Supply-side Strategy Implications on Demand-side Opportunities

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ABSTRACT

Major changes in the gas and electric markets have created a range of risk management products to support supply-side planning. The supply-side goal is usually to balance a client's tolerance for cost fluctuations with the lowest possible price. There are many implications a supply strategy has on demand-side opportunities. They should be considered carefully. This integration of supply and demand-side planning often does not take place because they have been thought of as two independent disciplines. They require two separate sets of expertise.

Historically, demand-side planning has been a responsibility for engineering and operations while supply-side planning was the domain of purchasing and procurement. The integration of supply and demand is critical to control of your total energy picture. The right hand needs to know what the left hand is doing. There are a number of situations that illustrate where an integrated supply and demand-side approach is vitally important.

This article will examine two situations as examples. We will show how your supply-side strategy affects your true energy costs and how that is different than in the past. We will also show how a supply-side strategy gives new triggers for demand-side actions.

ENERGY COST METHODOLOGY

To demonstrate the methodology needed to determine true energy cost, consider an end user who has a centrifugal chiller (electrically driven) and an absorption chiller (steam or fuel driven). Someone has to analyze the performance of the equipment (demand-side) and the true cost of energy (supply-side) to determine the optimum chiller to operate at any particular time. While this sounds simple, it is not trivial.

Equipment Performance

From a demand-side perspective, the performance of the two chiller options will vary as the loading on the chiller changes. In the case of the centrifugal chiller, its performance will also vary with changing condenser water temperatures (related to outdoor conditions).

Utility Cost

The supply-side perspective might be even more difficult to analyze, or at least, less likely to be considered. In the past, what you paid for gas or electricity was probably going to be the cost to use for this type of analysis. It used to be that electric rates were relatively stable until the utility applied for, and was granted, a general rate increase or fuel cost adjustment. Regulated gas tariffs have been reasonably stable, with rates changing moderately on a seasonal basis. Things are very different today. Gas is purchased and transported on a monthly basis, and for larger users, on a daily basis. Electricity has even more granularity being purchased on a daily basis, and for large users, on an hourly basis.

Cost and Market Price

In the chiller example, you may be thinking that the hourly market pricing is irrelevant. Your purchasing agent told you that she locked up the price of gas for the Nov–Mar strip, and so you know your gas cost for the entire winter. What you may not know is this: the locked in price is not the price to factor into your chiller analysis.

Your gas contract will include a daily or monthly cash-out provision so that if you use more or less than your nominated volume you will either pay extra, or receive a credit, at the prevailing market price. Therefore, your true cost of gas is the cash-out price.

Consider an example where you filled your car with gasoline at $2.00 per gallon. Now you are thinking about taking a trip, but the cost of gasoline has skyrocketed to $10 a gallon. How much will gas for the trip cost you? It will cost $10 a gallon, not $2.00. This is because you are going to have to replace the gallons you use with $10 gas.

The same is true for your natural gas. Any gas you are deciding whether or not to use has a value of the market price. The market price changes every day, not once a season. Electricity can be even more challenging because it may be changing every hour. In finance and accounting this method of cost assignment is called mark to market; that is, it assigns a value based on the current market price.

To perform the chiller analysis in this example, you would need a daily gas cost, an hourly electric cost, and of course, the performance analysis based on chiller loading and outdoor conditions. If this sounds complicated, it is, but there are many automated tools to perform these analyses.

DEMAND MANAGEMENT TRIGGERS

Consider how the interaction of supply and demand can affect your incentive for demand control.

Historical Demand Management

Historically, it has been a very attractive demand-side opportunity to do demand control. Demand control strategies are designed to reduce electrical demand charges (which can be 50% or more of the electric utility bill).

In the past a facility was billed according to the maximum demand registered in the billing month. Often included were other provisions (ratchet clauses) that considered prior months' demands as well. A demand control strategy is used to curtail loads or start generation during these peak periods to reduce the purchased power.

Unbundled Electric Supply

Things have changed with emerging supply-side strategies. In the case of deregulated power, there are two primary components of electric service pricing: transportation and commodity charges.

The transportation piece looks a lot like regulated power always has, except the bill is likely to show all the components factored into its cost. (Transportation charges in this context also include distribution charges. Together they are commonly referred to as T&D charges).

The commodity portion of deregulated electric supply can be provided to the end-user as a block of power based on a historical load profile. The supplier is going to match your historical load curve with their forward pricing model to generate your offer price. Therefore, the user has incentive to reduce peak demand before getting a price, but not afterwards.

Real Time Pricing

Another variation of electric pricing that exists in regulated and deregulated electric service territories is real time pricing (RTP). In this model the end user purchases power by the hour. They will have a price notification system that receives an RTP feed with the price per MWh one day in advance (may be provisional quote) up to 15 minutes in advance. In this case, the end user is incented to reduce demand during the hours with the highest cost, not necessarily when they are using the most power.

Demand Response

Another shift in the electric industry is the number of demand response programs that have emerged across the country. The intent is to offer financial incentives to electric consumers who are willing to modify their electric consumption during periods of high system demand.

There are a number of variations of the offers – curtailing load on demand to a pre-established base, demand auctions, curtailing at predetermined times, critical peak pricing, etc. They range from voluntary programs to ones with stiff compliance penalties. The specifics of each program will dictate how and when to do demand control.

Demand Management Today

The result of these new pricing models is that it gives the end user a variety of supply-side signals that encourage demand-side responses. This gives way to demand-side technologies related to manual control, automatic control, and generation.

Power monitoring and analyzing systems are necessary to support implementation of manual load curtailment. Automatic systems require similar power monitoring hardware, but also must have built-in analytics, and output control that supports automatic load management. Similarly, generation can be automatically dispatched to reduce purchased power during peak system conditions and must contain similar intelligence to effectively dispatch and control generation assets.

Generation Example

Consider an industrial facility with onsite steam and power generation using steam turbines. The normal mode of operation would be steam load following. That is, the turbine would be controlled to extract enough steam to supply the plant steam demand. The amount of electricity produced would be entirely dependant on the how much steam the plant's processes required. Steam extraction is a very cost-effective way to produce steam. Depending on the fuel cost, it can be just a few cents per kWh, nearly always less expensive than purchased power options.

However, most plants also have the capability to condense steam, or put a false steam load on their system. That heat will be rejected in cooling towers to produce more electricity. While considerably more power can be generated, it costs much more because the heat of condensing is wasted. Condensing can be four times the cost per kWh compared to extraction.

But that does not mean you do not want to condense steam. There are a number of times that the cost of purchased electricity, as a result of RTP or demand response, could be worth much more than the cost to condense.

That cost to condense at any particular time is called the strike price. It is the level above which, if the purchased power exceeds, the plant will go into condensing mode. However, the strike price can change every hour and needs to be updated accordingly. It must match the real-time performance characteristics of the equipment with the true cost of the electricity and fuel to the facility.

INTEGRATED SUPPLY AND DEMAND

The gas versus electric chiller option and the generation option are examples of the supply-side impact on demand-side actions. There are a number of other demand-side actions that are going to depend, or be predicated on, the supply-side circumstances. They might include:

- Off-Peak Power Usage
- Coincident Peak Reduction
- Load Aggregation
- Alternate Fuels
- Third Party Utility Supply.

Make sure you consider an integrated approach to your supply and demand strategies to amplify the total opportunity for energy control.

Reference

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ABOUT THE AUTHOR

Stephen B. Austin, P.E. has over twenty years experience with industrial energy, automation, and utility optimization. Currently he is the manager of engineering, for Square D Company, where he directs implementation of the industrial energy efficiency initiative. Prior to that, he was vice president of the Foresight Group, an independent energy and utility consulting company. Before that, he provided design and consulting engineering services to Glaxo Wellcome, a $40B international pharmaceutical manufacturing company. He also worked for Carolina Power & Light, a Fortune 250 utility, preparing and conducting complex energy studies for industrial customers. Mr. Austin has a bachelor's degree and Master of Science in mechanical engineering, both from N.C. State University. Mr. Austin may be contacted at steve.austin@us.schneider-electric.com.