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# How the Machine Economy is Transforming the Energy Sector

The New Data Management  
Approach for a World of Connected  
Machines and Smart Automation



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## A New Data Management Approach for a World of Connected Machines and Smart Automation

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*The energy sector is ripe for disruption and it's important to be aware of new technologies that could cause upheaval in the industry.*

Over the last decade, the energy sector underwent a great shift: **going digital**. Advancements in energy management software, energy optimization, energy forecasting and planning platforms, energy data analytics, and energy storage technologies brought new players into the market and created an entirely new energy landscape.

Those who succeeded were able to use these technologies to modernize their operations, improve customer experiences, and make themselves more efficient.

Now that these technologies are becoming increasingly affordable and mainstream, we're on the verge of the next great energy shift.



## The Machine Economy will rapidly transform the energy sector

Just as “going digital” was a game-changer in the last decade, the next great shift will be about “**getting smart**”.

To understand the enormity of this shift, here are 3 interesting statistics:

- ✓ AI, machine learning, and robotics will drive 70% of GDP growth over the next decade.
- ✓ By 2030, AI will contribute an estimated **\$15.7 trillion** to the global economy, more than the current output of China and India combined.
- ✓ **62% of leaders** are putting plans in place to succeed in a world filled with connected machines and smart automation – 16% are already investing and performing strongly.

It's now clear that decision-making AI and machines will be the primary driver of economic growth over the next decade in what's being referred to as the “**Machine Economy**”.

This is especially true in the energy sector, where machines and AI can help energy companies increase energy generation, improve energy efficiency, and reduce wastage. These changes will also create new business models with higher margins if energy companies get smart about the opportunities.

## There will be winners and losers as the energy industry transforms over time

The energy sector has been traditionally slow to adopt new technologies. Many energy companies are still relying on decades-old technologies.

However, the Machine Economy is bringing massive upheaval in the energy industry. Energy companies that are not making significant investments in these emerging technologies will quickly find themselves at a competitive disadvantage against those that do.

To remain competitive, energy companies need to start data-focused AI and machine learning initiatives immediately. The good news is that the energy sector is in an especially good position to take advantage of these next-generation technologies.



## The 4 primary technology trends that are transforming the energy sector in the Machine Economy

The energy market, with its aging energy infrastructure, is an ideal candidate for the Machine Economy to help modernize systems, reduce wastage, and optimize performance.

This transformation will be made possible by these 4 primary technological trends:



### 1. AI & Machine Learning

With all the new energy sources, energy trading, IoT devices, and energy management systems that are currently in place, energy companies have an unprecedented amount of energy data at their disposal.

AI and machine learning are serving as the brains that can constantly analyze all this data and help energy companies make more informed decisions about how they operate energy networks, design energy systems, and maintain day-to-day energy use.

### 2. Robotics

Robots are being used in energy installations and maintenance, and for monitoring energy generation and energy consumption. Robots can be used for tasks such as repairing pipelines, wind turbines, and other energy infrastructure.

By automating these tasks, energy companies can further improve efficiency and reduce costs.

### 3. The Internet of Things (IoT)

In the energy industry, energy management platforms have been used for years to create energy efficiency and alleviate energy waste. These programs are now being augmented with machine learning to further increase energy conservation efforts as well as to predict energy use.

Utilities need data from distributed energy sources and IoT devices to make this happen. These devices provide real-time energy use data that is fed back into the energy management platform to adjust energy usage patterns.

### 4. Blockchain

The energy sector is one of the most obvious markets for blockchain technology because it involves many different parties that use energy, trade energy, and maintain records about energy.

Blockchain technology can be used to manage energy transactions and energy trading between energy producers and energy consumers, while ensuring security and transparency.

*Energy companies need to adapt quickly in order to remain competitive in the Machine Economy.*





# Top 10 applications of AI, machine learning, and robotics in the energy sector

The combination of these new technologies is creating massive, new opportunities for energy companies to improve efficiency, optimize performance, drive innovation, and accelerate growth.

However, rather than trying to simply mimic solutions developed in other industries, it will be important for energy companies to focus on energy-specific solutions, such as:

## 1. Smart Grids

Grids can now be integrated with sensors, data analytics tools, energy storage systems, energy management platforms, and other types of energy technology to become “smart”.

By using smart grids, energy companies can collect energy usage data from every single device on the grid, and then use this information to develop energy efficiency projects for their customers. It also allows energy companies to monitor energy flow and energy use in near real-time.

Energy companies can then reduce energy consumption through automated demand response systems which can turn off energy during peak hours, resulting in energy savings for homeowners as well as energy companies.

## 2. Grid Security

The energy grid is a complex system that is vulnerable to cyberattacks. AI and machine learning can be used to improve the security of energy grids by preventing cyberattacks before they happen.

This involves using data analytics to identify patterns in energy data that may be indicative of a cyberattack. Once a cyberattack has been identified, AI and machine learning can be used to respond to the attack.



### 3. Grid Management & Efficiency

AI is used to optimize energy grids by managing energy flows between homes, businesses, storage batteries, renewable energy sources, microgrids, and the power grid itself. This reduces energy waste while increasing consumer engagement with energy consumption.

Renewable energy sources like wind and solar are becoming more popular, but they are intermittent energy sources. This means that energy from these sources is not always available when it is needed. This presents a problem for the energy grid because the energy has to be managed in real-time as it is being generated. AI and machine learning can help energy companies to predict when renewable energy will be available and manage energy grids accordingly.

### 4. Increased Production

AI and machine learning are also being used to improve production in the energy sector.

For example, oil and gas companies are using machine learning algorithms to improve well placement and increase production. By analyzing data collected from seismic surveys and other sources, these companies can make better decisions about where to drill for oil and gas. This will increase energy efficiency and create a simpler, more efficient energy grid that is easier to maintain by energy companies.

### 5. Predictive Analytics

Predictive analytics can be used to predict how energy demand will change. This information can then be used to plan for the future and build the necessary infrastructure to meet future energy needs.

By using predictive analytics, energy companies can also predict when a machine or piece of equipment is likely to fail. This not only helps to prevent unexpected outages, but it also saves money by allowing companies to plan for the replacement of critical and expensive energy assets and avoid unplanned maintenance work.





## 6. Energy Storage

The global energy storage market is set to grow 20 times by 2030. Smart energy storage systems are energy storage technologies that can be integrated into the energy grid to make energy management more efficient.

Energy storage is also being used to create virtual power plants, which allow energy companies to deliver energy when it is needed even if their current energy supply isn't enough. This helps to reduce the need for energy companies to build new power plants.

## 7. Energy Trading

Trading energy is different from trading other commodities because energy has to be delivered immediately. This presents a challenge for energy traders, but it is also an opportunity because energy markets are becoming more liquid.

AI and machine learning can be used to make energy trading more efficient by predicting energy demand and providing traders with real-time information about energy prices. With this information, energy traders can then make more informed decisions about when to buy and sell.

Blockchain technology has been used to create power purchase agreements (PPAs), a type of financial contract between energy buyers and energy sellers. Blockchain technology makes these contracts more efficient because it reduces transaction time, costs less to use than traditional PPA platforms, and is built on a highly secure platform.

## 8. Power Theft & Energy Fraud Detection

Theft and fraud of electricity costs the energy and utilities industry as much as \$96 billion every year globally, with as much as \$6 billion every year in the United States alone.

Power theft is the illegal tapping of energy from the grid. Energy fraud is the intentional misrepresentation of energy data or energy usage. AI and machine learning can automatically detect these anomalies and flag them for energy companies to resolve. This allows energy companies to protect their assets, reduce energy waste, and save money.



## 9. Microgrids

A microgrid is a small energy grid that can operate independently of the traditional energy grid. Microgrid control systems use AI and machine learning to manage energy flow and optimize energy usage.

Microgrids are becoming popular because they can provide energy security during emergencies and can integrate renewables into the energy grid more easily than traditional energy grids.

## 10. Customer Engagement

The energy sector is also starting to use AI and machine learning for customer engagement. By using AI and machine learning energy companies can provide customers with information that is specific to their needs.

This involves using data analytics to understand customer energy usage and then providing customers with information about how they can reduce their energy consumption by changing their usage habits.





## Data is a key driver of energy sector growth in the Machine Economy

Digital-first energy and utilities companies won in the last decade because they had fast access to reliable data. Now, these companies have a head start, as data is the key to unlocking the power of AI and ML. The more data you have, the smarter your systems will be.

These technologies rely on large volumes of data in order to be effective. Energy companies that can gather and process data quickly will be able to take advantage of these technologies and improve their competitiveness.

## Data teams face daunting challenges in the Machine Economy

Data volumes are exploding, but expectations for how fast data should be curated, prepared, and delivered for analysis and AI/machine learning haven't changed. Today, both humans and machines need fast access to reliable data in order to make informed decisions.

The first step in the process of delivering reliable data is to extract it from a wide variety of sources (databases, CRM and ERP software, social media platforms, APIs, IoT devices, etc.).

Once these data silos have been broken down, all that data must be consolidated into a central location, cleaned up, and prepared for analysis and AI/machine learning.

This process of data consolidation, cleansing, transformation, and rationalization is typically accomplished using 3 primary components:

- ✓ Data Lake: Where you ingest and store all your raw data. The data lake can be used by Data Scientists for advanced analytics purposes using AI and machine learning.
- ✓ Data Warehouse: Used to store curated, cleansed, and transformed data for business analysis and intelligence purposes.
- ✓ Data Marts/Products: Provides business experts with a subset of data based on their specific domain or use case (customer analysis, sales analysis, finance, etc.), without overwhelming them with a huge data warehouse that contains all reportable data.

We refer to this infrastructure as the “data estate”.



## Obstacles to building a modern data estate

Unfortunately, there are significant obstacles that can grind the process of building a modern data estate to a halt:

- ✓ **Exploding data volumes:** As we've already seen, organizations are experiencing an explosion in both the amount and the types of data that need to be collected, stored, and processed from a growing number of sources.
- ✓ **A backlog of requests:** Line of business teams outnumber data teams, which leads to a never-ending backlog of analytics requests. A quarter of business experts admit they have given up on getting an answer they needed because the data preparation and analysis took too long.
- ✓ **Talent shortages:** This assumes you already have a large data team of highly-specialized professionals who can do all this work. Demand for data and analytics skills is outstripping supply, leaving many companies struggling to find enough talent.
- ✓ **Data quality, security, and compliance:** 95% of data professionals report fears or concerns around controlling access to sensitive data, accidental data deletion, errors when analyzing data that lead to poor decision-making, security breaches, and regulatory compliance issues.
- ✓ **Communication barriers:** Even with a strong data team in place, communication barriers between business experts and the data team often create additional bottlenecks and slowdowns. 34% of business experts admit they are not confident in their ability to articulate their data questions or needs to the data team.
- ✓ **Constant re-skilling:** Data and analytics professionals are under constant pressure to spend what little time they have on learning the latest technologies, tools, and methodologies so they can preserve their market value.
- ✓ **Burnout:** The data team is often forced to spend significant amounts of time on tedious, repetitive data preparation tasks, which can lead to burnout and high turnover. 79% of data professionals have considered leaving the industry entirely.

These issues can cause bottlenecks and frustration, inhibit growth, and do considerable damage to your entire organization.





## Your options: create a fragile stack or lock yourself into a platform

To overcome these challenges, data teams in the energy sector typically take one of these two approaches to building their data infrastructure:

### Approach #1: The Stack

The process of ingesting, preparing, and delivering data for analysis has traditionally relied on a highly-complex stack of tools, a growing list of data sources and systems, and months spent hand-coding each piece together to form data “pipelines”.

There are several problems with this approach:

- ✓ **Never-ending pipeline creation:** New pipelines must be manually built for each data source, data store, and use case (analytics reports, for example) in the organization, which often results in the creation of a massive network of fragile pipelines. Most data professionals report that they spend up to 50% of their time solely on these types of tedious, repetitive tasks.
- ✓ **Stacks on stacks of tools:** To make things even more complicated, there is often a separate stack of tools for managing each stage of the pipeline, which multiplies the number of tools in use and creates additional silos of knowledge and specialization.
- ✓ **Vulnerable infrastructure:** Building and maintaining these complex data infrastructures and pipelines is not only costly and time-consuming, it also introduces ongoing security vulnerabilities and governance issues, and makes it extremely difficult to adopt new technologies in the future.
- ✓ **Fragile pipelines:** Even worse, these data pipelines are hard to build, but very easy to break. More complexity means a higher chance that unexpected bugs and errors will disrupt processes, corrupt data, and fracture the entire pipeline.
- ✓ **Manual documentation and debugging:** Each time an error occurs, data engineers must take the time to go through the data lineage and track down the error. This is nearly impossible if the meta-data documentation is incomplete or missing (which it often is).

### No wonder 85% of these projects fail.

We know how slow, painful, and expensive this approach is from years of first-hand experience as IT consultants. We struggled through all these same issues when helping our clients build their data infrastructures.



## Approach #2: The Platform

The data management market is now full of “platforms” that promise to reduce complexity by combining all your data storage, ingestion, preparation, and analysis tools into a single, unified, end-to-end solution. While this might sound ideal, these claims start to fall apart upon closer inspection:

- ✓ **Stacks in disguise:** Most “platforms” are actually just a stack of separate tools for building and managing each component of the data estate that have been bundled together for one price.
- ✓ **Stitched together like Frankenstein’s monster:** Yes, all the tools are sold by the same vendor, but they’re often collected through acquisitions, and it ends up just being a big, ugly mess of incompatible code that has been haphazardly stitched together into a “platform”.
- ✓ **Low-code\*:** Many of these platforms brag about being “low-code”, but when you dig into the details, there’s usually only 1 or 2 features that actually have this capability.
- ✓ **Welcome to data management prison:** Worst of all, you end up being locked into a proprietary ecosystem that won’t allow you to truly own, store, or control your own data. All tools and processes are pre-defined by the platform developer, and then hidden in a “black box” that you can’t access or modify. Many of these platforms even force you to migrate all your data to the cloud, and do not offer support for on-premises or hybrid approaches.
- ✓ **Trying to escape might cost you everything:** Not only do these platforms significantly limit your data management options, if you decide to migrate to a different data platform later, you must rebuild nearly everything from the ground up.

These solutions are not truly “platforms”, and they don’t really “unify” anything. They’re just stacks with better branding and a lot more restrictions.

In their efforts to convince customers that restrictions and lock-in are actually good things, the marketing teams for these companies have come up with all kinds of fancy-sounding names, such as:

- ✓ Pervasive Data Intelligence
- ✓ Adaptive Information Platform
- ✓ Analytic Process Automation

Whenever you hear terms like these (yes, these are 100% real), just know this is a sure sign that you are about to be locked into a propriety solution that will be impossible to get out of without severe consequences for your processes, your systems, and your entire team.



## The End of Data Management

We don't believe you should be forced to spend months hand-coding fragile pipelines between each component of your data estate using a complex stack of tools.

Nor do we believe in poorly-integrated "platforms" that impose strict controls and lock you into a proprietary ecosystem.

It's clear that these old approaches to data management simply cannot meet the needs of the modern energy sector. The rapid pace of the Machine Economy does not allow for the bottlenecks, slowdowns, and limitations these approaches bring.

***"The entire status quo of the "data management" industry is archaic, burdensome, and oppressive, and we believe it should be abolished."***

Data teams in the energy sector are in desperate need of a faster, smarter, and more flexible way to build and manage their data estates.

## A new approach for winning in the Machine Economy

Once we realized that these old approaches were woefully inadequate in the age of AI, machines, and exploding data volumes, we started asking ourselves: *What would a new approach for winning in the Machine Economy look like for data professionals in the energy sector?*

If we were able to find a winning approach:

- ✓ Data Teams could be free from tedious, repetitive tasks, and have time to focus on more fulfilling, high-impact analytics projects.
- ✓ Data Professionals could base their market value on their ability to drive strategic business outcomes, instead of merely on fulfilling a backlog of requests and learning the latest technology.
- ✓ Data Consultants could have the freedom to price their services based on how much value they deliver to their clients using smart, automated solutions, even if it takes them less time to do so.

Because a winning approach didn't exist yet in our industry, we had to look for winners in the broader IT industry to see what we could learn from them.



## The Machine Economy will be constructed by smart, low-code “builders”

What we learned is that 75% of all applications globally will be built using **low-code development tools** by 2024, according to Gartner. In fact, 41% of employees outside of IT are already developing their own data and technology solutions using these smart, low-code “builders”.

Shopify, Salesforce App Builder, and Microsoft Power Apps are some of the most well-known examples of these tools. The best ones feature:

- ✓ A simple, drag-and-drop user interface for quickly building technology solutions
- ✓ Automatic generation of most – if not all – of the underlying code
- ✓ Fast, seamless integration with your existing IT infrastructure

### Data Empowerment is low-code, agile, and unlocked

It quickly became clear to us that what data professionals in the energy sector need is a low-code “builder” solution of their own.

However, to meet the challenges of the Machine Economy, data professionals need a solution that goes beyond just being low-code.

It must meet all 3 of these criteria:

- ✓ **Low-Code:** It must be smart enough to build your entire data estate for you by automatically generating all the underlying code and documentation, from end to end.
- ✓ **Agile:** It must provide both highly-technical and less-technical users with a simple, drag-and-drop user interface for quickly ingesting, preparing, and delivering corporate data for analysis and AI/machine learning.
- ✓ **Unlocked:** It must overlay your data infrastructure, with no solution lock-in, while integrating all the data ingestion, preparation, quality, security, and governance capabilities you need into a single, unified, metadata-based solution.

Rather than waiting around for somebody else to create a solution that can meet all these criteria, we decided to just do it ourselves.





## Goodbye, data management. Hello, data empowerment.

Data teams at top-performing organizations such as Pandora, Komatsu, Colliers, the Puerto Rican Government, and the City of Lansing Michigan are already taking this new approach by using TimeXtender, the low-code data estate builder. [\(See all our Customer Cases\)](#)

How TimeXtender empowers everyone on your team:

- ✓ Business leaders can get fast access to reliable data, while reducing build costs by 70%, and maintenance costs by 80%.
- ✓ Data professionals can be free from tedious, repetitive tasks, and have time to focus on more fulfilling, high-impact analytics projects.
- ✓ Business users can start creating their own data products – no more bottlenecks.

With this new approach the energy sector becomes more

- ✓ **intelligent**, as AI and machine learning are used to improve energy management.
- ✓ **connected**, as the use of IoT devices increases.
- ✓ **productive**, as more companies adopt automated energy production and management technologies.
- ✓ **efficient**, as energy production and energy trading become more automated.
- ✓ **profitable**, as energy companies realize the benefits of technology adoption.
- ✓ **secure**, as microgrids grow in popularity and machine learning is used to detect energy anomalies.
- ✓ **democratic**, as energy trading platforms built on blockchain technology support energy projects in developing nations.
- ✓ **sustainable**, as machine learning is used to optimize renewable energy production.





## How TimeXtender Accelerates Your Journey to Data Empowerment

**Low-Code Simplicity:** TimeXtender empowers you to build a modern data estate 10x faster by providing a simple, drag-and-drop user interface for ingesting, preparing, and delivering data for analysis and AI/machine learning. The underlying code is generated automatically, which reduces build and maintenance costs by 70%-80%, frees data engineers from tedious, repetitive tasks, and provides less-technical business users with a code-free experience for creating their own data products.

Don't worry! Powerful developer tools, SQL scripting, and custom coding capabilities are still available, if needed.

**Seamless Integration:** TimeXtender seamlessly overlays your data infrastructure, connects to 250+ data sources, and integrates all the data preparation capabilities you need into a single, unified solution. This eliminates the need for complex stacks of tools, lengthy implementations, and costly disruptions, while still giving you complete control over how your data is stored and deployed.

**Future-Proof Scalability:** Because TimeXtender is independent from data sources, storage services, and visualization tools, you can eliminate solution lock-in, and ensure your data infrastructure is agile and highly-scalable to meet future analytics demands. With TimeXtender, you can quickly adopt new technologies and deployment models, prep data for AI and machine learning, and migrate to cloud platforms with one click.

**Smarter Pipelines:** When unexpected changes occur, fragile pipelines can easily break and must be manually debugged. With our metadata-based approach, whenever a change in your data sources or systems is made, you can instantly propagate those changes across the entire pipeline with just a few clicks. In addition, TimeXtender provides built-in data quality rules, alerts, and impact analysis, while leveraging machine learning to power our Intelligent Execution Engine and Performance Recommendations.

**Self-Service Analytics:** Our low-code technology, drag-and-drop interface, and Semantic Layer allow for fast creation and modification of data products, without requiring extensive data engineering knowledge. They can be created by business users once, and then be deployed to multiple visualization tools (such as Power BI, Qlik, or Tableau) to quickly generate graphs, dashboards, and reports.





## How TimeXtender Accelerates Your Journey to Data Empowerment

**Holistic Governance:** Our metadata-based approach allows us to neatly organize your data projects, while providing end-to-end documentation, data lineage visualization, and version control across multiple environments. By using metadata to drive the model and deploy the code, TimeXtender never requires any access or control over your actual data, eliminating security vulnerabilities and compliance issues.

**Enterprise-Grade Security:** TimeXtender's security features allow you to provide users with access to sensitive data, while maintaining data security and quality. You can easily create database roles, and then restrict access to specific views, schemas, tables, and columns (object-level permissions), or specific data in a table (data-level permissions).

**Trust and Support:** As a Microsoft Gold-Certified Partner, we have 15+ years of experience building modern data estates for over 3,300 organizations with an unprecedented 97% retention rate. When you choose TimeXtender, one of our hand-selected partners will get you set up quickly and help you develop a data strategy that maximizes results, with ongoing support from our Customer Success and Solution Specialist Teams. We also provide an online academy, comprehensive certifications, and weekly blog articles to help your whole team stay ahead of the curve as you grow.

### Learn How to Become Data Empowered with TimeXtender

[Book a demo](#) to learn how we can help you build a modern data estate 10x faster, become data empowered, and win in the Machine Economy.

### About TimeXtender

TimeXtender is an automated, low-code, drag-and-drop Data Estate Builder that empowers you to build a Modern Data Estate up to 10x faster than standard methods, prepare data for analysis, and make quality business decisions with data, mind, and heart. We do this for one simple reason: because time matters.

As a Microsoft Gold Certified Partner, we serve our 3,300+ customers, from mid-sized companies to Fortune 500, through our global network of partners. Visit the TimeXtender customer page to learn how we are helping clients build reliable data estates 10x faster than standard methods.

