Welcome!

- Thank you for joining today's webinar: **OpenADR and Its Impact on Building Control Systems**
- If you have a question please use the question box located on the right side of your screen.
- Questions for our speaker will be addressed at the end of the presentation.
- This webinar will be recorded for future playback.

Today's Speakers

- **Anno Scholten,** C.E.M, C.D.S.M, is President of Connexx Energy, a leading developer of applications and solutions that connect Smart Building with the Smart Grid. Anno has spent the last 25 years driving innovation in smart building systems and smart grid technologies.

- **Jim Boch,** Principal Electrical Engineer, Jim joined IPKeys with 30 years of industry experience with Fortune 500 companies. Jim has experience in the electrical power distribution, lighting and information technology sectors. He has assumed progressively greater responsibilities from project engineer to national product sector manager.

- **Allen Jones,** is an independent consultant specializing in the interaction between facilities and the Smart Grid. He has almost ten years of experience working on Smart Grid related topics. He serves on several national and international Smart Grid-related committees and also serves as an adviser to the BACnet Smart Grid Working. Group.

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OpenADR 2.0b and Its Impact on Building Control Systems

PJM and Oahu Case Studies

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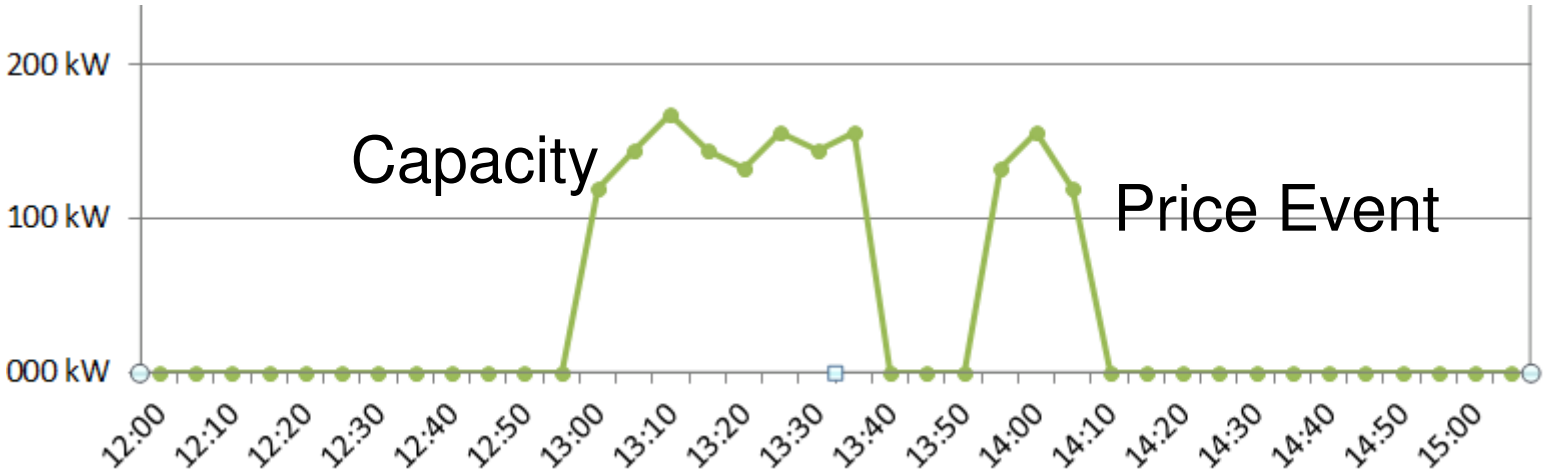
2014 Sync Reserve – Utilizing Secure Web Cloud Services

Successful 2012, 2014 -PJM-IPKEYS Pilots

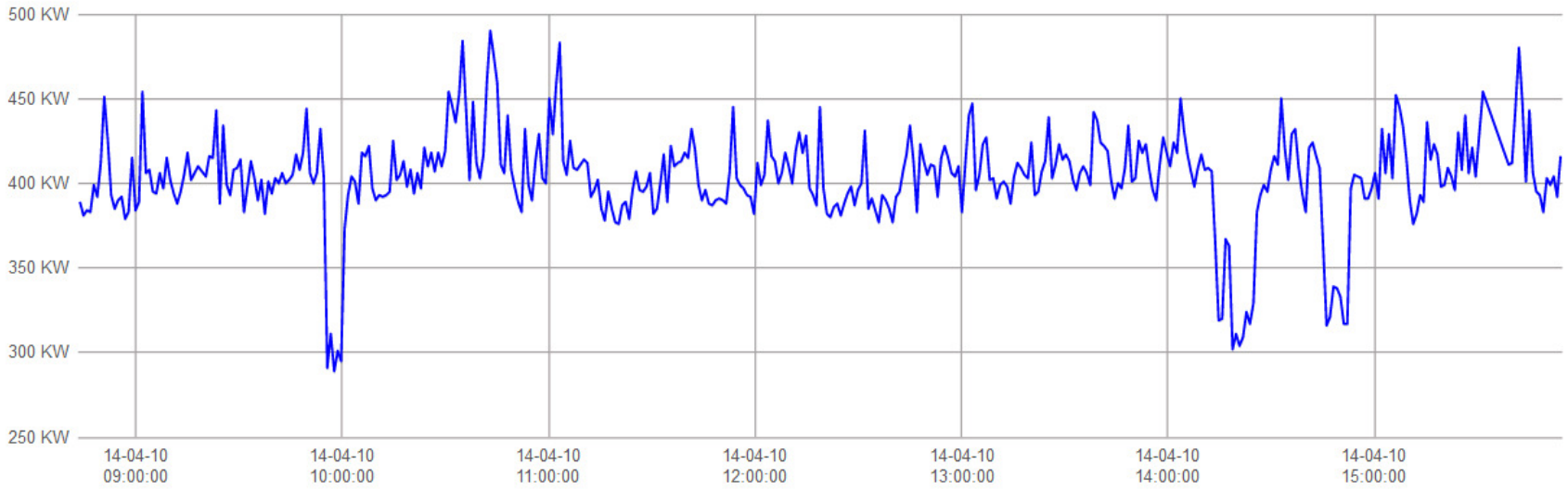
- 2012 Pilot
  - Demand Response Event Oadr 2.0a
  - Price Based Demand Response
  - Verification with Customer Data
  - Event and price based load shed verified with meter telemetry



2014 Auto Synch Reserves
Lighting Load Shed OADR 2.0b

EISS

Telemetry Data (70429.27 KWH Total) close



Zoom to: 1/2 H | H | D | W | M | Q | Y Start Date: 04/10/2014 End Date: 04/11/2014 Go

Auto Display Zoom selection. ☑

Zoom Range selected: Thu Apr 10 2014 08:43:11 GMT-0400 (Eastern Standard Time) to Thu Apr 10 2014 15:54:40 GMT-0400 (Eastern Standard Time)

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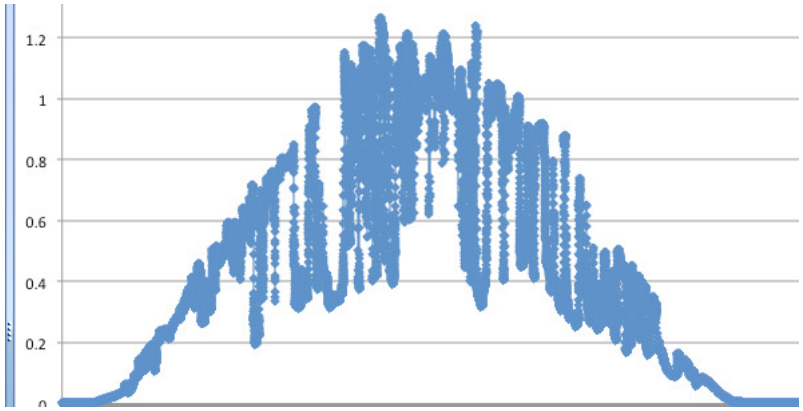
OHAU Problem Space

- Rooftop solar generation is non-uniform and constantly fluctuating
- Peak demand expected to grow in the near future

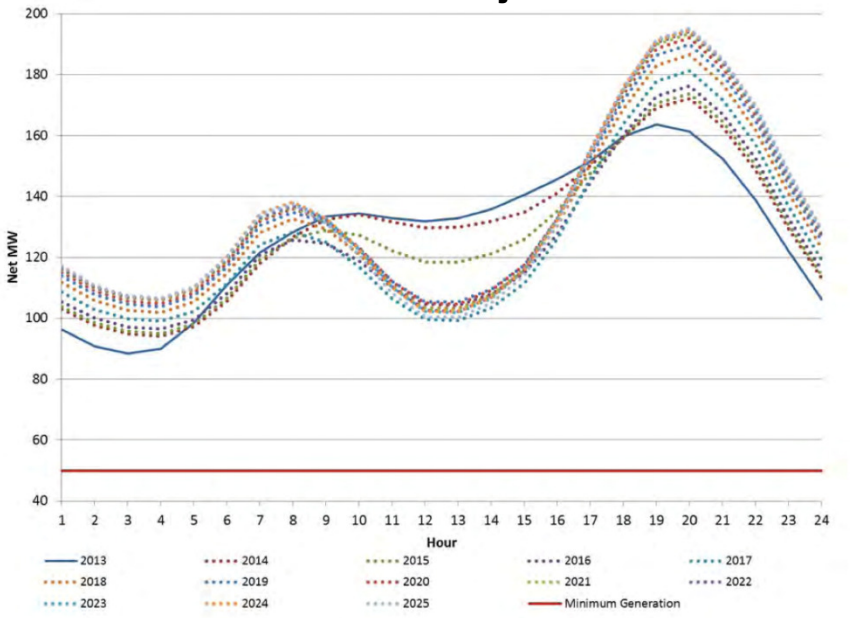
Solar Irradiance Data



Daily Load Profile

Maui – 2013 Actuals

2014-2025 Projections



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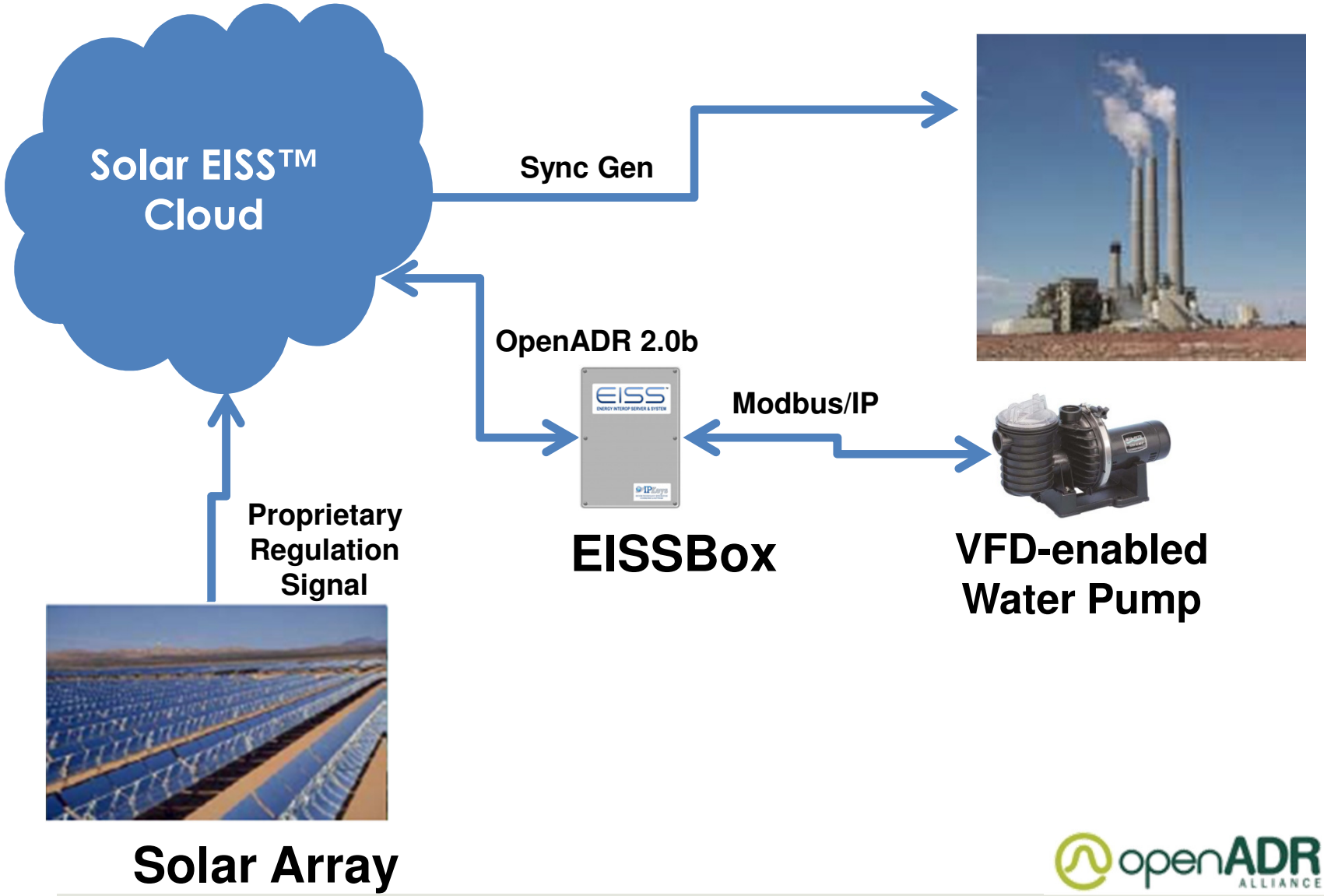
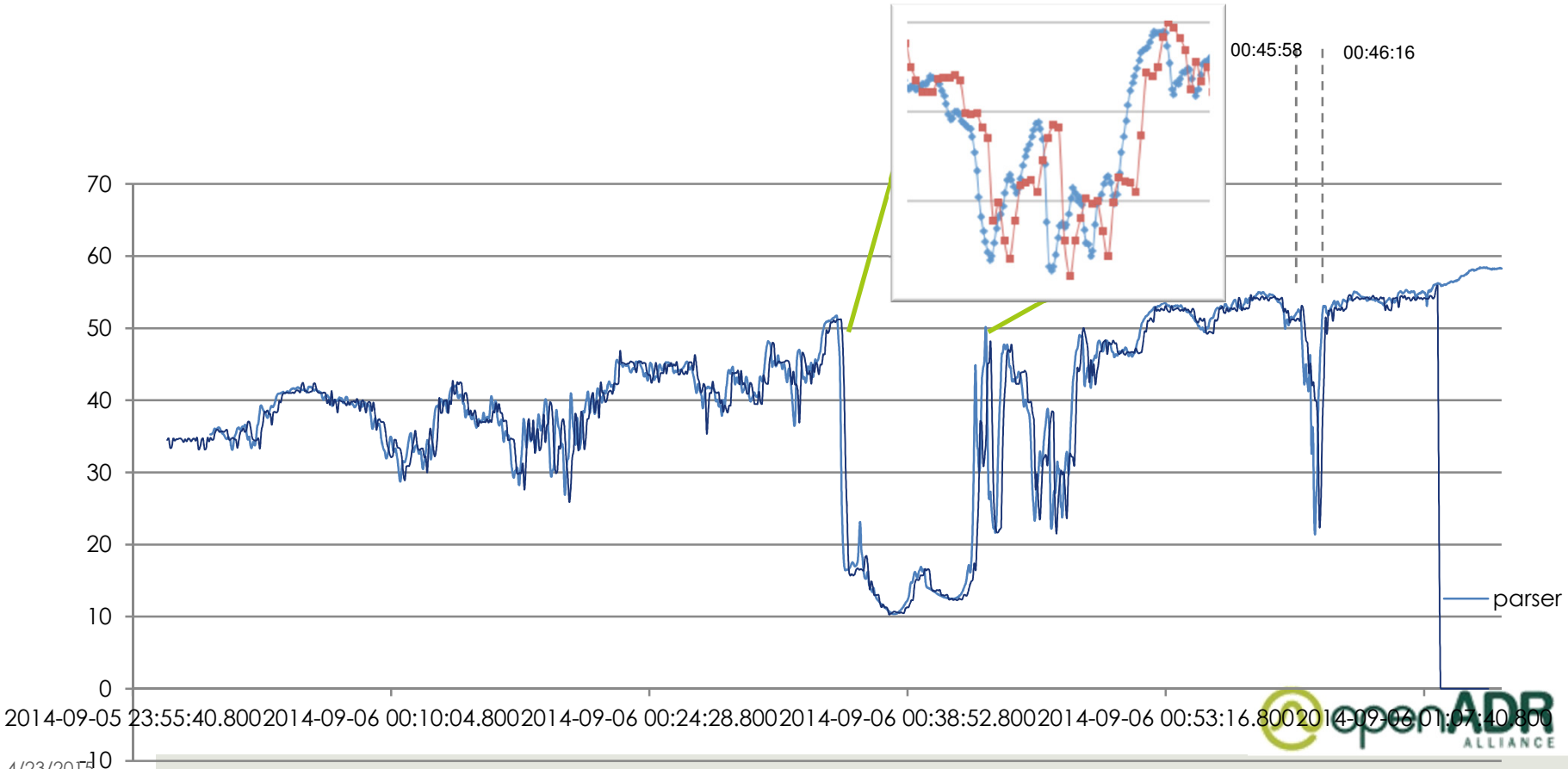
VFD Fresh Water Pump

Solar EISS™ Signaling Architecture



Load Latency

- VFD response time indirectly monitored through load response via meter data
- Calculated Load Response Time: ~16 seconds



PJM Performance Score Algorithm

$$\underset{\delta=0 \text{ to } 5 \text{ Min}}{\text{Correlation Score}} = r_{Signal\ ,Response\ (\delta,\delta+5\text{Min})}$$

Delay interval with the highest correlation between regulation signal and load response

$$\underset{\text{Score}}{\text{Delay}} = Abs\left|\frac{\delta - 5\ Minutes}{5\ Minutes}\right|$$

Direct calculation of effect of delay within maximum five (5) minute range.

$$Error = Avg\ of\ Abs\left|\frac{Response - Regulation\ Signal}{Hourly\ Average\ Regulation\ Signal}\right|$$

$$\underset{\text{Score}}{\text{Precision}} = 1 - \frac{1}{n}\sum Abs(Error)$$

Average of point-by-point mapping of error at each sample.

$$\underset{\text{Score}}{\text{Performance}} = \max\left[A * \left(\underset{\text{Score}}{\text{Delay}}\right) + B * \left(\underset{\text{Score}}{\text{Correlation}}\right)\right](A * + B *) + C * \left(\underset{\text{Score}}{\text{Precision}}\right)$$

Weighted average of all component scores.

Performance Score Results

- Maximum correlation was found with a data point offset of 10 (corresponds to ~10 second offset)
- Correlation Score: 0.992 at 10 second offset
- Delay Score: 0.967 at 10 second offset
- Precision Score: 0.9996 at 10 second offset
- Performance Score: 0.986 (0.330 + 0.322 + 0.334)

Q&A

- Recording and slides from this presentation will be available at www.openadr.org.
- The OpenADR Webinar Series will continue throughout 2015. More information on future webinar topics can be found on www.openadr.org.

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Thank You!

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