

SENIOR DESIGN EECE-401

Demand Response Team

Members:

Lloyd Eley

Itotoh Akhigbe

Marc Inniss



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Background



- ▣ Demand response systems involve consumers reducing their use of electricity in response to power grid needs or economic signals.
- ▣ Tacoma Power wants to implement this system in order to reduce the peak power consumption of their customers.
- ▣ This power management system has proven to be effective in many localities that consume large amounts of electricity.

Problem Definition



We need to develop a solution to implement demand response as customer energy loads continue to grow.

Design Requirement



- ❑ The system should reduce peak power at designated periods.
- ❑ Should fit into the current Tacoma Power system.
- ❑ Adhere to all federal and state electric codes and regulations.
- ❑ Develop an alternative solution that can be implemented barring failure of solution one
- ❑ The data analysis should consist of 10% of Tacoma Power's Residential Customers' Load (Taking into consideration the Climate of the Northwest United States).

Current Status of Art

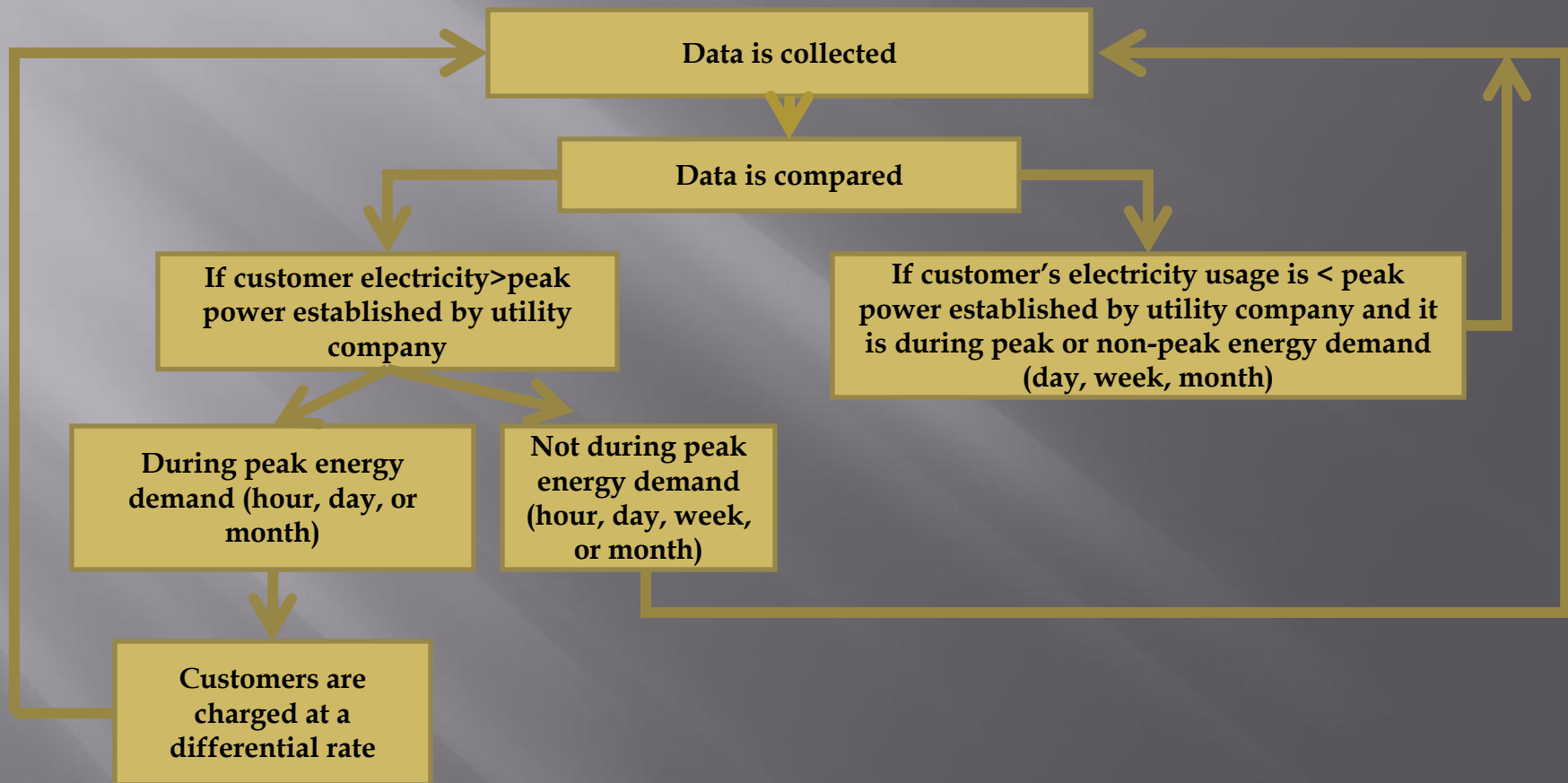


- ▣ ISO New England Inc.
 - Uses an Economic DR program
 - Compensate large electricity users for reducing consumption when market prices are high
 - One of the easier DR programs to employ

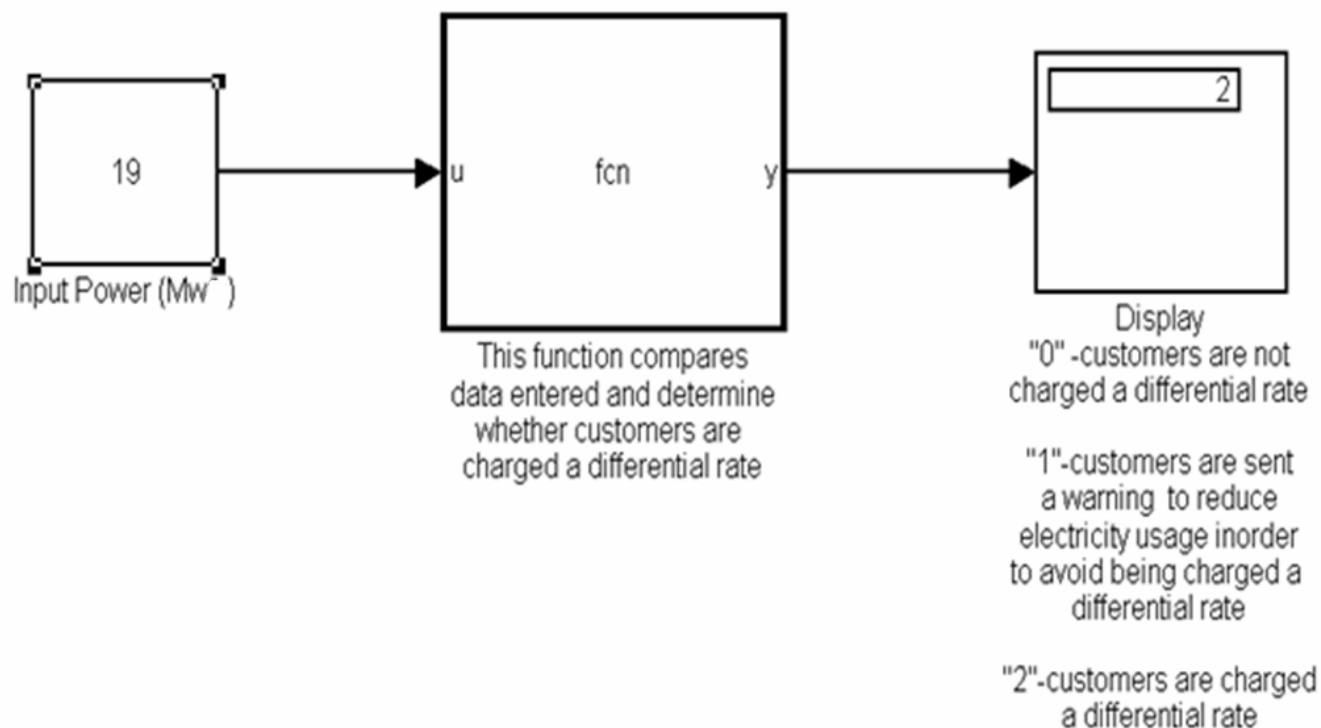
- ▣ Duke Power
 - Uses a Real-time DR program
 - Observed reductions of 200MW in those customers' load in response to hourly prices above 25 cents per kW/hr

- ▣ Portland General Electric
 - Uses Time-of-Use Demand Response program
 - Prices based on time of day, week, month and season
 - 2800 customers signed up
 - Data not yet available to judge success rate

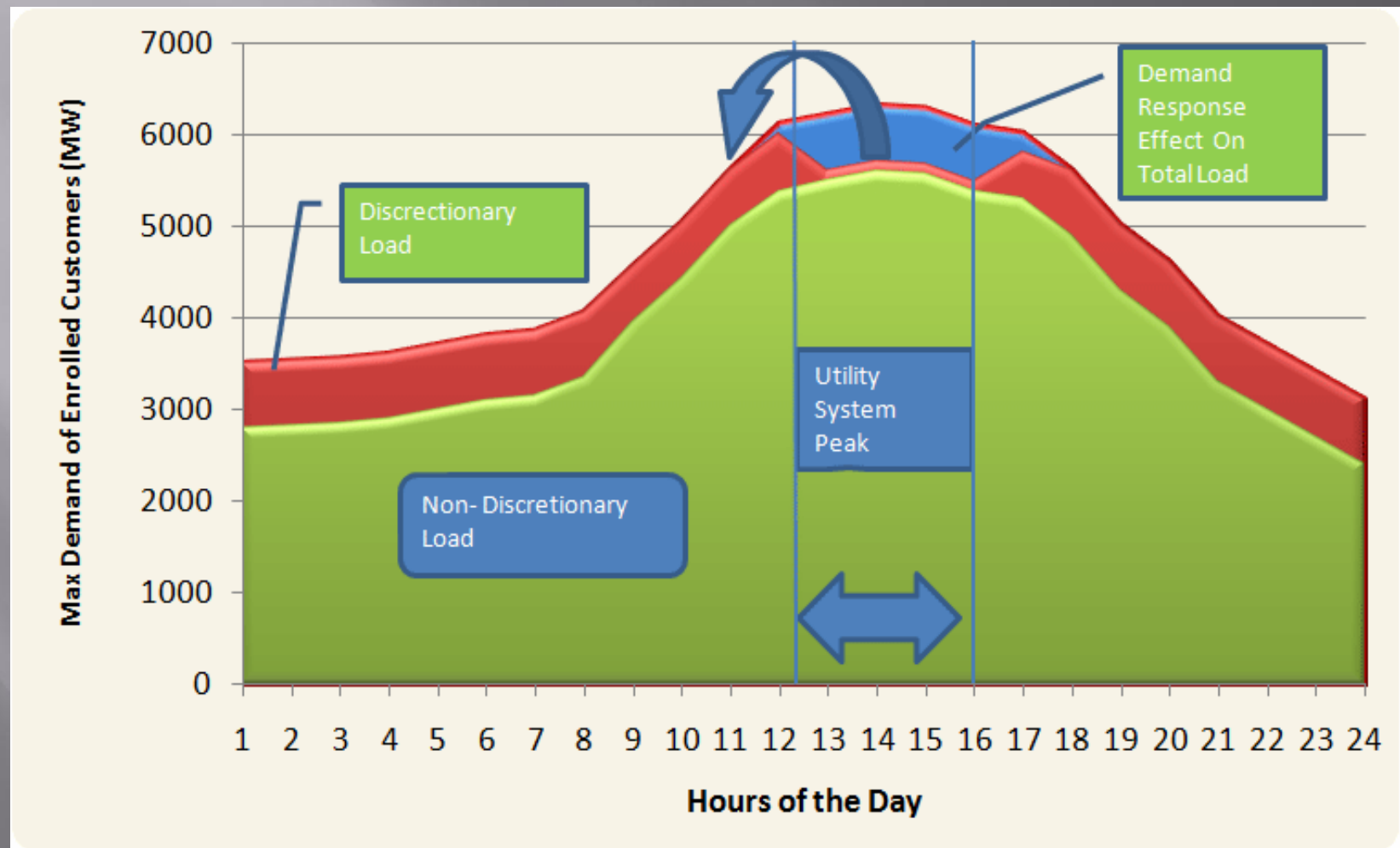
Solution Approach (Algorithm)



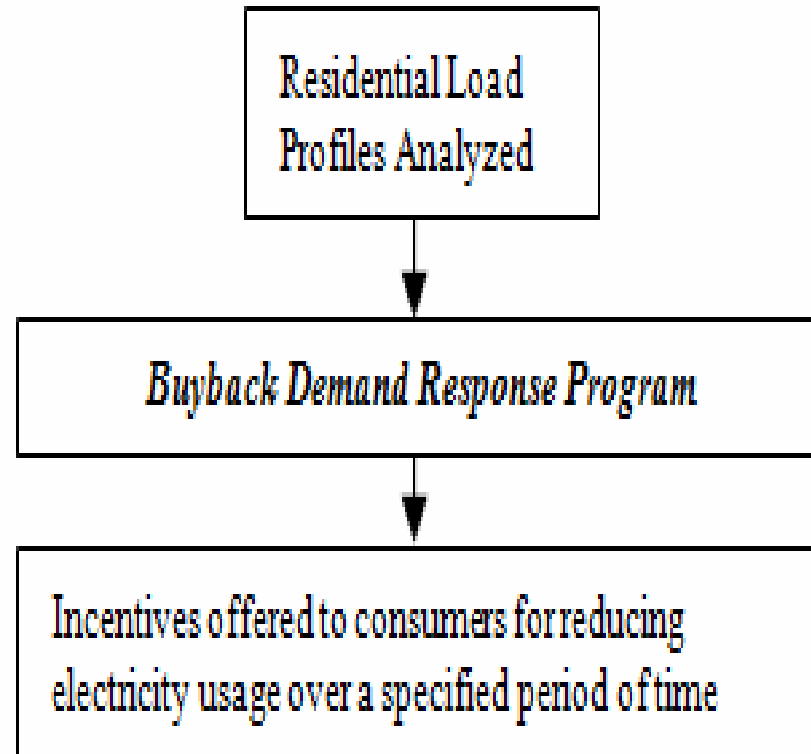
Simulink Representation



Estimated Graphical Representation



Alternative Solution Approach



Solution Approach

Evaluation Plan of Solution:

We will test the demo of the demand response system to see if it sends a warning to the customer to reduce its electricity usage when the energy demand reaches a threshold established by the utility company

Deliverables



- ▣ Software Package of the demand response system.
- ▣ Small scale DR demo.



Tasks and Project Management

| Tasks | Deliverables |
|--|--------------------|
| Research current demand response system and decide which one will be the most beneficial to Tacoma Power | November 1, 2009 |
| Develop a proposal to be implemented next semester | November 4, 2009, |
| Develop a clear plan of action for implementing the Demand Response System | November 25, 2009 |
| Schedule teleconference dates with our external advisors (Tacoma Power) for the entire semester | By January 6, 2010 |
| Develop and submit the design of the demand response framework to be implemented | January 17, 2010 |
| Begin implementing the demand response system | January 18, 2010 |
| Complete first working demo of our demand response system | February 14, 2010 |
| Complete final demo and report | March 1, 2010 |

Cost Resources



- ▣ Meter (\$100)
- ▣ MatLab (\$100, however it is available in the Howard University Electrical Engineering Lab)
- ▣ Simulink
- ▣ Miscellaneous (\$100)
- ▣ Total Cost: \$300 (Approximately)

Conclusion



The Demand Response System we will implement will minimize the peak power usage by the Tacoma Power customers (Specialize in the Northwest of the United States) either by the differential rate or by the buyback program.

Questions??

