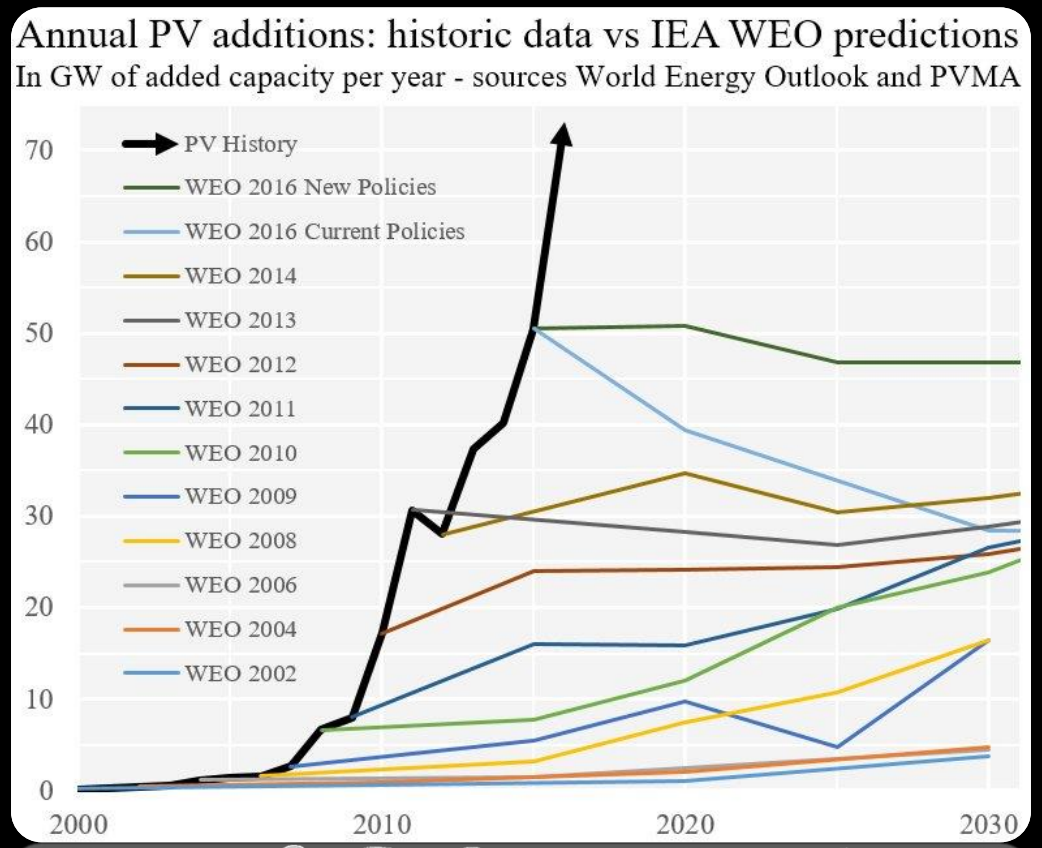
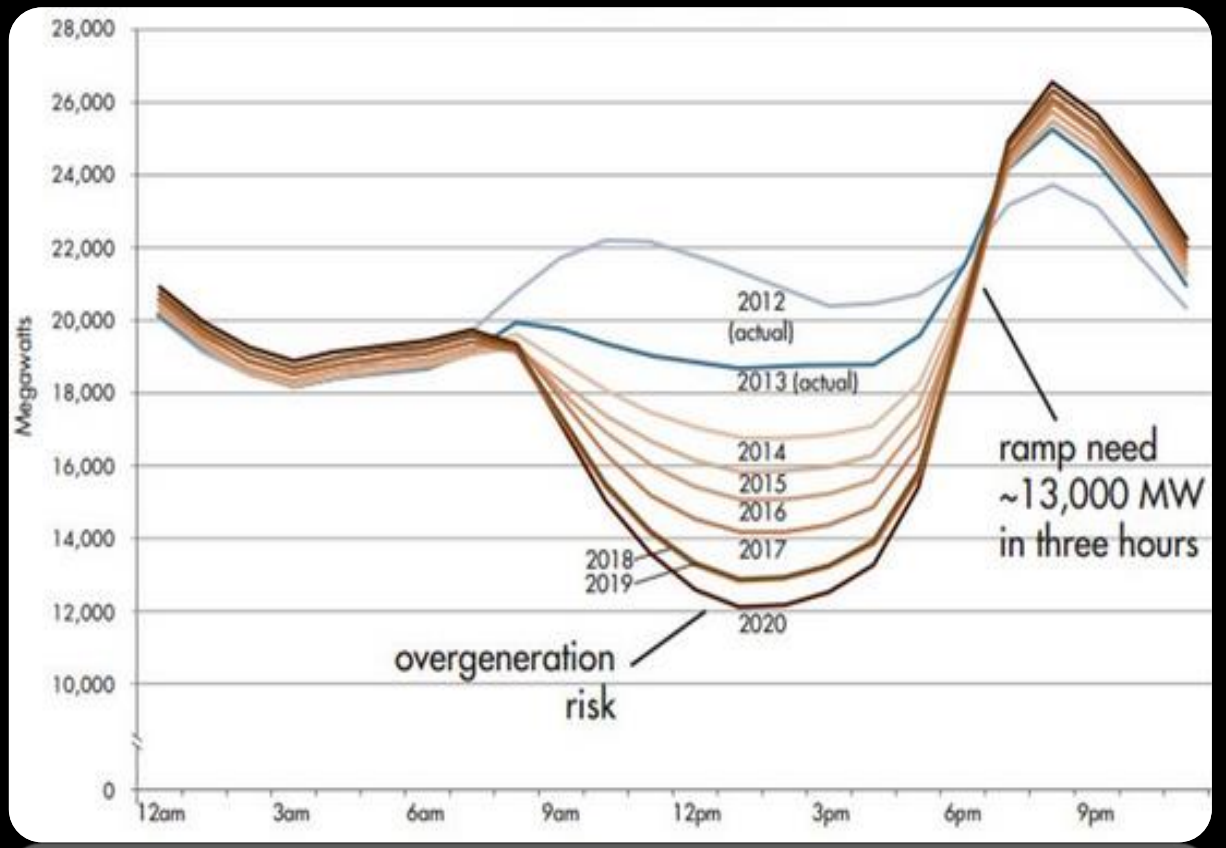
Growth In Renewables & It's Impact





"renewables would not be expected to reach 19.35 percent until roughly the year **2057**."

*…..We **exceeded** this mark in April 2017*

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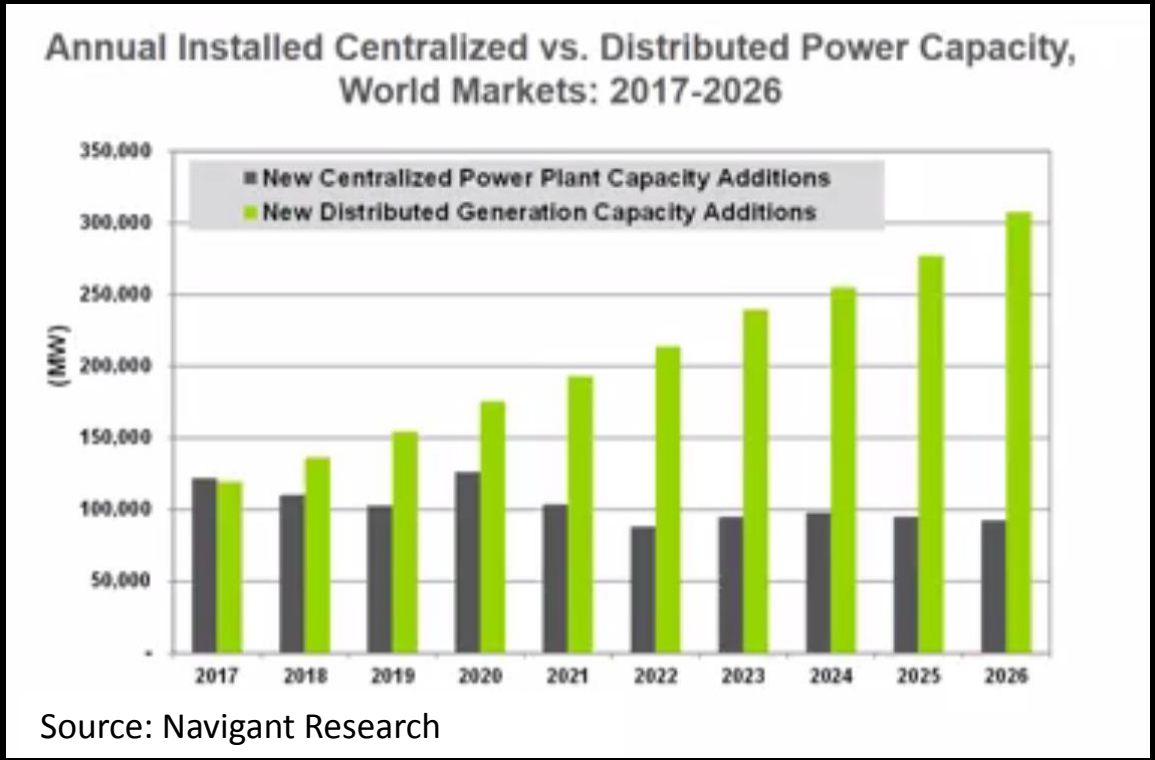
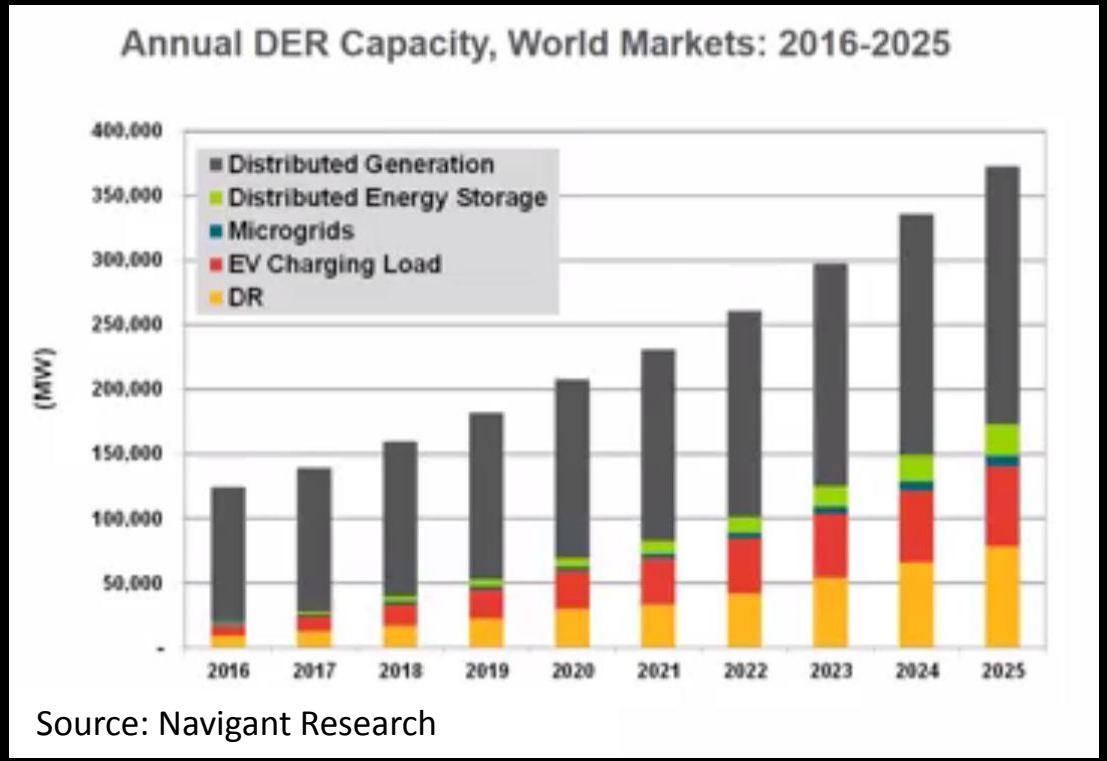
The market is changing…DER's are coming

Currently outpacing traditional generation



Source: Navigant Research



Source: Navigant Research

…and the trend is only going to increase across all DER's

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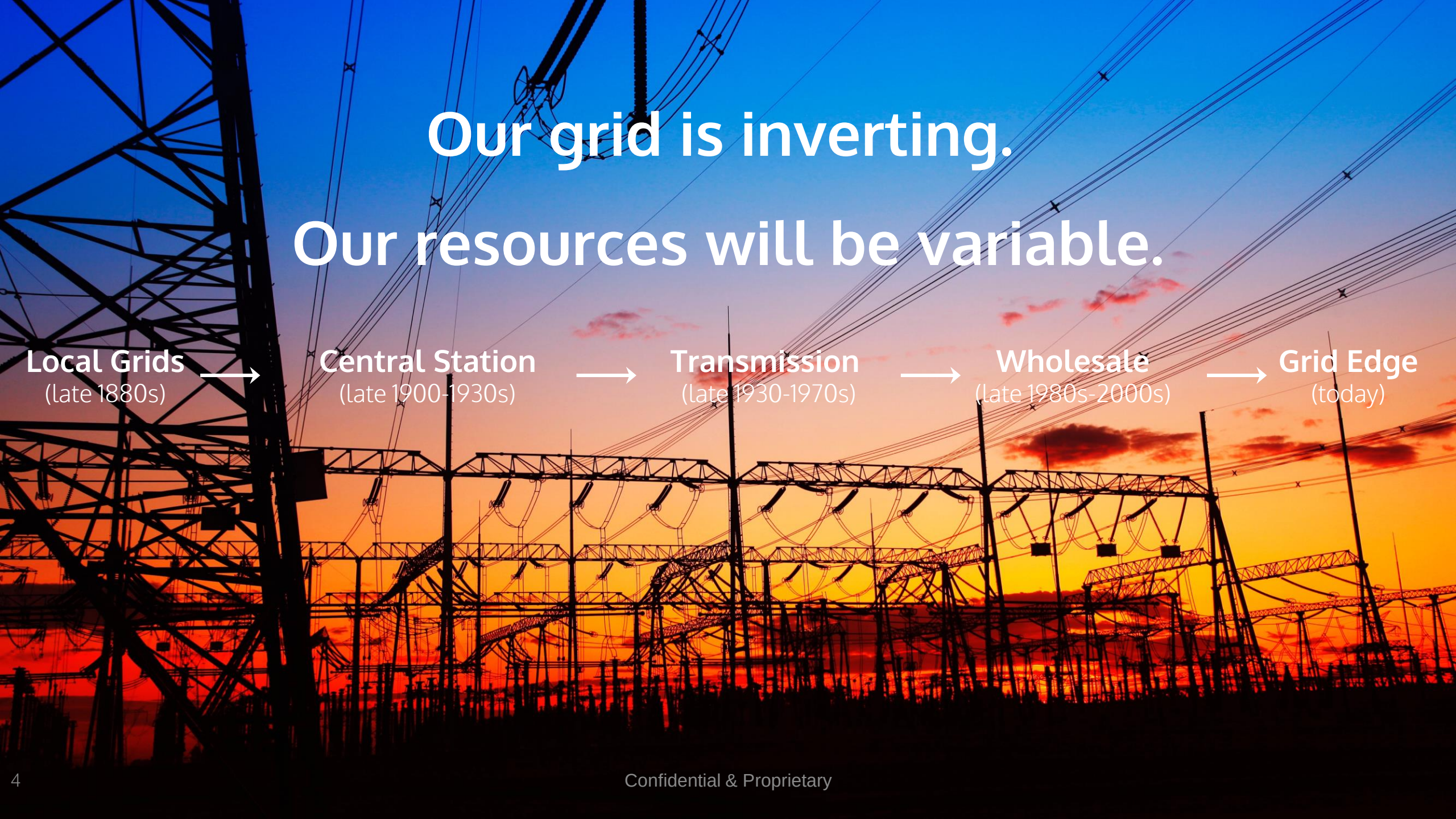
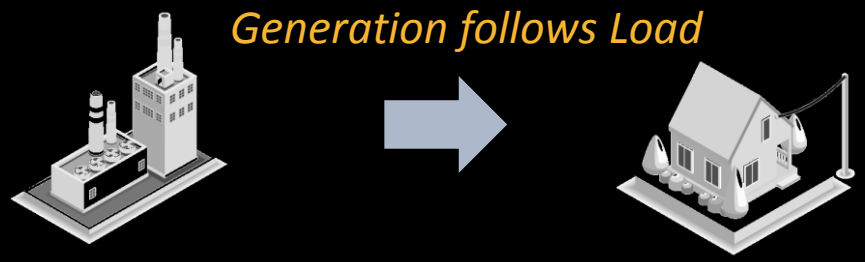


The New World of Distributed Energy

Old-World

Generation follows Load



Rate Payers

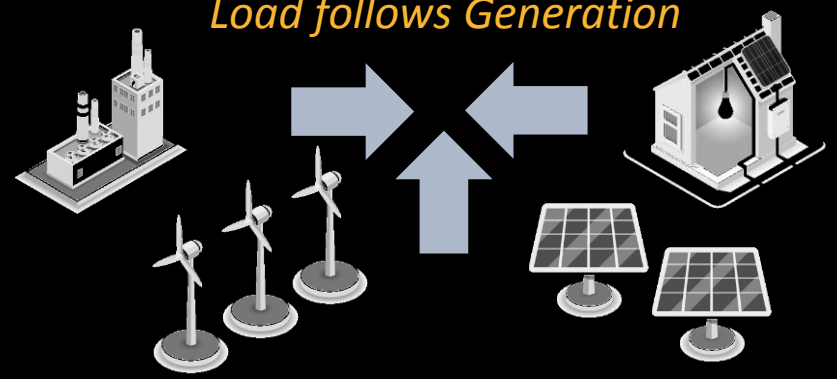
Hourly Energy Data

Static Grid

Volume of Electrons

New-World

Load follows Generation



Prosumers

Real Time Energy

Cost Arbitrage

Dynamic Grid

Services not Electrons

Optimization

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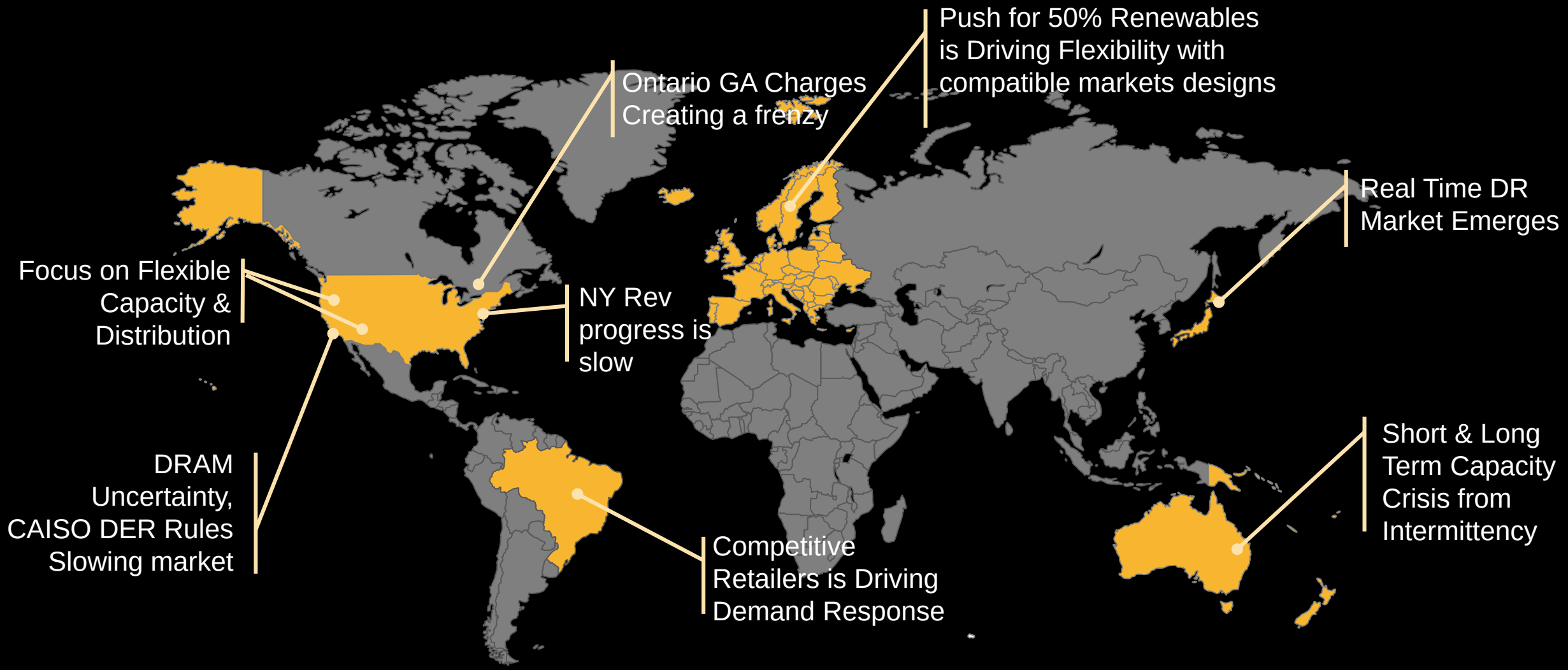
Global Market Movement



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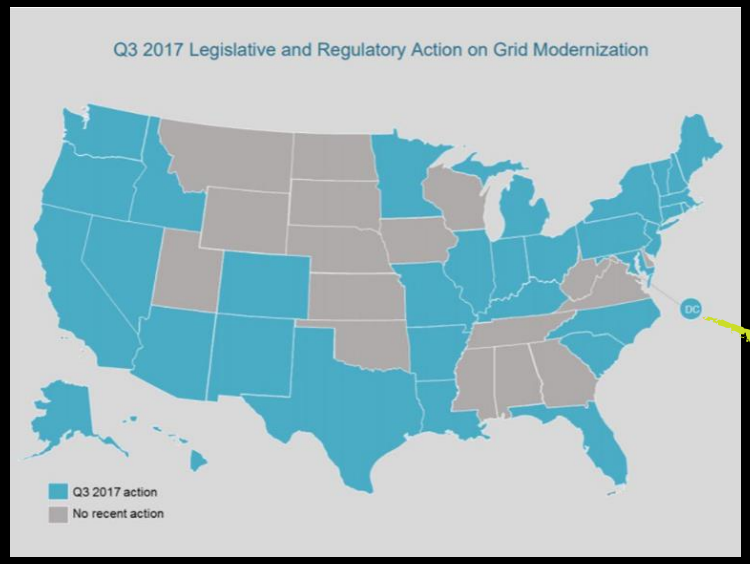
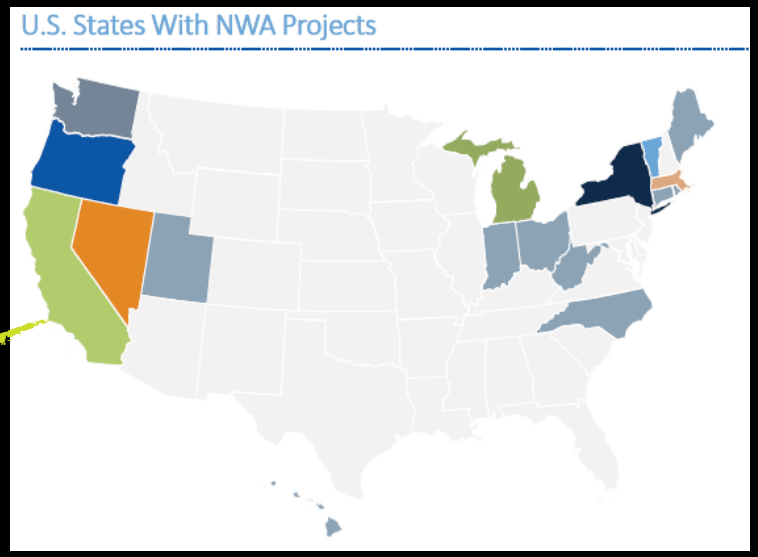
This New World Calls for NWA's...

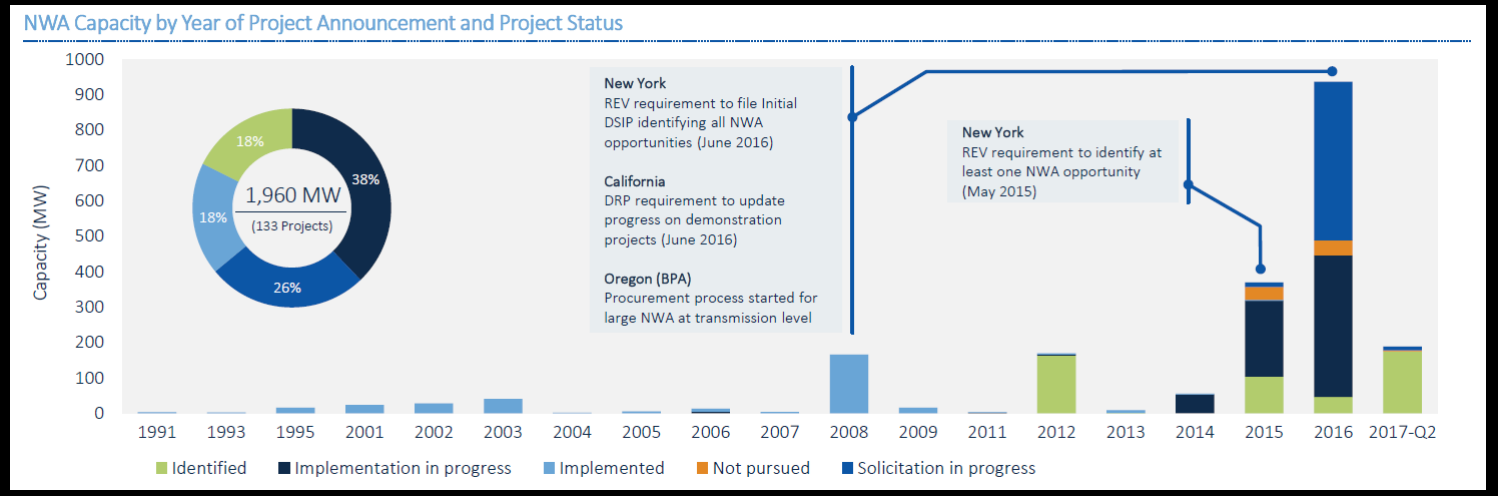


Source: NCCETC Q3 2017 grid modernization policy update

NWA Projects are being developed & executed at a rapid pace



Source: GTM Research



Source: GTM Research

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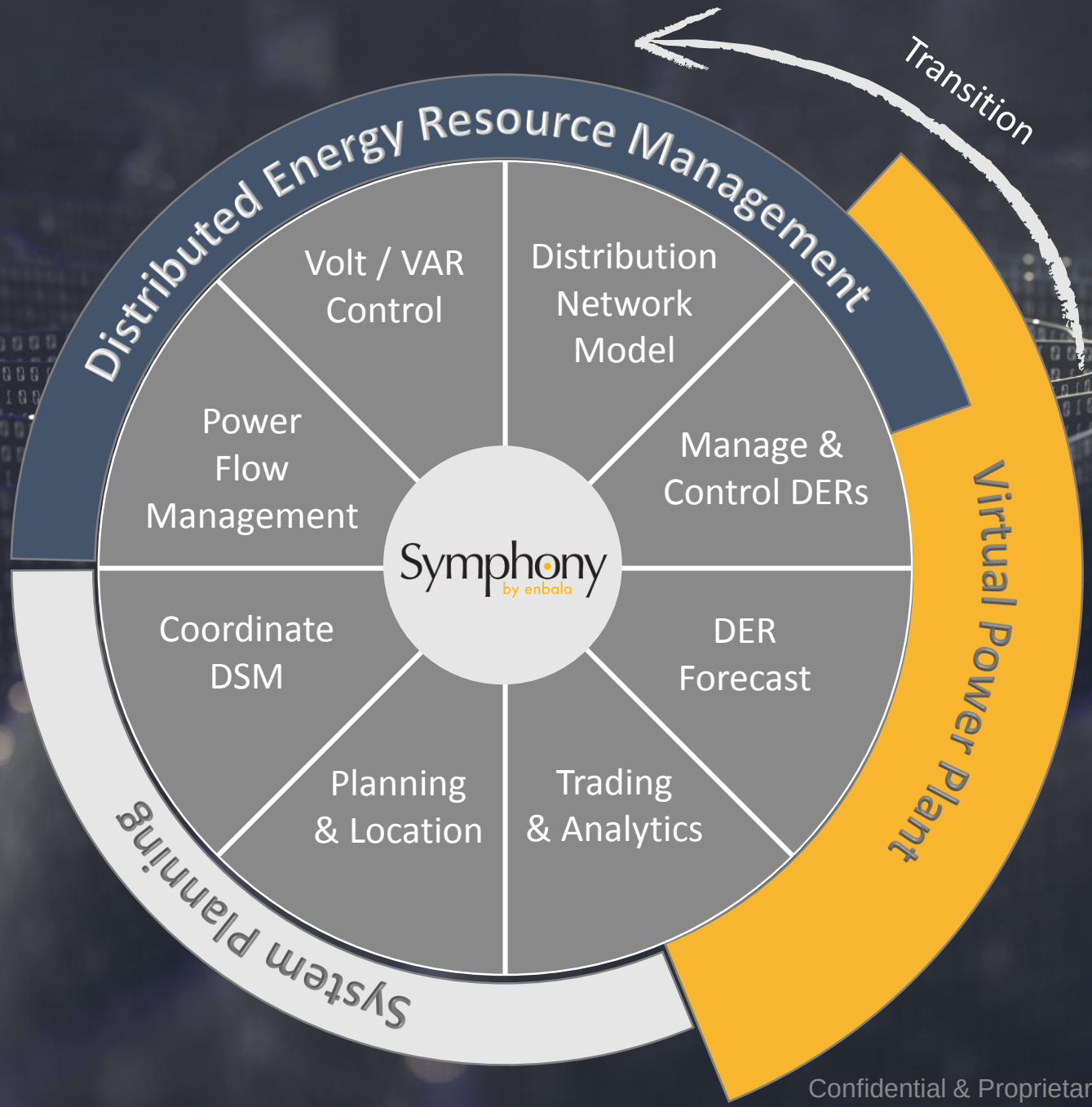
More Like this. . .



Virtual Power Plant

- Real Time Aggregation & Optimizatio
- Dispatch and Control of resources
- Wholesale Markets and Utilities

Distributed Energy Resource Management

- Distribution System Optimization
- Coordinated Operation of Resources
- Distribution Utilities

Distributed Energy is Forcing Change

	The 1980/90s		The 2000s		The Grid 2.0 by 2020	
Integration Approach	Bulk File Transfer		Bulk File Transfer		Open APIs	
Setup/Configuration	One Size fits all		Estimated		Hybrid	
Forecasting	Estimated & Fixed		Estimated		Intelligent Systems	
Local Optimization (TOU/PDM/Self Consumption)	None		Time Clock		Closed Loop	
Portfolio Optimization	None		Lego Block		Real Time Optimization	
Wholesale Market Transactions	None		Minimal		Bi-Directional	
Distribution System Power Optimization	None		Minimal		ADMS Integrated	
Distribution System Volt/VAR Optimization	None		None		ADMS Integrated	

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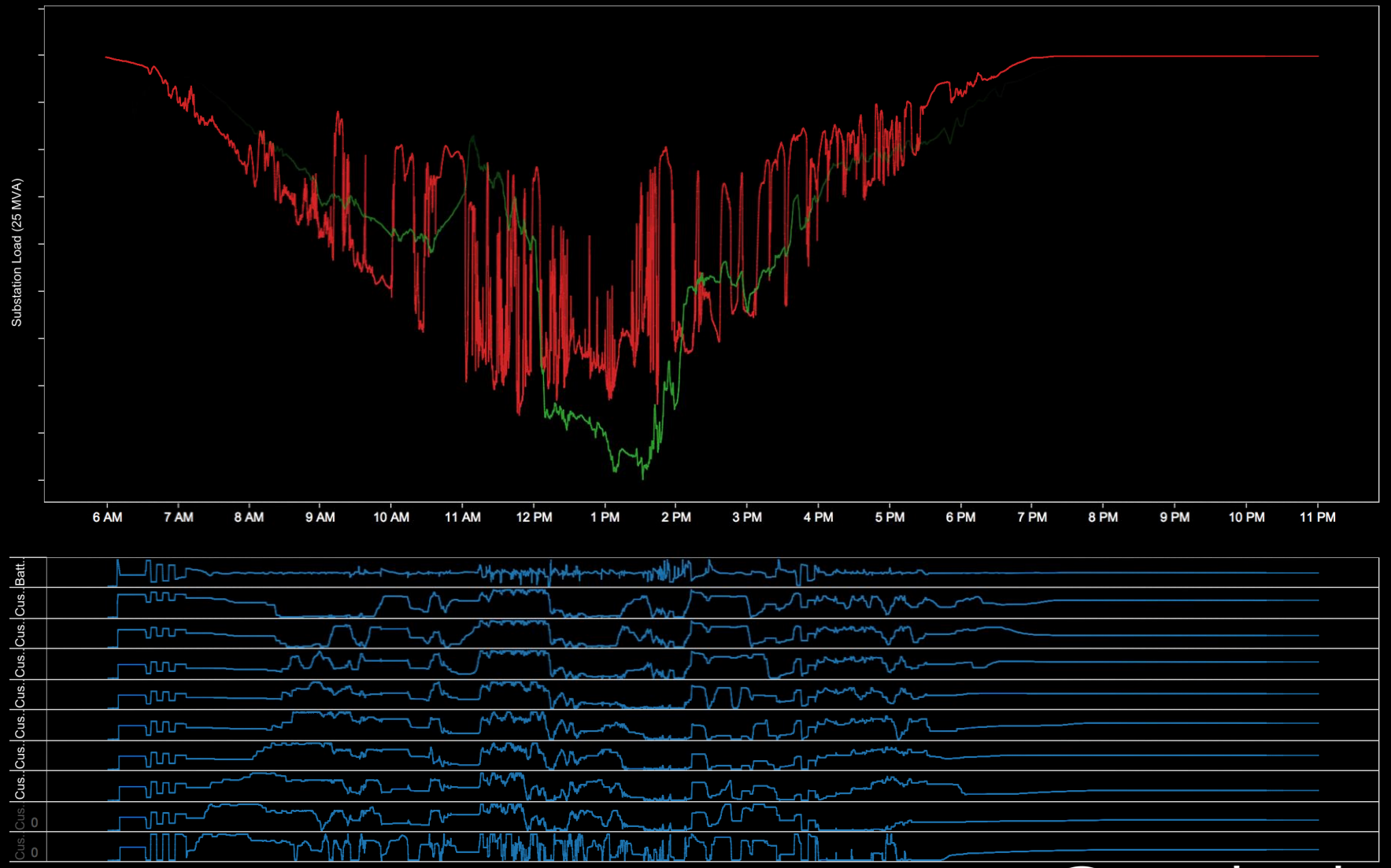
From Volatility to Reliability

Case Study #1

- Simultaneously Power Firming & Capacity Relief
- Network of Loads & Batteries to drive Power profile



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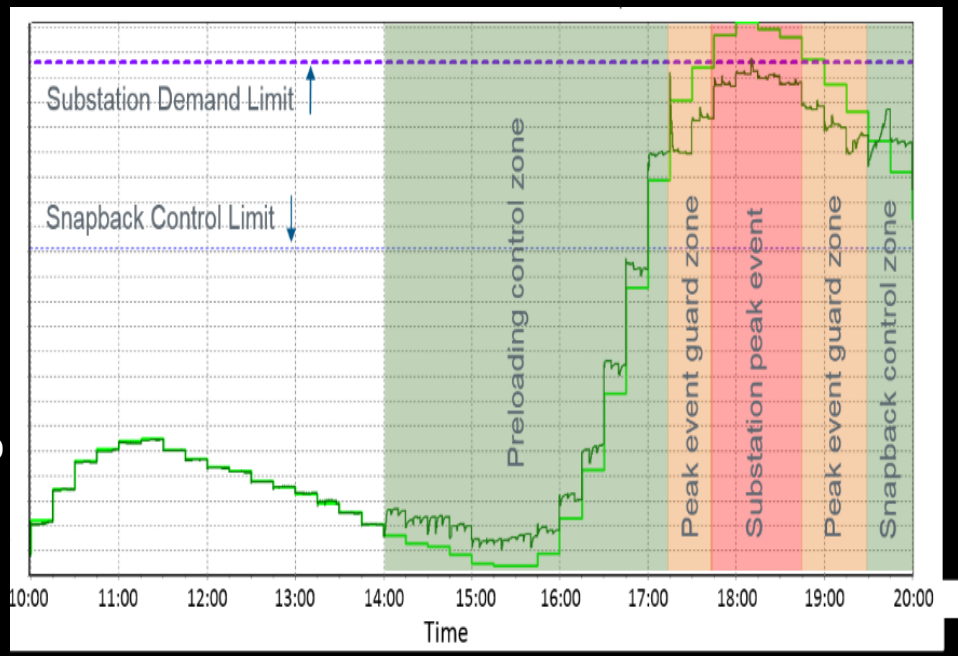
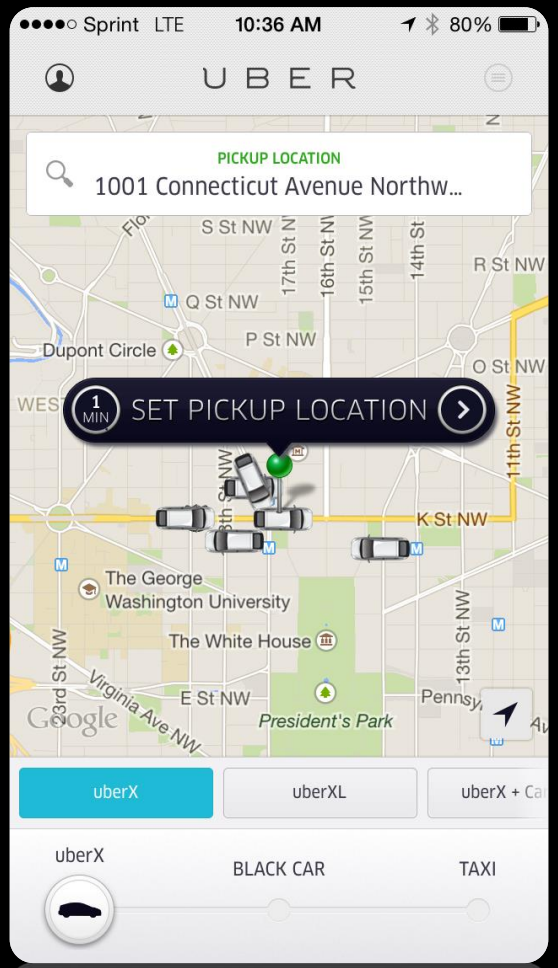
Substation Capital Investment Deferral

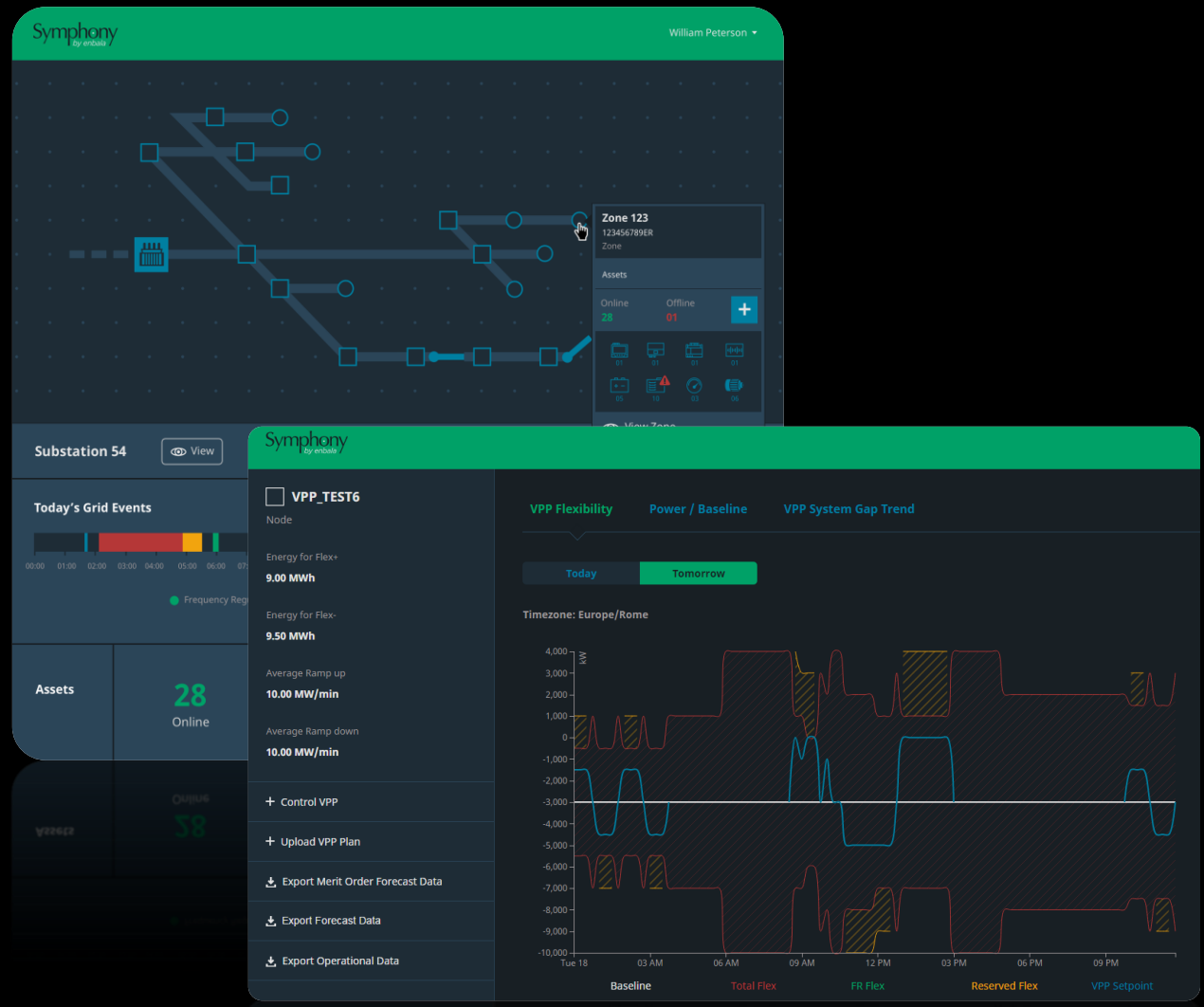
- **Benefits:**
  - Substation investment deferral through demand side management
  - Asset life extension
  - Revenue and reliability advantages for participating customers
- **Internet of Things Solution:**
  - **Constituents:** Customer, Enbala, network of C&I customers, e.g., meat plants, foundries, milling facilities, schools, retail facilities, transportation agencies, professional services and IT organizations.
  - **Things:** Substations, utility assets, distributed energy resources of participating commercial/industrial facilities
- **Process:** Control signals sent between the *Symphony by Enbala*^{TM} platform, the substation and and participating DERs to ensure appropriate loads store energy prior to peak. During the peak, the network utilizes the stored energy, reducing generation.
- **Deployment Status:** Initial feasibility study using data from three substations in British Columbia
- **Results:**
  - By analyzing flexibility within peak demand constraints, the controlled assets were aggregated and optimized, ensuring the substation load remained below peak threshold.
  - Potential to realize 8-10 MWs of DER control
  - Capacity cost - $66/kw-year



Improve Operations	Optimize Assets	Enhance Services	Generate Revenues	Increase Engagement	Improve Well-Being	Provide Security	Conserve Resources

Unlocking ‘the UBER model’ for Distributed Energy





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Thank You

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