Turbine Inlet Cooling (TIC): An Energy Solution That's Good for the Environment, Rate Payers and Plant Owners

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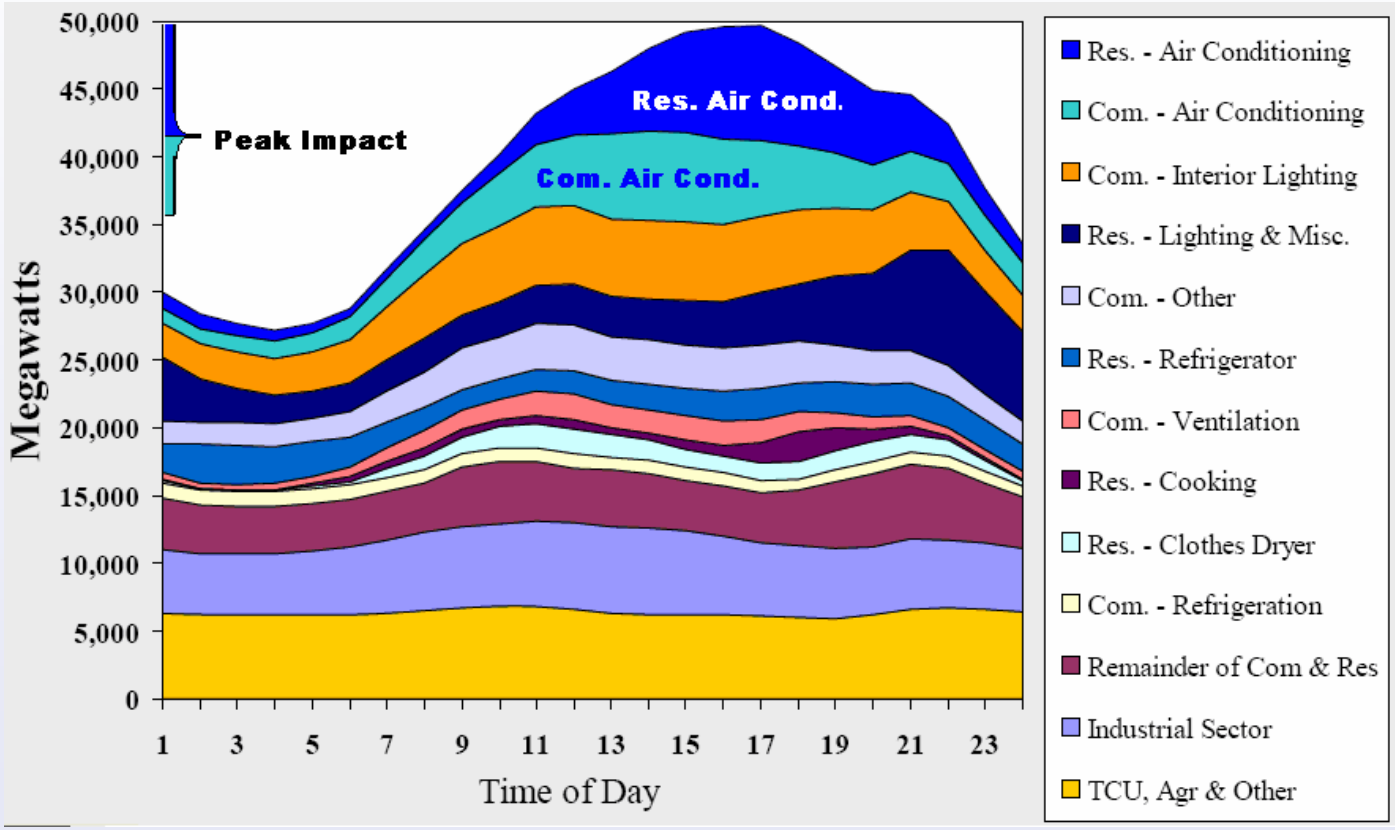
Commercial and Residential Air Conditioning Loads are Major Contributors to the Peak Power Demand



Source: Scot Duncan Presentation at ASHRAE June 2007

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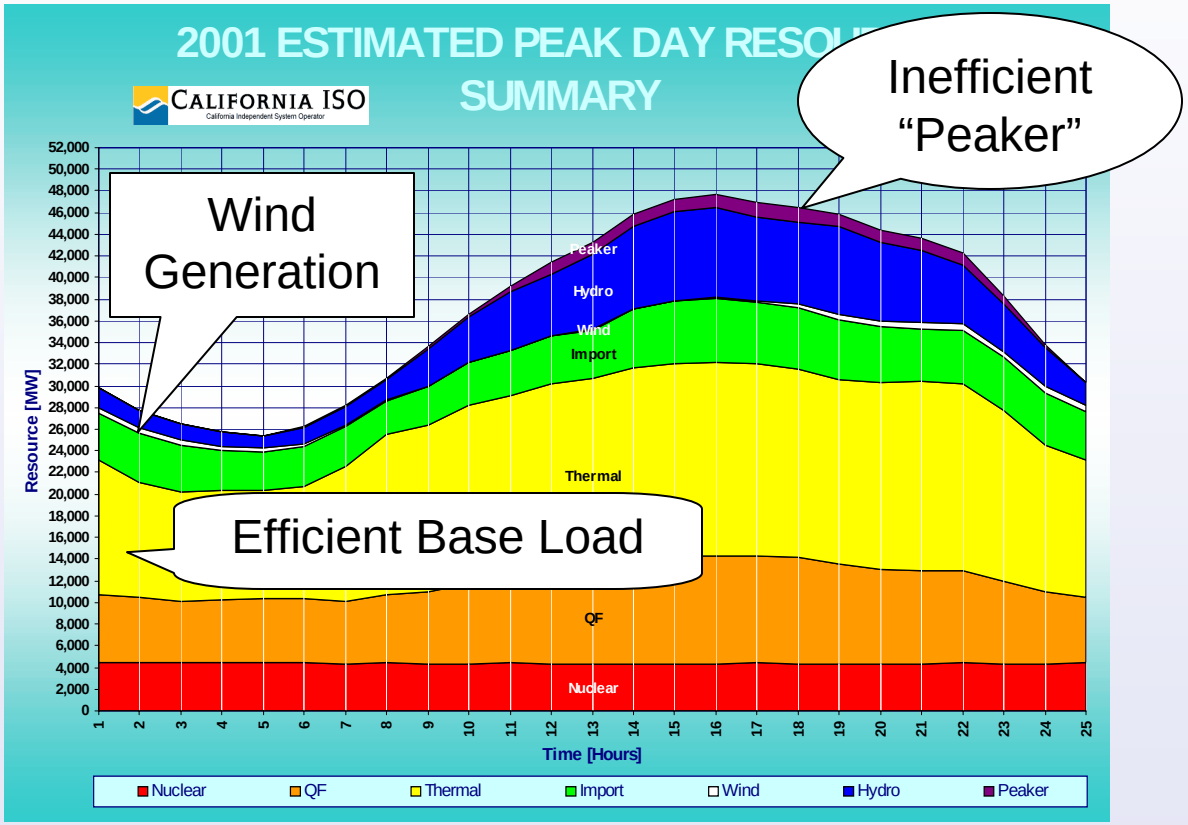
Contribution of Various Power Generation Technologies for Meeting Power Demand



Source: Scot Duncan Presentation at ASHRAE June 2007

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Power Demand and Electric Energy Price Rise with Hot Weather

- **Price of electric energy for the ratepayers goes up during the peak demand periods: as much as 4 times that during the off-peak periods**

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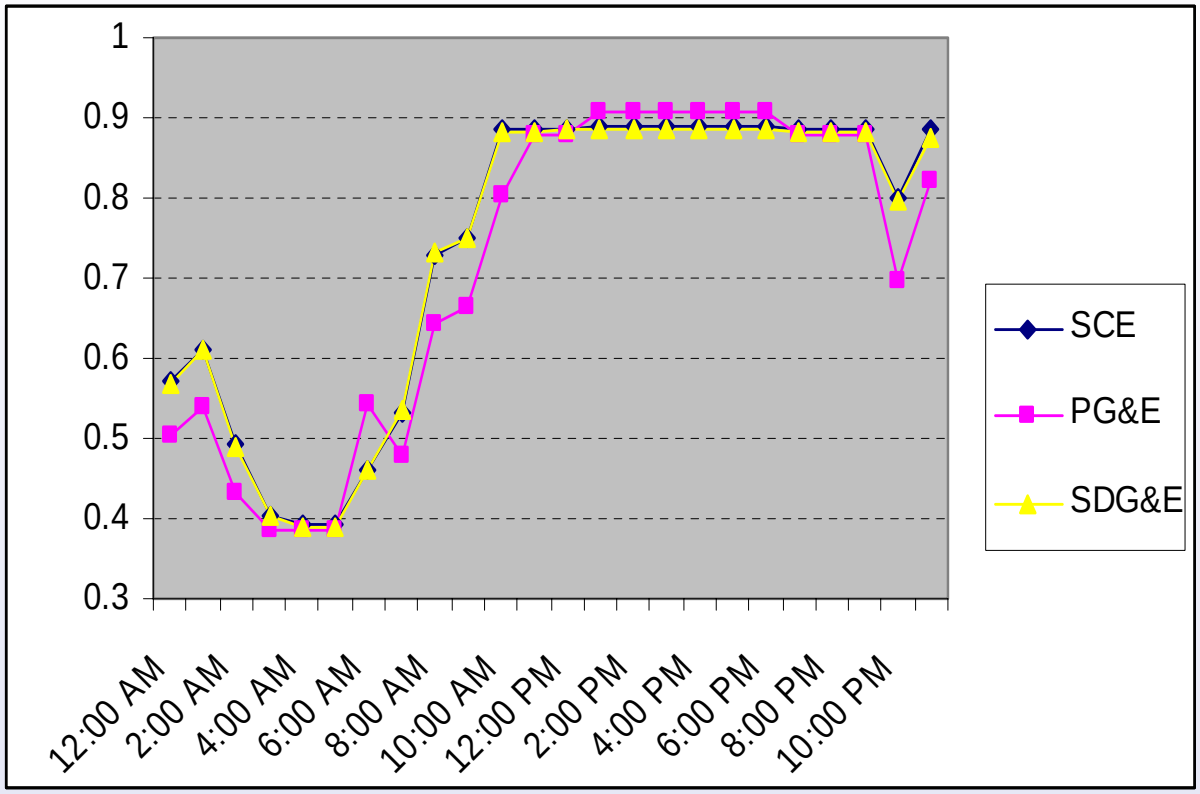
Emissions of CO2 During Summer (California)



Source: Scot Duncan Presentation at ASHRAE June 2007

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Combustion Turbine Power Plants Fundamental Flaws

- **During hot weather, just when power demand peaks,**
  1. Power output decreases significantly
     - *Up to 35% below rated capacity*
     - *Depends on the CT characteristics*
  2. Fuel consumption (heat rate) and emissions increase per kWh

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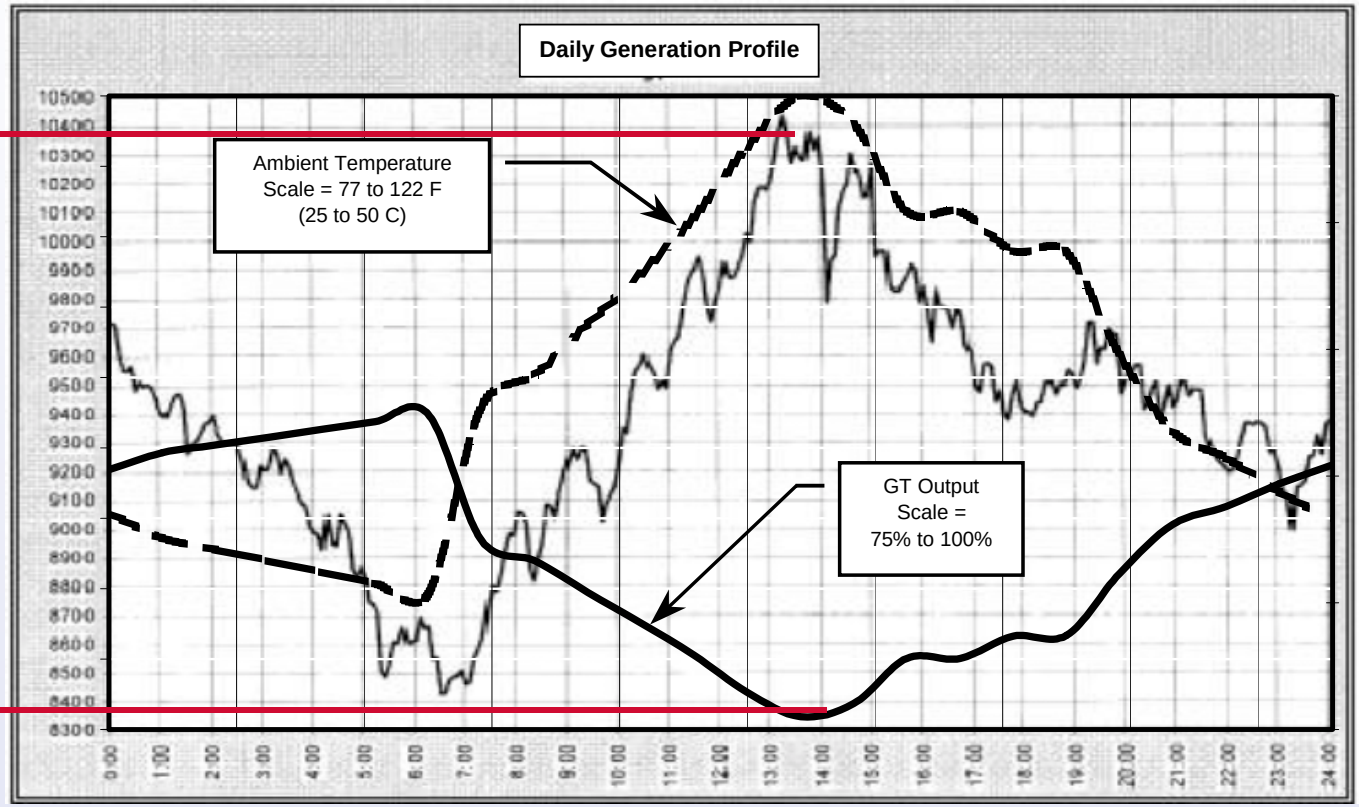
Greatest Generation Capacity Loss Coincides with Peak Power Demand

Peak Power Demand

Lowest Generation Capacity



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Turbine Inlet Cooling Economic Benefits

- Generates more MWh revenues during peak demand periods when electric energy price is high
- Reduces capital cost for the increased generation capacity compared to new power plants
- Reduces cost of electric energy generation compared to the low energy efficiency “peakers”
- Reduces cost for ratepayers by allowing lower capacity payments by the independent system operators (ISOs) for power producers

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TIC Helps Minimize Emissions

System	Combined-Cycle CT	Simple-Cycle CT	Steam Turbine
Fuel	Natural Gas	Natural Gas	No. 6 Fuel Oil
CO2 Emissions, lb/MWh	814	1250	2236
NOx Emission, lb/MWh	0.08	0.36	3.9
SOx Emission, lb/MWh	0	0	13.25

Source: Pasteris Energy, Inc.

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Suggested Changes To Regulatory Structure

- **Realize full potential of existing CT plants**
  - Use TIC before allowing new plants to be built
- **Exempt TIC from environmental re-permitting**
  - Impact of TIC is similar to ambient temperature naturally going down
- **Calculate capacity payments for plant owners on the basis of systems incorporating TIC**
  - Consistent with the PJM affidavit made to the FERC in July 2006

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Conclusions

- Turbine inlet cooling can provide significant increased generation
- Additional generation can be from efficient combined-cycle (CC) and simple-cycle (SC) power plants
- More MWh from CC and SC plant minimize/eliminate operation of higher-emission producing thermal power plants/steam-turbine systems
- Turbine inlet cooling of CC and SC power plants also reduces the cost of generation compared to the thermal power plants
- In summary, TIC is an energy solution that is good for the environment, ratepayers and plant owners

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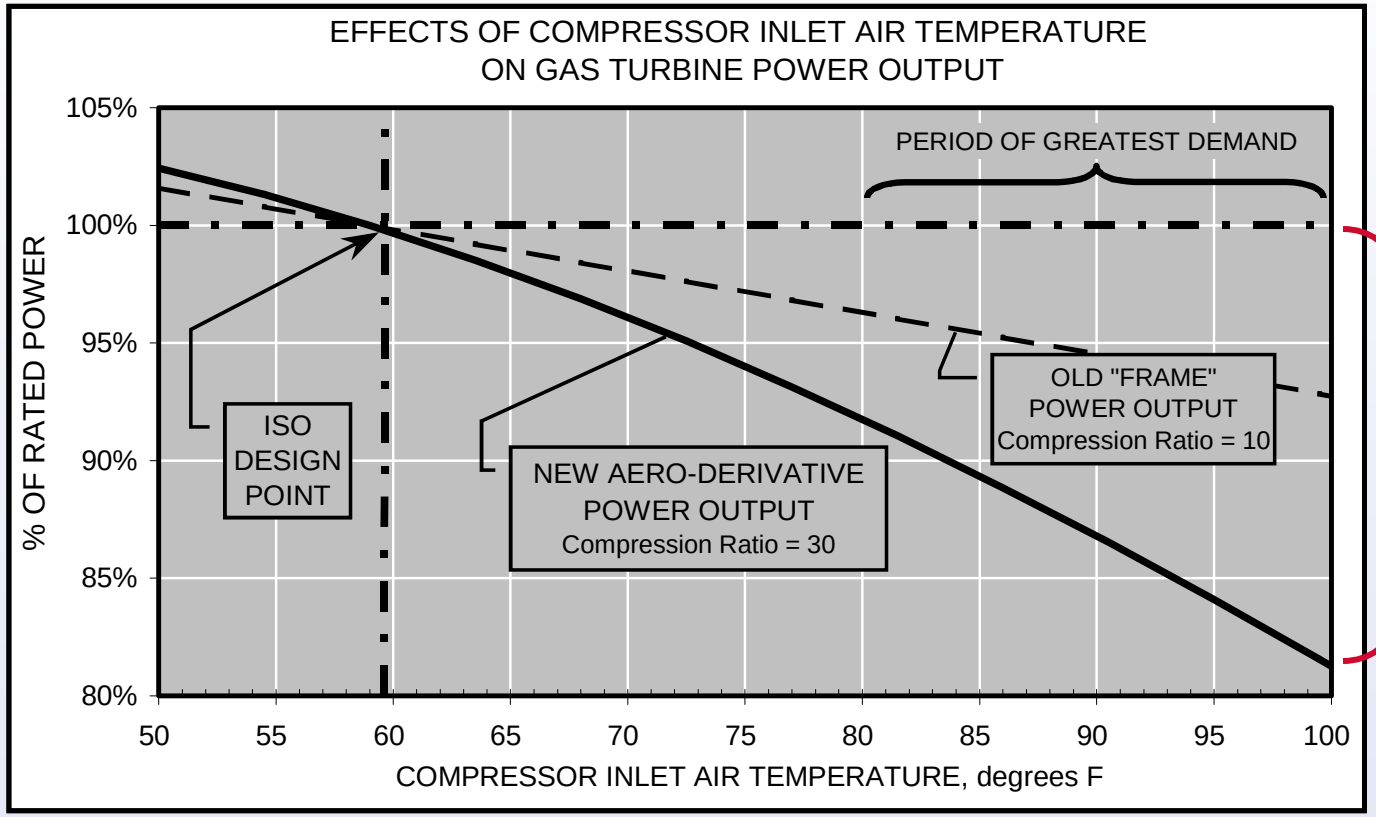
Combustion Turbine Power Plants
Fundamental Flaw # 1: Generation Capacity Decreases with Increase in Temperature



Up to 19% capacity loss at peak demand for this CT

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