

UTILITY & ENERGY COMPANIES

Who is this
pathway for?

This pathway is designed for energy providers, grid operators, utility companies (electricity, gas, water), and energy service companies that support buildings and infrastructure. It targets both public and private actors managing centralized and decentralized energy systems. The pathway is particularly relevant to departments in charge

of grid resilience, customer programs, and strategic innovation, providing a roadmap to ensure energy systems enable, rather than hinder, climate-resilient buildings and communities.

As the backbone of modern society, utility and energy companies face rising pressure from climate-driven disruptions: extreme heat waves strain cooling demand, floods damage distribution networks, and droughts affect hydropower and water supplies. These impacts not only affect

the reliability of energy systems but also expose utilities to financial losses, reputational damage, and regulatory scrutiny. Simultaneously, the transition to electrification, decarbonization, and distributed energy systems makes resilience a strategic imperative.

Utilities must ensure continuity of service, safeguard infrastructure, and support customer adaptation. Beyond grid stability, they can play a key role in equity: by offering tailored programs for vulnerable households, utilities help ensure the benefits of resilience are widely shared. Whether through adaptation audits,

targeted subsidies, or climate-informed infrastructure planning, utility companies hold both the tools and responsibility to accelerate resilience in the built environment. Their role is pivotal in making the buildings sector ready for an increasingly volatile climate.

Ensure grid resilience while enabling climate-ready buildings and communities.

Most utilities have yet to fully integrate adaptation into planning, budgeting, and service design. In the short term, they must build internal expertise,

begin climate-informed audits, and pilot adaptive solutions. Medium term, they should develop new products, engage regulators, and

embed resilience into system upgrades. By 2050, utilities should act as resilience enablers, actively co-designing adaptive systems with cities,

developers, and regulators, and supporting equitable access to resilient energy solutions.

UTILITY & ENERGY COMPANIES

Short-Term Actions

Actions	Resources & case studies	KPIs
Set Up or Support Climate Resilience Financing Instruments	CPI's Building Financial Instruments for Climate Adaptation report	Total amount of capital mobilized for decentralized or resilient energy and water infrastructure
Build Capacity and Tools for Adaptation Audits	EPRI's Climate READi	% of audit tools and templates standardized across departments
Map Vulnerabilities and Strengthen Emergency Preparedness Across Networks	Ouranos's Monitoring and Evaluation for a Resilient Electricity Sector Report	Frequency of updates to climate vulnerability maps and asset-level assessments

Medium-Term Actions

Actions	Resources & case studies	KPIs
Influence Infrastructure and Urban Design Toward Resilience	Rocky Mountain Institute (RMI)'s Reimagining Utility Climate Risk Planning	Number of operational decentralized systems or community microgrids launched
Detect Community Level Stress and Strengthen Emergency Preparedness	UNEP's Climate Information and Early Warning System	Number of communication campaigns or alerts issued annually on heatwaves, grid stress, or drought
Support Clients Through Adaptation Audits and Targeted Climate Risk Communication	PNNL's Emerging Best Practices for Electric Utility Planning with Climate Variability	Number of commercial or industrial clients receiving adaptation audits or technical resilience advice

Long-Term Actions

Actions	Resources & case studies	KPIs
Deliver Incentives and Programs for Vulnerable Households	UNDP's Empowering Vulnerable Households to Access Affordable and Clean Energy	% of targeted vulnerable households enrolled in programs
Establish Community-Based and Community-Led Resilience Programs	SEPA Resilient by Design report	Number of active partnerships with municipalities or communities for shared energy resilience projects (e.g., microgrids, cooling centers)
Integrate Adaptation into National Energy Planning and Forecasting	The Climate resilience section of Power Systems in Transition , IEA	Leading Evidence of collaboration with regulators on integrating adaptation into long-term energy demand models
Drive Innovation Through Pilots and Standards	PNNL's Climate Adaptation Approaches for Water and Electric Utilities report	Development of draft or revised resilience standards submitted to regulators



Short-term actions

Set Up or Support Climate Resilience Financing Instruments

Goal: Enable investment in decentralized and resilient energy systems by lowering financial barriers.

Description: Utilities should collaborate with financial institutions, (re)insurance institutions, regulators, and development banks to create financing mechanisms such as leasing programs, ESCO (energy service company) models, targeted subsidies, and preferential loan products, that support the deployment of resilient energy solutions. These may include solar & storage systems, microgrids, smart thermostats, and demand-response technologies.

- Climate Policy Initiative (CPI)'s [Building Financial Instruments for Climate Adaptation](#) report provides detailed guidance on how to structure and scale adaptation-finance instruments (e.g., for energy networks). Utilities can use this to partner with financiers and set up leasing or subsidy programmes for resilient energy solutions.
- International Institute for Sustainable Development (IISD)'s [Innovative Financial Instruments and Their Potential to Finance Climate Change Adaptation](#) report focuses on how adaptation-finance is often under-invested, especially in developing countries, and gives examples that utilities in the Global South or North can follow for financing resilient energy-infrastructure.
- This [article](#) highlights the rise of resilience bonds and blended finance for adaptation. Demonstrates market-trends utilities can tap into (e.g., issuing resilience-bonds to fund microgrids or resilient energy storage for communities).

INPUT INDICATORS

Measure the resources required to deliver

- Number of dedicated financing instruments or partnerships established to fund resilience projects (e.g., ESCOs, leasing models, subsidies)

LEADING INDICATORS

Looks forward at future outcomes and events

- Total amount of capital mobilized for decentralized or resilient energy infrastructure

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in deployment of climate-resilient technologies (e.g., solar+storage systems) financed through these mechanisms

Build Capacity and Tools for Adaptation Audits

Goal: Develop standardized tools, maps, training programs, and a skilled workforce to perform adaptation-focused energy audits.

Description: Utilities should develop internal expertise, tools, and staff training to perform adaptation-focused audits. They should allocate staff and funding, and pilot the integration of audits into existing client services. In the immediate term, audits may be outsourced to third parties, but governments and regulators should provide resources, maps, and climate data to accelerate internal capacity-building.

Action 1

Resources

KPIs

Action 2

- Rocky Mountain Institute (RMI)'s [Reimagining Utility Climate Risk Planning](#) describes a structured framework for utilities to perform climate risk assessments (identify, quantify, integrate into planning)
- Electric Power Research Institute (EPRI)'s [Climate READi](#) provides a large library of guidance, references and tools to help companies plan, design and operate their infrastructure with resilience in mind.
- Electricity Sector Council of Canada's [Adaptation through Risk Management: Electricity Sector Climate Adaptation Planning Guide](#) is a detailed sector-specific guide for utilities to integrate adaptation into business-planning, valuable for building internal audit and adaptation-capacity.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Budget allocated to staff training and audit tool development
- % of employees trained on adaptation audit methodologies
- Number of partnerships established with research institutions or technical agencies

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of adaptation audits performed per quarter
- % of audit tools and templates standardized across departments
- Integration of climate risk datasets into audit models or GIS systems

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Share of audited clients implementing recommended resilience measures
- Reduction in energy service disruptions or performance loss during extreme events
- Demonstrated cost savings or avoided damages for clients implementing audit recommendations

KPIs

Map Vulnerabilities and Strengthen Emergency Preparedness Across Networks

Goal: Anticipate risks to critical infrastructure and ensure effective response to climate-related disruptions.

Description: Utilities should conduct a comprehensive mapping of vulnerabilities across their networks, including substations, pipelines, power plants, and transmission lines, under different climate scenarios. This mapping must draw on downscaled data and probabilistic risk models provided by governments, regulators, and research institutions. Based on these assessments, companies should revise

and update emergency preparedness protocols, including outage response, load-shedding priorities, and disaster recovery plans. Tools to track service interruptions and early warning systems should be integrated into daily operations, allowing utilities to detect stress in communities and respond proactively.

- WRI [Aqueduct Water Risk Atlas](#): Portfolio-screening tool for current/future water stress, flooding, and drought. Helps triage assets and set site-level KPIs.
- EPRI's [Costs and Benefits of Proactive Climate Adaptation in the Electric Sector](#)
- Ouranos's [Monitoring and Evaluation for a Resilient Electricity Sector Report](#) details how utilities can build monitoring and evaluation frameworks, map vulnerabilities, integrate climate-scenario data into network planning and emergency response.
- This Adaptation Community's [Climate Risk Sourcebook](#) provides modular templates for risk assessment which utilities can adapt for network-vulnerability mapping (e.g., identifying substations at flood risk or transmission lines exposed to wildfire).

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Completion of a comprehensive climate risk and asset vulnerability map covering all critical infrastructure

LEADING INDICATORS

Looks forward at future outcomes and events

- Frequency of updates to climate vulnerability maps and asset-level assessments

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % reduction in service interruptions or damage incidents linked to climate events

KPIs

Medium-term actions

Influence Infrastructure and Urban Design Toward Resilience

Goal: Align energy infrastructure planning with resilient urban development.

Description: Utility infrastructure decisions (grid upgrades, substation location, decentralization strategies) shape long-term energy access and resilience. Utilities must proactively engage in territorial planning, advocating for microgrids, local production, and resilient system design. This is especially crucial in areas where grid reliability is already under strain or central systems are vulnerable. Utilities should collaborate with municipalities, developers, and insurers to support climate-smart infrastructure decisions.

- Rocky Mountain Institute (RMI)'s [Reimagining Utility Climate Risk Planning](#) brief examines how utilities can integrate climate risk assessment frameworks into infrastructure planning processes (grid upgrades, microgrids, network design). Directly relevant when utilities engage with urban and infrastructure planning to align energy infrastructure with resilient urban development.
- European Environment Agency (EEA)'s broad [handbook](#) on integrating climate resilience into infrastructure (including energy) across planning, design and implementation. Utilities can use it to influence urban/energy infrastructure decision-making in collaboration with municipalities and developers.
- Although focused on water and sanitation utilities, the principles of resilient infrastructure, decentralised services and utility-territory planning detailed in the International Water Association's [Climate Smart Utilities Initiative](#) also apply strongly to energy utilities as they participate in urban/territorial planning.

INPUT INDICATORS

Measure the resources required to deliver

- Regulatory and technical feasibility studies completed for microgrid deployment

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of operational decentralized systems or community microgrids launched

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % reduction in outage duration or grid recovery time after climate shocks

Action 1

Resources

KPIs

Detect Community-Level Stress and Strengthen Emergency Preparedness

Goal: Anticipate risks to critical infrastructure and ensure effective response to climate-related disruptions.

Description: Utilities can analyze usage anomalies, service interruptions, and outage reports to detect early signs of stress in neighborhoods especially under heat or cold extremes. Combined with updated load-shedding protocols and disaster recovery plans, this action enhances adaptive capacity both for the company and the communities they serve.

Action 2

- This National Renewable Energy Laboratory (NREL)'s [Power Sector Resilience Planning Guidebook](#) for utilities on resilience planning that includes mapping vulnerabilities, asset-risk assessment, and scenario planning is essential for utilities to detect stress signals across networks and strengthen preparedness protocols.
- United Nations Environment Programme (UNEP)'s [Climate Information and Early Warning Systems](#) highlights the role of early warning systems (EWS) in adaptation. Utilities can reference this to build or integrate early warning/monitoring systems that detect community stress (e.g., peak loads, outage precursors) in advance of extreme climate events.
- Smart Electric Power Alliance (SEPA)'s [Resilient by Design: Utility Strategies for Climate-Ready Distribution](#) describes how utilities are embedding resilience into distribution planning and operations, including practices for detecting operational stress and building emergency response readiness.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Establishment of a structured communication plan for climate risk alerts (via SMS, bills, apps, etc.)

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of communication campaigns or alerts issued annually on heatwaves, grid stress, or drought

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Documented improvement in client-side adaptive behaviors (e.g., reduced consumption during grid stress)

KPIs

Support Clients Through Adaptation Audits and Targeted Climate Risk Communication

Goal: Enable commercial and industrial clients to identify vulnerabilities, adopt adaptive measures, and respond to climate-related energy risks through a combination of tailored audits and proactive communication.

Description: By offering or facilitating audits that assess climate vulnerabilities (such as exposure to heatwaves, grid instability, or water stress) utilities can help clients prioritize resilience upgrades, from equipment cooling to backup power solutions. While third-party providers may initially lead these audits, utilities should work toward internalizing this capacity, leveraging their access to energy use data and infrastructure insights. At the same time, embedding climate risk messaging into routine client communications (such as energy bills, mobile apps, or SMS alerts) enables clients to anticipate and respond to extreme weather events, adopt adaptive behaviors, and improve energy efficiency under stress conditions. Together, these strategies position utilities as trusted, forward-looking partners in resilience, offering both practical guidance and timely signals to empower their customers.

- Pacific Northwest National Laboratory (PNNL)'s [Emerging Best Practices for Electric Utility Planning with Climate Variability](#) is a resource for utilities and regulators focusing on planning, asset management and contingency measures under climate risk. Useful for utilities developing audit tools and client-services around resilience.

Action 3

INPUT INDICATORS

Measure the resources required to deliver

- Development of in-house or partner-supported adaptation audit protocols and tools

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of commercial or industrial clients receiving adaptation audits or technical resilience advice

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of audited clients implementing recommended adaptation measures

Resources

KPIs

Long-term actions

Deliver Incentives and Programs for Vulnerable Households

Goal: Ensure equitable access to resilience solutions.

Description: Utilities should develop targeted subsidy or leasing programs for low-income households to access decentralized energy and adaptive technologies. These programs must be coordinated with national and local social equity goals.

- Energy cities' [Engaging with Vulnerable Households Guidance and Toolkit](#) provides a practitioner-toolkit for utilities (or local energy actors) on how to engage vulnerable households, design inclusive service models, and deliver benefits to low-income consumers
- United Nations Development Programme (UNDP)'s [Empowering Vulnerable Households to Access Affordable and Clean Energy](#) focuses on access to clean energy for vulnerable households, including frameworks for utilities and governments to coordinate on equitable access. Useful for utilities developing programs aligned with social equity.
- This [Energy efficiency support schemes for energy poor consumers](#) study from SciencePo's European Chair for Sustainable Development and Climate Transition of how utilities in Europe are targeting vulnerable households with efficiency and support schemes provides examples of how utilities can structure programs for resilience and affordability.

INPUT INDICATORS

Measure the resources required to deliver

- Amount of funding allocated to household resilience programs
- Number of partnerships with social housing providers or local governments
- Number of adaptive technologies included in eligible incentive schemes

LEADING INDICATORS

Looks forward at future outcomes and events

- % of targeted vulnerable households enrolled in programs
- Average time between application and delivery of adaptive solutions
- Level of community awareness and satisfaction with offered programs (survey-based)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in reported energy vulnerability or outages among participating households
- Measurable improvement in adaptive capacity or reduction in indoor overheating events
- Sustained use and maintenance rate of adaptive technologies over 3+ years

Action 1

Resources

KPIs

Establish Community-Based and Community-Led Resilience Programs

Goal: Move beyond individual buildings to foster community-wide resilience and ensure adaptation efforts reach the most vulnerable.

Description: Utilities should partner with municipalities, civil society, and local communities to co-design and implement neighborhood-scale resilience initiatives. These programs could include shared battery storage systems, community-managed microgrids, public cooling centers, early-warning alert systems, and grassroots emergency preparedness networks. By supporting community-led governance, utilities help ensure that resilience efforts are rooted in local priorities, foster social cohesion, and provide energy, health, and spatial co-benefits.

Examples include community-managed early warning systems, locally maintained energy hubs, and participatory demand-response strategies that integrate resilience into local planning. Empowering communities to lead adaptation builds stronger systems of mutual support, enhances accountability, and ensures sustainability over the long term. Utilities, in this model, act not only as infrastructure providers but also as partners in building the social and institutional fabric of resilience.

Action 2

- This Smart Electric Power Alliance (SEPA) [Resilient by Design](#) report examines how 17 utilities are embedding resilience into distribution planning and collaborating with communities. Valuable case studies for utilities looking to implement community-led resilience programs.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of community-level resilience initiatives supported or co-financed by the utility

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of communication campaigns or alerts issued annually on heatwaves, grid stress, or drought

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Documented improvement in client-side adaptive behaviors (e.g., reduced consumption during grid stress)

KPIs

Integrate Adaptation into National Energy Planning and Forecasting

Goal: Ensure climate adaptation is fully embedded into future energy system design and demand projections.

Description: Utilities should use insights gained from adaptation audits, community resilience programs, and grid performance during extreme events to shape national-level energy planning and forecasting. This includes feeding real-world data on vulnerabilities, demand spikes, and resilience measures into the models that guide long-term energy policy, infrastructure investments, and demand scenarios.

- The [Climate resilience](#) section of [Power Systems in Transition](#) from the International Energy Agency (IEA) offers a conceptual framework and data on how electricity systems must evolve to be resilient. Utilities can use this to feed into national planning, demand forecasting and long-term infrastructure design.
- [Regulatory mechanisms for climate-resilient urban energy systems](#) (Sustainable Cities and Society, 2024) research paper discusses how utilities and regulators can ensure adaptation is embedded in energy system regulatory frameworks and planning processes

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Contribution of the utility to national or regional climate risk forecasting exercises

LEADING INDICATORS

Looks forward at future outcomes and events

- Evidence of collaboration with regulators on integrating adaptation into long-term energy demand models

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Inclusion of climate risk metrics in national energy security and reliability indicators

KPIs

Drive Innovation Through Pilots and Standards

Goal: Test, evaluate, and scale adaptation measures in the energy sector.

Description: Support pilot projects on building-grid interaction under extreme conditions and document results for replication. Collaborate with regulators and manufacturers to develop performance standards and testing protocols for resilient systems, ensuring innovation is scalable and credible. Integrating adaptation into mainstream planning processes helps ensure that future energy systems are designed to withstand heatwaves, floods, droughts, and grid stress, rather than treating resilience as a separate or siloed objective. Close collaboration with national governments, regulators, and research institutions is essential to align these inputs with broader energy transition and climate policy goals. In doing so, utilities shift from being reactive service providers to strategic partners shaping climate-ready national energy systems.

Action 4

- The [Electrical Utilities Criteria](#) from the Climate Bonds Initiative sets out science-based standards for utilities, including requirements for adaptation & resilience infrastructure
- Pacific Northwest National Laboratory (PNNL)'s [Climate Adaptation Approaches for Water and Electric Utilities](#) report is a comprehensive compendium of adaptation strategies for utilities, including many innovation examples and pilots. Helps utilities design, evaluate and scale adaptation measures.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- R&D budget dedicated to adaptation-related pilots
- Number of partnerships with regulators, manufacturers, and research bodies
- Existence of internal protocols for pilot evaluation and data sharing

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of adaptation pilot projects initiated annually
- % of pilot projects evaluated and published with performance results
- Development of draft or revised resilience standards submitted to regulators

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Adoption rate of validated resilience standards by utilities or manufacturers
- Reduction in climate-related system downtime or infrastructure failure rate
- Increase in investment in resilient infrastructure aligned with new standards

KPIs

