DOE Energy Storage Systems Research Program Annual Peer Review

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Design of the FESS 20 MW Frequency Regulation Plant

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Frequency Regulation

Benefit of Flywheel Based Frequency Regulation

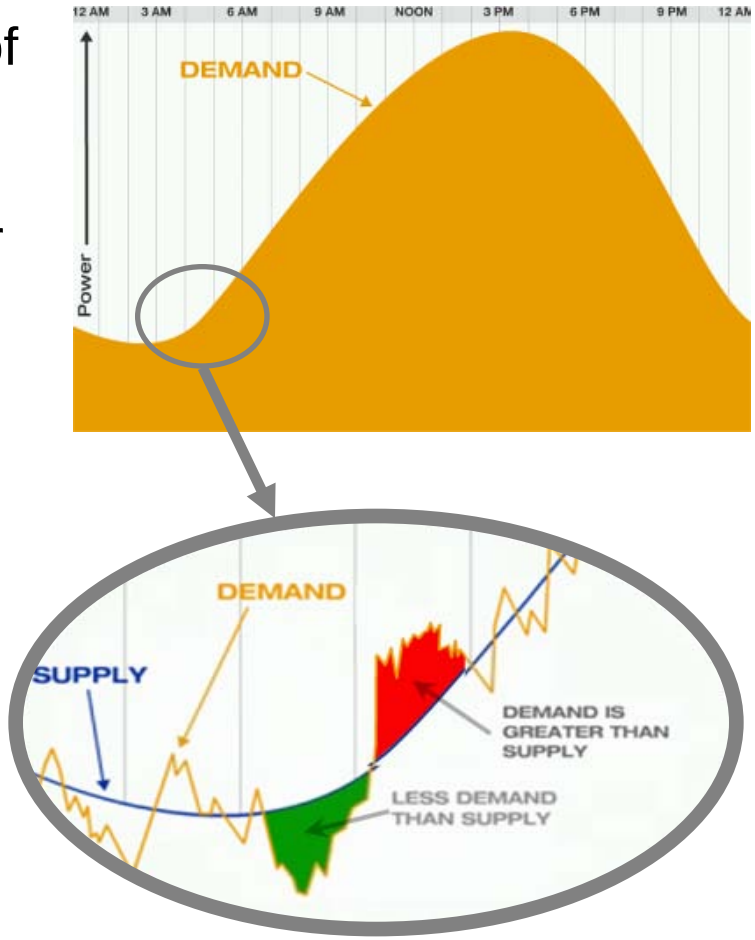
Beacon POWER

Increases the Reliability and Stability of the Grid

- Frees up generator capacity
- Fast response may reduce quantity of necessary frequency regulation
- Gives ISO another option
- Benefit for deployment of wind power

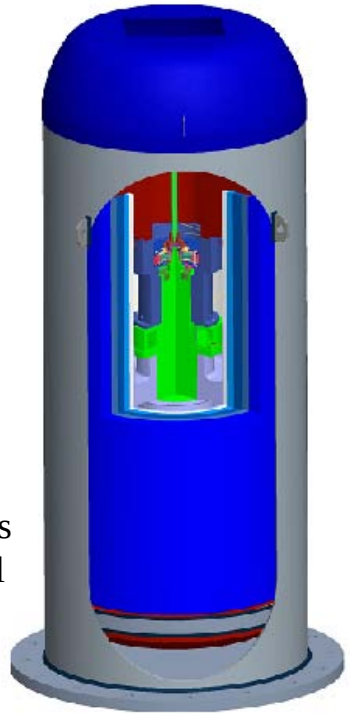
Environmental

- No direct fossil fuel consumption
- Zero plant emissions



Beacon's Market Strategy

- Sell frequency regulation service instead of product
- Provide services via deregulated open-bid markets
- Qualify with scale-power demonstration testing
- Commercialize with 25 kWh Gen 4 flywheel
- 1st service revenues in 2007 (1 MW)
- 10 to 20 MW of service revenues in 2008



Beacon Power's
Gen4 Flywheel

Design of the 20 MW FESS FR Plant

20 MW Plant Program Overview

Beacon POWER

Technology Comparison

- Hydro
- Fossil fuel
- High level comparison to lead acid facilities

Development of 20 MW FR Plant Drawing Package

- Interconnect substation and grid requirements
- Environmental considerations regulatory and otherwise
- Building design and layout
- Operational factors

Optimization of Plant Size (1 to 40 MW)

Program Start Date: September 1, 2006

Third Party Evaluation of Technology

- Cost performance
- Environmental impact
- Benefit of fast response

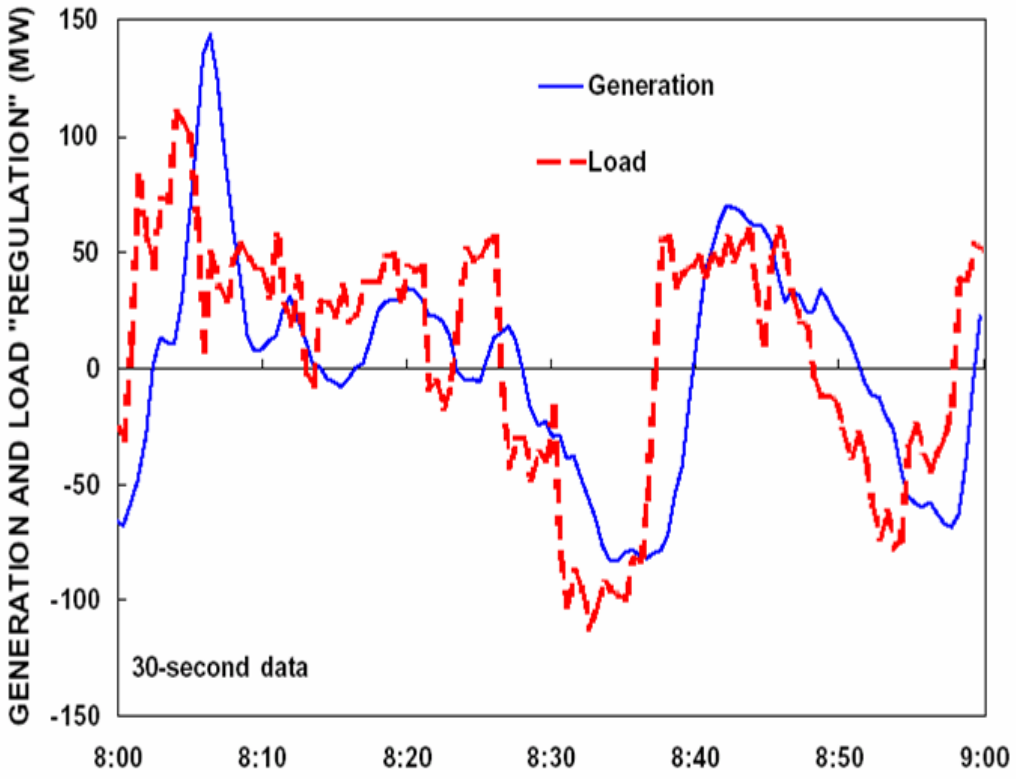


Chart courtesy of Eric Hirst & Brendan Kirby used in various papers

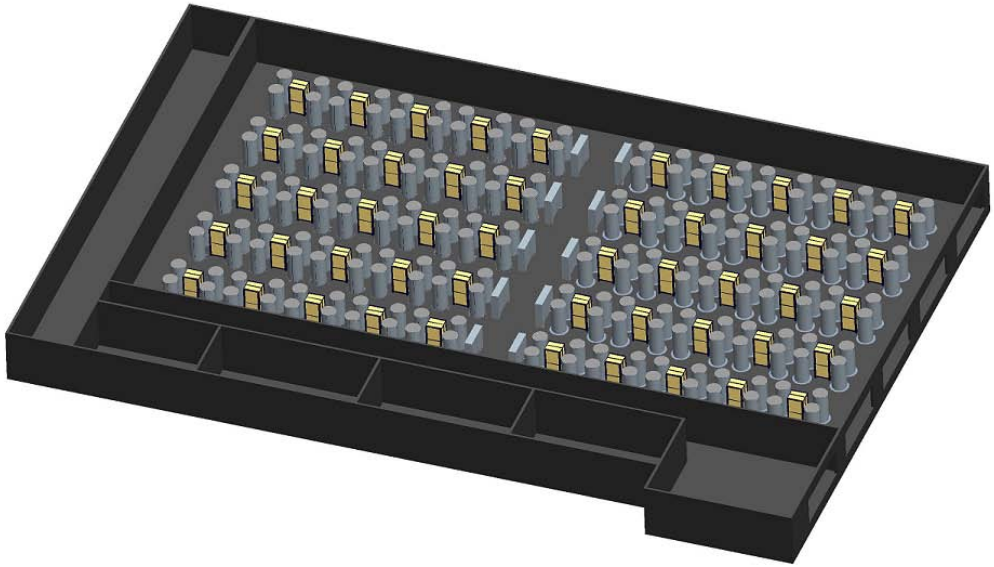
Design of the 20 MW FESS Plant

Conceptual Design

Beacon POWER

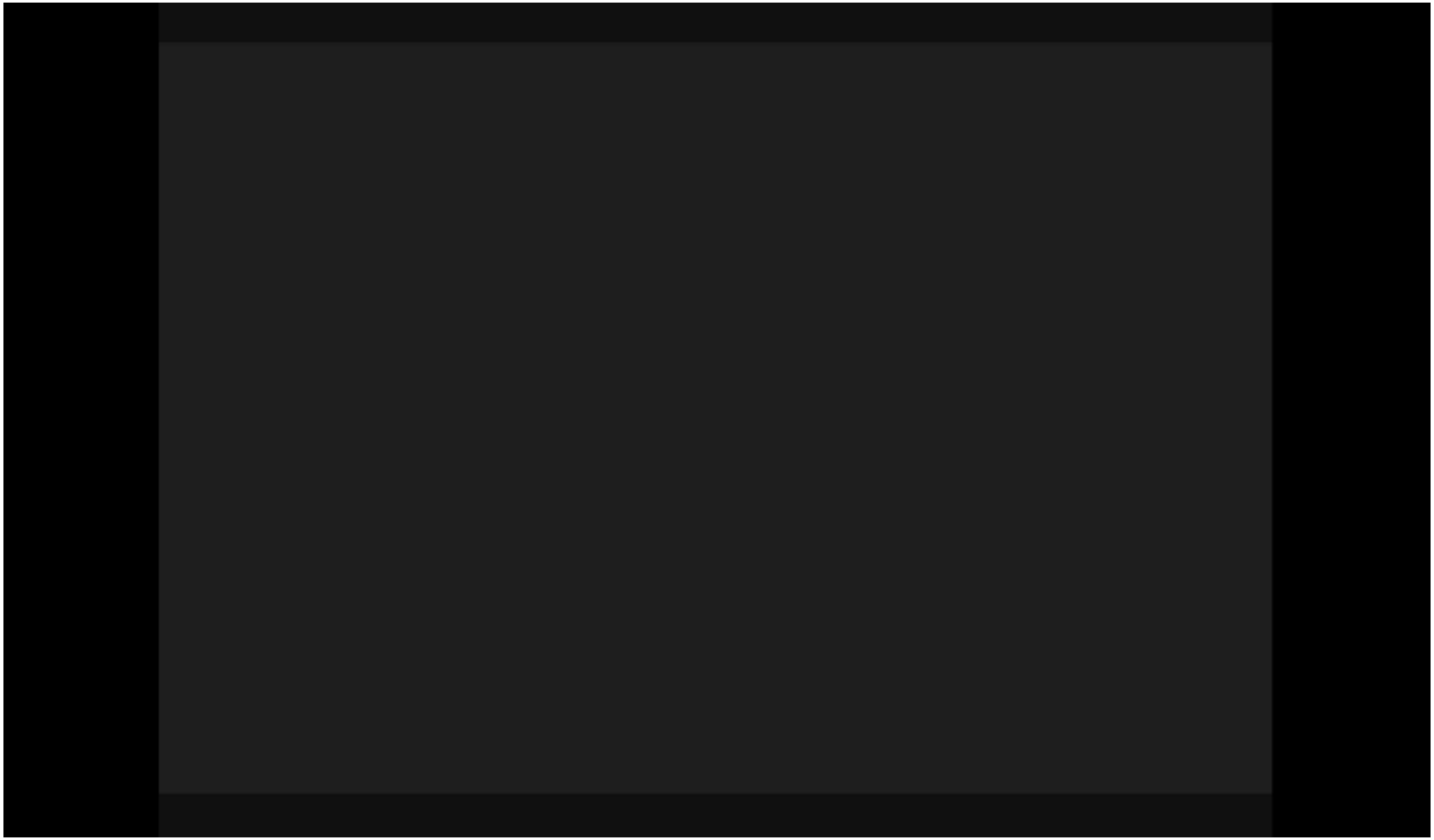
Facility Development Goals

- Generic Design Modular Design
- Design for 6 Month Construction
- Optimized Performance
- Design for Minimal Maintenance
- Design for LEEDS-NC rating



Smart Energy Matrix 20 MW Plant

[This slide contains an audio/video demonstration. Right-click the box and select "Play" to view. Allow demonstration to complete before advancing to next slide.]



Optimization of Plant Size

Flywheel Based Frequency Regulation

Optimization Studies

- Optimal plant size based on region
- Land costs
- Operational factors, i.e. HVAC Analysis
- Addition of PV to offset system losses

Flexible Design

- Cost performance
- Environmental impact
- Benefit of fast response

Frequency Regulation

Summary Conclusions

Program goals linked directly to Market Strategy

Grid Benefits

- Release excess generation capacity
- Improve stability of grid
- Additional ancillary services possible

Environmental Benefits

- Generates no emissions
- Recycles energy
- Reduction in fuel consumption

Frequency Regulation

Statement of Future Work

Beacon POWER

Technology Comparison

- Complete work
- Obtain final report

Conceptual Design

- Complete evaluation of proposals
- Select contractor
- Refine building specification
- Generate generic drawing package

Optimization Studies

- Hire staff
- Perform optimization studies