Economics and Operations Working Group

June 12, 2002

HYDROPS WORKSHOP

9:00 AM to 4:00 PM

PSE's Access Call Center
19900 North Creek Parkway
Bothell, WA

Space is limited to a first come basis. Please RSVP team leader, Lloyd Pernela at 425-462-3507 or email at lperne@puget.com

Facilitator: Lyn Wiltse, PDSA

WORKSHOP AGENDA

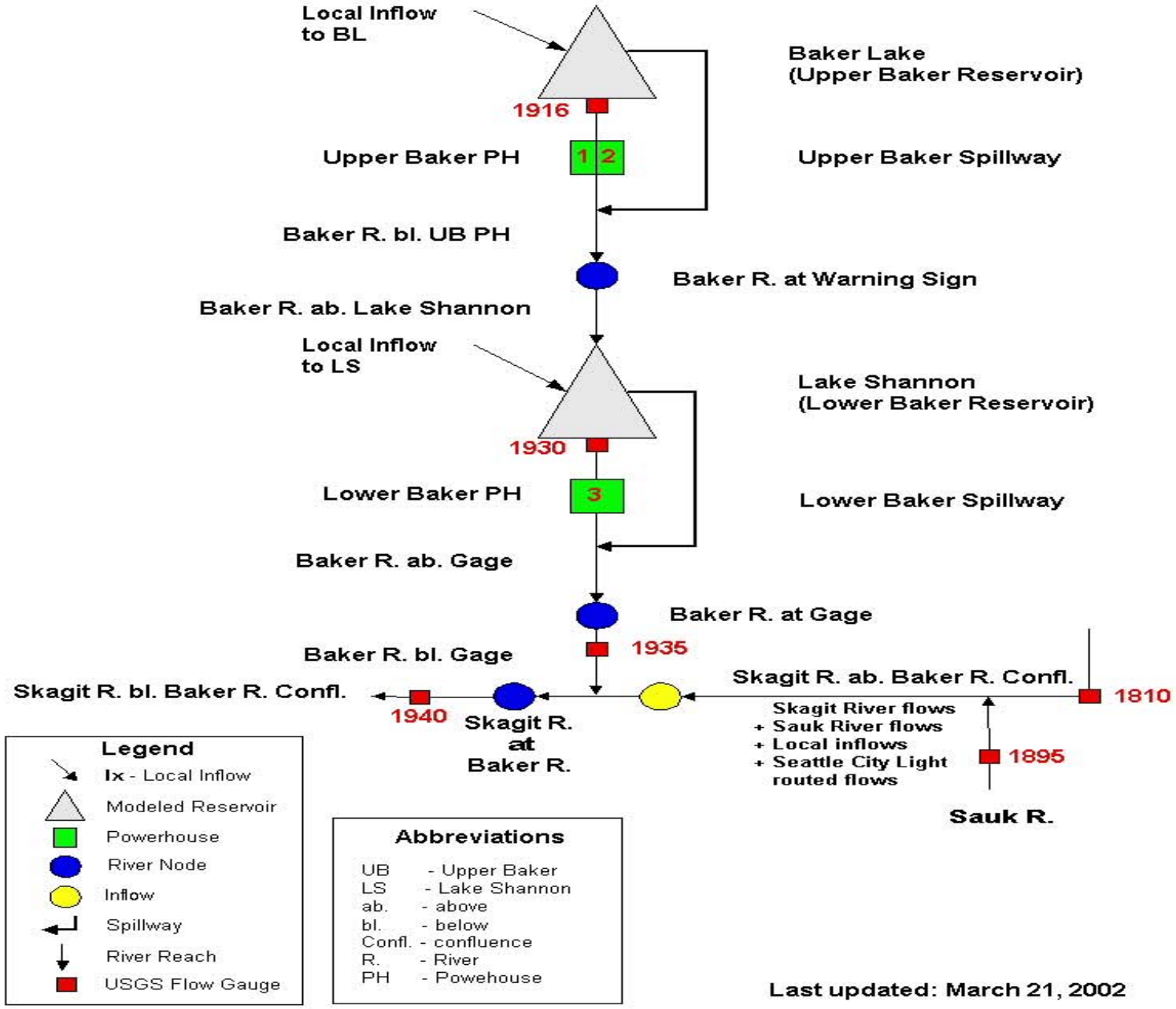
- Review revise minutes April 10th meeting — 9:00 to 9:20
- Confirm agenda — 9:20 to 9:30
- Purpose and goals of day — 9:30 to 9:45
- Overview of basin modeling (break midway through) — 9:45 to 12:00
  - Hydrology for hydroelectric operations
  - Rainfall runoff and snowmelt models
  - Reservoir management
  - Simulation versus optimization
  - Power generation and optimization
- Lunch and Call Center overview (Janet Gaines) — 12:00 to 12:45
- Computer Lab: optimization exercise — 12:45 to 2:00
- *HYDROPS* model system overview — 2:00 to 2:20
- Inputs and outputs: — 2:20 to 2:30
- "Hands-on" computer lab: Baker *HYDROPS* model — 2:30 to 3:45
  - Ramping exercise
  - Turbine performance exercise (time permitting)
- Next steps — 3:45 to 4:00
  - Action Items
  - Set agenda for next meeting
  - Evaluate meeting

DRIVING INSTRUCTIONS from I-405:

Take exit number 24, NE 195th towards Beardslee Blvd. (.2 miles)
Turn East on NE 195th (.20 miles)
Turn South on North Creek Parkway (.27 miles)
In Building 19900 receive a badge, your destination is the computer training room.

Skagit River Routing

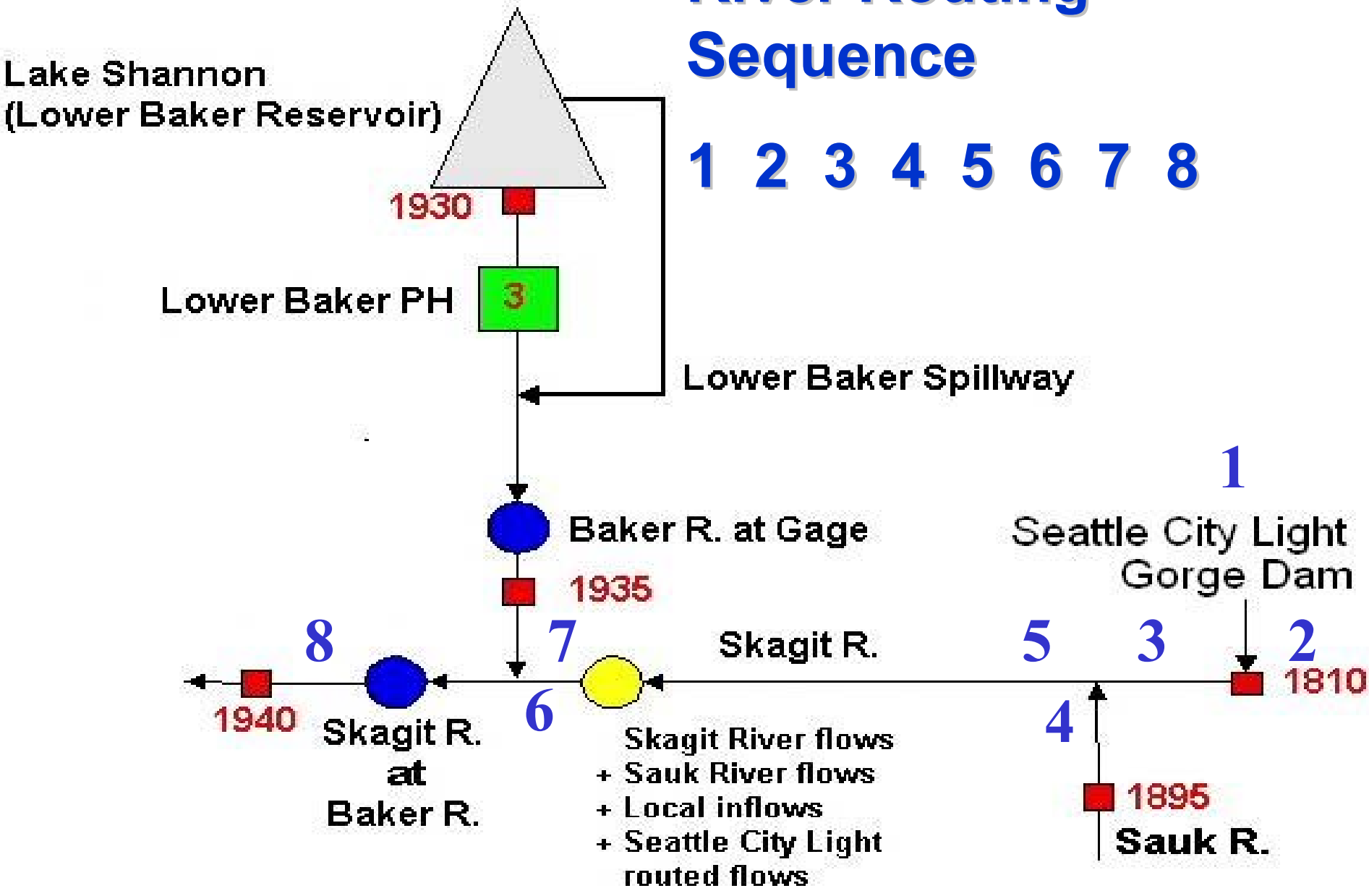
BAKER RIVER SYSTEM



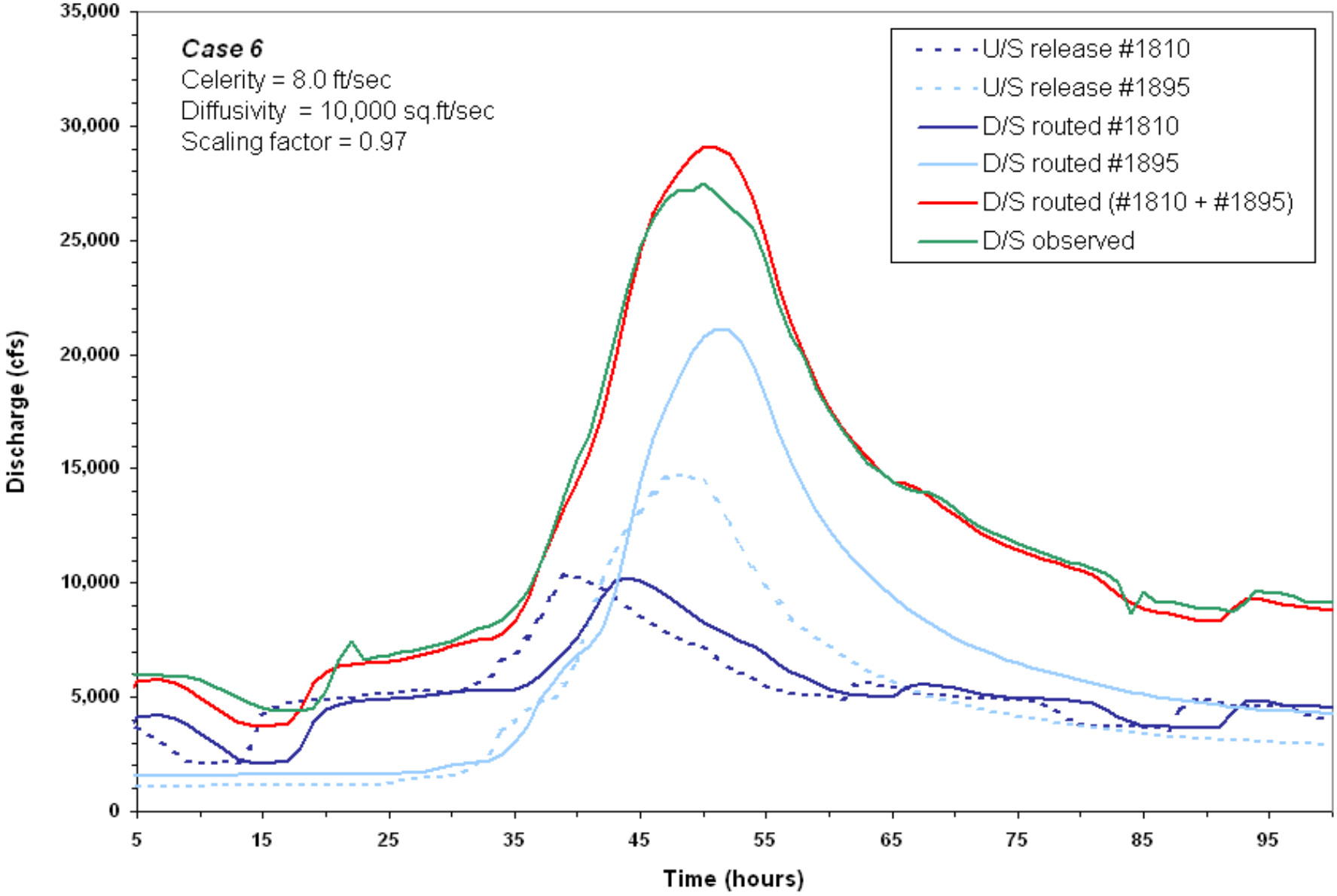
Last updated: March 21, 2002

River Routing Sequence

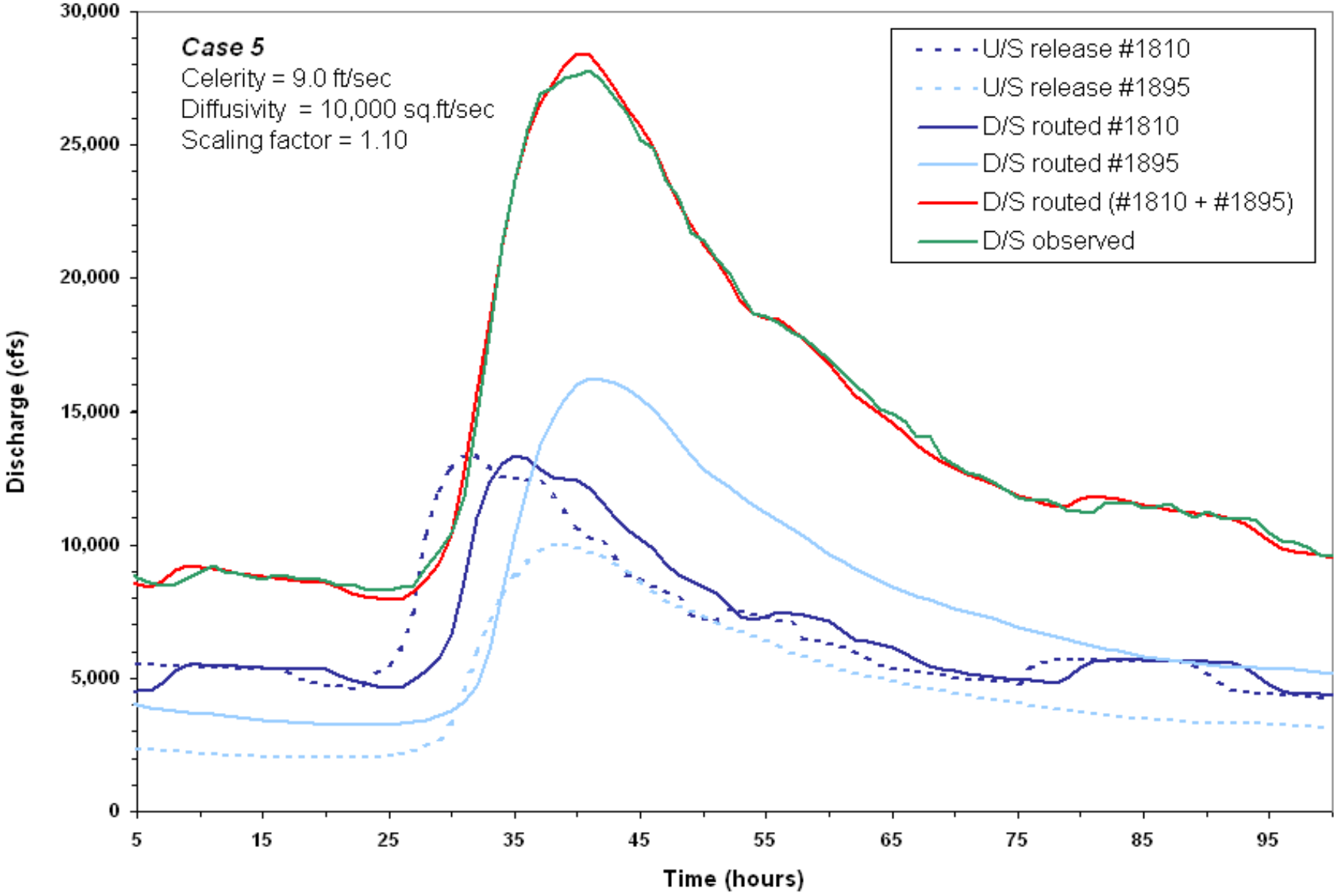
1 2 3 4 5 6 7 8



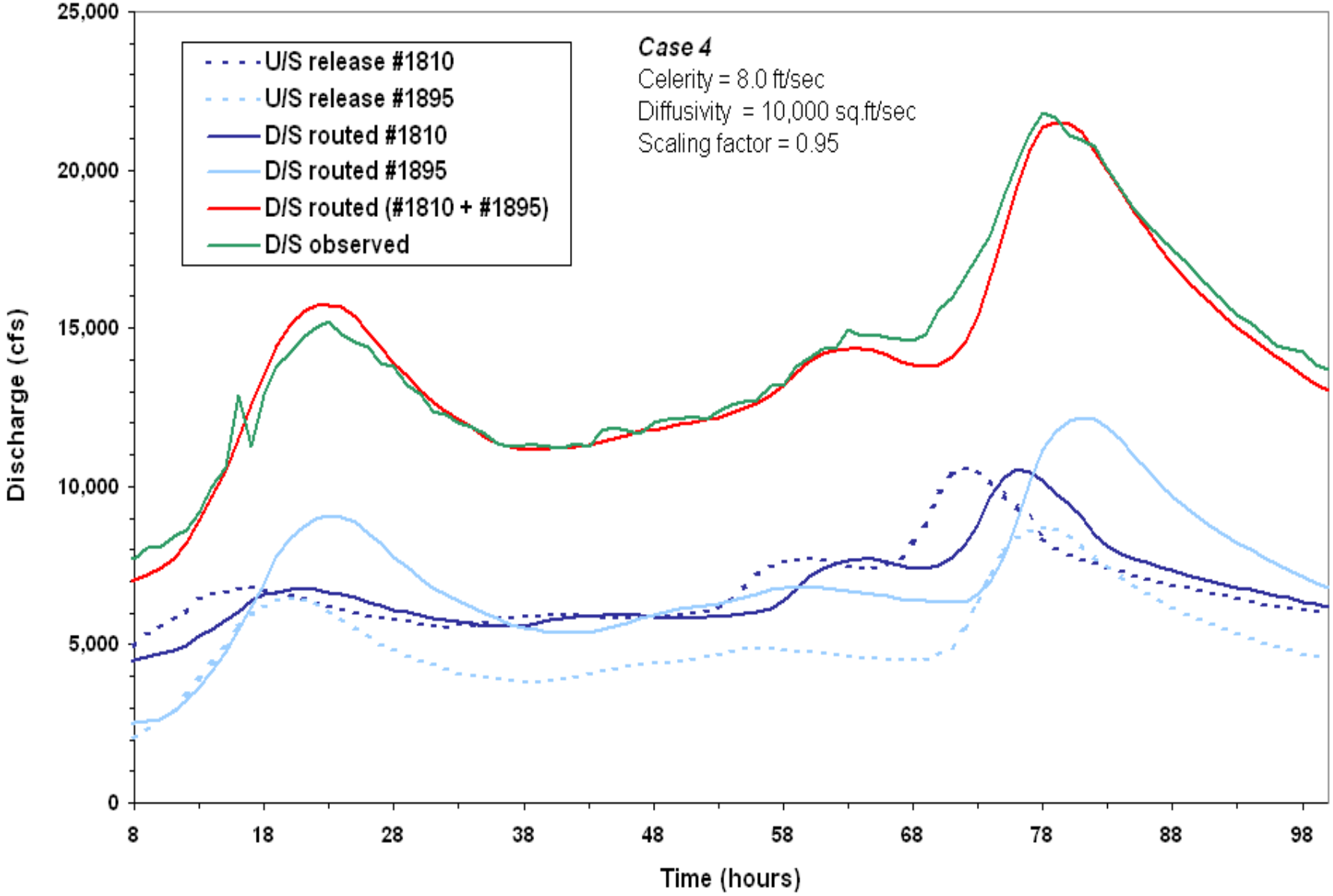
Skagit River Routing- Case 6



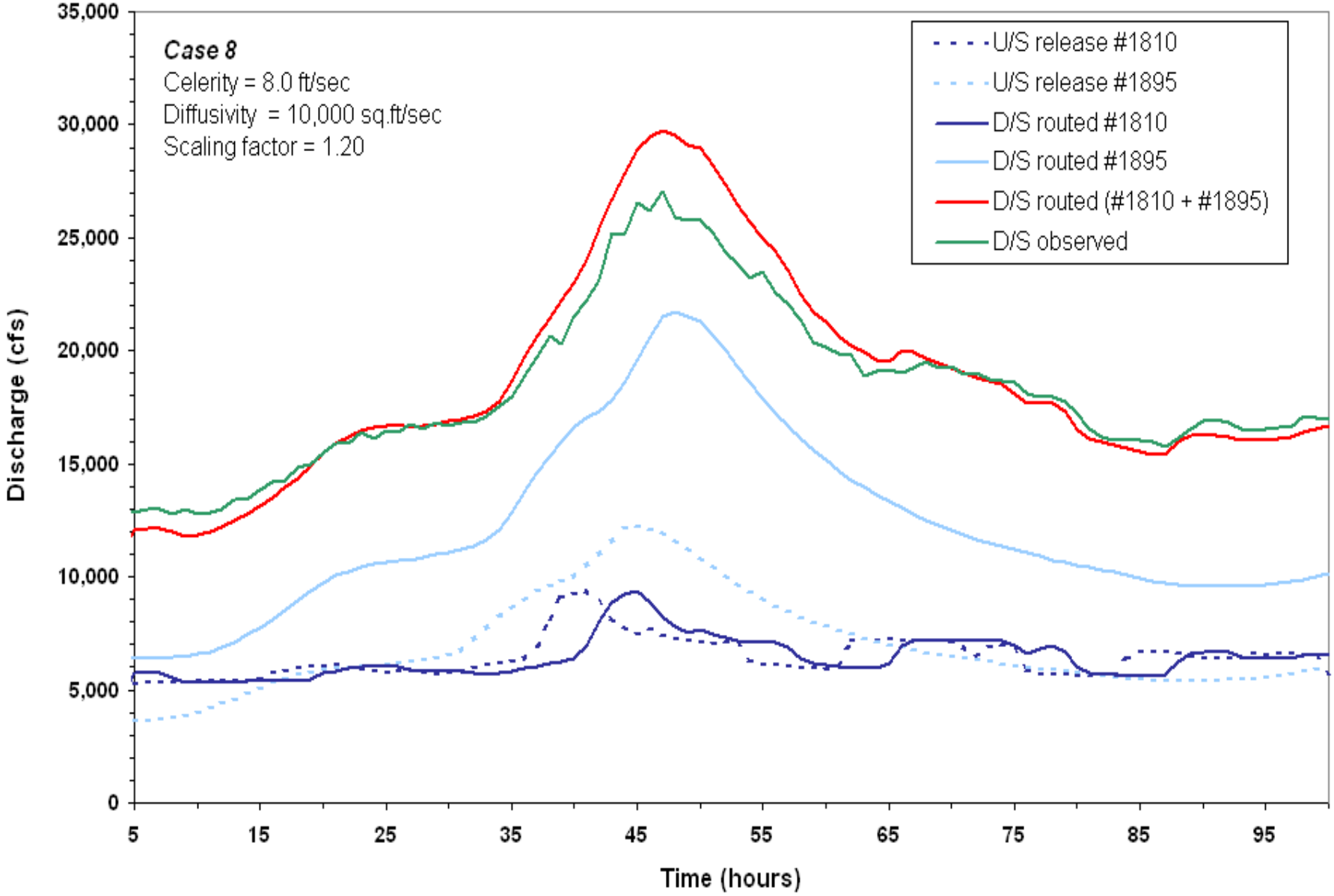
Skagit River Routing- Case 5



Skagit River Routing- Case 4



Skagit River Routing- Case 8



Electricity Demand Forecasting

Demand Forecasting Components

Annual trend – Historical load growth/decline

Seasonal – Historical month by month pattern

Diurnal – Forecasted hourly weather

Forecast Electricity From Weather

- Temperature (main actor)
- Sunshine (cloud cover)
- Precipitation (may lag several days)
- Humidity (less important here)
- Wind (especially in winter)

Electricity vs Temperature

Correlation depends on temperature

- At low temperatures, the electricity demand will ***decrease*** when temperature ***increases*** **(**less need for electricity heating)

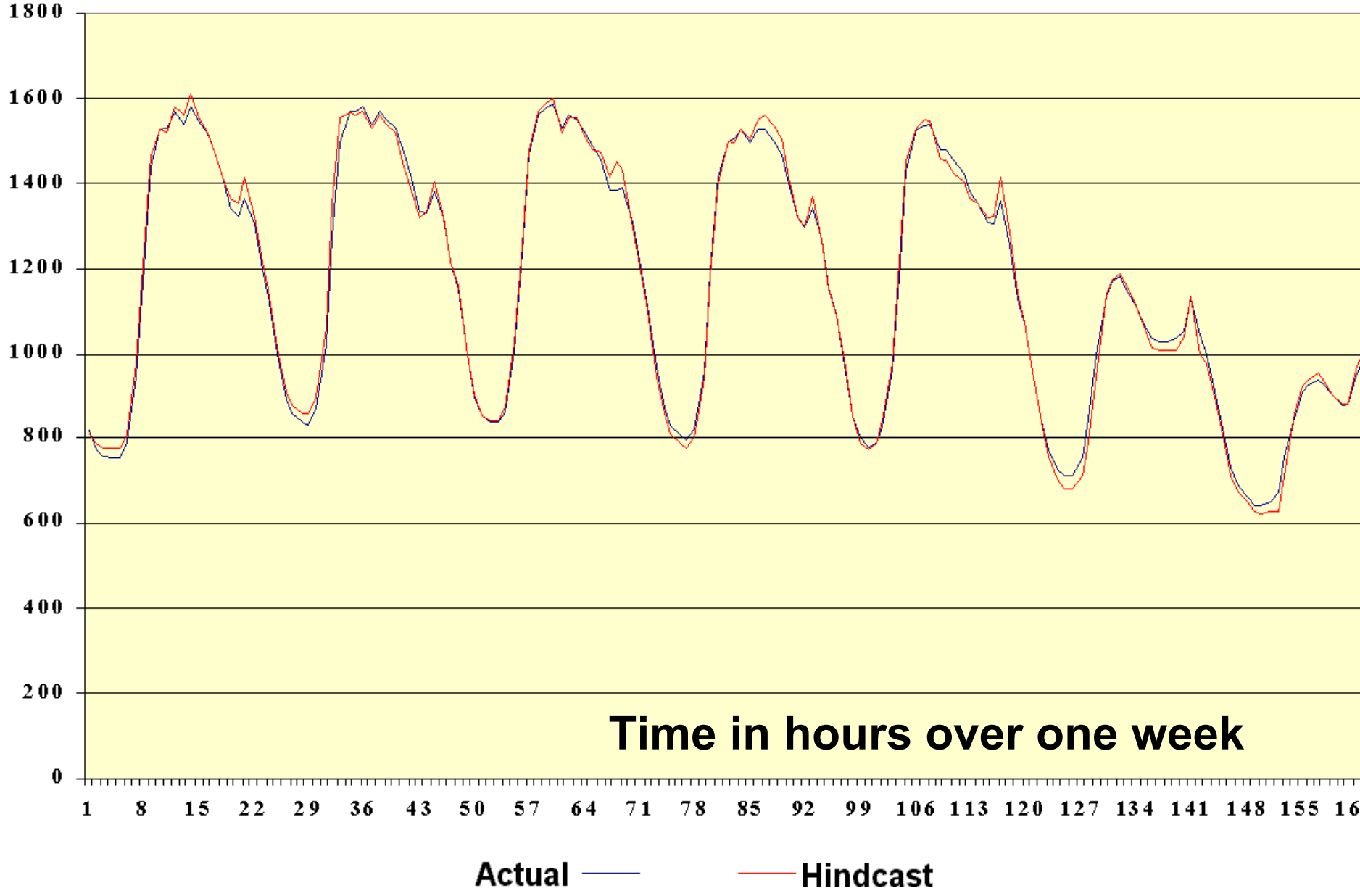
- At higher temperatures, the demand does *not change at all* when the temperature increases (“comfortably warm”)

- At even higher temperatures, air conditioning will increase the electricity demand

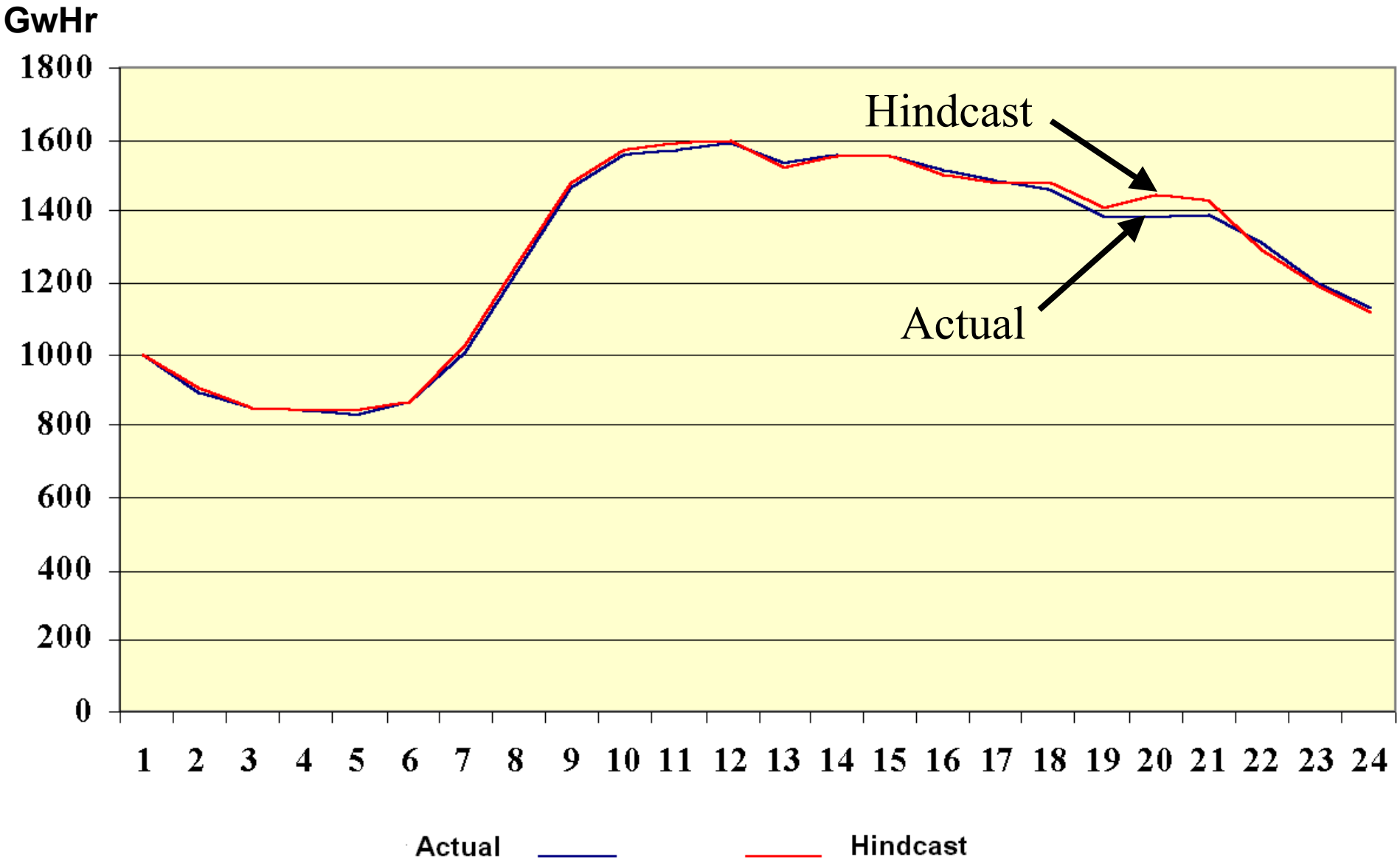
Forecast exceptions

- **Holiday forecasts**
  - Special - Thanksgiving and Christmas
- **Time-of-day**
  - Day and night weather influence is different
- **Other exceptions**
  - Other holidays
  - Civil emergencies
  - Power system emergencies

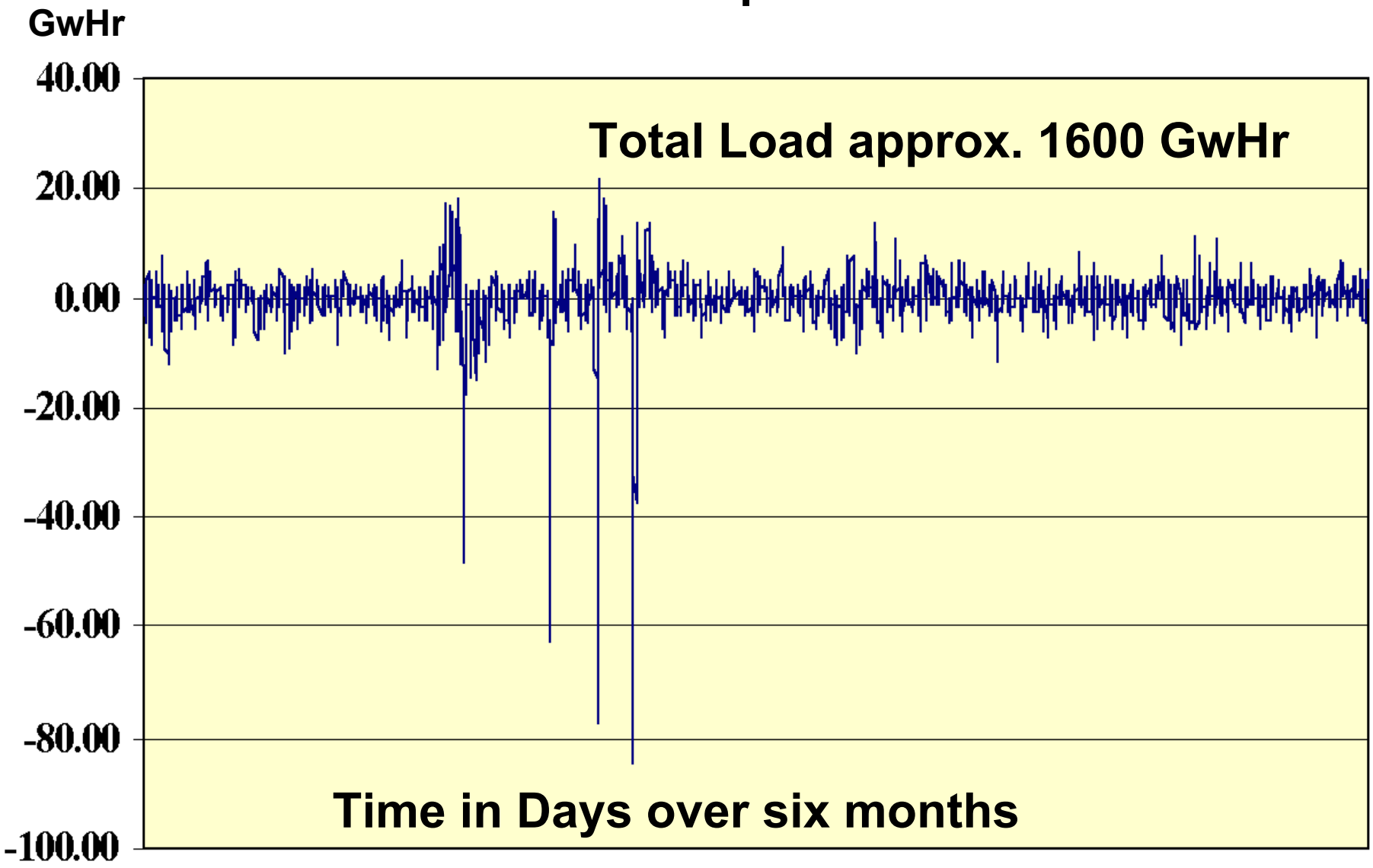
Comparison of Hindcast and Actual Electricity Consumption



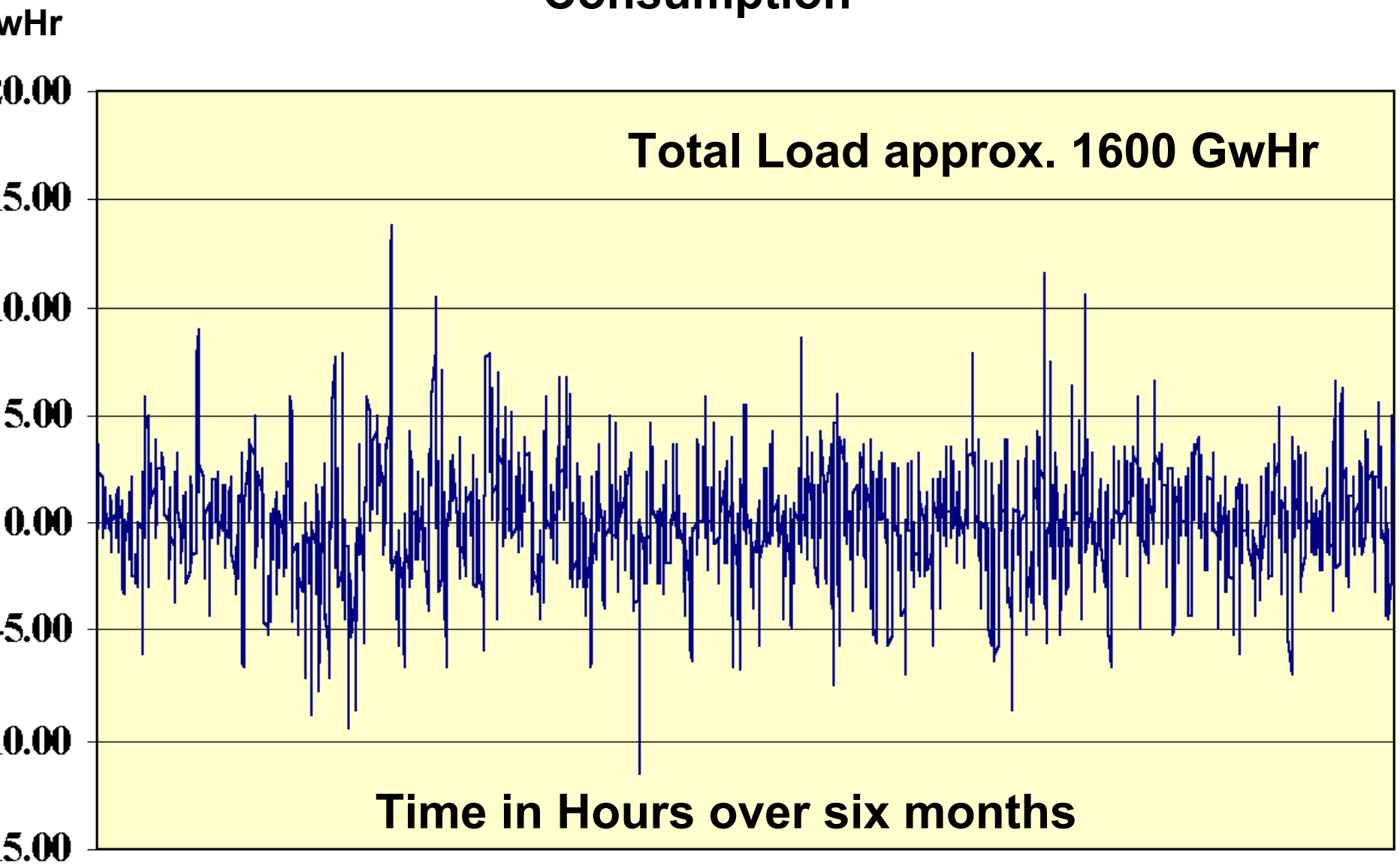
Comparison of Hindcast and Actual Electricity Consumption



Daily Hindcast Deviation from Observed Electricity Consumption



Hourly Hindcast Deviation from Observed Electricity Consumption



Conclusion:
From a perfect weather forecast

- One day-ahead: Less than 2% deviation

- One hour-ahead: Less than 1% deviation