MEMORANDUM

TO: Power Committee

FROM: Massoud Jourabchi

SUBJECT: Electrical load impacts of indoor commercial cannabis production

BACKGROUND:

Presenter: Massoud Jourabchi and Maggie Lahet

Summary: Under state of Washington initiative I-502 legal production of cannabis started in 2013-2014. Council analysis estimated the demand for electricity for the growers of cannabis represent about 80-163 Mwa of new load to the regional system.

Relevance: Producing a long-term Load forecast is a requirement of the Act. In responding to this requirement, Council's load forecast keeps track of all forms of electricity consumptions, in particular new and emerging loads. Three such emerging loads are data centers, electric vehicles and in-door cannabis production. In this presentation we will present results of preliminary analysis on load impact from cannabis production.

Workplan:
1.D. Update long-term load forecast. In preparation of the Seventh Power Plan, forecast of loads from cannabis producers will be incorporated into the long-term demand forecast.

Background: The State of Washington, through its initiative process, enacted a law allowing for recreational use of cannabis. Hundreds of producers have now been licensed to grow and process cannabis. Those producers using indoor growing facilities place a significant load on the electrical system to provide lighting, HVAC and other required services for the plants. Staff conducted interviews with a number of these producers in order to develop estimates of existing and forecast of electrical loads from these operations.

More Info: NA
IMPACT OF CANNABIS PRODUCTION IN THE PACIFIC NORTHWEST ON REGIONAL ELECTRICITY LOADS

September 9, 2014

Acknowledgement

THIS PRESENTATION BENEFITED FROM INDUSTRY BACKGROUND WORK DONE BY CLEARESULT COMPANY.

Why are we doing this study

- Better understanding of impact of I-502 on electric loads in state of Washington.
- Indoor cannabis production can be a very electricity intensive.
- Provide information on energy efficiency potential for Seventh Plan development
Presentation Overview

- Growing Cycle – Why Growing Has Moved Indoors
  - Stages and pace of plant development in nature
  - Stages and pace of plant development in modern indoor growing facilities
- Results from Council’s survey of I-502 producers
- Load Forecast Range
- Identify Potential Energy Efficiency Options
Estimated State Shares of National Cannabis Production (2006)*

- California: 42%
- Hawaii: 12%
- Kentucky: 13%
- Tennessee: 14%
- Washington: 18%
- Oregon: 1%
- Idaho: 0%
- Montana: 0%

*As estimated by Federal Government

Natures Growing Cycle

- **Time**: Mid Spring, Up to Summer Solstice, Mid Summer, Late Summer
- **Plant Mode**: Seedling, Vegetative Mode, Flower Mode, Seed Mode
- **Long Days**: ~ 12-14 weeks
- **Shorter Days**: ~ 8-12 weeks

LONG DAYS

SHORTER DAYS
Method of Production

Why producers go indoors?

Indoor operations seek to:
- Reduce cycle time
- Replicate and standardize ideal outdoor conditions:
  - Temperature
  - Lighting
  - Atmosphere
  - Watering
  - Nutrients / plant food
- Increased security
Modern Indoor Growing Cycle

Time
- Always
- Always
- Always

Plant Mode
- Clone
- Vegetative Mode
- Flower Mode
- Seed Mode

LONG DAYS
18-24 hours of light

SHORTER DAYS
12 hours of light

SWITCH ROOMS

~ 6-8 weeks

~ 8-10 weeks

An indoor grow module accommodating 4 plants sucks as much electricity as 29 refrigerators.

Mother Jones
Electricity Use in Indoor Production

Aluminum Production ~ 16 KWH/kg
Indoor Cannabis production ~ 5000 KWH/kg

Hourly Load profile of one indoor producer
Producers do not have a flat profile
Hourly Load Shapes  
(one producer)
Can contribute significantly to winter peak

System Peak Period

Findings from Council’s Survey of I-502 Producers

- 121 out 2626 Producers approved in July
- 1,913 Processor applications
- 2,167 Retail applications
- 13 Indoor producers were surveyed
  - Square footage, facility layout, plant strain and number of plants etc. vary by producer
  - Lighting, directly or indirectly, accounts for 80% of electricity use
Survey Results (continued)

Baseline for indoor production:

- **Vegetation Room**
  - 1,000W Metal Halide, plus other lights
  - 2-8 plants per lamp
  - Operated 24 hours on, 18 hours on/6 hours off

- **Flowering room**
  - 1,000W High Pressure Sodium w/adjustable ballast 600W-1150W
  - 2-3 plants per lamp
  - Operates 12 hours on/12 hours off

- **HVAC**
  - Rooms have separate HVAC and lighting
  - Mini split for every 1,000 sq. ft. with additional large unit
  - Temperature and Humidity set points

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**Preliminary Estimate of Demand for Cannabis 2014-2035**

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### Preliminary Estimate of Demand for Cannabis 2014-2035

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### Forecast of Demand from Producers* 2014-2035 (preliminary)

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* Does not include processors and retailers.
Range of Forecast of Demand for Electricity

- **60 MWe** calculated using estimated demand for cannabis in Washington and borrowed metric of kWh/kg
- **80 MWe** calculated using % of total sq. ft. that each tier occupies and primary source metric of .04 kW/sq. ft.
- **160 MWe** calculated using total allowable square footage for Washington cannabis production and using borrowed metric of kWh/sq.ft./cycle

Forecasted range of 60-160 MWe

Efficiency Potential

- Surveyed Washington producers expressed interest in switching to energy efficient lighting (concerned about cost of LED lamps)

- **LED Lighting Being Tested**
  - **Test 1 - Cannabis Strain: Bio-Diesel**
    - HPS: 1.68 lbs total yield, 1,000W, 4’x4’ area, 1.53lb/kW, 27.95% THC
    - LED: 1.9lbs total yield, 780W, 4’x4’ area, 2.44lb/kW, 26.07 %THC

  - **Test 2 - Cannabis Strain: Durban Poison**
    - HPS: 1.75 lbs total yield, 1100W, 4’x4’ area, 1.6lb/kW, 14.39% THC
    - LED: 1.85 lbs total yield, 780W, 4’x4’ area, 2.37lb/kW, 22.28% THC

Findings: LED provided 6% increase in yield, 48% increase in conversion efficiency in lb/kW
Summary

- Indoor cannabis production is very energy intensive.
- There are significant efficiency gains possible by:
  - Using better lighting and HVAC
  - Moving to greenhouses
- More research needed to establish the current and future baseline.