



*Geothermal Projects
at the
Oregon Institute of Technology*

A. Chiasson

Geo-Heat Center, Oregon Institute of Technology

Oregon Geothermal Working Group Meeting
Sept. 15, 2011

Acknowledgements

- *Toni Boyd*
- *John Lund*

Overview

OIT Geothermal

Direct Thermal Uses

Current Uses

- Campus (district) heating since 1963
- Campus hot water needs
- Snow melting
- Thermal energy sales to neighboring retirement home

Past Uses

- Aquaculture (late 1970s)
- Greenhouse (late 1970s)
- Absorption cooling (1980s –1990s)

Future Possibilities

- Aquaponics
- Absorption cooling

Electric Uses

Current Uses

- 280 kW Pratt & Whitney packaged binary organic Rankine cycle (ORC) unit

Under Development

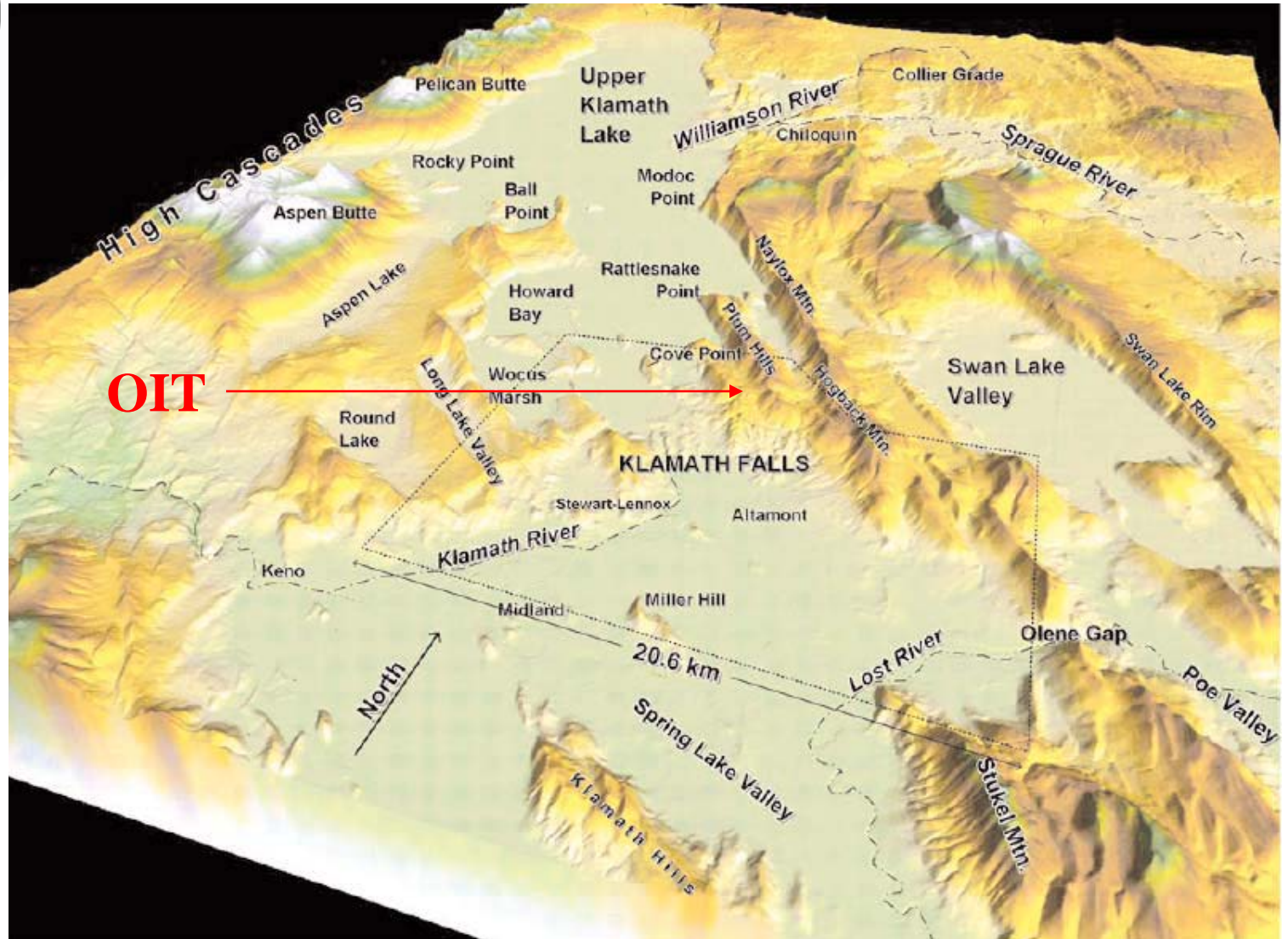
- 1.75 MW binary ORC unit custom designed by team led by Johnson Controls Inc.



Geothermal History at OIT

- Previous location was a military facility
- Original campus (1947 – 1960) spent \$100,000/yr for heating
- Appropriation of \$150,000 for exploration for a new campus for OIT – late 1950s
 - Used for master plan
 - Exploration to determine availability of geothermal water for space heating

Oregon Dept. of Geology & Mineral Industries map of the Klamath Basin



Geothermal at OIT

1960: Well #1, 1200 ft, 300 gpm, 76°F
1960: Well #2, 1280 ft, 130 gpm, 196°F
1960: Well #3, 1150 ft, ~100 gpm, 65°F
1962: Well #4, 1224 ft, 250 gpm, 90°F
1962: Well #5, 1720 ft, 425 gpm, 194°F
1963: Well #6, 1850 ft, 320 gpm, 195°F
2009: Well #7, 5300 ft, 2500 gpm, >195°F
1989: Inj#1, 2050 ft, 700 gpm, >100°F
1992: Inj#2, 1675 ft, 700 gpm, >100°F
2011: Inj#3, 2500 ft, ? gpm, 80°F



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
©2011 Europa Technologies
©2011 Google
Image State of Oregon

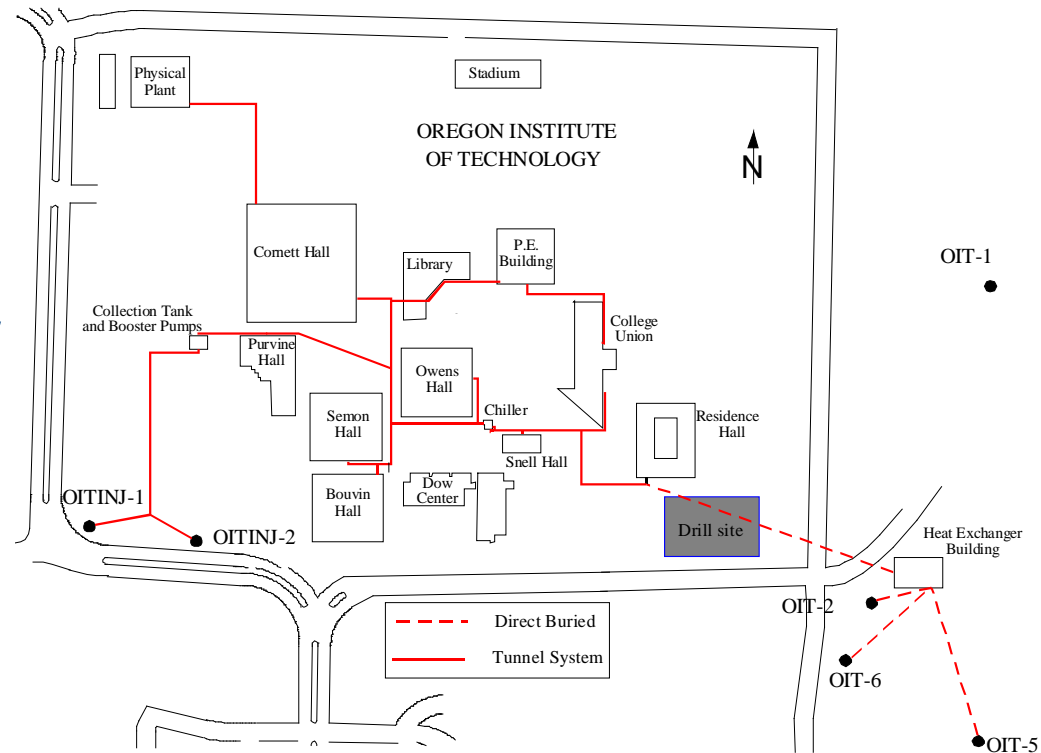
42°15'37.69" N 121°47'04.76" W elev 4445 ft

Eye alt 5910 ft

Imagery Date: 6/28/2005

OIT Campus District Heating

- Approx. 165°F water after leaving small geothermal power plant
- Currently using 3 Wells #2, #5, #6. To be augmented by Well #7.
- ~1 million sq. ft of space heating.
- 40,000 sq. ft of snow melting
- Saving \$1 mil/yr



OIT Campus District Heating (*cont.*)

- Thermal energy sales to neighboring retirement home.
- Began Jan. 2011
- Delivering 114 gpm geothermal water at 184°F.
- Approx. \$70,000 annual income.



OIT Campus Snow Melting

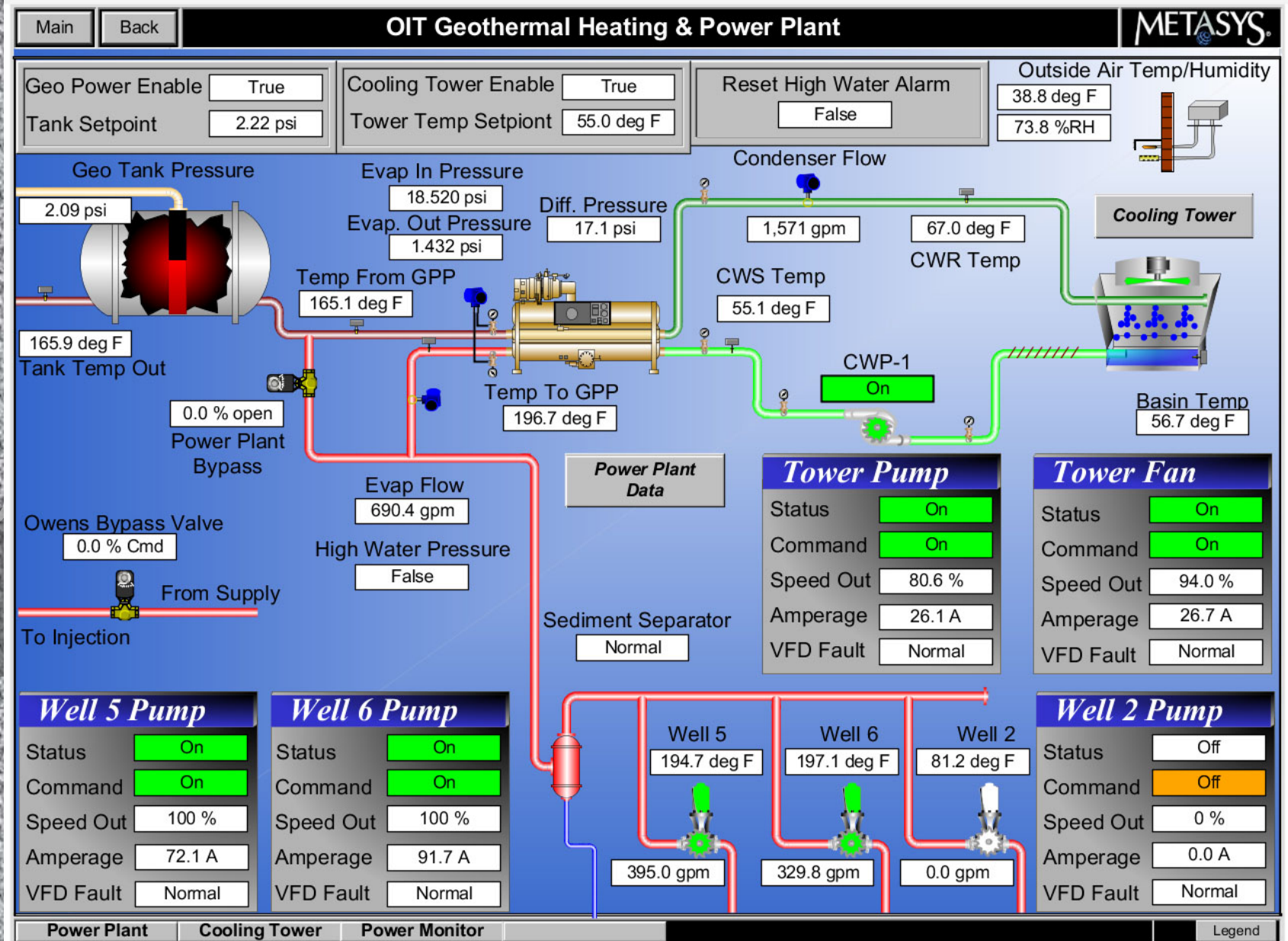


“Small” Geothermal Power Plant

- 280 kW rating
- Pratt & Whitney binary ORC plant
- Use existing wells, with a maximum flow rate of 600 gpm
- Oregon’s first geothermal combined heat and power (CHP) plant
- Only geothermal CHP plant in US
- Fully operational as of January 2010.



"Small" Geothermal Power Plant

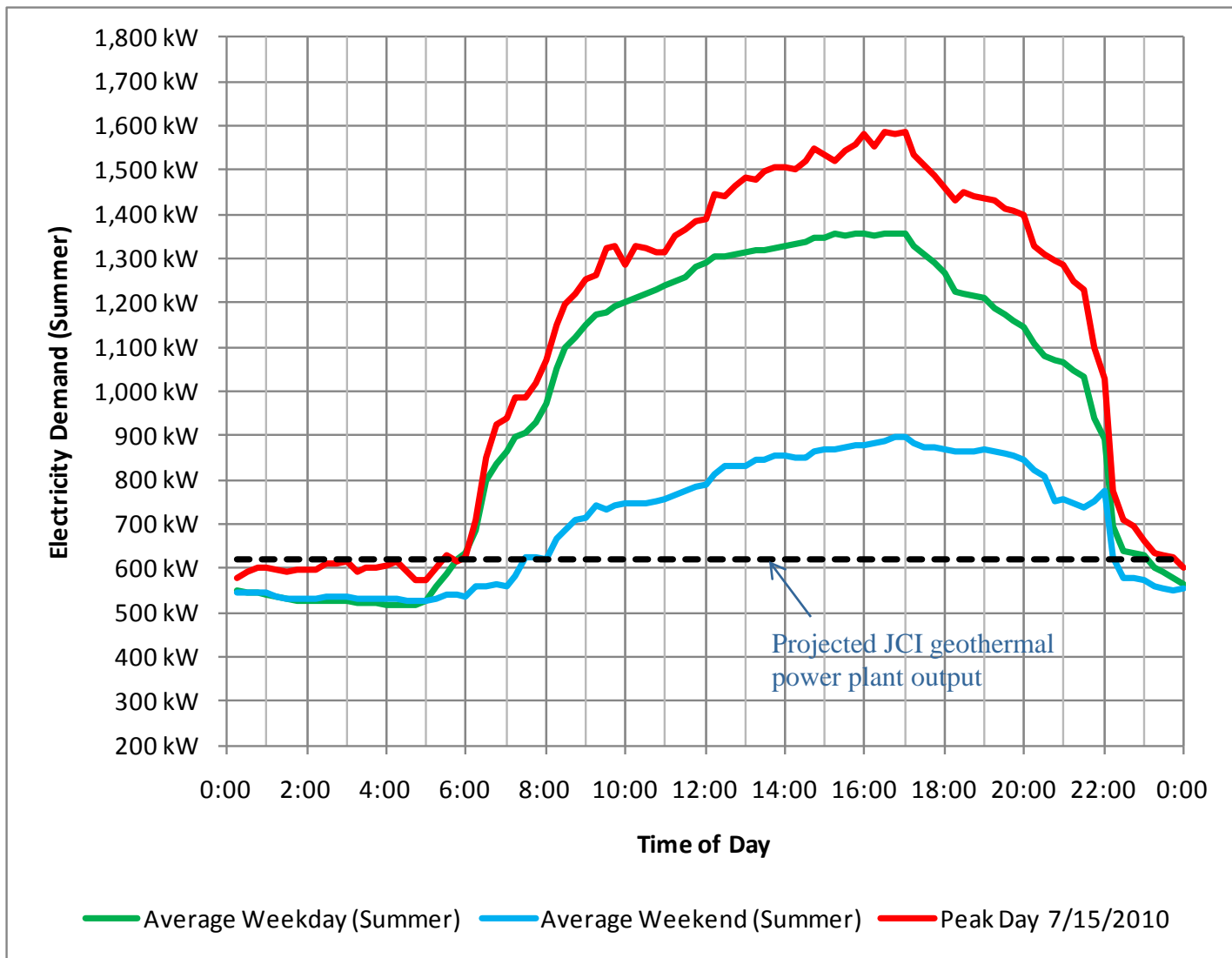


New Geothermal Power Plant

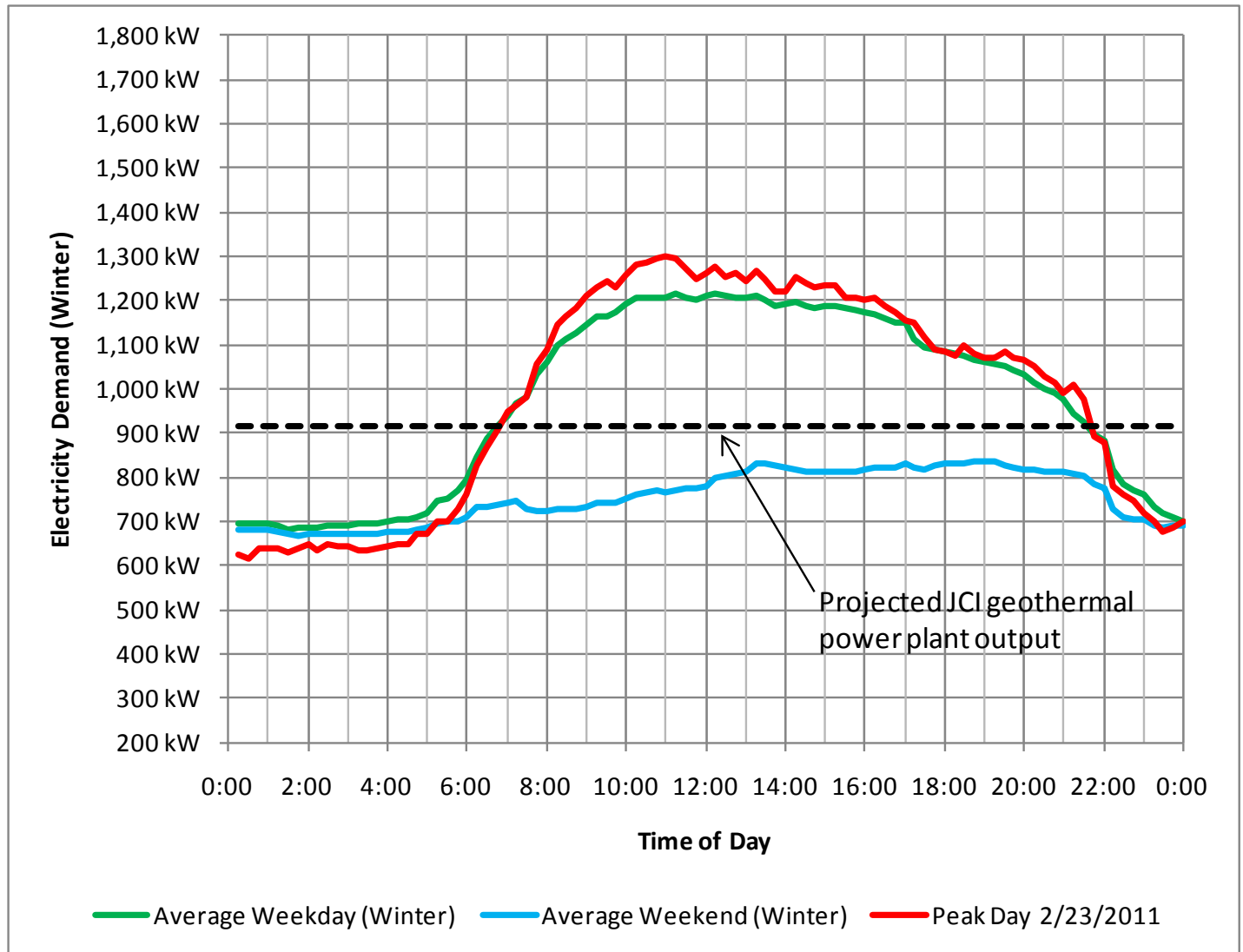
- Contracts just signed with press release soon to follow.
- Custom built plant consisting of two generators with a combined 1.75 MW rating.
- Final design being prepared.
- Significant parasitic loads expected, mostly due to relatively low geothermal supply temperature.
- Combined with the “small” geothermal power plant, will meet about 70% of OIT’s annual electricity consumption, or about 7.0 MWh/yr (equivalent to about 700 homes).

New Geothermal Power Plant (cont.)

Brief Loads Analysis - Summer



New Geothermal Power Plant (cont.) Brief Loads Analysis - Winter



Conclusion

- OIT is the **first campus** to receive all of its energy for space heating from an on-site geothermal resource.
- OIT has the **first geothermal power plant** on a university campus.
- OIT installed the first geothermal combined heat and power (CHP) plant in Oregon (and is the only one currently operating in the US).
- We are approaching and will eventually exceed being a 100% renewable energy campus. A 2.5 MW photovoltaic array will be completed in early 2012.