



Climate Change and Electricity Demand: Applying the New Temperature Scenarios

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*Scenario Analysis Subgroup Meeting
December 13, 2005*

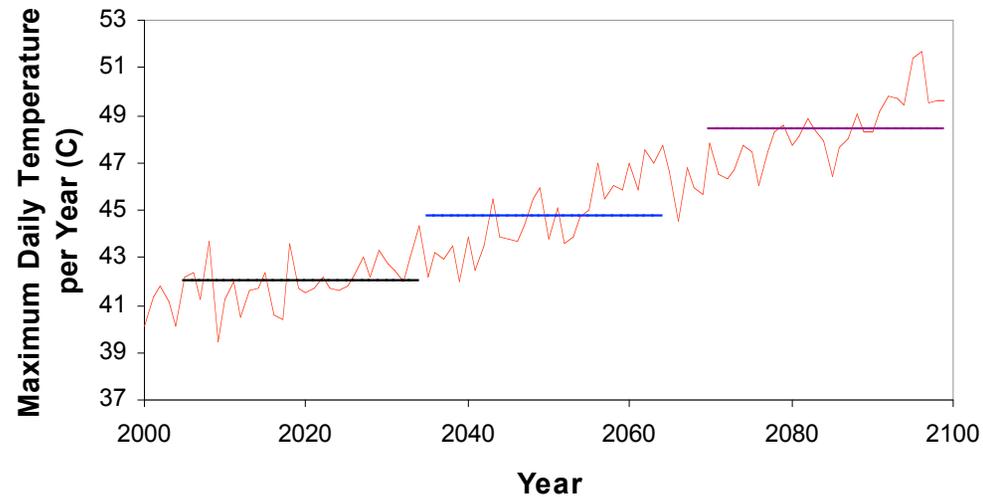


Overview

- * **Purpose:** Apply new projections to obtain illustrative, “back-of-the-envelope” estimates of the potential impacts on electricity and peak demand
- * **Approach:**
 - ▶ Estimate simple models of the current relationships between temperature and demand, and maximum temperature and peak demand
 - ▶ Apply to projections to illustrate orders-of-magnitudes when future temperature changes are imposed on current electricity system and demographics

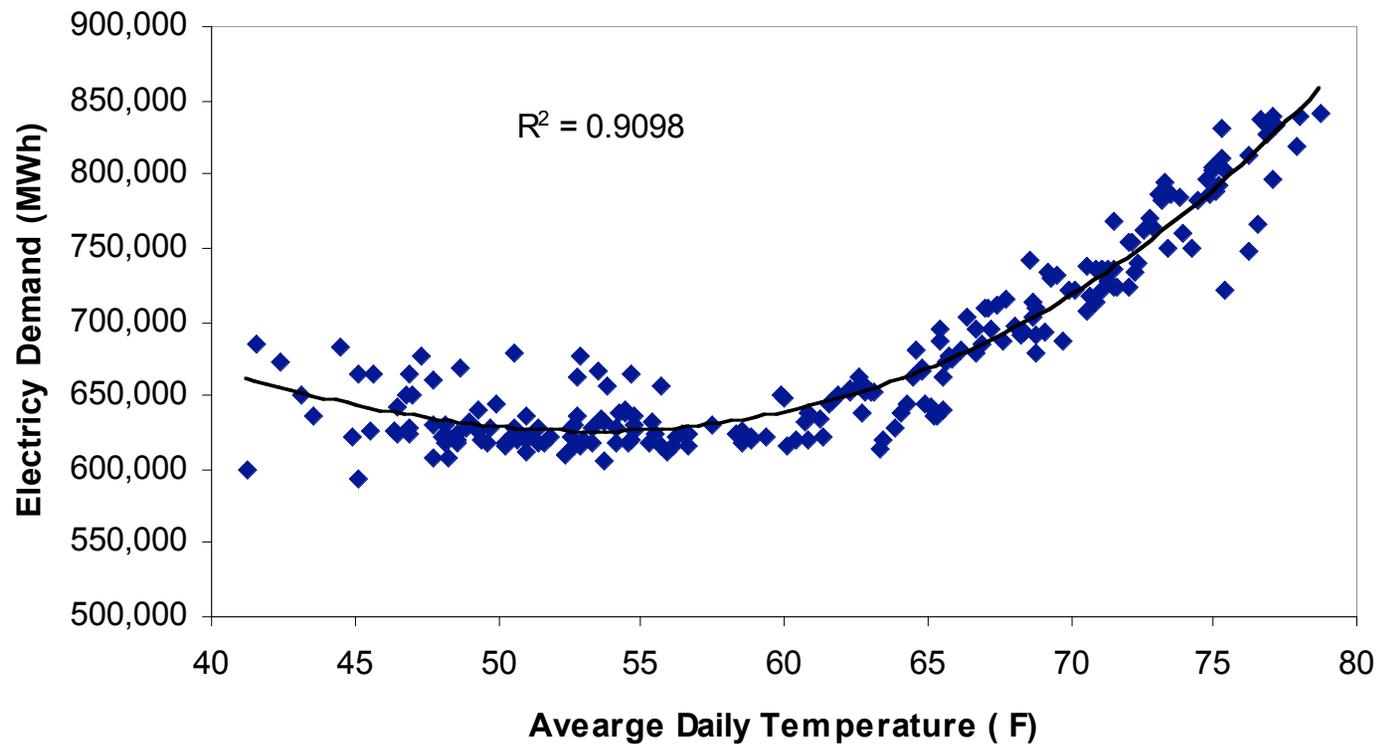


Maximum Hourly Temperatures by Year, Simulated Historical (1961-1990) and Projected (2005-2034, 2035-2064, 2065-2099): Hadley3 A1Fi



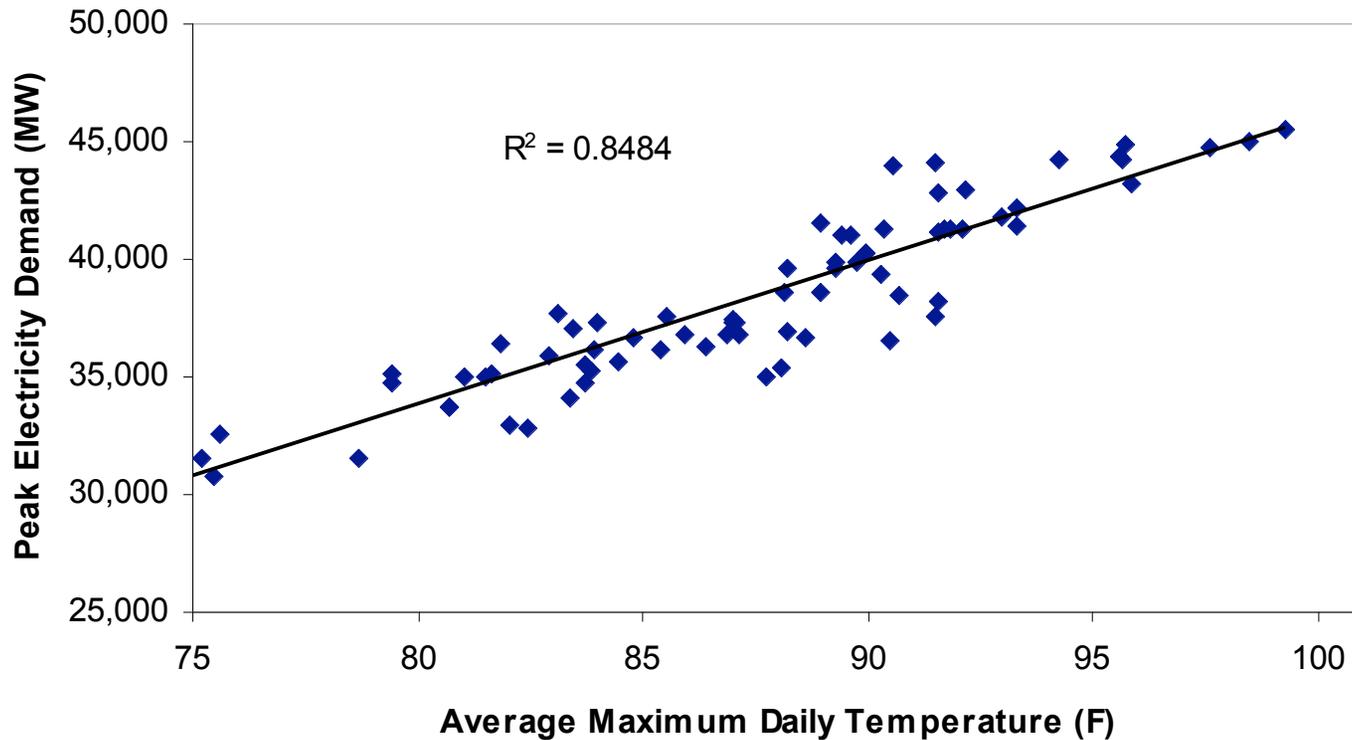


Electricity Demand in the CalISO area as a function of Average Daily Temperature: 2004





Peak Electricity Demand in the CalISO area as a function of Maximum Daily Temperature: June-September 2004





Estimated Increases in Annual Electricity and Peak Load Demands for the A1Fi, A2, and B1 scenarios relative to the 1961 to 1990 base period

Time Period	Temperature Scenario	Change in Annual Electricity Demand (%)	Change in Peak Demand (%)	Climate Model	Emission Scenario
2005-2034	Low	0.9	1.4	PCM	Low (B1)
		2.5	1.5	GFDL	Low (B1)
		1.2	1.0	PCM	Medium-High (A2)
	Medium	2.9	3.6	GFDL	Medium-High (A2)
	High	3.4	4.8	HadCM3	Higher (A1fi)
2035-2064	Low	1.7	1.5	PCM	Low (B1)
		2.5	5.0	GFDL	Low (B1)
		2.4	2.2	PCM	Medium-High (A2)
	Medium	5.0	5.0	GFDL	Medium-High (A2)
	High	9.0	10.9	HadCM3	Higher (A1fi)
2070-2099	Low	3.1	4.1	PCM	Low (B1)
		5.8	7.3	GFDL	Low (B1)
		5.3	5.6	PCM	Medium-High (A2)
	Medium	11.0	12.1	GFDL	Medium-High (A2)
	High	20.3	19.3	HadCM3	Higher (A1fi)



Potential effects

- ★ Examples of economic impacts:
 - ▶ At current growth rate of statewide aggregate electricity expenditures, a 3% increase in demand in 2020 would imply approximately \$1Billion (2000) in additional costs
 - ▶ A 10% reduction in hydroelectric supply would imply approximately \$350M in additional costs



Potential strategies for reducing impacts

- ★ The potential impact of climate change is one of numerous uncertainties facing California's electric power system, but an important one:
 - ▶ Further detailed study of the relationships between temperature and electricity demand is a high priority in order to improve planning
- ★ Increasingly, “resilience” of the system, and robustness of system planning against this uncertainty, will be important:
 - ▶ Adaptive management techniques, continued emphasis on renewables and energy efficiency
 - ▶ Reducing the urban heat island effect