generation costs, they do not generate enough market revenues to fully offset the load costs. Therefore, load costs above revenues generated is an indication of inadequate resource planning by utilities.

Load Serving Entities and the RTO Energy Market

RTOs have no generation resources. They facilitate the sale and purchase of electricity between its members. They typically have a centralized energy market. Its reliability standard is designed to cost-effectively meet the combined loads of its all its members, not the load of any one member.

Vertically integrated utilities or Load Serving Entities ("LSE") that are members of the RTO, pay the RTO for the hourly[1] load of its customers at a price set by the RTO. This load cost is independent of the energy provided to the market from generation of the LSE in that hour. For example, if a LSE's load is 1,000 mega-Watts ("MW"), it pays the RTO for 1,000 MW regardless of the fact that it, in that same hour, is generating 600 MW, 1,000 MW or 1,200 MW.

Generally, LSEs bid a generation resource into the market at a price to cover the variable cost of generating energy from that resource.[2] If the market price is equal to or greater than the bid provided for a resource (meaning revenue generated will at least cover the variable cost of generating energy from that resource), then the energy from that resource is sold into the market and the fuel cost to generate that energy is charged to the customer.

In Missouri, this charge by the RTO for load is considered purchased power and the cost flows through the fuel adjustment charge ("FAC") to the LSE's customers. Revenue from the sale of energy to the RTO is considered off-system sales revenue which is also included in the FAC in Missouri offsetting fuel and purchased power costs. The difference between the hourly market prices offered for generation and the prices charged for the load is a measure of congestion in the market. The cost to customers can be described with the following simple equation.

$$\text{Cost to Customers} = \text{Fuel Cost} + \text{Load Cost} - \text{Generation Revenues}$$

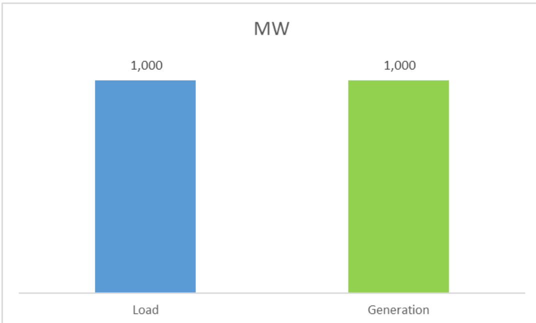
The following three scenarios demonstrate in simplistic terms, how having enough, too little, and more than enough impacts costs to customers. The following assumptions are made to simplify the scenarios.

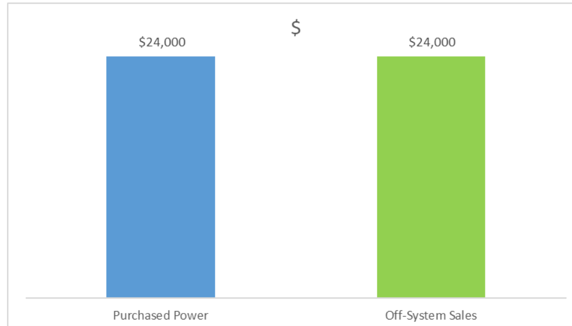
Congestion	$0/MWh
Load Charge	$24/MWh
Revenue for Generation	$24/MWh
Generation Variable Cost	$22/MWh

[1] While this is typically done on a 5-minute basis, for this document, the price interval will be considered hourly which is calculated as the average of the 5-minute prices.

[2] Generation can be self-committed meaning it generates regardless of the market price. The assumption in this document is that none of the generation is self-committed.

Scenario 1: Load = Generation



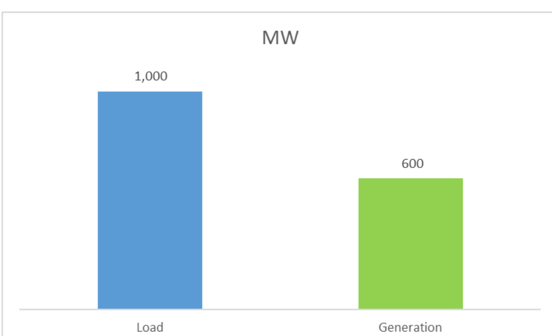


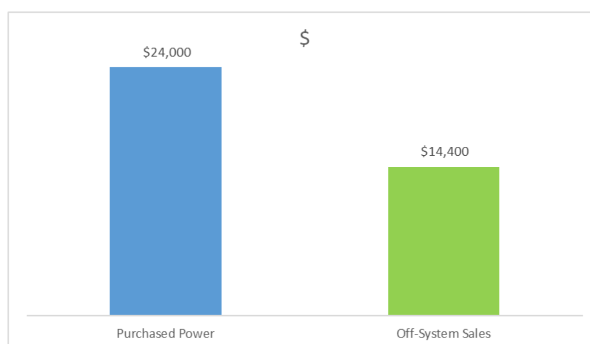
In this scenario, the price of $24/MWh for the load of 1,000 MW (1,000 MW x $24/MWh = $24,000) results in a load or purchased power cost. The RTO is pay $24/MWh for generation so the revenue provided for the 1,000 MW of generation is $24,000 (1,000 MW x $24/MWh = $24,000). When this revenue is netted against the load cost there is no additional cost for the customers for the utility being a member of the RTO. The variable cost (fuel and O&M) for that generation was $22/MWh so the customers would pay $22,000 (1,000 MWh x $22/MWh = $22,000) just as they would have paid if the utility was not a part of the RTO.

The cost to customers for this hour is:

Cost to Customers	=	Fuel Cost	+	Load Cost	-	Generation Revenues
$22,000	=	$22,000	+	$24,000	-	$24,000

Scenario 2: Load > Generation





In this scenario, the price of $24/MWh for the load of 1,000 MW (1,000 MW x $24/MWh = $24,000) results in a load or purchased power cost just as in Scenario 1. The RTO is pay $24/MWh for generation so the revenue provided for the 600 MW of generation is $14,400 (600 MW x $24/MWh = $14,400). The variable cost (fuel and O&M) for that generation was $22/MWh so the customers would pay $13,200 (600 MWh x $22/MWh = $13,200) in variable cost for the generation.

The cost to customers for that hour is:

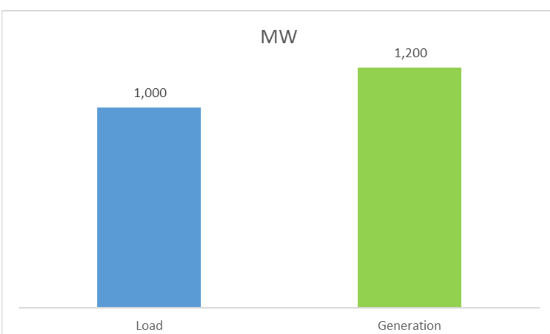
Cost to Customers	=	Fuel Cost	+	Load Cost	-	Generation Revenues
$22,800	=	$13,200	+	$24,000	-	$14,400

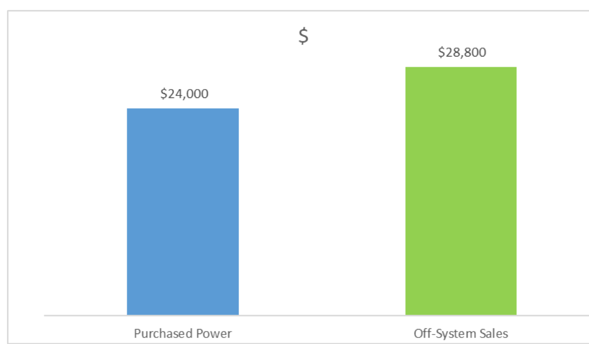
The total cost of not having generation in the market is greater in this scenario than the first scenario. In addition to the increased cost, this LSE relies on the generation of other members of the RTO to meet 400 MW of its customers load requirements.

There are generally two reasons why a LSE buys more from the RTO than it generates. First, it may be because other members have resources that can generate electricity at a cost lower than the LSE. This is a monetary benefit to the LSE's customers because buying from the market is cheaper than the fuel costs of the LSE. There are no reliability concerns for customers since, if the energy cannot be provided by the market, the LSE can generate it, but at a higher cost than purchasing through the market.

The other reason a LSE may buy from the market is that the LSE does not have enough generation resources available that hour regardless of the market price offered to meets its customers' loads thus relying on other utilities to provide energy for its customers. In this instance, the price risk is assumed by customers because the load cost flows through the FAC. There is little to no consequence to the utility because the load cost flows through the FAC.

Scenario 3: Load < Generation





In a RTO market, the generation a LSE can provide to the market is not limited to the load of the utility. In this scenario, the price of $24/MWh for the load of 1,000 MW (1,000 MW x $24/MWh = $24,000) results in a load or purchased power cost of $24,000 just as in Scenario 1 and 2. The RTO is paid $24/MWh for generation so the revenue provided for the 1,200 MW of generation is $28,800 (1,200 MW x $24/MWh = $28,800). The variable cost (fuel and O&M) for that generation was $22/MWh so the customers would pay $26,400 (1,200 MWh x $22/MWh = $26,400) in variable cost for the generation.

The cost to customers for that hour is:

Cost to Customers		Fuel Cost		Load Cost		Generation Revenues
$21,600	=	$26,400	+	$24,000	-	$28,800

In this scenario, the customers have no reliability risk for the utility has more generation than its customers needed.

Summary of Scenarios

	Cost to Customers	Fuel Cost	Load Cost	Generation Revenue
1: Load = Generation	$22,000	$22,000	$24,000	$24,000
2: Load > Generation	$22,800	$13,200	$24,000	$14,400
3: Load < Generation	$21,600	$26,400	$24,000	$28,800

In reality, these scenarios play out for every hour and an LSE may experience all three scenarios in a day. It is rare that a utility supplies the exact amount of energy into the market that it needs. For a well-balanced utility, there will be hours when it supplies more to the market and hours when the market supplies its needs cheaper than if it generated itself.

When looking at these scenarios, a utility could decide that its objective would be to have resources so that the generation would be greater than the load often enough that it would net out any times that load was greater than generation. The fallacy of this objective is that market prices are not static. They fluctuate within every hour. By building to provide energy to the market and not to meet customer loads exposes customers to price risk. If the prices used in the resource planning analysis are accurate, then the customers see the bills estimated in the resource planning process. However, the only thing that is certain about projections is that they will be wrong. This type of planning puts this risk on customers.

Absent in the economics of these three scenarios is the cost of the investments in generation. Resource planning is a balancing of the investment cost for generation and the benefits of both reliability and RTO revenue.

LSE Types

Type 1: Prudent Utility

The resource planning objective of the prudent utility is to meet its customers' loads 8,760 hours of the year at a reasonable cost that minimizes risks and values flexibility across a variety of various futures – some of these futures should include extreme market prices. Its resource planning objective is to be able to provide generation required by its customers every hour at a cost below market prices. To do this all generation resource types are considered taking into account uncertainties and risks of each resource (e.g. reliability of natural gas delivery, intermittent availability of renewables, nuclear waste disposal, residual disposal, environmental restrictions). The flexibility of the resource during extreme events (e.g., extreme natural gas prices, market volatility, extreme weather) is also a consideration when choosing a resource. While a prudent utility can meet its customers' needs on a stand-alone basis, it sees value in being a part of a market where it can sell its generation when it is not needed by its customers and can take advantage of other utilities' diversity of energy resources and loads. This utility does not build to meet the RTO planning reserve margin but meets the RTO planning reserve margin because it builds with a margin that will ensure it is able to meet its customers' needs.

Prudent Utility Response to Scenarios

Scenario 1: Load = Generation

Prudent Utility has the ability to be in this position in every hour of the year. It's rare that it actually occurs but it is possible and planned for.

Scenario 2: Load > Generation

Prudent utility will take energy from the market when the price is below its cost of generating more energy or it has a forced outage at one of its generation plants. Reliability for its customers remains high and customers' bills will be reduced when market prices are lower than generation.

Scenario 3: Load < Generation

Prudent utility could find itself in this position at times when its load is low and its generation is available. It does not build with an objective of being in this situation because that results in higher bills due to the increased investment.

Type 2: Market Player Utility

The Market Player Utility's planning objective is to beat the market. The critical assumption in its resource planning process is forecasted market price assumptions. If actual market prices meet or exceed planning projections, customers' bills are lowered by the market gain; if market prices are lower than projected in the planning, customers' bills are increased. There is little risk to Market Player Utility if it has a FAC, because market risk will be assumed by its customers. Therefore it is not important to the utility whether or not the price assumptions are correct in its analysis.

Reliability of resources to meet customers' energy requirements is not a consideration. Actually customer load is inconsequential to the Market Player Utility. Least-cost in planning is measured by how much revenue the utility forecasts the resources can generate in the market not by how well it meets customers' needs. There is no risk to the utility if forecasted market prices are not realized. Fixed costs plus a return for shareholders are recovered through rates charged customers regardless of whether the resources are in-the-money or not.

Part of the planning process of the Market Player Utility is to make sure that the utility meets RTO planning reserve margin. It is not a natural fallout of the planning process. The RTO is necessary for Market Player Utility's customers to be assured that they have the energy resources they require; the Market Player Utility cedes its responsibility for providing energy to its customers to the RTO.

<u>Response to Scenarios</u>

Scenario 1: Load = Generation

This scenario occurring for a Market Player Utility in any given hour is a coincidence. It is not planned for. Market Player Utility only adds generation to beat the market, not to assure its customers that it can meet their load requirements. It depends on the RTO market to provide energy for its customers.

Scenario 2: Load > Generation

This scenario occurring for a Market Player Utility in any given hour is a coincidence. While it is not necessarily planned for, the Market Player Utility is not concerned when it occurs. The increased cost of purchasing from the market is covered by its customers through the FAC. The Market Player Utility is hoping that Scenario 3 will happen enough to generate revenues to cover costs incurred in this scenario.

Scenario 3: Load < Generation

This is the scenario that the Market Player Utility is hoping happens. If it does not happen enough to cover the increased costs that occurred in other hours, there is no harm to the utility for the load costs are recovered from the customers through the FAC. Its customers pay, not only for the increased cost when this planned for but not realized scenario does not occur, but also the capital cost of and return on additional generation that was built to beat the market.

Type 3: Moocher Utility

Moocher Utility avoids adding owned-generation. It has a short-term view for meeting RTO capacity requirements often relying on other utilities' excess capacity to meet the RTO's requirements through capacity-only contracts and keeps it old, inefficient but fully depreciated generation operable so it is considered capacity for the RTO. The Moocher Utility cedes its responsibility for providing energy to its customers to the RTO relying on other utilities and the RTO energy market to meet its customers' energy requirements.

<u>Response to Scenarios:</u>

Scenario 1: Load = Generation

This scenario occurring for a Moocher Utility in any given hour is an unlikely coincidence. It is most likely to occur when load is low.

Scenario 1: Load > Generation

This is the likely scenario for a Moocher Utility in any given hour. Its reliance on capacity-only contracts to meet the RTO planning reserve margin means that it is not concerned with providing reliable, low cost energy for its customers. Customers' bills can be volatile due to the fluctuations of the cost of market energy. Because the costs flow through to the customer, there is no consequence to Moocher utility of not having capacity without energy.

Scenario 3: Generation > Load

This scenario rarely happens for the Moocher Utility because it meets the RTO capacity requirements with capacity only purchased power agreements.

Conclusion

Electric utility resource planning in the days before RTO markets centered on obtaining resources that would provide reliable energy at a reasonable cost for customers. RTOs offer valuable additional resources for energy and increased reliability to supplement a utility's resources. However, the energy markets have opened another objective for adding resources – playing the market. When owned-resources are added, electric utility shareholders can earn a return on investment with a utility's projected possibility of revenues that, in the long run, are greater than the cost to customers. Earnings to shareholders are a given. A reduction to customers' bills due to market revenues is a possibility. However, even if this possibility does not pan out, shareholders still receive earnings and customers pay the costs.

A utility can rely on RTOs for energy to meet its customers' needs reducing its risk of adding additional generation. However, the objective of a RTO is to cost-effectively meet the combined loads of its members and not the load of any one member.

The interplay between a utility and the RTO it belongs to should be considered in resource planning but a resource portfolio should be built to assure customers safe, reliable, and adequate service at just and reasonable rates. Customers' should not be used as a financing resource for playing the RTO energy markets.