Virtual Microgrid Presentation

PRESENTATION TIMES

Wednesday
10:30 am – 11:00 am
12:30 pm – 1:00 pm
2:30 pm – 3:00 pm

Thursday
9:30 am - 10:00 am
10:45 am - 11:15 am
SOLAR POWER SOUTHEAST, POWERED BY SEIA AND SEPA

This event is produced by SEIA and SEPA. Unlike other solar conferences, all proceeds from the event support the expansion of the U.S. PV solar energy market through both associations’ year-round research and education activities, and through SEIA’s advocacy, research and communications efforts.
Question:
Solar + Storage, where do we go from here?

Answer:
Microgrids, will take us to the “Grid of Grids”
A Rapidly Expanding Distributed Renewable Energy World
Harvesting Distributed Renewable Energy Supplies

- Solar (Photovoltaic)
- Wind Turbine
- Hydro Generators (Dams)
- Hydrogen (Fuel Cell)
- Bio Fuel ICE Generators
- Thermoelectric Generators
- Combined Heat and Power Generators (CHP)
- Piezo-Electric Generators
- Wave/Tide Generators
- Future?
Storage: From Intermittent Supply to Dispatchable Smart Load Support

- **Batteries (electrochemical)**
- Super Capacitors
- Flywheels
- Pumped Hydro Electric
- Compressed Air
- Electrolysis (H₂ Generation from H₂O)
- PEM Cell (hydrogen regeneration)
- Cryogenic Energy Storage
- Molten Salt
- Future?
Microgrids
“The technology that pulls it all together.”

The local integration of...

✓ Smart Energy Supply
✓ Smart Energy Loads
✓ Smart Energy Storage
✓ Smart Energy System Management
The Microgrid Value Proposition
“The technology that is poised to transform electricity.”

- Resiliency
- Environmental benefits
- Energy Independence
- Reliability
- Cost savings
- Service to Remote locations
- Energy Access in Developing World
- Peak Shaving/Demand Charge Reduction
- 3rd Party Power Services
- Utility System Support
- EMP Protection
- Energy Efficiency
- Power System Portability
Heading Down the Path: New Age of Electricity
…smart meters, smart appliances, renewable and energy efficient resources in an distributed, integrated, highly articulated, flexible, efficient and resilient infrastructure.
Facilitated by Microgrids in a Grid of Grids Mesh:
An power topology that will do for electricity what the Internet did for information
Using Transactive Energy Control

Enabled by Modern Information Technology
5G/USB-PD/Digital Electricity
Requiring new technology & new business models...

...Moving toward “Energy as a Service”
And the integration of the best available technologies
Key New Technologies …

A greater use of **Direct Current Power Electronics**…

- Digital Electronics
- Portable & Fixed Loads
- Smart Controls
- Bi-directional Integration
- Added Reliability & Safety
Key New Technologies …

An expanded array of New Sources and Efficient End-use Devices…

- High Efficiency Electronic Lighting & Appliances
- Portable (battery) & Fixed (connected) Loads
- Smart Controls – Power/Signal Integration
- Bi-directional Integration
- Integration of CHP & CHCP
- Added Reliability & Safety
New Building Level Business Models ...

**Services**
- Pwr. Sys. Design & Installation
- Sys. Ops., Mgmt. & Service
- Energy Intell, Optm. & Mgmt.
- Virtual Power Plants
- Community Microgrids
- Intg. Pwr.,Comm., & Security
- Preemptive Maintenance
- Transactive Pwr. Mgmt.
  - Consumer Retail
  - Retail to Distributor
  - Distributor to Wholesale
  - Bulk Prod. to Wholesale

**Key Drivers**

**Apps**
- Smart Building/Home
- Power Storage
- Electric Vehicle Charging
- Electro-active Environments
- Augmented Reality
- Dist. Sys. Support
  - VARs
  - Peak Demand
  - Freq. Maint.
  - Fault Resilience

**Key Drivers**
- Services
- Apps
Fast Vehicle Charging: Direct Current as a Utility Supplied Service

Technology Includes:
- DC as a Service (DCaaS)
- Bulk/Reserve Storage
- Co-located Production
- Bi-directional Flow
- Integration of Renewables
- Provide Grid Service
- Resilient Grid Connection
- Open communication Links
...to enable an interconnected grid of grids infrastructure...

Controlled in tiers of Transactive vs. Hierarchical Energy domains

- Wind Farms
- Solar Farms
- Sub-station Energy Storage
- H2 Fuel Cell Peaking Plant
- Community Microgrids
- Campus Microgrids
- Sub-station Energy Storage

CONTENT BY SMART ENERGY MICROGRID MARKETPLACE

EMERGE ALLIANCE
...of non-synchronous nanogrids, microgrids & macrogrids...

Organized in a Tiered Framework

The ENERNET

Macrogrids

Regional

Tier 3

Microgrids

Community

Tier 2

Nanogrids

Campus

Tier 1

Building

Level, Room, Device

Area

CONTENT BY SMART ENERGY MICROGRID MARKETPLACE
Internet of Things + Enernet of Power
System Capabilities

- Dispatching Assets
- Forecasting Utilization
- Simulation & Modeling
- Market Management
- Optimizing loads
- Integration Optimizers
- Control Storage
- DR Management
- Integration with Utility DMS

- Power Flow Control
- Data Exchange
- Smart Meter Data
- Limiting Spinning Reserves
- Monitoring Equipment
- Managing Outages
- Self-Healing Switching
- Support of Customer-Facing Applications
The Live Microgrid
An Onsite Demonstration of Advanced Microgrid Capability
The Virtual Microgrid
A 3D Visual Demonstration of Advanced Microgrid Capability
The MICRO-PEDIA™
An Electronic Self-directed Microgrid Encyclopedia
Unfortunately, we’ve run out of time.
We hope you join us again soon!

Back to the Future of Electricity

Thank You!
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