EnerVantage

Load Profile
Corner Stone of Energy Mgmt.

Dale Rector
(502) 963-8230
dale.rector@enervantage.com

Uses for Load Profile Analysis

Load profile analysis is the study of energy demand, consumption and timing. The objective is to identify the drivers for these components and how those drivers interact with each other. Then the facility can then begin to manage the drivers which they can control. The drivers that can't be controlled, must be mitigated through the appropriate selection of supply chain options.

- Rate schedule selection.
- Demand response evaluation.
- Generation/Co-generation.
- Supply solicitation.
- Sales tax exemption.
- Energy efficiency assessment.
- Process optimization.
- Budget preparation.

Load profile data provides the basis for all energy management evaluations.

What can you tell with load analysis?

- Daily and weekly consumption patterns.
- Frequency of demand occurrence.
- Impact of weather on demand.
- Base-load energy consumption.
- Contribution of processes to demand/consumption.
- Impact of production changes.
- Seasonality or other time-related trends.

Rate Selection - Load Factor

The load factor is a basic "efficiency" calculation of the actual units used each month compared to the maximum possible. It can also be viewed as your average demand divided by your peak demand.

Load factor is important in rate selection because many utilities still use block rates with separate demand and consumption charges. Utility rates typically have a declining consumption charge based on volume used. Therefore, the greater the load factor %, the lower the weighted average cost. This structure commonly applies to electricity, natural gas, water, sewer, internet and telephone.

$$LF\% = \frac{Actual\ Consumption}{Peak\ Demand\ x\ Time}$$

Example:

$$LF\% = \frac{2{,}250{,}000\ kWh}{5{,}000\ kW\ x\ 24\ hrs\ x\ 30\ Days} = 62.5\%$$

Rate Selection – Time-Of-Use

Some utilities, notably electricity and cell phone service providers have differentiated rates based on the time of day used. The prices are higher during peak periods and cheaper during off-peak periods in the hopes of getting flexible users to make a specific choice of when to use the service.

In these instances, it is important to know the percentage of on-peak consumption to off-peak consumption. This requires knowing which hours are on and off peak and then having a method of monitoring consumption on an hourly basis.

A good example is that an operation with three shifts may benefit from a time-of-use rate structure. Adding a third shift doesn't contribute to demand charges and thus can be done at just the variable energy cost. Since this is typically off-peak, the variable cost for this period can be even lower than first shift operations.

Demand Response – Load Shifting

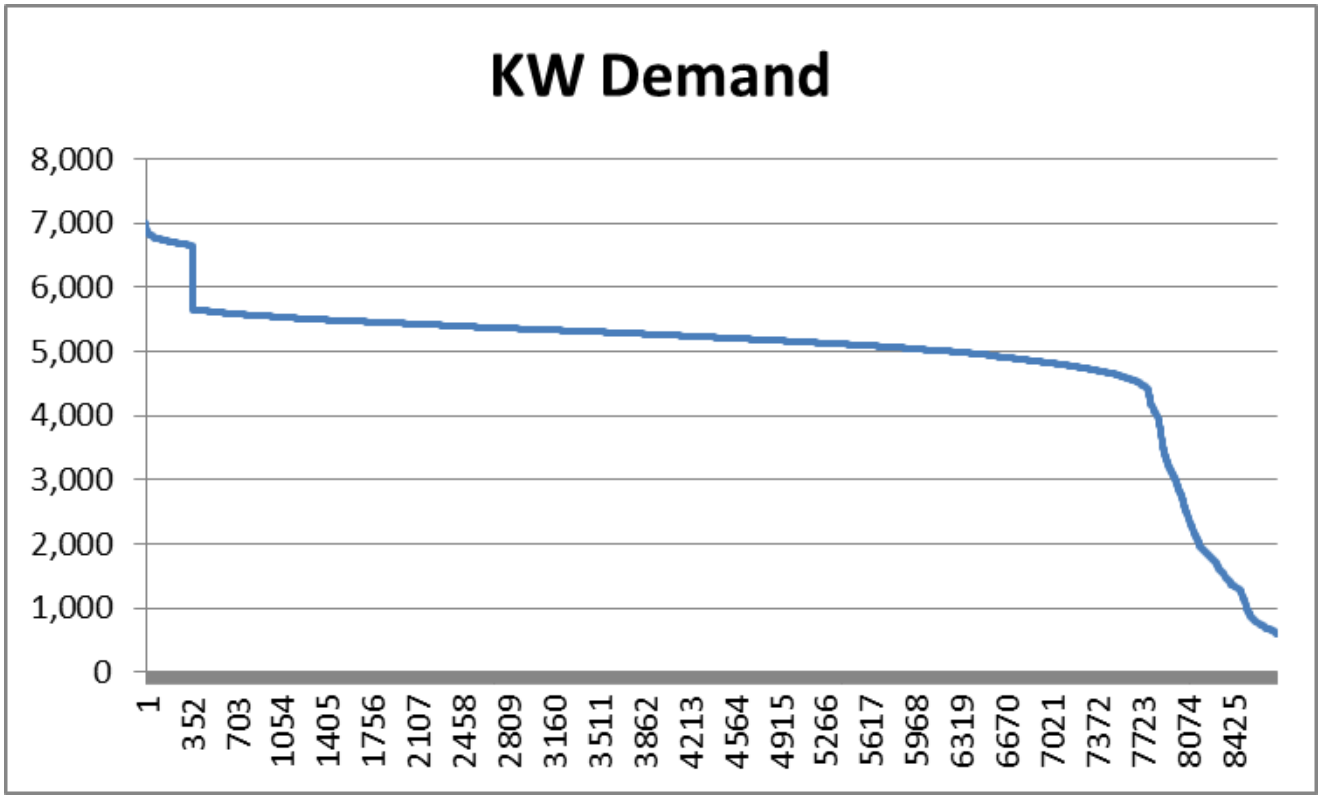
Time differentiated rates also encourage load shifting. Load shifting is either a temporary or permanent movement of a process from on-peak to off-peak periods.

It is helpful to have process level metering to determine the impact of shifting a process from on-peak to off-peak periods. A brick manufacturer might opt to crush scrap brick during off-peak hours when electricity costs are lower considering that this is not a critical manufacturing process. Sub-metering the crusher will identify exactly how much demand it contributes and may even indicate that the crusher be metered separately as interruptible load.

Demand Response - Interruption

Another simple tactic is to sort the hourly or daily consumption of the utility commodity and then see what percentage of time the facility is above a specific level.

In the example to the right, the facility only exceeds 5,700 kW of demand 4.2% of the time. In particular it is only when they custom process a high carbon content steel. Since this demand driver is not weather-related, the facility is a good candidate for an interruptible contract with a firm service level of 5,700 kW.



Supply Solicitation

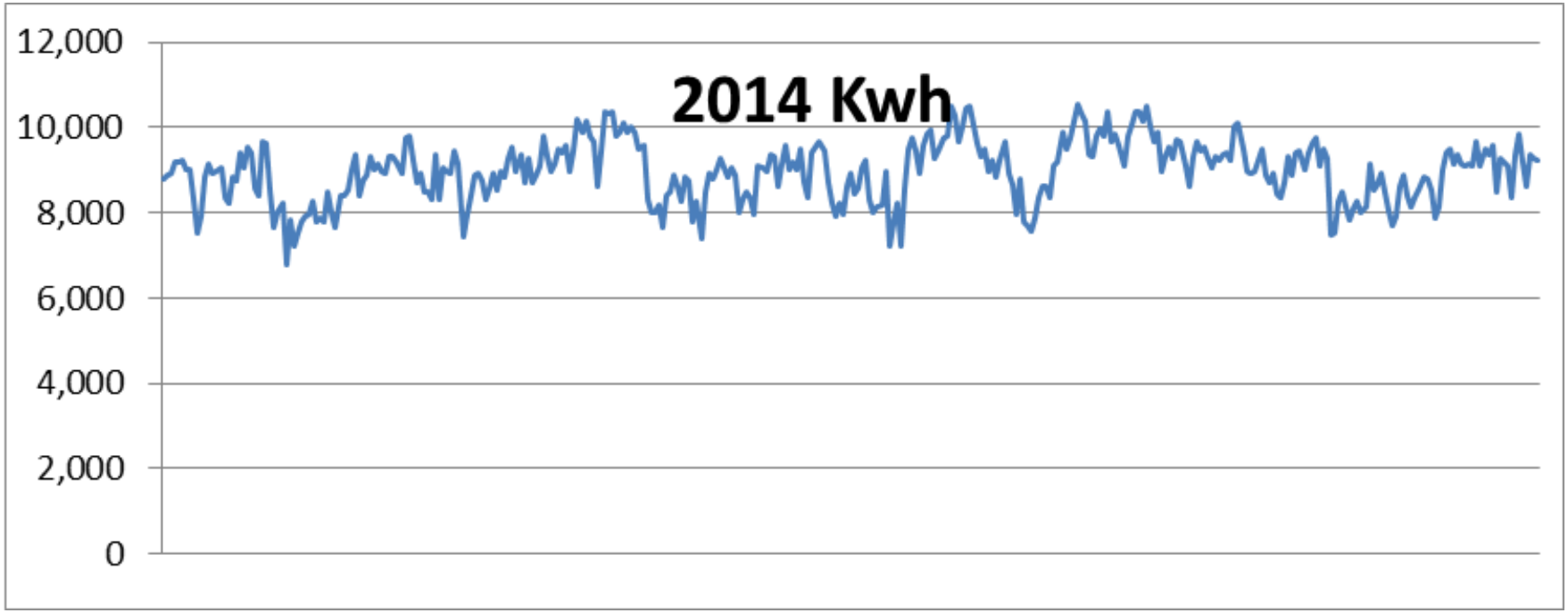
The main purpose for load profile analysis in the RFP process is to determine the type of product to solicit from suppliers. It is not necessary to provide the data to suppliers as they will obtain your load data directly from the utility.

The hourly load data can be used in conjunction with historical on-peak and off-peak prices and forward curves to run sensitivity analysis on different product types. Product types include:

- Load Following – A fixed price for all consumption regardless of volume or time.
- Block – Generally a fixed volume for a fixed price.
- Index – Generally a variable price for a variable volume.
- Combination - Base-load volume purchased at a fixed price with remainder at index.
- Interruptible – A fixed or variable payment for interruption of load on request.

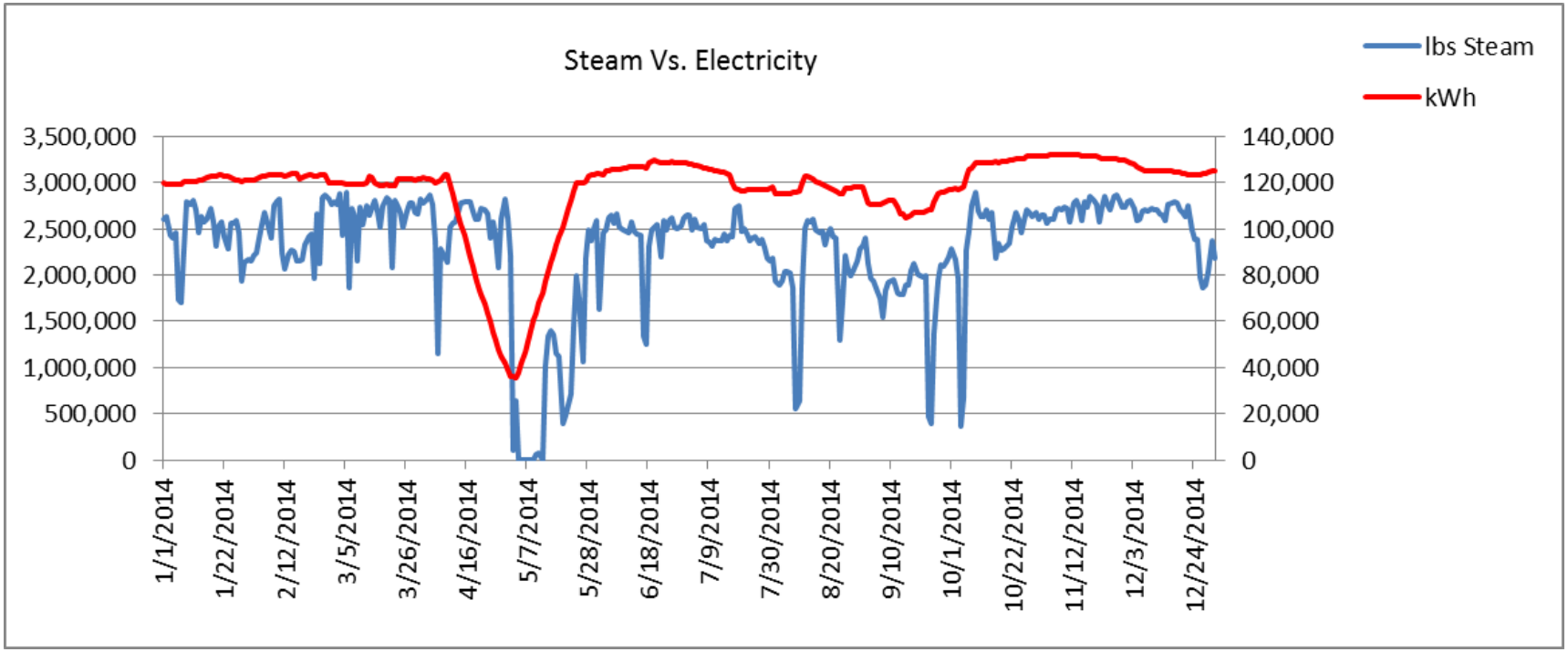
Supply Solicitation

The customer below has a relatively high load factor, so would get a good rate with a load following product. A slightly less conservative option might be to fix an around-the-clock block of 8,000 kW and price the balance based on a daily index. A more aggressive but lower cost option might be to fix an on-peak only block of 8,000 kW with all off-peak hours settled at an index price. This facility might also choose to fix smaller blocks at different times based on pre-determined triggers.



Generation/Co Generation

The correlation between steam and electricity usage primarily determines if both of these commodities could be generated using the same natural gas supply source. Simply graphing this correlation provides a good visual representation of the synergy involved, particularly for those without an engineering background.



Sales Tax Exemption

Many states offer exemption from sales tax on utilities consumed in manufacturing. The interval data, along with on-site inspection of equipment, review of equipment specifications and interviews of plant personnel allows for a breakdown of consumption by process. These processes can then be allocated between manufacturing and non-manufacturing to prove predominant use.

EnerVantage

XYZ Company
Jeffersonville, Indiana
Predominant Use Study

Electricity
Account # 123-4567-890
Meter # 1543222

Description	M/N	Qty	H.P.	KW	Hrs/ Day	Days/ Wk	Wks/ Yr	Hours/ Year	Percent Loaded	Total kWh	Non Mfg kWh	Mfg. kWh	Comments
Blanking Line #1													
Uncoiler Drive Blower	N	1	1	0.75	12	5.75	52	3,588	70%	1,874	1,874	0	Supports uncoiling the coil
Pinch Roller Drive Blower	M	1	0.5	0.37	12	5.75	52	3,588	70%	937	0	937	Cools the pinch roller.
Washer Pump	M	1	50	37.30	12	5.75	52	3,588	50%	66,916	0	66,916	Removes oils from the coil.
Washer Pump Filter Pump	M	1	7.5	5.60	24	5.75	52	7,176	75%	30,112	0	30,112	Supports the washer pump.
Main Hydraulic Pump	M	1	20	14.92	24	5.75	52	7,176	85%	91,006	0	91,006	Drives rollers.
Leveler Drive Blower	M	1	1	0.75	12	5.75	52	3,588	75%	2,007	0	2,007	Cools the leveler.
Leveler Oil Pump	M	1	1	0.75	24	5.75	52	7,176	70%	3,747	0	3,747	Adds oil to the coil for corrosion resistance
Mist Collector	M	1	15	11.19	24	5.75	52	7,176	70%	56,210	0	56,210	Pulls oil out of water.
Air Knife	M	1	50	37.30	12	5.75	52	3,588	75%	100,374	0	100,374	Blows moisture and oil off roller after washer.
Feed Roller Drive Blower	M	1	1	0.75	12	5.75	52	3,588	70%	1,874	0	1,874	Supports the feed roller.
Blanking Press	M	1	100	74.60	24	5.75	52	7,176	85%	455,030	0	455,030	Cuts shape of product into the coil.
Run-Out Conveyor	N	1	0.5	0.37	18	5.75	52	5,382	65%	1,305	1,305	0	Moves finished product
Magnet Conveyor Blower	N	1	0.75	0.56	2	5.75	52	598	50%	167	167	0	Transports scrap
Reject Conveyor	N	1	1.75	1.31	2	5.75	52	598	70%	546	546	0	Transports scrap
Reject Cart	N	1	2.75	2.05	6	5.75	52	1,794	75%	2,760	2,760	0	Transports scrap

Energy Efficiency Assessment

An energy efficiency assessment starts with the same steps as a sales tax exemption study. Once the consumption is identified by process, this information is compared to benchmarks to determine if energy can be reduced without compromising production.

Load profile analysis in energy efficiency assessments may identify:

- Replacement of equipment with more efficient models.
- Modification of equipment, such as adding variable speed drives to motors.
- Modifying the process, such as moving from centralized to decentralized compressed air production.
- Replacing equipment or processes with a substitute, such as replacing a natural gas heating process with electricity.
- Elimination of equipment entirely, such as selling metal to a recycler instead of shredding it on site.

Process Optimization

Many companies that are energy or water intensive monitor consumption per unit of product produced. For example, iron-ore pellet manufacturers monitor natural gas consumption per ton produced. Tracking this information on hourly or daily basis allows these companies to identify problems within their process based on increases in the consumption/ton. The data may even pinpoint the time and possible equipment causing the problem.

Example:

A gradual increase over months of natural gas consumption/ton of aluminum melted allows smelting operations determine which furnaces need burner maintenance or refractory wall replacement. Given that these are expensive operations, timely notice and scheduling to ensure capacity is available during shutdown is vital.

These companies can also identify how effective improvements are based on a change in energy consumption. Adding an air curtain to a furnace to minimize heat loss when the door is open can be evaluated using “before and after” hourly meter data.

Budgeting

As noted previously, many companies monitor consumption per unit produced and the impact of weather on the facility. As a result, production and weather forecasts can be used to forecast the consumption of energy or water. Keep in mind to adjust for planned production process changes or energy efficiency improvements. Plugging this information into the applicable rate structures or forward curves for the commodities can provide a much better budget estimate than just “increasing by 5%”.

Perhaps almost as important as using load profile analysis to prepare the budget, is being able to use the information to explain variances to budget. The load profile information can be used to identify whether cost increases are due to changes in volume or changes in price and whether or not these changes are controllable or non-controllable.

Putting it all together

Load profile analysis techniques do not have to be complex and costly to be effective. More important is objective assessment, an experienced eye and creative problem solving. EnerVantage can help with any facet of load profile analysis, including:

- Determining the type and extent of monitoring needed.
- Collecting relevant data.
- Analyzing results.
- Developing reporting structures.
- Implementing energy infrastructure or efficiency projects.
- Validating results.

Contact us at (502) 963-8230 or (402) 905-4070