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An Investor's Guide to Companies and Opportunities in the Electrification/ Power / Grid Modernization sector

This guide provides an overview of the electrification / power / grid modernization sector, and the investment opportunities associated with segments of the industry. It walks through the electric supply chain, then breaks it into segments, outlines innovations and disruptions happening in each, and identifies the CAGR and TAM associated with several segments of the electrification market. It then outlines the firms associated with R&D and product market share in each segment. It can be used by investors to evaluate investment opportunities and better understand what publicly traded companies operate in certain segments of the market. It suggests the best investment opportunities by forecasted growth into 2030.

Electric Power Subsector Market Opportunities

As of late 2024, the Electric Power subsector is forecast to increase by a 28% CAGR through 2032, largely driven by global decarbonization efforts, EV transport growth, AI-based power demands, and changing consumer needs. The stage is set for investors to achieve above average to high returns in this sector, and for market entrants and existing players to rapidly gain share in the early innings of the electric modernization market.

The industry will start to exhibit signs of faster decentralization as residential consumers continue to experience increasing rates amidst a downturn in personal incomes. The cost of modern electric

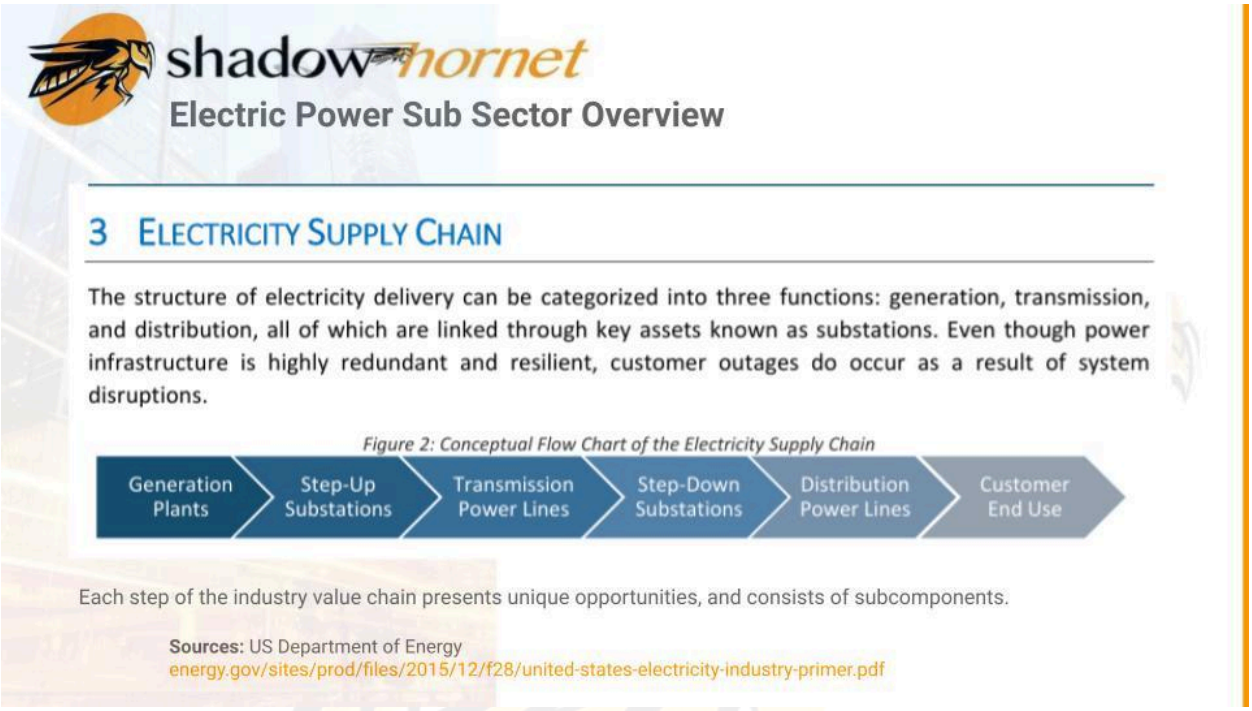
infrastructure (and thus capital and operating expense) is simultaneously increasing, and for now, the residential and commercial consumers subsidize that cost. This trend is unsustainable and creates the need for new power modulation and demand gating/sharing technology, fueling the 28% CAGR associated with this market.

Demand for electric power will be accelerated by robust global governmental funding and support for electrification, modernization, and decarbonization efforts. However, some segments of this market could be very challenged in 2025 by US Federal policy that strongly de-emphasizes offshore wind and the domestic EV market.

Regardless of administration change, the electric power market offers several subsegments for potential entry, each with their own barriers, characteristics, and market structure. The following pages will outline a framework for assessing these opportunities, the players in each market segment, and growth areas to help investors and firms evaluate the best entry point for the Electric Power market.

Overview of the Electrification and Modernization Market

Investors need to understand the market and its various segments to make better informed decisions. The exhibit below illustrates the six components of the electric power supply chain at a very high level.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Electric Power Sub Sector Overview

3 ELECTRICITY SUPPLY CHAIN

The structure of electricity delivery can be categorized into three functions: generation, transmission, and distribution, all of which are linked through key assets known as substations. Even though power infrastructure is highly redundant and resilient, customer outages do occur as a result of system disruptions.

Figure 2: Conceptual Flow Chart of the Electricity Supply Chain

Generation Plants → Step-Up Substations → Transmission Power Lines → Step-Down Substations → Distribution Power Lines → Customer End Use

Each step of the industry value chain presents unique opportunities, and consists of subcomponents.

Sources: US Department of Energy
energy.gov/sites/prod/files/2015/12/f28/united-states-electricity-industry-primer.pdf

At the most basic level, the electric supply chain consists of:

1. Generation facilities and their inputs (e.g. natural gas, coal, nuclear, solar, wind, hyrdoelectic, biomass/biofuel)
2. Substation infrastructure, which includes power modulation assets and facilities
3. Transmission infrastructure, which includes power transmission and monitoring
4. Step-down substations which include inverter and transformer infrastructure to prepare power for lower voltage distribution
5. Distribution networks (transformers, pole assets, lines, connections)
6. Customer consumption (residential/commercial/industrial usage)

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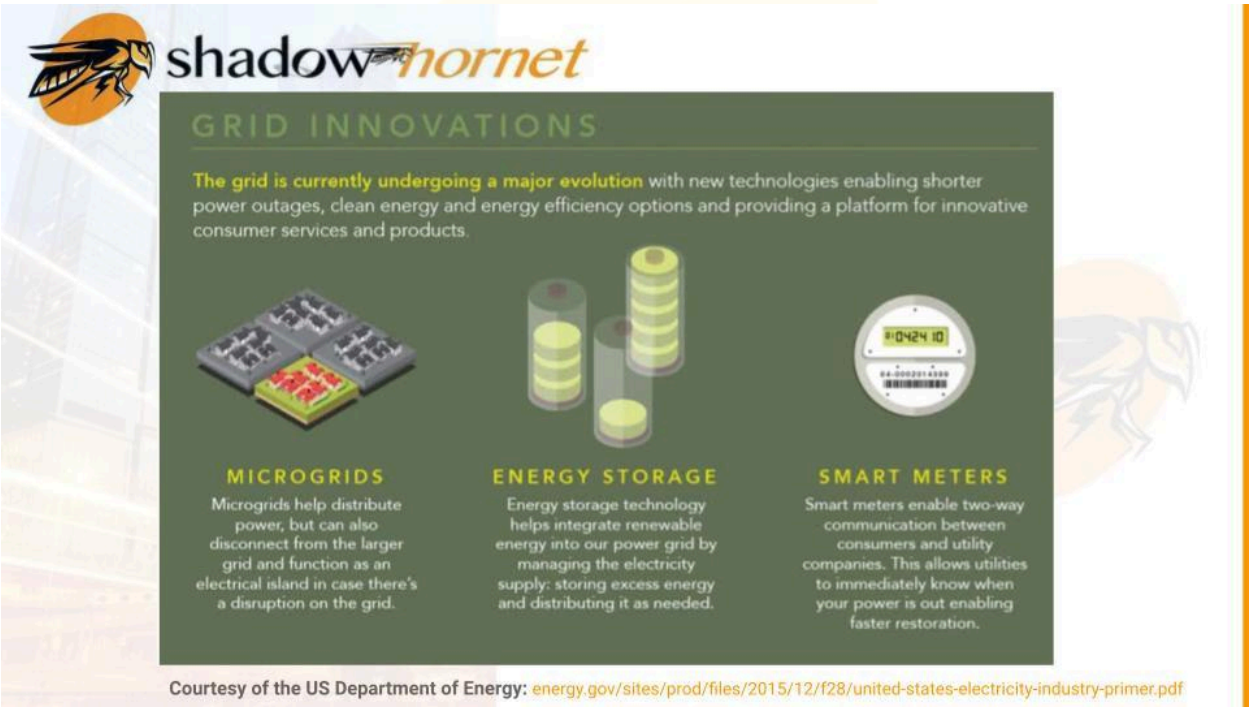
Innovation and Disruption Affecting the Electrification / Power / Grid Modernization Supply Chain

Each of these supply chain areas is seeing innovation and disruption from new technologies and approaches. The US electric grid is based largely on 19th and 20th century concepts and has remained largely unaltered as demand for electricity has surged, and new sources of energy came online at scale in the first two decades of the 2000's. Below are areas in which the supply chain is changing - these areas represent market opportunity for investors:



Courtesy of the US Department of Energy: energy.gov/sites/prod/files/2015/12/f28/united-states-electricity-industry-primer.pdf

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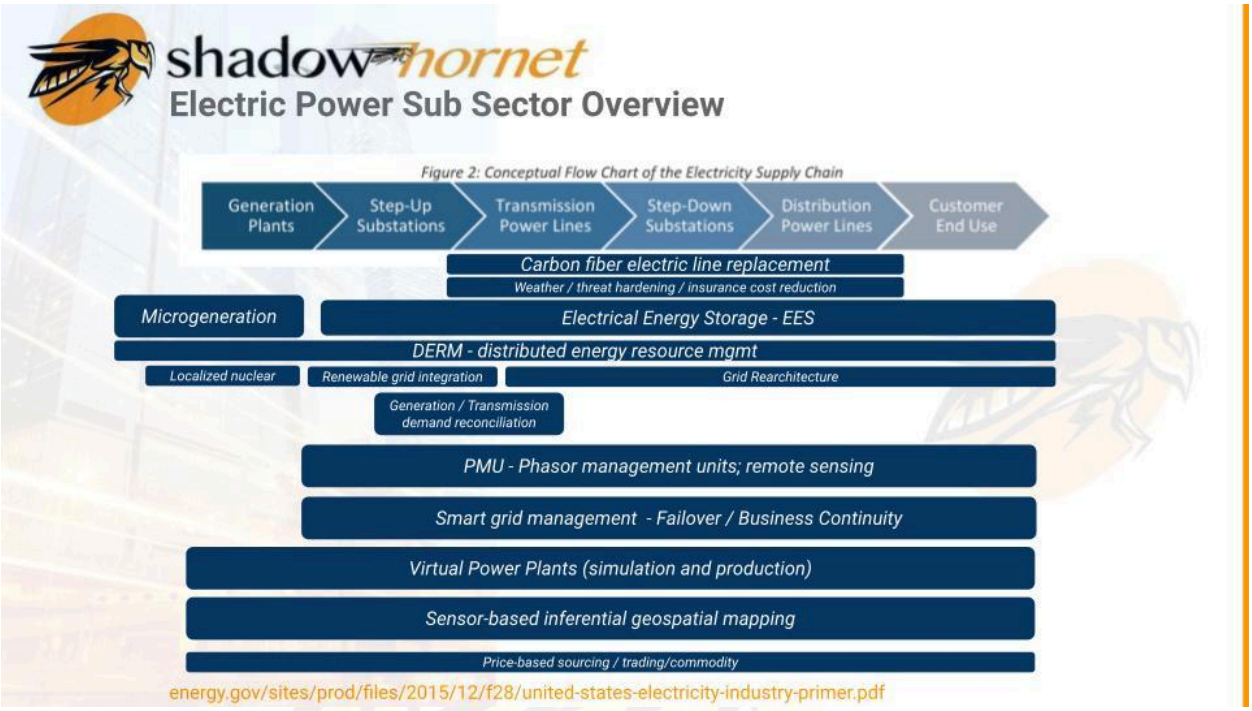

The Best Investment Opportunities: Total Addressable Market (TAM) and CAGR (Compound Annual Growth Rate) By Electric / Power / Grid Modernization Market Segment

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Electrification Market Opportunity Overview

NOTE: Offshore wind = $140B TAM by 2036 however variability is high due to political policy threat NOV 2024

Opportunity Area	TAM	CAGR	Maturity
Microgridding / grid re-architecture	$17.8 - 46.9B	20.5%	North America to grow at 13.5%. Possible entries: smart inverters and voltage control devices, net metering
Sensors / PMU remote monitoring	$4.4 - 9.7B	20%	Connectivity and Sensors Group, or CSG, 2024 -2029
DERM (Distributed Energy Resource Management)	$0.57 - 1.86B	18.3%	2023 - 2030. Market trifucated into: VPP, Analytics, Management and Control. (Includes renewable integration, generation/transmission demand reconciliation)
EES	$8.6 - 30.1B	11.2%	2020 - 2032.
Carbon fiber line replacement	$3.6 - 7.0B	8.8%	2023 - 2033. Early adoption. Applicable segment is "pitch" fiber, may substantially reduce TAM (80%).
OSP threat mitigation	$3.7 - 4.9B	4.2%	10% of total power tower/equip market.
Sensor / intuit asset management	$3b - 3.3B	3%	Geospatial enterprise solutions
Thermal components (fusing)	$5.8 - $6.8B	3%	Specific to grid re-architecture

These market verticals distinguish themselves in CAGR...and represent a mix of small and large market opportunities

Opportunity Analysis

The largest opportunities in electrification / power / grid-modernization lie in Grid Re-Architecture (20.5% CAGR), Sensor-based Phasor Measurement and Remote Monitoring (20%), Distributed Energy Resource Management or DERM (18.3%), EES or Electrical Energy Storage (11.2%), and Carbon fiber line replacement (8.8%).

Dwarfing all of these opportunity areas, combined, is Offshore Wind Power Generation, forecast to be an astonishing $140B market by 2036. However, this TAM seems unrealistic given the failure of offshore wind to compete effectively with all other forms of power generation due to substantial capital investment, environmental regulation, and maintenance costs. Additionally, US Presidential candidate Donald Trump has targeted offshore wind as a priority to de-emphasize through his administration's policy.

Since the offshore wind segment is largely burgeoned by the US Federal government, it is highly unlikely that this market segment will perform as currently forecast by the DoE because of an increasing likelihood that Trump will win the 2024 US election.

Why the Opportunity Exists

For over 100 years, the entire business model of the electric utility was designed around central power generation by regional monopolies, supported by state and Federal government. This model resulted in a largely centralized grid design with materials available in the 1920s-1940s (copper wire) stringing transmission lines to houses across wide expanses in the rural US, and with mazes of overhead lines criss-crossing in cities.

In the past, electric generation was limited to coal, then coal + hydroelectric power. Over time, nuclear power became a viable source of generation. Thanks to R&D advancements and successful demonstration projects, the early 2000's ushered in an era of viable renewable energy, mainly solar and wind, but also including biofuel and biomass. Since the electric grid is based on a centralized model and one way (Direct Current - DC) power, and legacy technology, the grid needs to adapt to incorporate these new sources, and increase its distribution and transmission capacity.

Firms are leading the way in development of new products, services, materials, and software, much of it AI-enhanced, to meet the energy needs of the next American generation.

Market Players by Segment

Below are the major players in each segment, as well as a list of all companies involved in next generation electric power technologies.

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Knowledge Gathering - Market Players
Sensors / PMU / Remote Monitoring
DERM - Distributed Energy Resource Management
Electrical Energy Storage - EES
Carbon Fiber-Based Line Modernization
Market Participants:
10. Vivint Solar + Sunrun
9. GE Vernova
8. AES
7. Sociedad Química y Minera
6. Johnson Controls
5. Energizer
4. Enphase Energy
3. Albemarle
2. Panasonic
1. Tesla
Opportunity Segments:
Lithium-ion battery migration
Hazardous materials disposal and supply chain
Lead–acid batteries, supply chain
Pumped-storage hydropower
Compressed-air energy storage,
Redox flow batteries,
Hydrogen
Building thermal energy storage,
Long-duration energy storage technologies
Supply chain assurance
Security

All Market Players Comprehensive List

https://docs.google.com/spreadsheets/d/1m8WuhbHwqgcNPhE46hF0C6cSFyChwtmlDEBQ3BqElSA/edit?usp=sharing

Publicly Traded Opportunities

The following firms are publicly traded entities, and represent consideration for future investment. In a subsequent guide, we will provide more detailed analysis on these companies and their unique positioning in the market.

Player	Subsector	Stock Symbol	Current Price (7/16/24)
Lockheed Martin Corporation	Microgridding / Grid Integration and Re-Architecture	LMT	468.58
Exelon Corporation	Microgridding / Grid Integration and Re-Architecture	EXC	35.52
Tesla	Microgridding / Grid Integration and Re-Architecture	TSLA	256.56

Toshiba Corporation	Microgridding / Grid Integration and Re-Architecture	6502.T (Tokyo Stock Exchange)	
Honeywell International, Inc.	Microgridding / Grid Integration and Re-Architecture	HON	218.47
ABB	Microgridding / Grid Integration and Re-Architecture	ABBNY	57.94
Caterpillar	Microgridding / Grid Integration and Re-Architecture	CAT	360.58
Schneider Electric	Microgridding / Grid Integration and Re-Architecture	SU.PA (Euronext Paris)	
Siemens	Microgridding / Grid Integration and Re-Architecture	SIEGY (OTC), SIE.DE (Frankfurt Stock Exchange)	

Eaton	Microgridding / Grid Integration and Re-Architecture	ETN	332.46
General Electric	Microgridding / Grid Integration and Re-Architecture	GE	162.85
Hitachi	Sensors / PMU / Remote Monitoring	HTHIY (OTC), 6501.T (Tokyo Stock Exchange)	107.43
Itron (U.S.)	DERM - Distributed Energy Resource Management	ITRI	142.61
Oracle (U.S.)	DERM - Distributed Energy Resource Management	ORCL	138.03

Enel (Italy)	DERM - Distributed Energy Resource Management	ENLAY (OTC), ENEL.MI (Milan Stock Exchange)	
Mitsubishi Electric Corporation (Japan)	DERM - Distributed Energy Resource Management	MIELY (OTC), 6503.T (Tokyo Stock Exchange)	
Doosan Heavy Industries & Construction (South Korea)	DERM - Distributed Energy Resource Management	034020.KS (Korea Stock Exchange)	
Vivint Solar + Sunrun	Electrical Energy Storage - EES	RUN	17.28
GE Vernova	Electrical Energy Storage - EES	GEV	182.74
AES	Electrical Energy Storage - EES	AES	17.65

Johnson Controls	Electrical Energy Storage - EES	JCI	72.18
Energizer	Electrical Energy Storage - EES	ENR	30.33
Enphase Energy	Electrical Energy Storage - EES	ENPH	116.17
Albemarle	Electrical Energy Storage - EES	ALB	97.71
Panasonic	Electrical Energy Storage - EES	PCRFY (OTC), 6752.T (Tokyo Stock Exchange)	
Tesla	Electrical Energy Storage - EES	TSLA	256.56

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Conclusions

This is meant to be a guide for investors trying to learn more about the electrification / power / grid modernization vertical. The space presents several compelling opportunities for analysis and potential investment/market entry. However, many policy risks in 2025 may temper the outlook for specific areas like offshore wind and non-domestic (US) produced EV's, solar components, and materials.

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We're Power / Electrification / Grid Modernization / Utilities / Business Experts who can help solve your toughest business challenges.

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