



## Policy Evolution for the Digital Storage Age

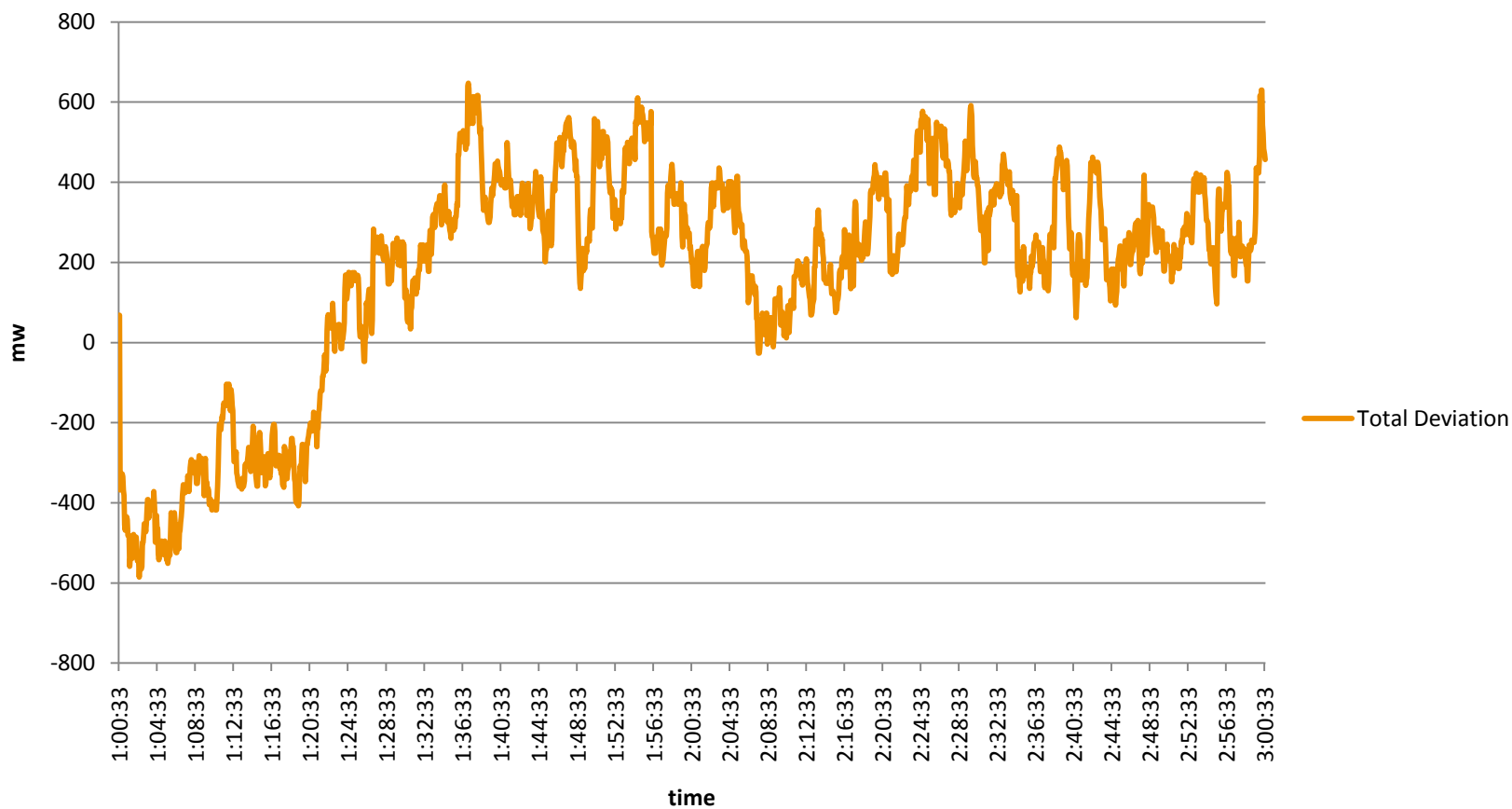
Eric Hsieh  
EUCI Storage Conference  
January 25, 2011

# Outline

- Problem Solved with Fast Storage
- Tariff Barrier Types
- Policy Process and Status

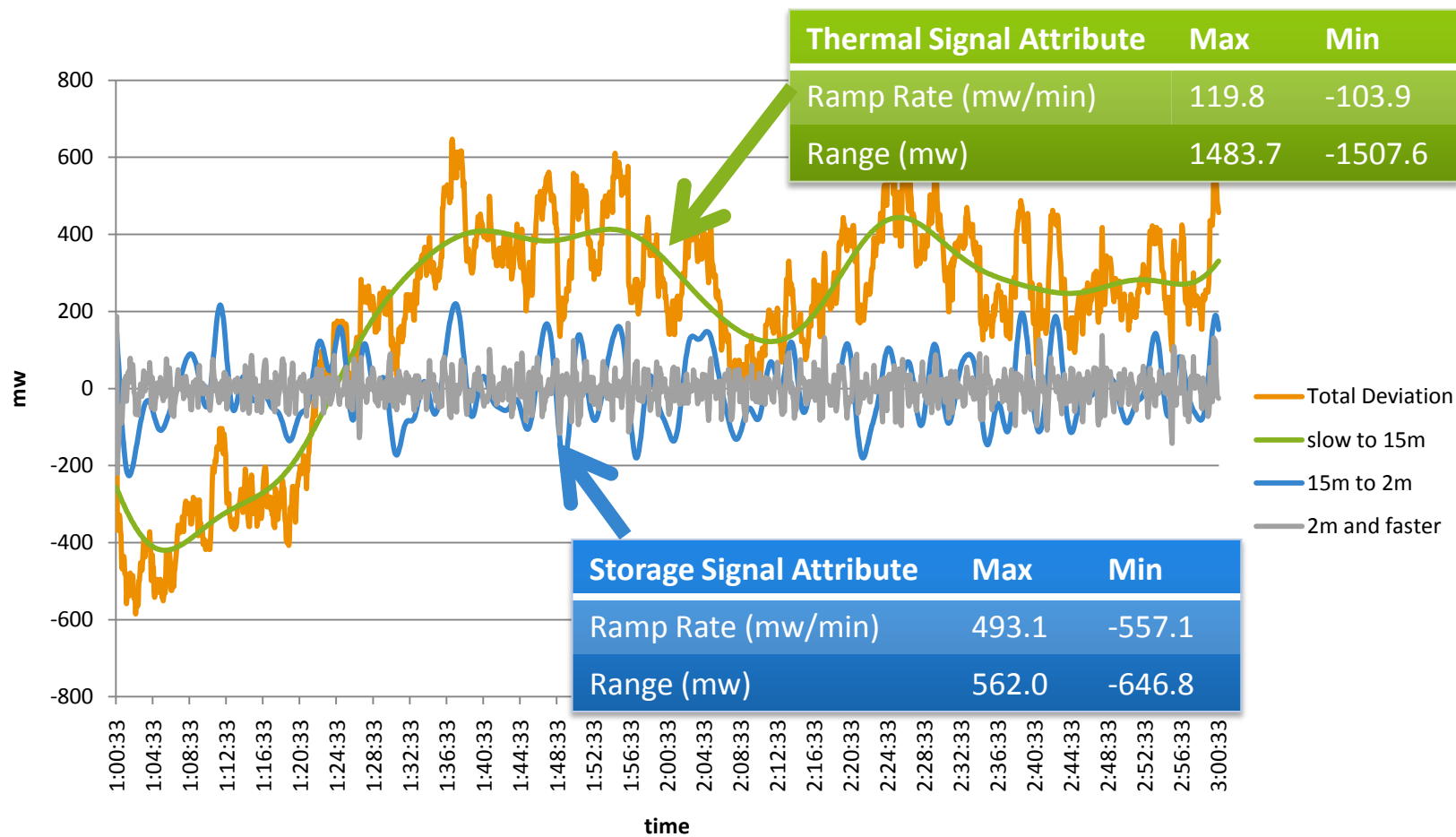
# Problem: ACE is faster than most generation

## Total deviation from schedule in a medium-sized system



# Solution: Separate fast and slow components

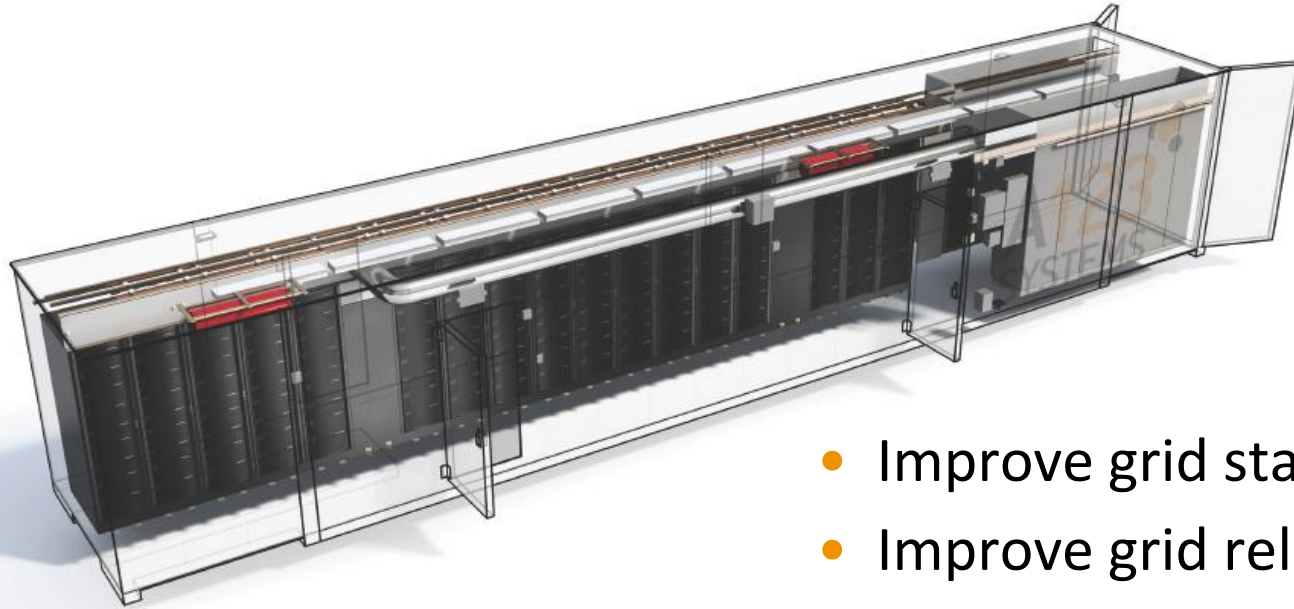
Thermal units provide energy and storage units provide ramps



# A123 Solution: Smart Grid Stabilization System (SGSS™)



## Digital Energy Storage for the Electric Grid



- Improve grid stability
- Improve grid reliability
- Enable integration of renewable sources such as wind and solar
- Rapid deployment

**FLEXIBLE:** Can be used for frequency regulation, spinning reserve, black start, smart grid applications, and integration of renewable sources

# A123 Worldwide Deployments



**Location**  
Detroit, MI  
**Capacity**  
1 MW/500 KWH  
**Application**  
PV Integration  
Distributed Energy Storage  
**Operational Date**  
2011 Q3 (Estimated)



**Location**  
Westover, NY  
**Capacity**  
20 MW/5 MWH  
**Application**  
Frequency Regulation  
**Operational Date**  
2010



**Location**  
Huntington Beach, CA  
**Capacity**  
2 MW/500 KWH  
**Application**  
Regulation Pilot  
**Operational Date**  
November 2008

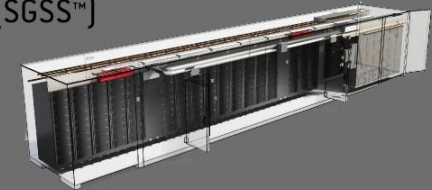


**Location**  
Tehachapi, CA  
**Capacity**  
8 MW/32 MWH  
**Application**  
Wind Ramp Management  
**Operational Date**  
2012 (Expected)



**Location**  
Atacama Desert, Chile  
**Capacity**  
12 MW/16 MW Nominal  
**Application**  
Spinning Reserve  
Frequency Response  
**Operational Date**  
November 2009

Smart Grid  
Stabilization System  
(SGSS™)



*A123 has shipped more than 35MW of SGSS units to customers worldwide, making the company the largest producer of lithium ion batteries for power grid ancillary services.*

**Project Status**

● In Service ● In Progress

Confidential.

# Tariff Barriers to Fast Storage

## Provisions for power-focused applications



### State of Charge Management

- A resource can specify a preferred MW level in order to prevent over- or under-charging



### Pay for Performance

- A resource receives incentives for faster and/or more accurate ramping

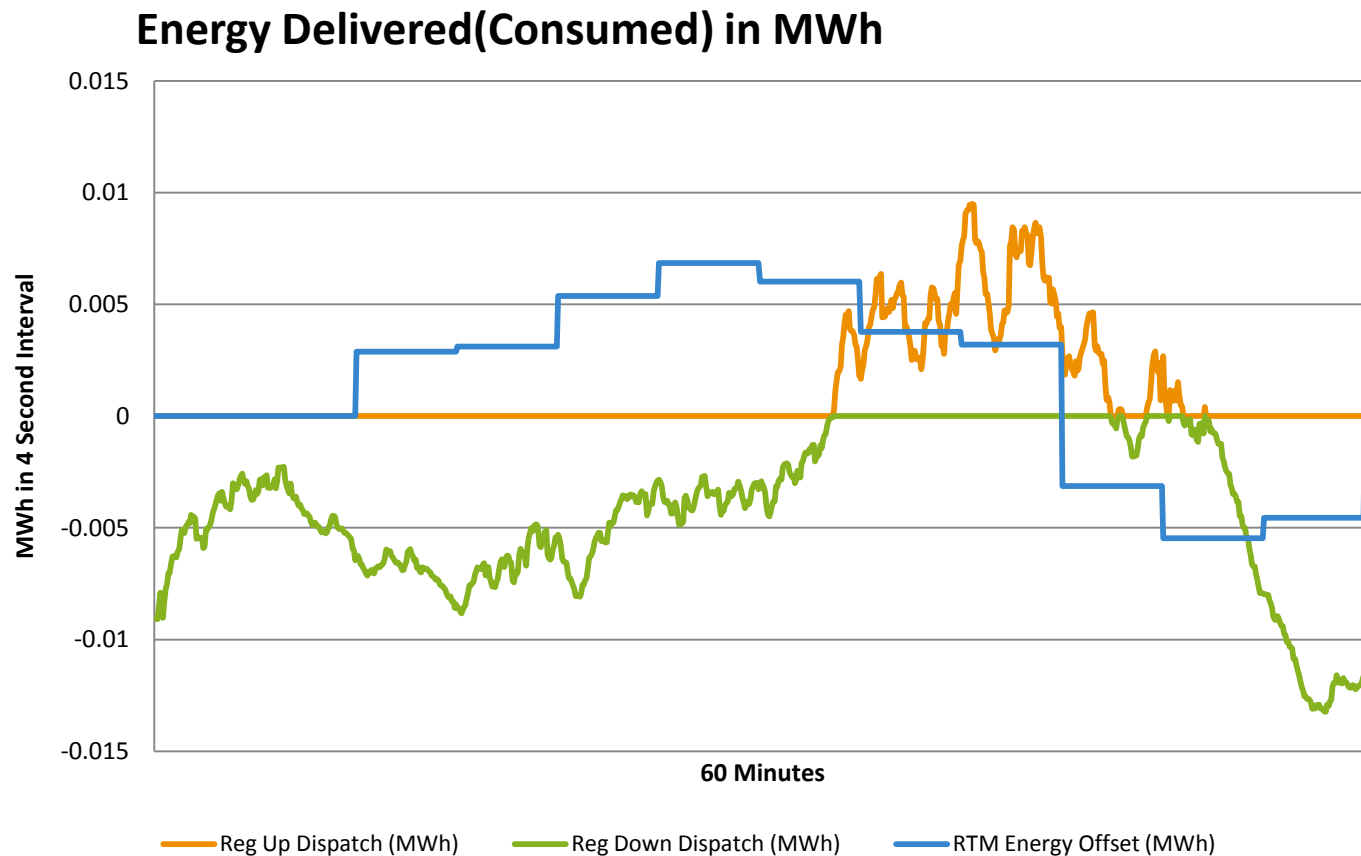


### Wholesale Energy Netting

- Rules for energy sales and purchases should be symmetrical

# State of Charge Management Example

## CAISO Regulation Energy Management Proposal (12/2010)





# Pay-For-Performance Example

## ISONE Pilot Mileage Payments

ISO  
FERC  
Sect  
App

Hourly payments for regulation services to pilot program Participants shall be calculated as:

$$\frac{(RCP * \text{Time-on-Regulation Megawatts}) + (RCP * \text{Capacity-to-Service Ratio} * \text{Regulation Service Megawatts} * (\text{time on in minutes} - \text{fade time in minutes}))}{\text{time on in minutes}}$$

where

RCP = Re

Time-on-R

Capacity-to-Service Ratio determined in acc

Regulation Service Megawatts provides a “Pay-for-Performance” mechanism. Storage has received thermal generation

Order 890 Compliance Filing

Issued by: Raymond W. Hepper,  
Vice President and General Counsel  
Issued on: August 5, 2008  
DMEAST #10090285 v1

Effective: October 5, 2008  
Filed to comply with order of the Federal Energy  
Regulatory Commission, Docket Nos. ER08-54-000 and  
ER08-54-001, issued May 7, 2008, 123 FERC ¶ 61,133 (2008)

# Wholesale Netting Example

## PJM Revisions to Station Power Definition (Approved 9/2010)

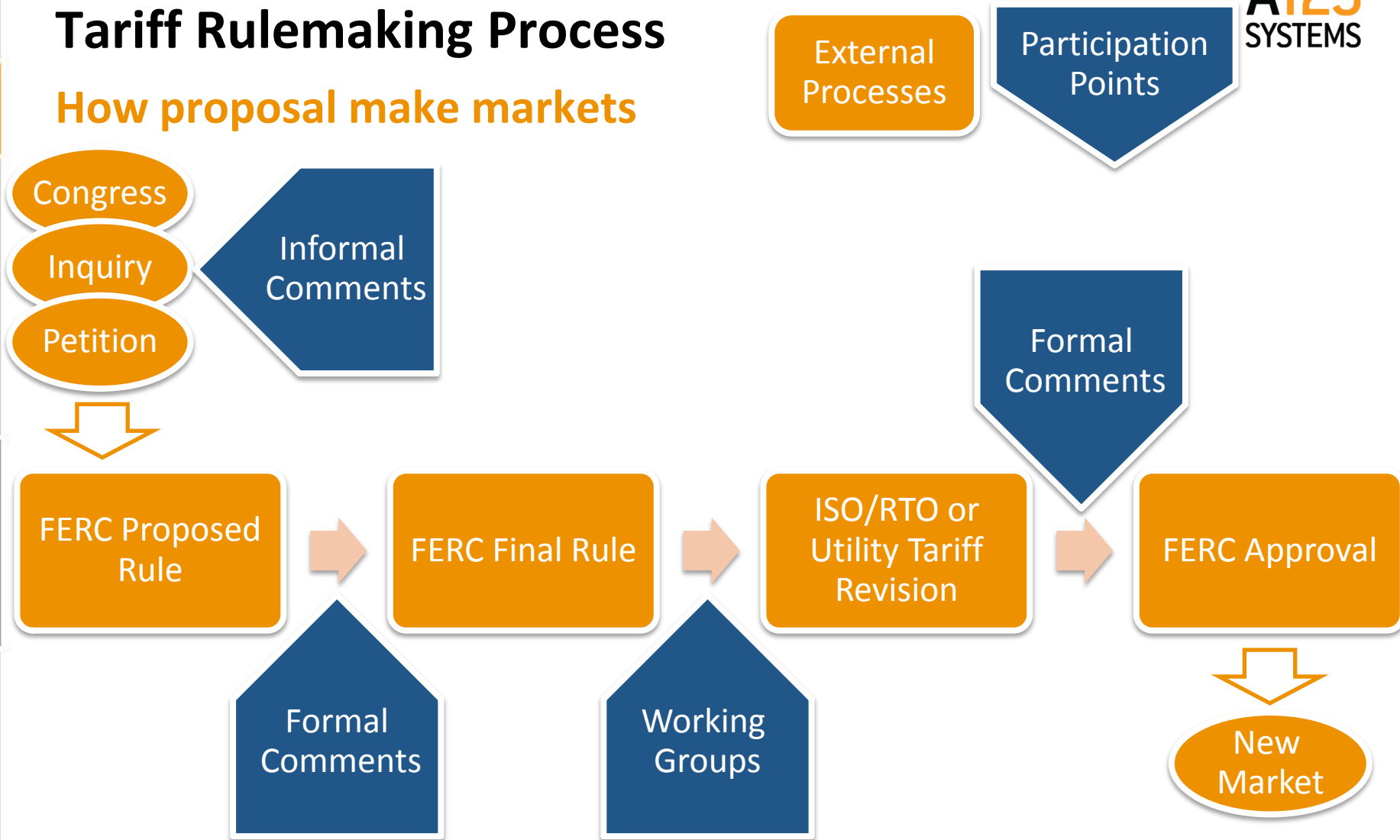


### Proposed Revisions

- **Revised Section 1.3.33.B:** ““Station Power” shall mean energy used for operating the electric equipment on the site of a generation facility located in the PJM Region or for the heating, lighting, air-conditioning and office equipment needs of buildings on the site of such a generation facility that are used in the operation, maintenance, or repair of the facility. Station Power does not include any energy (i) used to power synchronous condensers; (ii) used for pumping at a pumped storage facility; (iii) used for charging an Energy Storage Resource; or (iv) used in association with restoration or black start service.”
- **New Section 1.3.1G:** “Energy Storage Resource” shall mean flywheel or battery storage facility solely used for short term storage and injection of energy at a later time to participate in the PJM Ancillary Services markets as a Market Seller.

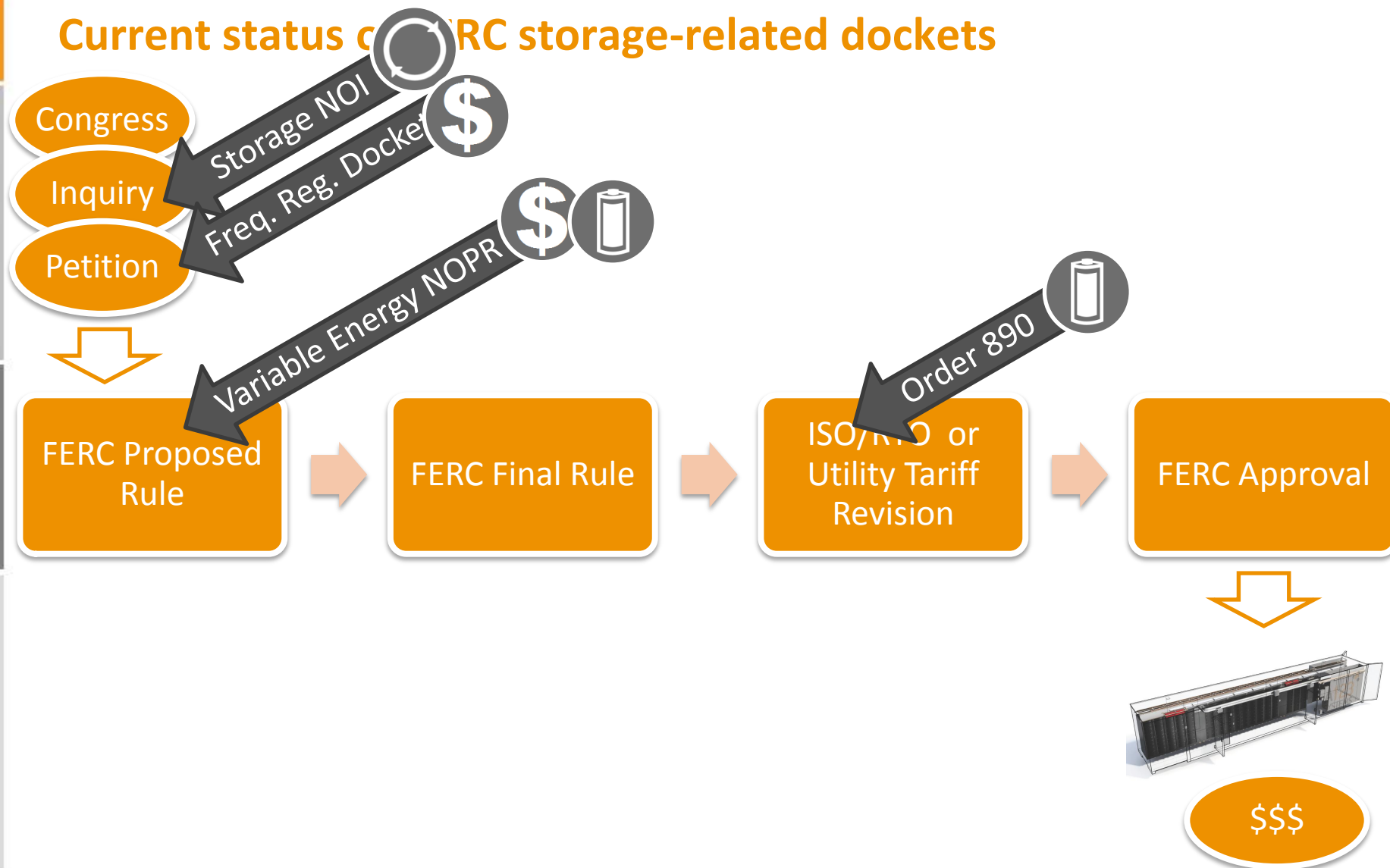
# Tariff Rulemaking Process

## How proposal make markets





















# Tariff Rulemaking Process Status

Current status of FERC storage-related dockets



# ISO/RTO Storage Regulation Rule Status

As of 1/2011: Excellent, Good, Poor, In Progress

ISONE	• 24 GW			
NYISO	• 33 GW			
PJM	• 136 GW			
ERCOT	• 65 GW			
MISO	• 111 GW			
CAISO	• 47 GW			

# Speed Improvements Over 25 Years

## Information Technology

From wikipedia commons



**1 KFLOPS**



From wikipedia commons



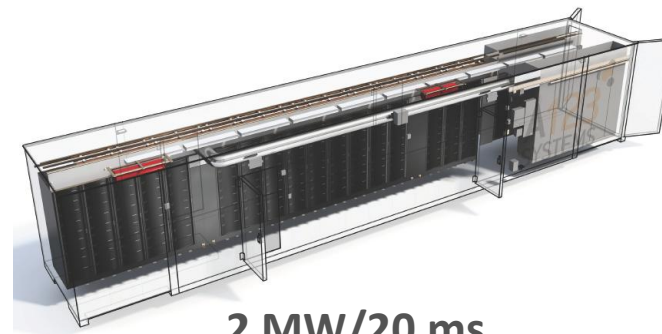
**10 GFLOPS**  
**100,000,000x faster processor**

## Power Systems

From wikipedia commons



**2 MW/5 mins**



**2 MW/20 ms**  
**15,000x faster ramp rate**

- Tariff provisions should harness technological progress



**For more information:**

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