Colorado Springs Utilities
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White Paper #7

The Hidden Costs of Low Load Factor

This applies to large customers that have demand charges on their bills.

Spreading out electric usage during the day is a great way to keep the overall unit cost of electricity down. If usage cannot be spread out evenly, lower "load factors" will result in higher demand costs, increasing the overall cost of electricity. Controlling the load factor is one way to control electric costs.

Not all customers can make changes to improve their load factors. But for those that can, reduced demand charges and overall cost of electric service can be rewarding!

The term "load factor" is the ratio of average use to maximum use. If all electric loads are turned on fully and never turned off, this would be a load factor of 1.0, although this would obviously be wasteful.

Utility demand charges are levied because the maximum sustained demand for each customer represents a portion of the utility infrastructure that is dedicated to them. This includes a portion of the generating plants, the transmission lines, etc. which all cost money to install and maintain. If these are only occasionally used, the revenue from the actual usage is low while the maintenance and amortized costs for these things remains the same – demand charges are intended to stabilize the revenue stream. In essence demand charges are a penalty for *not* using the installed capacity. As a utility, our overall load factor is around 70 percent.

Large customers will always have a demand charge, however with good load factors (70 percent or higher) the demand charges are a small percentage of the total electric bill. For large customers with lower load factors, the demand charges will become an increasingly large percentage of the total. A study of 12 large customers with varying load factors was made and the results are in the graphs below. While not an exact correlation, the pattern is very clear that low load factors cost the customers money. Take a look at these and notice how both the "demand percentage of total bill" and "overall cost per kWh" rise proportionally as the load factor drops off.

So what can you do? Look at how and when you use electricity to find possible ways to control your load factor.

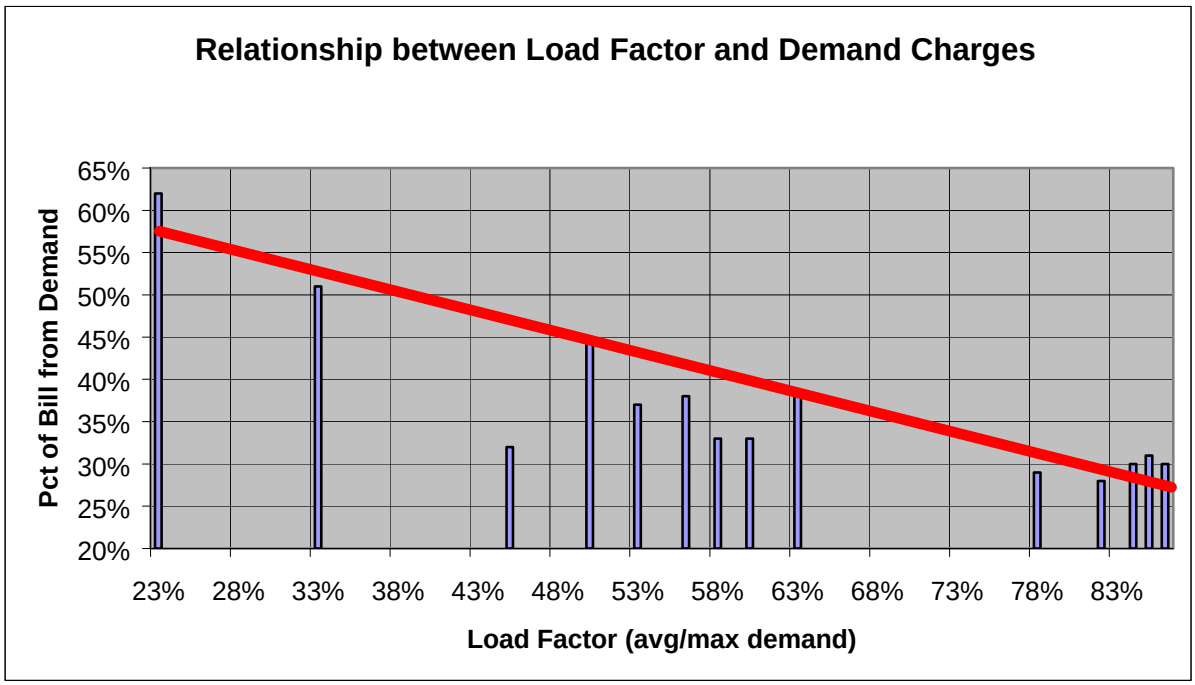
For office and retail facilities that operate from 8-5 p.m. and then shut down overnight, the load factor will be 'built-in' at around 50 percent. The only options here would be demand reduction during the day – possibly higher efficient lighting or higher efficiency air conditioning.

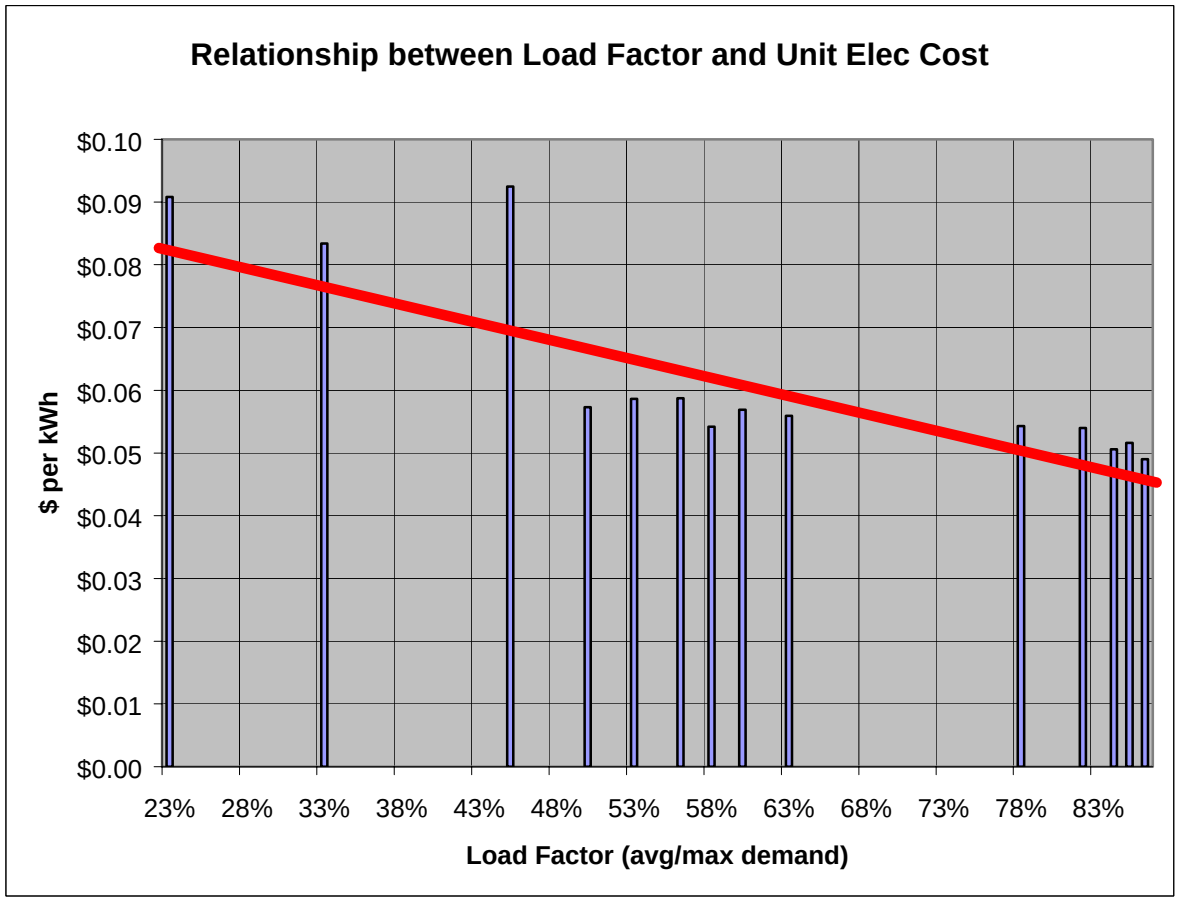
Other typical commercial segments have distinct patterns of load factor, and each have their own business drivers that may or may not be controllable. Some typical values are shown below

Segment	Average Load Factor
Education	75-80%
Grocery	75-80%
Health Care	55-65%
Multi-Family	50-65%
Retail	50-60%
Lodging	45-60%
Restaurant	50-55%
Office	45-55%
Manufacturing	35-50%
Highest Individual	90%
Lowest Individual	15%

Survey of 890 ETL Customers, 2004
Results are averaged.
Ranges represent monthly variations

For manufacturing facilities, scheduling or staggering large electric loads so their loads don't occur at the same time will help. With the advent of "just in time" delivery, the concept of backlogging work and schedule smoothing has become harder to do, and a consequence of that paradigm shift has been lower load factors and higher utility costs. If the customer's expectations don't allow a little bit of delay for scheduling a smooth flow of production, then there is a good chance the utility costs will increase for those parts.


Relationship between Load Factor and Demand Charges
Pct of Bill from Demand
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
23%
28%
33%
38%
43%
48%
53%
58%
63%
68%
73%
78%
83%
Load Factor (avg/max demand)


Relationship between Load Factor and Unit Elec Cost
$ per kWh
$0.10
$0.09
$0.08
$0.07
$0.06
$0.05
$0.04
$0.03
$0.02
$0.01
$0.00
23%
28%
33%
38%
43%
48%
53%
58%
63%
68%
73%
78%
83%
Load Factor (avg/max demand)

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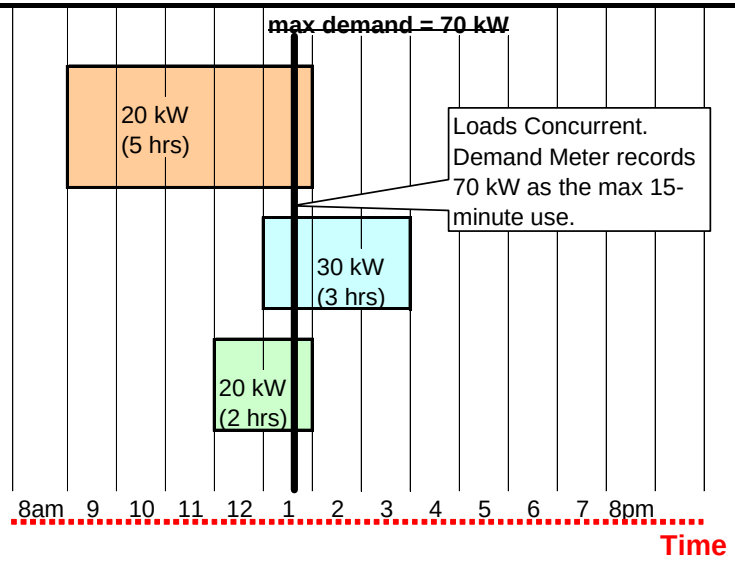
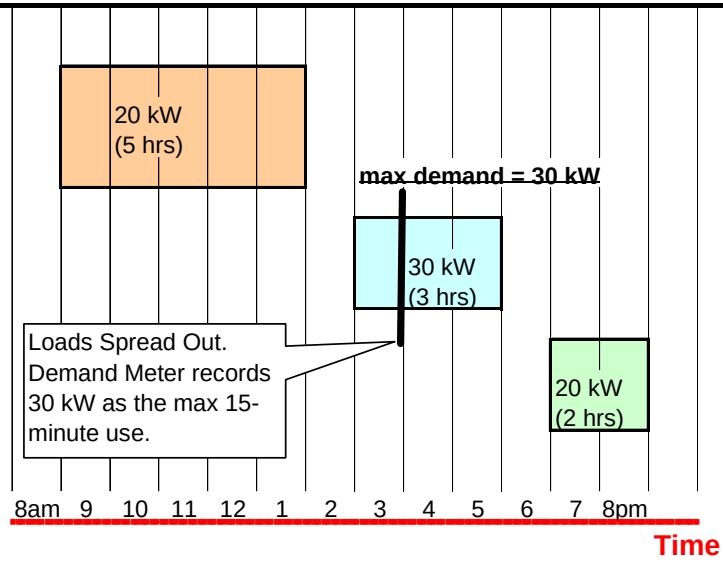


380	Consumption per day(kWh)	
11400	Consumption per month(kWh)	
16	Avg demand (kWh per hour)	
70	Max demand (kW)	
23%	**Load Factor**	
$ 672	**Demand Charge per month**	
$ 660	**Energy Charge per month**	
$ 0.12	***Effective cost of power ($/kWh)***	



380	Consumption (kWh)	
11400	Consumption per month(kWh)	
16	Avg demand (kWh per hour)	
30	Max demand (kW)	
53%	**Load Factor**	
$ 288	**Demand Charge per month**	
$ 660	**Energy Charge per month**	
$ 0.08	***Effective cost of power ($/kWh)***	

Load Factor and its effect on Utility Cost

Based on June 2004 ETL rate:
$0.0579 per kWh, on peak
$0.32 per kW-day demand charge