

REPORT

AI in the *energy* industry



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If effectively harnessed, AI could improve the efficiency and management of vast, increasingly complex energy systems. This would reinforce efforts to ensure energy security, affordability, and sustainability around the world.”

Dr Fatih Birol
Executive Director, International Energy Agency

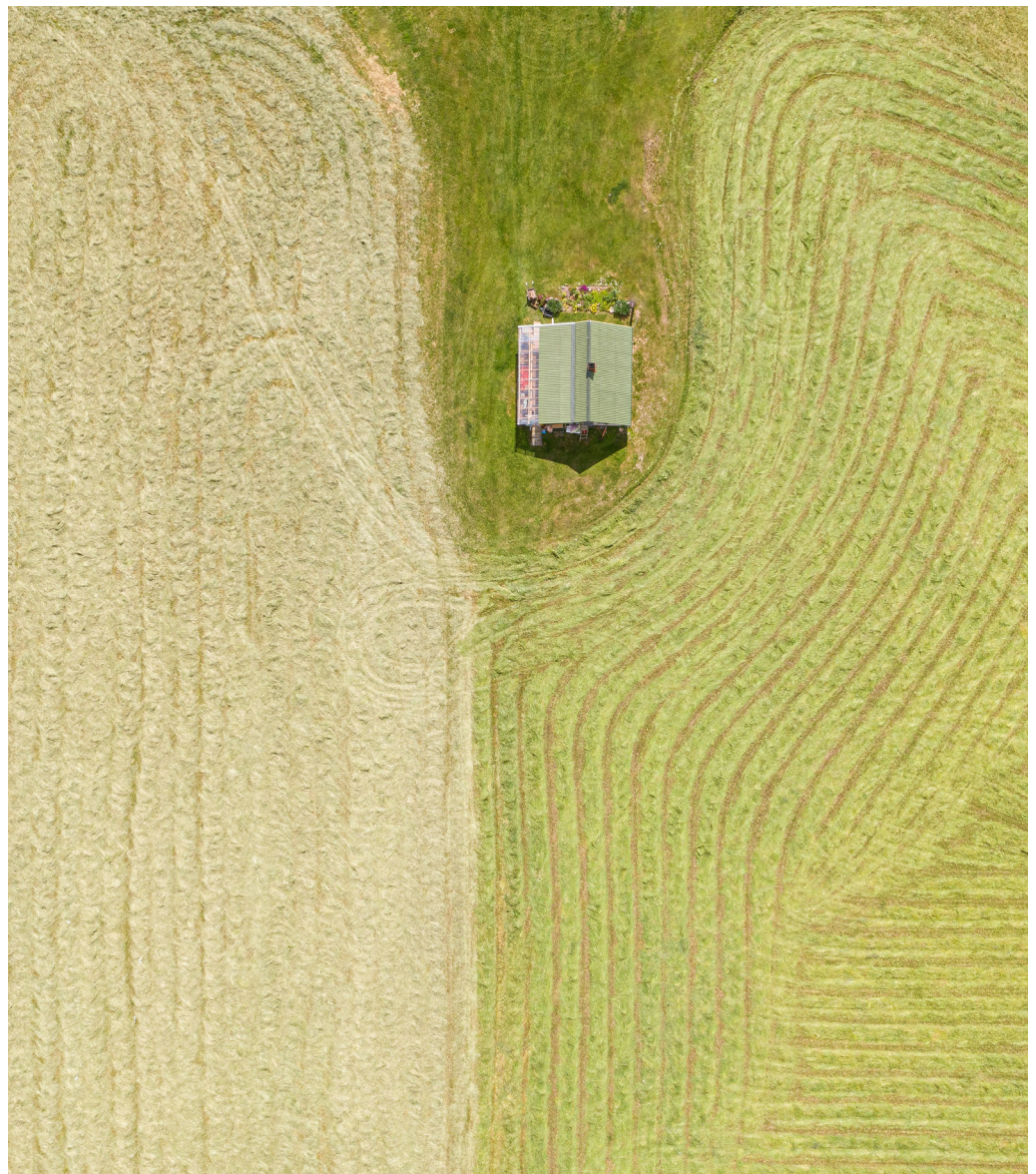
Source: Real-World Impact of AI in Energy – India AI Impact Summit Compendium (2026)

The AI landscape: traditional, generative, and agentic AI

Traditional artificial intelligence (AI) refers to machine learning and statistical models that operate on structured data to automate, predict, and optimise decision-making processes. These systems are designed to identify patterns and improve outcomes in areas such as forecasting, risk management, and operational efficiency.

Generative AI (GenAI) extends these capabilities by using large language models (LLMs) and other generative architectures that are built to handle general inputs and outputs. GenAI can analyse and create content from unstructured data such as text, images, or audio, enabling more interactive and context-aware use of information. An assistant (sometimes used interchangeably with agent) is an LLM configured to perform a specific task through prompt engineering and data access.

Agentic AI systems equip LLMs with a level of autonomy and access to a predefined toolbox allowing models to perform complex tasks such as writing code, drafting slides, querying databases, and accessing systems.



State of AI

AI is scaling in trading, while most of the energy value chain is still at pilot stage

Energy is a large and varied sector, including utilities, grid operators, traders, retailers, and asset developers; AI moves at different speeds across it. Trading and battery optimisation lead, where decisions are frequent and data is rich; specialists built around AI already compete with incumbents. Asset development and operations lag, held back by critical infrastructure, legacy systems, and fragmented asset data.

AI creates value at every stage of the energy value chain

AI's value sits along the whole value chain, from building assets to operating them, trading their output, and serving customers. We see four stages:

#1. Develop and build. AI shortens the path to commissioning through faster design, documentation and costing, live project controls, and procurement support that flags supplier and interface risk early.

#2. Operate and maintain. Gains come from predictive maintenance, diagnostics that connect alarms, maintenance history, risk and asset information, and a grid that orchestrates distributed generation, demand, and storage.

#3. Trade and optimise. AI supports trading with real-time risk exposure and optimises BESS and hybrid plants, with industrial loads, heat assets, and EV charging hubs bid into the markets as flexibility markets mature.

#4. Serve customers. The value is here now, in end-to-end automated customer journeys, real-time segmentation that triggers the right offer, and flexibility services that manage household EVs, heat pumps, and batteries – and share the revenue with the household.

The strategic battleground – capturing the value

Value creation is now visible in all four stages, and five choices will decide who captures it. Most incumbents have already made them, implicitly or by default, and often differently in each silo.

Efficiency play or mission critical: Most treat AI as a cost lever. In retail and trading, it is quickly becoming the business core.

Rapid experimentation or structured planning: Entrants scale what works; incumbents plan to protect critical infrastructure. Know your game in each stage to avoid wasting resources.

Top-down or bottom-up: Bottom-up delivers scattered pilots. Top-down points AI at the problems where it creates the most business impact – if leadership is in place to drive it.

Build or buy: Buy standard processes off the shelf. Build where proprietary asset, grid, and market data differentiate, and choose which decisions you will not outsource.

Centralised or distributed: Siloed operating models produce pilots; a central core for governance, data, and platforms can produce AI-embedded operations.

There are no universally right answers. The risk lies in not making any deliberate choices.

Few sectors have as much data as energy, but critical infrastructure, legacy systems, and a fragmented ecosystem keep AI from reaching scale

Energy's complexity makes the potential unusually large ...

Energy is measured end to end: more and more of the system is metered, every trade is settled, and modern wind turbines, cables, and transformers report their own state. Smart meters, intraday markets, and asset sensors add granularity every year, and data is tied to money flows through prices, volumes, imbalances, and outages in real time. Few industries map their physical product as completely as the energy system does.

At the same time, the system is challenged: the exponential growth of renewable generation leads to increasing price volatility and physical instability, and rapid electrification puts pressure on infrastructure build-out. The transition to new technologies such as Power-to-X and long-duration energy storage (LDES) requires trillions of euros of investment under high uncertainty, raising the need for de-risking through forecasting and analysis. The combination of abundant data and need for complex, real-time decision-making is where AI creates the most value.

... but the same complexity makes adoption slow

AI is arriving in energy, but mostly in pockets where data is contained and the downside is limited: customer service tools in retail, largely bought in and tailored, and predictive maintenance on parts of the fleet. Moving AI into the core of grid and asset operations is slower, held back by critical infrastructure demands, legacy systems, and a fragmented ecosystem.

Critical infrastructure sets the bar for cyber- and operational security extremely high, and European regulation restrains the obvious use case: connecting flexible assets and infrastructure in real-time, optimised ecosystems. Legacy systems add to this, as asset owners are often restricted to the AI solutions their suppliers provide – or spend years untangling their operations. And the data that makes energy so measurable is scattered across grid operators, asset owners, vendors, and internal silos.

The result: structural barriers to harvesting the AI potential are real.



72%

of energy infrastructure leaders expect AI to transform how their organisation operates within the next three years¹

34%

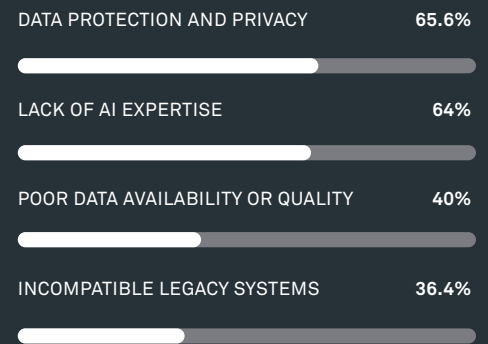
of EU energy utilities use at least one AI technology, well above the 20% average across all EU enterprises¹

However, only around 9% of EU energy supply companies use AI in production or service processes

Why energy companies are holding back on AI²

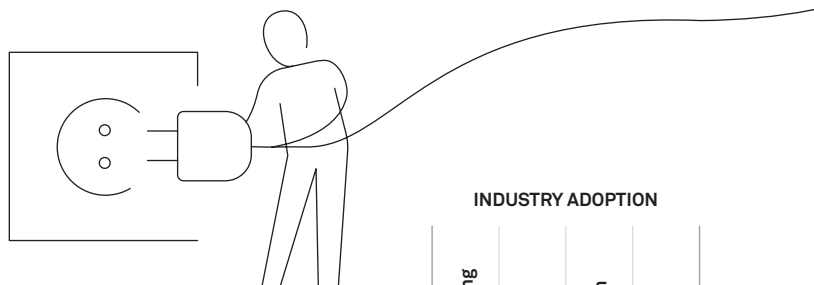
Sources:

- 1) Implement Analysis (2026), Siemens Infrastructure Transition Monitor (2025), Eurostat The Use of AI Technologies in the EU (2026).
- 2) Eurostat, The use of AI technologies in the European Union, 2026 edition. Table 8.



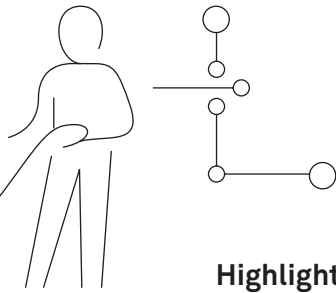
AI across the energy value chain

USE CASES



			INDUSTRY ADOPTION			
	Use case	Description	Emerging	Low	Medium	High
01. Develop and build	Design and engineering	Support the full engineering process with AI, from generating and testing design options to producing documentation, quantities, and cost estimates, so engineers deliver faster with fewer late changes.	☐	☒	☐	☐
	Project and portfolio controls	Give project and portfolio owners one live view of cost, schedule, and progress across projects under construction, flagging deviations before they hit the critical path.	☐	☒	☐	☐
	Procurement, contract and supplier risk support	Fast-track procurement with AI-supported tender analysis and supplier evaluation. Combine risks across contracts and suppliers into one testable view and flag emergent risks with suggested actions.	☐	☒	☐	☐
02. Operate and maintain	Predictive maintenance and condition monitoring	Provides fleet-wide asset data for condition monitoring and predictive maintenance in operations and maintenance (O&M), allowing COOs to act on cost drivers.	☐	☒	☐	☐
	Diagnostics and asset information	Turn alarm codes, failure history, and technical documentation into structured asset data, and give technicians troubleshooting advice based on similar faults across the fleet.	☒	☐	☐	☐
	Grid-edge orchestration of distributed assets	Support the change of the grid into a node in a network of distributed generation, demand, and storage, optimising multiple variables.	☐	☐	☒	☐
03. Trade and optimise	Real-time trading risk exposure and algo-trading	AI-supported trading for small desks powered by real-time analytics and forecasts, with flags on trading risk exposure against procurement and consumption.	☐	☒	☐	☐
	BESS and hybrid plant optimisation	Forecast prices and available capacity, and optimise dispatch and bidding of standalone BESS and hybrid wind, solar, and storage plants across wholesale and balancing markets.	☐	☐	☒	☐
	C&I flexibility	Pool flexible load from industrial processes, heat assets, and EV charging hubs, forecast what each site can shift without disrupting operations, and bid it into wholesale and balancing markets.	☐	☒	☐	☐
04. Serve customers	End-to-end customer service and journey	Automate onboarding, billing questions, moves, and switching in one continuous journey. Customers get answers in seconds, and advisors can focus on complex and high-value cases.	☒	☐	☐	☐
	Household flexibility services	Offer households a service that automatically manages their EV, heat pump, and battery, lowers their bill, and shares the flexibility revenue, turning a commodity contract into a lasting customer relationship.	☐	☒	☐	☐
	Real-time customer segmentation	Move from static segments to live customer understanding. AI reads behaviour as it happens and triggers the right offer or add-on at the right moment, lifting relevance, retention, and revenue per customer.	☒	☐	☐	☐

Note: Industry adoption reflects Implement's assessment of how widely Northern European energy companies run each use case in production.



Highlighted future AI use cases in the energy industry

USE CASES – Deep dives

01. Procurement, contract, and supplier risk support	Why:	Capital projects in offshore wind, grids, and new value chains depend on a few critical suppliers and many contract interfaces. Procurement teams handle large tender packages under time pressure, and risk sits in contract terms, interfaces, and supplier performance that no one sees in full. Problems surface late, when they are expensive to fix.
	Examples:	A combined machine learning and generative AI solution aggregates risk, analyses tender material, compares bids, and screens contracts for deviations from standard terms. During execution, it monitors supplier performance, contract obligations and interfaces between packages, combines the risks into one testable view, and flags emerging issues with suggested actions for the project team.
	Impact:	Faster procurement cycles, stronger negotiation positions, and fewer late surprises in delivery. This improves cost and schedule certainty across the project portfolio.
02. Diagnostics and asset information	Why:	Many failures on energy assets cannot be predicted and occur with little warning. Optimisation tools exist, but most rely on standardised forecasts, error codes, manual search, and each technician's own experience. Structured asset information, maintenance history, and as-maintained bills of materials are rarely connected, so technicians lack a full picture of the specific asset and of similar faults across the fleet, and repeat visits follow.
	Examples:	An AI assistant combines alarm sequences, operating data, maintenance history, as-maintained bills of materials, and documentation. When a fault occurs, it links it to similar cases across the fleet, suggests likely root causes and proven fixes, suggests interventions based on cost and performance risk, assigns work instructions, and lists the parts and tools to bring. It also turns maintenance logs into structured asset data.
	Impact:	Faster fault resolution, fewer repeat visits, and higher availability. Better asset data also lays the foundation for predictive maintenance and reliability analysis.
03. Real-time trading risk exposure and algo-trading	Why:	Trading risk management needs large teams and many models, and it is slow. Companies want to widen their trading window. They also want to reduce costs and lower the entry barriers to trading.
	Examples:	An AI-powered trading and risk platform continuously monitors market positions, weather forecasts, renewable generation, imbalance prices, and commodity markets to calculate risk exposure in real time. AI models identify trading opportunities and generate recommendations, while automated controls flag unusual market conditions.
	Impact:	Real-time risk flags and AI-supported trading make it possible for SMEs to trade energy and flexibility. Companies can also trade 24/7 across multiple commodities and markets.
04. Real-time customer segmentation and AI sales agent	Why:	Many retailers do not track or log customer types, so they do not know why customers buy from them. At the same time, AI agents may switch providers automatically for customers, which can drive a lot of switching. This is a risk to the retail model, because the model depends on aggregation (buy wholesale, sell retail) and on information advantage from price forecasting. AI can put both at risk.
	Examples:	An AI-powered sales agent continuously analyses customer behaviour, consumption patterns, product preferences, and market conditions to segment customers in real time. It proactively recommends relevant products (EV charging, solar subscriptions, flexibility services, or green electricity contracts), while adapting offers and communication to customers.
	Impact:	More relevant offers, a better customer experience, and more cross-selling opportunities.





USE CASES – Implement Consulting Group cases

Implement reference cases

These two cases illustrate how Implement Consulting Group has helped clients set the direction for AI and embed it into core business processes, delivering tangible business impact.

Scaling customer service with AI assistants

As its EV charging customer base grew, support enquiries were projected to double in 18 months. We built a 24/7 customer assistant to answer questions and route complex cases and sales leads to agents, plus a Microsoft Teams assistant that gives agents reference-backed answers from internal knowledge. The customer assistant connects to the existing contact centre, while the internal tool makes scattered knowledge available in agents' daily work. Both combine generative AI for natural dialogue with predictive AI for controlled answers. We also established an AI operating model and trained a team to own analytics and ongoing improvements.

Impact

- High AI resolution, with 3,300 customer chats and 2,700 agent queries solved end-to-end over 12 months
- Call-handling time fell by a third; new-agent ramp-up was halved
- Handled growing support demand with substantially fewer FTE without loss of quality

AI strategy for a sustainable fuel and CO₂ logistics company

A European logistics provider and first-mover in establishing value chains in CO₂ and sustainable fuels needed a clear direction for its AI rollout. The nature of the business sets strict requirements on how quickly it can turn new operational demands into working capability. We ran a six-week mobilisation phase to set the ambition and the organisation behind it. Through focused interviews and workshops, we defined the AI ambition and value focus, agreed the guiding principles, identified the capabilities and services to build or buy, and mapped the gaps in how AI is owned across IT and the business.

Impact

- Six-week mobilisation setting AI ambition, value focus, and guiding principles
- AI capabilities, services, and focus areas defined for a three-year roadmap
- AI ownership gaps mapped across seven operating model dimensions

Customer service

AI assistants

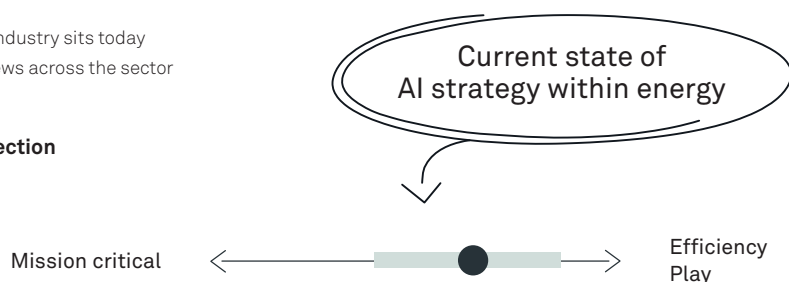
AI strategy

Energy transition

In our experience, energy companies must make explicit strategic choices to turn AI ambition into value

- Where the industry sits today
- Range of views across the sector

Strategic direction



Today, mostly an efficiency play. As AI-first companies emerge with low costs and on-par quality, it will challenge incumbents' fundamental business models in retail and wholesale, making it mission critical.

Scope and ambition¹



The divide is within the sector and organisational structure. Light AI-first entrants build in AI from the start. Established asset-heavy players move carefully and are now building plans to scale.

Value creation approach



Mostly bottom-up and productivity-driven. The pull now is for leadership to point AI at the business issues that matter most and drive the development.

Capability strategy



Leaning towards buy, as vendor and software-embedded AI mature. Build is where proprietary asset and market data will differentiate.

Operating model



Spread across functional silos today. Expect a move towards a central core that sets governance and shared foundations.

There are no universally right answers – but there is a cost to leaving choices about AI ownership, governance, leadership, and workforce capability implicit.

Note: 1) The wide spread in Scope and ambition reflects the diversity of approaches between new entrants and incumbents.



Future outlook

AI in energy is no longer a question of if or when. The direction is becoming clearer, even if the speed has yet to pick up. In the near term, AI will move from individual copilots to business-driven use in internal processes and customer service. Over time, we expect household AI agents, local flexibility markets where distribution system operators buy capacity from prosumers and electric vehicles, and AI-driven asset development. As this unfolds, two shifts will change where value is created and who captures it.

The first shift is from owning energy to orchestrating it. As the system becomes more variable and flexible assets multiply, value moves from selling volume to managing flexibility and timing. Retail shows it clearly. AI agents that compare and switch suppliers will erode margins that rest on customer inertia, while EVs, heat pumps, and batteries let retailers offer something new: managing the household's energy and sharing the flexibility revenue. Retailers that only sell kilowatt-hours will compete on price alone.

The second is from capital to delivery capacity. The build-out of grids and generation is constrained as much by engineering hours, procurement, and technicians as by funding. Companies that use AI to design, procure, build, and maintain more with the same people will deliver pipelines others cannot. This is why asset-heavy companies are well placed to benefit.

Capturing either shift depends less on the technology than on whether energy companies have the trusted data, leadership, and people readiness to use AI safely and at scale. Progress starts with pragmatic use cases that double as entry points for data foundations, cybersecurity by design, and compliance for AI-supported decisions. The harder work lies inside the organisation: structuring asset information, connecting functional silos, integrating AI with operational technology, deciding who owns AI, and bringing people along.

At Implement, we see early leaders investing in data foundations, governance built for critical infrastructure, vendor solutions where they fit, and, most importantly, organisational learning. Lasting impact will depend on the ability to move from pilots to operation, and to find a strong position in a changing value chain before AI-first business models reshape the market from the outside in.

We can support you throughout your AI journey – from strategy and operating model design to adoption and technical implementation

We believe in co-creation to deliver successful solutions, and we bring together a team of experts in machine learning, data engineering, security, and change management to help clients with:

Our offerings:

AI strategy

We help leadership teams decide where AI can create business value. We connect use-case discovery with practical roadmaps and operating model design. The goal is to strengthen competitiveness and identify new sources of growth.

- AI ambition and use-case prioritisation
- Feasibility assessment and roadmap development
- AI operating model and governance design
- Capability and organisational readiness assessment
- Platform and implementation partner selection

AI adoption

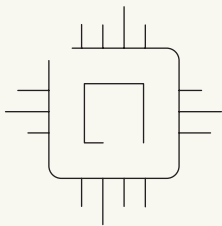
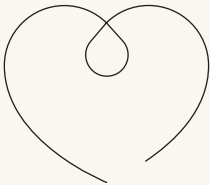
We help organisations use AI tools effectively in daily work. Our focus spans individual productivity, software development, and broader transformation. We also address legacy constraints so efficiency gains can support lasting operational improvement.

- AI training and productivity improvement
- Change management and leadership enablement
- Embedding AI in operating models and ways of working
- Workforce capability and talent development
- Value realisation and continuous improvement

AI technology

We build prototypes and AI products, then take the strongest solutions into production. Our specialists work alongside client teams on internal and customer-facing applications. This embedded approach develops the capabilities clients need to continue independently.

- Proof-of-concept and AI product development
- Deployment and scaling of AI solutions
- AI delivery model and integration with existing systems
- Tech stack, platform, and architecture selection
- Privacy, security, and regulatory compliance



About Implement

Local roots, global perspective.

Born in Denmark with offices in Copenhagen, Aarhus, Stockholm, Malmö, Gothenburg, Oslo, Zurich, Munich, Hamburg, Düsseldorf, and Raleigh, NC. With 2,000+ employees, multinational clients, and worldwide projects, we offer expertise with a global perspective.

We believe that great organisational impact leads to great impact for humanity. Implement was created to help turn true expertise into real change.

- Founded in 1996
- Employee-owned
- Average CAGR of 20%
- Working globally



Ready to unlock AI's potential?

Daring to dream. Ready to Implement.

AI holds immense potential, but realising it requires trusted information, capable people, and leaders who can turn insight into action.

We are at the early stage of innovation, much like when the lightbulb was first invented, with more breakthroughs yet to come. The challenge is to imagine what is possible and focus on achieving disruptive impact through concrete actions.

At Implement, we translate imagination into reality, collaborating to prototype and bring about change while addressing the natural concerns that come with new technologies. Join us in harnessing AI's transformative power to create tangible benefits.

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