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AN EXELON COMPANY

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NASPI, Welcome to Chicago

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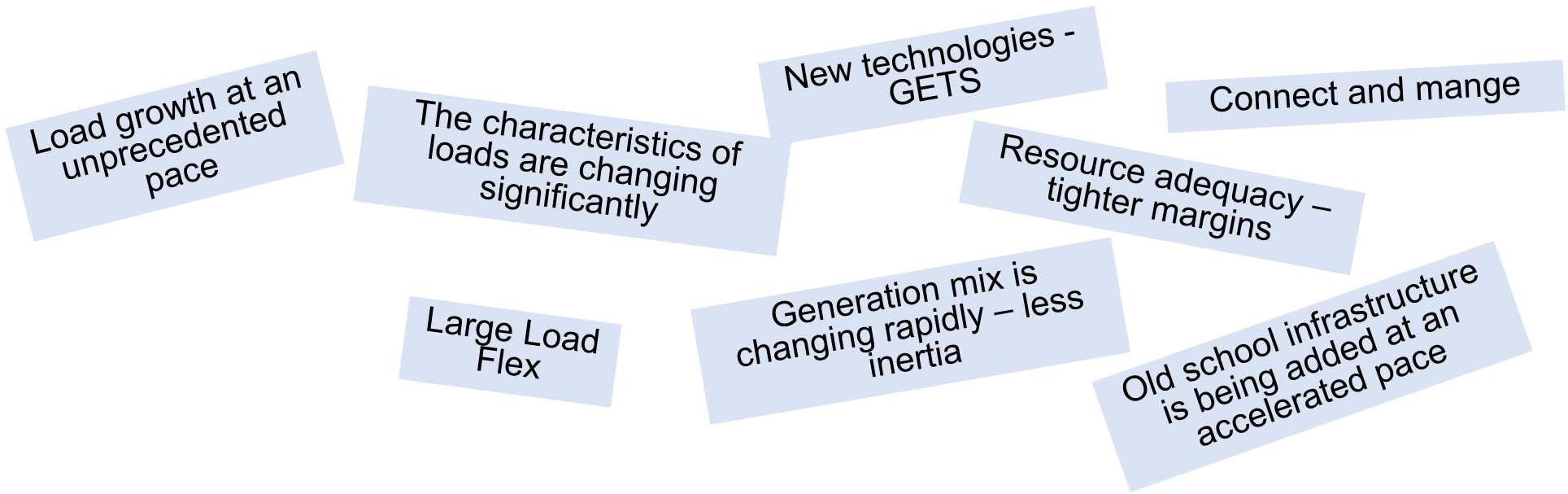
Why we are here today

“Most complex failures don’t happen because of one bad decision. They happen because a system behaves exactly as it was designed to.”



“Five years from now, what decision we’re making today will we wish we had made differently?”

Welcome to Chicago!

- One of America's greatest cities!
  - Museums & Zoo
  - Professional sports teams - Football, basketball, hockey, soccer and two baseball teams
  - World class dining
  - Renowned architecture
  - Lake Michigan
  - The weather is never boring
- To do's while you are here:
  - Take an architecture boat ride
  - Walk along the lake
  - Visit a museum, or two, or three
  - Eat pizza – deep dish or Chicago

Welcome to Chicago!

Argonne National Laboratory

Argonne had its beginnings in the **Metallurgical Laboratory** of the University of Chicago, formed in part to carry out **Enrico Fermi's work on nuclear reactors for the Manhattan Project** . Since then the laboratory was a hub for peaceful use of nuclear physics; nearly all operating commercial nuclear power plants around the world have roots in Argonne research. More than 1,000 scientists conduct research at the laboratory, in the fields of energy storage and renewable energy; fundamental research in physics, chemistry, and materials science; environmental sustainability; supercomputing; and national security.

Willis Tower

We put a Substation in the basement!!!

Fermi National Accelerator Laboratory

A satellite view of Fermilab. The two circular structures are the Main Injector Ring (smaller) and Tevatron (larger).

High-Temperature Superconducting (HTS) Power Cable

- Resilient Electric Grid (REG) Project
- Technology: HTS AC power cable using American Superconductor (AMSC) wire
- Capability: ~3000 A at ~12 kV (≈62 MVA)
- Purpose: Improve grid resiliency and allow power rerouting around substations

Exelon Overview

6 T&D-only utilities
Operate within seven regulatory jurisdictions

4 major metro areas served
Chicago, Philadelphia, Baltimore, and Washington D.C.

20,000
Employees across our operating companies

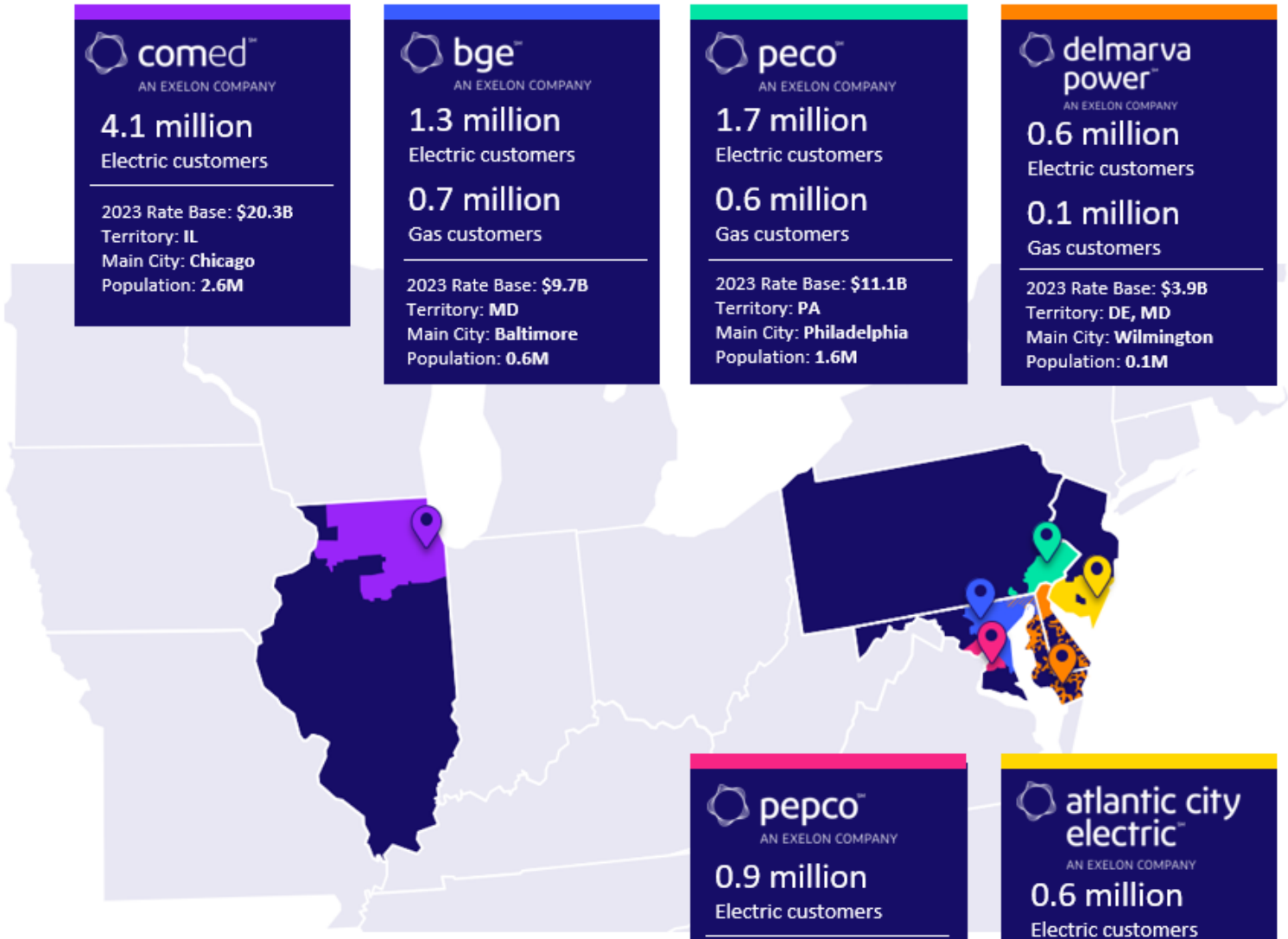
10.7 million(1)
Electric and gas customers served across our service territories

25,600
Square miles of combined service territory across our jurisdictions

184,300
Circuit miles of electric and gas distribution lines

11,160
Circuit miles of FERC-regulated electric transmission lines

Exelon's mission is to be the leading diversified energy company by providing reliable, clean, affordable and innovative energy products.



(1) Customer count reflects the sum of Exelon's total gas and electric customer base; Exelon consolidated customer count may not sum due to rounding

Peak Loads and Generation Information

Company	Summer All-Time Peak	Winter All-Time Peak	Gen Cap / # Gen Units
bge AN EXELON COMPANY	**7,236 MW** (7/21/2011)	**6,712 MW** (2/20/2015)	**4,861 MW / 18**
pepco AN EXELON COMPANY	**7,023 MW** (7/22/2011)	**6,066 MW** (2/20/2015)	**6,121 MW / 32**
atlantic city electric AN EXELON COMPANY	**3,009 MW** (8/3/2006)	**1,801 MW** (1/7/2014)	**1,222 MW / 12**
delmarva power AN EXELON COMPANY	**4,288 MW** (8/3/2006)	**4,168 MW** (1/23/2025)	**3,827 MW / 59**
peco AN EXELON COMPANY	**8,984 MW** (7/22/2011)	**7,166 MW** (1/7/2014)	**13,025 MW / 84**
comed AN EXELON COMPANY	**23,753 MW** (7/20/2011)	**16,514 MW** (1/6/2014)	**33,850 MW / 163**
Exelon	**~ 55 GW**	**~ 42 GW**	**~ 63 GW**

Current generation deactivations across Exelon's footprint will be over 5,800 MW by mid-2029

The industry problem is no longer “Do we have PMUs?” — it’s “What do we do with all this data, safely and reliably, in real time?”

Data Volume, Velocity, and Complexity (The Core Problem)

- PMUs stream 30–120 measurements per second, per device - producing terabytes of data annually.
- Traditional grid systems (SCADA, EMS) were designed for seconds-to-minutes data, not sub-second streams
- Many existing architectures cannot ingest, process, and analyze PMU data fast enough
- Often PMU data is collected but vastly underutilized - only a fraction of available measurements is utilized in real-time operations

Emerging Grid Dynamics Are Outpacing Legacy PMU Use

- The grid is changing faster than PMU applications have evolved:
  - High inverter-based resources (IBRs)
  - Lower system inertia
  - Faster transients and control interactions
- Traditional PMU analytics were designed for:
  - Synchronous generator-dominated systems
  - Low-frequency oscillations
- Modern grids need:
  - Faster detection
  - Edge-based analytics
  - New models

PMUs are no longer limited by sensing or deployment—the real challenge is operationalizing high-speed synchrophasor data into trusted, real-time decision support at grid scale

A look at the ComEd load and generation challenge

- Approximately ***25,000 MW of data center load*** is expected within ComEd by 2035
- Large load increases collide with policy
  - CEJA – Climate and Equitable Jobs Act in Illinois
    - 100% clean energy by 2050
      - Coal to be phased out by 2030
      - Substantial nature gas to be phased out by 2045
    - 1,000,000 EVs by 2030
- Current generation deactivations across ComEd's footprint will be over ***5,800 MW by mid-2029***

Vastly different load characteristics

Wind, solar, and nuclear will remain - how to we control voltage and frequency after the loss of inertia and much of the ability to regulate voltage?

How will PMU's help – monitoring to actions

Monitoring, monitoring, monitoring

- Oscillation detection
- Detect sudden load ramps almost instantly
- Rapid phase-angle changes
- Early frequency impacts
- Inertia measurement
- PMUs enable wide-area phase-angle monitoring, which:
  - Shows how much electrical "stress" exists between regions
  - Reveals congestion long before thermal limits are reached
- Distinguish data-center-driven events from generation or transmission faults
- Provide ride-through verification

Actions

- Voltage support becomes proactive instead of reactive
  - Fine-tuning of capacitor/reactor switching
  - Better FACTS or STATCOM control
- Validate load models after interconnection
- Measure actual ramp rates and power factor behavior
- Confirm whether grid upgrades performed as expected

Our objective today is to build out actions and determine how we facilitate the operationalizing them

“The question isn’t whether change is coming. It’s whether we choose to lead it—or explain it later.”

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Thank You and Enjoy your stay!