ACEEE Hot Water Forum

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California's Title 24 and Water Heating

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Session - 6D

Energy Budget Calculations

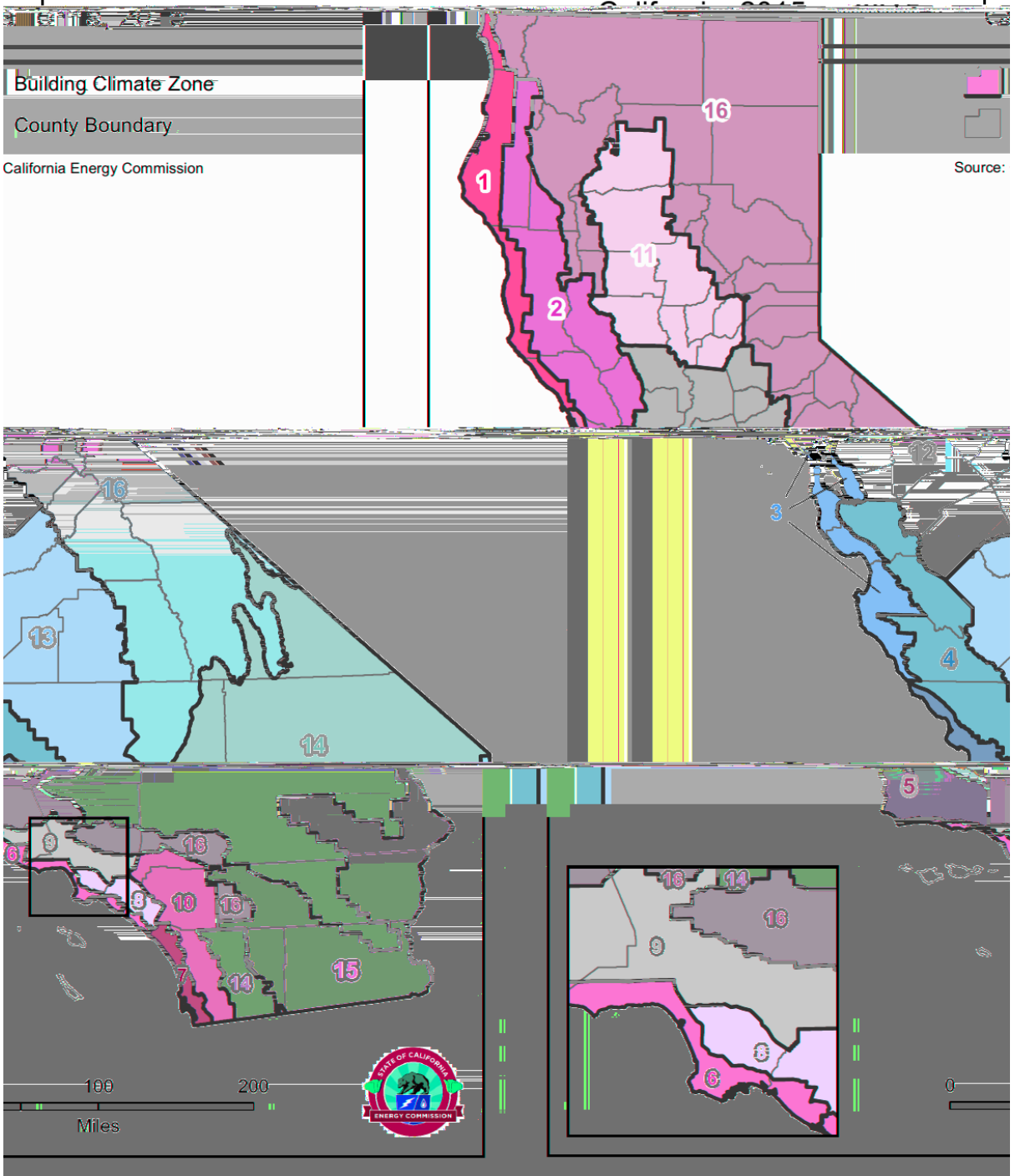
What is Title 24?

- Title 24, part 6 of California Code of Regulations
- sets energy efficiency standards for residential and non-residential buildings
- developed based upon the cost-effectiveness of energy efficiency measures in new buildings
- Before a building permit will be granted, a Title 24 energy report must be submitted to verify the proposed building complies

How Does Title 24 Work?

- establishes an energy "budget" based on a computer simulation of the building's one-year energy use
  - depends on climate zone
- Prescriptive method: individual components meet the prescribed minimum energy requirement.
- Performance method: uses state approved software program to calculate minimum level of energy efficiency necessary for compliance.
  - flexibility allows for more trade-offs.

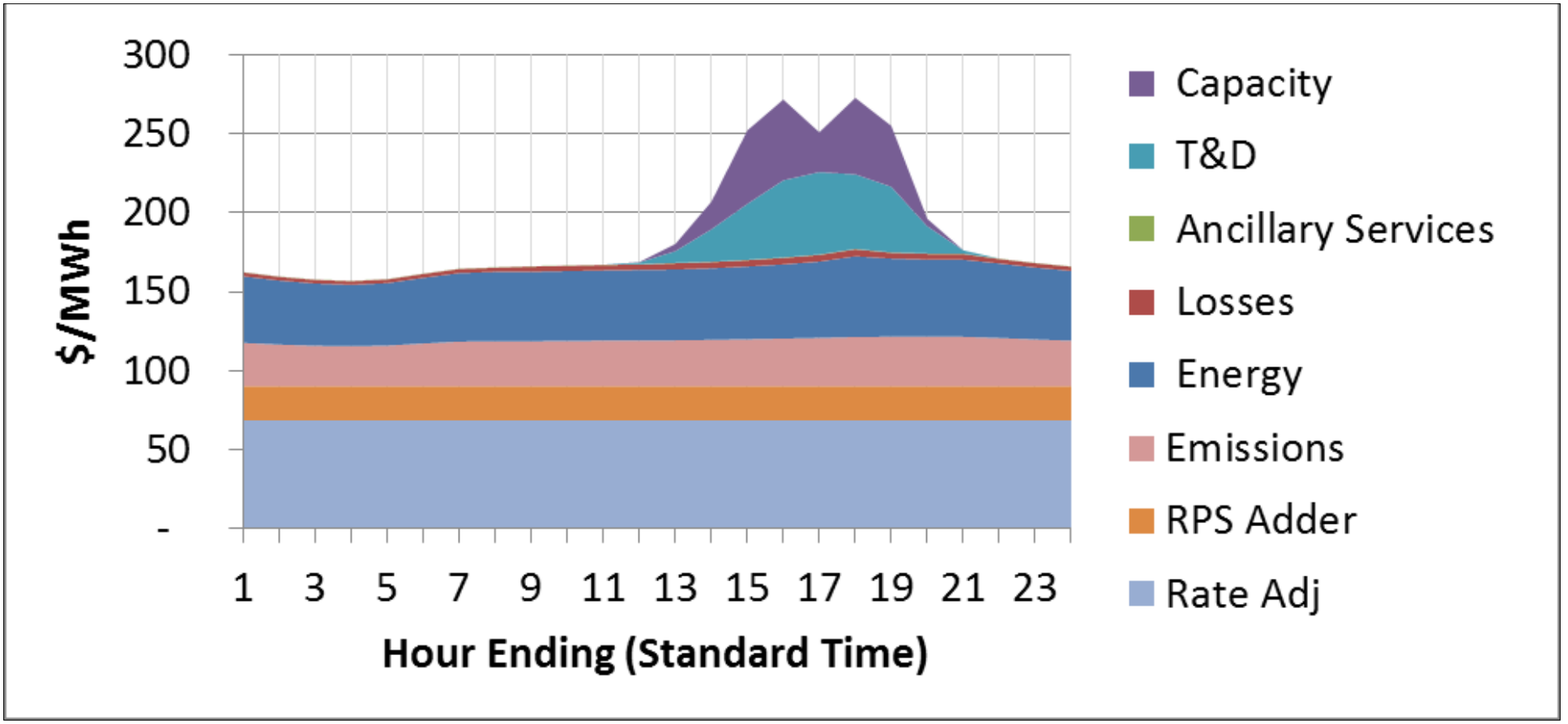
Building Climate Zones



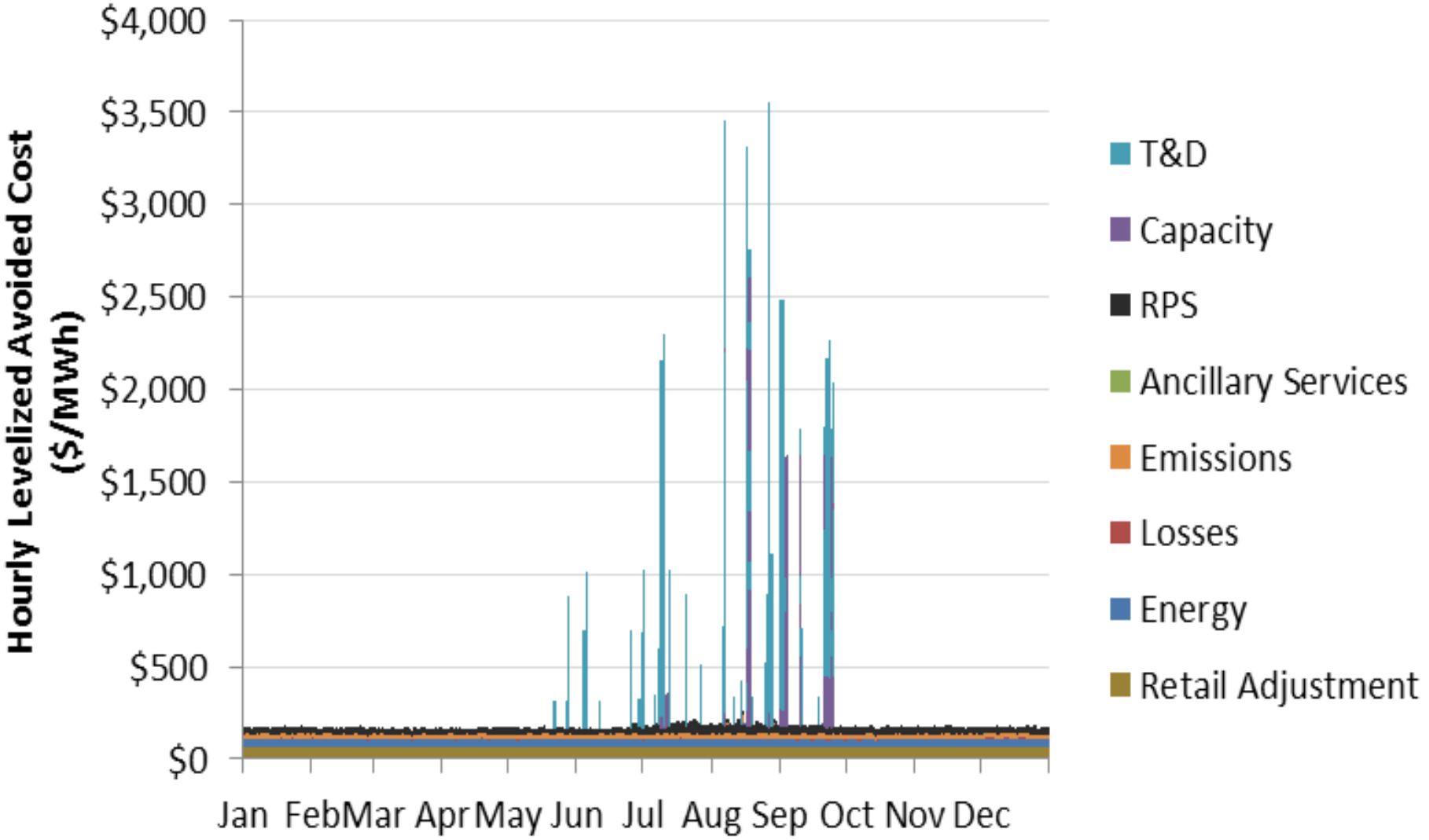
Time-Dependent Valuation (TDV)

- energy efficiency measure savings valued differently depending on hour of year the savings occur
- better reflect the actual costs of energy to consumers, to the utility system, and to society
- encourages building designers to design buildings that perform better during periods of high energy cost
- developed for each of the sixteen climate zones

Hourly Average TDVs for Climate Zone 12



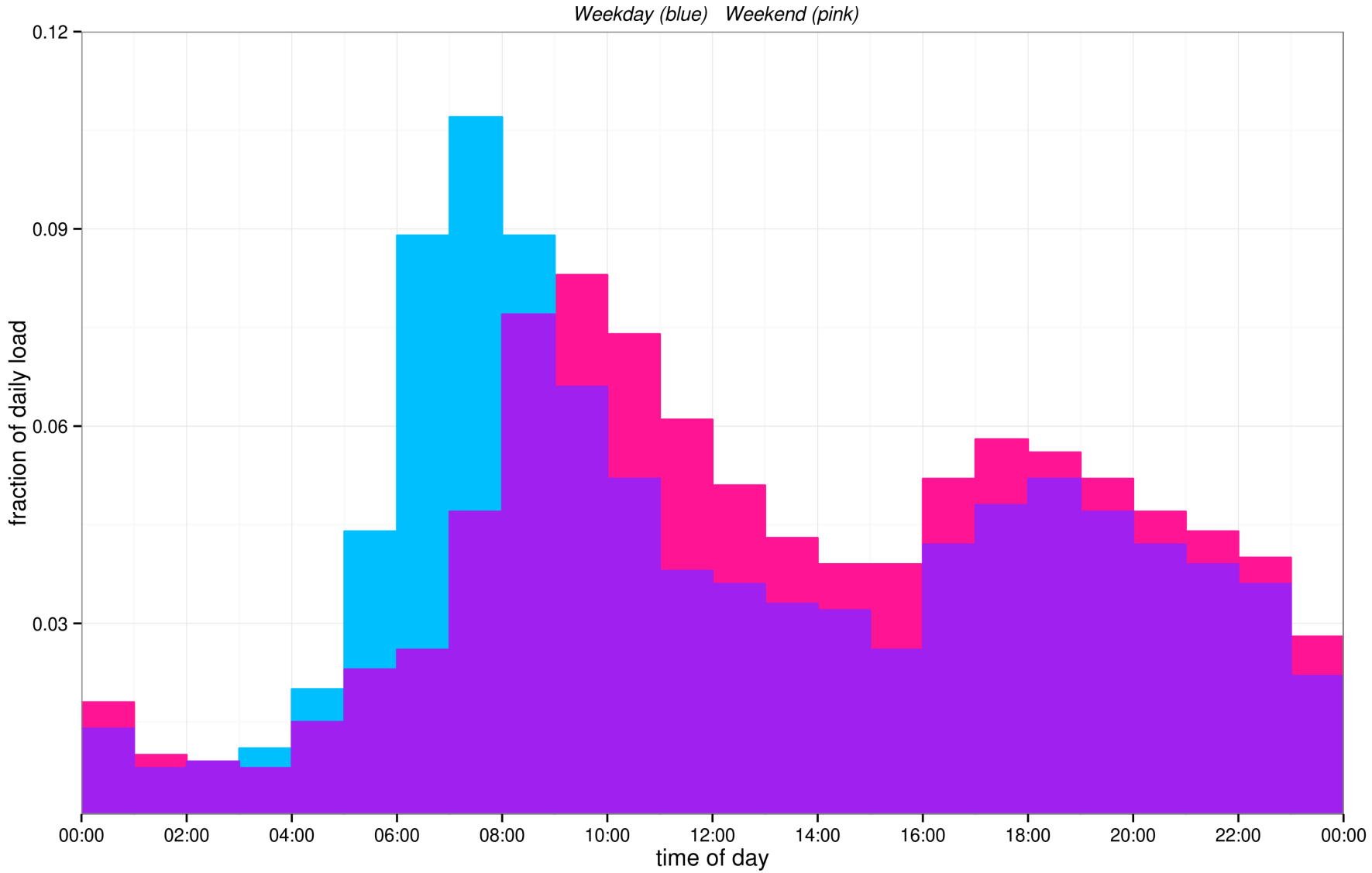
Annual Hourly TDVs for Climate Zone 12



Current Water Heating Energy Calculations

- from early 1990s (daily)
- converted to hourly 2002
- scaled for house size, climate, pipe insulation, plumbing configuration, recirculation controls

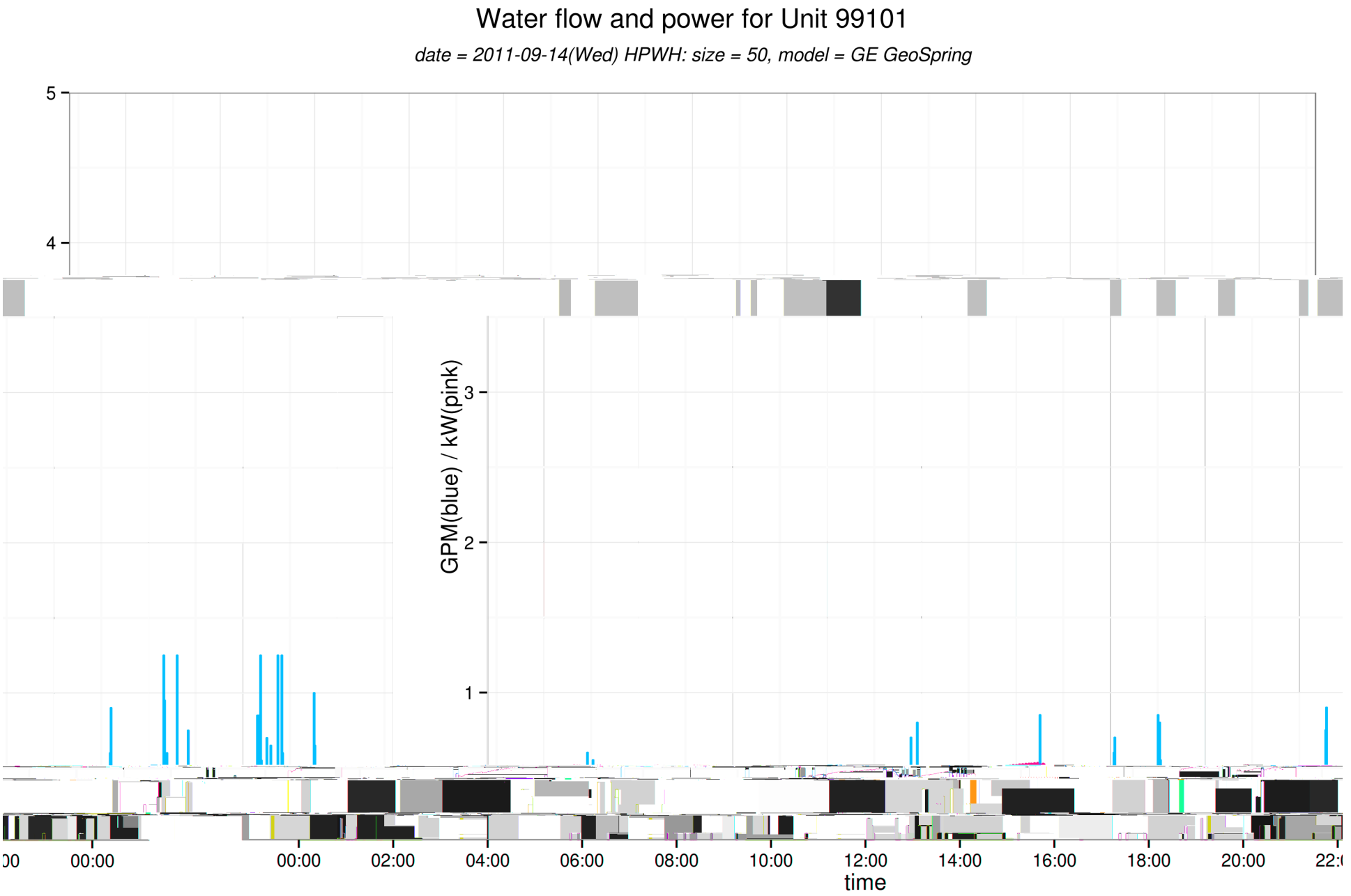
T24 Hourly Hot Water Schedule



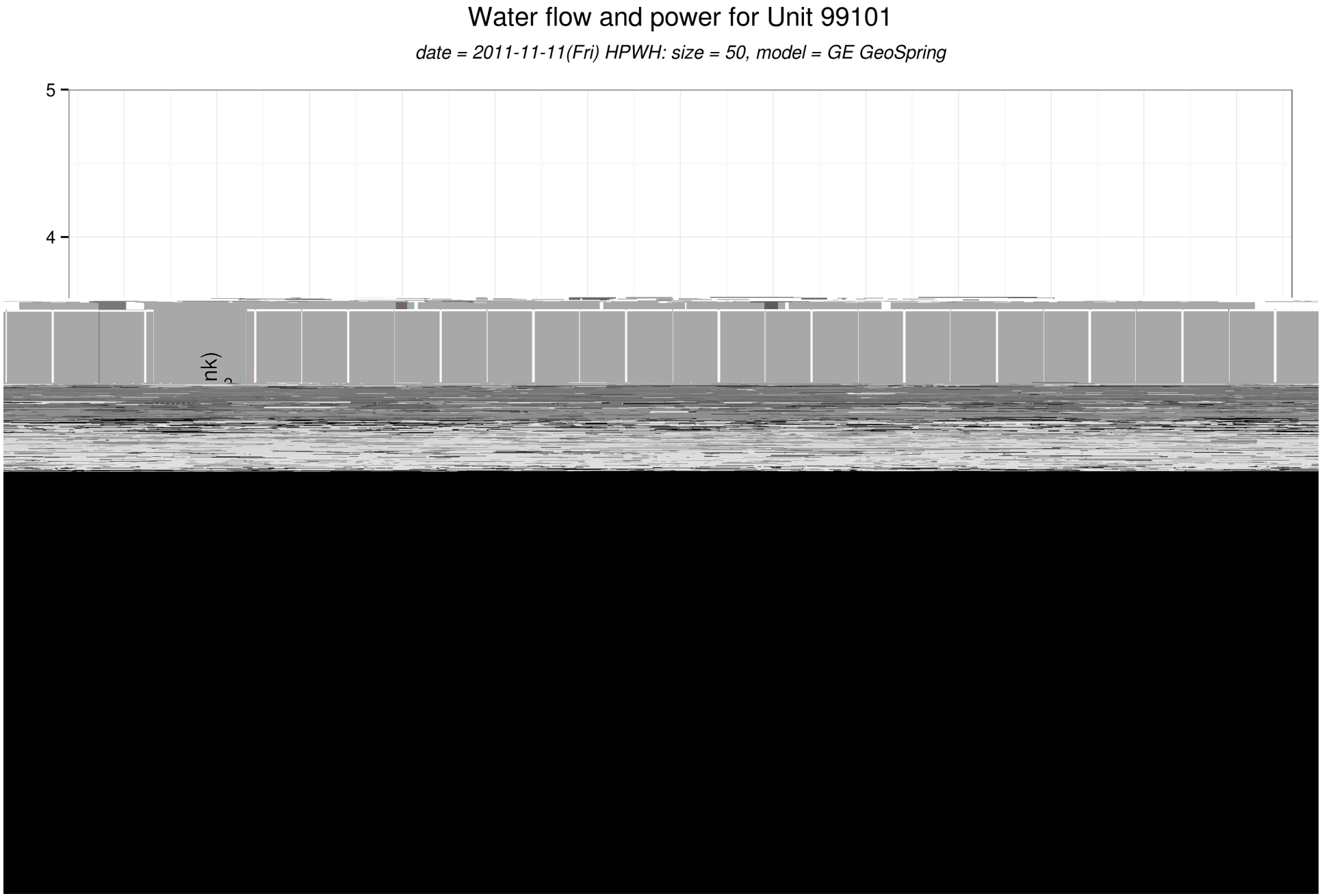
Problems with HW Calculation

- doesn't match actual hot water use profiles
- doesn't match actual energy use profiles
- doesn't account for water saving technnologies
- limited to test procedure results
- locks in fossil fuel technologies
- no credit for grid-interactive capabilities

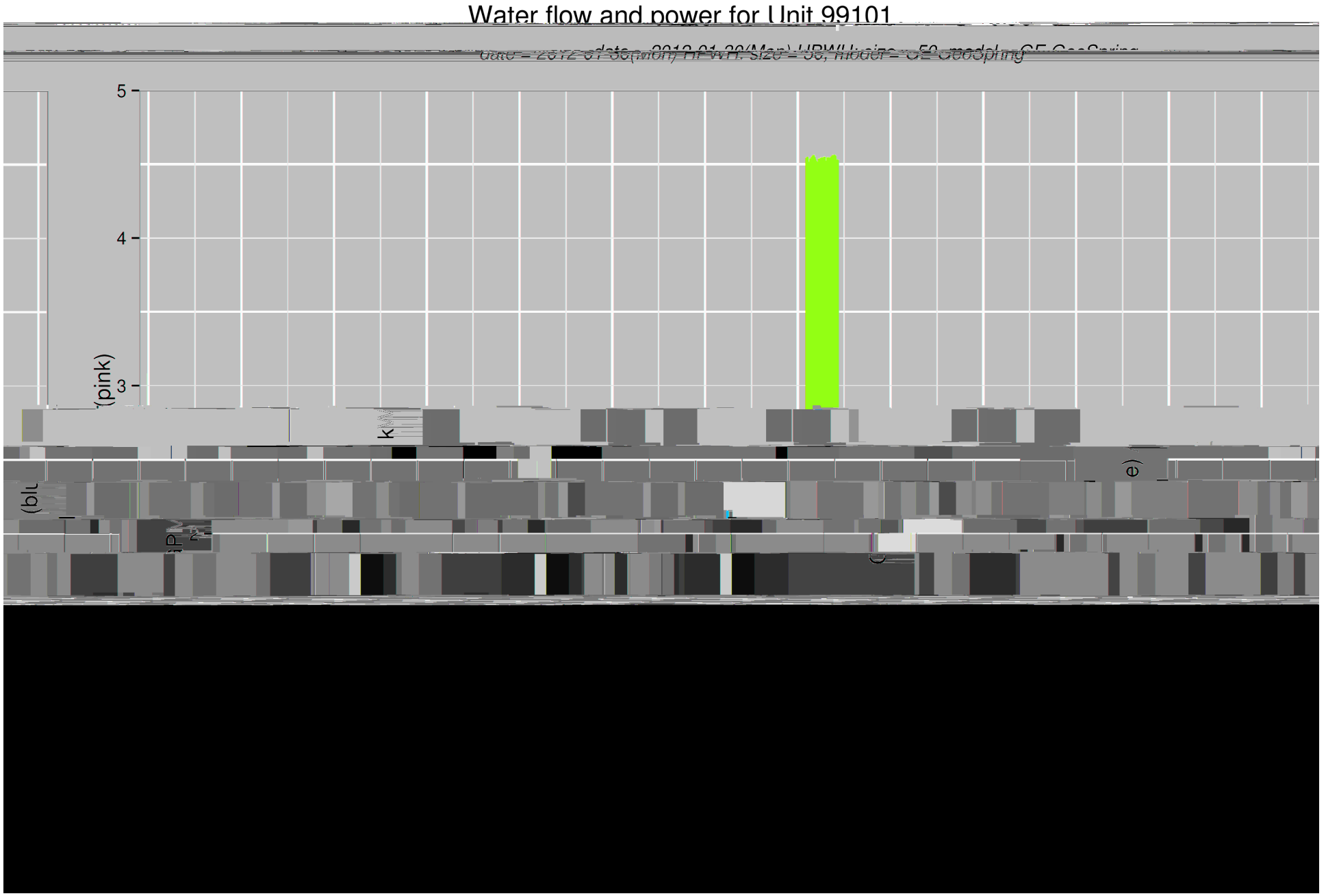
Sample Field Data



More Field Data



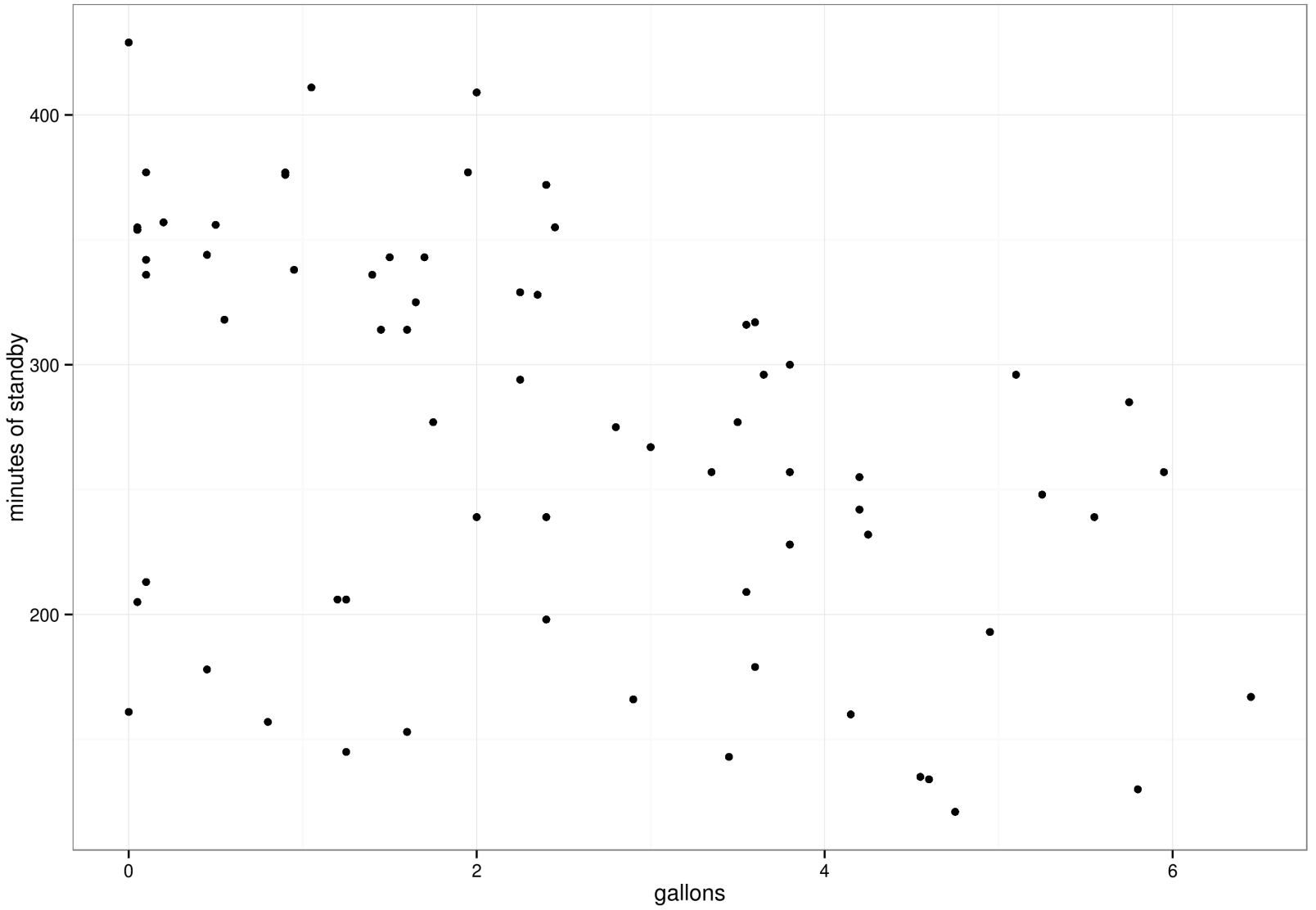
Even More Field Data



Thoughts on Developing Hourly Energy Profile

- daily hot water budget from RESNET
- typical 8760 hour draw patterns?
- test procedure doesn't give enough information
- look at field data
  - standby time as function of water drawn
  - recovery energy as function of water drawn
  - variation by WH models
- credit for grid-interactive or smart WHs?

standby time vs gallons drawn



California energy policies

- new residential construction zero net energy by 2020
- 33% of retail electricity from renewable power by 2020;
- greenhouse gas emissions to 1990 levels by 2020;
- regulations requiring power plants that use coastal water for cooling to either repower, retrofit or retire;
- policies to increase distributed generation;
- executive order for 1.5 million zero emission vehicles by 2025

CA ISO Duck Curve