SAG LIAISON CALL
July 26, 2016
SAG July Liaison Call agenda:

1. Randy Fish, Energy Storage
2. Dave Gardin Chapter Sustainability Representative: St. Louis
3. Eric Teicholz, Bill Conley, SAG/ESUS Update
Corporate Overview

Strategen Consulting
» Consulting in renewables & energy storage since 2005
» Unique focus in strategic advisory work in the clean energy industry

California Energy Storage Alliance (CESA)
» 501(c)(6) founded in January 2009
» 80+ member companies
» Active in 20+ regulatory proceedings at CPUC and CAISO, as well as State Legislature

Energy Storage North America (ESNA)
» Largest storage conference in NA (1800+ attendees)
» 42 countries in attendance, 100+ exhibitors
» Next event: October 4-6, 2016 San Diego Convention Center

Global Energy Storage Alliance (GESA)
» 501(c)(3) founded in January 2014
» Identifies and promotes international best practices
Overview

Energy Storage 101

• Technologies

• Grid Locations

• Distributed Applications & Value Streams

• Case Studies

• Financing

• Energy Storage North America
Technologies

- **Electro-Chemical Storage** (Flow battery / Lithium Ion)
- **Mechanical Storage** (Flywheel)
- **Bulk Mechanical Storage** (Compressed Air)
- **Thermal Storage** (Ice / Molten Salt)
- **Bulk Gravitational Storage** (Pumped Hydro)
- **Transportation** (Electric Vehicles)
## Customer Sited Applications

| Demand Side Permanent Load Shifting | Permanent Load Shifting - electric  
Business Customer, Building Thermal Mgt. |
|------------------------------------|--------------------------------------------------------------------------------|
| **Bill Management & Demand Response** | Business Customer, Peak/Max Demand Mgt.  
Residential Customer, TOU Bill Management  
Residential Customer, Solar Integration and bill management  
Aggregated C&I / VNM Solar + Storage  
Multi-family Residential, Solar and Demand Mgt. |
| **Bill Management + Market** | Business Customer, Bill + Market Participation  
Residential Customer, Bill + Market Participation |
| **Utility Controlled** | Grid Operation Benefits |
| **Reliability** | Storage to provide reliability and aggregated market services  
Storage to provide reliability and DR |
| **EV Charging** | EV Charging, Public Charging Station  
EV Charging, Commercial or Municipal Fleet  
EV Charging, Residential Home  
Solar + Storage + EVs with bidirectional mkt participation  
Storage + Evs with bidirectional mkt participation  
EV Aggregated Charging with Market Participation (V1G)  
EV Aggregated Charging/Discharging with Market Participation (V2G) |
Example: Commercial Electric Bill Management

Energy storage system reduces end-customer demand and energy charges

**Note that savings is very dependent on facility load profile and electric tariff**

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### Annualized Energy Savings

<table>
<thead>
<tr>
<th>Time of Use</th>
<th>kWh Avoided</th>
<th>Total Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Peak Discharge</td>
<td>19,715</td>
<td>$2,539</td>
</tr>
<tr>
<td>Mid-Peak Discharge</td>
<td>35,391</td>
<td>$2,884</td>
</tr>
<tr>
<td>Off-Peak Charge</td>
<td>(77,496)</td>
<td>$(4,794)</td>
</tr>
<tr>
<td>Total</td>
<td>(22,391)</td>
<td>$629</td>
</tr>
</tbody>
</table>

### Annualized Demand Savings

<table>
<thead>
<tr>
<th>Time of Use</th>
<th>kW Avoided</th>
<th>Total Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anytime</td>
<td>160</td>
<td>$14,956</td>
</tr>
<tr>
<td>On-Peak</td>
<td>120</td>
<td>$6,626</td>
</tr>
<tr>
<td>Mid-Peak</td>
<td>160</td>
<td>$1,027</td>
</tr>
<tr>
<td>Max or Total</td>
<td>160</td>
<td>$22,609</td>
</tr>
</tbody>
</table>
Case Study: Santa Rita Jail

- One of the largest US correctional facilities
- 3 MW average daily peak demand
- Existing microgrid allows islanding from utility indefinitely
  - Includes 1.5 MW PV, 1 MW fuel cell, and diesel generators

Since installing 2 MW/4 MWh energy storage system (ESS) in 2012, facility has:
- Saved $100,000 annually on electricity costs
- Reduced demand charges
- Performed microgrid balancing solely with ESS
- Bolstered security and reliability of power supply

More info: https://building-microgrid.lbl.gov/santa-rita-jail
Case Study: Walmart Solar Plus Storage Systems

- SolarCity is pairing solar and storage on 23 Walmart stores nationwide
- 200 kw / 400 kWh battery systems
- Two Primary Applications:
  1. Peak load reduction
  2. Backup power

Building Case Study: Rockefeller Center

• CALMAC Thermal Storage
• Ice-making chiller supplies 8,600 ton-hours of energy storage
• During heavy cooling demand, ice cooling supplements chiller, thereby:
  1. Offering flexibility to system operator
  2. Allowing real-time optimization of cooling plant efficiency
  3. Reducing peak energy demand
  4. Reducing energy and demand costs
DOE Database of Energy Storage Projects & Policies

Financing

<table>
<thead>
<tr>
<th>Type</th>
<th>Cash</th>
<th>Lease</th>
<th>Shared Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Upfront purchase</td>
<td>Term</td>
<td>Developer owns asset &amp; savings are shared</td>
</tr>
<tr>
<td>Pros</td>
<td>Capture 100% of system savings</td>
<td>No upfront cost</td>
<td>No upfront cost, no risk</td>
</tr>
<tr>
<td>Cons</td>
<td>Technology &amp; performance risk</td>
<td>Performance risk (high downside risk)</td>
<td>Shared savings</td>
</tr>
</tbody>
</table>

- Storage qualifies for Federal Investment Tax Credit (ITC) if sited with and charged by renewables (some conditions apply)
- Incentive programs in California and New York offset CAPEX
- State grants for pilot projects (esp. for resiliency and critical infrastructures)

Chart adapted from Green Charge Networks
Key Takeaways

Storage is cost-effective today for many applications and can:

» Save facilities money and potentially generate revenue
» Firm and store onsite renewable generation
» Provide flexibility and allow building optimization
» Increase resiliency and backup capabilities

It’s a win-win-win for Customers, Utilities, and the Grid!
- 2000+ energy storage policy, technology & market leaders
- Energy users and managers from across North America
- Full day of commercial and industrial storage case studies and best practices
- Speakers include facility managers and planners from:
  - Walmart
  - Marine Corps Miramar
  - Alameda County
  - OATI Data Center
  - City of San Diego
  - LINC Housing
  - College of Marin
  - SF Dept. of Environment

**Keynote Address**

*October 5th, 9:15am – 9:45am*

How Storage is Enabling the World’s Largest Retailer to Achieve its Clean Energy Goals

Mark Vanderhelm, VP of Energy, Walmart

**Special Offer:** Attend ESNA’s C&I track on October 5 for free (a $695 value) with code ESNA16IFMA - [http://esnaexpo.com/attendees/registration](http://esnaexpo.com/attendees/registration)

- IFMA World Workplace attendees can engage with over 100 exhibitors at ESNA’s Expo Hall for free
Thank you!

Randy Fish
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Chapter Presentations:

1. How is sustainability group organized in your chapter (a bit about chapter size/organization)
2. Primary sustainability activities chapter is are involved with
3. What's on your web (and URL)
4. Wish list? what else is chapter interested in, needs not being met, potential role of IFMA national
5. Contact info for you as sustainability liaison
1. How is sustainability group organized in your chapter (a bit about chapter size/organization)

- Board Level Sustainability Liaison Position and Education Chair position (SFP)
2. Chapter Sustainability Activities

- Annual tradeshow with BOMA and IREM
- St. Louis High Performance Building Challenge
- Incorporating sustainability topic into monthly meeting
- City of St. Louis – City Energy Projects
- Benchmarking classes
- Sponsor of the St. Louis High Performance Building Initiative
3. What else is the chapter interested in, what needs are not being met or what could be a potential role in IFMA national?

• Green Leasing (from tenant perspective)
• Metering best practices
• Educational opportunities on updated building codes and inclusion of more modern energy practices into building codes – perhaps something on the role of building codes?
Contact Information

• St. Louis Chapter website: http://ifmastl.org/index.php

• Sustainability Liaison, David Gardin - davegardin HVAC@gmail.com

• Chapter Past President, Chris Laughman – Christopher.laughman@stls.frb.org
2016 Webinars:

Jan 21 Sustainable Procurement
Feb 17 ENERGY STAR (Guide Webinar)
Mar 8 Getting Started (Guide Webinar) – confirmed (178 registrants)
May 18: 12 PM Central: Measuring and Reporting (Guide Webinar) (375 registrants)
Jun 22: Waste Disposal (Guide)
Jul 13: Voice of the Tenant/Tenant Star (with EPA)
July 13: Engaging Tenants in Energy Efficiency – Cindy Jacobs, EPA

https://attendee.gotowebinar.com/recording/4255201634878825987

Sep 7, 12 PM Central: Resilience Planning for Facility Managers
Dr. Sarah Slaughter, MIT, BICE,
Oct: WWP, no webinar
Webinar URLs > KL

2015

- Mar 24, Emissions: https://attendee.gotowebinar.com/recording/1261714147782873089

2016

- Jan 21 Sustainable Procurement: https://attendee.gotowebinar.com/recording/4973828137377506306
- Feb 17 ENERGY STAR - https://attendee.gotowebinar.com/recording/8637296428037464835
- Mar 8 Getting Started - https://attendee.gotowebinar.com/recording/6074554726479061505
How-to Guides

Updates Completed in KL: Lighting, Green Rating Systems, ENERGY STAR, Waste, Occupant Engagement, Carbon Footprint

16 Updates Moved to Knowledge Library With Metadata:

Status of Guide Updates:
1. Getting Started (in process)
2. Carbon Footprint (done)
4. Data Centers
5. Landscaping
6. Water
7. Low Cost/No Cost Energy Savings
8. Food Service
9. ENRGY STAR (done)
10. Green Rating Systems (done)
11. Waste Stream Management (done)
12. Green Cleaning (in development)
13. Lighting (done)
14 Commissioning

New Guides Under Development
1. Occupant Engagement (done)
2. Measuring + Reporting (done, not yet in KL)
3. Green Procurement

New Process Trial: Linked In, Intern, Green Schools Alliance Program, ESUS SME
Communities of Practice
http://www.ifma.org/community/community/communities-of-practice

Communities:

1. Operations & Maintenance Health & Safety Community
2. Information Technology Community
3. Business Leadership, Finance, Communication Community
4. Real Estate Advisory and Leadership Community
5. Workplace Evolutionaries (WE) Community
6. Environmental Stewardship Utilities & Sustainability Community
Upcoming SAG Liaison Calls

• Tuesday, September 27 @ 12 PM CST
• Tuesday, November 22 @ 12 PM CST
Thank you for joining us today.

Questions? Comments? Want to get more involved? Email us at sustainability@ifma.org

Contact: Jaclyn Lee
Jaclyn.lee@ifma.org