

Solar Power Southeast



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



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.

Solar Power Southeast

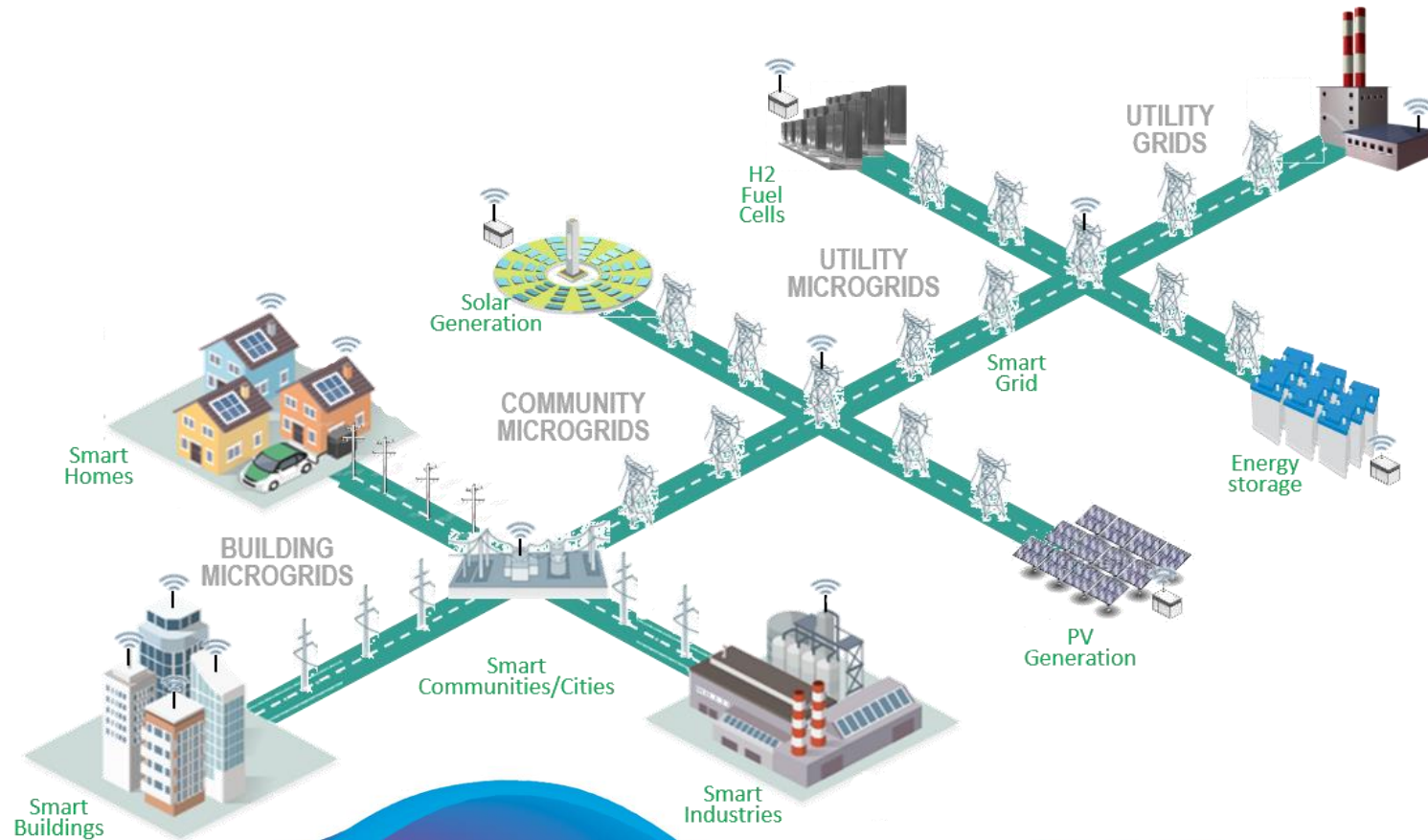
Question:

Solar + Storage, where do we go from here?

Answer:

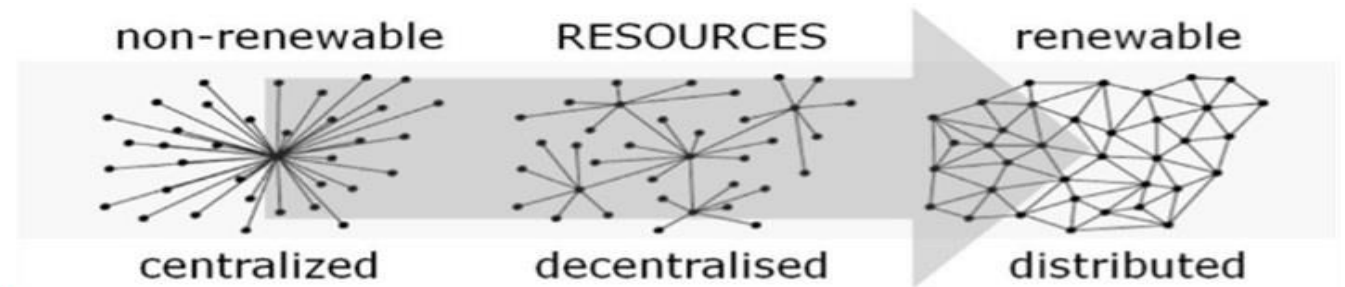
Microgrids, will take us to the “Grid of Grids”

A Rapidly Expanding Distributed Renewable Energy World



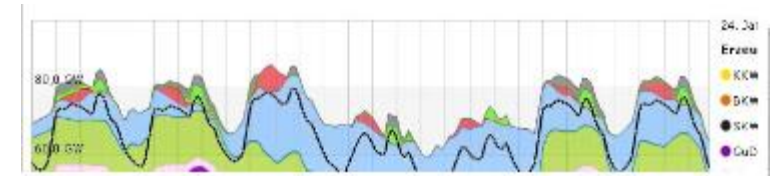
Harvesting Distributed Renewable Energy Supplies

- **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 (H_2 Generation from H_2O)
- 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



Powered with Smart Energy

...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**

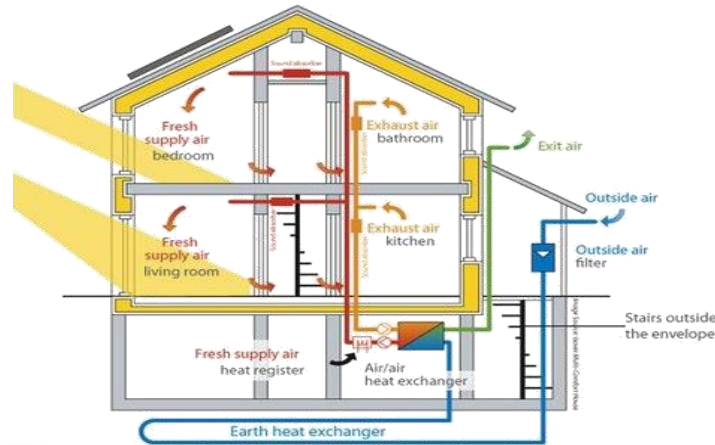
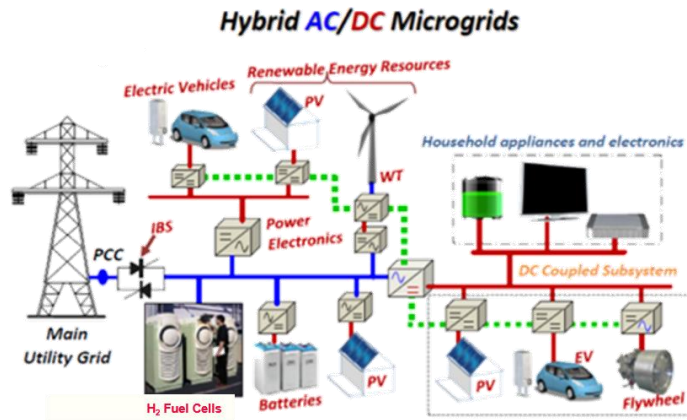


Requiring new technology & new business models...

...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...



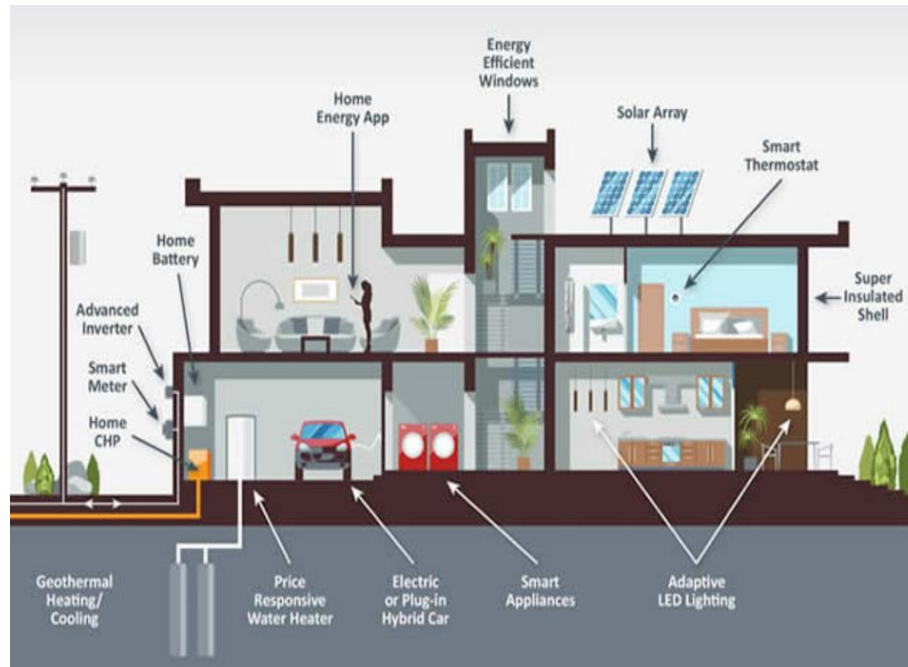
- High Efficiency Electronic Lighting & Appliances
- Portable (battery) & Fixed (connected) Loads
- Smart Controls – Power/Signal Integration
- Bi-directional Integration
- Integration of CHP & CHCP
- Added Reliability & Safety

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

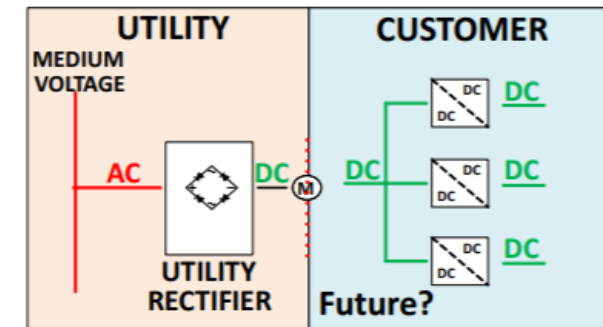
- Smart Building/Home
- Renewable Energy Prod.
- Power Storage
- Electric Vehicle Charging
- Electro-active Environments
- Augmented Reality
- Dist. Sys. Support
 - VARs
 - Peak Demand
 - Freq. Maint.
 - Fault Resilience

Fast Vehicle Charging: Direct Current as a Utility Supplied Service



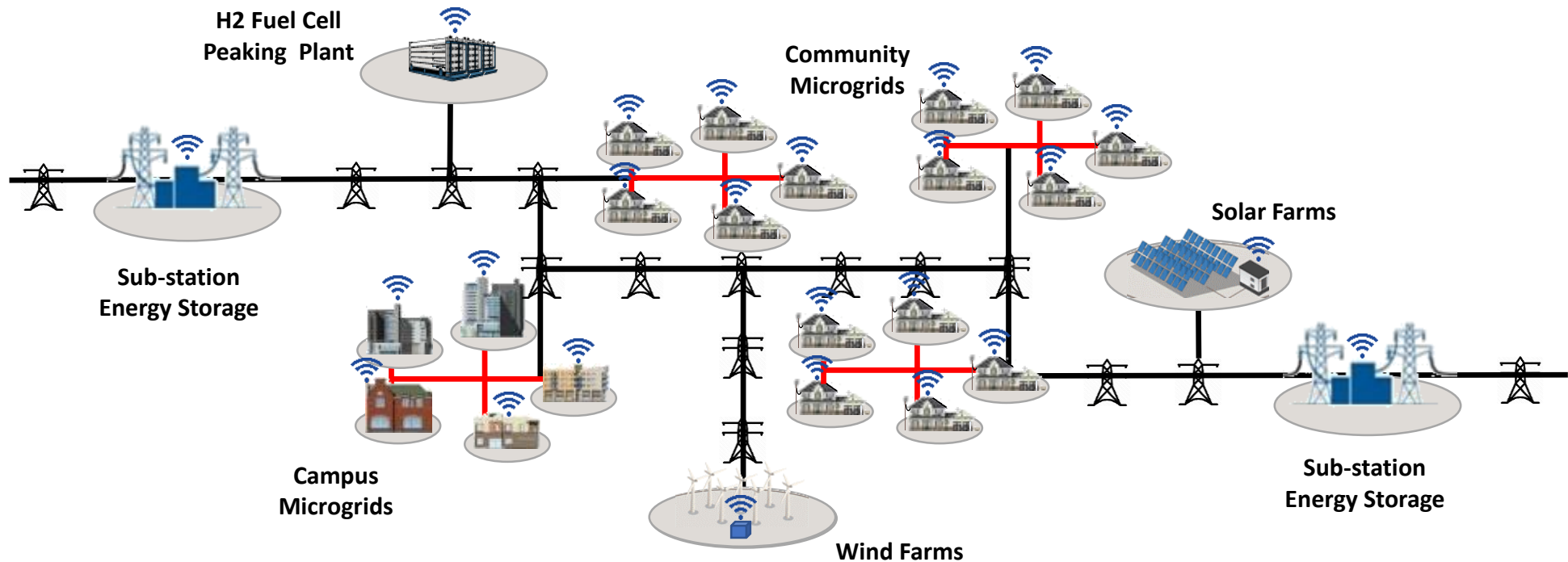
Technology Includes:

- 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



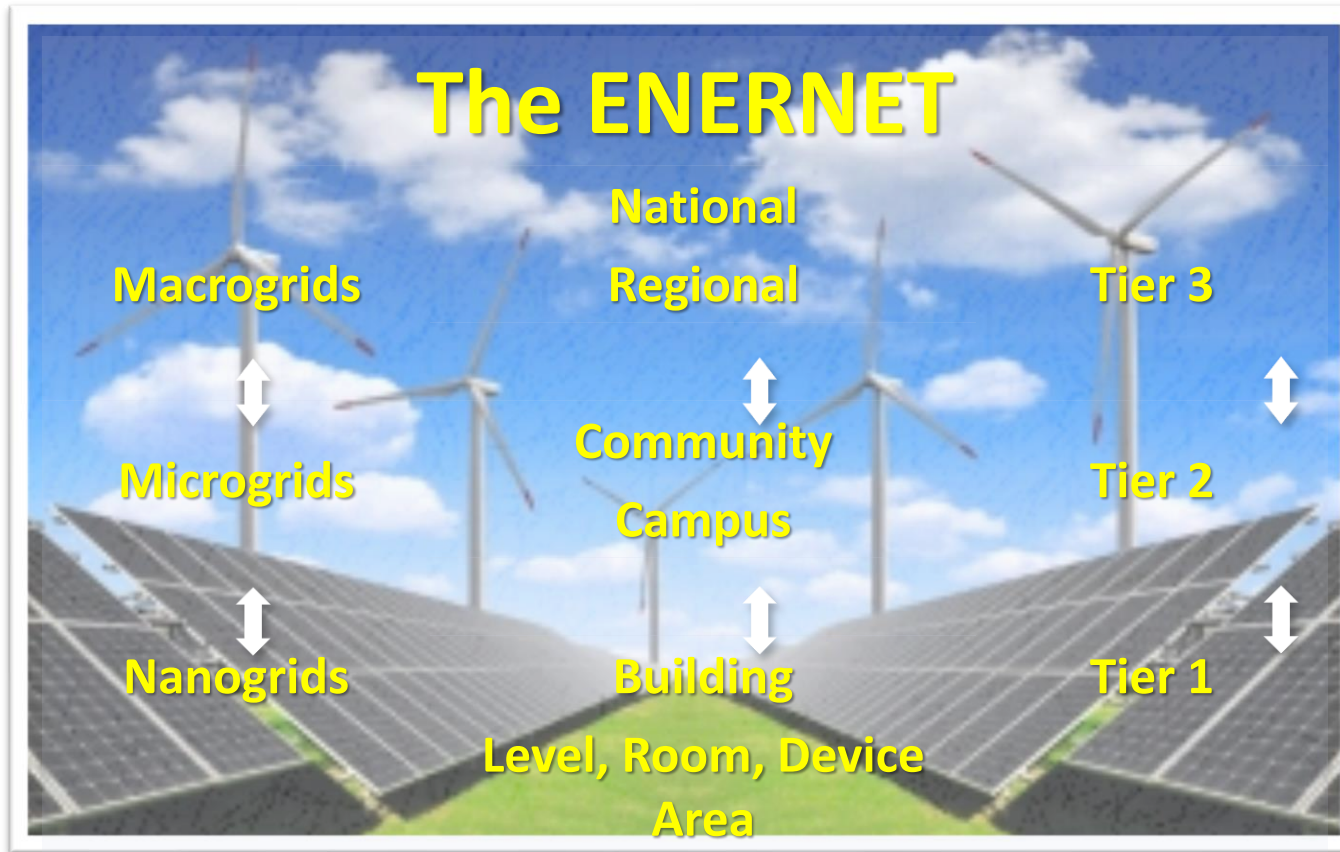
...to enable an interconnected grid of grids infrastructure...

Controlled in tiers of Transactive vs. Hierarchical Energy domains



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

Organized in a Tiered Framework

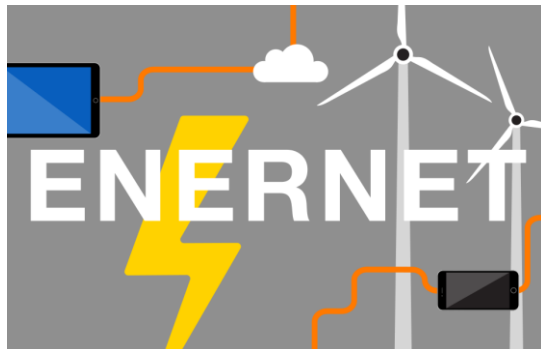
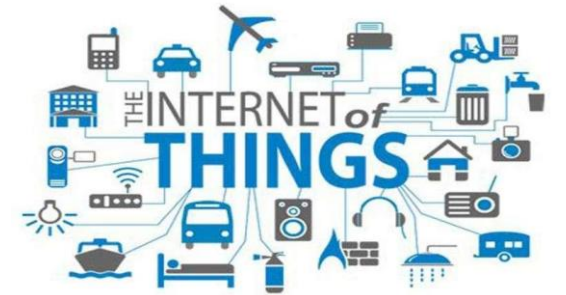


Internet of Things + Enernet of Power

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



An Onsite Demonstration of Advanced Microgrid Capability

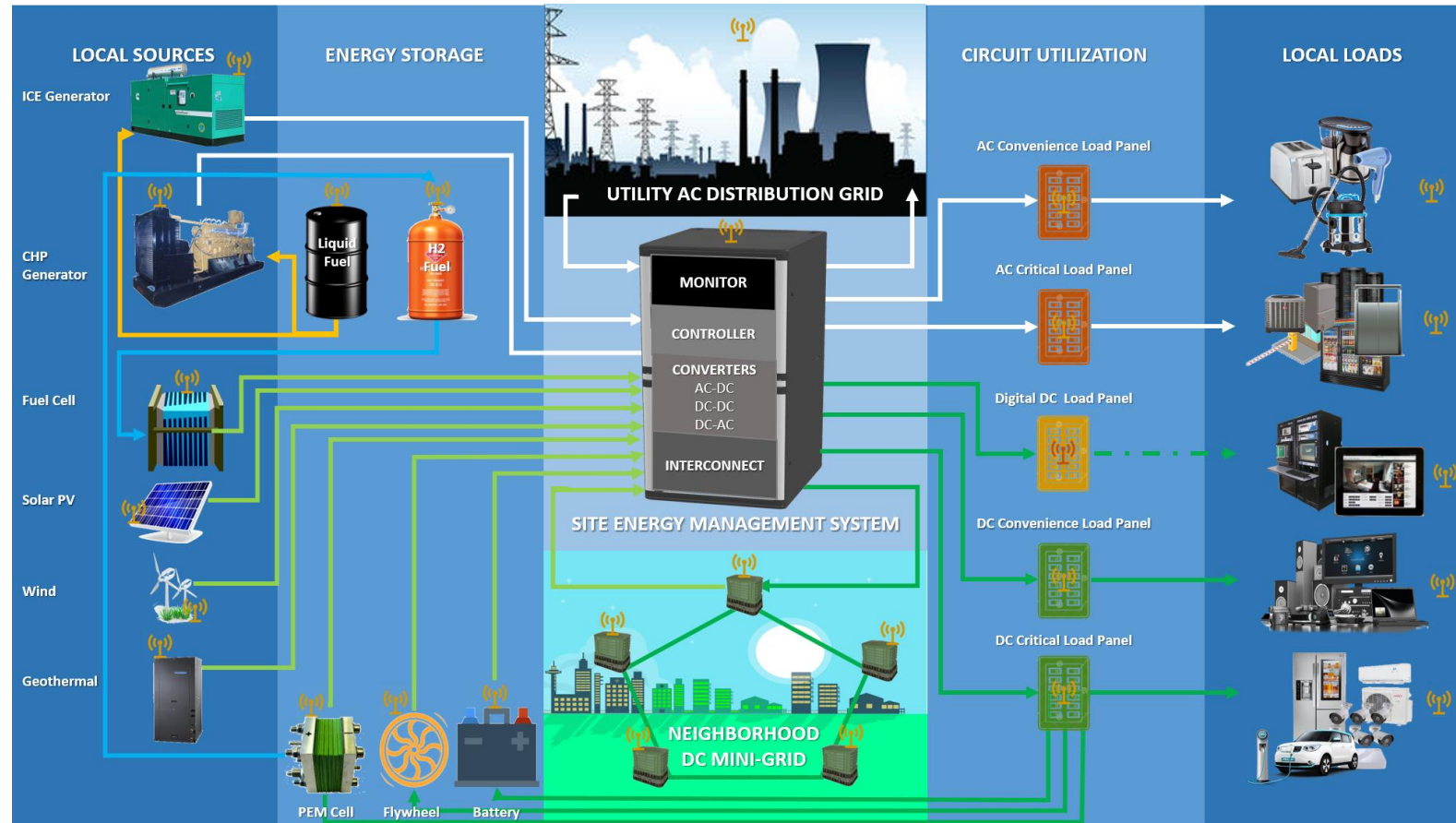


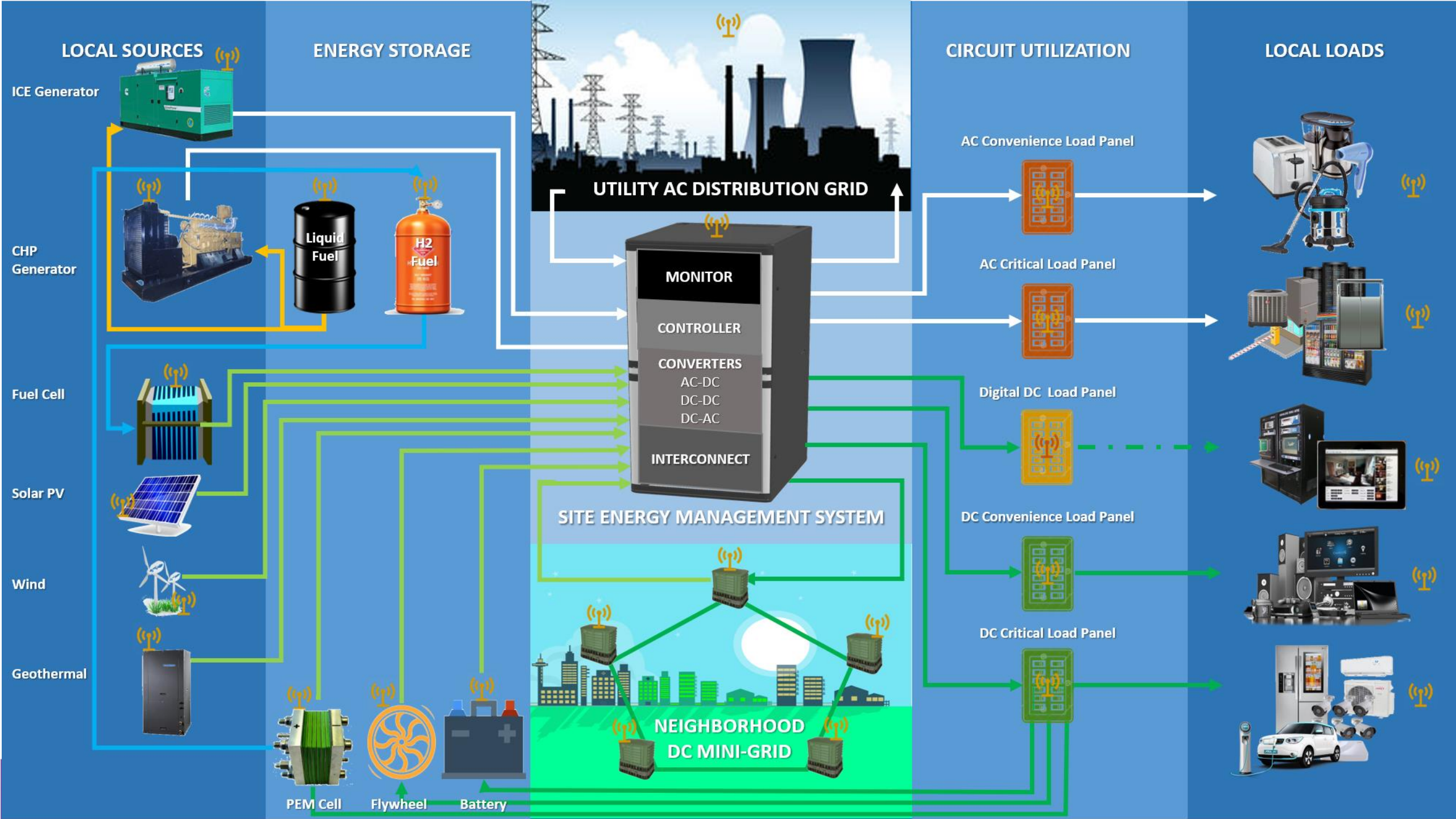
ENERGY STORAGE
INTERNATIONAL



The Virtual Microgrid

A 3D Visual Demonstration of Advanced Microgrid Capability





The MICRO-PEDIA™

An Electronic Self-directed Microgrid Encyclopedia

How
Microgrids
Work

Microgrid
Applications

Explore the
Microgrid
World

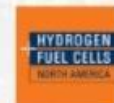
Microgrid
Technologies

Microgrid
Anatomy

CONTENT BY



NORTH AMERICA SMART ENERGY WEEK





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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