

ENRG 58 - Demand Response for Energy Auditors

COURSE DESCRIPTION: 5% of California generation is only utilized for 40 hours over a year. The power plants represented in this 5% are the dirtiest and most expensive in the state. We can eliminate the need for this generation through the use of demand response (DR) and load management. This class explores the applicability of various DR strategies including global temperature adjustment, global dimming for lights, pre-cooling and load control devices. DR rates and incentive types will be covered. Other topics include thermal storage and other load shifting systems, AutoDR, persistence and commissioning of these systems.

18 Hours lecture

LEARNING OUTCOMES:

- Assess the importance of load management and demand response in limiting peak load across the electrical grid
- Calculate and analyze load factor for various facilities as part of an effort to determine the impact of demand response or load shifting strategies
- Synthesize information on the variables that inform load management and demand response projects including utility rates, climate, facility type, facility usage patterns and occupant satisfaction
- Evaluate specific facilities for the potential application of various load management and demand response measures
- Integrate back-up generators and alternative work-force schedules into demand response strategies, and consider the challenges these measures introduce
- Assess the value of automating demand response strategies to speed up response time and eliminate human errors

COURSE TOPICS:

- I. Management and operation of electrical grid
 - A. Balance of load management strategies
 - B. Role of utilities and California Independent System operator
 - C. Benefits to California
- II. Load factor and billing data analysis for Demand Response and Load Shifting
- III. Implementation issues, benefits and challenges of various demand response strategies:
 - A. Global temperature adjustment
 - B. Supply air temperature increase
 - C. Chilled water temperature increase
 - D. Cooling valve limit
 - E. Duct static pressure decrease
 - F. AC cycling controllers
 - G. Chiller demand limit
 - H. Fan VFD limit
 - I. Fan quantity reduction
 - J. Turn off lights in specific zones
 - K. Dimmable ballasts
 - L. Stepped or bi-level lighting controls
 - M. Addressing miscellaneous equipment
 - N. Alternative work schedules
 - O. Demand limit strategy
- IV. Peak Load shedding or shifting
 - A. Daylighting controls
 - B. Thermal storage

1. Chilled water
 2. Ice
 3. Solid materials
 4. Phase-change materials
 5. Chemical storage
- C. Night flushing/pre-cooling
- D. Equipment charging
- V. Back-up generation and co-generation
- A. Applications
 - B. System integration issues
 - C. Air quality regulations
- VI. Commissioning of load management systems
- VII. Utility pricing signals and auto demand response

TYPES OF ASSIGNMENTS:

- I. Calculate a facility load factor using smart meter data and determine if load factor is appropriate for facility type
- II. Use smart meter data to predict the benefit of specific load shifting and demand response measures
- III. Identify appropriate demand response and load shifting strategies for an actual facility
- IV. Calculate the financial benefit of DR strategies for a specific facility using information on load profiles and utility rates for said facility
- V. Calculate the financial benefit of thermal storage or other load shifting strategies for a specific facility using information on load profiles and utility rates for said facility
- VI. Develop a proposal for a utility rate that will encourage voluntary demand response in an equitable way
- VII. Develop a report on an emerging demand response or load shifting technology or a novel implementation of existing demand response or load shifting technologies

TEXTBOOKS & RESOURCES:

- Websites such as:
 Demand Response Research Center - <http://drrc.lbl.gov>
 California Independent System Operator - <http://www.caiso.com>
 PG&E Demand Response - <http://www.pge.com/mybusiness/energysavingsrebates/demandresponse>
 PG&E Demand Response - Time-Varying Pricing -
<http://www.pge.com/mybusiness/energysavingsrebates/timevaryingpricing>
 CalMac thermal storage systems - <http://www.calmac.com>
 Austin Energy thermal storage program -
<http://www.austinenergy.com/energy%20efficiency/Programs/Rebates/Commercial/Commercial%20Energy/thermalEnergyStorage.htm>
 Smaller, Closer, Dirtier: Diesel Backup Generators in California -
http://www.edf.org/sites/default/files/2272_BUGsreport_0.pdf
- Field trips:
 Offices of California Independent System Operator
 Facility with Auto-DR systems implemented
 Facility with thermal storage systems implemented
 Facilities for students to analyze where load management and demand response may be beneficial