

AEIC Grid Advancement Program

A Collaboration to Solve the Top 10 Grid Modernization Challenges in 2026



Powered by:



AEIC Grid Advancement Collaborative Program



Welcome to the AEIC Grid Advancement Program. It's time to modernize the grid — faster, smarter, and more affordably by working together.

Today's grid is facing an extreme amount of demand between the rise of AI data centers, electrification, and DERs. As a result, prices have been increasing since 2021, and capacity is strained. With utilities expected to scale faster, grid modernization isn't optional. It's an imperative.

That's where the AEIC Center for Operational Excellence's Grid Advancement Collaborative Program comes in. This 12-month, cohort-based innovation journey is built by utilities, for utilities—designed to tackle the top 10 operational challenges identified in AEIC's Grid Modernization Report.

You'll Receive:

Grid Modernization Report	Maps top challenges (from 6,000+ documented utility barriers) so you focus on high-ROI efforts.
Use Case Playbooks	10 playbooks to guide internal alignment and cross-functional field trials.
Technology Stacks	Each challenge comes with suggested affordable modernization tools (vs. business-as-usual)
Solution Scouting & Matching	Field-ready solutions mapped directly to each challenge for faster pilot prep.
Monthly Cohort Calls	Share progress and learn from peer utilities tackling the same problems.
InnovationWorks Access	A centralized collaboration platform to manage, track, and scale innovation.

Why Join?

This program is built by utilities, for utilities, and grounded in the day-to-day realities of our industry. It's focused on the operational challenges teams are facing right now, and structured to help you move beyond endless pilots into creating real change faster.

If you are a utility operator who is shifting toward more data-centric tools and workflows to meet what the grid will demand next, this is for you.

The Top 10 Challenges We'll Solve

- 001 Resilient Grid: Building a wildfire and weather resistant grid
- 002 Aging Grid: Upgrading assets in the new normal
- 003 Grid Constraints: Overcoming capacity bottlenecks
- 004 Grid Constraints: Overcoming supply chain bottlenecks
- 005 Grid Constraints: Overcoming interconnection bottlenecks
- 006 Flexible Grid: Operationalizing DERs in a 2-way Grid
- 007 Flexible Load Forecasting: Planning for a non-linear future
- 008 Flexible Customers: Engaging customers in a dynamic Grid
- 009 Securing the Flexible Customer: Meeting the future of IT/OT convergence
- 010 Grid Workforce: Enabling the workforce of the future

Introduction

Meeting the Grid of the Future Today

The Association for Edison Illuminating Companies





Vice President at AEIC

Get in Touch

This report highlights the work in front of us to modernize the grid. The technology to solve the key challenges exist. The hard part is not finding the solutions. It will be the ability to balance affordability with innovation and modernization to usher in the future.

The cost to operate and maintain the grid today is no longer just a function of the present—it is the compounding result of decades of deferred investment, increasing reliability demands, and the rapidly advancing dynamic energy transition. We are now burdened with paying for three overlapping challenges at once: yesterday's aged infrastructure, today's reliability and climate resilience expectations, and tomorrow's adoption of new technologies and capabilities.

This trifecta is placing unsustainable pressure on utility budgets, ratepayer affordability, and regulatory frameworks. Yet, regulatory and stakeholder conversations often isolate these pressures when, in truth, it is their combination that drives current costs. Fuel volatility, inflation, labor shortages, extreme weather, growing large-load interconnection requests (like data centers), and increasingly complex customer expectations all overlap in a system originally designed for a steady, linear future. But the future will be non-linear, unpredictable and require higher levels of flexibility that can only come from a digital backbone that will increasingly consist of non-wire solutions that are a combination of utility and non-utility owned generation.

So, what can we do about it?

The future grid will not be built by doing more of the same. We must modernize how we plan, how we regulate, and how we partner. It will require courage to modernize processes with shared responsibility for grid performance, and a reset of relationships between utilities, regulators, developers, large load customers like datacenters and communities.

We must stop solving within the box of outdated rules. It is time to rebuild grid by thinking out of the box.

Time to Rebuild the Grid By Thinking Out of the Box

We must modernize how we plan, how we regulate, and how we partner.
The following recommendations offer a path forward:

1

Create Safe Spaces to Innovate

Incentivize rapid piloting and experimentation that leads to production at scale

- Performance-based earnings mechanism
- Regulatory protection for well defined pilots
- Cross-utility learning

2

Utility/Developer Task Force

Utilities cannot plan in isolation. Create developer-utility alignment initiatives that will drive affordability

- Create interoperability standards that will enable data and DERs
- Vendor agnostic interoperability
- Technology matures faster, need to future proof investments

3

Capitalization of SaaS

As we move to more NWA and build out the needed data backbone, we need to consider the business model

- Capitalize NWA solutions
- Consider data, that is becoming the new backbone, as infrastructure
- Look to avoided costs that can be achieved through NWA and data

Time to Rebuild the Grid By Thinking Out of the Box

We must modernize how we plan, how we regulate, and how we partner.
The following recommendations offer a path forward:

4

Confronting the Load Crisis

Explosive, unpredictable new loads from hyperscalers is not compatible with 3–5-year IRP planning cycles.

- New disclosure rules for large load requests
- Regional planning task forces
- Real-time probabilistic forecasting tools

5

Overhaul IRP & System Planning

Current IRP planning was built for a steady grid. It now needs to account for non-linear load growth

- Rolling, adaptive planning.
- National and regional scenario planning.
- Non-Wires solutions as standard practice

6

Empowered Accountability

The regulatory model must empower future-oriented outcomes

- Support investments in planning tools, people and process
- Authorize build out of the data-driven digital backbone
- Require transparency with KPIs

Collaboration

Welcome to InnovationWorks

The collaboration platform for the AEIC Grid Advancement Program



InnovationWorks: The Innovation Copilot for Change Champions



AEIC is proud to host our *Grid Operations Program* on **InnovationWorks** — a secure, online collaboration platform purpose-built for the energy industry.

Backed by world-renowned Harvard Business School innovation expert **Dr. Linda Hill**, and co-developed by **utility veterans at PGE**, InnovationWorks empowers utility teams to accelerate innovation, share insights, and adopt solutions faster — all while avoiding the common trap of “*pilot purgatory*.”

What You’ll Find in the AEIC Workspace:

A Private Member-Only Space

Dedicated exclusively to AEIC members to collaborate, share case studies, and crowdsource answers to the energy industry’s most pressing challenges.

Top 10 Challenges + Proven Solutions

Explore real-world case studies and solutions matched to AEIC’s Top 10 Grid Operations Challenges. See how your peers have solved similar problems — and share your own successes.

Peer Collaboration, Elevated

Tap into collective genius: pose a challenge, comment on others, or co-develop a pilot. All contributions are documented for transparency and learning.

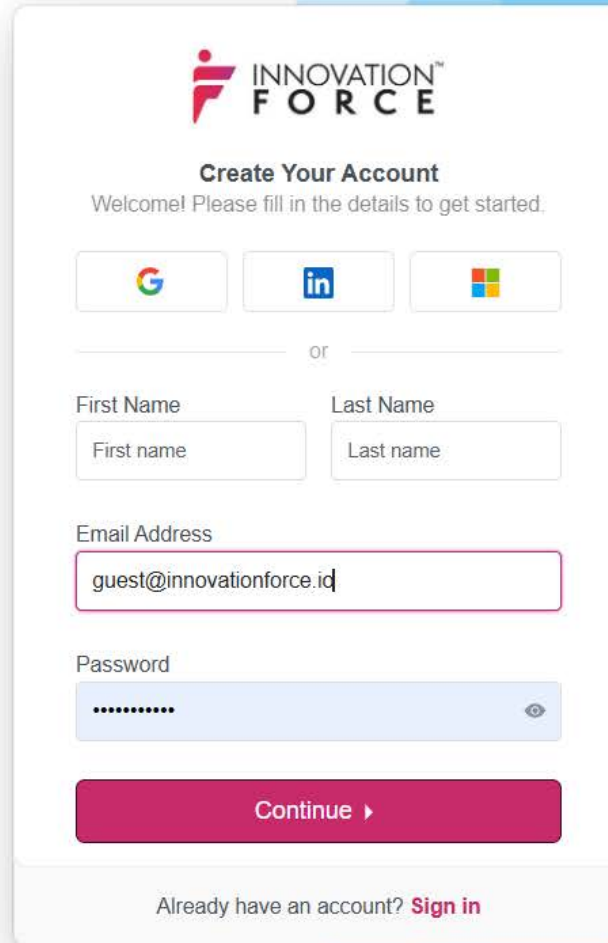
Let’s innovate together!

AEIC members can [log in today](#) and begin exploring the InnovationWorks workspace.

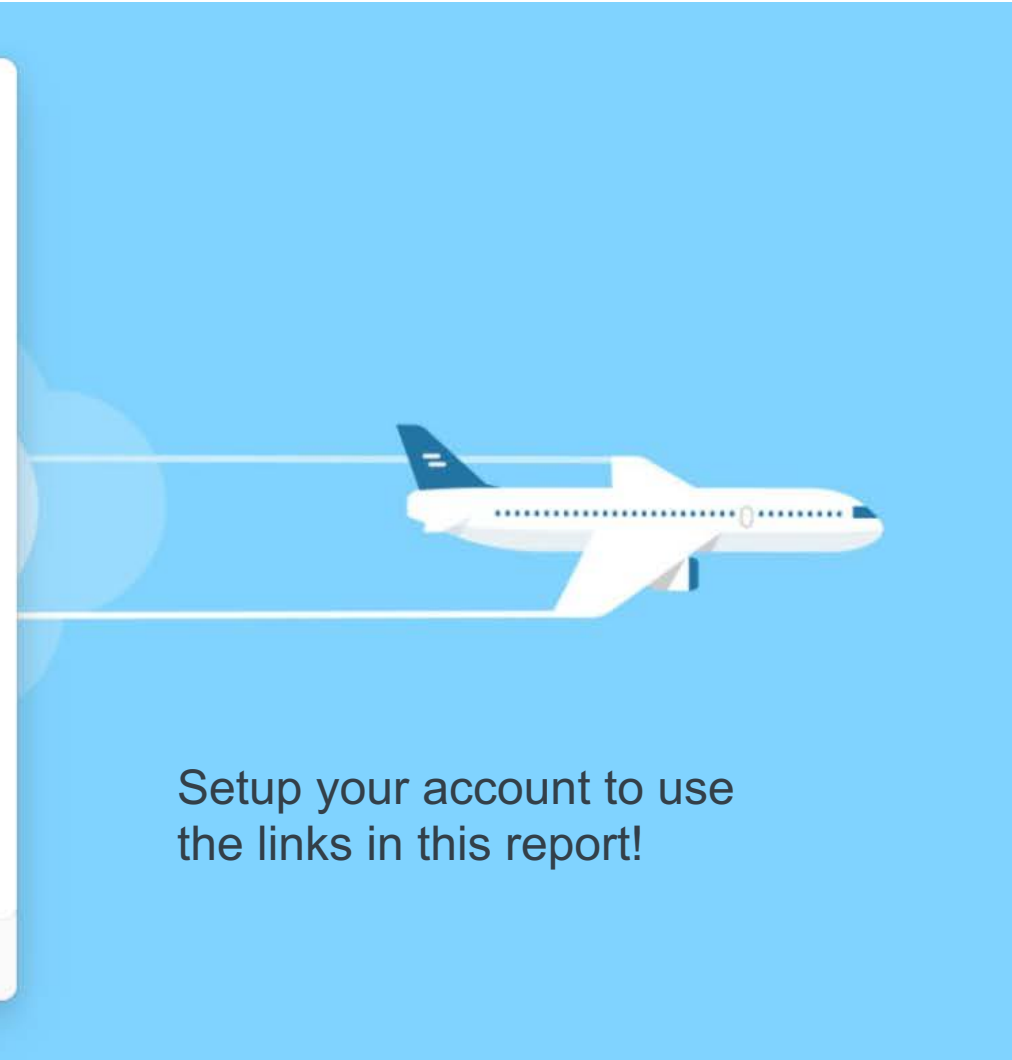


Get Started! Log-in to the AEIC Member Workspace

CLICK HERE



The screenshot shows the 'Create Your Account' page for Innovation Force. At the top is the logo and the heading 'Create Your Account' with a welcome message. Below are social login options for Google, LinkedIn, and Microsoft. A 'or' separator is followed by input fields for 'First Name' and 'Last Name'. The 'Email Address' field contains 'guest@innovationforce.id'. The 'Password' field is masked with dots and has a visibility toggle. A pink 'Continue' button is at the bottom, and a link for 'Sign in' is at the very bottom.



Setup your account to use the links in this report!

Email support@innovationforce.io if you need help or have any questions!

HANGAR

Published

12 Challenges Found

Solutions

All

Challenges



FILTERS



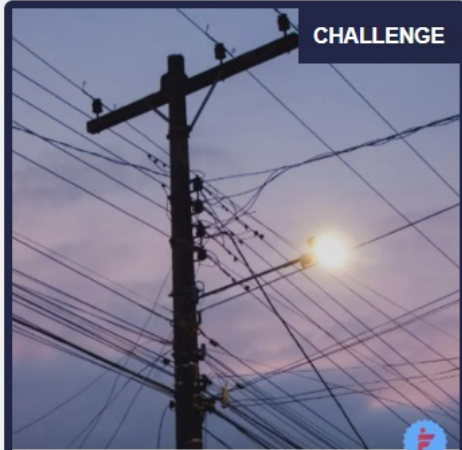
CHALLENGE

001 Resilient Grid: Building a Weather and Wildfire Resilient Grid in the New Normal

Source Company: InnovationForce

44 36

Solve



CHALLENGE

002: Aging Grid: Upgrading Aging Assets in the New Normal

Source Company: InnovationForce

17 22

Solve



CHALLENGE

003 Grid Constraints: Overcoming Capacity Bottlenecks

Source Company: InnovationForce

40 33

Solve



CHALLENGE

004: Grid Constraints: Overcoming Supply Bottlenecks

Source Company: InnovationForce

20 30

Solve



CHALLENGE

005: Grid Constraints: Overcoming Interconnections Bottlenecks

Source Company: InnovationForce

48 21

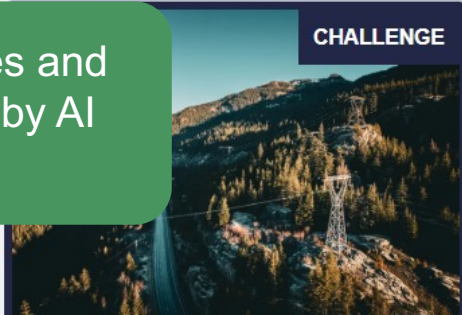
Solve



CHALLENGE

006 Flexible Grid: Operationalizing DERS in a 2-way Grid

Source Company: InnovationForce



CHALLENGE



CHALLENGE



CHALLENGE



CHALLENGE

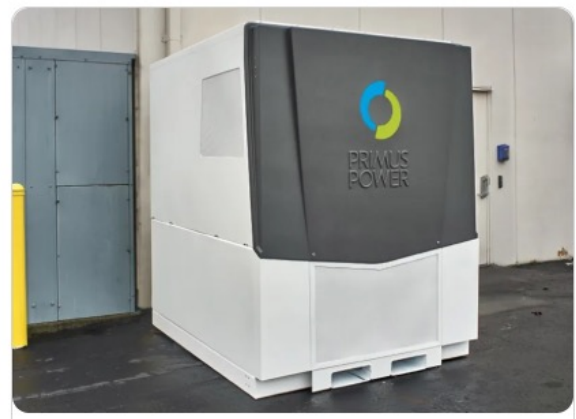
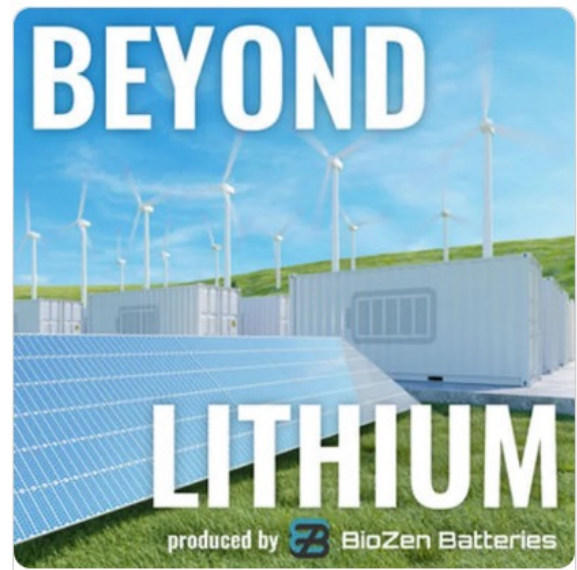
008 Flexible Customers: Engaging Customers in a Dynamic Grid

We have 12,000+ challenges and solutions all being matched by AI to help you on your journey!

USE CASE LIBRARY

Liked My Use Cases List Grid Create Use Case

Workflow Stage: ALL | Workflow Task: ALL | Airport: ALL | Runway: ALL | Categories: All | Captain: ALL | Status: ALL | Date Submitted: mm/dd/yyyy



Enhancing Energy Storage Efficiency and Safety
InnovationWorks AI
12 Nov, 2025
Under Review

Score: 0 | 1 | 0 | **Section**: New

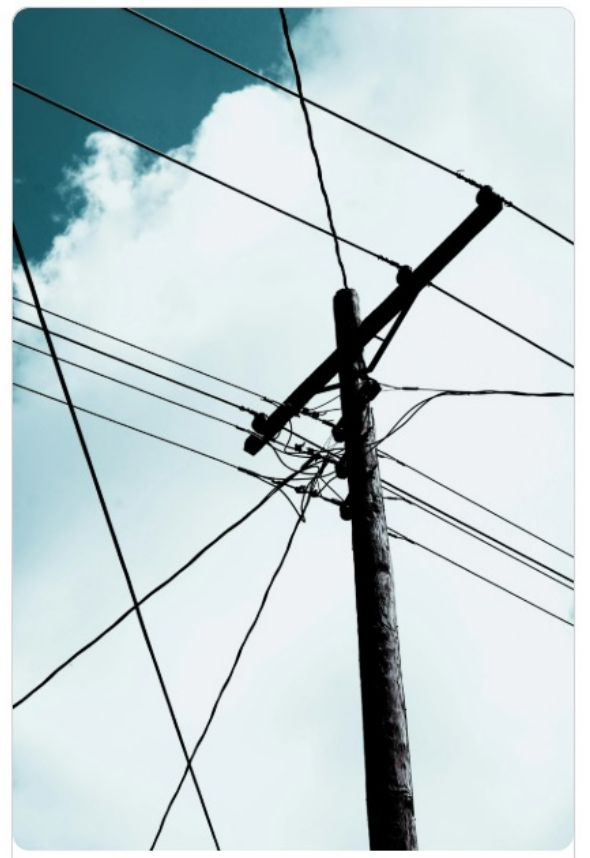
Airport | **Captain**
Emergency Preparedness: NA
BESS



All-in-One Modular Battery Energy Storage Solutions for Enhanced Efficiency
InnovationWorks AI
12 Nov, 2025
Assign Project Team

Score: 0 | 1 | 0 | **Section**: New

Airport | **Captain**
Emergency Preparedness: NA
BESS



Our use cases are kept private. Only AEIC members with access may join.

Airport | **Captain**

The Top 10 Challenges

Let's Get Started Solving the Top 10 Challenges

AEIC Grid Advancement Program



The Challenges

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001

Challenge Statement

Resilient Grid: Building a Weather and Wildfire Resilient Grid in the New Normal

We need targeted, cost-effective and risk-based resilience solutions to deliver reliability and resilience despite aging infrastructure and frequency in more extreme weather, flooding and wildfire events that disrupt service.

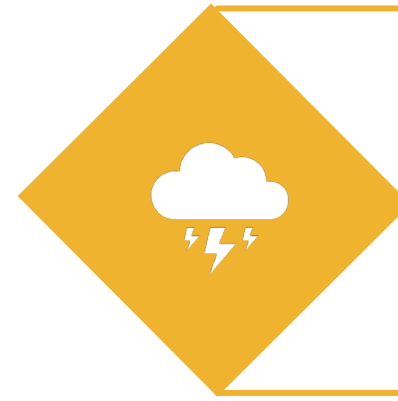


Themes



01

Wildfire risk mitigation: covered conductor, fast sectionalizing/relays, situational awareness (weather stations, AI, cameras), and non-wires options to respond to risks and reduce PSPS footprint.



02

Storm hardening & flood resilience, pole class upgrades, guying, structural replacements, selective undergrounding, substation flood barriers, tracked against reliability improvement and unit costs.



03

Outage automation such as FLISR/reclosers, ADMS and feeder automation for faster isolation and backfeed; improve SAIDI/SAIFI where feeder ties are sparse.



04

Situational awareness, comms, drones, field-area networks, satellite links in remote terrain, fiber core upgrades to keep control & telemetry during events

Challenge 001 Overview

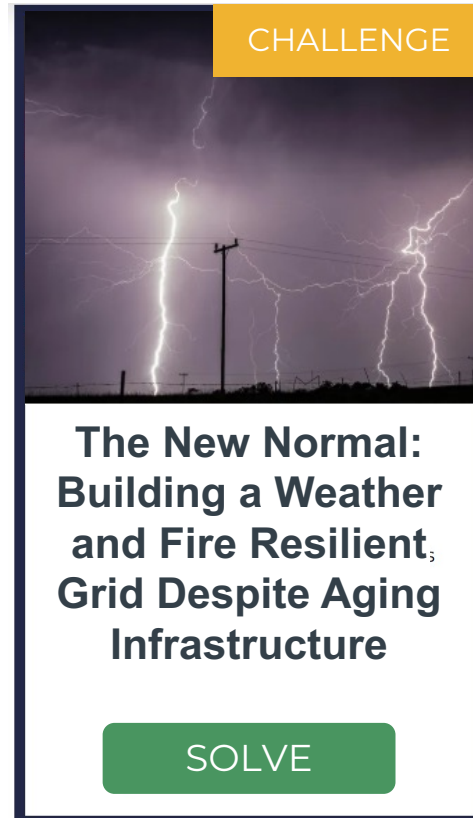
Overview

Utilities are investing heavily in replacing and hardening aging grid infrastructure in response to electrification and extreme weather. Multi-billion grid modernization and wildfire mitigation plans have been approved.

Climate hazards are now directly tied to asset vulnerabilities, with SAIDI/SAIFI and cost-per-mile metrics guiding investment. Yet most spending flows to traditional, high-cost methods like undergrounding and pole replacement, while modern, fast-deploying technologies may be underutilized.

What's at Risk

Without fast-deploying, affordable modernization technologies and leveraging data for intelligences, utilities face longer outages, higher restoration costs, asset failures, and stranded innovation. Capital could continue to flow to outdated infrastructure while proven resilience technologies struggle to scale.



CHALLENGE

**The New Normal:
Building a Weather
and Fire Resilient,
Grid Despite Aging
Infrastructure**

SOLVE

Current State

Capex-heavy solutions dominate; traditional pole replacements, vegetation management, and broad PSPS shutoffs.

Emerging tools like sectionalizing, wildfire AI, and predictive monitoring are stuck in pilots or fight for limited O&M budgets. Regulatory models reward asset-based investment over operational intelligence which will be the gold-standard needed to modernize the future grid.

Desired Outcome


Move toward fast and affordable resilience planning solutions that are cost-effective, modular and easy to deploy that can cut outages quickly and affordably. Data, software and communications would be capitalized alongside physical assets and, in some cases operational cloud-based software.

Utilities could shift from blanket rebuilds to targeted cost-effective hardening backed by real-time data, automation, and situational awareness.

Challenge 001

Example Challenges Created by AI from Research of Public Filings

CHALLENGE



Eversource

We need to implement transmission upgrades to improve grid resilience and storm hardening to support and accelerate the siting of transmission projects essential for maintaining reliable energy delivery during adverse weather conditions.

SOLVE

CHALLENGE




PG&E

We need to improve grid visibility and flexibility to maintain a safe, reliable, and affordable energy grid to effectively respond to climate-induced challenges such as wildfires and extreme weather events.

SOLVE

CHALLENGE




FPL

We need to enhance their systems to prepare for extreme weather events, including winterizing generation units and ensuring cooperation with fuel suppliers to reliably serve customers during extreme weather conditions and minimize service disruptions.

SOLVE

CHALLENGE



SDG&E

We need to establish a clear strategy to effectively mitigate the risks associated with wildfires to ensure that all potential hazards are addressed and to enhance public safety and operational resilience.

SOLVE

Click on the SOLVE button to learn more at the InnovationWorks platform.
Email support@innovationforce.io if you need help or have any questions!

Tech Stack 001

BAU Options	Traditional Approaches and Results
Strategic Undergrounding	Eliminates storm/wildfire exposure \$2M - \$10M per mile
Pole/Conductor Replacement	Stronger infrastructure vs storms/wildfires (\$50k-\$200k per mile)
Traditional Vegetation Mgmt.	Reduce tree-related faults \$1k - \$2k per mile annually
Traditional GIS/Asset Mapping	Basic asset inventor, outage and vegetation mgmt. (\$1M - \$5M/deployment)
Manual Storm Response & staging	Crews dispatched reactively
Public Safety Power Shutoff (broad)	Prevents wildfire ignitions via large de-energization zones

Modernization Levers	Descriptions
Covered Conductor Sectionalizing	Reduce wildfire/storm ignition risk; enable mile targeted PSPS
FLISR/ADMS Automation	Faster isolation & service restoration
Reinforcement Technology	Extend life of poles or physical grid assets without replacement
Structural Health Monitoring	Predictive detection of pole tilt/weakness. Target wrap & replacement
Advanced Materials Fire, Ice / Resistant Insulators	Region specific resilience to fire, ice and storms
Intelligent Substation Monitoring	Predictive failure detection, flood/fire alerts
Digital Twin technology	Model grid stress, prioritize upgrades

Resilient Grid: Building a Weather and Wildfire Resilient Grid in the New Normal

We need targeted, risk-based and cost-effective resilience solutions to deliver reliability and resilience despite aging infrastructure and frequency in more extreme weather, flooding and wildfire events that disrupt service.

SOLVE

Tech Stack 001 Continued

Modernization Levers

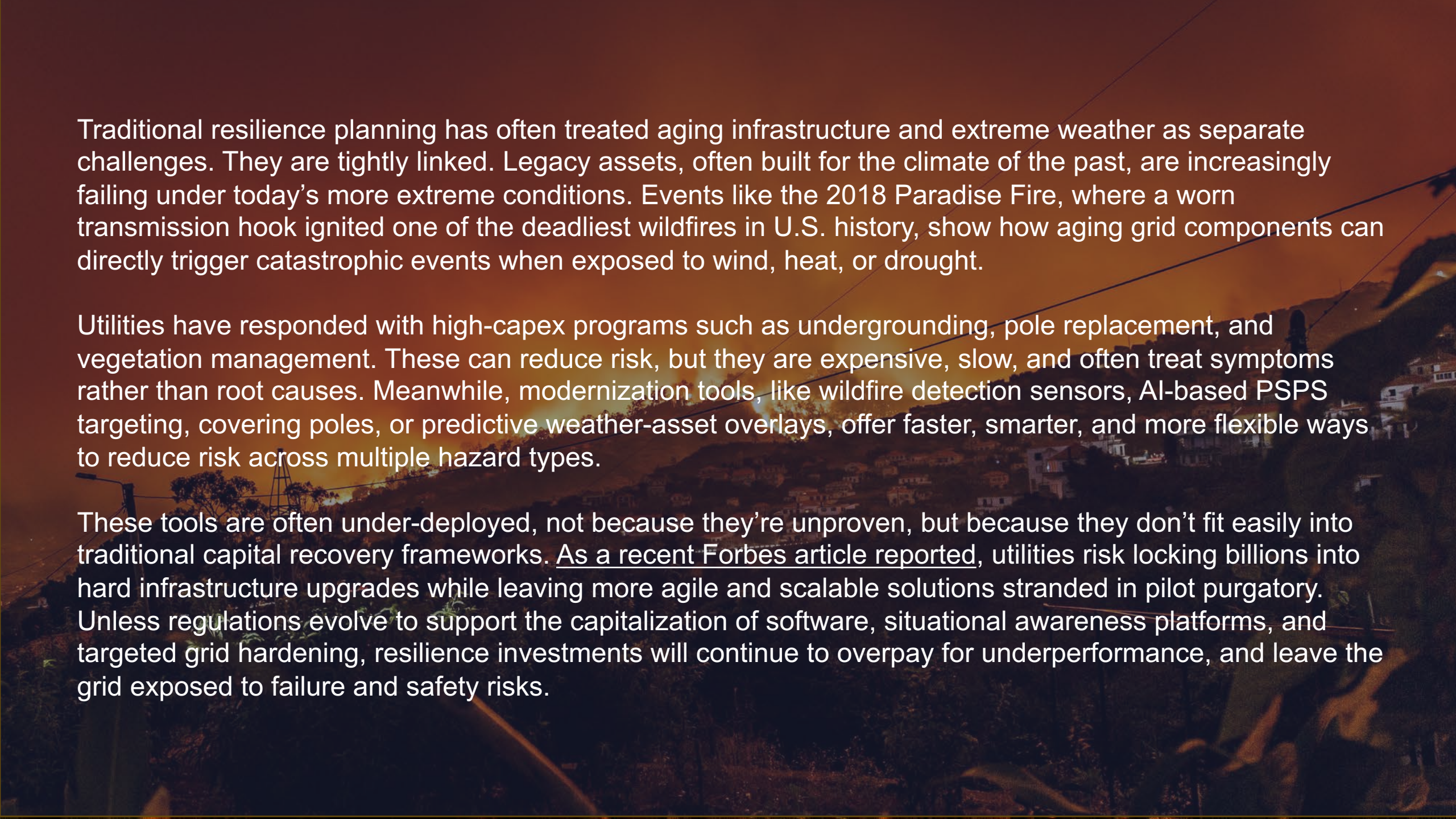
Descriptions

Advanced GIS (LiDAR/Drones/AI)	High resolution vegetation, wildfire and flood/storm mapping
Weather & Situational Awareness	Predictive ops, AI-driven/risk staging
Wildfire Detection Sensors	Early fire detection on grid assets
Wildfire AI Risk Modeling & Predictive PSPS	AI shrinks PSPS footprint, surgical shutoff
Integrated Vegetation + Wildfire AI	Dynamic fire/vegetation ignition risk forecasting
Flood Hardening	Protect substations, feeders from flooding surge
Cold Weather Resilience	Reduce line pole failures in extreme cold with coatings and monitoring
Flexible microgrids	Localized back-up and critical load protection hugs
Customer-Sited Backup Programs	Distributed resilience capacity
Batteries/Generators	Lowers PSPS impact
Advanced Communication	Ensure data and control (FAN, LTE, Sat)
Feeder Automatic Reconfiguration	Improves outage restoration and dynamically shifts load to reduce stress and avoid failures during storms, wildfires, and heat events
Non-Ignition Line Sensors	Advanced monitoring devices designed to avoid arcing or sparking, improving situational awareness in wildfire-prone areas
Falling Conductor Detection	High-speed monitoring that instantly trips a line if a conductor breaks

Resilient Grid: Building a Weather and Wildfire Resilient Grid in the New Normal

We need targeted, risk-based and cost-effective resilience solutions to deliver reliability and resilience despite aging infrastructure and frequency in more extreme weather, flooding and wildfire events that disrupt service.

SOLVE



Traditional resilience planning has often treated aging infrastructure and extreme weather as separate challenges. They are tightly linked. Legacy assets, often built for the climate of the past, are increasingly failing under today's more extreme conditions. Events like the 2018 Paradise Fire, where a worn transmission hook ignited one of the deadliest wildfires in U.S. history, show how aging grid components can directly trigger catastrophic events when exposed to wind, heat, or drought.

Utilities have responded with high-capex programs such as undergrounding, pole replacement, and vegetation management. These can reduce risk, but they are expensive, slow, and often treat symptoms rather than root causes. Meanwhile, modernization tools, like wildfire detection sensors, AI-based PSPS targeting, covering poles, or predictive weather-asset overlays, offer faster, smarter, and more flexible ways to reduce risk across multiple hazard types.

These tools are often under-deployed, not because they're unproven, but because they don't fit easily into traditional capital recovery frameworks. As a recent Forbes article reported, utilities risk locking billions into hard infrastructure upgrades while leaving more agile and scalable solutions stranded in pilot purgatory. Unless regulations evolve to support the capitalization of software, situational awareness platforms, and targeted grid hardening, resilience investments will continue to overpay for underperformance, and leave the grid exposed to failure and safety risks.

Key Take-Away

Aging infrastructure and climate hazards are a compounding threat to grid reliability, customer safety, and affordability. Every storm, fire, and flood exposes legacy assets that were never built for today's conditions. Resilience requires more than hardening, undergrounding and replacement, it demands modernization.

To deliver resilient, affordable service in this new normal, utilities must move beyond traditional rebuild strategies and embrace targeted, data-rich and cloud-enabled solutions. Modern tools deliver faster resilience at lower cost, and with the right regulatory reforms, including capital treatment of cloud-based software as infrastructure and risk-based performance incentives, they can scale. Without this shift, we risk spending billions undergrounding the past, instead of preparing the grid to take advantage of the data-rich future.



002

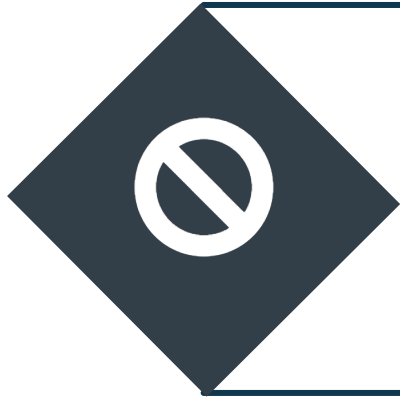
Challenge Statement

Aging Grid: Upgrading Aging Assets in the New Normal

We need to modernize or replace aging assets to increase reliability while managing affordability and meeting the needs of our energy future.



Themes



01

Non-Wires Alternatives: Utilities could spend more repairing aging assets and face supply chain constraints. Embedding smart features and NWAs can help defer or avoid expensive upgrades.



02

Operationalizing asset data: strategic opportunity to move away from reactive replacement to predictive, condition-based upgrades that rely on data-rich and more automated inspection-based solutions.



03

Outage automation such as FLISR/reclosers, ADMS and feeder automation allow faster isolation and can improve SAIDI/SAIFI. With more data and intelligence, outage management can become more predictive.



04

AI, situational awareness & comms – field-area networks, drones, satellite links in remote terrain, fiber core upgrades to keep control & telemetry during events

Challenge 002 Overview


Overview

Much of the U.S. electric grid infrastructure like poles, transformers, breakers, and substations, was built 40–70 years ago and is now operating beyond intended lifespans. Aging assets create escalating reliability risks, safety hazards, and O&M costs, while also constraining the integration of renewable resources and electrification growth.

Modernizing these assets requires utilities to balance replacement vs. refurbishment, targeted upgrades vs. wholesale rebuilds, and explore non-wires alternatives (NWA) to defer or avoid costly rebuilds.

What's at Risk

If not addressed, reliability will continue to deteriorate as poles, transformers, and breakers fail more frequently, leading to longer outages, higher SAIDI and SAIFI metrics, and increasing customer dissatisfaction. Safety risks also rise exposing utilities to potential injuries, liability, and reputational harm. Utilities will spend more on emergency repairs and reactive maintenance rather than planned, efficient investment.



CHALLENGE

**Aging Grid:
Upgrading Aging
Assets in the
New Normal**

SOLVE

Current State

Much of today's electric grid infrastructure is well past its intended design life. Utilities are operating poles, transformers, substations, and breakers that in many cases were installed in the 1960s and 1970s. As these assets age, reliability has declined, with failures leading to more frequent and longer outages.


Maintenance practices are still largely reactive, with resources spent on emergency repairs instead of predictive, risk-based replacement.

Desired Outcome

Instead of blanket replacements, utilities can deploy more advanced inspection tools, predictive analytics, and risk modeling to extend the life of assets where feasible and replace them only when necessary. When upgrades are made, assets are installed with smart features such as sensors, communications, and automation capabilities that enable integration into advanced grid management platforms.

Challenge 002

Example Challenges Created by AI from Research of Public Filings




CHALLENGE

Entergy

We need to replace aging poles and equipment to meet new standards to improve the reliability of the electric system.

SOLVE




CHALLENGE

Ameren

We need to address the rising costs associated with replacing aging infrastructure to maintain operational efficiency and reliability to mitigate the financial impact of unplanned outages caused by damaged and failed assets, especially in the context of increasing severe weather events.

SOLVE



CHALLENGE

Hydro One

We need to optimize the pacing of investments based on asset demographics, condition, and performance to mitigate risks associated with poor condition assets to ensure compliance with NERC and NPCC standards and enhance system reliability while minimizing operational risks

SOLVE



CHALLENGE

DTE

We need to address aging infrastructure across multiple substations to ensure reliability and capacity for new load growth to maintain operational efficiency and support the increasing demand for electricity in the region.

SOLVE

Interested in learning more about these challenges? Click on the SOLVE button to learn more at the InnovationWorks platform.

Email support@innovationforce.io if you need help or have any questions!

Tech Stack 002

Aging Grid: Upgrading Aging Assets in the New Normal

We need to modernize or replace aging assets to increase reliability while managing affordability and meeting the needs of our energy future.

SOLVE

BAU Options

Traditional Approaches and Results

Strategic Undergrounding	Eliminates storm/wildfire exposure on avg. \$2M - \$10M per mile
Pole/Conductor Replacement	Stronger infrastructure vs storms/wildfires (on avg. \$50k-\$200k per mile)
Traditional Inspections	Work crews manually inspecting assets
Traditional GIS/Asset Mapping	Basic asset inventor, outage and vegetation mgmt. (on avg. \$1M - \$5M/deployment)
Manual Storm Response & staging	Crews dispatched reactively

Modernization Levers

Descriptions

Asset Condition Monitoring	Sensors, drones, AI-enabled inspections.
Automated Inspection	Analyze imagery from drones and other risks
Predictive Analytics	Failure modeling for poles, transformers
Structural health monitoring	Predictive detection of pole tilt/weakness. Target wrap & replacement
Non-Wires Alternatives	DERs, DERMs, Demand Response can avoid upgrades or extend asset life
Intelligent Substation Monitoring	Predictive failure detection, flood/fire alerts
Digital Twin technology	Model grid stress, prioritize upgrades

Tech Stack 002 Continued

Modernization Levers

Descriptions

Smart Transformers & Grid Edge Intelligence	Replace old transformers with smarter ones that monitor health
FLISR/ADMS automation	Faster isolation & service restoration
Digital Substations	Digital relays and automated fault isolation
Resilience oriented upgrades	Composite poles, undergrounding in high-risk areas
Predictive failure models	AI and analytics to predict critical failures before they occur
AI-driven Outage Management Analytics	Use machine learning data, asset condition and grid topology
Digital Asset Management	Asset inventory traceability & integrity
Flexible microgrids	Localized back-up and critical load protection hugs
Customer-Sited Backup Programs	Distributed resilience capacity
Batteries/Generators	Lowers PSPS impact
Advanced Communication	Ensure data and control (FAN, LTE, Sat)
Feeder Automatic Reconfiguration	Improves outage restoration and dynamically shifts load to reduce stress and avoid failures during storms, wildfires, and heat events
Fault Detection Line Sensors	Advanced monitoring devices designed to avoid or pinpoint faults and outages

Aging Grid: Upgrading Aging Assets in the New Normal

We need targeted, risk-based resilience solutions to deliver reliability and resilience despite aging infrastructure and frequency in more extreme weather, flooding and wildfire events that disrupt service.

SOLVE



Accurate asset data is not just an operational need; it is a matter of public safety and trust. The failure to properly track, inspect, and upgrade aging assets has already contributed to catastrophic events as covered in Challenge 001. Poor visibility into asset condition and gaps in inventory records meant critical risks went unidentified before it was too late can create safety concerns, destroy entire communities, and create billions in liabilities.

These risks underscore that utilities cannot afford to treat asset tagging, data integrity, and inventory accuracy as administrative housekeeping. Asset monitoring, management and prediction are critical and possible today by deploying the technology stack assigned to this challenge. They are the frontline defense against safety incidents, wildfires, and cascading outages. As climate risks intensify, regulators, customers, and insurers will expect utilities to demonstrate not only that they know where every asset is, but that they can prove those assets are maintained, modernized, and safe. New solutions that can analyze data sets are even able to predict catastrophic failures before they happen. Assets management is not just about hardware, it's about getting comfortable with data, managing large data sets in the cloud and applying cutting edge analysis tools.

In short, a resilient and affordable grid begins with trustworthy asset data. Without it, utilities risk repeating the most costly and devastating failures in industry history.

Key Take-Away

Accurate asset data and inventory management is not a back-office task, it is the foundation of safety, reliability, and modernization. Without clear visibility into what assets exist, where they are located, and what condition they are in, utilities cannot prevent catastrophic failures like the 2018 Camp Fire in Paradise, California, which was sparked by aging equipment and poor asset oversight.

Reliable tagging and data integrity enable predictive maintenance, AI inspections, and smart grid technologies to function as intended, while also reducing O&M costs, improving outage response, and helping prioritize limited capital investments. The cost of getting asset data right is small compared to the billions in liability, regulatory penalties, and public trust lost from preventable failures.

A modern, resilient, and affordable grid begins with accurate asset data — without it, utilities risk building the future on a foundation of uncertainty.



003

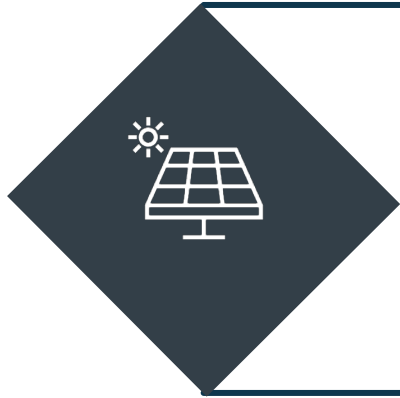
Challenge Statement

Grid Constraints: Overcoming Capacity Bottlenecks

We need faster, more affordable solutions to upgrade the grid to overcome capacity constraints coming from rapidly rising AI/data center load and growing electrification needs from more customers with EVs, heat pumps, etc.



Themes



01

Non-Wires Alternatives like Virtual Power Plant (VPP) and DER Aggregation can unlock peak demand shift by 2030; avoid stranded DER value. This also stresses the importance of standardization for interoperability.



02

EV & Data Center load growth creates multi-GW additions stressing feeders; managed charging & interconnections needed. Load forecasting can help avoid overbuild and manage peaks.



03

At customer sites, electrification of heating & industrial loads can reduce winter/summer peak risk outpacing capacity; integrating demand response/VPPs & thermal storage could help shift and shape load.



04

Interoperability and standardization required to overcome interconnection delays as well as enabling new applications such as VPPs and DERMS systems to dispatch and control.

Challenge 003 Overview

Overview


Distribution load is increasing at a pace that the grid was never designed to support.

U.S. utilities face rapidly rising distribution load from AI/data center growth, building/industrial electrification, and distributed energy resources (DERs), EVs and heat pump adoption that are all stacking demand on distribution feeders and substations.

What's at Risk

Customer could be left with stranded assets if data centers cancel interconnections or offset loads with their own generation stacks, leaving expensive infrastructure underutilized.

The reliance on capital-heavy solutions (vs non-wires alternatives) could force customers to pay more than necessary to maintain reliability.



CHALLENGE

Grid Constraints: Overcoming Capacity Bottlenecks

We need faster, more affordable solutions to upgrade the grid in order to overcome capacity constraints coming from rapidly rising distribution load stress from AI/data center growth and electrification needs of customers with EVs, heat pumps, etc.

SOLVE

Current State

Business-as-usual (BAU) approaches to upgrade traditional feeder and substation is too slow (on avg. 3–5 years) and expensive (on avg. \$5M+ per 10 MW substation upgrade).


Even DR and energy efficiency programs are rigid and will not be enough to shift demand shifts in shape or location needs over the long-term.

Desired Outcome

Instead of locking in higher bills through decades of capital cost recovery, customers would see faster savings and more reliable service with newer solutions like virtual power plants, managed EV charging, thermal load flexibility, and DERMS-enabled forecasting solutions that could deliver avoided costs.

Challenge 003

Example Challenges Created by AI from Research of Public Filings




CHALLENGE

ComEd

We need to upgrade infrastructure capacity to accommodate new peak demands that could exceed allowable limits of substation transformers to maintain service quality and prevent asset overload and low voltage violations that negatively impact customer service.

SOLVE



CHALLENGE

Duke Energy

We need to upgrade the existing energy infrastructure to handle projected increases in energy loads, particularly during peak demand periods to ensure reliable energy delivery and meet the growing demands of consumers without compromising service quality.

SOLVE




CHALLENGE

Arizona Public Service

We need to enhance grid capacity to accommodate the projected increase in total load requirements to ensure reliable energy delivery and meet future energy demands effectively.

SOLVE



CHALLENGE

Hawaiian Electric

We need to upgrade substations and lines, and add smart switches to improve operating flexibility and capacity to enable bi-directional power flow from future DERS

SOLVE

Interested in learning more about these challenges? Click on the SOLVE button to learn more at the InnovationWorks platform.

Email support@innovationforce.io if you need help or have any questions!

Tech Stack 003

BAU Options

Substation Feeder Upgrade

Energy Efficiency programs

Demand Response

Traditional Approaches and Results

Add new capacity ~\$500k/MW for a 20-40 yr payback

Permanent load reduction of 1-2% per program at \$200-\$400 per kW saved

Shifts 5-10% peak load via dispatchable programs ~\$50-\$150 per kW enrolled

Modernization Levers*

Virtual Power Plant

Customer Sited Storage

Managed EV Charging

Thermal Building Heat

Forecasting & DERMS tools

Dynamic Line Rating

Volt/Var Optimization

Intelligent Substation Monitoring

Flexible Interconnections

Phase Balancing

Dynamic Load Optimization

AI Driven Automated DR

Tower Raising Technology

Description of New Solutions

Aggregate DERs (solar, batteries, thermostats, EVs, into dispatchable capacity)

Provide targeted peak shaving, aggregated into portfolios

Align EV load with off-peak system capacity

Shift HVAC and heating loads, integrate thermal storage

Enable visibility, coordination and optimal dispatch, avoiding over building

Unlock 10-20% hidden feeder line capacity

Reduce peak by 1-2% free 2-4% feeder headroom

Enable predictive maintenance, avoid unnecessary expansions

Allow new large loads to rapidly connect to curtail/flex instead of full infrastructure

Balances load across phases, stabilize feeder voltage, unlocking hidden capacity

Communicates flexibility, orchestration of EVs, heat pumps, data centers.

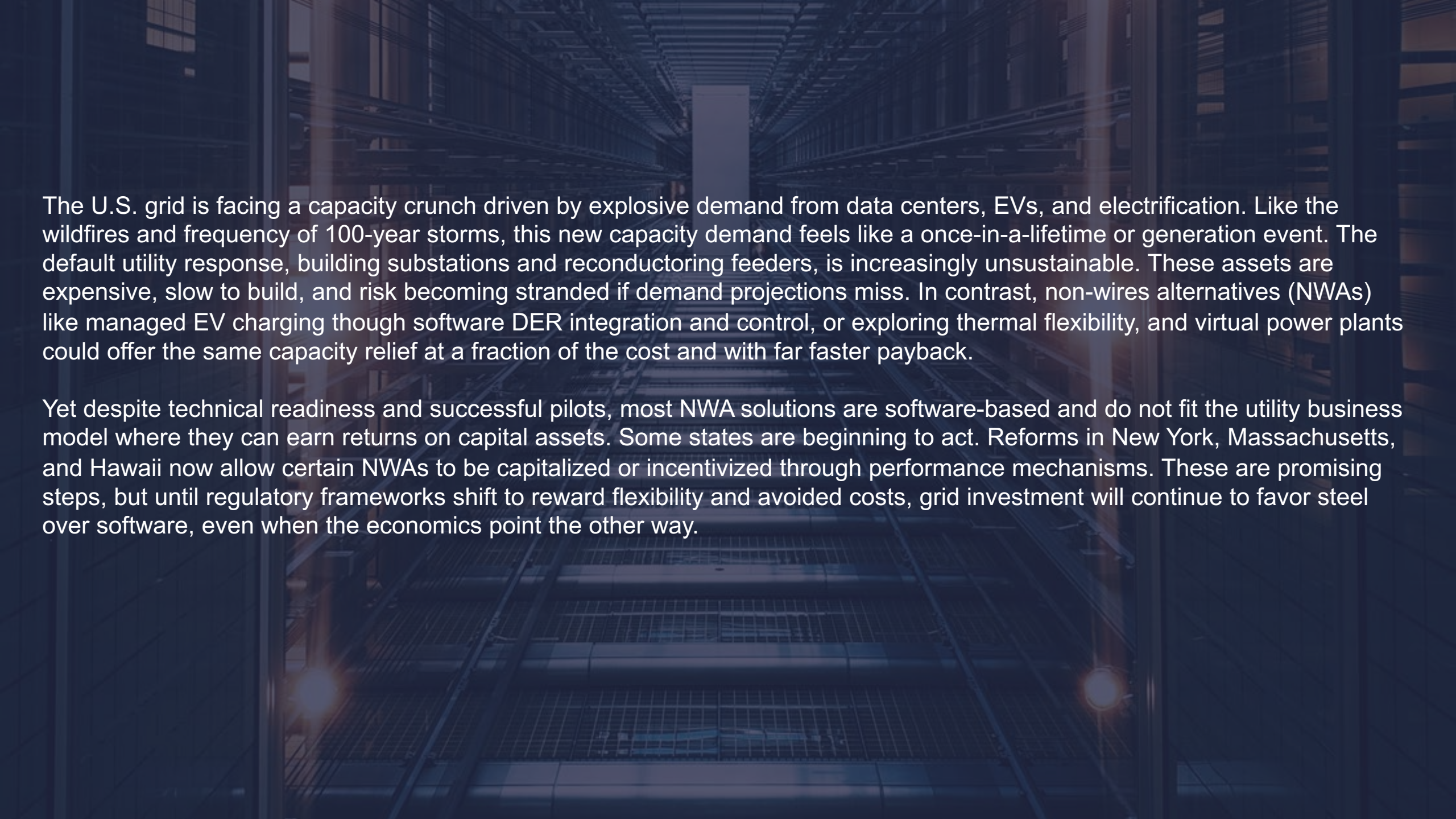
Next-gen DR uses AI to dispatch load reductions dynamically scaling beyond static curtailment

Boost clearance and enables reconductoring at 10-20% of a new build

Grid Constraints: Overcoming Capacity Bottlenecks

We need faster, more affordable solutions to upgrade the grid to overcome capacity constraints coming from rapidly rising AI data center distribution load stress and electrification needs of customers with EVs, heat pumps, etc. Instead of “steel in the ground”, where can AI and software drive capacity and avoided costs?

SOLVE



The U.S. grid is facing a capacity crunch driven by explosive demand from data centers, EVs, and electrification. Like the wildfires and frequency of 100-year storms, this new capacity demand feels like a once-in-a-lifetime or generation event. The default utility response, building substations and reconductoring feeders, is increasingly unsustainable. These assets are expensive, slow to build, and risk becoming stranded if demand projections miss. In contrast, non-wires alternatives (NWAs) like managed EV charging through software DER integration and control, or exploring thermal flexibility, and virtual power plants could offer the same capacity relief at a fraction of the cost and with far faster payback.

Yet despite technical readiness and successful pilots, most NWA solutions are software-based and do not fit the utility business model where they can earn returns on capital assets. Some states are beginning to act. Reforms in New York, Massachusetts, and Hawaii now allow certain NWAs to be capitalized or incentivized through performance mechanisms. These are promising steps, but until regulatory frameworks shift to reward flexibility and avoided costs, grid investment will continue to favor steel over software, even when the economics point the other way.

Key Take-Away

The cheapest, fastest, and most customer-friendly way to meet new demand is through NWAs, meaning we may not need a new substation every time.

But until utility incentives are aligned and these new technologies are tested, modernization will stall, and stranded assets will mount. This makes regulatory reform around NWAs one of the most important levers in avoiding billions in unnecessary costs and ensuring the grid evolves to meet the demands of an electrified economy.



004

Challenge Statement

Grid Constraints: Overcoming Supply Chain Bottlenecks

We need a resilient, diversified, and regionally aligned energy infrastructure supply chain to achieve timely and cost-effective grid modernization at the pace required by electrification and growing capacity needs.



Themes



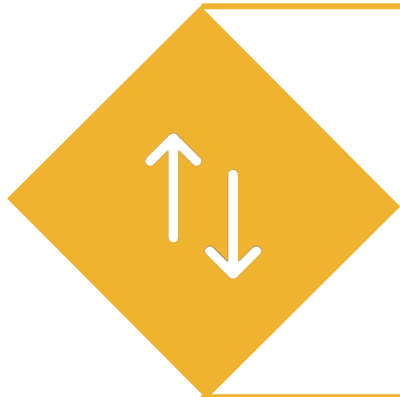
01

Supply Chain & Manufacturing Bottlenecks: Shortages to replace the millions of pole-top and pad-mount transformer units needed for customer connections and load growth. Manufacturing delays also impacting smart meters and switches.



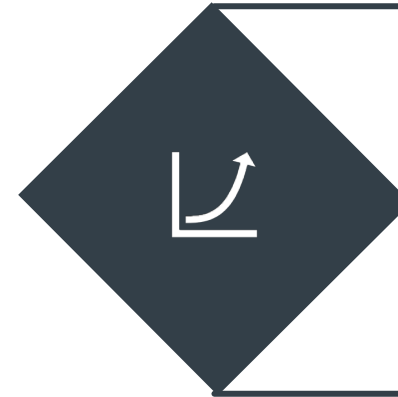
02

Supply Chain Concentration: Few domestic manufacturers; reliance on global suppliers could drive up costs and compliance risks. New tariff policies could increase costs further on imports – especially steel and timber.



03

Capex pressure driving multi-billion dollar spends across utilities while much smaller OPEX budgets means fewer resources to manage software or cloud-based applications that can help manage through the bottleneck.



04

Industry needs to move away from proprietary systems and toward vendor agnostic headend solutions for investment protection from stranded assets in supply chain crisis.

Challenge 004 Overview

Overview


Core grid equipment from transformers to meters, and cables to switchgear are facing long lead times and rising costs.

As of mid-2025, transformer prices have climbed 60–80% since 2020, and lead times for power transformers now exceed 2.5 years. Experts predict a potential 30% supply shortfall for power units and 10% for distribution units by year-end.

What's at Risk

Delays stall new customer connections, EV charging, and data center interconnections. Aging fleets risk failures that utilities cannot quickly replace, raising outage and safety risks.

Emergency purchases drive up costs, while meter delays undermine affordability programs and demand flexibility.



CHALLENGE

Removing Supply Chain Bottlenecks

SOLVE

Current State

Most transformer fleets are 30–40+ years old, and many AMI systems are due for replacement just as supply chains tighten.

Procurement is often one-off and reactive, with limited vendor pools and dependence on global suppliers. Domestic manufacturing capacity remains thin.

New software-based technologies could offer leapfrog opportunities.

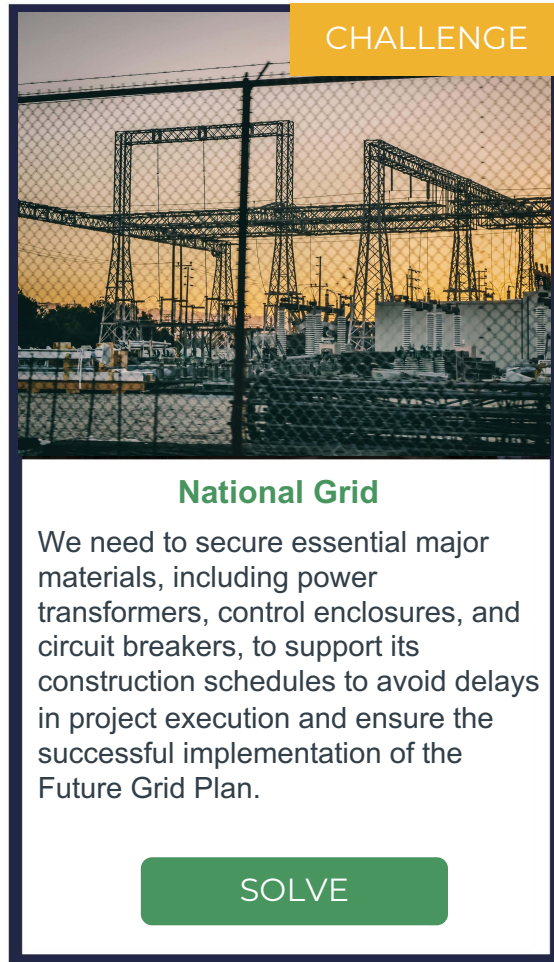
Desired Outcome

Utilities move from reactive replacement to a modernization strategy. Bulk purchasing and standardization shorten lead times, refurbishment extends asset life, and smarter equipment embeds sensing and control.


Paired with DER flexibility, this reduces load stress and ensures reliability, electrification progress, and affordability.

Challenge 004

Example Challenges Created by AI from Research of Public Filings



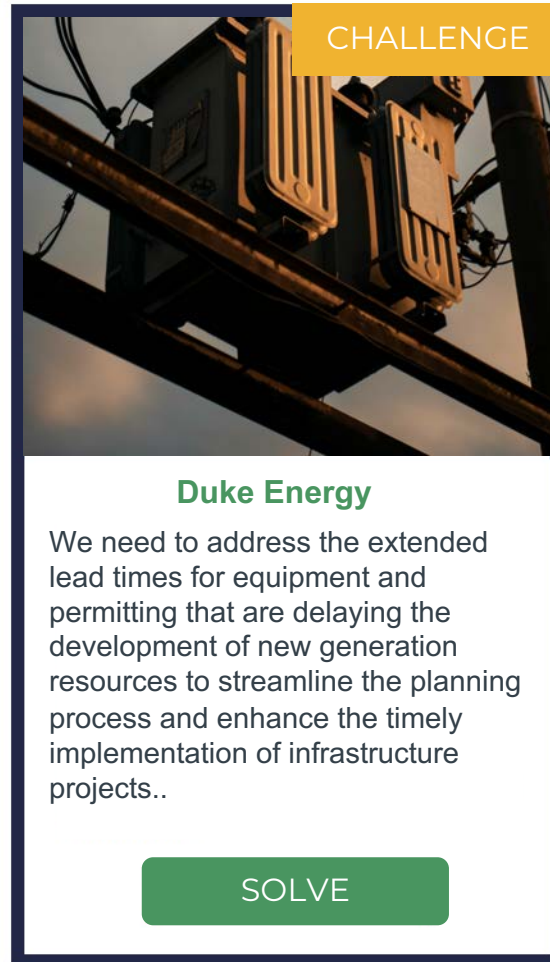
CHALLENGE




National Grid

We need to secure essential major materials, including power transformers, control enclosures, and circuit breakers, to support its construction schedules to avoid delays in project execution and ensure the successful implementation of the Future Grid Plan.

SOLVE



CHALLENGE




Duke Energy

We need to address the extended lead times for equipment and permitting that are delaying the development of new generation resources to streamline the planning process and enhance the timely implementation of infrastructure projects..

SOLVE



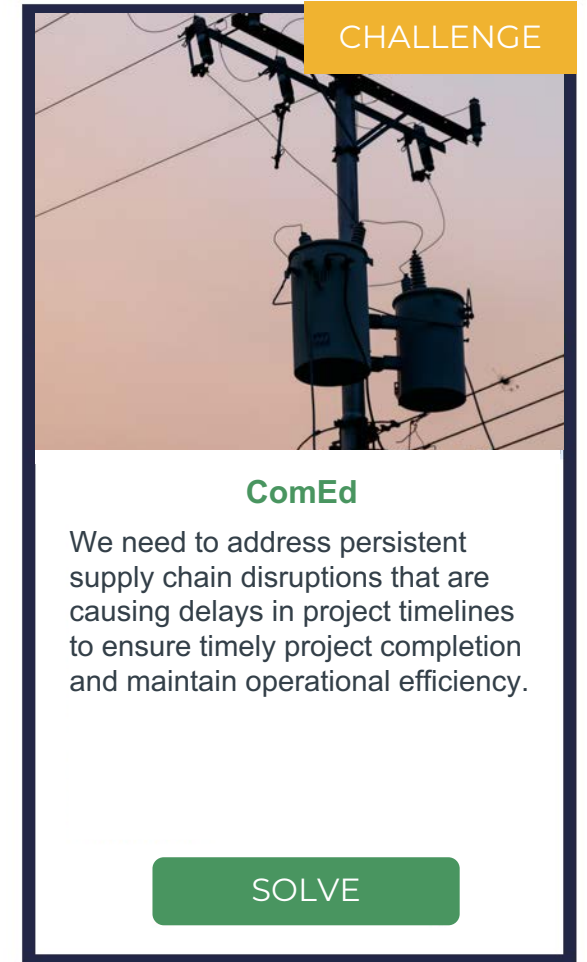
CHALLENGE




ConEd

We need to manage supply chain disruptions that interfere with the lead time and implementation timelines of Non-Wires Solutions (NWS) portfolios to ensure timely and effective implementation of NWS projects, which are critical for meeting load relief needs and enhancing operational efficiency.

SOLVE



CHALLENGE



ComEd

We need to address persistent supply chain disruptions that are causing delays in project timelines to ensure timely project completion and maintain operational efficiency.

SOLVE

Interested in learning more about these challenges? Click on the SOLVE button to learn more at the InnovationWorks platform.

Email support@innovationforce.io if you need help or have any questions!

Tech Stack 004

Removing Supply Chain Bottlenecks

We need a resilient, diversified, and regionally aligned energy infrastructure supply chain to achieve timely and cost-effective grid modernization at the pace required by electrification and growing capacity needs.

SOLVE

BAU Options

Replace Distribution Transformers
 Replace Substation Transformers
 Meter Replacement
 Switchgear / Breaker Replacement

Traditional Approaches and Results

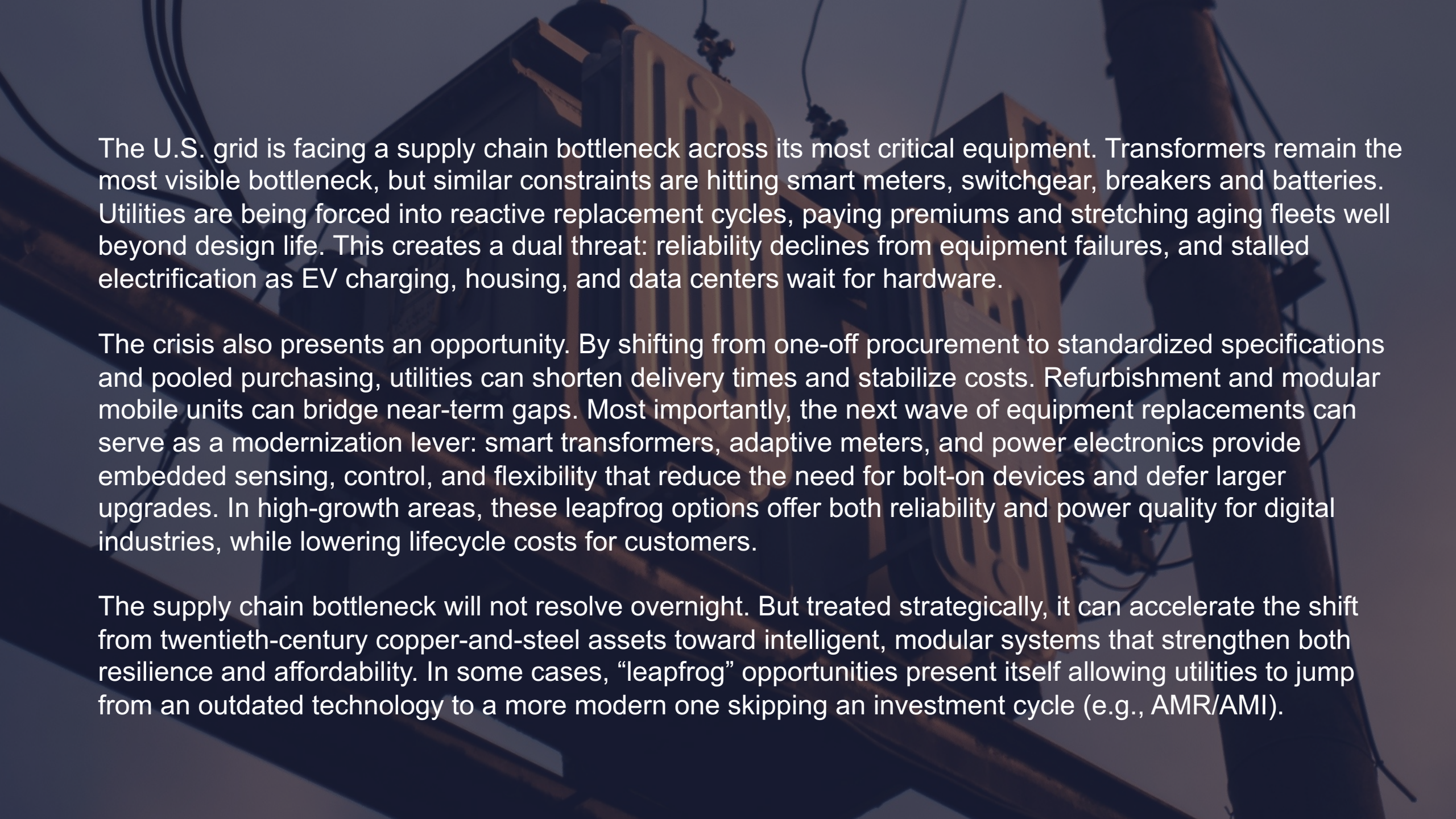
Meets incremental load; customer connections
 Maintain substation reliability; load growth
 Customer billing, TOU enablement
 Reliability at substations and feeders

Modernization Levers*

Regional Procurement Pools
 Standardization of Specs
 Mobile/Modular Transformer/Switchgear
 Refurbishment & Life extension
 DER Flexibility & VPPs
 Vendor Agnostic Headend Systems
 Power Electronics (Solid State Transformers)
 Non-Wires Alternatives
 Smart Distribution Transformers
 Dynamic rating
 Digital Twin Planning Tools
 Edge Controllers & Comms
 IEEE Interoperability

Description of New Solutions

Shorter lead times and unit costs
 Fewer custom builds, faster delivery
 Backstop for failures; bridges supply gaps
 Extend life 5-15 years
 Defers ~10-20% of transformer feeder upgrades
 Open data models for AMI and smart meter data
 Voltage/VAR support, bidirectional power flow & power quality data for DERs and data centers
 Defers substation feeder capacity projects (see Challenge 001)
 Grid-edge visibility; DER hosting
 Reliability extension
 Simulate grid expansion options, reliability extension
 Local coordination of DER clusters and EV fleets; low-latency
 Protocol agnostic solutions to avoid proprietary vendor lock-in



The U.S. grid is facing a supply chain bottleneck across its most critical equipment. Transformers remain the most visible bottleneck, but similar constraints are hitting smart meters, switchgear, breakers and batteries. Utilities are being forced into reactive replacement cycles, paying premiums and stretching aging fleets well beyond design life. This creates a dual threat: reliability declines from equipment failures, and stalled electrification as EV charging, housing, and data centers wait for hardware.

The crisis also presents an opportunity. By shifting from one-off procurement to standardized specifications and pooled purchasing, utilities can shorten delivery times and stabilize costs. Refurbishment and modular mobile units can bridge near-term gaps. Most importantly, the next wave of equipment replacements can serve as a modernization lever: smart transformers, adaptive meters, and power electronics provide embedded sensing, control, and flexibility that reduce the need for bolt-on devices and defer larger upgrades. In high-growth areas, these leapfrog options offer both reliability and power quality for digital industries, while lowering lifecycle costs for customers.

The supply chain bottleneck will not resolve overnight. But treated strategically, it can accelerate the shift from twentieth-century copper-and-steel assets toward intelligent, modular systems that strengthen both resilience and affordability. In some cases, “leapfrog” opportunities present itself allowing utilities to jump from an outdated technology to a more modern one skipping an investment cycle (e.g., AMR/AMI).

Key Take-Away

Supply chain constraints are a crisis, but also a chance to leapfrog and modernize.

By combining bulk procurement, refurbishment, and smart-ready equipment, utilities can keep electrification on track, reduce reliability risks, and transform replacements into long-term modernization wins.

These challenges spotlight the need toward interoperability and future-proofing investments with vendor-agnostic solutions.



005

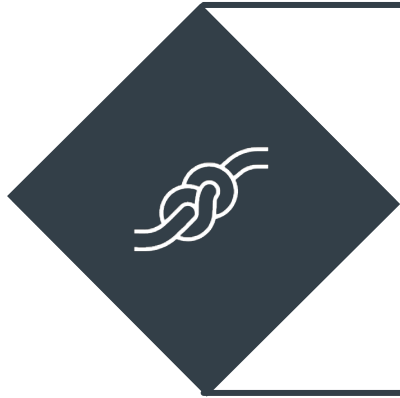
Challenge Statement

Grid Constraints: Overcoming Interconnection Bottlenecks

We need a more scalable, cost-effective, and scenario-driven regional transmission planning and interconnection capability to achieve accelerated the dynamic energy transition, improved grid reliability, and reduced project delays under new FERC mandates.



Themes



01

Interconnection queue backlogs, especially in MISO, PJM, and CAISO face multi-year delays. Cancelling projects could cause utilities to miss capacity needs and dynamic energy transition targets.



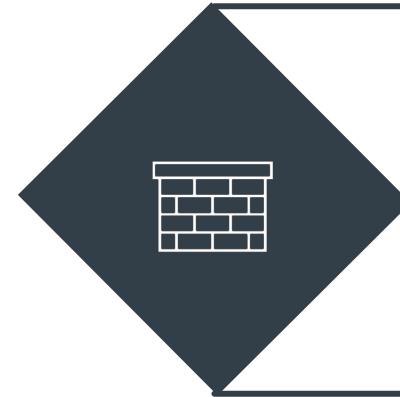
02

Transmission congestion, limited transfer capacity raises congestion costs. Improved flow via reconductoring, DLR, and targeted expansions.



03

Cost Allocation Disputes. States and utilities often argue over who pays for regional upgrades. FERC 1920 seeks to standardize benefit-cost methods, but implementation remains uncertain.



04

Planning fragmentation, regional planning is siloed and often missing local distribution needs and state policies. New requirement for 20-year scenario-based planning.

Challenge 005 Overview


Overview

Explosive demand from renewables, data centers, and electrification has pushed interconnection queues past 2,600 GW, with 4–5 year delays. Transmission congestion drives up costs, while disputes over who pays slow expansion.

FERC Order 1920 requires 20-year scenario planning and cost sharing, but execution is uneven.

What's at Risk

Clean energy projects risk cancellation, billions in congestion costs flow to customers, and reliability suffers as load grows faster than capacity. Cost allocation fights and permitting delays compound the problem.



**Clearing the Backlog:
Accelerating
Interconnection
Through Modern
Solutions**

SOLVE

Current State

Utilities still default to costly, slow new 345 kV lines or redispatch, which can exceed \$100M annually.

Grid-enhancing technologies like reconductoring, dynamic line ratings, and AI queue tools are proven, cheaper, and faster — but could remain sidelined by capex bias.

Desired Outcome

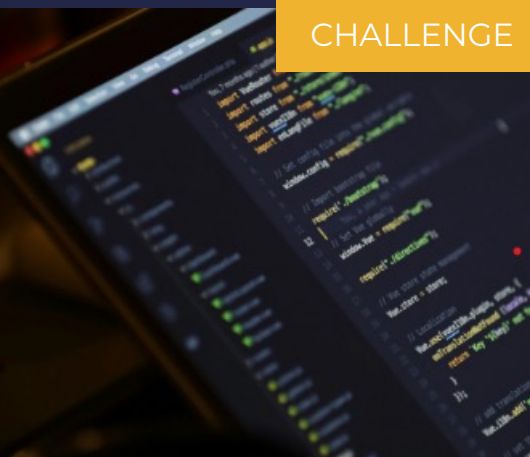
A balanced approach: targeted new lines plus rapid deployment of modernization tools that unlock capacity in 1–3 years at 70–80% lower cost.

Transparent, faster interconnection and scenario-based regional planning deliver affordable, reliable expansion aligned with dynamic energy transition goals.

Challenge 005

Example Challenges Created by AI from Research of Public Filings

CHALLENGE



ConEd

We need to automate the application management portion of the interconnection process, including application submittal, validation, tracking, and approval to streamline the interconnection process for distributed energy resources (DERs).

SOLVE

CHALLENGE



SCE

We need to streamline the interconnection application process to eliminate reliance on paper or soft copy requests to reduce manual processing times and improve the efficiency of the interconnection process..

SOLVE

CHALLENGE




Hawaiian Electric

We need to significantly upgrade the transmission and distribution systems to accommodate the interconnection of Distributed Energy Resources (DER) selected by the RESOLVE model to ensure system stability and meet the forecasted peak demand by 2046 and beyond.

SOLVE

CHALLENGE



XCEL

We need to identify and incorporate the costs associated with interconnecting Distributed Energy Resources (DER) to ensure optimal plan selection in the Integrated Resource Plan (IRP) to effectively manage costs and streamline the interconnection process for DER projects.

SOLVE

Interested in learning more about these challenges? Click on the SOLVE button to learn more at the InnovationWorks platform.

Email support@innovationforce.io if you need help or have any questions!

Tech Stack 005

BAU Options

Build new 345 kV transmission lines
Substation expansion
Dispatch and curtailment

Traditional Approaches and Results

On avg. \$5M-\$10M per mile, 7-10 years to permit and build
On avg. \$5M for 10 MW of capacity, decades to recover
Pay generators to shift output or turn off to manage congestion

Modernization Levers*

Advanced Reconductoring
Dynamic Line Rating
Phase-Shifting Transformers

Modular FACTS Devices
Topology Optimization Software
Storage-as-Transmission

AI Queue Automation
Hosting Capacity & Cluster studies
Hybrid Interconnection

Flexible Interconnection Agreements
Digital Twin Planning Tools
Tower Raising Technology

FERC 1920
Regional Cost-Sharing Frameworks
Congestion Hedging/Capacity Rights

Description of New Solutions

Increases thermal limits of existing lines, avoiding new ROW.
Unlock 10-20% hidden feeder line capacity
Re-routes flows to balance underutilized corridors

Smart Valves deployable in months reduce congestion and enhance flexibility.
Uses algorithms to optimize flows, often unlocking 5–10% capacity.
“Grid booster batteries” act as shock absorber at congested nodes

Cuts interconnection study times 30-50%, reduces cancellations
Improved transparency and reduces study rework
Storage + renewables raised capacity factors and reduces upgrade triggers

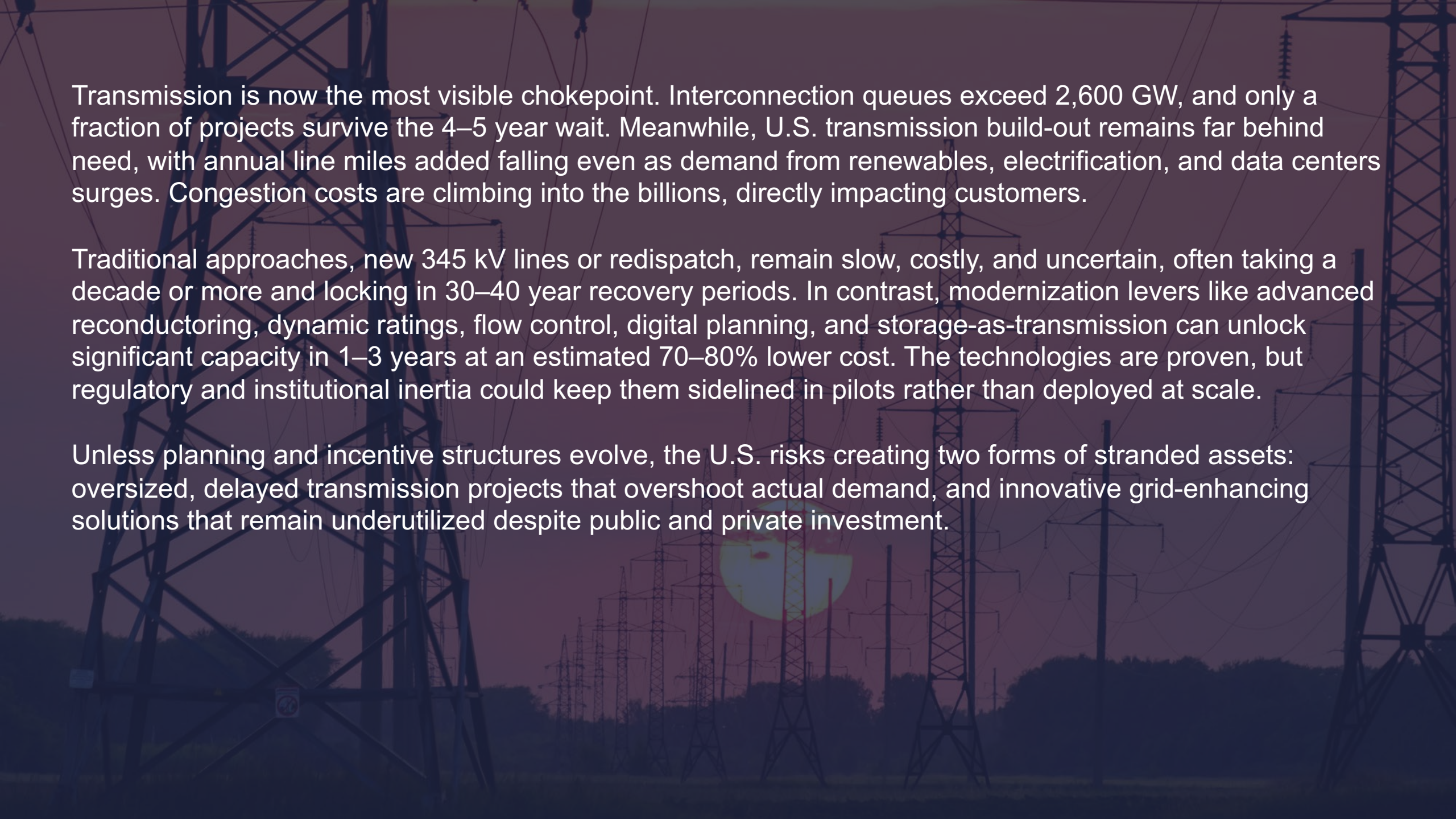
Offers limited-service interconnection to speed project entry
Simulate grid expansion options, avoiding stranded investments
Boost clearance and enables reconductoring at 10-20% of a new build

Integrates 20-yr scenarios, links T&D and DER
Reduces disputes, accelerates projects
Market incentives for third-party solutions

Clearing the Backlog: Accelerating Interconnection Through Modern Solutions

We need a more scalable, cost-effective, and scenario-driven regional transmission planning and interconnection capability to achieve accelerated the dynamic energy transition, improved grid reliability, and reduced project delays under new FERC mandates.

SOLVE



Transmission is now the most visible chokepoint. Interconnection queues exceed 2,600 GW, and only a fraction of projects survive the 4–5 year wait. Meanwhile, U.S. transmission build-out remains far behind need, with annual line miles added falling even as demand from renewables, electrification, and data centers surges. Congestion costs are climbing into the billions, directly impacting customers.

Traditional approaches, new 345 kV lines or redispatch, remain slow, costly, and uncertain, often taking a decade or more and locking in 30–40 year recovery periods. In contrast, modernization levers like advanced reconductoring, dynamic ratings, flow control, digital planning, and storage-as-transmission can unlock significant capacity in 1–3 years at an estimated 70–80% lower cost. The technologies are proven, but regulatory and institutional inertia could keep them sidelined in pilots rather than deployed at scale.

Unless planning and incentive structures evolve, the U.S. risks creating two forms of stranded assets: oversized, delayed transmission projects that overshoot actual demand, and innovative grid-enhancing solutions that remain underutilized despite public and private investment.

Key Take-Away

The grid needs a balanced strategy: new transmission where essential, but rapid deployment of proven modernization tools everywhere else.

Without this shift, billions will be spent on slow, high-cost projects while cheaper, faster solutions remain idle delaying dynamic energy transition goals and raising costs for customers if the largest generators do not join the grid.



006


Challenge Statement

Flexible Grid: Operationalizing DERS in a 2-way Grid

We need advanced DER integration capabilities, including real-time visibility, dynamic control, and planning tools to achieve safe, scalable, and reliable operation of a two-way, distributed energy grid.




Themes




01

Strategic use of operational data increases hosting capacity and visibility gaps, lack of real-time feeder capacity data, project delays for DER developers.




02

Voltage and protection challenges; high solar penetration creates voltage and reverse power flows; protection schemes fail in bi-directional grid.



03

Interoperability and Operational Flexibility Needs: DERs not integrated into dispatchable operators, DR, storage and EV charging flexibility remain siloed.



04

Planning tool modernization: Integrated Capacity Analysis, DERMS, ADMS and lack of automation could lead to costly overbuild or DER value.

Challenge 006 Overview

Overview

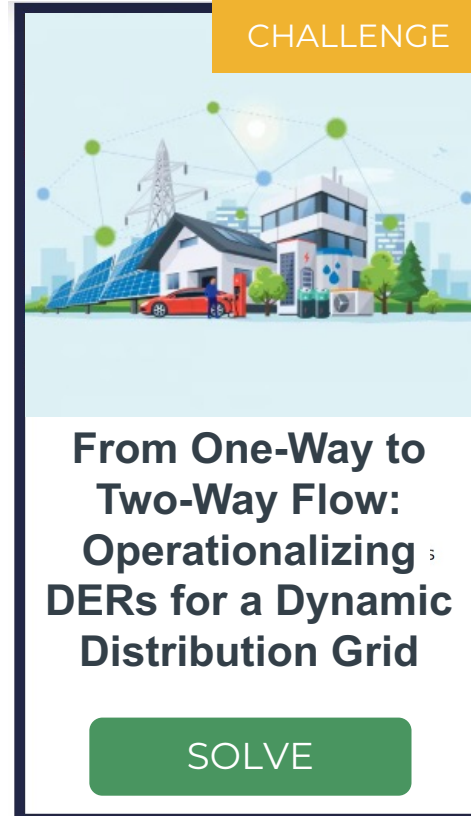
Distribution grids were designed for one-way power flows, from substation to customer, but with high penetration of rooftop solar, behind-the-meter batteries, EVs, and building flexibility, the grid is increasingly operating as a two-way, dynamic system.

This problem goes beyond the capacity challenge to focus on voltage stability, protection coordination, and dispatch visibility

What's at Risk

Customer could be left with stranded assets if data centers cancel interconnections or offset loads with their own generation stacks, leaving expensive infrastructure underutilized.

The reliance on capital-heavy solutions could force customers to pay more than necessary to maintain reliability.



CHALLENGE

**From One-Way to Two-Way Flow:
Operationalizing DERs for a Dynamic Distribution Grid**

SOLVE

Current State

Traditional tools and planning methods cannot manage these new dynamics at scale, and without modernization, utilities face safety risks, interconnection backlogs, and missed opportunities to leverage DERs as grid assets.

Desired Outcome


Instead of locking in higher customer bills through decades of capital cost recovery, utilities would unlock faster savings and greater reliability by adopting modern grid solutions—such as virtual power plants, managed EV charging, and DERMS-enabled forecasting.

These technologies enable cost-effective alternatives to traditional infrastructure, delivering measurable avoided costs and improving service for all customers.

Challenge 006

Example Challenges Created by AI from Research of Public Filings

CHALLENGE




Southern Company

We need to assess the necessary technology to stabilize the grid due to increased Distributed Generation (DG) adoption in order to ensure reliable power delivery and adapt to changing regulatory policies and Grid Resource Capacity (GRC) structures.

SOLVE

CHALLENGE




Dominion

We need to fundamentally change the electric grid to accommodate the dynamic flow of electricity from Distributed Energy Resources (DERs) in order to enhance grid reliability, improve power quality, and maximize the value of DERs while maintaining consistent electric service for customers..

SOLVE

CHALLENGE




ComEd

We need to upgrade existing distribution systems that were not designed for two-way power flows from customer premises to substations in order to ensure safe and reliable operation of the grid as renewable energy sources become more prevalent.

SOLVE

CHALLENGE



Duke Energy

We need to expand the deployment of distributed energy resources across the service area in order to improve grid resilience

SOLVE

Interested in learning more about these challenges? Click on the SOLVE button to learn more at the InnovationWorks platform.

Email support@innovationforce.io if you need help or have any questions!

Tech Stack 006

From One-Way to Two-Way Flow: Operationalizing DERs for a Dynamic Distribution Grid

We need advanced DER integration capabilities, including real-time visibility, dynamic control, and planning tools to achieve safe, scalable, and reliable operation of a two-way, distributed energy grid.

SOLVE

BAU Options

Traditional Feeder Upgrades

Blanket Interconnection

Traditional Approaches and Results

Reconductoring, voltage regulators., adds capacity addresses voltage rise

Ensures safety, but adds time/cost

Modernization Levers*

Capacity Analysis (ICA)

DERMS/ADMS

Advanced Forecasting

Smart Inverters

Volt/Var Optimization / CVR

Advanced Protection Schemes

Digital Twins Distribution

DER Aggregation / VPP Participation

EV Managed Charging

Flexible Interconnection Agreements

Digital Twin Planning Tools

Edge Controllers & Comms

Description of New Solutions

Transparency, faster interconnection

Enables real-time DER dispatch

Improves net load prediction; aligns DER dispatch with true conditions

Local voltage/frequency support

Peak reduction, feeder headroom

Adaptive and directional relays / safe two-way operations

Simulation of DER impact; proactive planning

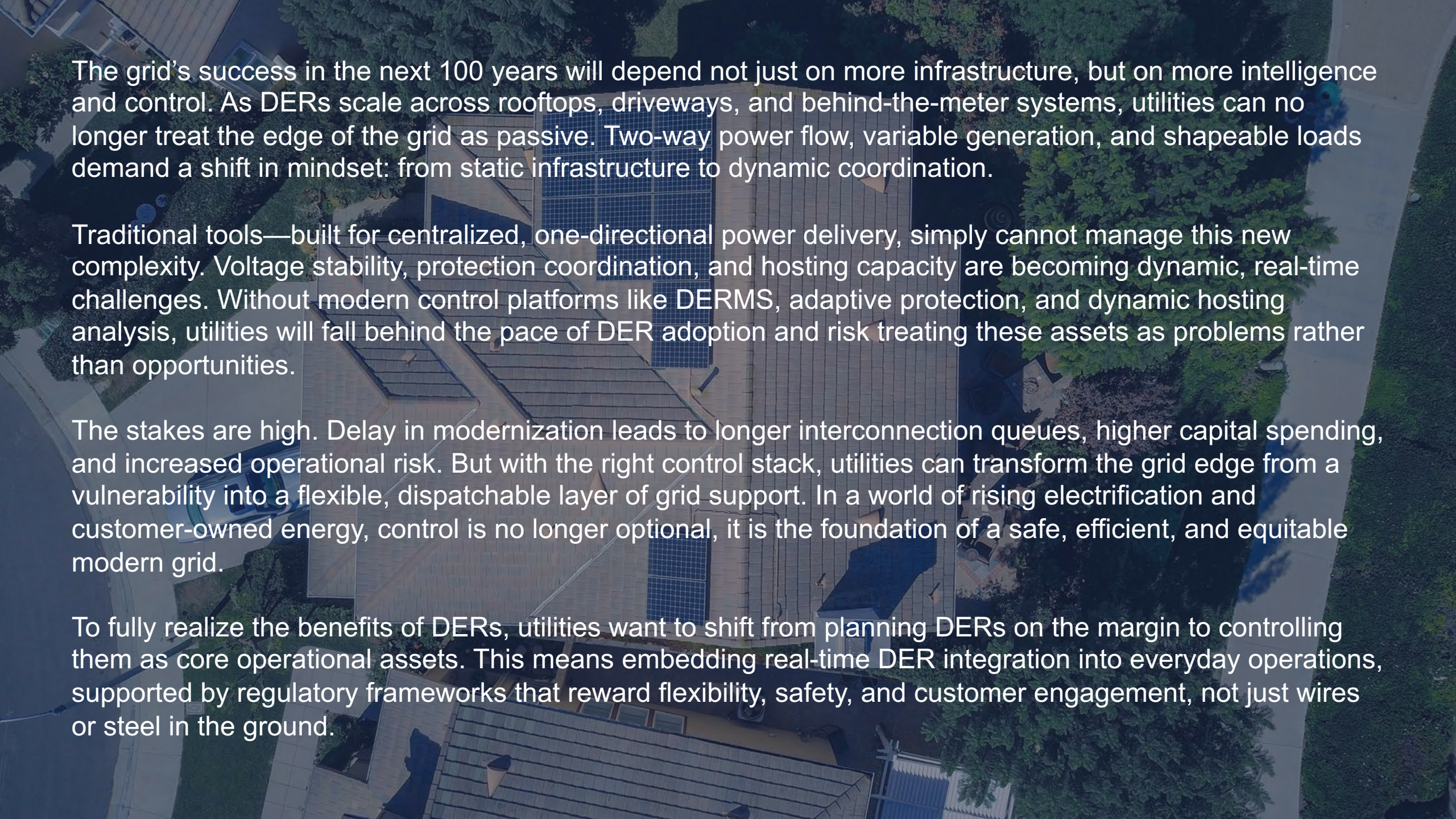
Shifts peak, relieves feeders

Prevents overloads, enables bi-directional flows

Offers limited-service interconnection to speed project entry

Simulate grid expansion options, avoiding stranded investments

Local coordination of DER clusters and EV fleets; low-latency

An aerial photograph of a residential neighborhood, showing several houses with solar panels installed on their roofs. The image is overlaid with a semi-transparent dark blue filter. The text is white and positioned in the upper left quadrant.

The grid's success in the next 100 years will depend not just on more infrastructure, but on more intelligence and control. As DERs scale across rooftops, driveways, and behind-the-meter systems, utilities can no longer treat the edge of the grid as passive. Two-way power flow, variable generation, and shapeable loads demand a shift in mindset: from static infrastructure to dynamic coordination.

Traditional tools—built for centralized, one-directional power delivery, simply cannot manage this new complexity. Voltage stability, protection coordination, and hosting capacity are becoming dynamic, real-time challenges. Without modern control platforms like DERMS, adaptive protection, and dynamic hosting analysis, utilities will fall behind the pace of DER adoption and risk treating these assets as problems rather than opportunities.

The stakes are high. Delay in modernization leads to longer interconnection queues, higher capital spending, and increased operational risk. But with the right control stack, utilities can transform the grid edge from a vulnerability into a flexible, dispatchable layer of grid support. In a world of rising electrification and customer-owned energy, control is no longer optional, it is the foundation of a safe, efficient, and equitable modern grid.

To fully realize the benefits of DERs, utilities want to shift from planning DERs on the margin to controlling them as core operational assets. This means embedding real-time DER integration into everyday operations, supported by regulatory frameworks that reward flexibility, safety, and customer engagement, not just wires or steel in the ground.

Key Take-Away

The future grid is no longer a one-way system; its success depends on control.

Advanced DER integration capabilities turn solar, batteries, and EVs from risks into flexible assets, enabling safe, reliable, and affordable two-way grid operations.

This will be the new normal for the grid in the next 100 years.



007

Challenge Statement

Flexible Load Forecasting: Planning for a Nonlinear Future

We need adaptive, data-driven planning tools with real-time DER visibility and flexible resource integration to achieve cost-effective, resilient grid investments in a rapidly evolving and uncertain demand environment.



Themes



01

Adaptive planning & forecasting: scenario-based planning tools that incorporate data, DER adoption, electrification, weather and market signals



02

Real-time DER data visibility: System-wide awareness of DER operations (solar, EVs, batteries) down to the feeder level. Hosting capacity and voltage monitoring with dynamic updates



03

Flexible Resource Integration: Controllable DERs (VPPs, DR, EV, BTM batteries), emphasis on distributed flexibility as an operational asset



04

Strategic use of operational data: Tools that accommodate unpredictable load growth from electrification or policy shifts, probabilistic models

Challenge 007 Overview

Overview

Utilities are navigating an era of rapid and unpredictable grid change. Electrification, data centers, DERs, and extreme weather are driving non-linear demand that legacy planning tools can't keep up with.

Traditional methods, like annual forecasts and static models, leave utilities exposed to costly missteps, either by overbuilding and stranding assets or underbuilding and triggering expensive emergency responses. Modern, data-driven planning must now become a core capability, not a side investment.

What's at Risk

Failure to modernize planning tools could result in billions in stranded or misallocated investments, rising customer costs, and declining regulatory trust. Utilities that can't anticipate load volatility or DER growth will fall behind, triggering emergency spending and delaying critical infrastructure.



CHALLENGE

**Forecasting Load:
Planning for a Non-
Linear Future**

SOLVE

Current State

Most utilities still rely on deterministic forecasts and manual planning cycles designed for gradual growth. DER visibility is limited, scenario analysis is slow, and NWAs are often treated as niche pilots rather than mainstream alternatives.

Planning systems lack automation and fail to reflect uncertainty or climate risks—leading to reactive investments and poor alignment with real-world system conditions.

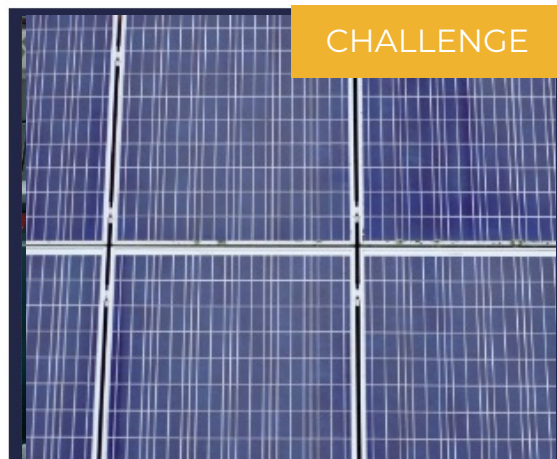
Desired Outcome

Utilities need adaptive, analytics-driven planning platforms that integrate real-time data, probabilistic forecasting, and DER visibility. Scenario-based tools should account for flexible demand, climate stress, and locational value, while NWAs and DERs must be treated as integral to capacity planning.

Automation should shrink planning timelines from years to months, enabling faster, smarter, and more affordable decisions.

Challenge 007

Example Challenges Created by AI from Research of Public Filings

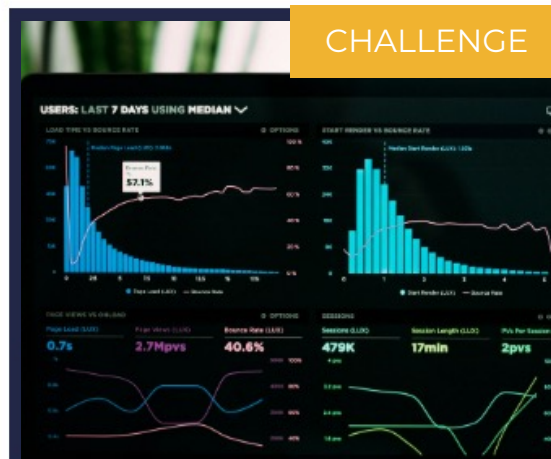


CHALLENGE

Ameren

We need to improve the integration of renewable generation forecasts into load growth scenarios to provide a more comprehensive view of future energy needs and enhance resource planning.

SOLVE



CHALLENGE

NYSEG

We need to transition from a top-down DER forecasting methodology to a reliable bottom-up forecasting approach to accurately reflect DERs by type, such as solar photovoltaic, energy efficiency, and storage..

SOLVE



CHALLENGE

Entergy

We need to account for uncertainties in load forecasting due to technological changes, economic activity, and increased adoption of electric vehicles to maintain reliable service and effectively plan for future energy demands.

SOLVE



CHALLENGE

Hawaiian Electric

We need to develop long-term load forecasts that accurately reflect system and network peak demand to guide infrastructure investment decisions and ensure reliable power delivery.

SOLVE

Interested in learning more about these challenges? Click on the SOLVE button to learn more at the InnovationWorks platform.

Email support@innovationforce.io if you need help or have any questions!

Tech Stack 007

BAU Options

Static Load Forecasting

Traditional Deterministic Models

Traditional Approaches and Results

Inexpensive annual updates that miss volatility

Incremental growth assumptions, limited DER/EV visibility

Modernization Levers*

Enhanced Load & Flexibility Forecasting

Climate-integrated Load Forecasting

End-use Appliance-level Forecasting

Integrated NWA Assessment Platforms

Locational Value Analysis

DERMS-lite Integration Planning Tools

Probabilistic Scenario Modeling

Distribution-edge Forecasting

AI-assisted Automated Planning Analytics

Digital Twin of Distribution System

Integrated Forecasting + DERMS Market Signals

AI/ML Forecasting Engines

Automated NWA Marketplace Platforms

Integrated Gas/Electric Forecasting

Description of New Solutions

Forecasts shapeable demand and load flexibility to improve near-term accuracy to avoid overbuilds

Captures long-term demand under extreme heat, wildfires & storms

Bottom-up view of load growth (e.g., EVs, heat pumps), more precise

Standardizes NWA cost-benefit analysis in planning

Quantifies value of DERs/storage by feeder/substation

Incorporates DER forecasts/visibility into planning

Captures uncertainty ranges, not single-point forecasts

Identifies local overloads before failures, supports transformer planning

Compress planning cycle times from years to months

Real-time simulation of load, DERs, weather impacts

Aligns planning with real-time operations and markets

Learns emerging load patterns faster than traditional models

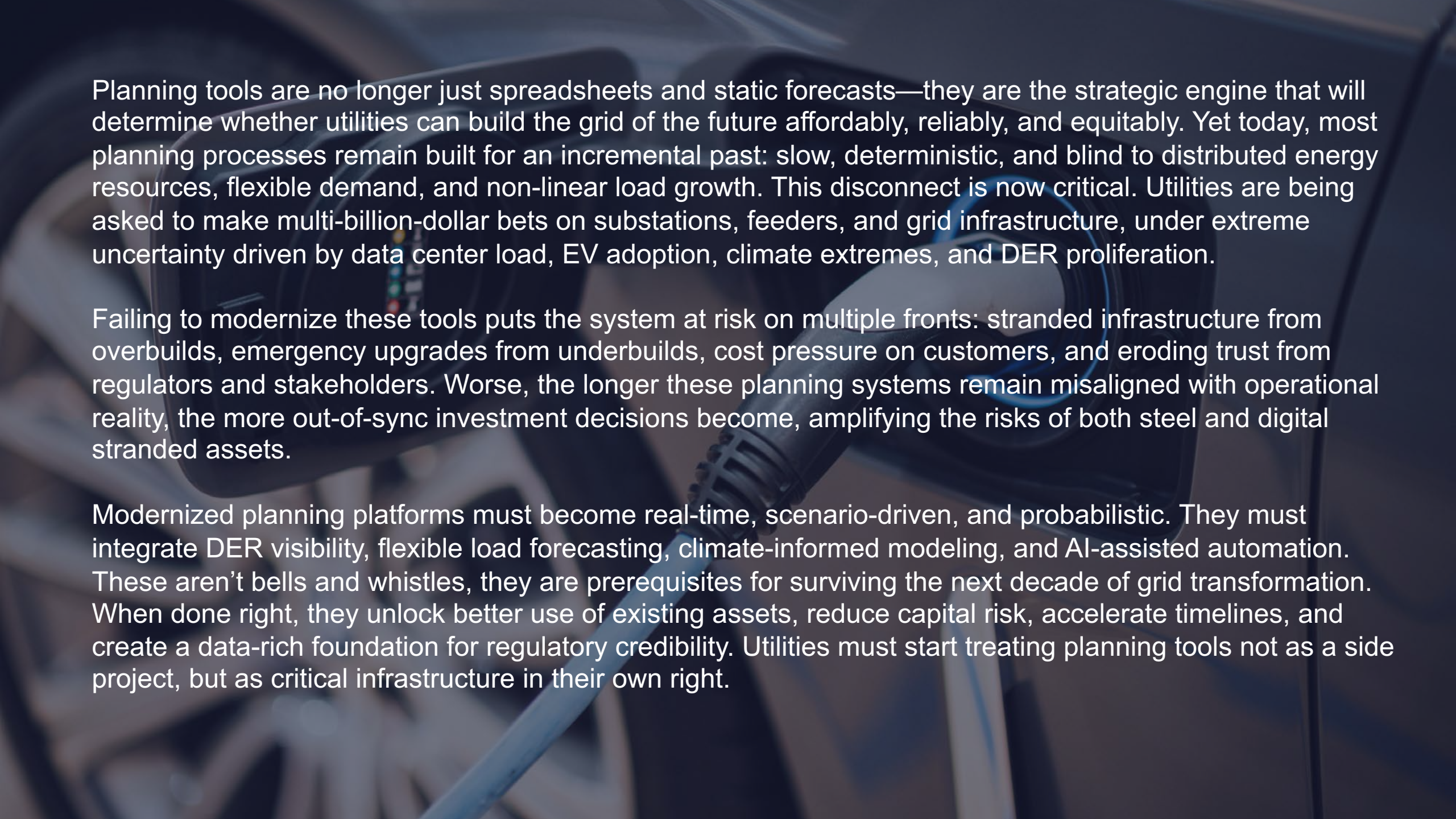
Bids DERs, DR, storage as virtual capacity in planning process

Models cross-impacts of electrification on gas demand and stranded risk

From Forecast to Flexibility: Modernizing Grid Planning for a Nonlinear Future

We need adaptive, data-driven planning tools with real-time DER visibility and flexible resource integration to achieve cost-effective, resilient grid investments in a rapidly evolving and uncertain demand environment.

SOLVE



Planning tools are no longer just spreadsheets and static forecasts—they are the strategic engine that will determine whether utilities can build the grid of the future affordably, reliably, and equitably. Yet today, most planning processes remain built for an incremental past: slow, deterministic, and blind to distributed energy resources, flexible demand, and non-linear load growth. This disconnect is now critical. Utilities are being asked to make multi-billion-dollar bets on substations, feeders, and grid infrastructure, under extreme uncertainty driven by data center load, EV adoption, climate extremes, and DER proliferation.

Failing to modernize these tools puts the system at risk on multiple fronts: stranded infrastructure from overbuilds, emergency upgrades from underbuilds, cost pressure on customers, and eroding trust from regulators and stakeholders. Worse, the longer these planning systems remain misaligned with operational reality, the more out-of-sync investment decisions become, amplifying the risks of both steel and digital stranded assets.

Modernized planning platforms must become real-time, scenario-driven, and probabilistic. They must integrate DER visibility, flexible load forecasting, climate-informed modeling, and AI-assisted automation. These aren't bells and whistles, they are prerequisites for surviving the next decade of grid transformation. When done right, they unlock better use of existing assets, reduce capital risk, accelerate timelines, and create a data-rich foundation for regulatory credibility. Utilities must start treating planning tools not as a side project, but as critical infrastructure in their own right.

Key Take-Away

Planning is no longer just a process—it's a core capability that determines whether we stay ahead of grid disruption or fall behind it.

Those that build adaptive, data-rich, and DER-integrated planning systems will avoid stranded investments, strengthen regulatory trust, and reduce system costs. Those that don't will face compounding delays, missed opportunities, and a shrinking ability to guide the energy transition at speed and scale.



008

Challenge Statement

Flexible Customers: Engaging Customers in a Dynamic Grid

We need integrated affordability strategies and customer-centric service models to achieve equitable, financially sustainable grid modernization for all customer classes and delivers value in a competitive, digitized energy landscape.



Themes

01



Affordability as a KPI: Bills must stay within measurable burden thresholds ($\leq 6\%$ income).

02



Electrification Load Growth: More customers are facing higher monthly bills due to EVs, heat pumps, and electrified appliances, creating a perception of lost affordability unless offset with smarter rate design and better data/service.

03



C&I Dynamics: Large data center loads and competitive retail choice raise risk of cost shifts to households.

04



Customer-Centric Service: Proactive notifications, personalized insights, and differentiated offerings make the utility a trusted partner rather than just a bill collector.

Challenge 008 Overview

Overview

As utilities invest heavily in grid upgrades to support electrification, resilience, and digitalization, they must keep energy affordable across all customer classes.

At the same time, customer expectations are rising, households demand personalized service and insights, while large commercial and industrial customers are exploring alternatives to utility supply. Without a strategy that integrates affordability with modern, customer-centric offerings, utilities risk losing trust, relevance, and financial stability.

What's at Risk

Without a proactive affordability and customer engagement strategy, utilities face rising arrears, widening equity gaps, and declining customer satisfaction. Households may blame the clean energy transition for higher bills, eroding public trust and slowing policy momentum. Meanwhile, loss of C&I customers could shift fixed costs onto more vulnerable ratepayers, compounding affordability risks and undermining utility revenue stability.



CHALLENGE

**Beyond Affordability:
Competing for the
Customer in a
Modern Grid
Economy**

SOLVE

Current State

Regulators in states like New York and California now require affordability to be measured and embedded in utility programs, including income-based rates and caps on energy burdens. Yet, most utilities still offer one-size-fits-all pricing, limited customer engagement tools, and reactive communications, leaving customers exposed to cost shifts.

Desired Outcome

Utilities should deliver affordability through data-driven, customer-centric service models. This means tracking energy burden KPIs, automating enrollment in support programs, and offering tailored digital tools that help customers manage usage and bills.

For C&I customers, utilities could offer premium services, like power quality guarantees or green energy options, to retain load and protect the broader customer base. The goal is to keep energy costs fair, transparent, and aligned with customer expectations in a digitized economy.

Challenge 008

Example Challenges Created by AI from Research of Public Filings



CHALLENGE

XCEL

We need to enhance their service offerings and technology interfaces to meet the growing expectations of customers for greater control and interaction with their energy services to provide customers with the tools and information necessary to manage their energy usage effectively and make informed energy choices.

SOLVE



CHALLENGE

PSEG

We need to maintain customer bill affordability while transitioning to cleaner energy sources to ensure that the financial burden on customers does not increase during the shift towards a more sustainable energy model.

SOLVE



CHALLENGE

Central Hudson

We need to identify and implement cost management strategies to prevent increases in customer bills to ensure affordability and customer satisfaction.

SOLVE



CHALLENGE

Portland General Electric

We need to upgrade substations and lines, and add smart switches to improve operating flexibility and capacity to enable bi-directional power flow from future DERS

SOLVE

Interested in learning more about these challenges? Click on the SOLVE button to learn more at the InnovationWorks platform.

Email support@innovationforce.io if you need help or have any questions!

Tech Stack 008

BAU Options

Traditional Bill Discount Programs
Volumetric-only Rate Recovery

Traditional Approaches and Results

Provides relief, but under-enrolled; reactive (manual enrollment)
Rising bills as capex grows; no relief for electrification

Modernization Levers*

Automated Low-Income Enrollment
Default TOU Rates
Income-Graduated Fixed Charges
Proactive Bill Notification
Enhanced Customer Portals and Apps
Managed Electrification Programs
Behavioral Efficiency / Energy Education
Appliance-level Insights (AI/Disaggregation)
Subscription-style Energy Plans
Power-Quality-as-a-Service
Reliability-as-a-Service
Customer-facing AI (Energy Coaches)

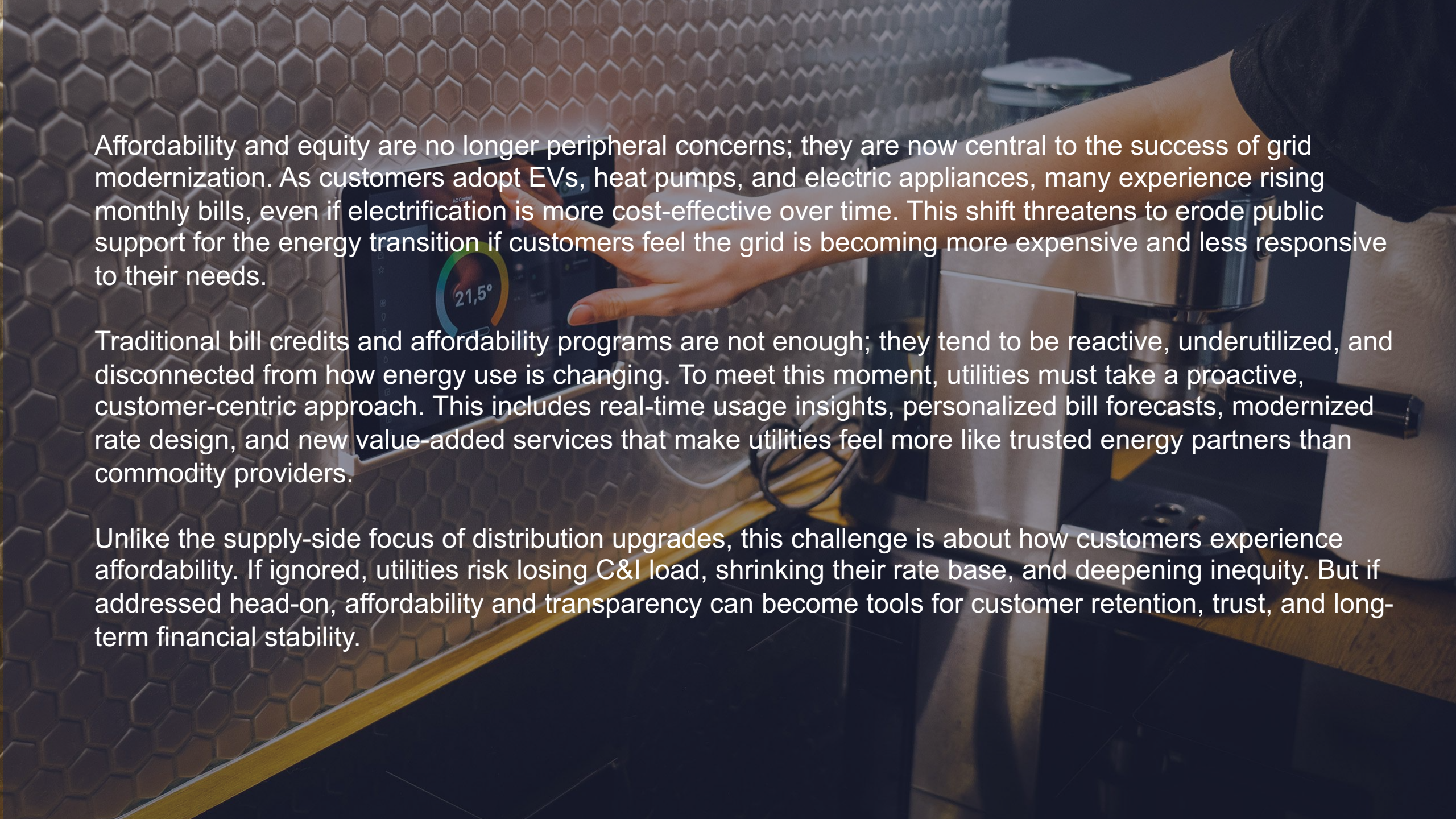
Description of New Solutions

Expands affordability reach; reduces arrears
Shifts loads, lowers peak costs, supports EVs/heat pumps
Stabilizes bills, lowers per-kWh price
Prevents bill shock, alerts on forecasted spend
Transparency empowers choice, usage/rate comparisons
Keep bills affordable as load grows' improves system efficiency
Empowers customers to reduce waste
Shows devices that could drive actionable savings
Flat rate tiers, bill predictability and competitive REPs
C&I data centers, premium service for hyperscale loads
Monetizes reliability with generator and battery integration
Personalized insights to help customers lower costs or use energy more efficiently

Beyond Affordability: Competing for the Customer in a Modern Grid Economy

We need integrated affordability strategies and customer-centric service models to achieve equitable, financially sustainable grid modernization for all customer classes and delivers value in a competitive, digitized energy landscape.

SOLVE

A person's hand is shown interacting with a smart thermostat screen. The screen displays a temperature of 21.5 degrees. The background is a wall with a hexagonal pattern. The person is wearing a dark shirt. The thermostat is mounted on a wooden surface. The overall scene is dimly lit, suggesting an indoor setting at night or in low light.

Affordability and equity are no longer peripheral concerns; they are now central to the success of grid modernization. As customers adopt EVs, heat pumps, and electric appliances, many experience rising monthly bills, even if electrification is more cost-effective over time. This shift threatens to erode public support for the energy transition if customers feel the grid is becoming more expensive and less responsive to their needs.

Traditional bill credits and affordability programs are not enough; they tend to be reactive, underutilized, and disconnected from how energy use is changing. To meet this moment, utilities must take a proactive, customer-centric approach. This includes real-time usage insights, personalized bill forecasts, modernized rate design, and new value-added services that make utilities feel more like trusted energy partners than commodity providers.

Unlike the supply-side focus of distribution upgrades, this challenge is about how customers experience affordability. If ignored, utilities risk losing C&I load, shrinking their rate base, and deepening inequity. But if addressed head-on, affordability and transparency can become tools for customer retention, trust, and long-term financial stability.

Key Take-Away

Utilities that embed affordability into modern, customer-focused service models will not only protect vulnerable customers, but they will also retain large ones, sustain revenue, and earn long-term public trust.

Customer experience is now a competitive advantage in the dynamic energy transition economy.



009

Challenge Statement

Securing the Flexible Grid: Meeting the future of OT/IT convergence

We need real-time internal network monitoring, vendor risk management, and DER cybersecurity alignment to achieve end-to-end grid resilience and compliance in a digitized, threat-exposed operational environment.



Themes

01



Aging Infrastructure: Many substations still run on legacy serial comms, radios, or leased lines, providing limited bandwidth and poor security

02



Visibility Gaps: Lack of unified situational awareness across OT and IT environments means cyber threats often go undetected until too late

03



Compliance vs. Resilience: Utilities could be incentivized toward orient cyber programs narrowly focused on passing NERC CIP audits rather than building adaptive resilience.

04



Supply Chain Exposure: Vendor firmware, comms modules, and third-party access remain key weak points.

Challenge 009 Overview

Overview

As utilities digitize operations and deploy increasingly interconnected grid technologies cybersecurity and communications infrastructure are no longer back-office concerns but core reliability risks. The transition from legacy OT systems to IP-based, real-time platforms has outpaced utilities' traditional cyber protections, opening vulnerabilities at both the core (substations, SCADA) and edge.

What's at Risk

As utilities digitize operations and interconnect more devices, the grid's cyber attack surface is rapidly expanding. A successful cyber intrusion, whether targeting a substation, DER system, or operational network—could cause widespread outages, compromise critical infrastructure, and damage public trust.

The stakes are rising as adversaries, including state-sponsored actors, exploit internal network weaknesses to evade detection.



CHALLENGE

**Securing the Flexible Grid:
Meeting the future of OT/IT convergence**

SOLVE

Current State

Most utility operational environments were not designed with modern cybersecurity in mind. Substations often rely on unencrypted, serial-based communications and aging field devices that lack segmentation or authentication. Network visibility is focused on perimeter defenses, with minimal monitoring of “east-west” traffic within substations and control centers—where threats often move undetected. DER and EV infrastructure at the edge creates new points of vulnerability.


Desired Outcome

Utilities need to evolve to a modernized, resilient cyber architecture that goes beyond compliance. This includes deploying Internal Network Security Monitoring (INSM) to gain real-time visibility across OT environments, detect lateral movement, and enable rapid incident response. Encrypted communications, IP-based networks with built-in segmentation and zero-trust principles. The goal is to build a grid meets new CIP-015 requirements and can recover from advanced threats.

Challenge 009

Example Challenges Created by AI from Research of Public Filings

CHALLENGE



National Grid

We need to bolster cybersecurity standards, processes, and tools to effectively reduce the risk of cyber intrusions to protect the grid from potential cyber threats and ensure the integrity of operations.

SOLVE

CHALLENGE




Southern Company

We need to develop architectures and requirements to implement internet-based controls from SCE's back office securely to enhance operational security and ensure safe interactions between back-office systems and internet-based controls.

SOLVE

CHALLENGE




Exelon

We need to protect customer information and their electronic and physical assets in to ensure the integrity and security of energy delivery systems, which are critical national infrastructure.

SOLVE

CHALLENGE



PPL

We need to enhance their cybersecurity strategy to effectively manage and respond to evolving cyber-related risks to protect their systems and assets from potential cyberattacks and ensure operational resilience.

SOLVE

Interested in learning more about these challenges? Click on the SOLVE button to learn more at the InnovationWorks platform.

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Tech Stack 009

BAU Options

Harden Legacy OT Networks
Patchwork NERC/CIP Compliance
Device Identity & Authentication

Traditional Approaches and Results

Basic uplift for legacy systems (segmentation, VPN, firewalling)
Meet minimum compliance only, manual audits and tactical fixes
PKI, digital certificates and role-based permissions for devices

Modernization Levers*

Utility-Owned Fiber Backbones
Private LTE/5G Utility-Grade Networks
OT-Aware SOC
SBOM/Firmware Signature Scanning
Zero-Trust Architecture
Cloud-Native Cyber Platforms (AI/ML)
DER-Integrated Security
SIEM Integration & Response
DER Vendor Compliance Governance
Penetration Automation Testing
Zero Trust Remote OT Access

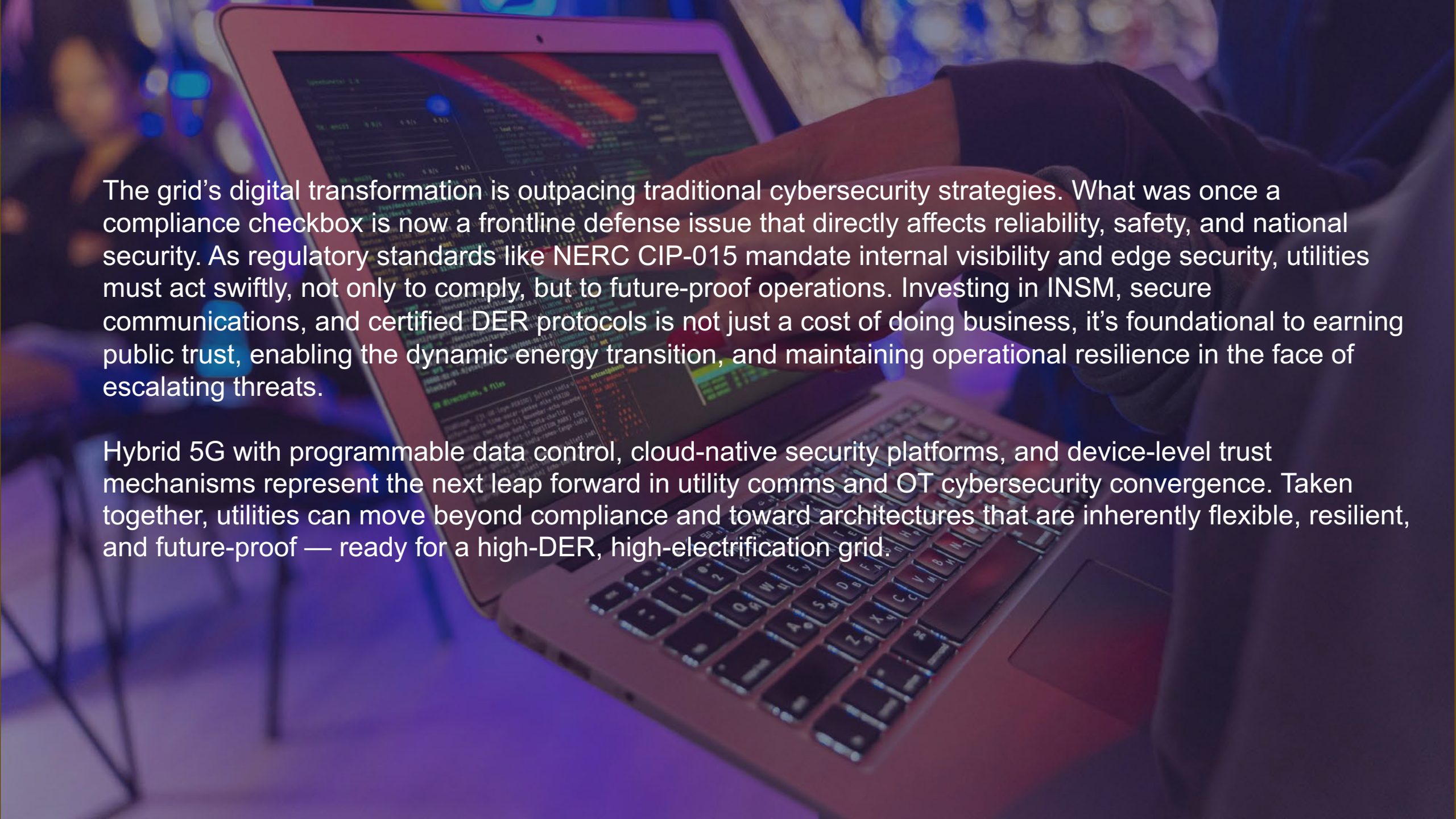
Description of New Solutions

Highly secure, high bandwidth comms
Built-in security like data packet control and network segmentation
Continuous monitoring, OT+IT incident response
Identifies banned or high-risk components (supply chain assurance)
Identity-based micro segmentation enforces least privilege trust rules
Anomaly detection, detects Volt-Typhoon style east-west attacks
Secures edge devices (PV, EVSE, storage) per IEEE 1547.3/UL 2941
Event correlation and automation
NIST-based validation for third-party assets
Simulate attacks, measure resilience
Secure field/vendor access without VPNs

Securing the Flexible Grid: Meeting the future of OT/IT convergence

We need real-time internal network monitoring, vendor risk management, and DER cybersecurity alignment to achieve end-to-end grid resilience and compliance in a digitized, threat-exposed operational environment.

SOLVE



The grid's digital transformation is outpacing traditional cybersecurity strategies. What was once a compliance checkbox is now a frontline defense issue that directly affects reliability, safety, and national security. As regulatory standards like NERC CIP-015 mandate internal visibility and edge security, utilities must act swiftly, not only to comply, but to future-proof operations. Investing in INSM, secure communications, and certified DER protocols is not just a cost of doing business, it's foundational to earning public trust, enabling the dynamic energy transition, and maintaining operational resilience in the face of escalating threats.

Hybrid 5G with programmable data control, cloud-native security platforms, and device-level trust mechanisms represent the next leap forward in utility comms and OT cybersecurity convergence. Taken together, utilities can move beyond compliance and toward architectures that are inherently flexible, resilient, and future-proof — ready for a high-DER, high-electrification grid.

Key Take-Away

Taken together, 5G, hybrid environments with programmable data control, cloud-native security platforms, and device-level trust mechanisms represent the next leap forward in utility comms and OT cybersecurity convergence.

They move utilities beyond compliance and toward architectures that are inherently flexible, resilient, and future-proof — ready for a high-DER, high-electrification grid.



010

Challenge Statement

Grid Workforce: Enabling the Workforce of the Future

We need to replace retiring expertise and develop the new digital, cyber, and analytics skills needed to operate the modern grid



Themes



01

A retiring workforce and puts important “tribal knowledge” at risks without systematic capture of expertise around the ability to safely and efficiently maintain critical assets.



02

Skills for the Digital Grid Future: shift to data, AI, analytics and OT/IT conference requires upskilling toward a future-proofing of the workforce that is more data-driven, distributed and dynamic.



03

Talent Pipeline: utilities face stiff competition for technical and digital talent from the tech sector and energy startups.



04

Safety, Reliability & Public Trust: any undocumented or understaffed skill gap could translate into safety risks for workers and the public and jeopardize restoration or response times.

Challenge 010 Overview

Overview

Utilities are facing a dual workforce challenge: a wave of retirements from experienced line workers, engineers, and operators, and a growing need for new digital skill sets to manage advanced technologies.

The knowledge gap between legacy expertise and modern grid requirements is widening. Training programs, knowledge capture, and new hiring pipelines must keep up.

What's at Risk

Failing to address workforce transition leaves utilities exposed to significant operational, safety, and financial risks. As veteran employees retire, critical operational knowledge will disappear, creating gaps in day-to-day reliability and long-term planning. New grid technologies such as DERMS and ADMS will fail to deliver promised ROI if employees lack the training to use them effectively.



CHALLENGE

**Grid Workforce:
Enabling the
Workforce of the
Future**

SOLVE

Current State

Decades of accumulated “tribal knowledge” about field operations and asset management are at risk of being lost, as much of this expertise remains undocumented. Existing training programs tend to be reactive and fragmented, leaving many employees underprepared for new responsibilities.. The result is a growing mismatch between the workforce utilities have and the one they need to modernize the grid.

Desired Outcome

A workforce that blends the deep operational knowledge of legacy utility employees with the digital fluency required to manage the modern grid. Knowledge transfer programs should capture the expertise of retiring workers through AI-assisted documentation, augmented and virtual reality training modules, and structured mentoring programs.

Challenge 010

Example Challenges Created by AI from Research of Public Filings



CHALLENGE

SCE

We need to develop a skilled workforce capable of delivering electrification upgrades to meet the necessary pace and scale of electrification efforts.

SOLVE



CHALLENGE

National Grid

We need to develop strategies to attract, hire, and retain the necessary talent to construct, operate, and maintain a smarter and cleaner energy system to support the significant investments in the electrical network and ensure the successful implementation of the Future Grid Plan.

SOLVE



CHALLENGE

XCEL

We need to ensure that their teams possess the necessary skills and knowledge to operate effectively as the grid evolves to adapt to the changes brought by the adoption of distributed energy resources and electric vehicles..

SOLVE



CHALLENGE

Consumers

We need to ensure that its field resources, both internal and contracted, are adequately planned and aligned with the forecasted work demand to support its electric distribution investment strategy effectively.

SOLVE

Interested in learning more about these challenges? Click on the SOLVE button to learn more at the InnovationWorks platform.

Email support@innovationforce.io if you need help or have any questions!

Tech Stack 010

Enabling the Workforce of the Future

We need to replace retiring expertise and develop the new digital, cyber, and analytics skills needed to operate the modern grid

SOLVE

BAU Options

Tribal Knowledge

Documents Share

Traditional Recruitment Pipelines

Traditional Approaches and Results

Undocumented training or capture of knowledge

Unorganized upload of documents after an employee retires

HR and recruiting pipelines

Modernization Levers*

AR/VR

AI Assisted Documentation

Continuous Learning Platforms

Digital Twins

Workforce Planning Tools

Digital Field Guides

Real-time Access to Data Models

Simulation Tools & Apprentices Programs

Gamified Training Programs

Online Training and Certifications

Continuous Education Programs

Partnership with Universities or Labs

Internship Programs

AI Coaches Based on Peer Knowledge

Description of New Solutions

Goggles and technologies for training and remote assistance

Fill documentation gap with AI tools to create training

Learning management systems capture and test to develop new skills

Simulation of real-situations, guidance of what to expect

Develop retirement planning and recruitment

More interactive field training that is tablet/digital based

Data and forecasting tools can train what to expect

Apprentice and training can be augmented with real-life scenarios

Create upskilling or reskilling incentives

Learn digital, AI or new data skills through online programs

Support leaders being upskilled through continuous education programs

Partner with labs to augment missing knowledge gaps

Partner with universities to compete in the talent pipeline

Create AI coaching based on “tribal” knowledge, codify this knowledge

The grid of the future cannot be built without the workforce of the future. Utilities face a dual challenge: replacing the deep institutional knowledge being lost to retirements while simultaneously building new capabilities in data, digital systems, and distributed energy management. If unaddressed, this gap risks slowing modernization efforts and undermining reliability.

Artificial Intelligence (AI) offers a way to bridge the widening gap. AI-enabled tools can capture and digitize decades of operator and field experience, turning it into living knowledge systems that new workers can access in real time. Predictive analytics can reduce reliance on institutional memory by flagging asset failures before they occur. AI-powered training (including AR/VR simulations) can accelerate learning curves for new engineers and line workers, preparing them to operate in increasingly complex, data-rich environments.

The path forward requires a multi-pronged workforce strategy:

- Knowledge capture platforms to preserve legacy expertise before it's lost.
- AI-driven training and simulation programs to rapidly upskill new hires.
- Digital twins and decision-support tools to augment workforce productivity and safety.
- University and technical partnerships to build hiring pipelines for next-gen grid professionals.
- Regulatory support for workforce investments tied to measurable outcomes.

A modernized grid demands a modernized workforce. By investing in people and equipping them with AI-powered tools, utilities can ensure institutional knowledge is preserved, new skills are built, and the sector is prepared to manage both today's reliability needs and tomorrow's dynamic energy transition.

Key Take-Away

The energy transition is not just about the electrons; it's about the people.

Utilities must capture legacy expertise while equipping a new, AI-enabled workforce with the digital skills to manage a more complex, data-driven grid. Investing in people with the same urgency as infrastructure is essential to securing reliability, resilience, and modernization. The technology challenge, is also a people challenge.



Appendix

The 60+ Public Plans and Regulatory Filings



Source	Plan	Utility	Plan	Utility	Plan
Alabama Power	Alabama Power IRP	Entergy	Entergy Louisiana IRP Final Report 2023	Pacific Corp	2025 IRP and Clean Energy Plan Progress
Ameren	IRP Annual Update 2024	ENMAX	2023 Financial Report	PG&E	EPIC Annual Report
APS	IRP 2023	EPCOR	2023-2027 Distribution System Plan	PG&E	Distribution Grid Needs Assessment 2023
ATCO	2023 Sustainability Report	Eversource	Electric Service Modernization Plan 2024	PG&E	Grid Modernization Report April 2024
Bonneville Power	2024 Annual Report	Exelon	Sustainability Report 2023	PGE	Distribution System Plan 2024
Brookfield	2024 Annual Report	Fortis BC	2024 Annual Report	PPL	Sustainability Report 2022
California PUC	CA Electric Program Investment Report 2023	FPL	Ten Year Site Plan 2024	PSEG	Sustainability Report 2023
Central Hudson	Distribution System Integration Plan 2020	Grant County PUD	2024 IRP	Salt River Project	2023 Integrated System Plan
Chelan Co	2024 Annual Report	HECO	Hawaii Integrated Grid Plan May 2023	Santee Cooper	2024 IRP and 2024 Sustainability Report
ComEd	ComEd Grid Plan	Hydro One	2023 Sustainability Report & 2021 Transmission Plan	SCE	EPIC Annual Report
conEdison	Integrated Long Range Plan 2025	Idaho Power	2025 IRP and 2024 Demand Side Report	SCE	2025 Rate Case
Constellation	2023 Sustainability Report	Lewis County PUD	2024 IRP	SCE	Wildfire Mitigation Plan 2025
Consumers	Electric Distribution Infrastructure Investment Plan 2024-2028	Manitoba Hydro	2040 Strategy	SDG&E	Wildfire Mitigation Plan 2023-2025
Dominion	Dominion Grid Transformation Plan Phase 2	Maryland	Maryland Electric System Planning Report 2022	SDG&E	Wildfire Mitigation Plan 2025
Maryland	Maryland Electric System Planning Report 2022	National Grid	Future Grid Plan 2023	Seattle City & Light	Grid Modernization Roadmap 2021
National Grid	Future Grid Plan 2023	Northwestern Energy	2024 Annual Report	SoCalGas	Compliance Plan 2024
Hydro One	2023 Sustainability Report & 2021 Transmission Plan	NJBPU	Grid Modernization Final Report	Southern Co	Net Zero Report
DTE	DTE Electric Distribution Grid Plan 2023	NYPA	Sustainability Integrated Report	Tacoma Power	2022 Integrated IRP and 2023 Clean Energy Implementation Plan
Duke Energy	Duke Energy Indiana IRP 2024	NYSEG	System Implementation Plan 2023	TVA	2019 Integrated IRP
		NYSERDA	Grid Modernization Central Hudson Evaluation Case Study	XCEL	Integrated Distribution Plan 2023
		PA	Electric Reliability Report 2024 Final		



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