

Integration of Distributed Energy Resources
within a Smart Microgrid
Smart Grid Rulemaking Distribution Workshop
CA Public Utilities Commission

Byron Washom
Director of Strategic Energy Initiatives
UC San Diego
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Snapshot of UCSD's Microgrid

- ❑ Operates a 42 MW peak load microgrid in parallel with the SDG&E distribution network
- ❑ Self Generates 80% of its annual electricity
- ❑ CCHP plant contributes to the district heating and cooling system throughout the campus
- ❑ Energy density (kWh/ft²/yr) is 2x that of typical commercial space due to research requirements and patient care at 2 hospitals

Legacy and Planned Infrastructure

□ Legacy Infrastructure

- 2x13 MW Gas Turbine Cogen
- 1 MW of PV
- 60 gensets = 32 MW
- 3.8M gal thermal storage tank that achieves *daily* ~ 14% Permanent Load Shifting
- 41% Demand Response during last Stage I CAISO Alert
- SCADA system meters 9 load centers and 78 buildings representing > 50,000 points and has a command of 4,500 thermostats and control points
- <http://mscada01.ucsd.edu/ion/>

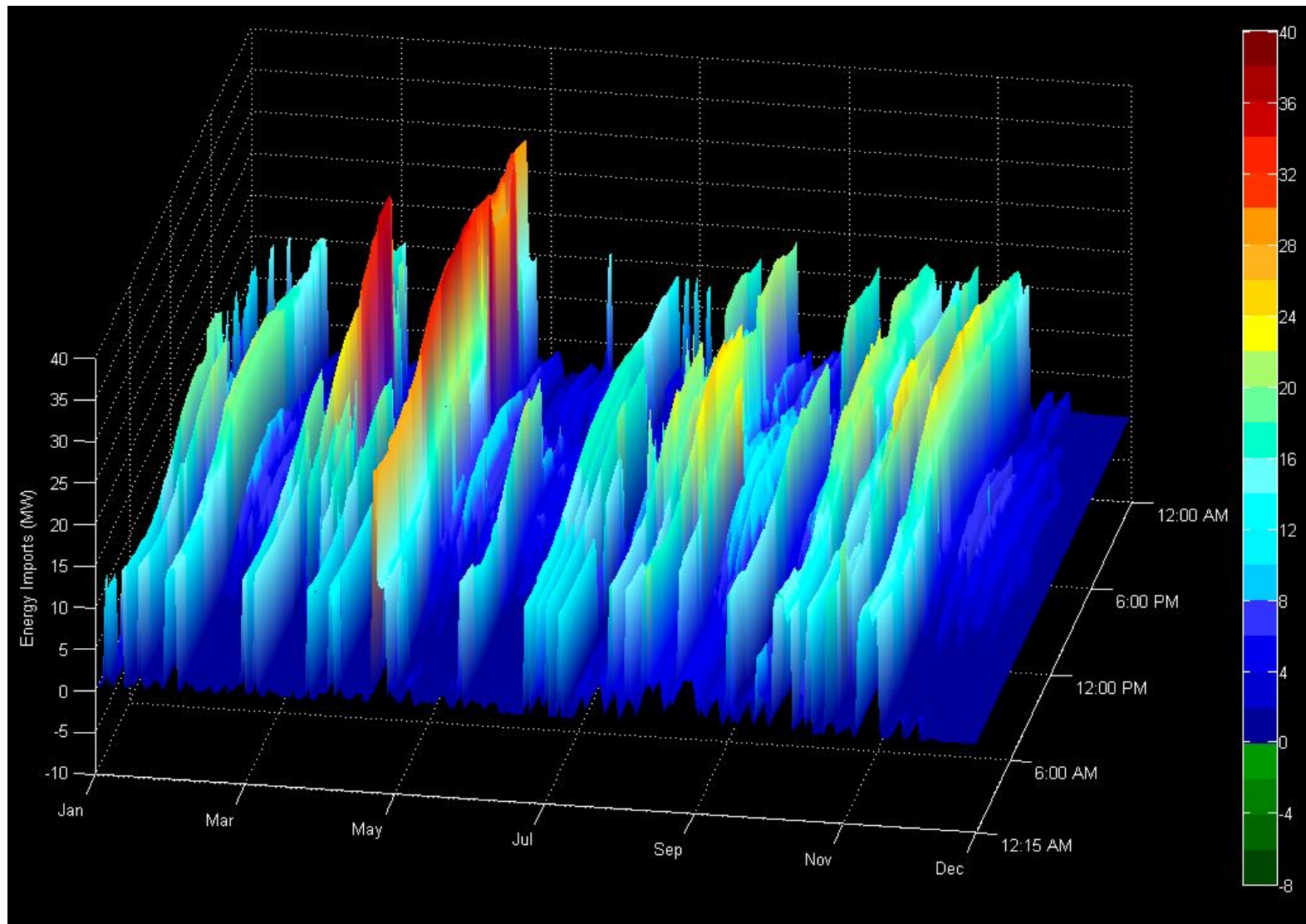
□ Planned Infrastructure

- New 15 MW Gas Turbine with partial methane supply
- 2.8 MW of base load, molten carbonate fuel cell using currently flared methane fuel
- 6 MW of electricity energy storage ≥ 20 MWh
- Delivery of five purchased CNG-Hybrid buses (10/09)
- Delivery of > 40 EV and Plug in Hybrids (9/10)
- ARRA funded expansion of sensors, controls and displays
- DC Modular Data Center

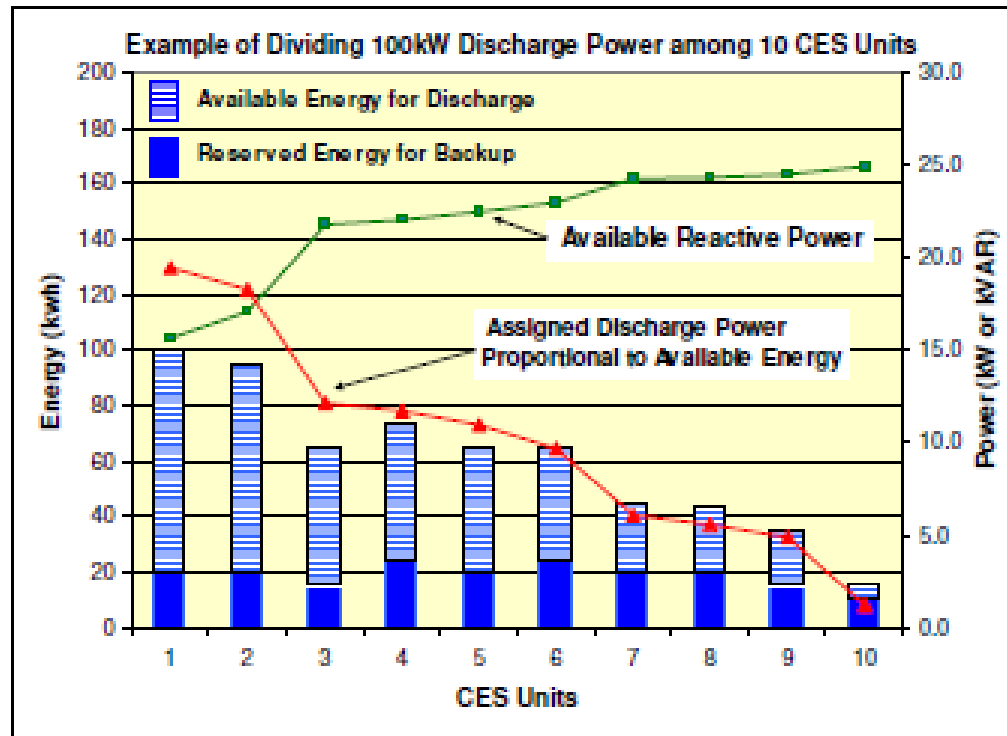
CEC Grant for Smart Grid Integration

- UCSD was the highest scorer in a recent CEC solicitation for Smart Grid Integration
- The \$2M, 30 month program will deploy
 - An advanced “mission critical” master controller
 - A Siemens scheduler platform that will provide hourly market price signals to optimize supply, demand and storage resources based upon a detailed value benefits analysis by E3
 - Real time data acquisition that the San Diego Supercomputer will data mine, visualize, analyze

Optimizing Supply, Demand & Storage



Decentralized Storage Opportunities



Source: AEP

- ❑ 6 MW of Electricity Storage planned
- ❑ 1 MW of PV dispersed at six different sites and desire for 2 MW more
- ❑ CPUC Rulemaking 08-03-008 and current ARRA solicitations provide an excellent opportunity to integrate decentralized energy storage into our legacy infrastructure

UCSD as Use Case for Ten Types of Customers

