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June 7, 2011

## MEMORANDUM

**TO:** Power Committee Members

**FROM:** John Fazio, Senior Power Systems Analyst

**SUBJECT:** Follow up to Verification of Council Thermal Resource Assumptions

This is a follow up to last month's power committee discussion on thermal resource data and modeling. Last month staff described sources of resource data, described what information is collected, explained how the information is validated, illustrated some of the validation methods used, and laid out considerations for data processing improvements. In this presentation more detail is provided on how thermal resource operation is simulated in the GENESYS model.

The task of validating the GENESYS simulation is assigned to the Adequacy Forum's technical committee. In general, it involves comparing simulated resource dispatch with actual resource operation under various load, hydro and wind conditions. The simulated hourly dispatch is compared for;

- aggregate resource types (hydro, thermal, wind)
- aggregate resources based on fuel (gas, coal, nuclear)
- individual resources

The process also checks to see if the order of dispatch is reasonable. Least expensive resources should be dispatched first and more expensive resources, such as market purchases, should be dispatched later. Also, when wind generation picks up, higher-operating-cost resources should be displaced first.

Our findings show that the aggregate and individual simulated dispatch of thermal resources is consistent with observed results. The modeling, however, can always be improved. Next steps include; 1) adding seasonal resource capabilities, 2) adding ramp-up and ramp-down limits (primarily for coal) and 3) continuing to investigate potential transmission limitations that might impede certain utilities' access to market resources.

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# Follow up to: Verification of Council Thermal Resource Assumptions



Power Committee Meeting  
Whitefish, Montana  
June 7, 2011

# Purpose

1. To ensure that our thermal resource data accurately portrays the real capability of NW resources (discussed at the May power committee meeting).
2. To ensure that our simulation models accurately represent how thermal resources will be used.

# Conclusions – Data

- Questioning data sources and simulation methods is always good (akin to a peer review).
- In general, our data vetting process is working but it is an ongoing task and improvements can always be made.
- Council staff works with utilities and resource owners to check and update data.

# Conclusions – Simulation

- Validation involves checking simulated resource dispatch against actual dispatch.
- Patterns in the simulated dispatch are checked for consistency with actual dispatch patterns under various load, hydro and wind conditions.
- In general, simulated dispatch is acceptable but improvements can be made (see last slide).

## Review:

Where do we get our resource data and how do we vet it?

- Discussed at the May 5<sup>th</sup> Power 4 meeting
- Data originates from utilities or owners
- Data is gathered and reported by different entities
- Data sometimes varies across reports
- We work with utilities on an ongoing basis to crosscheck databases
- A sample of thermal data on next slide

# Thermal Resource Capacity

	Source of Data						
	GENESYS	Nameplate	White Book Winter	WECC Winter	WECC Summer	EIA Winter	EIA Summer
Beaver 1-7	521	586.2	521	497	470	505	470
Bennett	180	172.8	180	178	165	171.9	164
Boardman*	435	601	580	585	585	585	585
Centralia 1	670	730	670	670	670	702.5	702.5
Danskin 1	180	170	180				

GENESYS uses White Book Winter capacity where available, WECC Winter as second choice, and Nameplate if neither of the other two are available.

\*GENESYS counts 75% of the available capacity of Boardman because 25% is sold outside the region.

## How do we ensure that GENESYS accurately reflects resource operation?

- Compare historical vs. simulated hourly dispatch
  - For aggregate resources types (hydro, thermal, wind)
  - For thermal fuel types (coal, gas, nuclear)
  - For individual resources
- Check simulated dispatch for
  - Under-supply conditions
  - Over-supply conditions
  - Various wind and hydro conditions
- Adequacy Forum's technical committee is tasked with reviewing the simulation



# Checking Simulated Dispatch

- **Check under-supply conditions**  
All resources should be dispatched
- **Check over-supply conditions**  
All resources that can be turned off should be off
- **Check individual resource dispatch**
  - Ensure resources are dispatched in the right order (i.e. thermal displaced first when wind picks up)
  - Ensure individual resource dispatch makes sense

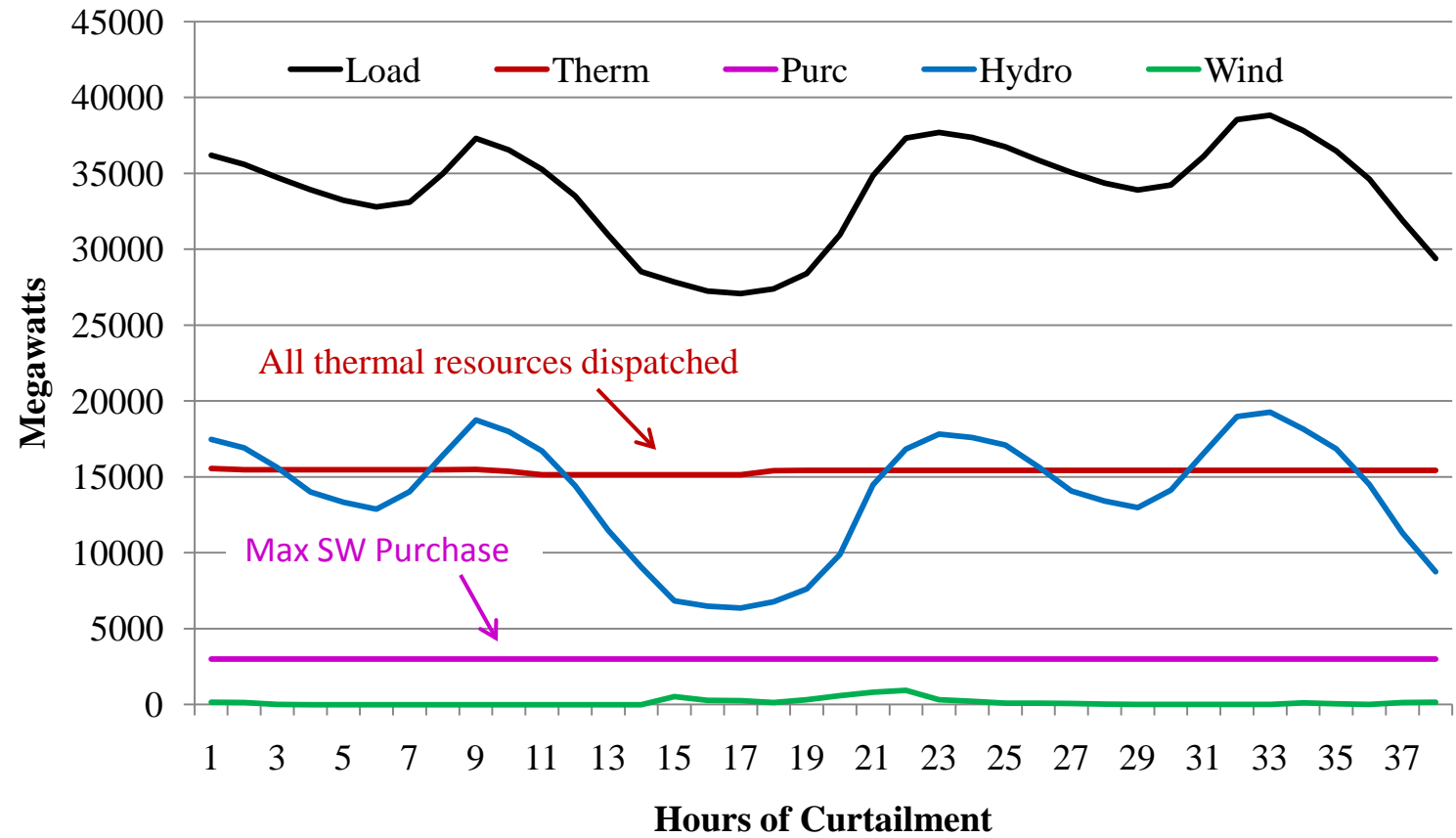
# Caveats

- The following slides show both simulated and actual resource dispatch
  - **Actual** resource dispatch is provided by BPA for its balancing authority area.
  - **Simulated** resource dispatch is produced by the GENESYS model and covers the NW region.
- The scales are quite different and the relationships of loads to resources are different as well (e.g., for BPA hydro is much bigger than load).

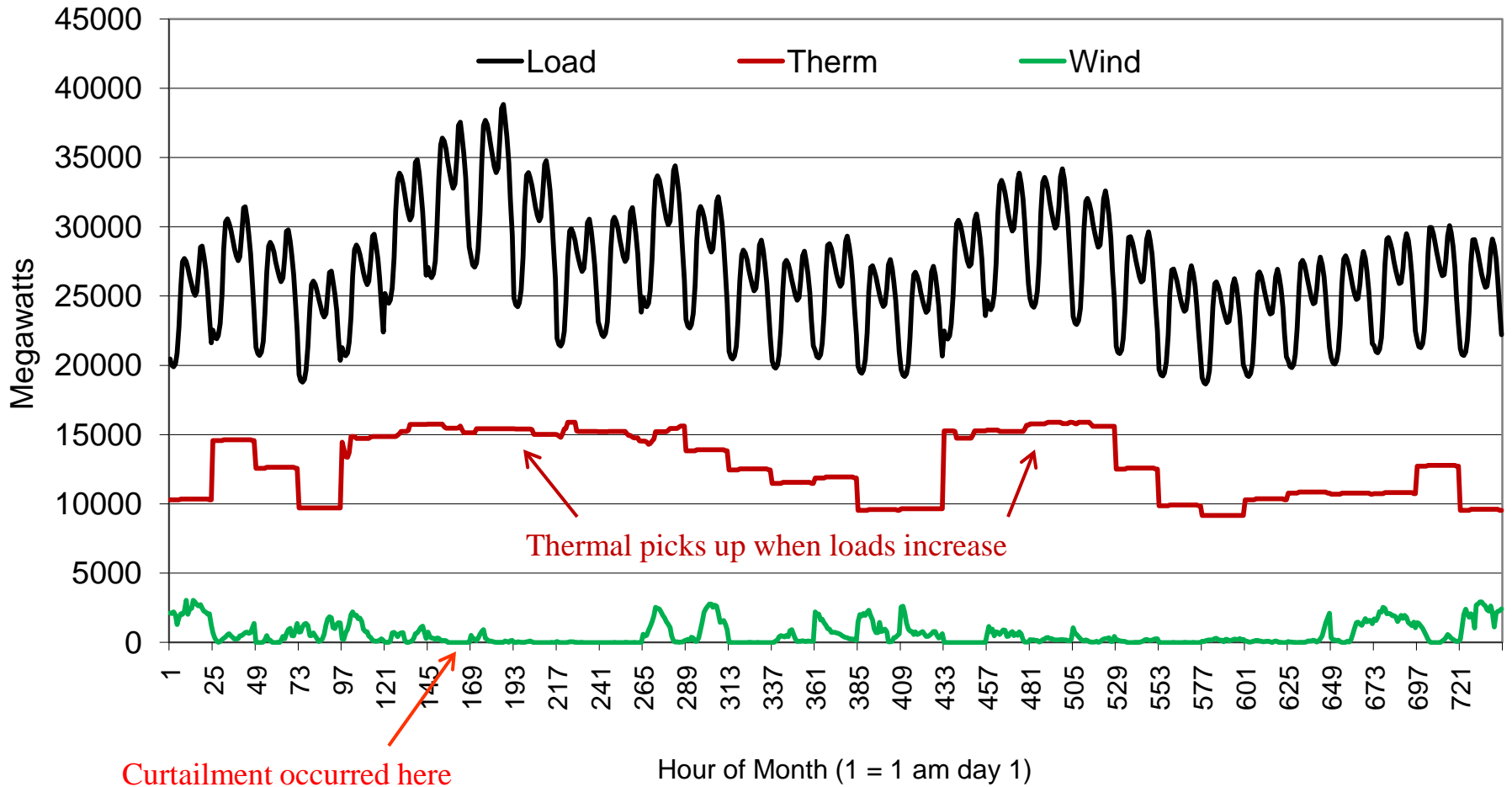
# Check Under-Supply Conditions

# Under-Supply Condition

**Under-Supply **Simulated** Dispatch During a Curtailment**

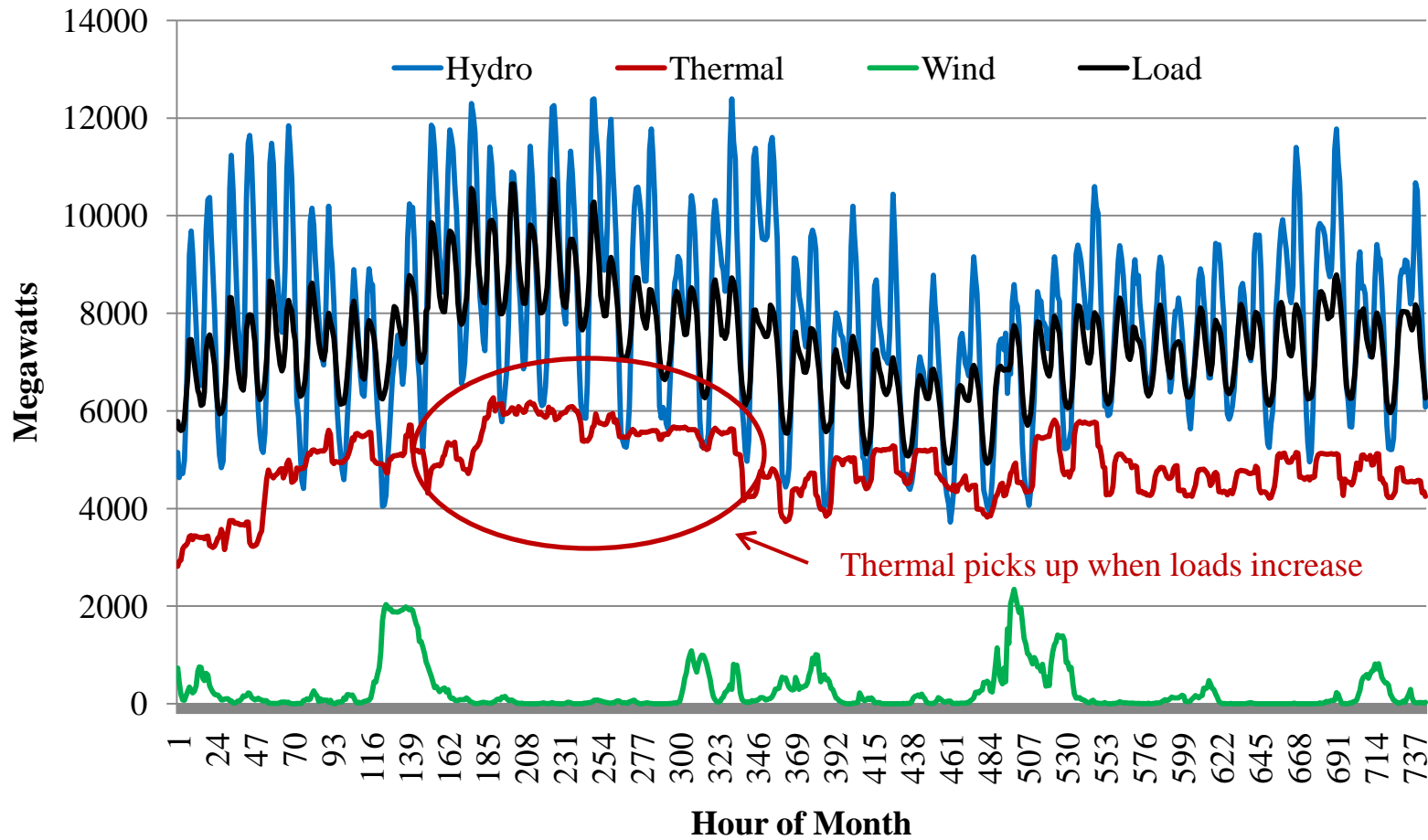


# Simulated Hourly Dispatch\*



# Actual Hourly Dispatch

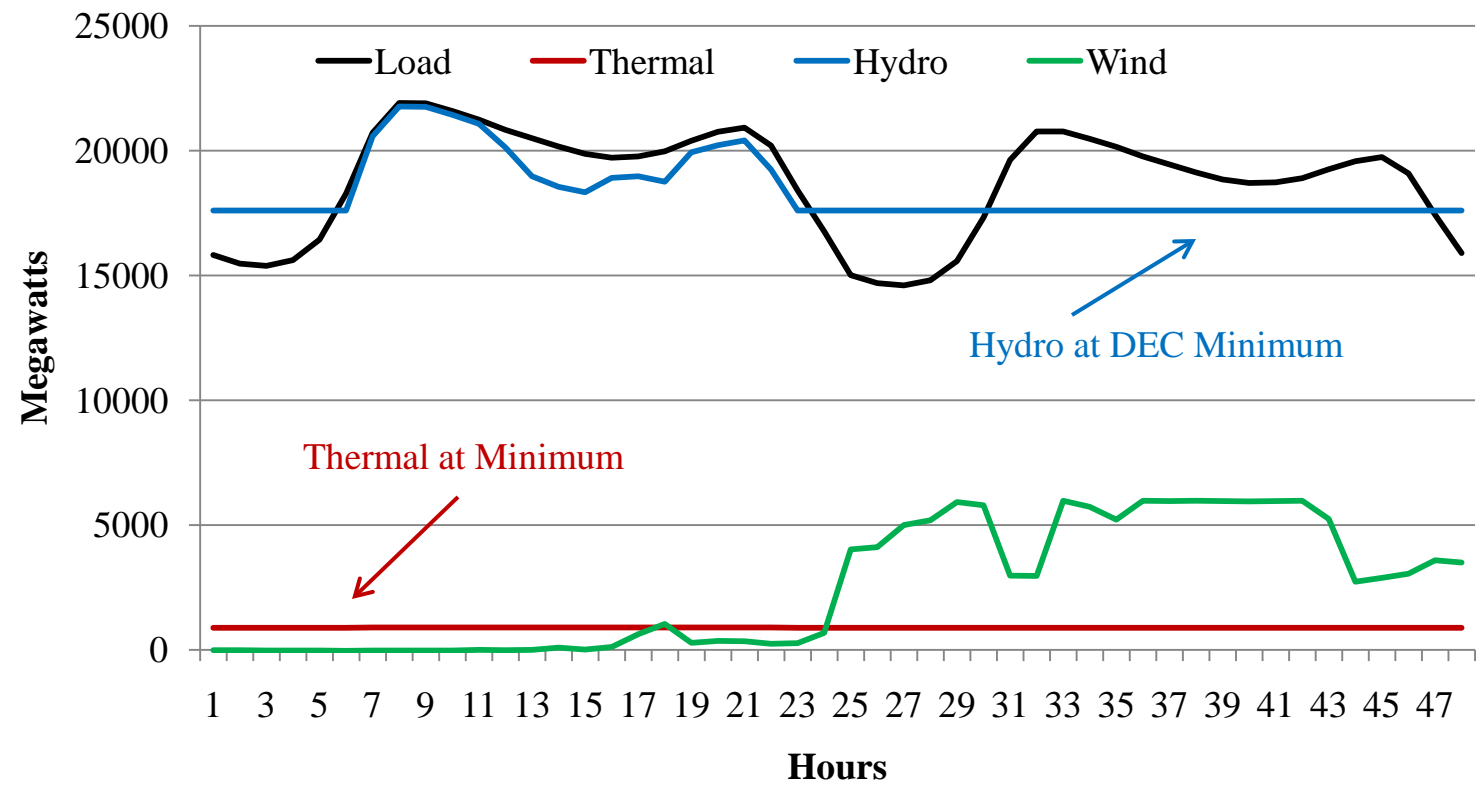
## Historic Under-Supply Condition - Dec 2009



# Check Over-Supply Conditions

# Over-Supply Condition

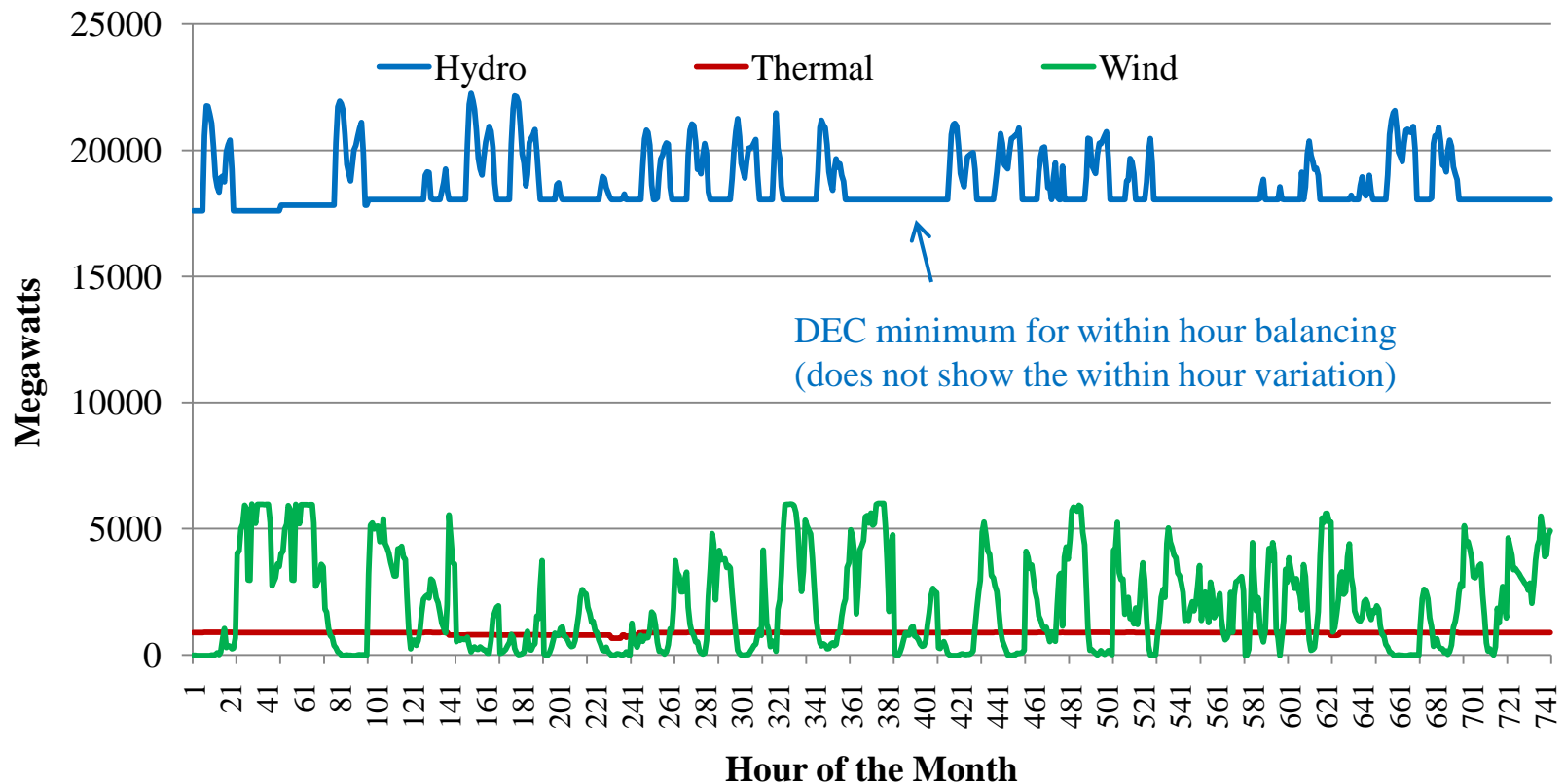
Over-Supply **Simulated** Dispatch





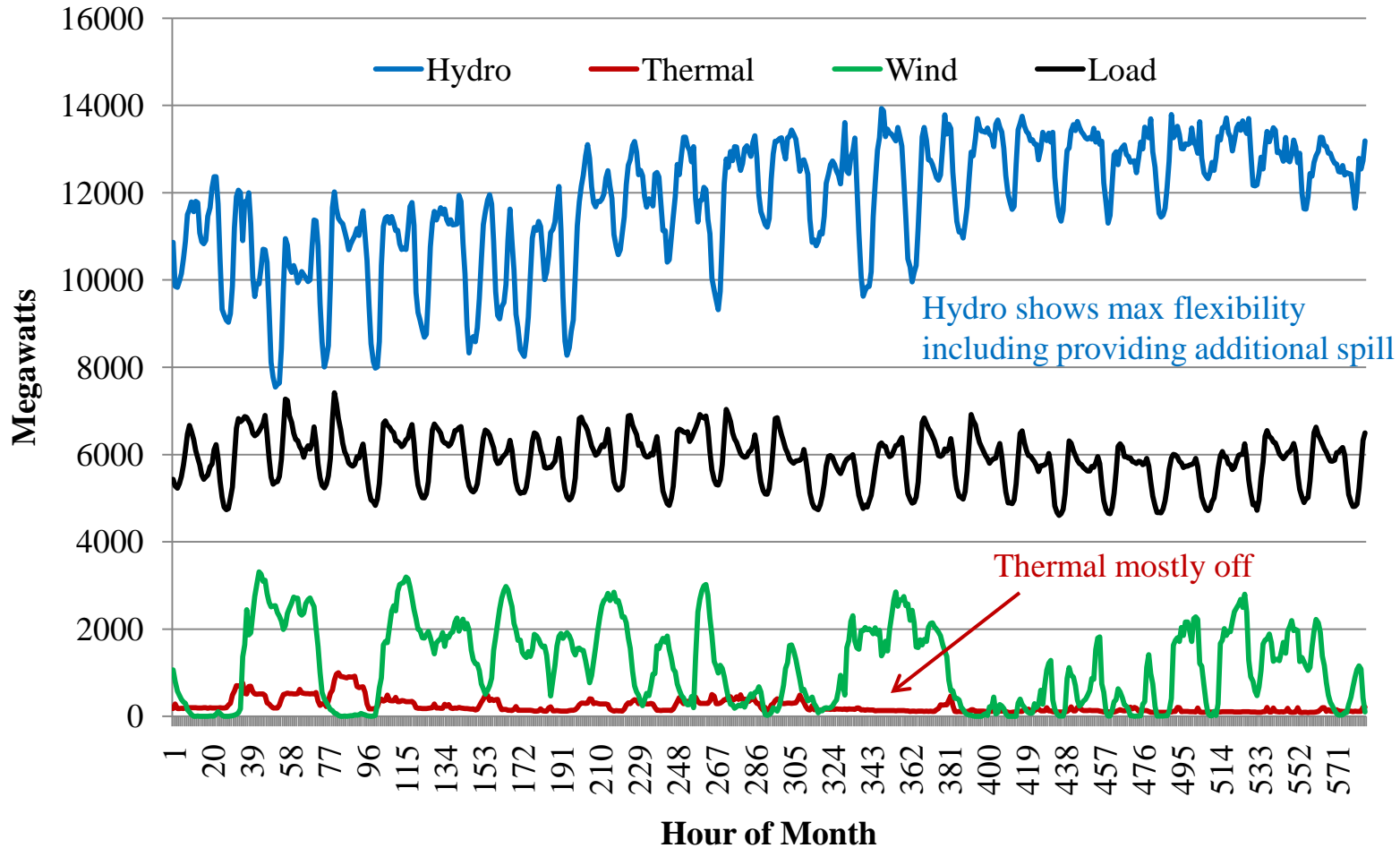
# Simulated Hourly Dispatch

## Simulated Hourly Generation - May '98 Water



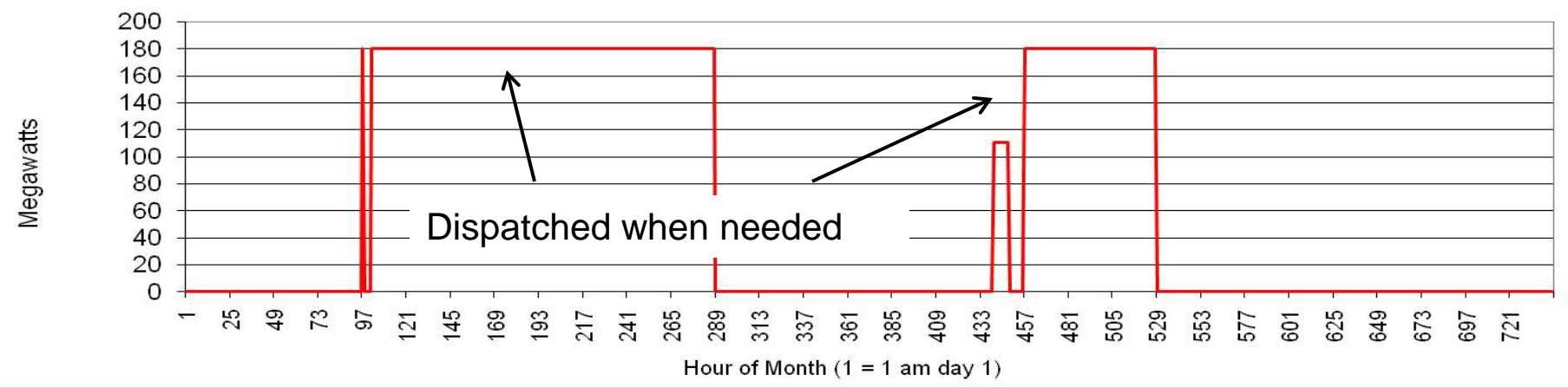
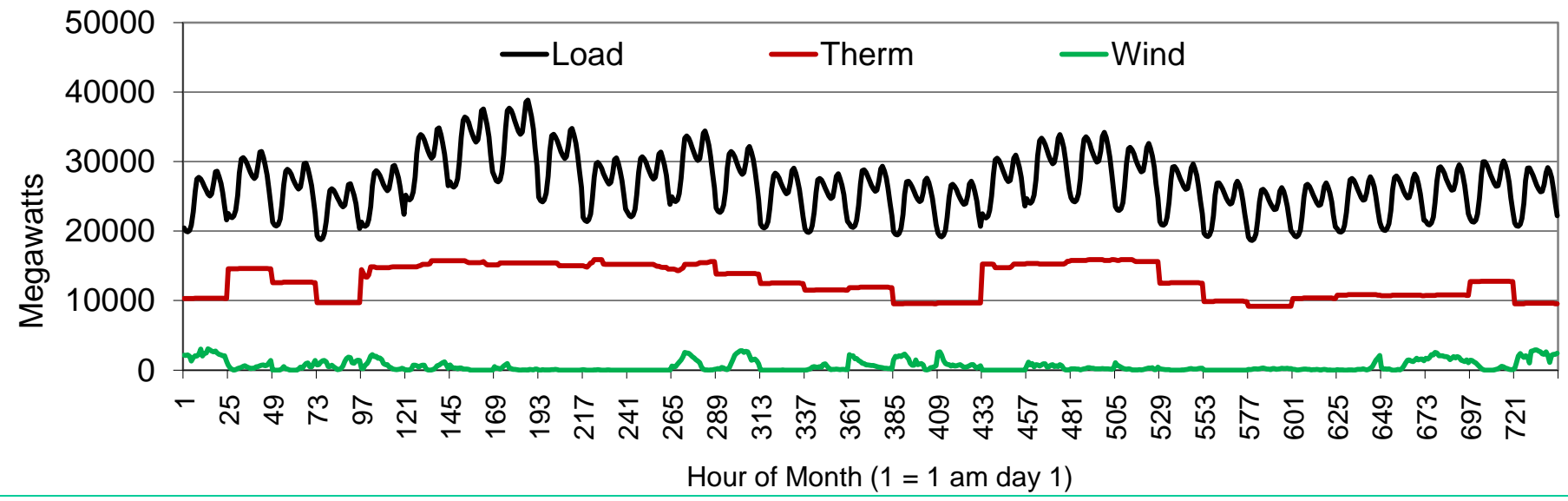
# Actual Hourly Dispatch

## Historic Over-Supply Condition - May 2011



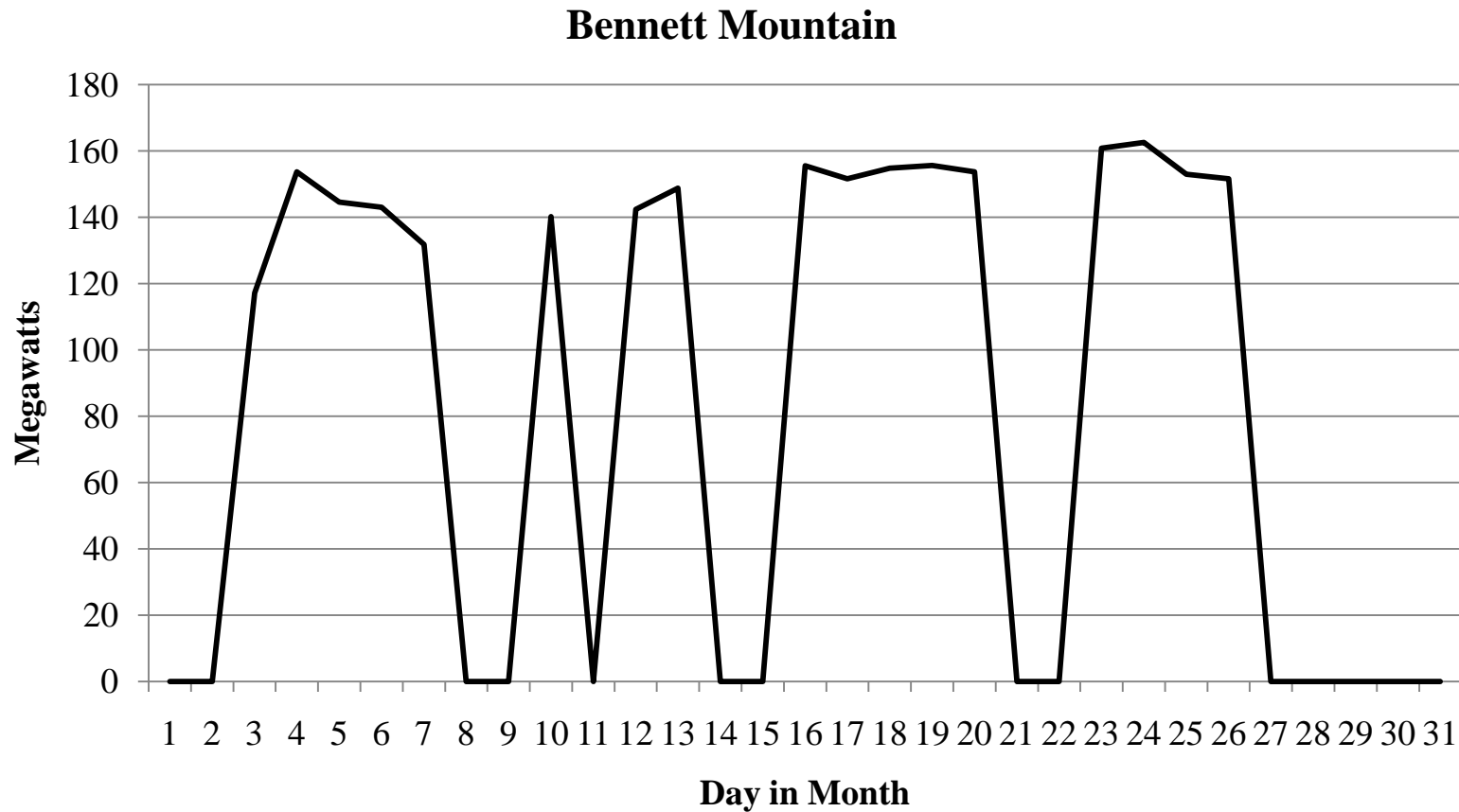
# Check Individual Resource Dispatch

# Simulated Winter\* Dispatch for Bennett Mountain (gas)

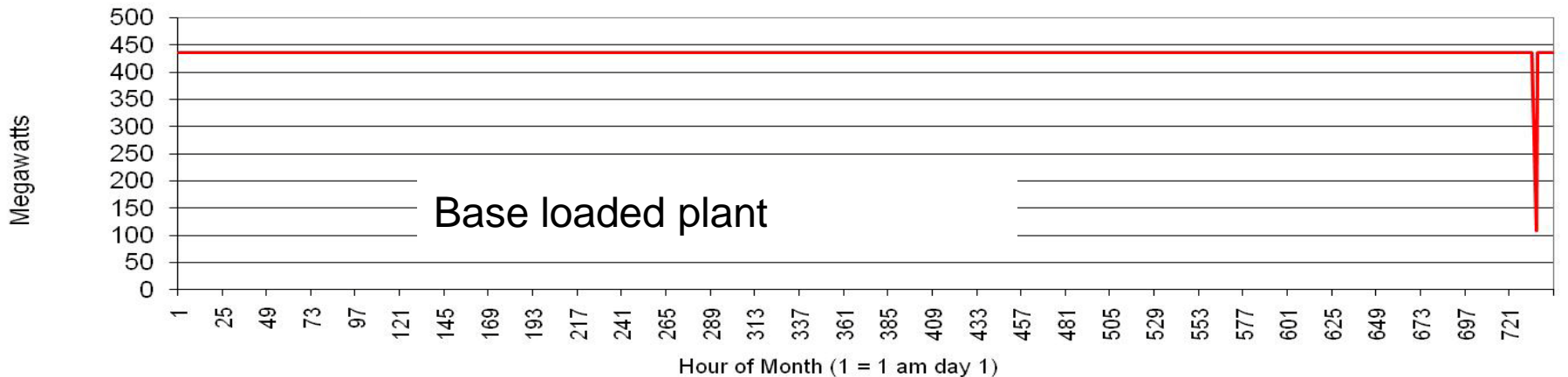
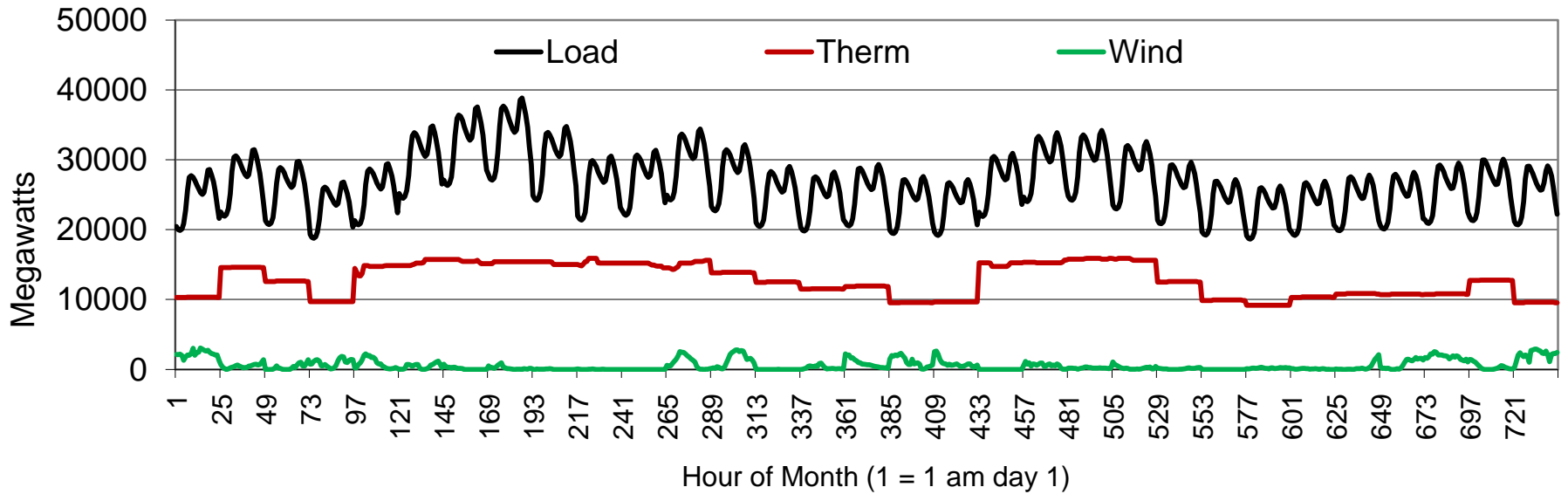


# Historical Daily Dispatch

## Bennett – August\* 2010



# Simulated Dispatch for Boardman (coal)



# Next Steps

- **Add seasonal capacity values** to the simulation (GENESYS currently uses winter capacity values only because until recently the region focused on winter problems)
- **Add ramping rate logic** (to better estimate over supply conditions doesn't affect adequacy assessments)
- Continue to investigate potential **transmission bottlenecks** and how to deal with them in the simulation