ed-watch
Your online resource partner

Climate Scenario Analysis for Sustainability Reporting

Case Study Day 1: Con Edison's Multi-Billion Dollar Climate Change Adaptation

Background & The Climate Catalyst

In October 2012, Superstorm Sandy slammed into the Northeast U.S., bringing a massive ocean storm surge that entirely flooded New York City's low-lying electrical infrastructure. More than 1 million Con Ed customers lost power, critical substations were submerged in saltwater, and the economic damage was catastrophic.

Con Ed realized a fundamental truth that defines modern utility management: **historical weather trends can no longer be used to predict future infrastructure needs.** Climate change has shifted the baseline.

In response, Con Ed partnered with climate scientists at Columbia University to conduct a comprehensive *Climate Change Vulnerability Study*. They used predictive models for the years 2030, 2050, and 2080 to launch a multi-billion-dollar infrastructure hardening initiative.

The Climate Threats & Hardening Solutions

Con Ed's hardening strategy addresses three distinct climate-driven threat vectors: rising sea levels, severe "cloudburst" rainfall, and extreme heatwaves.

1. Sea-Level Rise & Coastal Storm Surge

- **The Threat:** Sea-level rise means that even minor coastal storms now push ocean water much further inland than they did 30 years ago, threatening to drown coastal substations in corrosive saltwater.
- **The Hardening Solution:** Con Ed re-engineered their coastal facilities to a strict new physical standard: **raising or protecting all critical equipment to 5 feet above the FEMA 100-year floodplain**. This specific number accounts for 3 feet of projected sea-level rise and a 2-foot safety buffer ("freeboard").
- **Physical Upgrades:**
    - **Perimeter Walls & Gates:** Built miles of concrete perimeter flood walls and heavy-duty, deployable flood gates around vulnerable assets like the East 13th Street Substation in Manhattan.
    - **Submersible Equipment:** Replaced standard components with specialized submersible transformers and network protectors that can continue operating safely even if entirely underwater.
    - **Conduit Sealing:** Sealed all underground conduits and cable entry points with waterproof materials to stop water from traveling between buildings.

2. Torrential Rainfall & "Cloudburst" Flooding

- **The Threat:** Climate change has increased the frequency of severe, fast-moving storms that drop massive amounts of rain in minutes. This causes flash flooding from the ground up, even in areas far away from the ocean.

- **The Hardening Solution:** Legacy switchgear (the switches that route electricity) built decades ago was never designed to sit in water. Con Ed launched a campaign to physically elevate this infrastructure.
- **Physical Upgrades:**
    - **Elevated Platforms:** Lifted unit substation switchgear onto raised metal platforms well above ground-level pooling heights.
    - **Automated Pumping:** Installed high-capacity, automated backup water pumps inside the facilities to aggressively drain water faster than flash floods can accumulate.

3. Extreme Heat & Chronic Heatwaves

- **The Threat:** Projections showed that NYC days exceeding 95°F would triple by 2050. Continuous extreme heat causes high demand (AC usage) at the exact moment that power lines and transformers lose operational efficiency because they cannot cool down. This causes equipment to melt, sag, or catch fire.
- **The Hardening Solution:** Rewriting material and engineering standards to withstand higher baseline ambient temperatures.
- **Physical Upgrades:**
    - **Composite Conductors:** Replacing standard overhead wires with aluminum/composite conductors that expand less and resist sagging when carrying high loads in high heat.
    - **Advanced Cooling:** Upgrading transformer cooling systems by adding advanced reflective thermal coatings, larger radiators, and higher-capacity cooling fans.
    - **Smart Loops:** Implementing smart-meter technology to isolate and automatically reroute power away from overloaded grid segments before the heat causes permanent physical destruction to the transformers.

ed-watch
Your online resource partner

Con Edison's Climate Resilience Framework

Principle	Core Objective	Concrete Engineering Actions (Examples)
1. Prevention	Stop the damage before it happens. Physically reinforce infrastructure to withstand projected, future climate extremes rather than relying on historical weather data.	* Building 5-foot perimeter flood walls around low-lying substations. * Installing submersible transformers that operate completely underwater. * Elevating critical switchgear onto raised metal platforms. * Applying reflective thermal coatings to transformers to handle severe heatwaves.
2. Mitigation	Minimize the impact if a failure occurs. Design system flexibility and smart grid capabilities so that a localized failure doesn't cause a massive, widespread blackout.	* Deploying Smart Loops to automatically isolate damaged grid segments and reroute power via unaffected lines. * Using network protectors to prevent power backfeeds during localized flooding. * Segmenting the grid so critical infrastructure (like hospitals) stays powered even if residential blocks drop offline.
3. Response	Accelerate recovery post-event. Upgrade equipment, logistics, and personnel planning to ensure that when a historic storm does breach defenses, power is restored as fast as safely possible.	* Installing high-capacity, automated water pumps to drain flooded facilities instantly. * Pre-positioning heavy emergency gear and mobile generators outside of flood zones prior to a storm.

Principle	Core Objective	Concrete Engineering Actions (Examples)
		* Establishing pre-arranged mutual aid agreements with other regional utilities to flood the area with external technicians immediately after a storm passes.

The Business Case (The Financial Return)

Con Ed's data proves the business case: while the upgrades cost billions, these proactive investments **prevented more than 1.2 million customer power interruptions** during subsequent severe storms, saving the utility hundreds of millions of dollars in emergency repair costs and keeping critical infrastructure (hospitals, subways, and water systems) online.

Metric	The Reality / The Return
The Investment	Con Ed invested **over $1 billion** in targeted storm-hardening initiatives following Superstorm Sandy.
The Tangible Benefit	To date, those specific physical upgrades have **prevented more than 1.2 million customer power interruptions** during subsequent severe weather events.
The Financial Payoff	In a major metropolitan area like New York, avoiding 1.2 million outages translates directly to **hundreds of millions of dollars saved** in emergency operations, and **billions of dollars saved** in broader economic activity for the city.