# DR as a DER Option:

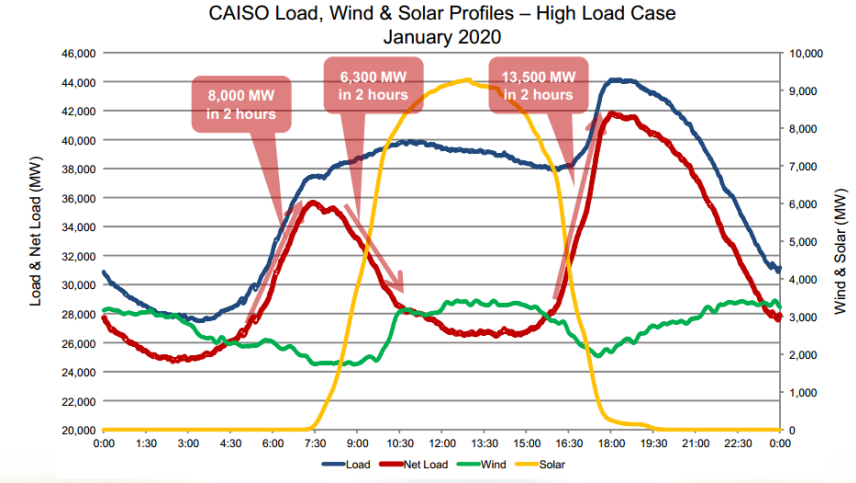
## *A New Tool to Support a Greener, Dynamic, and Decentralized Grid*

**National Town Meeting on Demand Response & Smart Grid**
**May 26 – 28, 2015, Washington, D.C.**

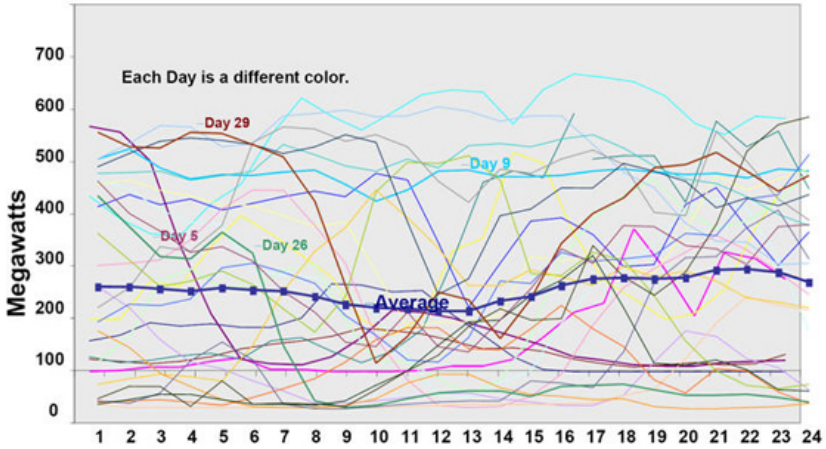
**Todd Sankey, Chief Architect, Enbala Power Networks**
tsankey@enbala.com

*The information contained in this presentation is for the exclusive and confidential use of the recipient. Any other distribution, use, reproduction or alteration of the information contained in this presentation, by the addressee or by any other recipient, without the prior written consent of ENBALA Power Networks Inc. is strictly prohibited.*

# Leading Indicators of Industry Change




*…Increased Ramping yet reduced Peak Shifting requirements.*




*…renewable integration continues to stress the system planning and operations.*

New York Times September 14, 2014

*Electric utility executives all over the world are watching nervously as technologies they once dismissed as irrelevant begin to threaten their long-established business plans.*



enbala POWER NETWORKS

# Power and Energy for Generators



For a generator, power is constrained, but the energy is limited only by the fuel source. Lifetime is decades.

Controllable because of a dedicated energy reservoir.

# Power and Energy for Generators



For a generator, power is constrained, but the energy is limited only by the fuel source. Lifetime is decades.

Intermittent renewables have no energy reservoir.

# Power and Energy for Energy Storage Devices



Energy storage devices add a dedicated energy reservoir back to the grid.

For an energy storage device, power is constrained by the inverter, and energy is limited by the storage medium. Lifetime is hopefully a decade.

# Power and Energy for Demand Devices



Demand devices often also have an energy reservoir, but it is not dedicated to the grid.

Power is limited by the load, average power is limited by the average work needed, energy storage is limited by the application, but energy (total work) is essentially unlimited. Lifetime is decades.

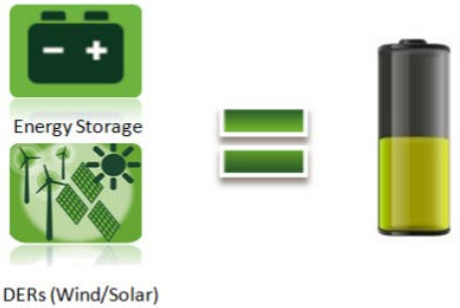
# How Can Flexible DR Help the Environment and the Grid?
# Hybrid Storage Concept – Batteries Alone are Not Enough

## The Problem:

*Battery storage is often viewed as the "holy grail" for renewable energy integration. Storage is a key technology; however, large battery installations are expensive, intensive, and result in lost power – they are not 100% efficient. A recent study has also shown that lithium-ion batteries have potential adverse impacts on the environment and public health beyond the benefits from their day-to-day use.†*

## The Solution:

A hybrid energy storage network that utilizes a diverse portfolio of energy storage technologies (including smaller, more cost-effective, and environmentally-friendly batteries) to provide a combination of high efficiency, power and energy storage capability. This solution resourcefully taps into the inherent storage existing within the energy-consuming processes at large commercial and industrial sites.




*†Batteries made with cathodes using nickel and cobalt, and electrode processing with solvents, have the most potential adverse environmental impact, including resource depletion, climate change, ecological toxicity, and human health, such as respiratory, pulmonary, and neurological effects.*
*(http://sciencebusiness.technewslit.com/?p=13963)*

# Providing System Regulation With Loads

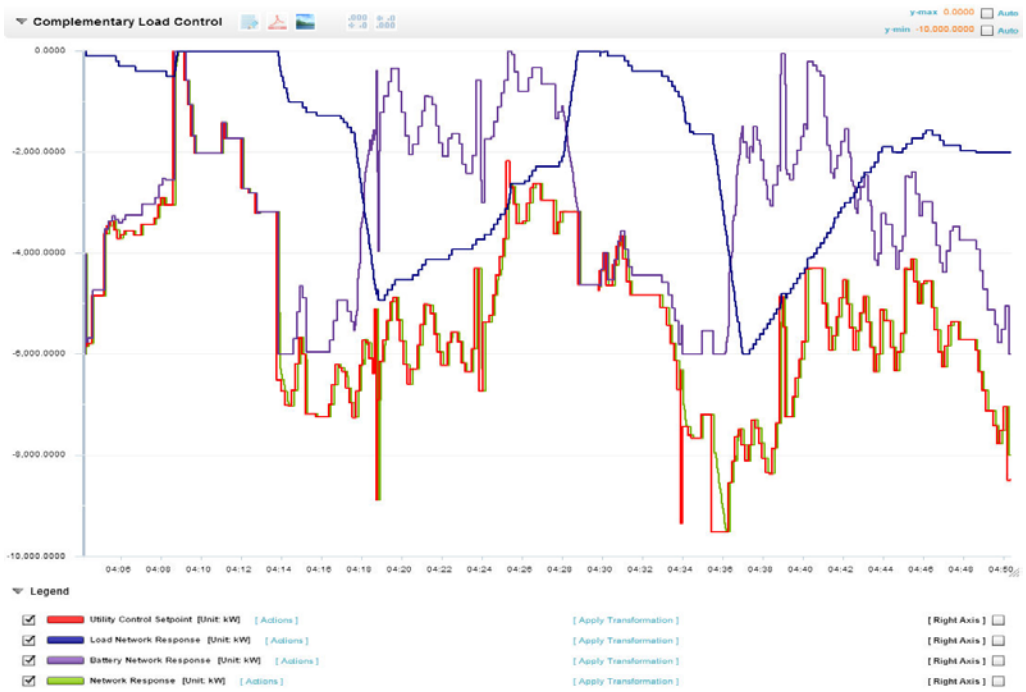



- Live loads providing System Regulation in PJM
- Control is better than most generators
- Storage is essentially free and optimally efficient
- But some loads can not participate



enbala POWER NETWORKS

# … and with Hybrid Storage




- Loads and batteries being co-optimized
- Response is better (or cheaper)
- More loads can participate
- Smaller and fewer batteries needed
- More applications



enbala POWER NETWORKS

# The Next Great Opportunity for Our Industry

*Dynamic, real-time and flexible DR is the application our modern grid needs...*

*Historically, utilities have delivered energy and given away stability; in the future, their primary business will be stability and efficiency, which will require a holistic approach to grid management.*

*By utilizing all energy storage capabilities including dedicated (batteries) and non-dedicated (demand) to their full potential, utilities and grid operators can better integrate renewables, regain control, and increase efficiency– creating a greener and more sustainable future power system.*



# Thank You

**For further information, please contact:**

**Todd Sankey, Chief Architect**
Enbala Power Networks

Tel: **604.998.8919**
Email: **tsankey@enbala.com**

URL: **www.enbala.com**



# References


- Apt, J., Fertig, E., & Katzenstein, W. (2012). Smart Integration of Variable and Intermittent Renewables. *System Science (HICSS), 2012 45th Hawaii International Conference on*, (pp. 1997 - 2001). Maui.
- Bentek Energy, LLC. (2010, April 16). *How Less Became More... Wind, Power and Unintended Consequences in the Colorado Energy Market.* Bentek Energy, LLC. Retrieved from http://docs.wind-watch.org/BENTEK-How-Less-Became-More.pdf
- Fripp, M. (2011). Greenhouse Gas Emissions from Operating Reserves Used to Backup Large-Scale Wind Power. *Environmental Science and Technology*, 45, 9405 - 9412.
- Katzenstein, W., & Apt, J. (2009). Air Emissions Due to Wind and Solar Power. *Environmental Science and Technology*, 43, 253-258.
- Kindle, A. (2012). *Improved Emission Functions for Generators, and How They Help Resolve a Controversy about the Emission Effects of Wind Power*. Retrieved from http://eeg.tuwien.ac.at/eeg.tuwien.ac.at_pages/events/AAEE-PhD-Day-2013/08_kindle.pdf
- Lew, D., Brinkman, G., Kumar, N., Besuner, P., Agan, D., & Lefton, S. (n.d.). *Impacts of Wind and Solar on Emissions and Wear and Tear of Fossil-Fueled Generators.*
- *Prager, F. (2010, May 28). Setting the Record Straight on Wind Energy.* Retrieved from Denver Post: http://www.denverpost.com/recommended/ci_15177817%202007