Advancing Electrification and Decarbonization in Utilities and Manufacturing

Empowering the Energy of Change.

TECBOMO

UTILITIES

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UTILITIES

Executive Summary

By 2030, the utilities industry will undergo one of its most profound transformations in decades, driven by explosive electricity demand growth, aggressive decarbonization mandates, widespread electrification, and the need for massive grid modernization. We see this shift as an opportunity to leverage advanced software like GridOS®, EcoStruxure™ ADMS, and DERMS integrations with partners GE Vernova, Schneider Electric, and ABB to enable resilient, optimized, and sustainable grids.

By 2030, utilities will evolve from traditional providers to sophisticated orchestrators of a dynamic, decentralized, renewable-heavy ecosystem. The industry will be more digital, flexible, and customer-centric—powered by electrification software that optimizes grids, integrates DERs, and drives net-zero progress.

The utilities industry faces unprecedented challenges and opportunities driven by rising electricity demand, the integration of renewables, electrification of end-uses, and urgent decarbonization goals. Electrification software solutions empower utilities to modernize grids, optimize operations, and support sustainable energy ecosystems. Key to this is grid optimization software, which enables proactive management of complex networks.

Decarbonization—reducing or eliminating carbon emissions—extends beyond utilities to manufacturing, where data analysis plays a pivotal role in identifying efficiency gains, optimizing energy use, and tracking progress toward net-zero targets.

Our success hinges on leveraging strategic partnerships with industry leaders GE Vernova, Schneider Electric, and ABB in power management and electrification. These collaborations integrate cutting-edge technologies like advanced distribution management systems (ADMS), grid orchestration, and AI-driven analytics into our offerings, helping clients achieve greater efficiency, resilience, and sustainability.

Key Projections and Trends for the Utilities Industry by 2030

1. Explosive Electricity Demand Growth

Global electricity demand is expected to rise robustly, with forecasts showing annual growth of 3-4% through the late 2020s, far outpacing overall energy demand. In the US, demand surges from data centers (potentially 515-720 TWh by 2030, up from 180-290 TWh in 2024), industrial electrification (adding ~25-35 GW), EVs, and buildings. Data centers alone could account for 8-12% of US power demand (up from ~3-4% today). Globally, renewables will meet over 90% of new demand growth, with electricity demand rising ~40% by 2035/

2. Massive Shift to Renewables and Decarbonization

Renewables will dominate new capacity, with global additions of ~4,600 GW from 2025-2030 (doubling prior periods). Solar PV will lead (~80% of growth), followed by wind, pushing renewables' share in electricity generation from ~32% in 2024 to 43% by 2030. Variable renewables (solar/wind) could reach 27% of supply. Utilities will target net-zero or deep decarbonization (e.g., carbon-free power sectors in many regions by 2035), with coal retirements (~80-100 GW in the US) offset by renewables, storage, and some gas/nuclear. Offshore wind, pumped hydro, and battery storage will scale dramatically for flexibility. ~40% by 2035 in many scenarios.

3. Unprecedented Grid Investments and Modernization

US utilities alone plan $1.1-1.4 trillion in capital expenditures by 2030 (doubling prior decade levels) for transmission/distribution upgrades, new capacity (~209 GW additions), and handling peak demand shifts (e.g., from summer cooling to winter heating with electrification). Transmission capacity may need to expand 2-3x in some regions. Grid congestion from data centers and DERs will drive smart grid tech adoption.

4. Proliferation of DERs, EVs, and Behind-the-Meter Resources

Distributed energy resources (DERs) like rooftop solar, batteries, EVs, and demand response will explode, with utilities managing high penetrations (50-70%+ renewables in some grids). EVs could reach tens of millions on roads, requiring grid-edge intelligence. DERMS and ADMS will become essential for real-time monitoring, forecasting, violation resolution, and optimization—turning intermittent resources into dispatchable assets via virtual power plants (VPPs).drive smart grid tech adoption.

5. Advanced Software and Digital Transformation as Core Enablers

Tools like ADMS (projected market ~$7.4B by 2030), DERMS, AI-driven forecasting, and grid orchestration (e.g., GridOS®) will be ubiquitous for resilience, outage reduction, and flexibility. Cloud-native, integrated platforms will unify OT/IT data, enable predictive analytics, and support markets participation (e.g., FERC Order 2222). Cybersecurity, Zero Trust models, and automation will be non-negotiable amid rising threats.

6. Challenges and Opportunities

Key hurdles include supply chain delays, permitting bottlenecks, reliability risks from retiring baseload (e.g., coal/gas), and balancing affordability with clean energy goals. However, this creates massive value: faster restoration, deferred CapEx, new revenues from services/markets, and accelerated decarbonization. Partnerships with leaders like GE Vernova (GridOS® for orchestration), Schneider Electric (EcoStruxure™ for DERMS/ADMS), and ABB (energy management/automation) will be pivotal.

Electrification Software Solutions for the Utilities Industry

Electrification software encompasses digital tools that enable utilities to manage the shift from traditional fossil-based systems to electrified, renewable-integrated grids. These solutions address increased demand from electric vehicles, data centers, and industrial processes while ensuring reliability and affordability.

Core capabilities include:

- Real-time grid monitoring and control
- Integration of distributed energy resources (DERs) like solar and storage
- Predictive analytics for demand forecasting
- Outage management and restoration
- Cybersecurity and data orchestration

By unifying data from intelligent electronic devices (IEDs) and supervisory systems, these tools transform raw information into actionable insights. TECBOMO's SaaS platforms streamline billing, meter reading, outage communication, and smart grid transitions, making legacy infrastructure compatible with modern demands.

Partnerships with GE Vernova (GridOS® for grid orchestration), Schneider Electric (smart grid software for flexibility and resiliency), and ABB (energy management and automation) allow TECBOMO to deliver end-to-end solutions that accelerate electrification while reducing environmental impact.

Five Steps to Grid Optimization Software for Utilities

Grid optimization software is essential for utilities navigating renewables growth, DER proliferation, and extreme weather. Drawing from industry best practices, here are five key steps to implement effective grid optimization:

1. **Form a Connected, Validated Data Fabric**
   Build an integrated foundation by unifying data across transmission, distribution, and edge assets. This creates a single source of truth for real-time visibility, enabling proactive operations and reducing silos.

2. **Enhance Visibility and Control with Advanced Analytics**
   Deploy tools for forecasting, grid balancing, and DER orchestration. Use AI/ML to analyze data for better decision-making, optimizing network performance and integrating renewables effectively.

3. **Implement Outage and Event Management**
   Equip utilities to assess impacts, dispatch resources, and restore power swiftly during disruptions. End-to-end systems improve reliability, customer communication, and recovery times.

4. **Drive Data-Driven Decision Making**
   Leverage analytics for maintenance scheduling, infrastructure investments, and scenario planning. This supports cost reduction, resilience, and alignment with decarbonization targets.

5. **Enable Continuous Improvement and Scalability**
   Adopt cloud-based, upgradeable platforms that support evolving needs like increased electrification and DER growth. Foster cybersecurity, automation, and stakeholder collaboration for long-term success.

   TECBOMO, in collaboration with GE Vernova's GridOS®, helps utilities execute these steps seamlessly, delivering faster restoration, lower costs, and enhanced grid orchestration.

Decarbonization of Data Analysis in Manufacturing and Utilities

What is Decarbonization?

Decarbonization refers to the systematic reduction and eventual elimination of carbon dioxide (CO_2) and other greenhouse gas emissions from operations, energy use, and supply chains. It involves shifting to low- or zero-carbon energy sources, improving efficiency, and deploying technologies like carbon capture to achieve net-zero goals.

In utilities and manufacturing—energy-intensive sectors—decarbonization targets Scope 1 (direct emissions), Scope 2 (indirect from purchased energy), and Scope 3 (supply chain) emissions.

The Role of Data Analysis in Decarbonization
Advanced data analysis is the backbone of effective decarbonization:

Energy Efficiency Optimization: Real-time monitoring identifies waste, enabling heat recovery, process tweaks, and reduced consumption.

Emissions Tracking and Reporting: Data platforms aggregate usage, calculate carbon footprints, and support compliance (e.g., CDP reporting).

Renewable Integration and Electrification: Analytics forecast demand, optimize renewable dispatch, and model electrification impacts.

Scenario Planning: Simulate pathways (e.g., fuel switching, CCS) to prioritize investments with the highest emissions reductions.

Cross-Sector Synergies: In manufacturing, data-driven insights reduce energy per unit output; in utilities, they balance loads to minimize fossil reliance.

Power Management and Electrification Partnerships

TECBOMO proudly partners with global leaders to deliver superior power management and electrification solutions:

- GE Vernova: Integrating GridOS and electrification software for grid orchestration, DER management, and decarbonization acceleration. This enhances our ability to provide AI-driven, resilient grid tools.
- Schneider Electric: Collaborating on smart grid technologies for digitization, optimization, and automation, supporting flexibility, resiliency, and risk mitigation.
- ABB: Leveraging expertise in energy management, automation, and electrification to offer robust solutions for grid reliability, renewable integration, and industrial efficiency.

These partnerships enable TECBOMO to offer comprehensive, scalable SaaS platforms that address complex challenges in utilities and manufacturing, driving sustainable outcomes for our clients.

Power Management and Electrification Partnerships - Case Studies

GE Vernova

Integrating GridOS® and electrification software for grid orchestration, DER management, and decarbonization acceleration. This enhances our ability to provide AI-driven, resilient grid tools.

Case Study Highlight: Fingrid (Finland's Transmission System Operator)
Fingrid leverages GE Vernova's GridOS® Orchestration Software, including the Load Frequency Control (LFC) module, to automate frequency regulation amid rising renewable integration. The solution monitors power fluctuations in real-time, automatically adjusts generator outputs, and maintains grid stability. This modular approach supports rapid deployment, enhances renewables orchestration at scale, and aligns with evolving regulations—resulting in more efficient, automated operations and reduced manual intervention for a cleaner, more reliable grid.Case Study Highlight: One Grid Operation AS (Norway)

Through integration of GridOS®, Norwegian utilities Tensio AS and Linea AS gain increased visibility, faster decision-making, and enhanced security. The platform's grid-specific data fabric unifies OT/IT/external data (e.g., weather), enabling AI-driven automation and renewables integration. Over three years, this supports a secure, dependable electricity supply amid growing electrification demands, accelerating grid modernization without silos.

Schneider Electric:

Collaborating on smart grid technologies for digitization, optimization, and automation, supporting flexibility, resiliency, and risk mitigation.Case Study Highlight: Composite Utilities Using EcoStruxure™ ADMS with Embedded DERMS

A Forrester Consulting Total Economic Impact™ study (commissioned by Schneider Electric) analyzed utilities deploying EcoStruxure ADMS integrated with DERMS. Results include an 184% ROI, $40 million net present value over five years, and $61.8 million in benefits versus $21.8 million in costs. Key outcomes: accelerated DER integration, faster outage restoration, improved grid efficiency, and stronger support for decarbonization through better management of renewables and demand response—delivering payback in just 16 months while enhancing reliability and sustainability.Case Study Highlight: Austin Energy

Austin Energy selected Schneider Electric's ADMS to integrate millions of data points into a unified experience, enabling smarter operational decisions. This supports renewable-heavy portfolios, improves outage management, and advances decarbonization goals by optimizing grid performance in a changing climate—reducing disruptions and aligning with aggressive emissions targets.

ABB:

Leveraging expertise in energy management, automation, and electrification to offer robust solutions for grid reliability, renewable integration, and industrial efficiency.

Case Study Highlight: Washington State Ferries (WSF) Electrification Program
ABB supplies hybrid electric propulsion systems, including Onboard DC Grid™ power distribution, energy storage, advanced energy management, and integrated automation for WSF's new ferries. As part of a $3.98 billion plan to electrify 16 vessels, this enables seamless integration of hybrid technology, real-time monitoring, and performance optimization—reducing emissions, enhancing energy efficiency, and supporting sustainable maritime transport aligned with broader electrification trends.

What is DERMS in the Utilities Industry?

DERMS is a software platform designed to monitor, control, optimize, and orchestrate DERs—both utility-owned (front-of-the-meter) and customer/third-party-owned (behind-the-meter)—to deliver grid services while maintaining reliability, efficiency, and resilience.

Unlike traditional centralized generation, DERs are dispersed across the distribution network, introducing challenges such as intermittent output, bidirectional power flows, voltage fluctuations, congestion, and "masked load" (where local generation hides true consumption). DERMS addresses these by providing:

Real-time visibility and situational awareness
Forecasting and predictive analytics (e.g., for solar irradiance, weather, and load)
Automated dispatch and control to resolve violations (e.g., overvoltage, overloads)
Aggregation of diverse DERs into virtual power plants (VPPs) for market participation
Integration with other systems like ADMS (Advanced Distribution Management System), OMS, and markets.

Key Benefits of DERMS Solutions

DERMS delivers measurable value across operational, economic, and sustainability goals:

Improved Grid Reliability and Resilience
Proactive violation detection and resolution prevent outages, backfeeds, and voltage issues. Real-time coordination balances supply/demand fluctuations from renewables.

Cost Savings and Optimization
Defer capital expenditures by accurately assessing hosting capacity and EV/solar impacts. Reduce operational costs through efficient dispatch, peak shaving, and avoided infrastructure builds.

Higher Renewables and DER Integration
Safely manage 50-70%+ renewables penetration with advanced forecasting, optimization, and aggregation—turning intermittent resources into reliable, dispatchable assets.

Enhanced Customer and Market Participation
Enable prosumer engagement (e.g., incentives for EV charging or battery dispatch) and support market participation (e.g., FERC Order 2222 compliance) for new revenue.

Decarbonization Acceleration
Maximize clean energy use, reduce fossil reliance, and support net-zero goals by optimizing flexible DERs for grid services.