Analysing the Response of the Residential Sector to the Hydro Shortage

Seminar: Making Household Energy More Sustainable

The Sustainable Energy Forum

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The 2008 Electricity Shortage

How much saving?

By whom?

The Database

- Electricity Commission
  - Half-hour data by supply point
  - Back to 1996
- Electricity Market
  - Daily Updates
  - Available next day

Who uses what??

- Residential?
- Commercial?
- Industrial?

- Major industry known from own supply points

Who uses what (cont)?

- MED publishes data
- 1 year+ delay
- Annual data
- Accurate?
- Other fuels even worse

Can make approximate inference

- Some supply points heavily residential
- Take several points and look for the common (residential) component.
- “Subtract off” other loads.
- Only approximate.

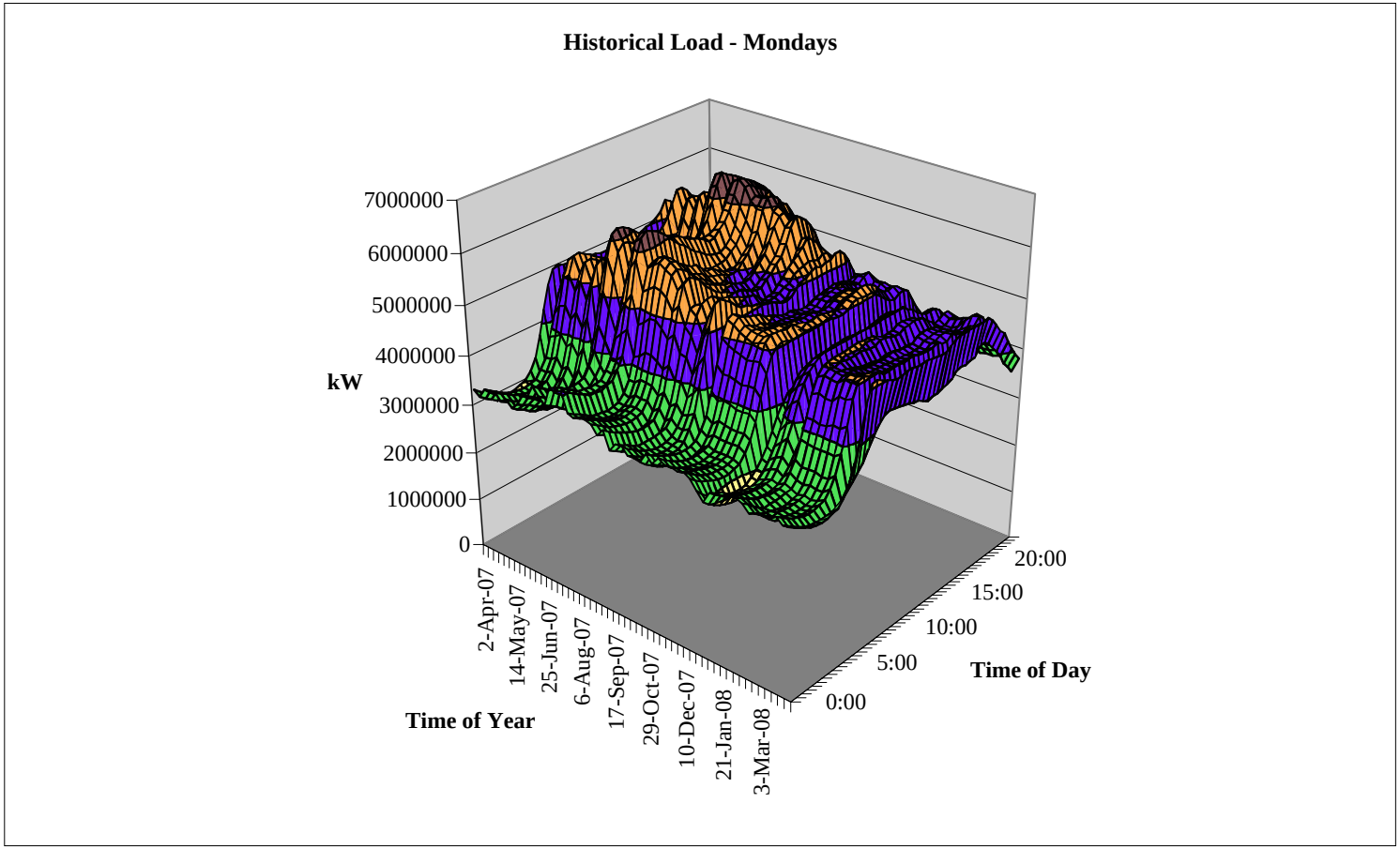
Analysis method

- Take (several years of) half-hourly data
- Decompose the structure
  - Time of day
  - Day of week
  - Seasonal effects
  - Holidays
  - Daylight savings
  - *Etc.*

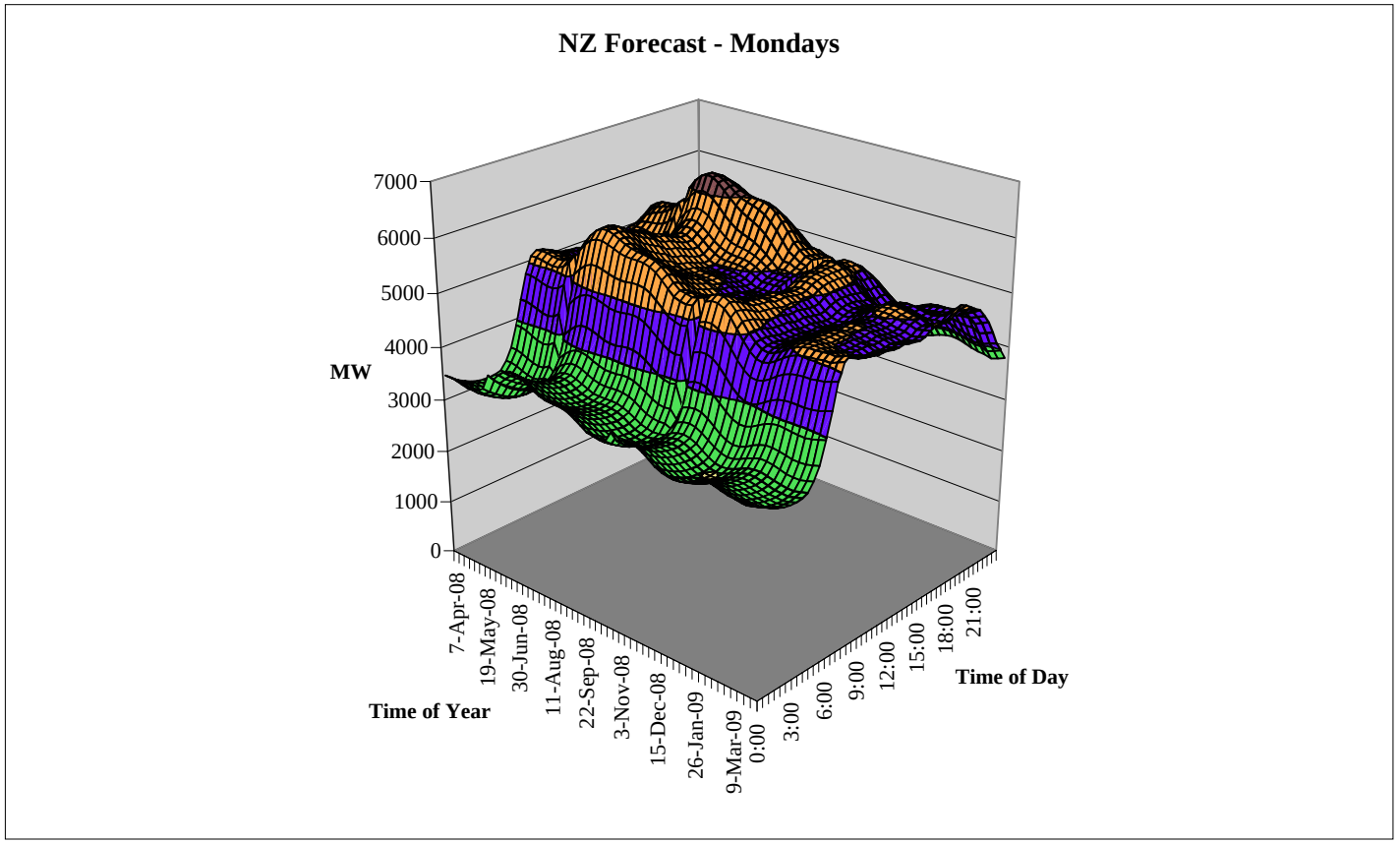
Analysis method 2

- Project forward to produce a forecast
- Incorporates the historical structure
  - Time of day
  - Time of year
  - Holidays, daylight savings
- Unknowns:
  - Weather
  - Economy

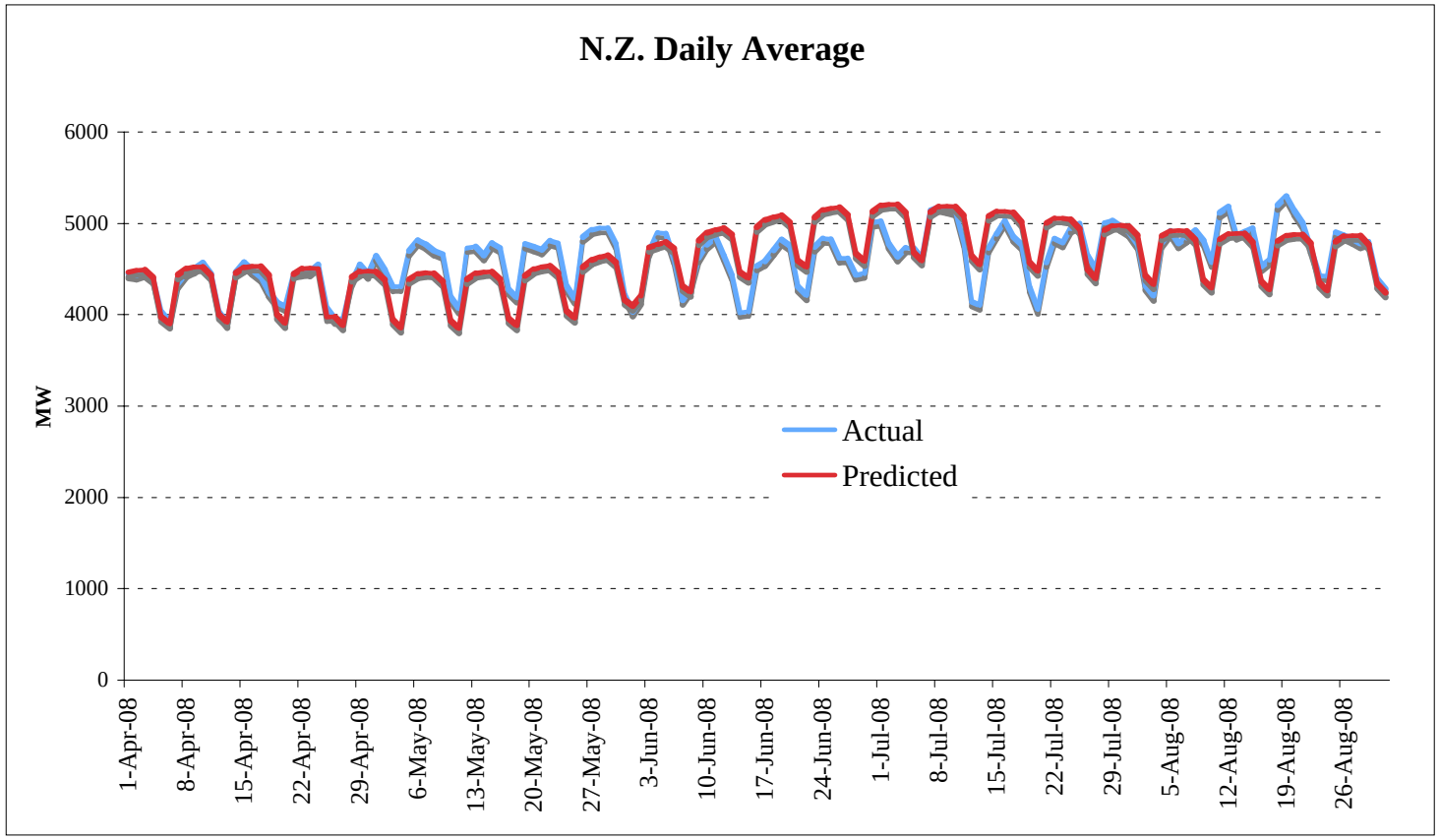
Historical Load - Mondays



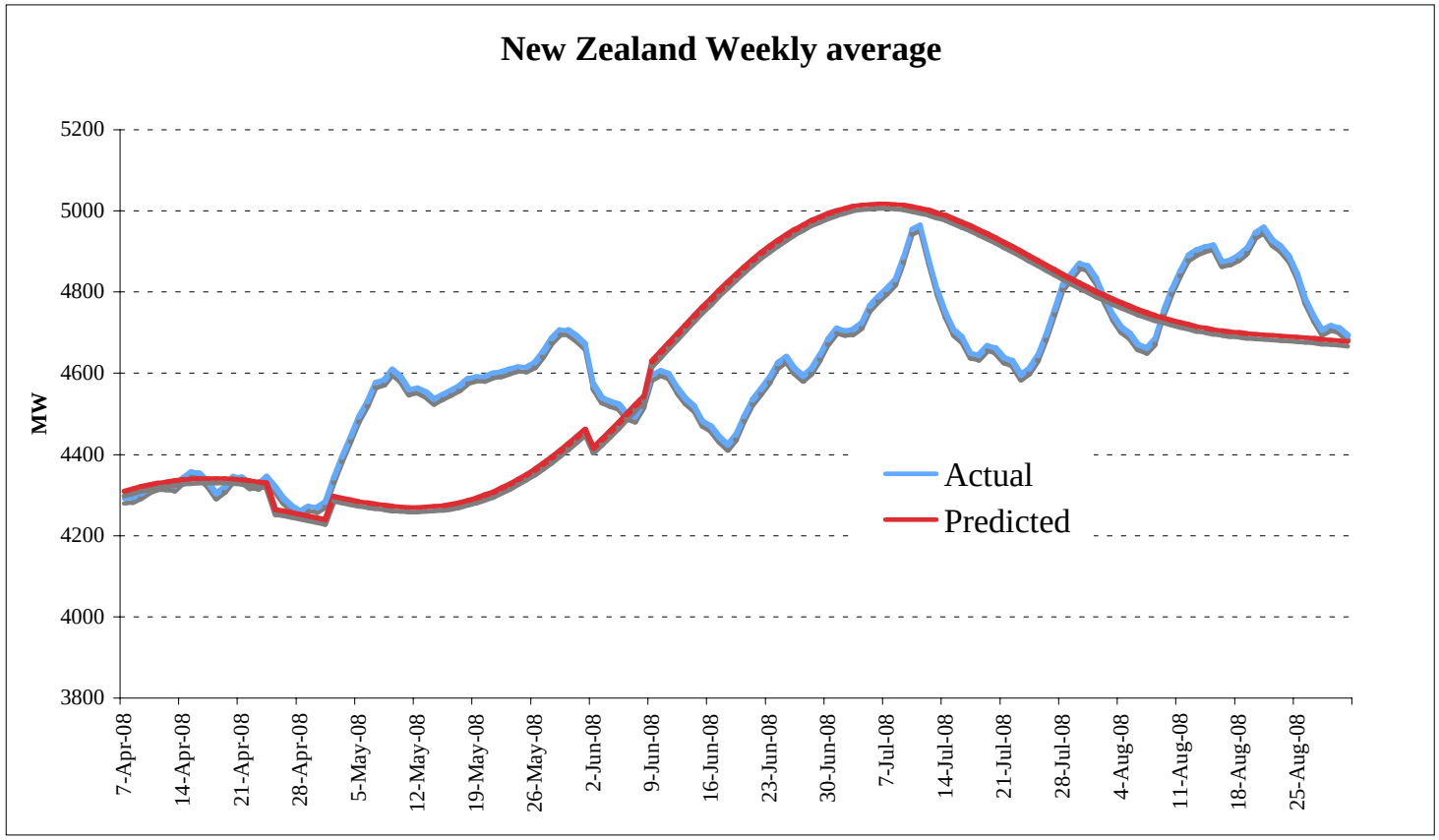
NZ Forecast - Mondays



New Zealand Total



New Zealand - weekly



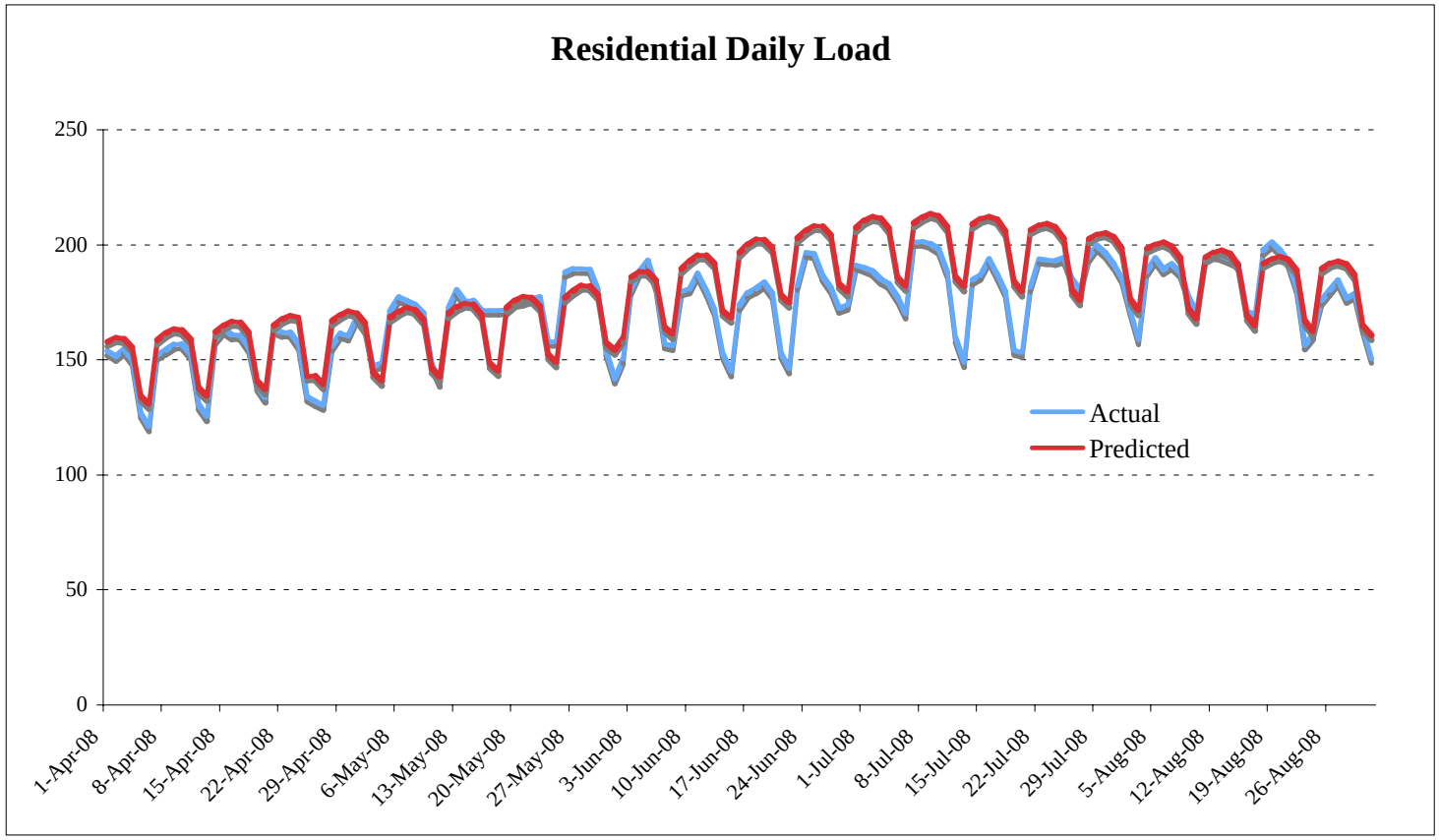
NZ (total) savings

- Load clearly lower over the critical period (June–July)
- Savings approx 4.5%

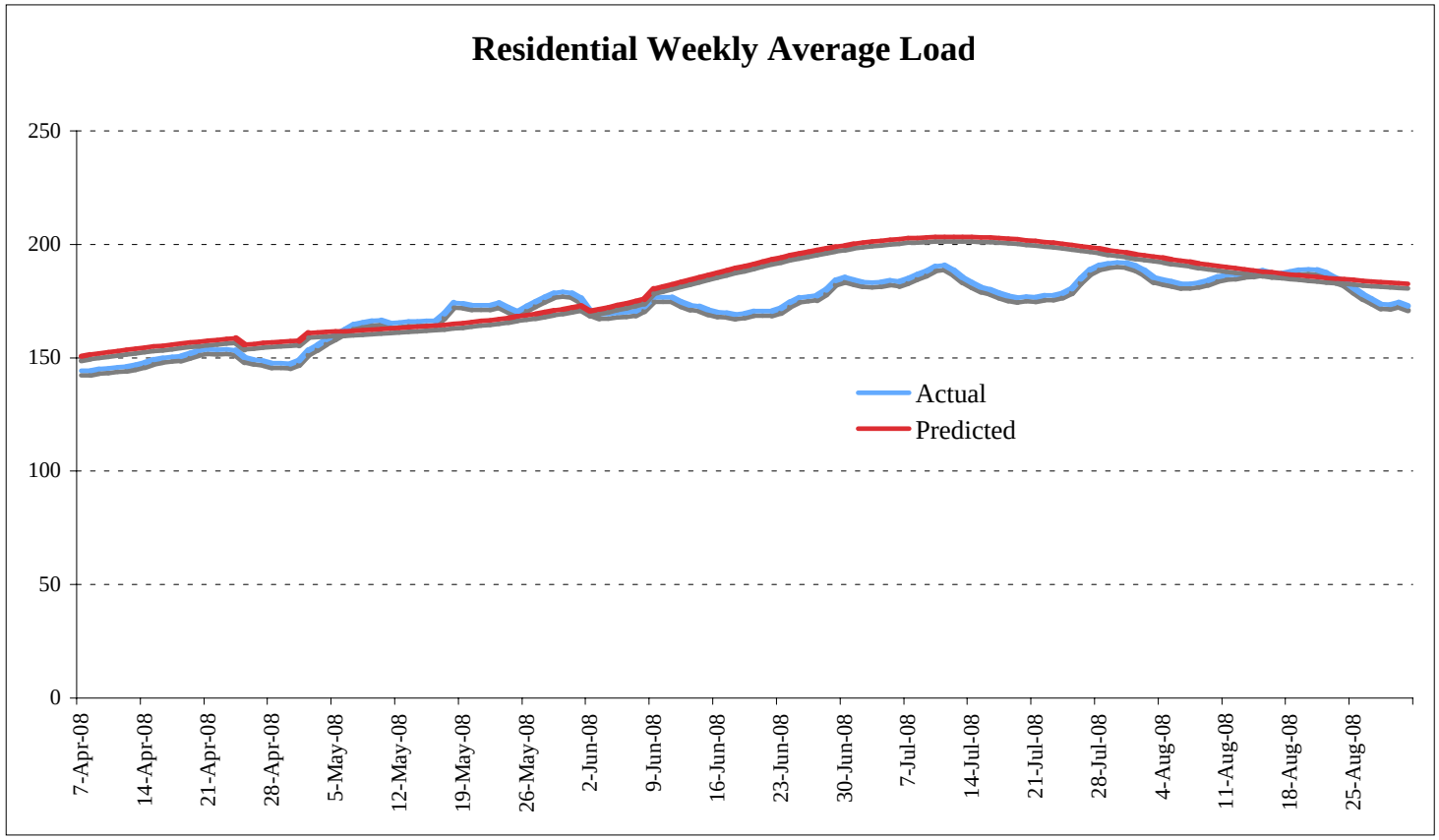
Residential Load

- No direct data
- Can be estimated (approximately) from a number of supply points known to be (mainly) residential.
- “Subtract off” Commercial/Industrial as best we can.

Residential Daily Load



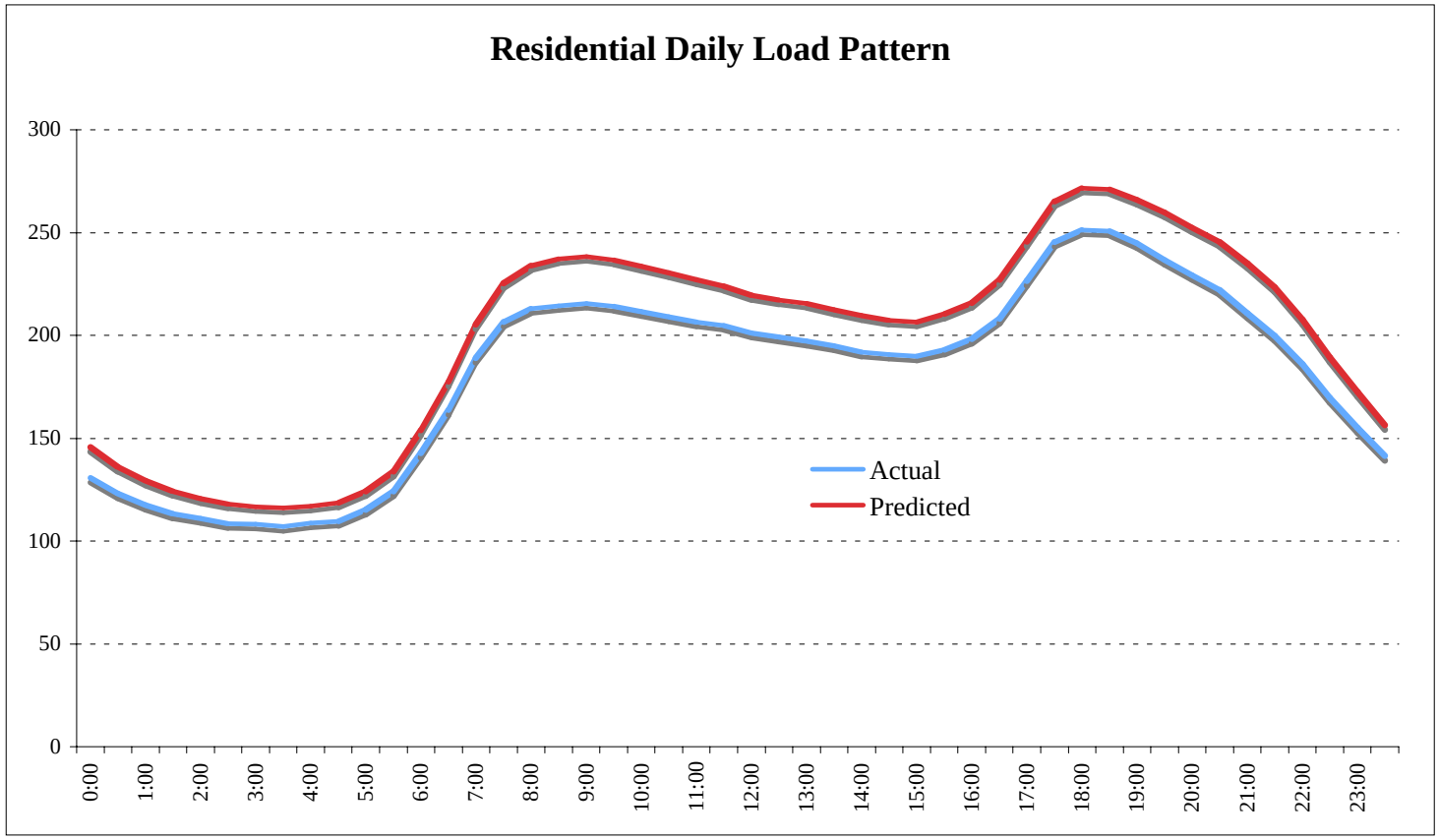
Residential Weekly Load



Residential

- Clear savings over the June–July Period
- Time of highest demand
- Savings approx 7%

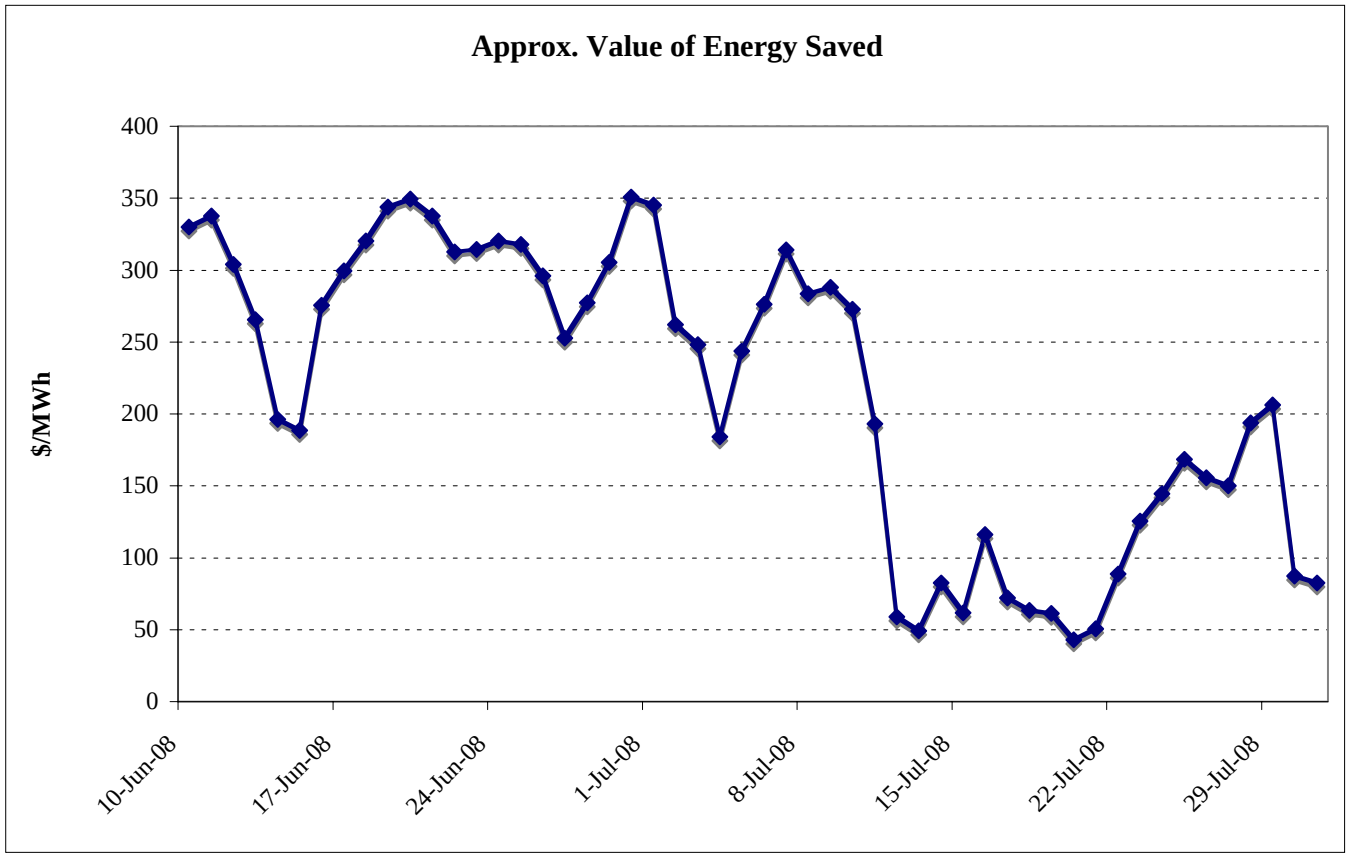
Time of day (June-July)



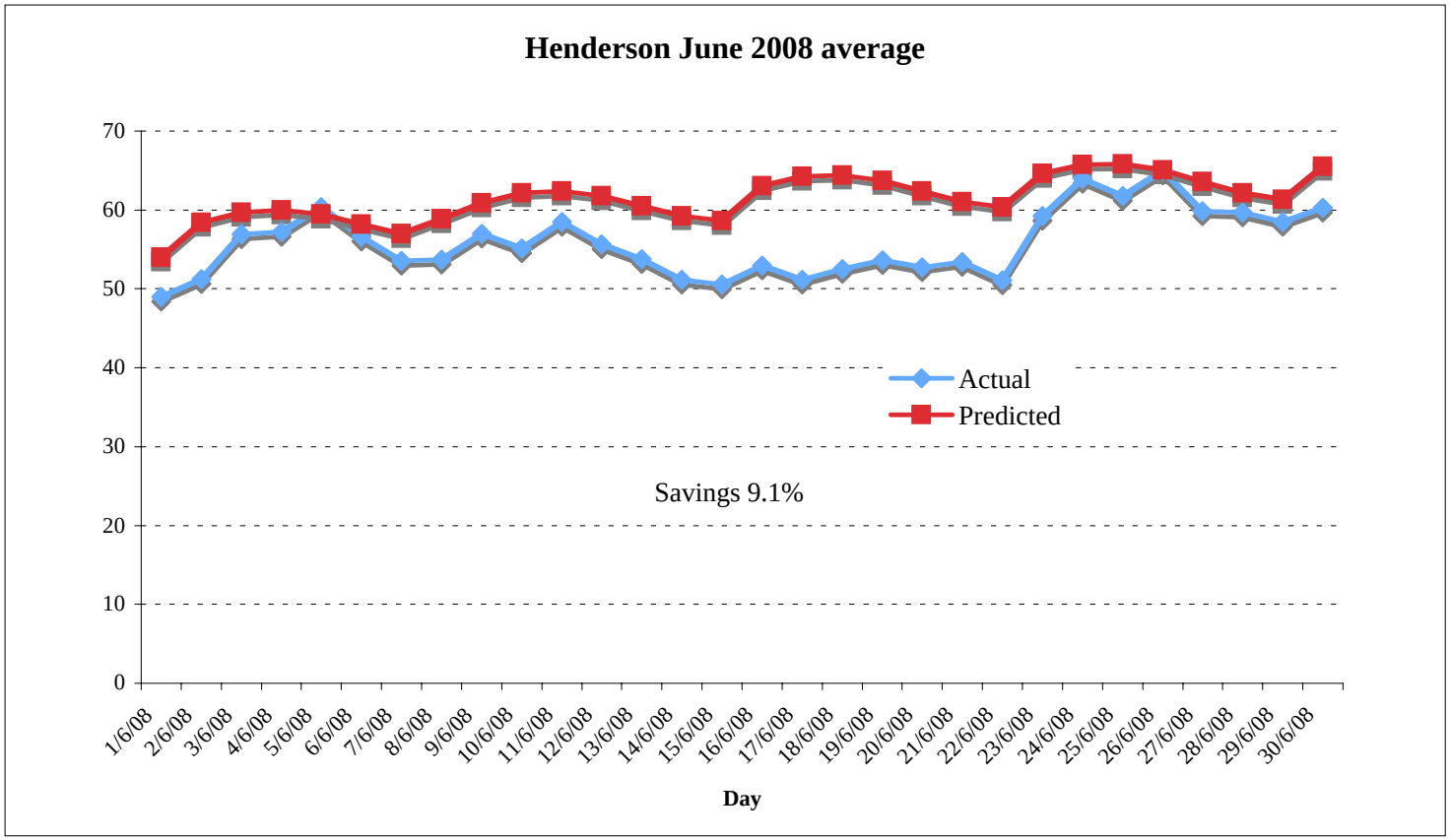
Time of day (June-July)

- Savings throughout the day, but higher at peak times.
  - Particularly evening peak

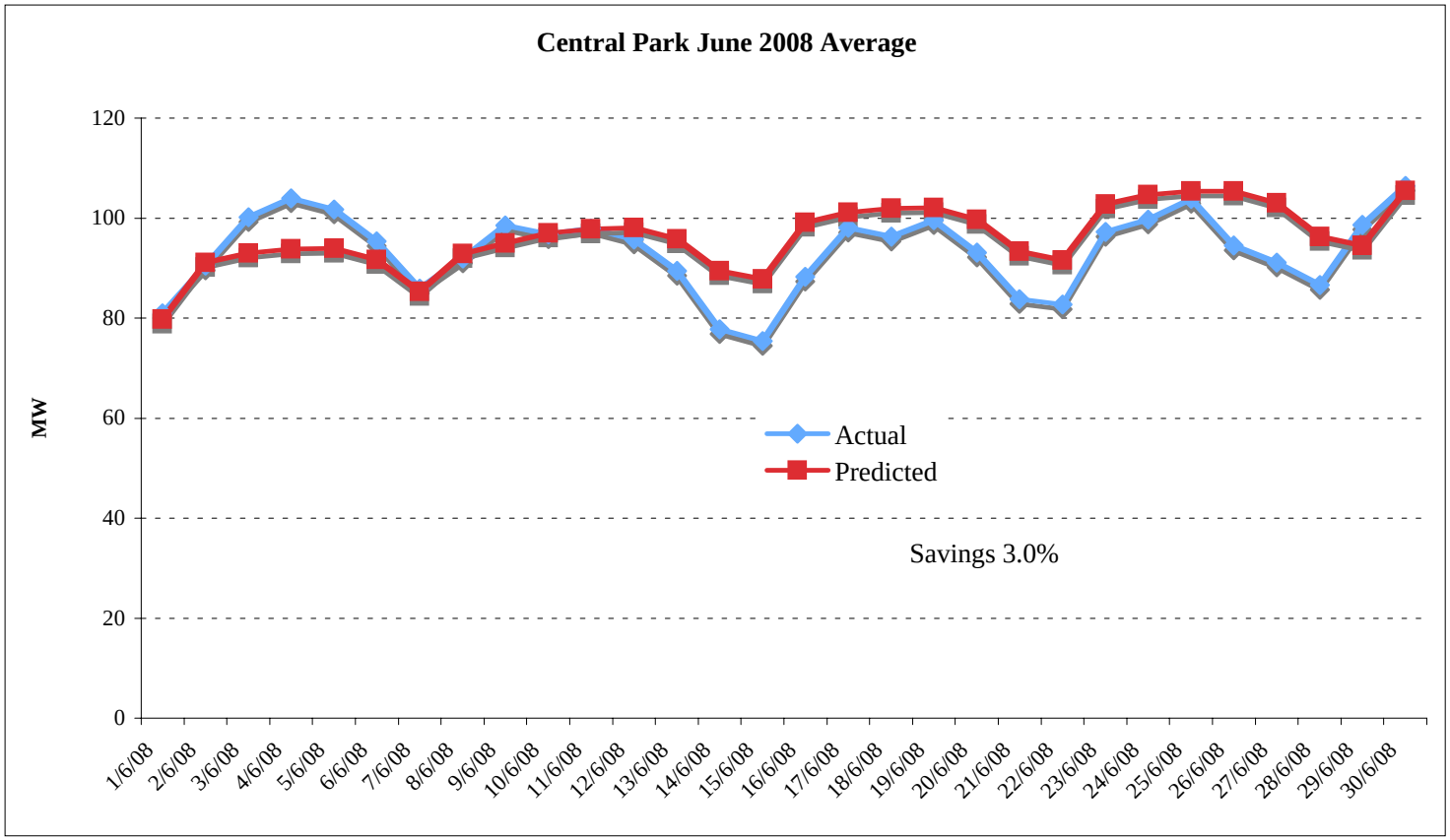
Value of Energy



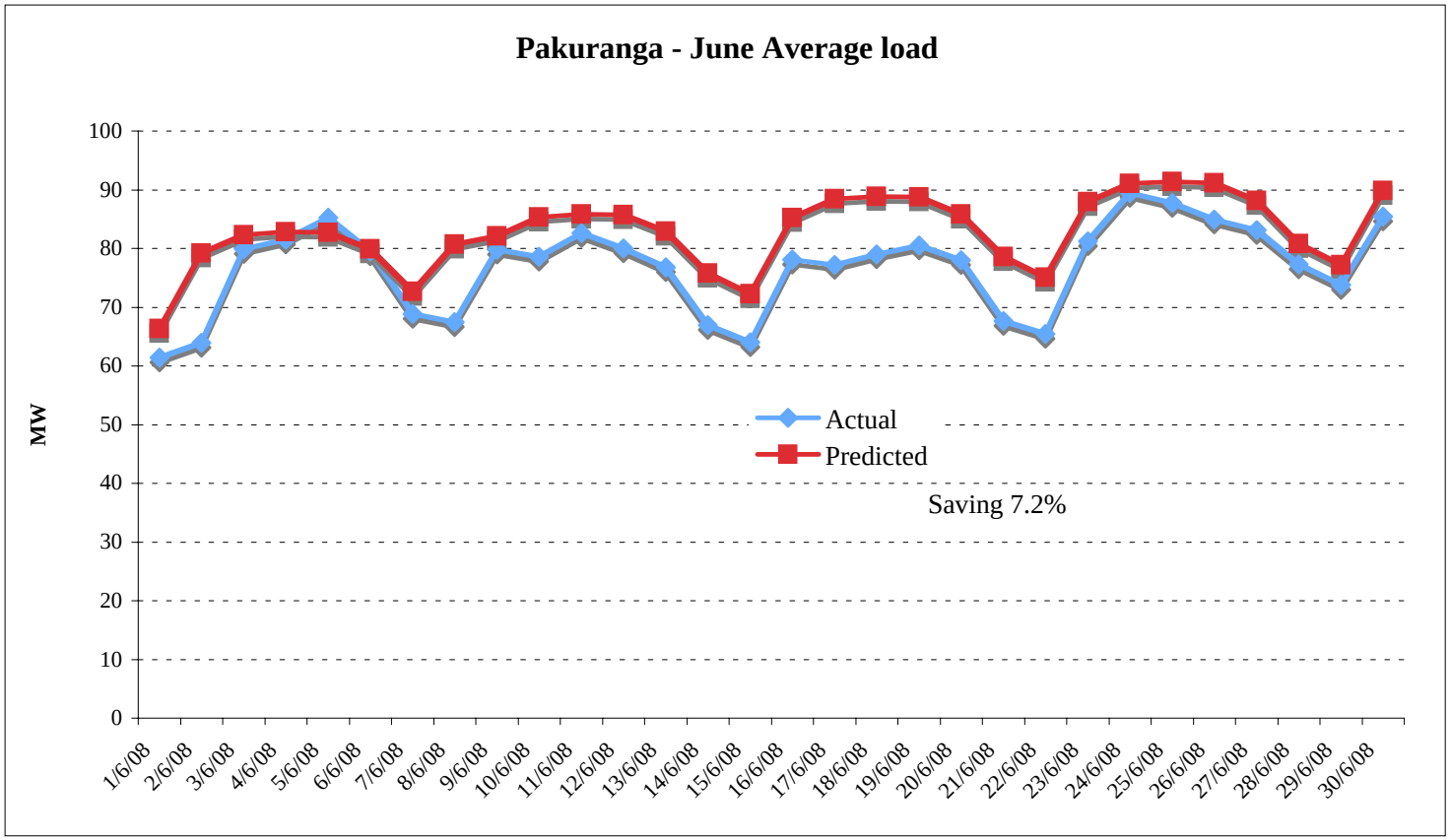
By Supply Point - Henderson



By Supply Point - Central Park



By Supply Point - Pakuranga



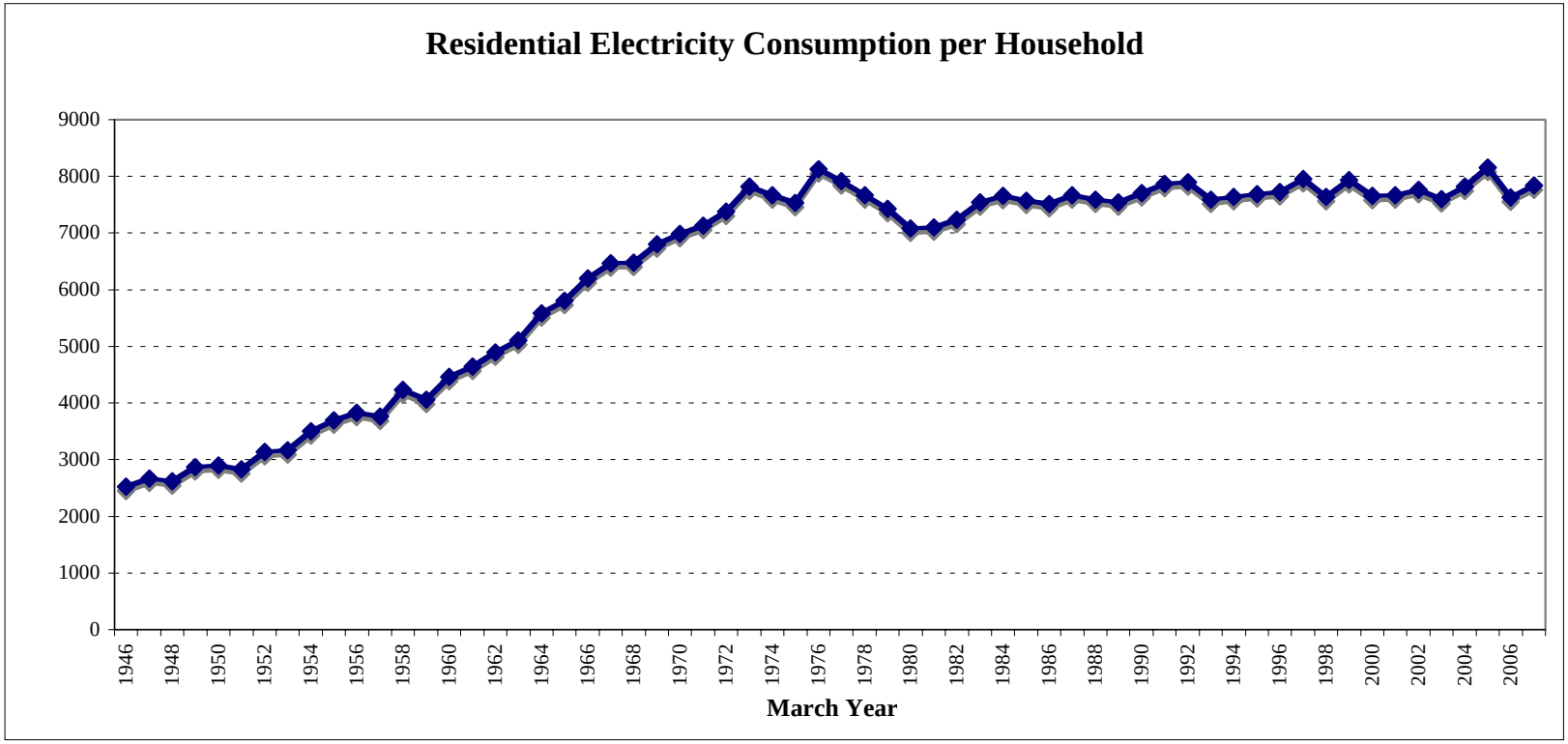
Consumption Drivers

- Population
- # of Households
- Climate
- Appliances
- Other Fuels

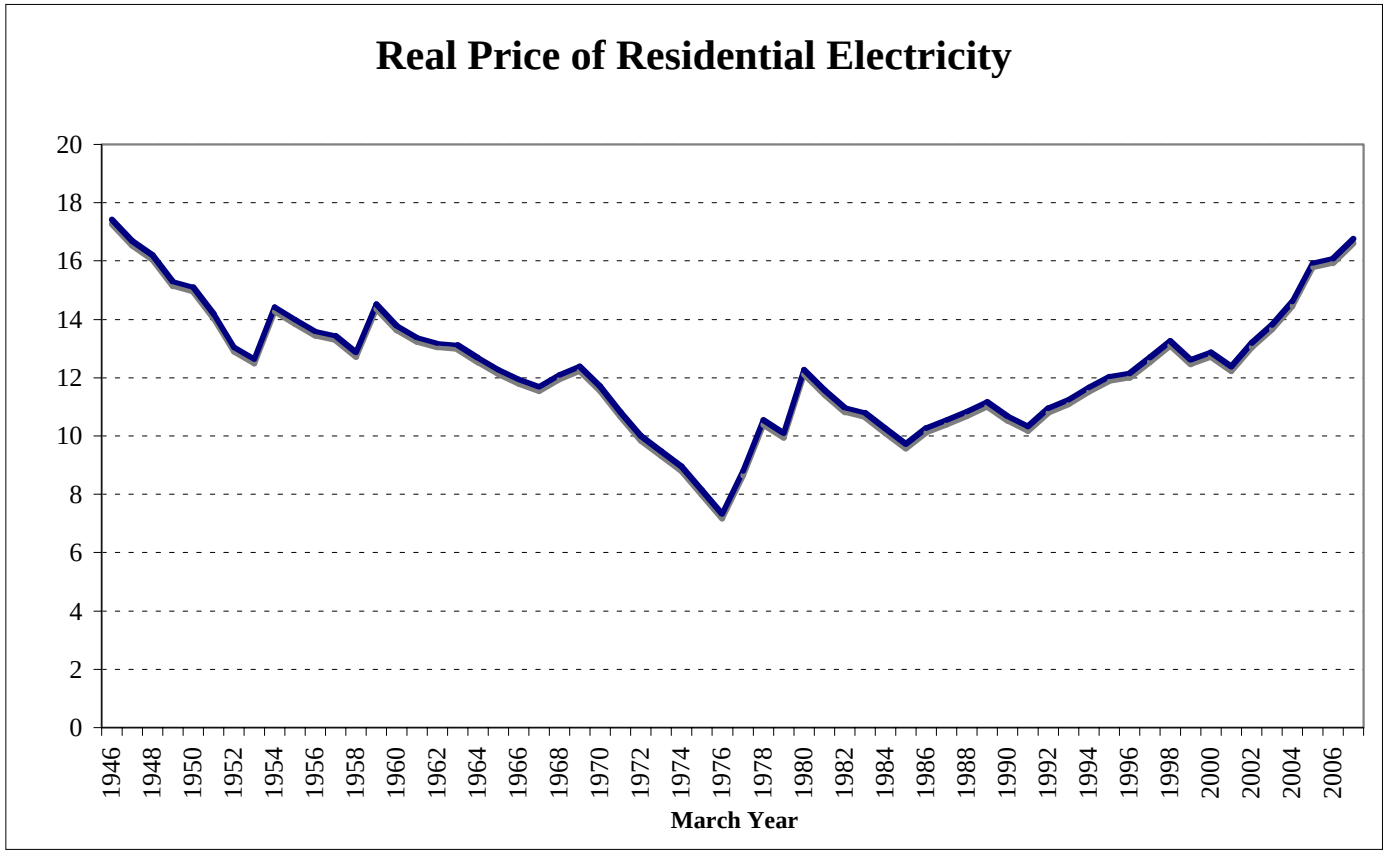
Residential share

- Drops from ~50% in 1974
- To ~33% in 2007

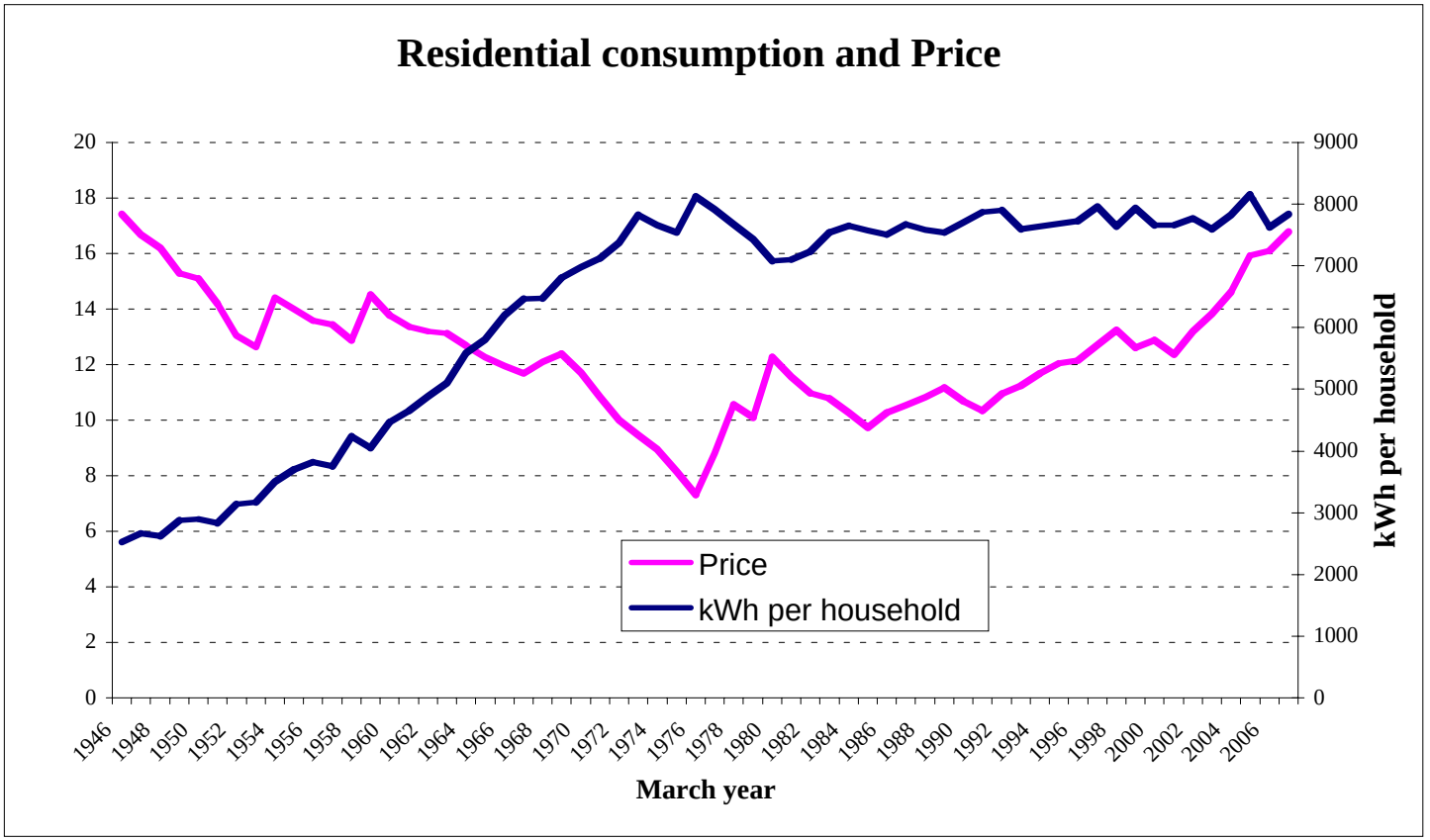
Historical Consumption (per hh) 1946–2007



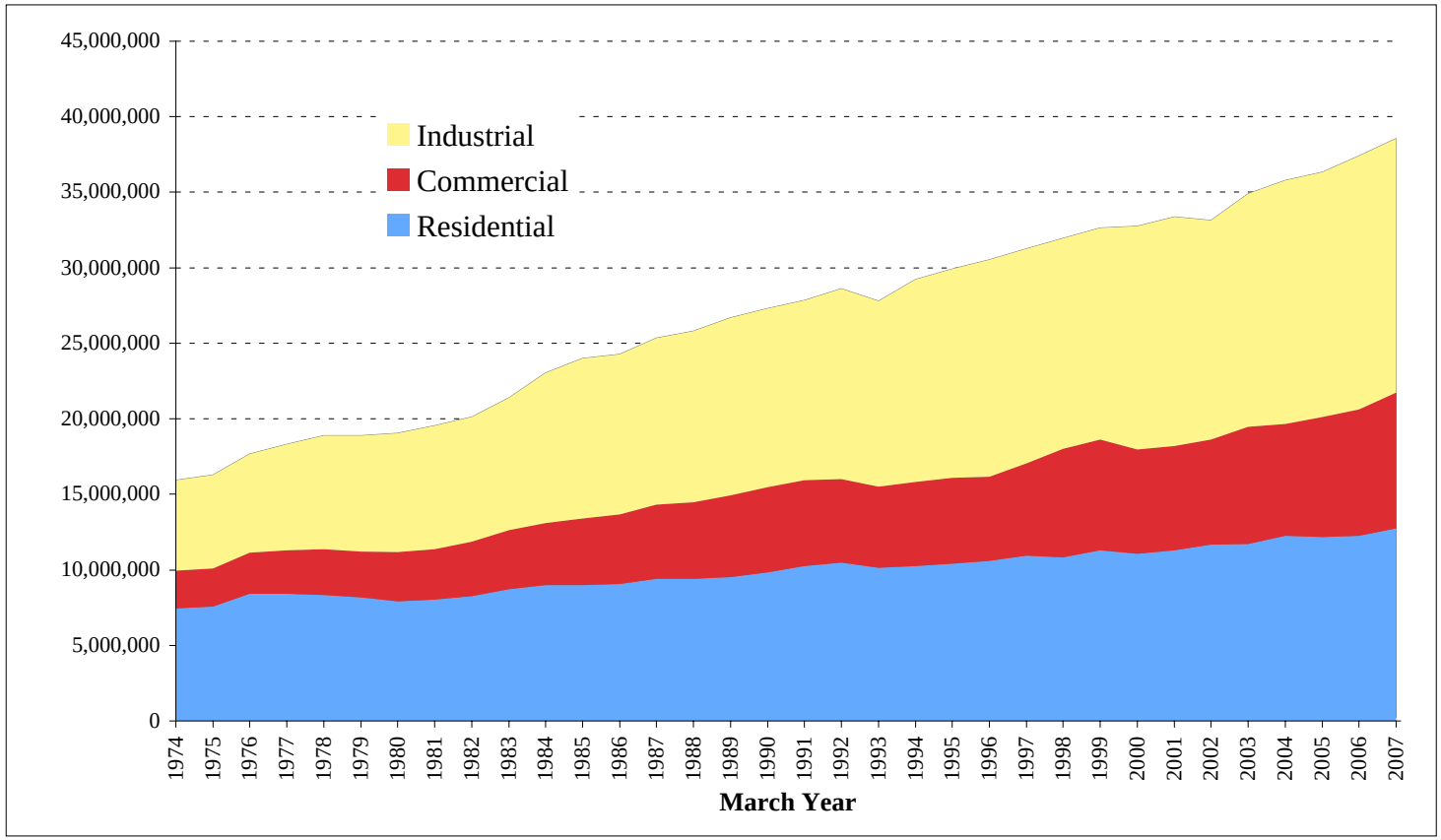
Real Price (1946–2007)



Consumption & Price



Historical Consumption 1974-2007



A short History

- Price dropped steadily to 1977
- Increased thereafter
- Demand grew to 1977
- More or less constant demand post 1977
  - More appliances, TV, computers, etc
  - Reduced heating load?

Some conclusions

- Residential Consumers did a bit better than average.
- Value of the energy saved was high (c. $300/MWh, 30¢/kWh) over much of the period.
- Where did the savings go?
  - Other fuels?
  - Cold homes?