

Flywheel Technology Energy Storage for Grid Services

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Beacon Power Overview

- Public Company – NSDAQ: BCON
- Supplier of fast response frequency regulation using flywheel energy storage:
  - Merchant service provider
  - Seller of turnkey plants
- Operating commercially in ISO-NE since November 2008 (1-3 MW)
- 20 MW merchant plant in NY, complete April, 2011
- Second 20 MW merchant plant to break ground in 2011 in eastern PA
- Pursuing sales of turnkey plants in the US and internationally

1st 20 MW Flywheel Plant – NY

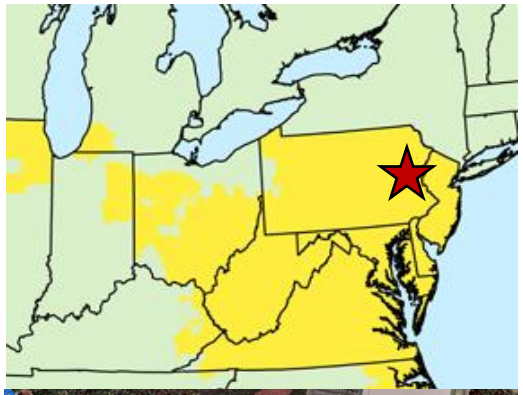
- 200 high-speed, high-energy 25 kWh/100 kW flywheels
- +/- 20MW Regulating range
- Energy storage capacity: 20 MW for 15 minutes
- 4 second full range response
- Provides ~20-40% of regulation for NY State

20 MW plant in Stephentown, NY

Highlighted by the White House as being one of the *100 Recovery Act Projects that are Changing America*

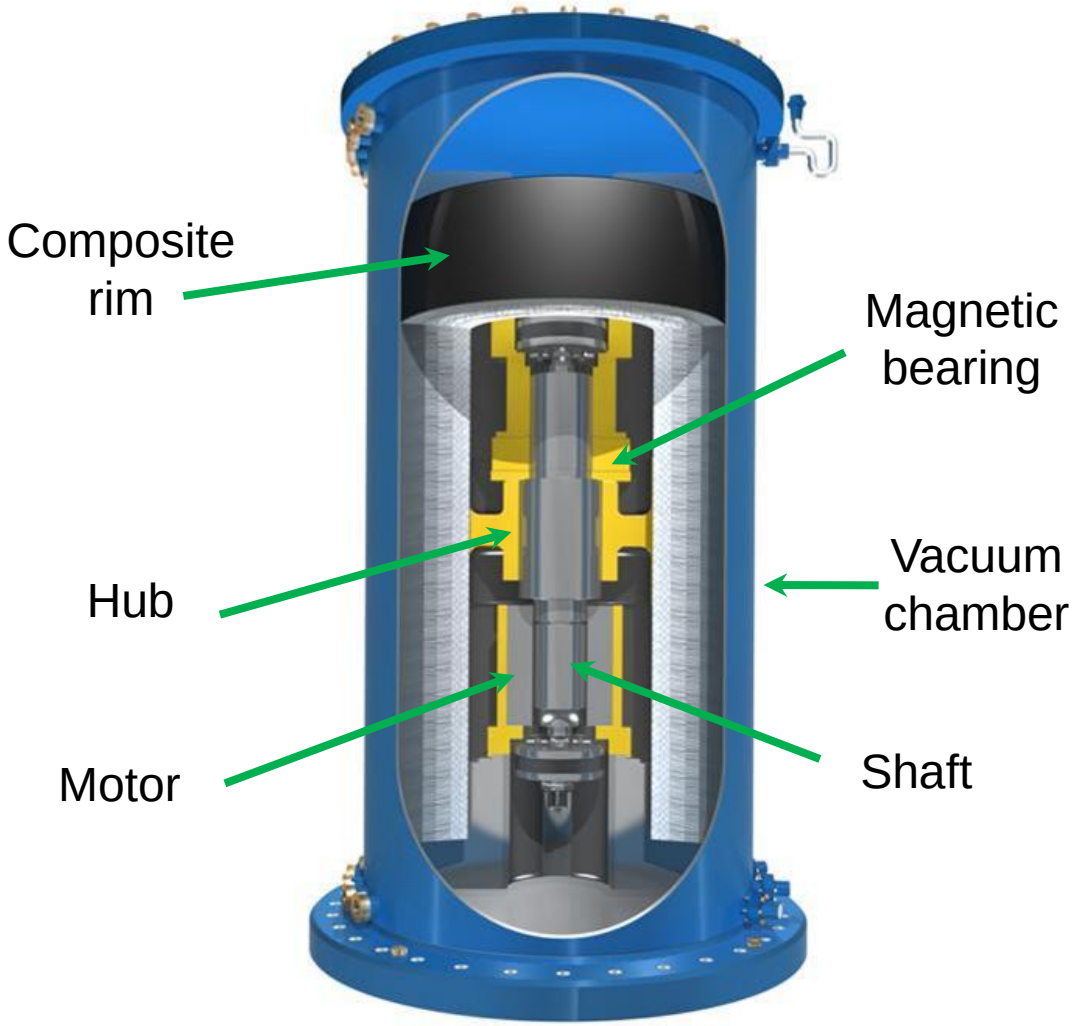
2nd 20 MW plant -- Pennsylvania

- 20 MW facility in Hazle Township, Pennsylvania
- Identical to Stephentown, New York plant
- Located in PJM where interconnection process has begun
- PJM is a strong supporter of energy storage and Pay-for-Performance pricing
- Expected gross margin -- 80-85%
- Approx. $53 million cost ($16 MM cost reduction vs. Stephentown)
  - $24 million smart grid stimulus grant
  - $5 million PA state grant



Core Technology

Fourth-generation flywheel



- 100kW/ 25kWh
- Proven performance
- 2-3 times more effective than fossil generators
- 20-year design life
- 125,000 equivalent cycles
- Zero energy storage degradation over time
- Strong IP position

Flywheel Product Development

2000

Gen 1

2001

Gen 2

2004-05

Gen 3

2007-08

Gen 4

- Gen1 and Gen2 adressed telecommunication applications
- Over 1,000,000 hours of operation in the field without mechanical failure
- Only flywheel technology capable of addressing grid-scale applications

2006/2007

Successful demonstrations in California and New York

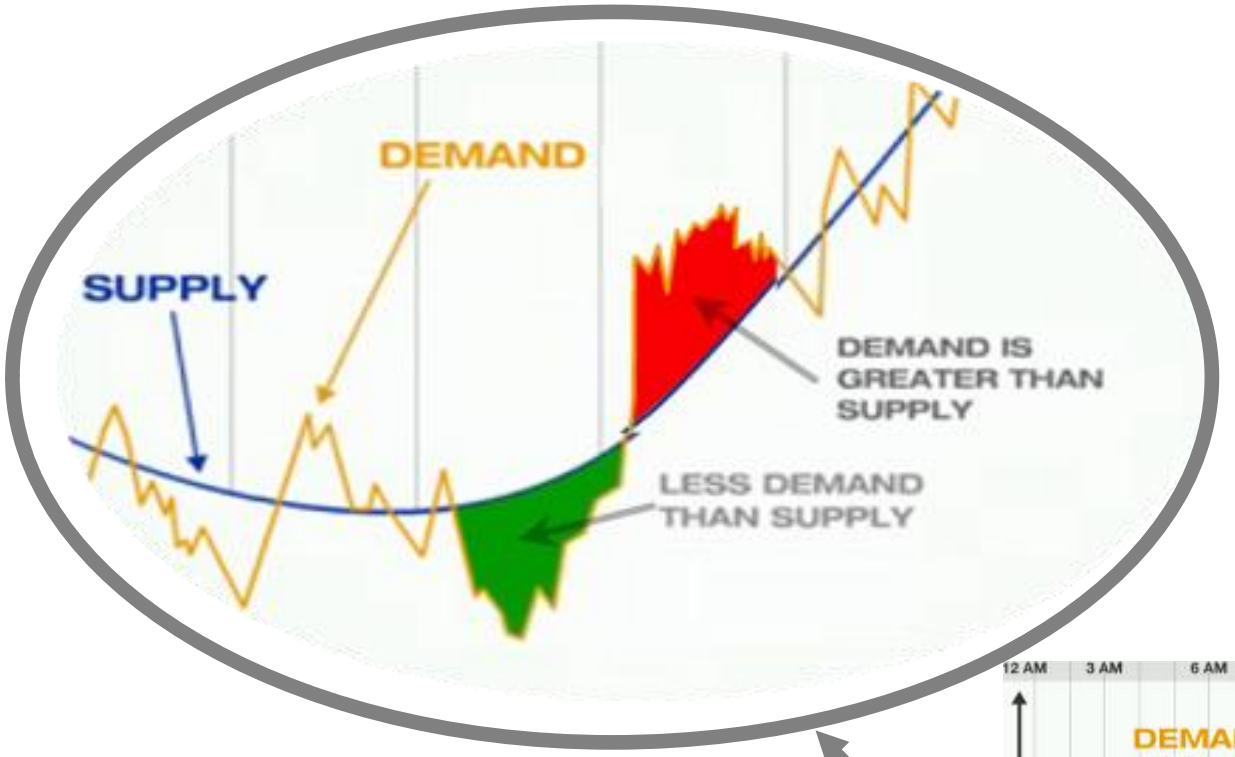
2008 - present

Commercial operation and service revenue

Basic 1 MW Plant Building Block

- Transformers and support equipment
- Ten 100 kW / 25 kWh flywheels
- Electronics and controls inside container

What is Frequency Regulation?



Animation available at
www.beaconpower.com

Renewables Need more Regulation

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Expected increase in Regulation capacity (MW) requirements at 20% and 33% RPS (Spring*)

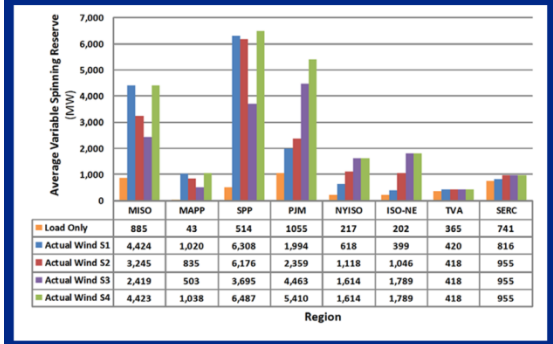
	2006	2012	2020
Maximum Regulation Up Requirement (MW)	277	502	1,135
Maximum Regulation Down Requirement (MW)	-382	-569	-1,097

California ISO
Your Link to Power

Requirement increases by 300% with 33% wind

Impact of 20% Wind Penetration in Eastern U.S.

Beacon POWER



	MISO	MAPP	SPP	PJM	NYISO	ISO-NE	TVA	SERC
Load Only	885	43	514	1055	217	202	365	741
Actual Wind S1	4,424	1,020	6,308	1,994	618	399	420	816
Actual Wind S2	3,245	835	6,176	2,359	1,118	1,046	418	955
Actual Wind S3	2,419	503	3,695	4,463	1,614	1,789	418	955
Actual Wind S4	4,423	1,038	6,487	5,410	1,614	1,789	418	955

"Load Only" is today's regulation requirement

Scenarios 1,2,3 show different mixes of on-shore, off-shore and regional mixes for 20% wind penetration

Scenario 4 is 30% wind penetration

*For 20% wind penetration, the **average increase** in forecasted need for regulation resources is **several hundred percent**…*

EASTERN WIND INTEGRATION AND TRANSMISSION STUDY, January 2010 Prepared for NREL by: EnerNex Corporation Knoxville, Tennessee, NREL Technical Monitor: David Corbus, Prepared under Subcontract No. AAM-8-88513-01

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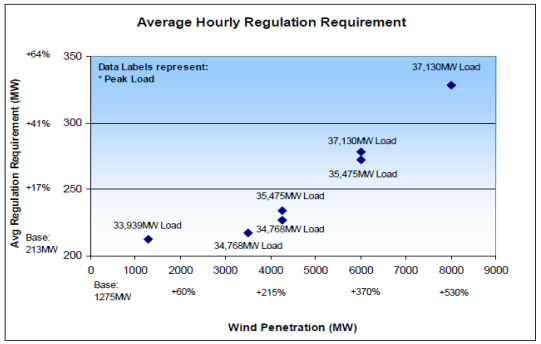
ISO NEW YORK INDEPENDENT SYSTEM OPERATOR

Regulation Req. vs. Wind Level

- As shown in the graph below, the average regulation requirement increases approximately 9% for every 1,000MW increase between the 4,250MW and 8,000MW wind penetration level.



Requirement increases by 60% with 10% wind

"PJM expects the requirement for regulation to increase from 1,000 MW today to 2,000 MW when we reach 20% wind penetration."

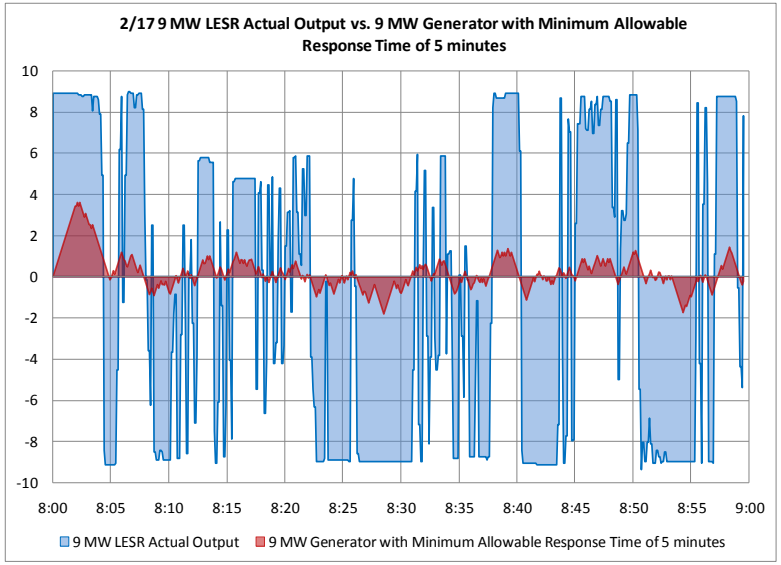
– Terry Boston, CEO of PJM
Storage Week conference, July 13, 2010

Requirement increases by 200% with 20% wind

ACE Correction Example

- 9MW of Flywheels dispatched
- 275 MW total contracted *

3.3% of regulation from Flywheels



- 7.4 MWh managed by flywheels
- 31.1 MWh Total ACE energy dispatched **

23.8% ACE correction from flywheels

Max benefits come from fast first and dispatch at full power

* http://www.nyiso.com/public/webdocs/market_data/reports_info/nyiso_regulation_req.pdf Accessed 4/29/11.
** ACE data provided by NYISO Customer Relations on 3/4/2011

Strong FERC support

- ✓ FERC issued Order 890 directing ISOs to open regulation markets to non-generation assets
- ✓ Asset Class – Energy storage-based regulation, separate from generation and demand response
- ✓ Energy Settlement – Net at wholesale price
- ✓ Energy Management – Grid operator controls state of charge
- ✓ Optimized Dispatch – Fastest resources are dispatched first
- ✓Pay for Performance – Payment in proportion to regulation effect actually provided, not just the capacity offered

Future Flywheel Models

Power/Energy	Time	C-rate	Primary application	Comment
100kW/25kWh	15 min	4C	•Frequency Regulation •Micro grid load following •Ship power	In production
500kW/12 kWh	+/- 45 sec	50C	•Frequency Response •Rail •UPS •Pulse power	Current model modified with big motor, half-rim
100kW/100kWh	1 hour	1C	•Renewable ramp mitigation •UPS •Fast reserve •Peak shaving	ARPA-E funding 85-90% cost reduction / kWh

Frequency Regulation of the Future

Zero-emissions flywheel energy storage … is a better performing, more cost-effective regulation asset… a much better match for clean renewable energy…