AEG – New York State

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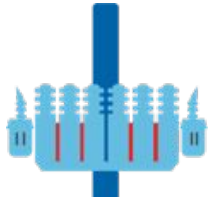
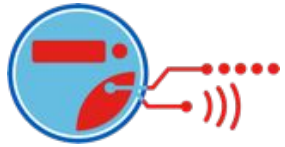
Mission-Critical Infrastructure Solutions

Coming Together to Optimize & Transform the Low-Voltage Distribution Network

DISTRIBUTED ENERGY MANAGEMENT



GRID MANAGEMENT



METERING SOLUTIONS

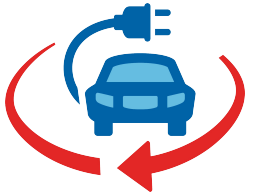
CONSUMER ENGAGEMENT

SMART CITIES

UTILITY IOT SOLUTIONS

NETWORKING & COMMUNICATIONS

DISTRIBUTED INTELLIGENCE APPLICATIONS



ELECTRIC VEHICLES

Dynamic Forces Impacting Our Industry

Complex interrelated problem that requires new, integrated, industry collaboration

GRID COMPLEXITY

Global market for EVs projected to continue at >50**%/year rates** with Res, Commercial adoption.

- NYC vs. Massachusetts - same electricity at 1/35 space
- New transmissions needed to connect renewables to NYC
- EV: 30% of 1.5M customers impact $2.5B upgrade cost

ENVIRONMENTAL

States with 100% renewable energy or 100% clean energy target: **16 and counting**…

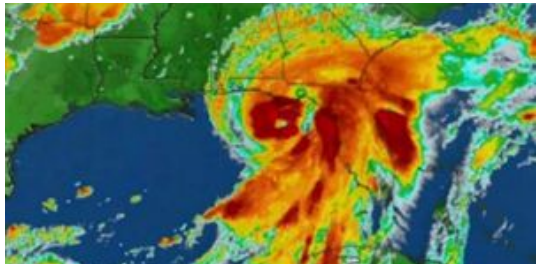
- Heavy reliance on fossil fuels in NYC: greater access to hydropower and wind resources upstate
- NYC has > 1M buildings increase 2/3rd of NYC's total GHG emissions—drive energy efficiency and clean energy priority

CUSTOMER EXPERIENCE

58% of commercial respondents were “extremely willing” to pay more for additional services from their electricity provider.

- High energy costs: ~600,000 NYC families (over 1.5M) paying greater than 6% of their income towards energy
- Access to low-cost energy, more flexible clean options burdened by cost, complexity

UNEXPECTED EVENTS



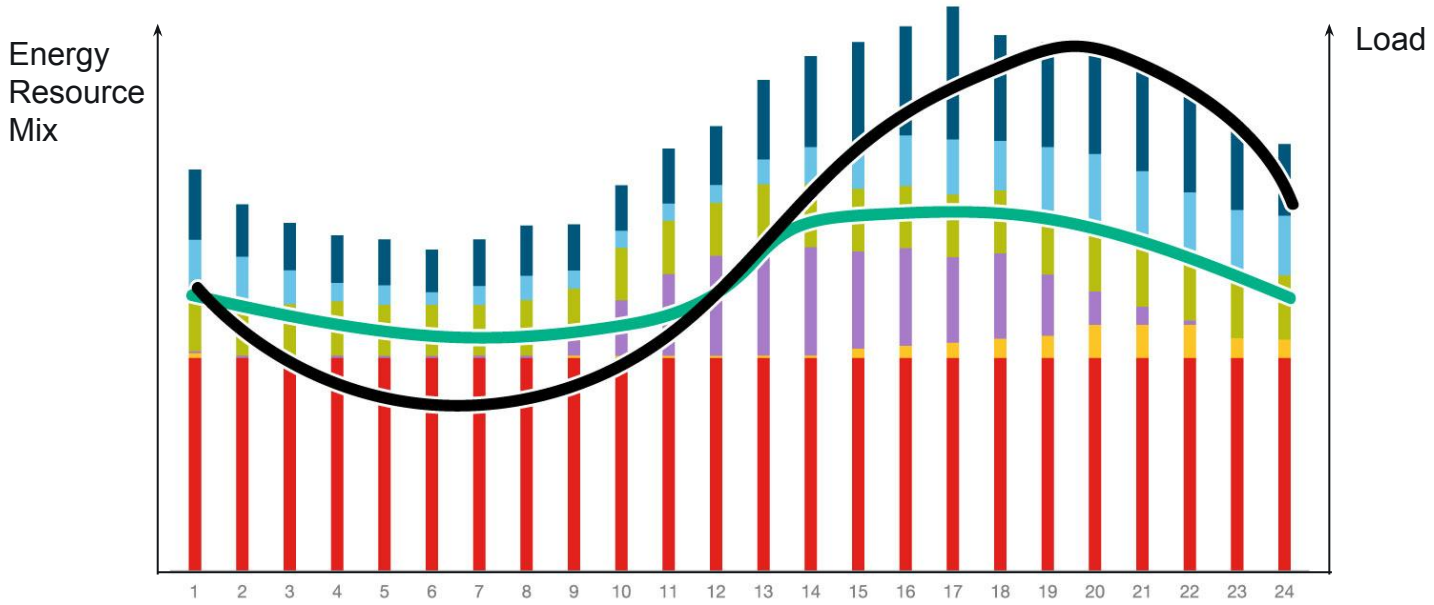
New data confirm **increased frequency in extreme weather events**.

- Average max summer temp increased by 3.5°F since 1970 with more heat waves. More frequent storm events, heavier downpours creating more vulnerabilities for NY energy system
- Clean energy requires grid NY investments to harden grid assets.

Supply and Demand Imbalance at the Grid Edge

Flexible, dynamic demand orchestration is required to meet reliability, affordability and sustainability goals

Circuit Level Energy Resource and Demand Balance Over 24hrs

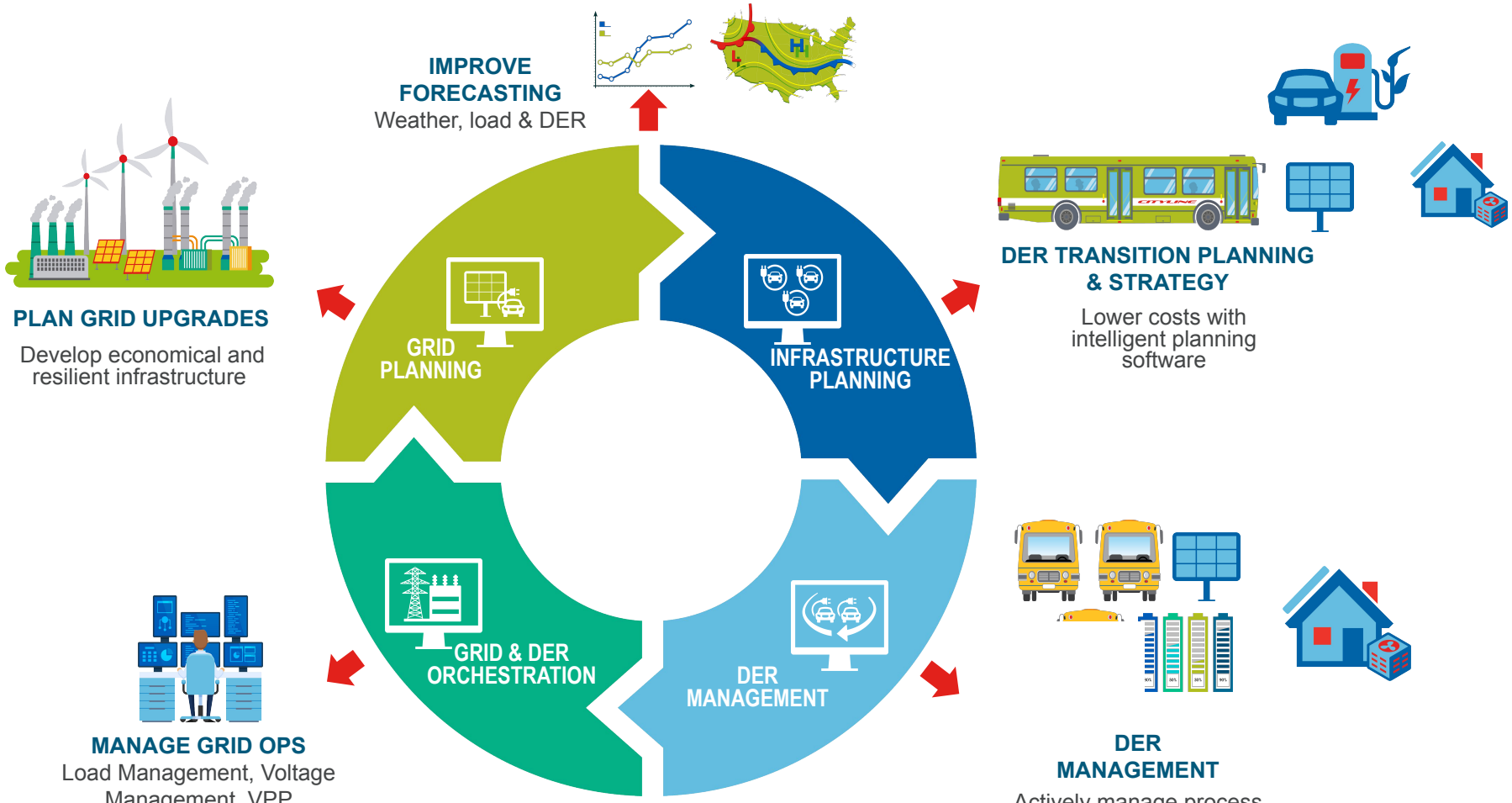


Energy resource mix (includes Coal, Gas, Hydro, Wind, Solar, etc.)
Load curves: Black is current – Green is target

- **Complex demand needs**
  - Significant energy demand changes through the day, vary by location/ circuit and change over time with high amplitude requiring peak resources and driving grid upgrades.
- **Challenging resource mix and distribution.**
  - Increasing, variable loads (e.g. lg buildings)
  - EV adoption
  - Variable supply Solar, Wind
- **Flexible demand management to flatten the curve**
  - Flexible Demand Response, Energy Efficiency, leveraging EV, storage w TOU, flex bill, managed charging, BOYT etc.
- **Wholistic approach needed**
  - Flexible demand management
  - Real-time at grid edge end-to-end solution
  - Coordination across multiple constituencies
  - Consumer engagement

Integrated Approach for Residential and Commercial

Integrated approach for the Energy, Residential, Commercial and Transportation Ecosystem



12-month Collaboration Challenge

"Regarding Grid Modernization, to achieve New York's Carbon & Equity goals, a critical obstacle to collaboratively overcome within the next 12 months is:"

Lack of visibility into charging patterns and grid loading of residential and commercial EV owners in high-penetration EV neighborhoods (e.g. Long-Island) to develop off-peak or managed charging programs.

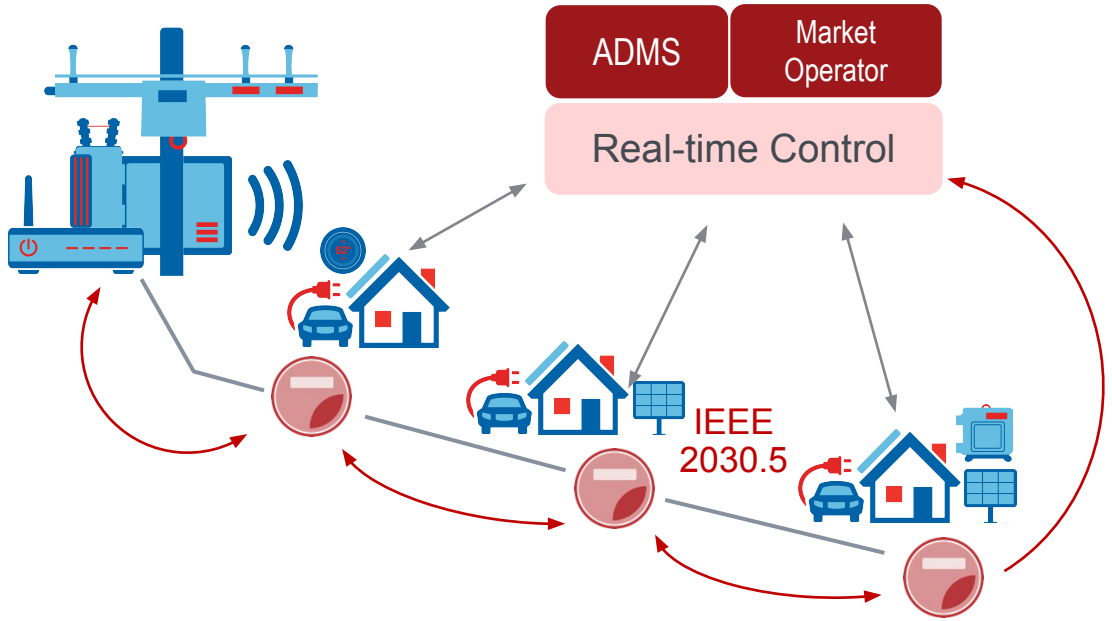
12-months benefits for EV charging adoption and grid benefits

- Understanding of the charging patterns home and away
- Measure Ability to impact changing charging patterns
- Measure impact on grid, avoid bottlenecks in distribution gird
- Model for scalable roll out and grid planning
- Informing future use cases for standardization and scale

Appendix

Control of Low-Voltage Network with Distributed Intelligence

Management of distribution systems at the edge integrated with ADMS/SCADA



DIFFERENTIATED APPROACH

Single DI-enabled real-time data analytics & control platform enables solutions to utilities on customer and grid side

TRANSFORMATIVE RESULTS

Delivering layers of value: visibility, load & charging control, AI driven analytics, market participation, transactional energy

Smart Meter 2.0

Enhancing AMI use cases

Grid Edge Operation

Low-voltage grid resiliency, power quality, transformer protection, outage management

Distributed Energy Resources

Managing multiple behind-the-meter DERs incl. EV, solar, and storage for system reliability, renewable firming

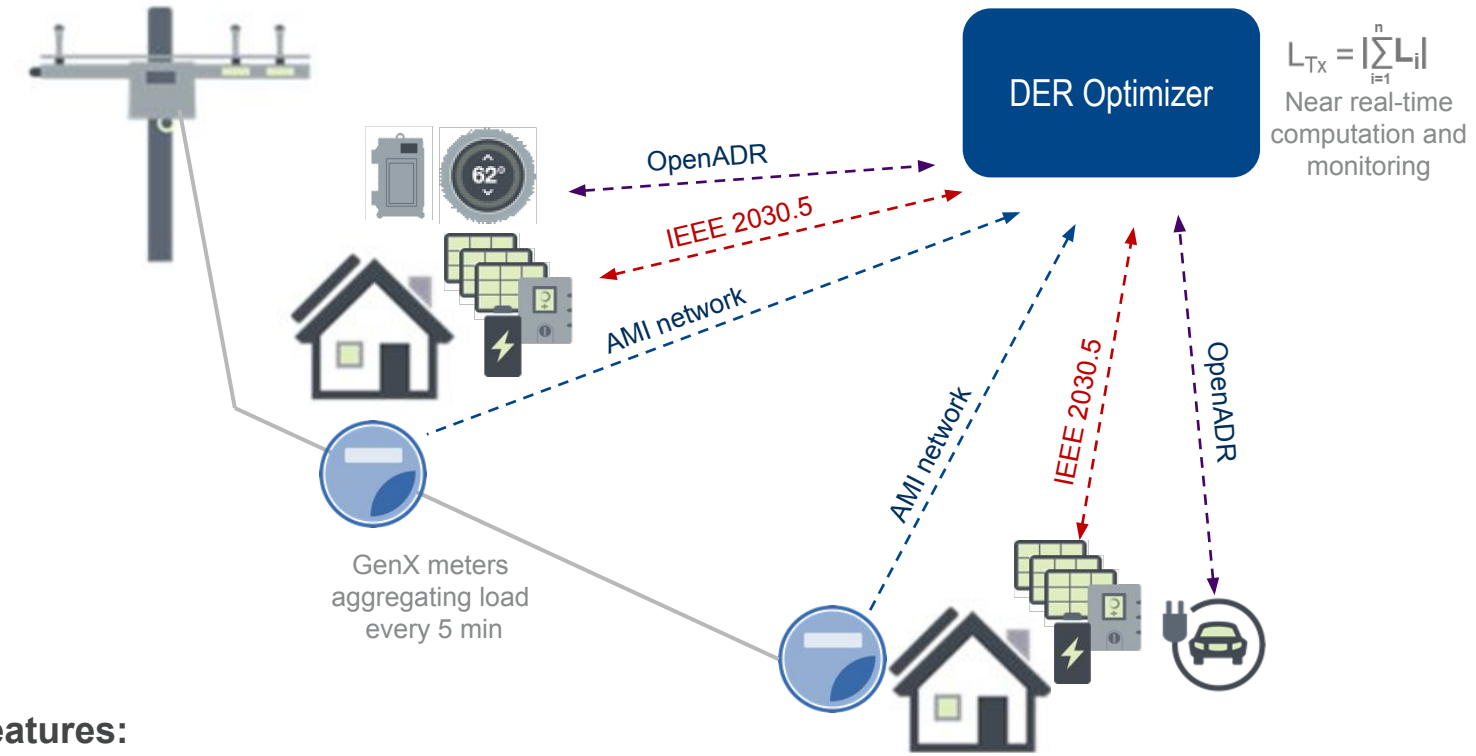
EV Infrastructure

Highly reliable, secure and flexible EV management for fleet/semi/public

Consumer Engagement

High-fidelity Load Disaggregation HAN 2030.5

Transformer Protection Using High-Frequency AMI



Features:

- Near real-time transformer load monitoring and control
- Control PV, Battery, EV, HVAC, pool loads to shift load profile

Operational Overview:

- Identify DERs and vulnerable transformers
- All meters on vulnerable transformer use SIQ to send 5-minute load information to DER Optimizer
- DER Optimizer computes total transformer load and analyzes load against transformer heating curves in near real-time
- When capacity/loss of life threshold exceeded, DER Optimizer actively shifts & controls loads to optimize profile seen by transformer
- Engages customers in “Active DR” program to enable more value with multiple DERs and grid management

Customer Success: Duke Energy Florida

Behavioral EV program with a foundation for control

- Duke Energy Florida is leveraging its existing instance of IntelliSOURCE Enterprise to deploy Itron's new **DER Optimizer** modules and run a new managed EV charging program at scale
- Program includes both **telematics**-based monitoring and **load disaggregation**-based monitoring – allowing for *all* EV owners with Level 2 chargers to participate
- Itron's solution also includes **detection** of premises with EV charging (via AMI analytics) so that Duke can proactively target and recruit new EV adopters into the program as the EV market evolves and grows in their territory over time