ONCOR ENERGY STORAGE and MICROGRID

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DOE Electricity Advisory Committee

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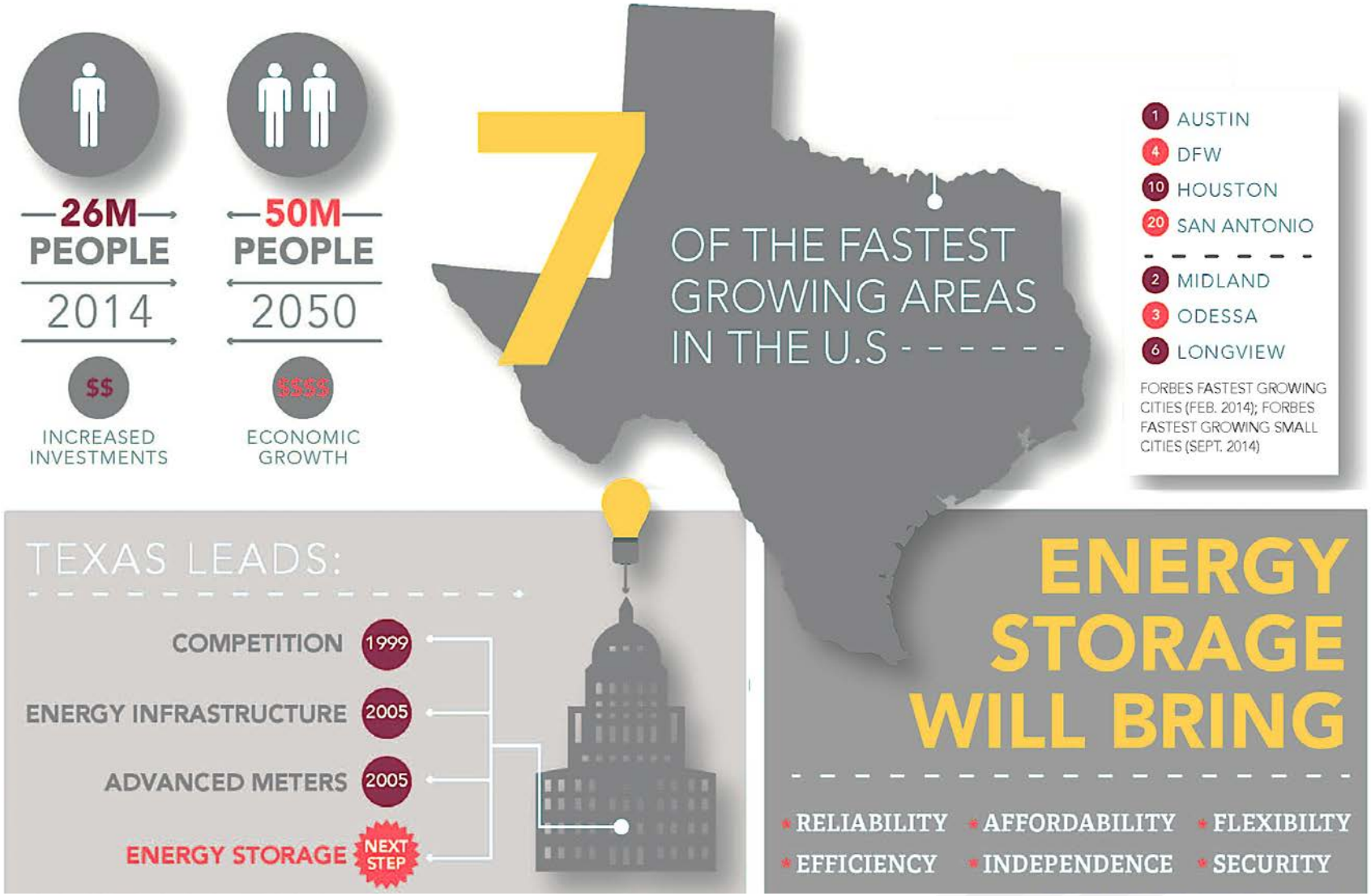
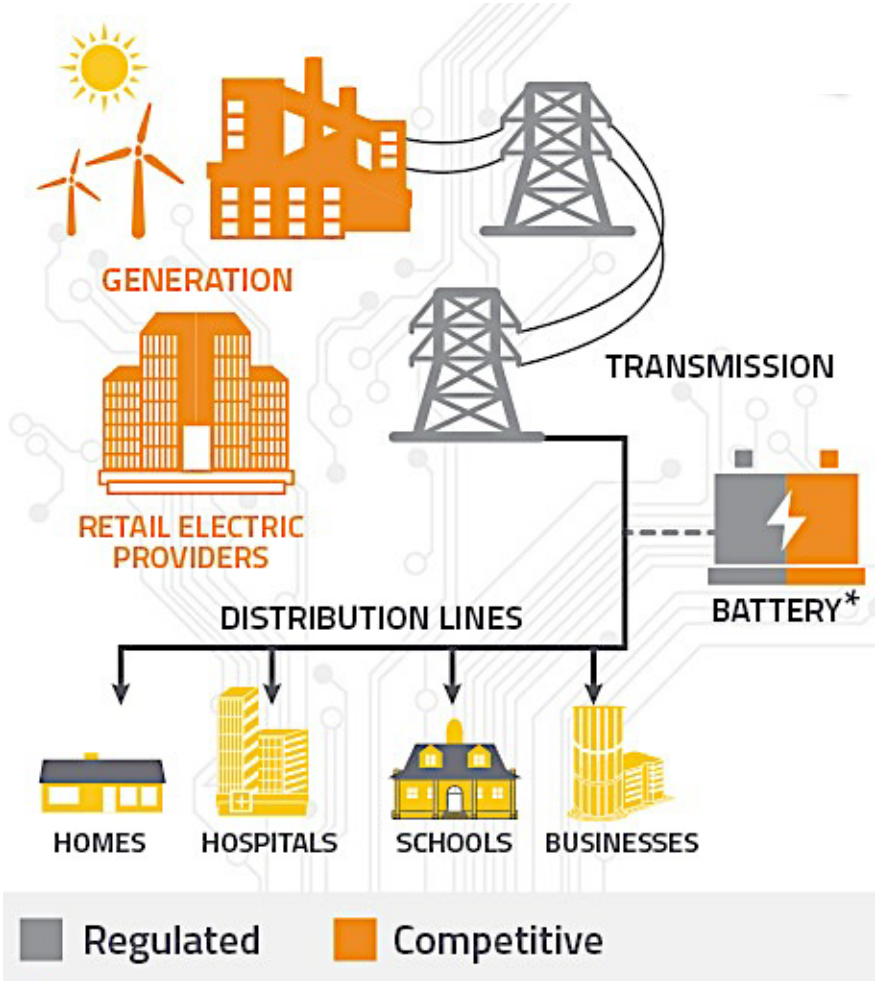
TEXAS' CHALLENGE: POWERING OUR FUTURE GROWTH

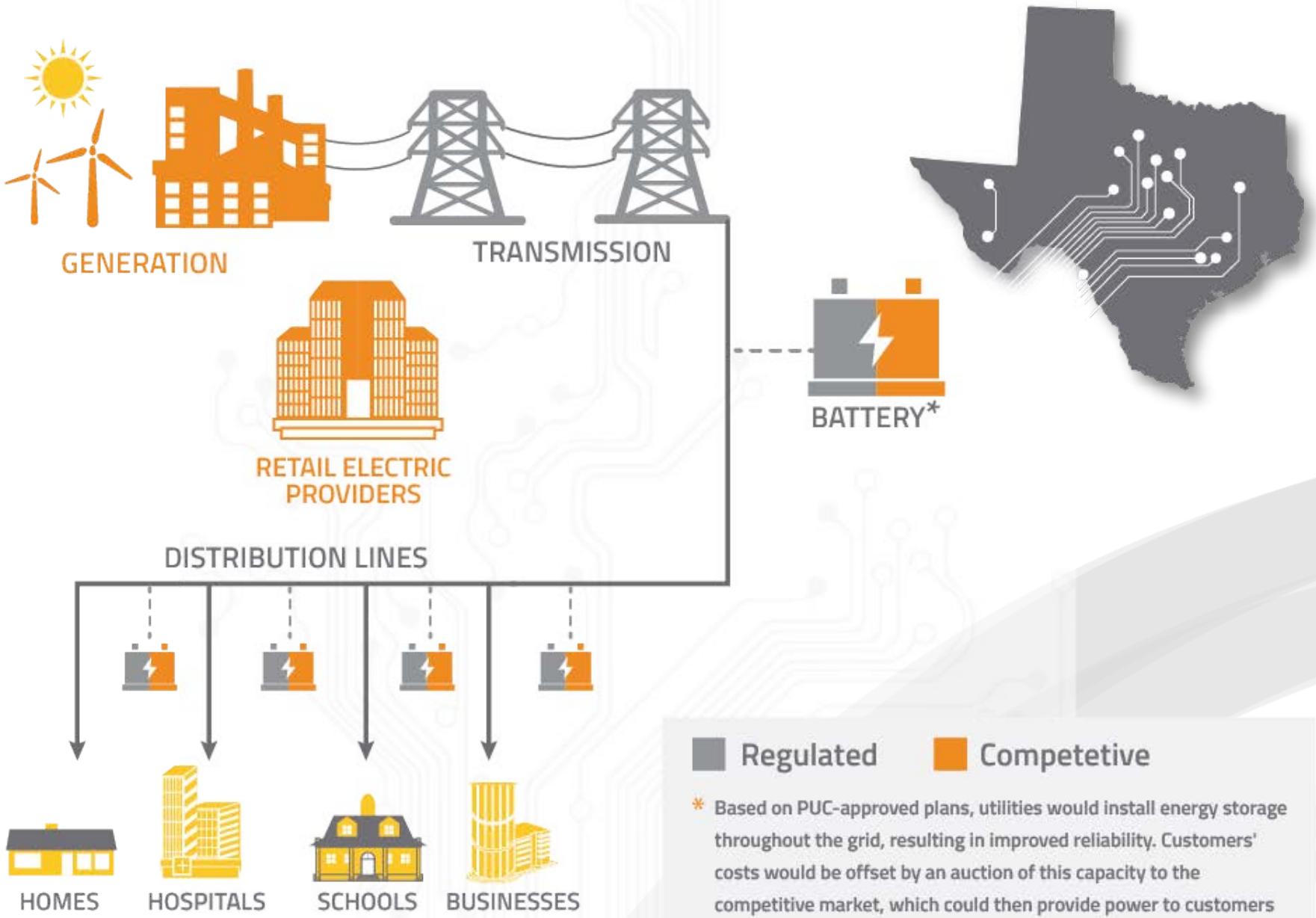


ENERGY STORAGE: CRITICAL COMPONENT



Grid integrated energy storage is the <u>only</u> technology that allows utilities to accomplish all of the following:

- Improve reliability by providing backup power during short-term outages
- Defer transmission and distribution investment through extending grid element life and optimization of system
- More efficiently and flexibly use existing power resources
- Improve voltage regulation
- Address renewable integration and grid stability



Regulated Competetive

* Based on PUC-approved plans, utilities would install energy storage throughout the grid, resulting in improved reliability. Customers' costs would be offset by an auction of this capacity to the competitive market, which could then provide power to customers when they need it the most.

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INDIVIDUAL VALUE STREAMS CREATED BY STORAGE

MARKET

- Renewable generation smoothing and dispatch
- Demand and time-of-use energy management
- Electric supply reserve capacity
- Peak shaving/load following
- Fast response ancillary services
- Capacity firming
- Frequency regulation
- Energy arbitrage
- Phase balancing
- Carbon reduction

RELIABILITY

- Support local grid during outages
- Reduce SAIDI, MAIFI, SAIFI
- Volt/VAR support – manage voltage & correct power factor to unity
- Reduce cold-load pickup after grid outage
- Transmission congestion relief
- T&D asset investment deferral
- Renewables grid integration

CUSTOMER

- Increased reliability
- Increased grid efficiency and flexibility
- Technologically advanced grid infrastructure
- Lower customer bills

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UTILITY EXPERIENCE WITH ENERGY STORAGE

ONCOR'S INITIAL INSTALLATION

SAMPLE OF UTILITY PROJECTS

- Department of Energy
- Detroit Edison
- Duke Energy
- Pacific Gas & Electric
- San Diego Gas & Electric
- Southern Cal Edison
- United Kingdom
- Italy

NEIGHBORHOOD STORAGE RELIABILITY INITIATIVE

Our Goal

Oncor has a goal to implement technologies, facilities, and operating procedures that improve distribution reliability, safety, efficiency, and the customer experience.

Purpose

The Neighborhood Storage Reliability Initiative will evaluate the effectiveness of deploying small-scale battery storage for the purpose of bridging short duration outages and improving local power quality.

Project Details

Six 25 kW Lithium Ion batteries have been installed, tested and monitored.

Capacity

These batteries are capable of bridging outages up to a few hours duration.

Project Timeline

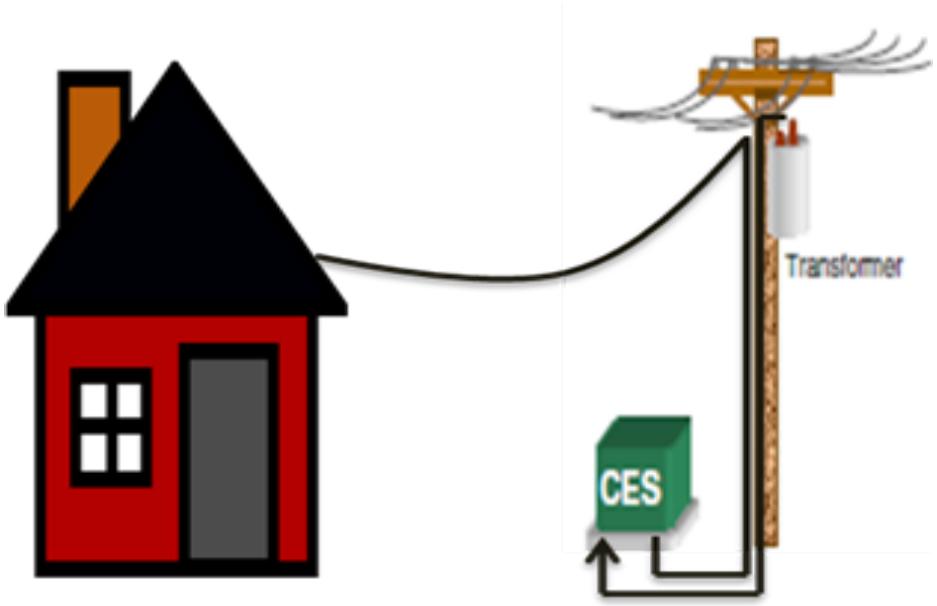
Installations occurred Q2, Q3 and Q4 2014.

*Source: S&C Electric Company

BENEFITS OF NEIGHBORHOOD STORAGE RELIABILITY INITIATIVE

Neighborhood storage is a localized means of:

1. Keeping the lights on during short-term outages.
2. Closing the gaps and smoothing the variations between local household loads and renewable power sources.
3. Enhancing the quality of power delivered to customers.
4. No on-peak or EEA event recharging.



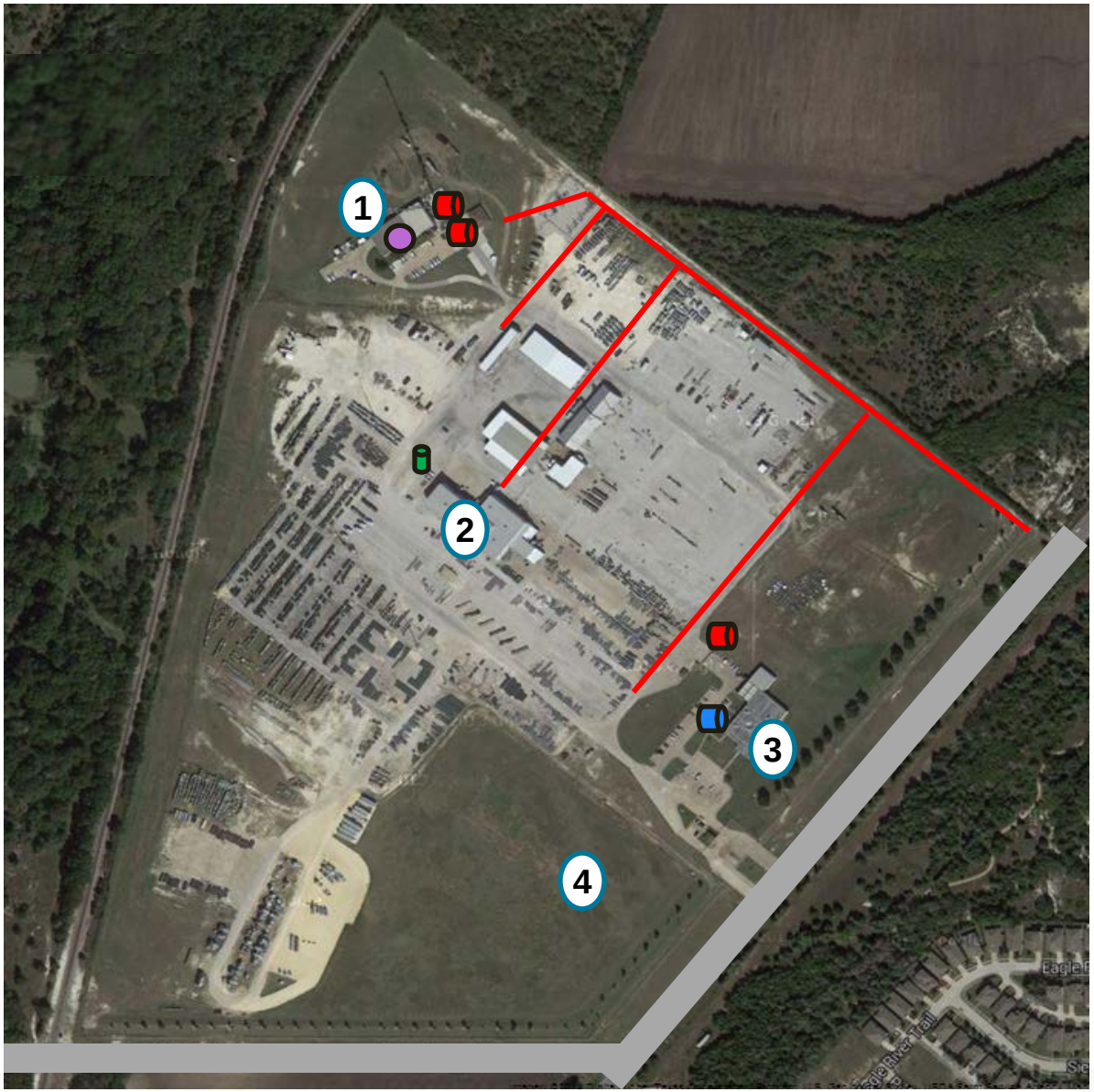
The Neighborhood Storage Initiative is one element of Oncor's efforts to improve distribution reliability.

MICROGRID

- ***A microgrid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. If desired, a microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island-mode.***

- ***Microgrid Key Attributes (Defining Characteristics)*:**
  - Grouping of interconnected loads and distributed energy resources
  - Can operate in island mode or grid-connected if desired
  - Can connect and disconnect from the grid if desired
  - Acts as a single controllable entity to the grid

ORIGINAL SITE – Early 2014



Existing Components:

TOC 1

2 – 175 kW Diesel Backup Generators

1 – 50 kVA UPS

Transformer Shop 2

1 – 25 kW/25kWh NSRI Battery

Meter Services 3

1 – 45 kW Propane Backup Generator

Functions at the Site:

TOC 1

Transformer Shop 2

-Inspect

-Refurbish

-Environmental Lab

Meter Services 3

Planned New Environmental Lab 4

Legacy Grid Becomes Microgrid

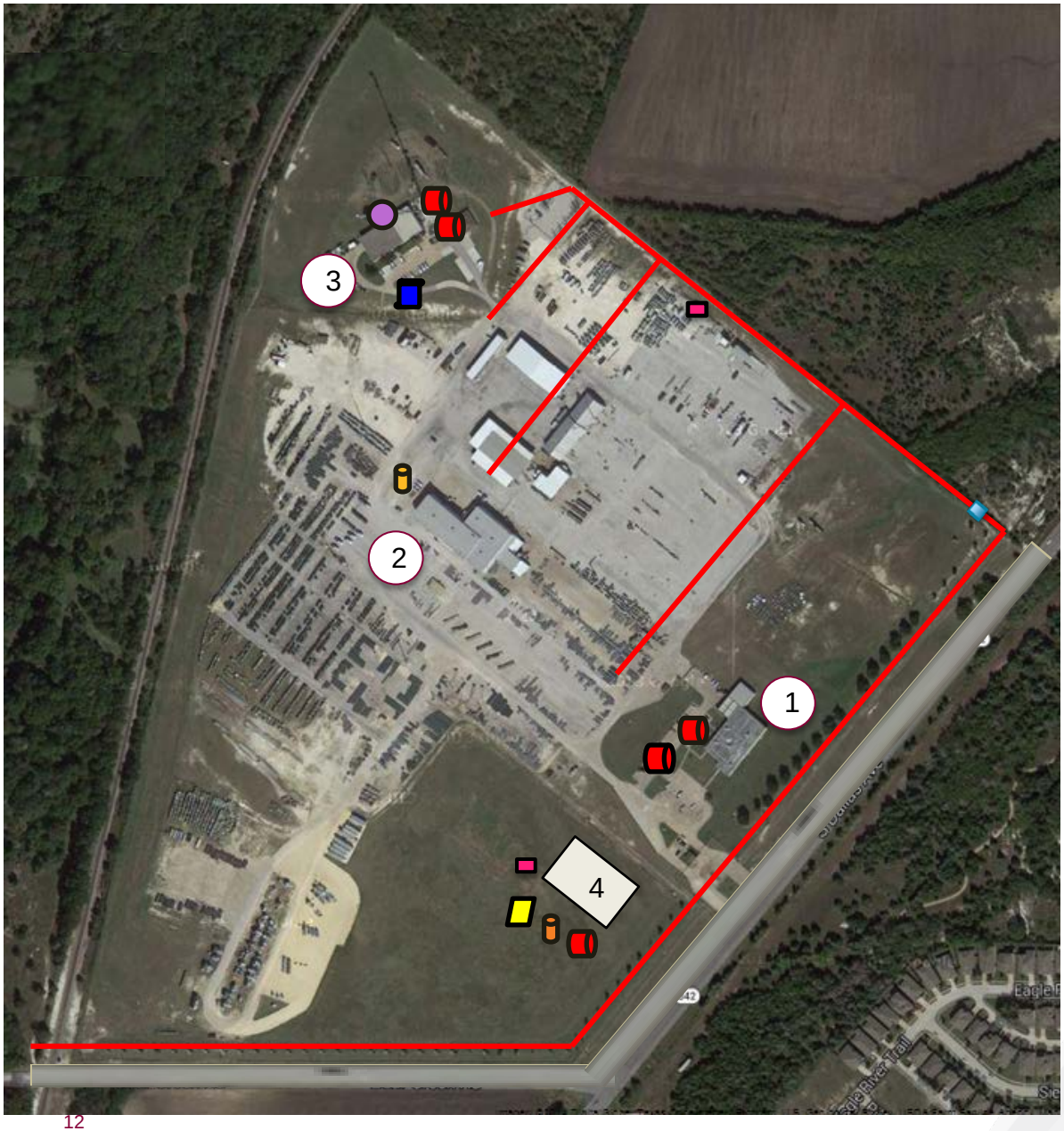
Legacy

- Utility service to each facility
- Only the most critical loads served with traditional UPS and emergency generator

Revised to Microgrid

- Single point of service to the entire site
- Utility-grade distribution system on-site
- Can be split into 3 distinct microgrids
- Additional generation
- Prioritize critical functions for operation during grid outages
- Test the integration of solar PV, microturbine, and energy storage on a distribution system

TODAY



Site:

- IntelliTeam on Grid Source Primary Meter Point
- 2 – Switchgear

Meter Services (1):

- 1 – 45 kW Propane Backup Generator
- 1 – 200 kW Diesel Backup Generator

Transformer Shop (2):

- 1 – 25 kW/25kWh Battery

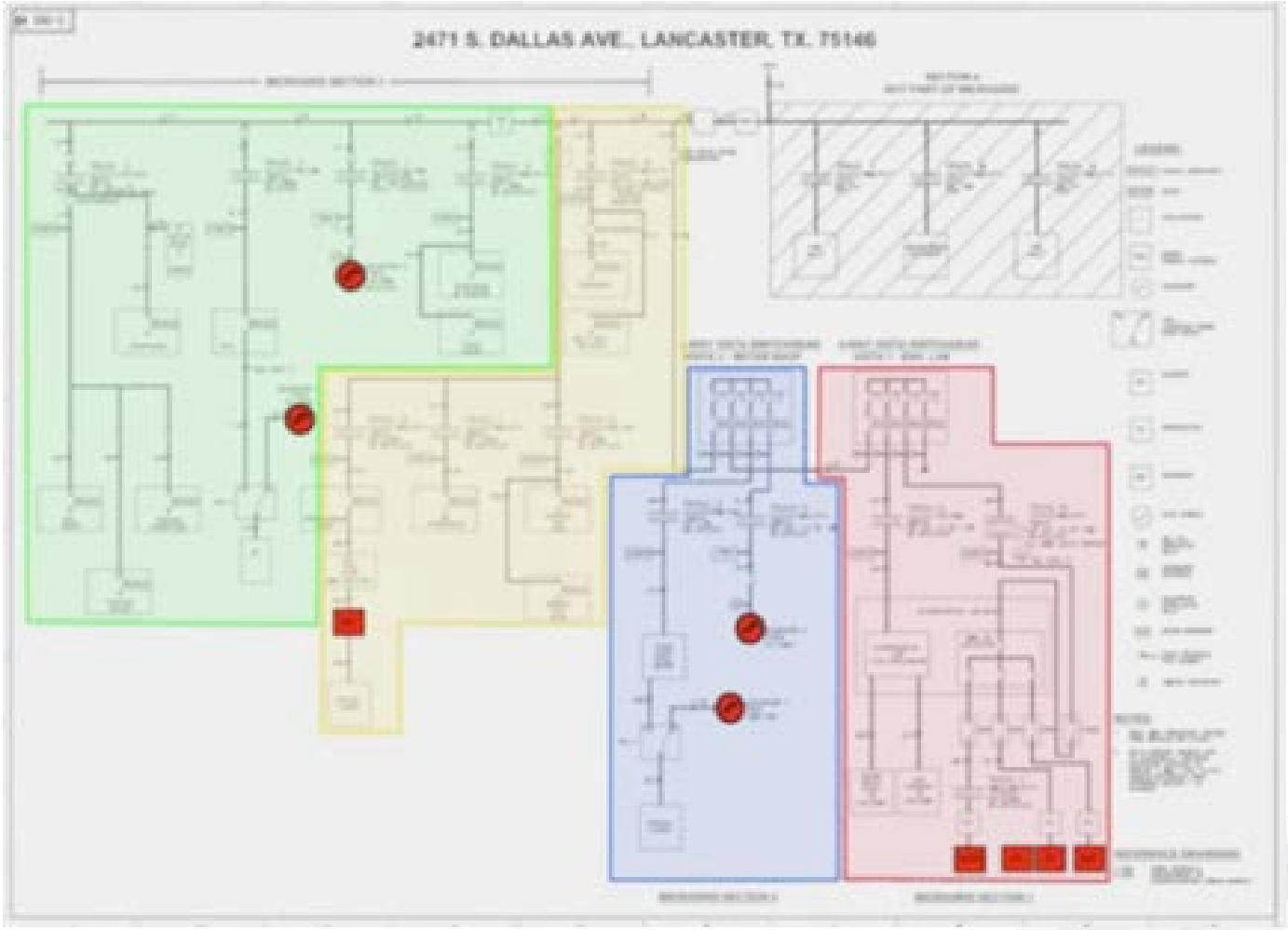
TOC (3):

- 2 – 150 kW Diesel Backup Generators
- 1 – 50 kVA UPS
- Microgrid Control System

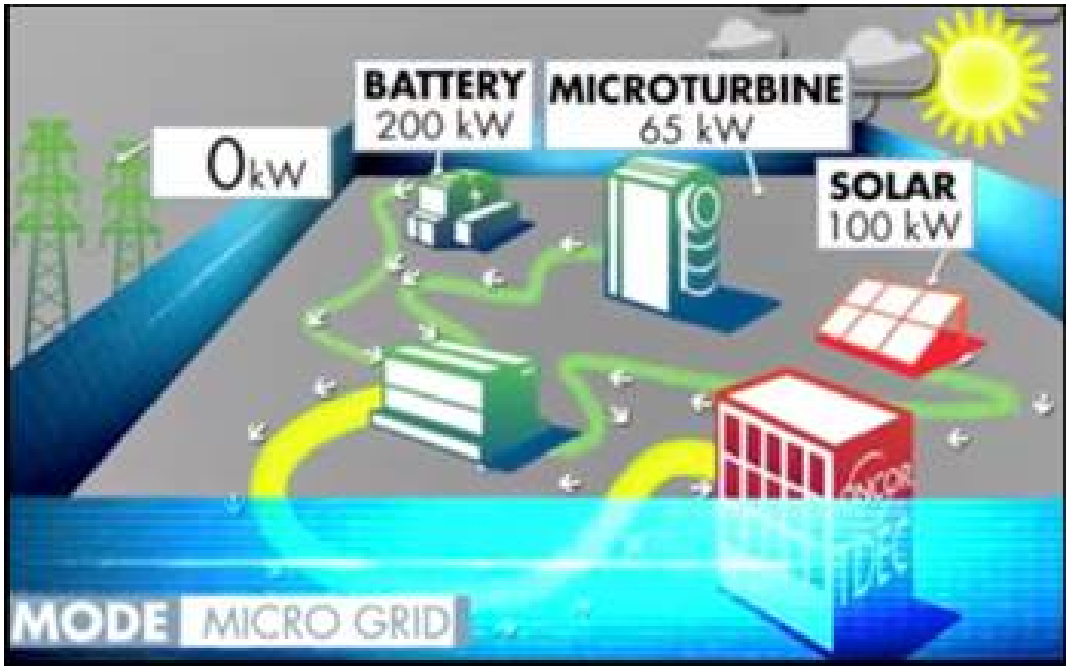
Environmental Lab (4):
Microgrid Demonstration/Education Center

- Solar
- Battery
- Microturbine

Oncor MicroGrids Within the MicroGrid

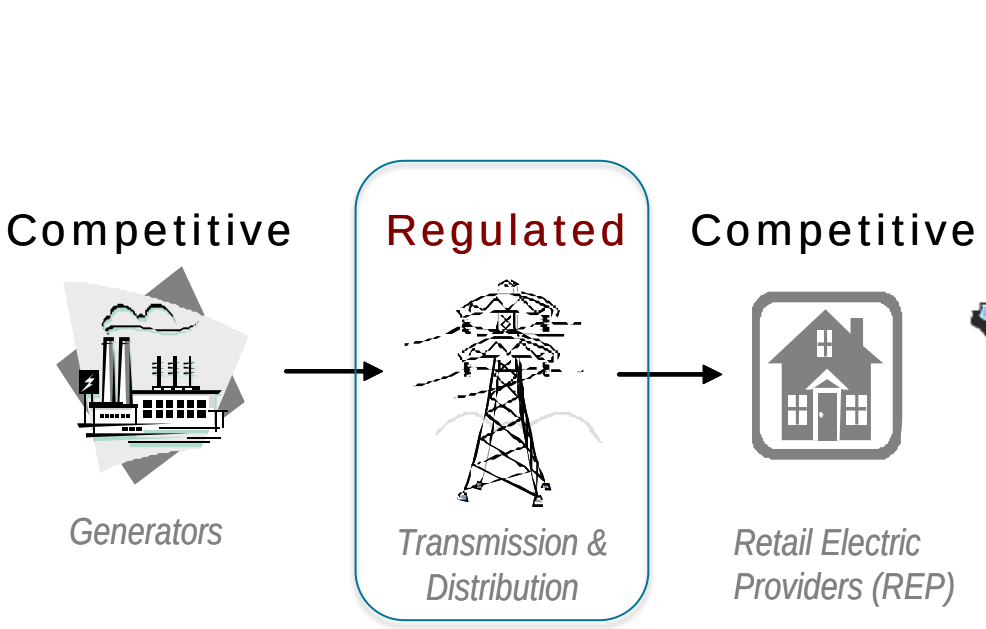


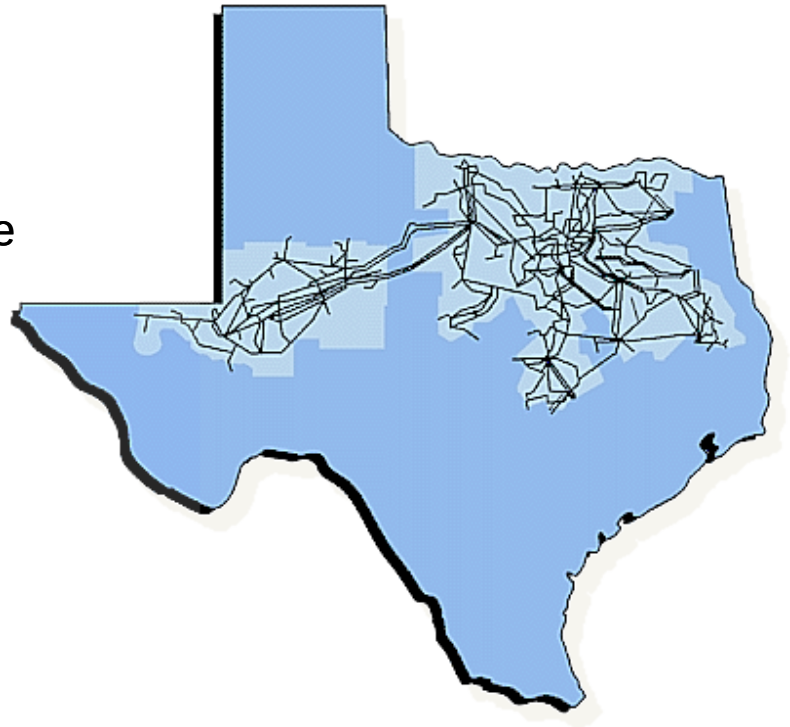
Oncor MicroGrid Operations



The Demand Side Operations platform improves the economics of distributed energy resources by leveraging ERCOT market signals, weather and forecasting information, historical energy usage data and real-time building information.

OUR ROLE IN THE MARKET





- Competitive ERCOT wholesale and retail electric energy market since 2002 for investor-owned players
- Regulated delivery utilities – do not generate, own, or sell electricity

Reliable delivery through the application of technology

Contact

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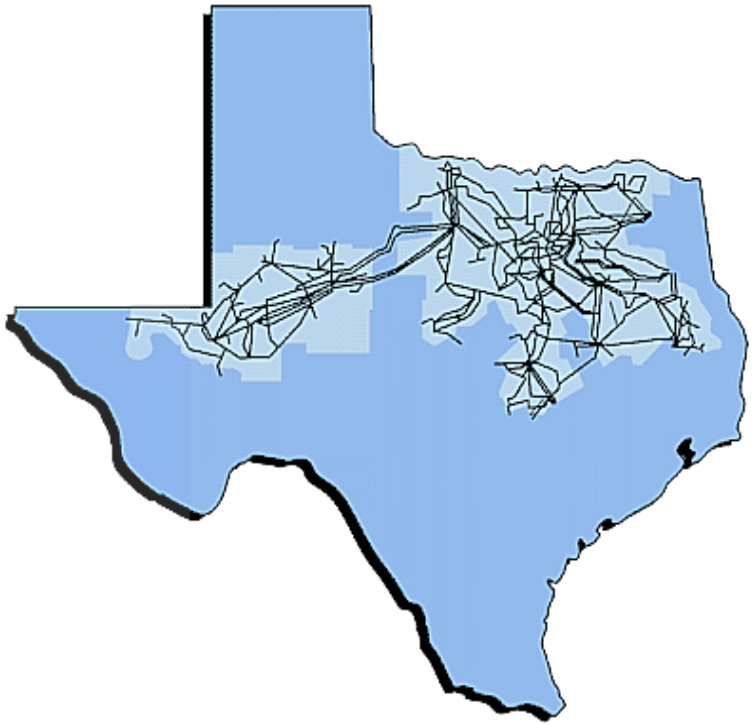

Refererences

- ERCOT
- www.ercot.com

- ERCOT Quick Facts
- http://www.ercot.com/content/news/presentations/2015/ERCOT_Quick_Facts_12815.pdf

- ERCOT Power Forward – Annual State of the Grid Report
- http://www.ercot.com/content/news/presentations/2015/2014%20State_of_the_Grid_Web_21015.pdf

- Brattle Report –
- http://www.brattle.com/system/publications/pdfs/000/005/087/original/The_Value_of_Distributed_Electricity_Storage_in_Texas_Chang_Pfeifenberger.pdf?1415626528
-
- Brattle Press Release – a nice summary of the report
- http://www.brattle.com/news-and-knowledge/news/749

- Full-length technical report to be released in 2015

- Website about Oncor Storage Concept
- www.foundationgrid.org