Cannabis Cultivation:
Managing Peak Demand

DENVER ENVIRONMENTAL HEALTH

Peak Demand – How Does Your Grow Stack Up?

Not all cannabis cultivation facilities use power in the same manner; the facilities that level out their peak power needs reduce their electricity bills substantially. This summary describes how to measure your facility's peak demand, the resulting load factor and how significantly this affects your energy bill.

Xcel Energy charges Secondary General (SG-Rate) customers (which include all cultivation facilities) in two ways:

- Total energy consumed, measured monthly (kilowatt-hours, kWhs)
- Peak demand, high point recorded each month (kilowatts, kWs)

Xcel Energy measures the power demand regularly, recording the highest demand reached as the Peak Demand for that billing cycle, stated on the bill as Billed Demand. A building's demand equals the total watts, or kilowatts, needed to power all the devices turned on at any given time – lights, HVAC, pumps, cameras, etc. Large fluctuations are more difficult for Xcel Energy to manage, and thus, they bill accordingly. This article focuses on demand which is very manageable, not to mention cost effective. On the example bill below all the "kW" charges are based on the Billed Demand high point, in this case 65 kWs.

Electric Service - Account Summary					
Invoice Number			Secondary General	27760 kWh x 0.004730	$131.30
Meter No			GRSA		($0.08)
Rate	SG	Secondary General	Trans Cost Adj	65 kW x 0.070000	$4.55
Days in Bill Period	29		Elec Commodity Adj	26802.76 kWh x 0.033670	$902.45
Current Reading	13061	Actual 07/01/2011	Elec Commodity Adj	957.24 kWh x 0.036100	$34.56
Previous Reading	12714	Actual 06/02/2011	Demand Side Mgmt Cost	62.76 kW x 0.310000	$19.46
Multiplier	80.000		Demand Side Mgmt Cost	2.24 kW x 0.220000	$0.49
Measured Usage	347		Purch Cap Cost Adj	65 kW x 4.100000	$266.50
Kilowatt-Hours Used	27760		Distribution Demand	65 kW x 4.840000	$314.60
Measured Demand	0.815	kW Actual	Gen & Transm Demand	65 kW x 10.960000	$712.40
Billed Demand	65	kW	Service & Facility		$40.00
			Renew. Energy Std Adj		$48.53
			Subtotal		**$2,474.76**
			Franchise Fee	3.00%	$74.24
			Sales Tax		$196.76
			Total Amount		**$2,745.76**

Peak Demand can be translated into Load Factor which is a measure of how effectively the building utilizes its power needs. Calculating Load Factor is an effective internal tool for managing your facility's peak demand. The basic formula is:

$$\text{Load Factor} = \frac{\text{kWhs}}{\text{kWs} * \text{days} * 24\text{hrs/day}}$$

For example; a facility that has two flowering rooms, each with 10 kWs worth of lights/equipment, and rotates use of the rooms for 12 hours on and 12 hours off will have a perfect 1.0 Load Factor (or 100 percent). Neither room is illuminated at the same time so the Peak Demand remains at 10 kWs. If the facility lights both rooms at the same time, however, the Peak Demand will double to 20 kWs during that time. The Peak Demand charges are now double for the month and the Load Factor is halved, 0.5 (or 50 percent). Any overlap of the two rooms is costly – even for 10 minutes. Steady, consistent power demand is best.

The total amount of electricity used (kWhs) is the same in either scenario since all the lights are operating the same amount of total hours. However, the cost differences are significant when fees are applied to the billed demand amount. Each kW in the example is estimated to cost approximately $21.25 which is a sum of the fees highlighted in blue (plus taxes). Therefore scenario two with 10 extra kWs costs an additional $212.50 to operate each month.

A current Boulder County pilot study provides excellent examples of reducing costs through peak demand management. Below is an example of the load factor calculation for one of the facilities in the pilot:

$$\text{Load Factor} = \frac{\text{kWhs}}{\text{kWs} * \text{days} * 24\text{hrs/day}} = \frac{27760 \text{ kWhs}}{65 \text{ kWs} * 29 \text{ days} * 24\text{hrs/day}} = \frac{.61 \text{ or } 61\%}{\text{Load Factor}}$$

In the example chart below, the curves indicate how a building's load factor will affect the cost of electricity. The range of load factors is from 44 to 61 percent (represented by black points) and the optimal states of power utilization range upwards of 80 percent (represented by green points). A facility that optimizes its load factor can save an estimated 22.8 percent.
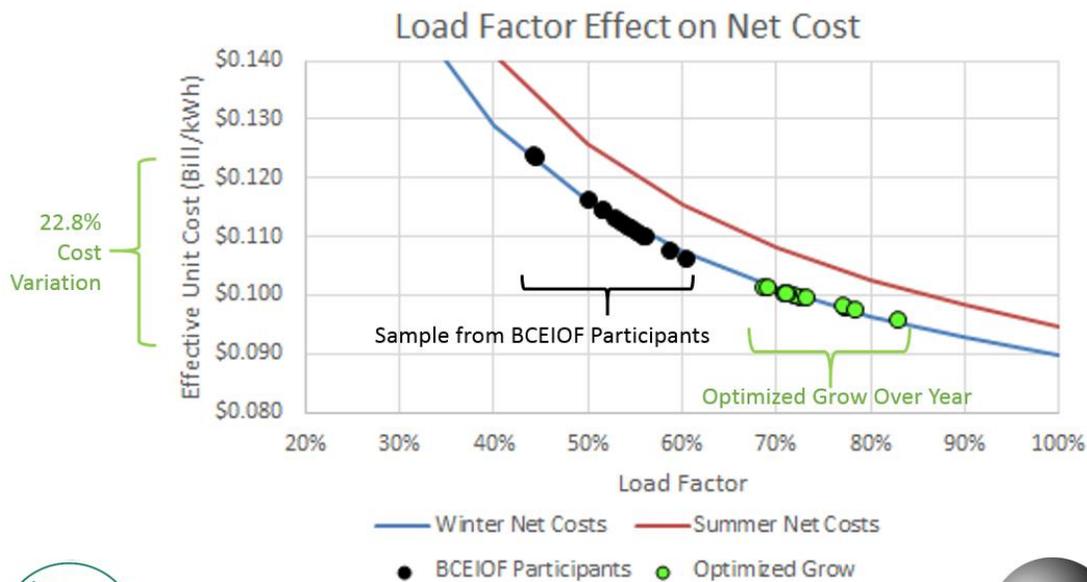
Consider the following recommendations to minimize a facility's peak demand:
- Stagger lighting schedules to avoid overlap as much as possible
- Adjust lighting schedules to coincide with cooler evening temperatures to reduce cooling needs, particularly if there are unavoidable overlapping lighting schedules
- Where possible, cycle cooling unit compressors. Two or more units can be cycled to prevent multiple compressors from running simultaneously
- Install real-time energy monitors to track and control specific loads
- If there are other sizeable but irregular electric loads such as extraction production, schedule these during lower peak demand periods.

[1] Note: Total electricity costs in this model are representative of Boulder County. Denver facilities will exhibit different prices, but follow a similar curve.