We are creating a Sustainable Energy Future
"renewables would not be expected to reach 19.35 percent until roughly the year 2057."

.....We exceeded this mark in April 2017
The market is changing…DER’s are coming

Currently outpacing traditional generation

...and the trend is only going to increase across all DER’s

Source: Navigant Research
Our grid is inverting.

Our resources will be variable.
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
Global Market Movement

- Push for 50% Renewables is Driving Flexibility with compatible markets designs
- Real Time DR Market Emerges
- Short & Long Term Capacity Crisis from Intermittency
- Competitive Retailers is Driving Demand Response
- Focus on Flexible Capacity & Distribution
- DRAM Uncertainty, CAISO DER Rules Slowing market
- Ontario GA Charges Creating a frenzy
- NY Rev progress is slow

Focus on Flexible Capacity & Distribution
This New World Calls for NWA’s…

NWA Projects are being developed & executed at a rapid pace

Source: NCCETC Q3 2017 grid modernization policy update

Source: GTM Research
Flexibility is the Key to Reliability

But not like this. . . !
More Like this. . .
Virtual Power Plant

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

Distributed Energy Resource Management

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

- Volt / VAR Control
- Power Flow Management
- Coordinate DSM
- Planning & Location
- Distribution Network Model
- Manage & Control DERs
- DER Forecast
- Trading & Analytics
- Coordinate DSM
- Planning & Location
- Distribution Network Model
- Manage & Control DERs
- DER Forecast
- Trading & Analytics
# Distributed Energy is Forcing Change

<table>
<thead>
<tr>
<th>Integration Approach</th>
<th>The 1980/90s</th>
<th>The 2000s</th>
<th>The Grid 2.0 by 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk File Transfer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Setup/Configuration        |              |           |                      |
| One Size fits all          |              |           |                      |

| Forecasting                |              |           |                      |
| Estimated & Fixed          |              |           |                      |

| 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      |
From Volatility to Reliability

Case Study #1

- Simultaneously Power Firming & Capacity Relief
- Network of Loads & Batteries to drive Power profile
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*™ 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
Thank You

Jonathan “J.T.” Thompson
Vice President Regional Sales
Enbala Power Networks
832.475.7272
jthompson@enbala.com