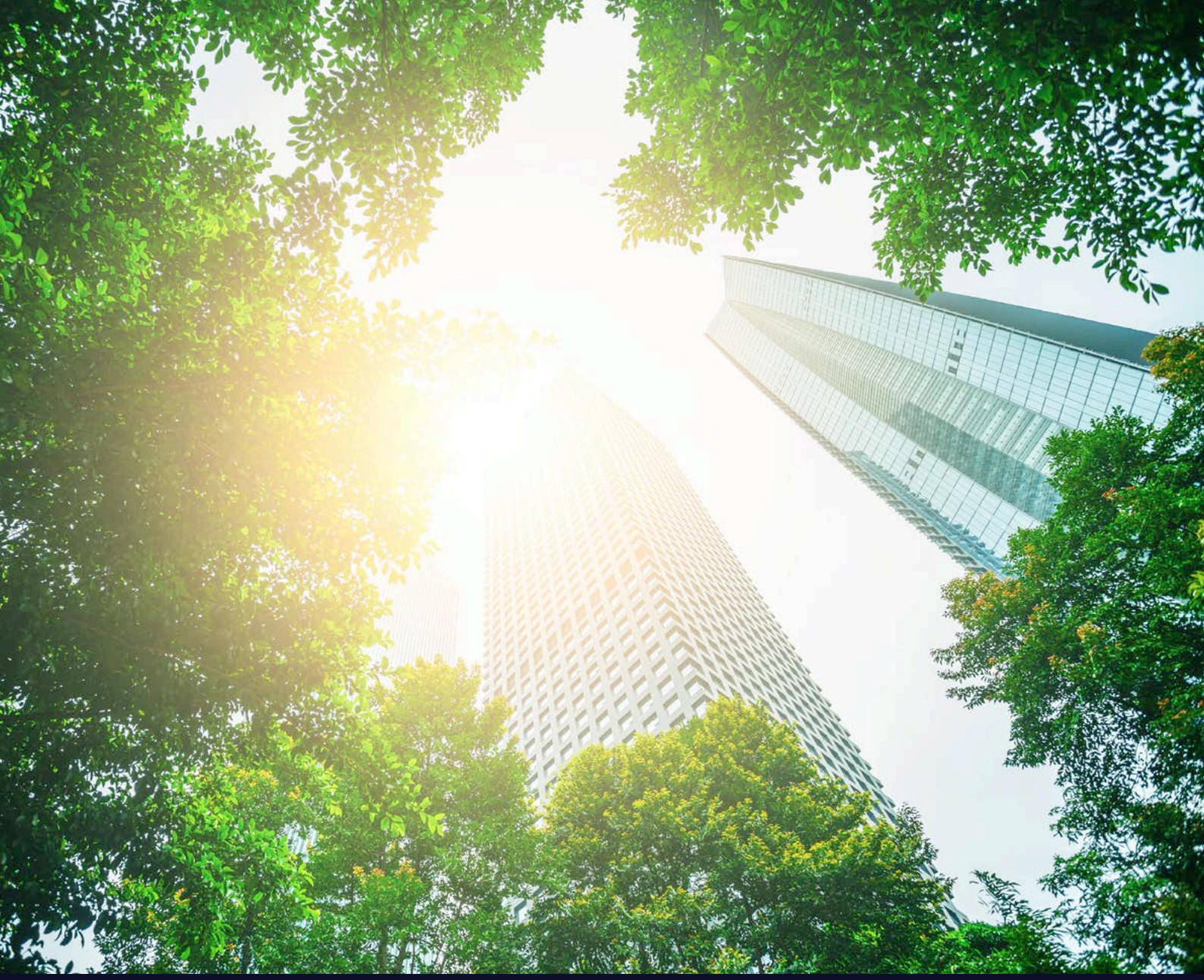
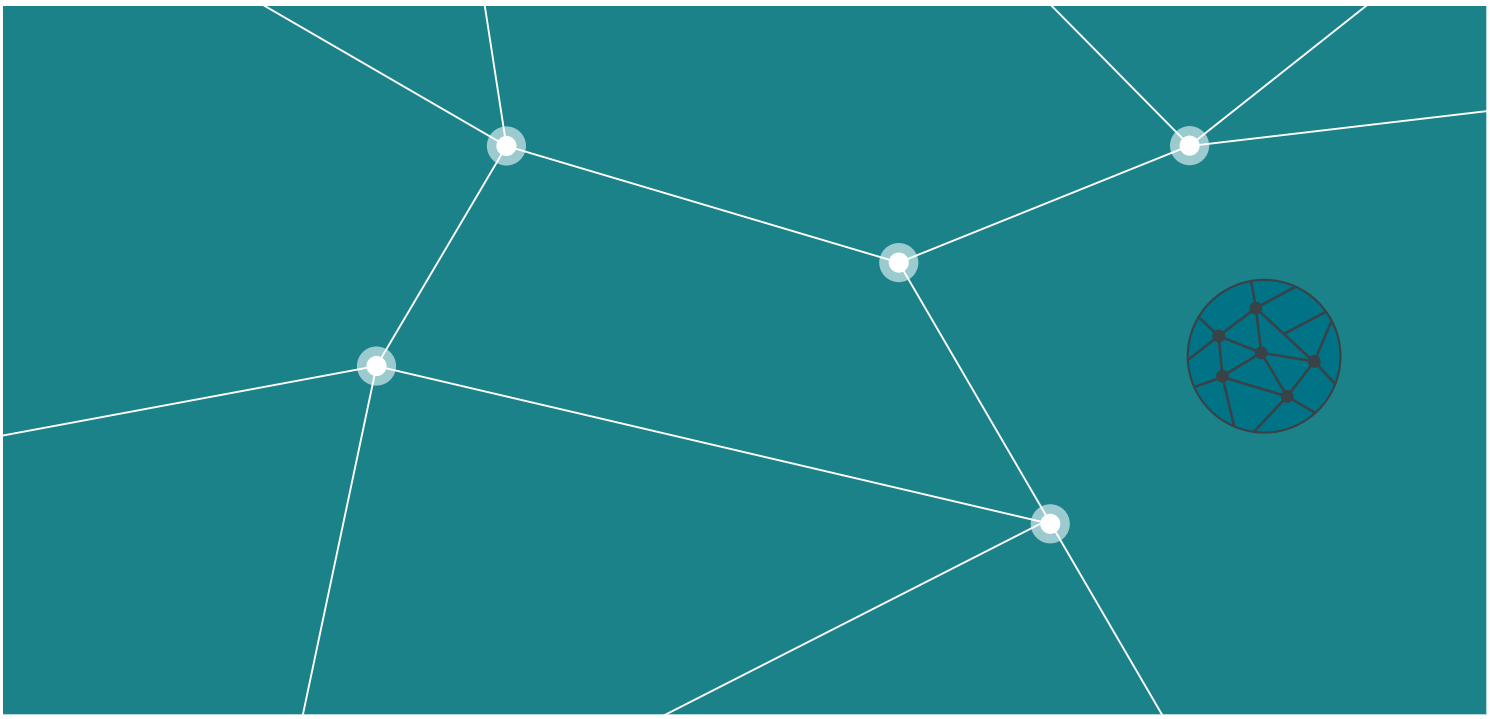


WHITEPAPER

Optimizing energy and operational costs **with analytics and AI**

Increasing profitability by saving energy

SIEMENS



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Monitor. Analyze. Optimize. Introducing Siemens EEA

Discover opportunities to optimize your energy use through Siemens' Energy Efficiency Analytics (EEA) cloud-based software-as-a-service product for big data collection, processing, and analytics. Reduce CO2 emissions, boost operations, and strategically approach complex tariffs – regardless of industry. Increase energy efficiency with cutting-edge technology, but without internal IT investment.
The Siemens' cloud advantage means real time data to help you better understand your consumption behaviors, while leveraging opportunities to increase energy efficiency.

Look at siemens.com/eea

Benefits at a glance

Generate additional savings

Save up to 25% of energy consumption caused by energy-intensive equipment.

By the way:
The savings generated by EEA are contantly over-achieving the expectations of our clients!

Try it: Risk-free

We offer flexible business models with outcome-based options, so you get your return on invest as quickly as possible. Moreover, EEA does not require your impact business processes nor a production stop. And of course, it holds up to the Siemens standards in data privacy and security.

Easy and quick implementation

You can apply Siemens' EEA indipendently from your equipment's manufacturer. Our equipment-agnostic software delivers actionable saving recommendations right from the beginning. The SaaS-business model allows you to continuously achieve additional savings over time.

AI and power domain expertise combined

Apply state of the art AI technology from a software that is shaped by the energy domain know-how of our Siemens experts.
Unlimited real-time and high freuquency measurements delivers the data upon which your recommen-dations for actions are built.

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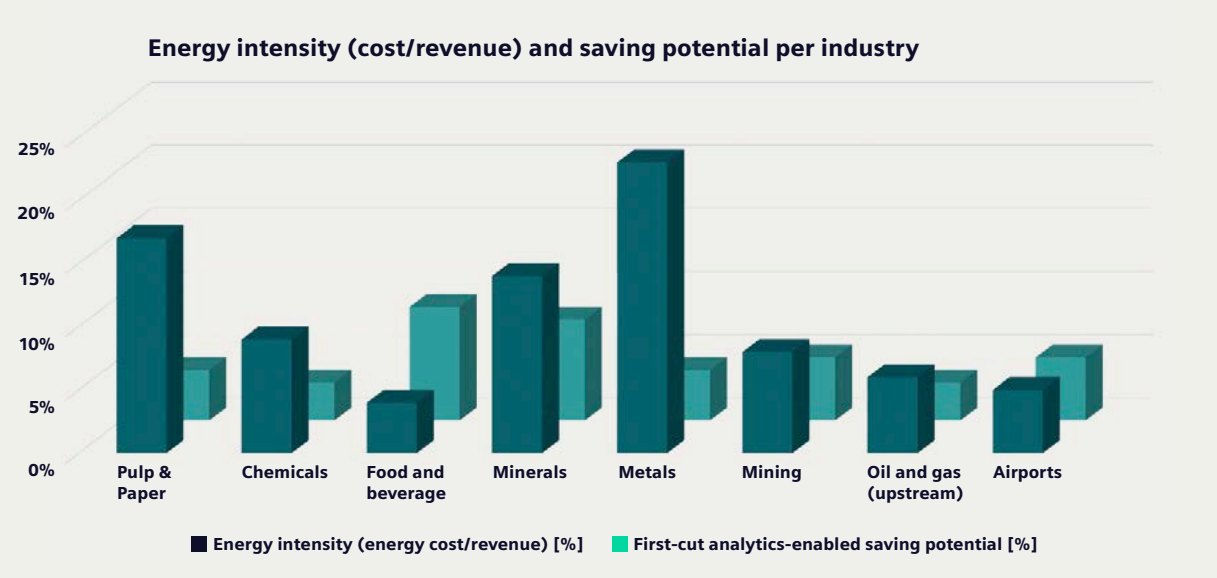
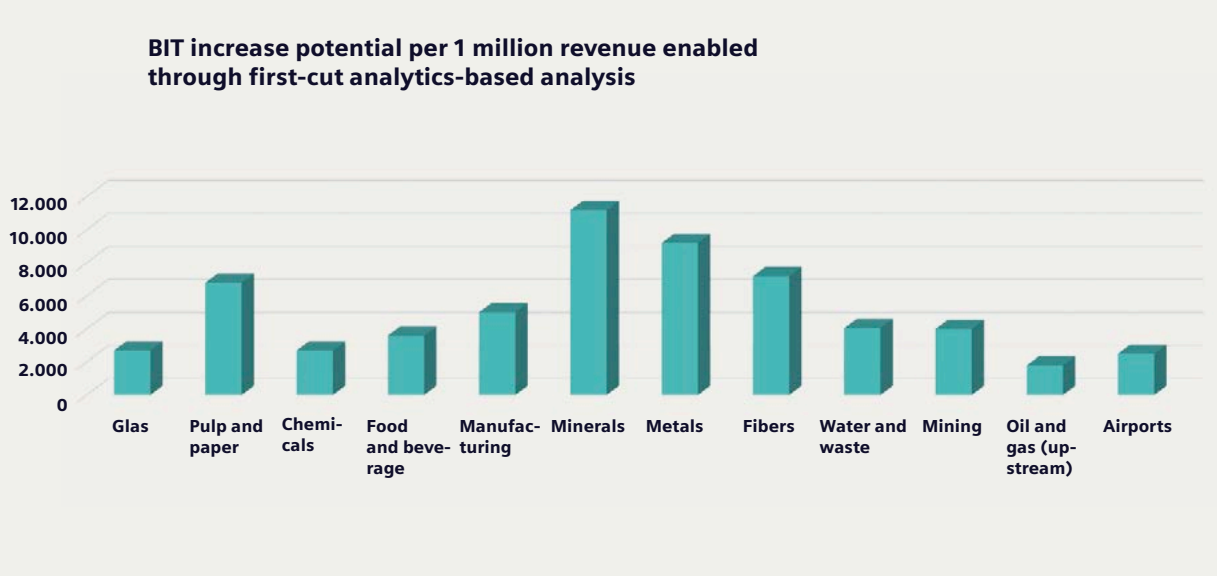
Become part of a global cross-industry community of analytic optimizers

There is saving potential in every industry.
By realizing this potential with EEA, you can easily increase your EBIT.





Where EEA identifies **the additional chunk of savings**

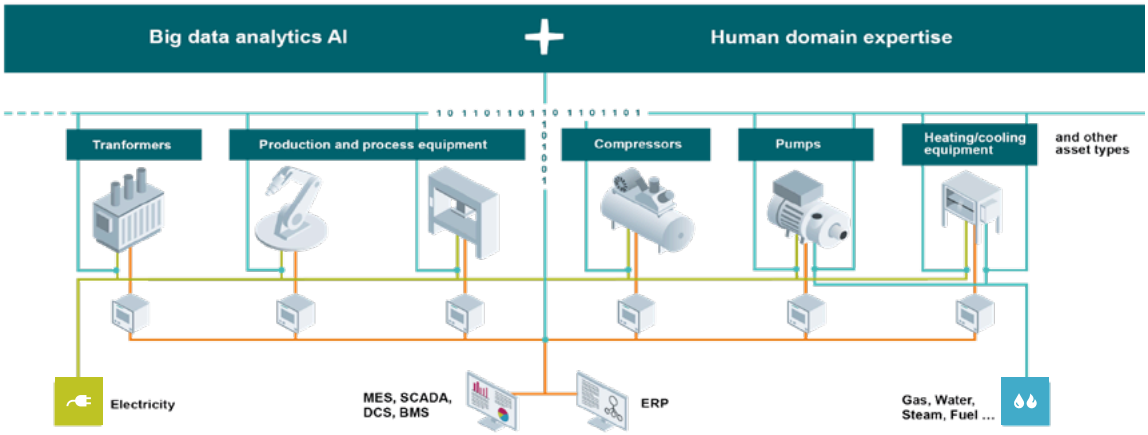
1. Transformers:
EEA Transformer Optimization aims to help our customers discover opportunities to optimize the usage of their transformers, reduce reactive power, screen power quality and develop transformer sizing and switch-over measures, using big data collection, data processing, and analytics. This service can be executed with historical or real time data from the transformers. The customer receives a report and access to a web interface.

2. Production and process equipment:
EEA analyzes energy consumption with process data to gain an even better understanding on the behavior of the equipment. Starting from this baselining, EEA computes measures to improve asset performance, performs benchmarking based on millions of datapoints, and predicts asset behavior from an energetic point of view. Any optimization measure is quantified as to payback and impact.

3. Compressors:
EEA Compressor Optimization uses advanced analytics and AI to optimize the efficiency of compressor systems, thereby enabling savings without impacting the gas flows required by the underlying processes. Use our vendor agnostic approach only based on operational data to find your individual optimal control settings and overall compressor system setup and save up to 17% in cost.

4. Pumps:
EEA Pump Optimization makes the most of unsupervised learning, segmentation and dynamic time wrapping in order to find consumption states and give recommendations on which operating states are most optimal for your energy bill while maintaining required throughputs to the process. As all EEA modules, EEA Pump Optimization is purely based on operational data and identifies those optimization measures with best payback.

5. Heating and cooling equipment:
This analysis uses outlier detection, peak detection and time series modelling in order to find unnecessary temperature and energy peaks in heating consumption over time. Our big data analyses are able to model the thermal inertia of the systems so we can propose new settings that will result in a lower consumption while maintaining temperature levels as they.



Energy Efficiency Analytics: **The Gestamp success story**

Learn how Gestamp decreased CO2 emissions by 15%

Siemens' cloud-based, energy-efficiency application offers a unique value proposition: Collecting big data-/software-as-a-service product in real time, to help your company better understand its energy use. Learn how Gestamp Automoción SL uses big data to streamline operations and conserve on energy.

The company:
Represented in 20 countries, Spanish automotive supplier Gestamp Automoción SL is a world leader in designing, developing, and manufacturing metallic assemblies and components for main automobile manufacturers. Worldwide, the industry leader operates more than 100 factories (delete brackets), 12 R&D centers, and 34,000 employees.

The challenge:
Gestamp's energy efficiency index was steadily increasing. At the same time, electricity prices at factory locations were on the rise. Gestamp was looking for cost- and time-savings to efficiently allocate resources. So in 2014, Gestamp reached out to Siemens looking for a solution that would help indentify potential savings.

The solution:
Siemens' Energy Efficiency Analytics (EEA) monitors real-time energy consumption using Gestamp's own big data. Defining behavioral patterns in equipment helps Gestamp better gauge how to improve energy consumption and cut costs. Implemented in currently implemented in 18 factories around the world across Spain, Germany, the UK, France, and Poland, Gestamp uses data from EEA to make investment and operational decisions.

The result:
With Siemens EEA, Gestamp reduced its CO2 emissions by 15 percent. Already a success in almost 20 factories across the globe, Gestamp plans to bring EEA to the rest of their facilities around the globe.

By the numbers

Since implementing Siemens EEA, Gestamp discovered several ways to optimize

8M€
saving in electricity bills per year

18
factories online in various continents with more being added

>100
optimization measures implemented every year

Two years
(or less) payback time on average

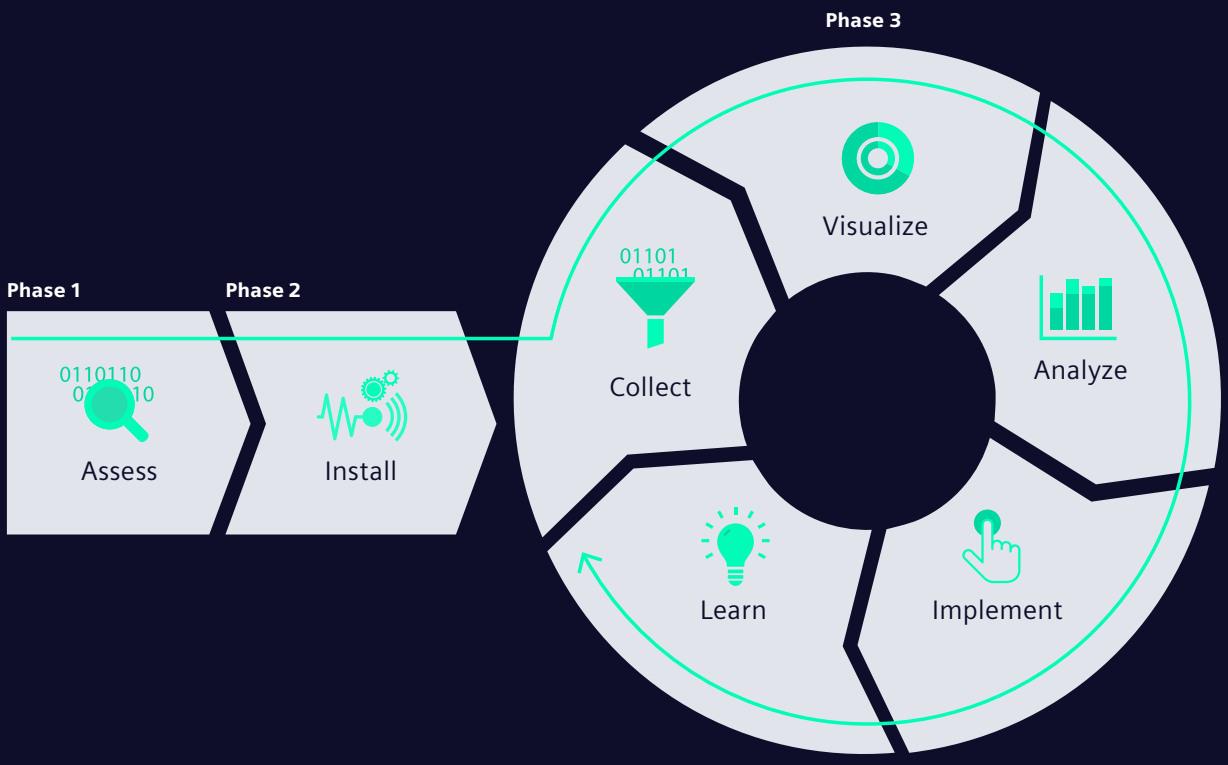
15%
average energy reduction

"No licenses, no software, no CAPEX, no extra people in my factory, just a web address and a password to show how we perform.

René González
Manufacturing Director, Gestamp

Implementation: **Phases 1-3**

Siemens understands that each industry, each company, faces their own challenges. That's why the very first implementation phase incorporates an individual assessment of the customer's facility or facilities.
The outcome of this initial assessment? A distinct and individualized metering concept along with a potential-savings forecast.



Why is energy productivity important?

- Increases efficiency within your processes and at your facilities.
- Allows you to participate in the market and use more complex tariffs to your advantage.
- Relieves pressure to reduce CO2 emissions.
- Increases margins in competitive markets.

Phase 1:
Assessment

To begin, we evaluate your current situation – taking your industry and your company's unique needs into consideration. After developing an individualized metering concept, we forecast your potential savings. How? Through collaboration. Siemens' experts will come together with your experts to evaluate existing SCADA systems, determine hardware needs, and connect your existing data to the cloud.
No CAPEX: Financial options are available through Siemens Financial Services.

Phase 2:
Installation

We'll install the hardware – meters, sensors, and communication devices – near monitored equipment or integrate into existing panels.
Than, our experts will commission the system and validate the data upload to the cloud.
Communication follows secure protocols and, where possible, uses a separate network within facilities to ensure appropriate segregation.

Phase 3:
Analyze. Learn. Repeat.

Analysis begins with our experts or your own energy consultants. Your data is accessed through a secure web portal. So, you can make energy decisions based on data. Learn where you can save, reallocate resources, and more. Discover new saving opportunities as more data is collected and analyzed. Continue to benchmark against your other facilities and between your vendors to see where you can improve and where you're "getting it right". In a nutshell, make your business leaner, stronger, and more profitable.

Use cases:
Let your data do the work for you

See how your big data can work for you

Energy consumption is the key to savings and increased efficiency. Once you realize how much energy you consume and how it's used, you can find ways to optimize. Our modular and cost-effective cloud-based software enables you to capture big data for monitoring and analysis. Making it easier for you to recognize energy-use patterns and discover new behavior patterns.

Increase sampling, increase transparency

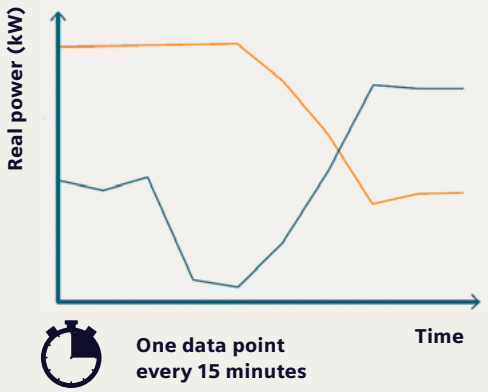
Resolution matters. Consumption patterns offer a wealth of information about your machine's performance and the accuracy of its settings. When you couple resolution and transparency with frequent samples, your visibility is increased. This is critical to ensure smooth operations that can be translated into fewer failures and a longer life.

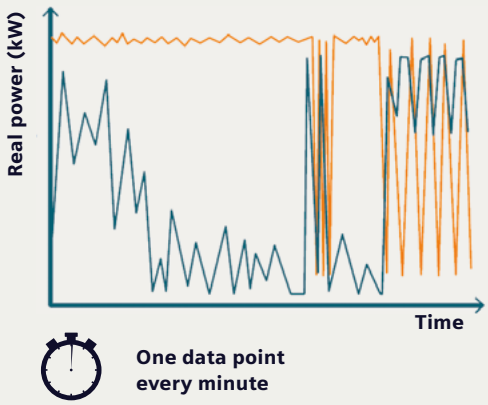
In focus:
Misbehavior of an air compressor set

These graphs show the importance of high frequency sampling by illustrating the misbehavior of an air compressor set.
With the traditional monitoring of 15-minute frequency sampling, it is impossible to appreciate the real behavior of your assets.
With high frequency sampling of one data point per minute, you gain a better understanding of your energy consumption.
In this situation, two compressors are in oscillating mode, which translates into higher energy consumption and multiple starts/stops per minute.

Result:

Detection of misbehaviors and increased visibility



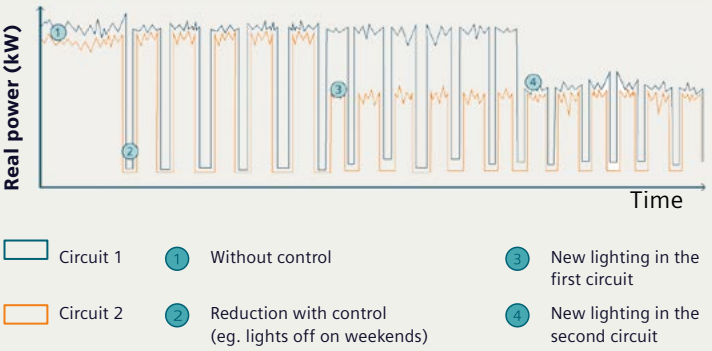


Know where to invest

Immediately see the outcome of your investments. For example, two lighting circuits before and after fixture replacement and implementation of an advanced control system via EEA. After realizing the cost-savings and improved light quality through this simple measure, the customer did the same for the rest of its plant.

Result:

Up to 60% savings and higher light quality



Circuit 1
Circuit 2
1 Without control
2 Reduction with control (eg. lights off on weekends)
3 New lighting in the first circuit
4 New lighting in the second circuit

Negotiate better contracts

Be informed before selecting your type of energy tariff or negotiating power-consumption contracts. Choose your level of contracted power based on your actual needs. Optimize your energy contracts to save (potentially) thousands of euros on monthly bills – without effort.

Result:

Savings of more than 20k€ per year in penalties

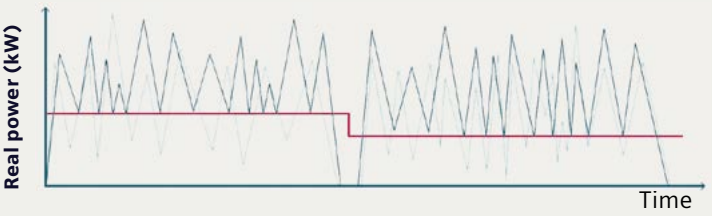
Contracted power profile before analysis
Optimized contract

Make cost-effective decisions

The cloud advantage means being able to benchmark your facilities worldwide and compare vendors – easily and efficiently. Your equipments' energy consumption behaviors factor into the selection process of vendors for new projects. Gain the needed transparency to plan for new investments and make cost-effective choices. This graph illustrates how high frequency sampling allows you to visualize stand-by versus energy consumption within short operation cycles.

Result:

40% decrease in energy consumption due to high-resolution data



Energy consumption (blue press)
Energy consumption (green press)
Stand-by consumption
1 Adjustments by vendor

The right stuff: **Technology matters**

Behind every great application is even better technology

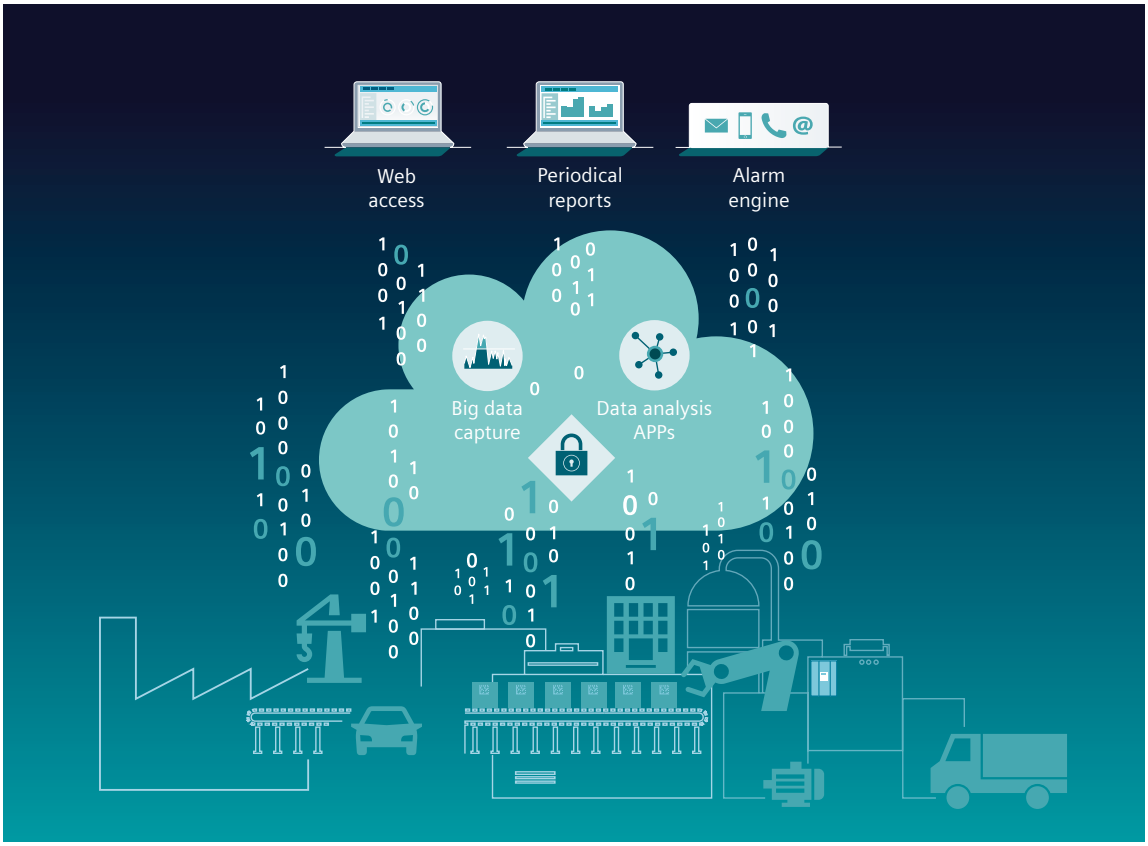
A high-tech, energy-efficiency application that grows with you and your needs, EEA is developed from state-of-the-art technologies that allow for scalability as requirements grow. The cloud behind the application captures large amounts of data with an adequate system to store, manipulate, retrieve, and analyze. At the core of our solution is data sampling, connectivity, cloud software, databases, computation, and the artificial intelligence software used for our application's advanced features.

Metering and connectivity – on site

Collecting data is the beginning of the process. Siemens offers a large range of sensors and meters able to provide the transparency needed to track energy use and quality. If you already have hardware in place, we can integrate your existing system into our software. Once your hardware needs are met, we ensure that the data is securely transfered to EEA.

The cloud software: Openstack

EEA runs on a private cloud that utilizes Openstack, a cloud-operating system that controls large pools of computing, storing, and networking resources through a data center. The system is deployed from two data centers, from two different locations. Each center has redundant servers, so each data point is stored in four different servers to ensure the security and availability of data.



The tech behind the technology

Apache Cassandra:
The choice when you have a high volume of writes. Big data and requests to write on the database are always successful.

Apache Spark:
Optimized for speed and reliability, this technology allows you to make a query of more than one billion data points and receive an answer in around one second. Apache Spark offers a great level of transparency for your data analysis.

H2O:
Integrated into EEA, this is the software for big data analysis and artificial intelligence modelling. H2O applies machine learning and predictive analytics to solve today's most challenging business problems.

Cybersecurity is key

Your secrets are important to us, too. Siemens' tried-and-true cybersecurity measures ensure your data's integrity and safety. We have built in strong measures at every front and within every process, including:

- Your facilities:
  firewalls, TLS-secured and end-to-end encrypted and certified data transfer
- Cloud platform:
  encrypted data, certificate-protected and role-based access, and more
- Web access:
  role-based access, digital certificate authentication, and more

Competitive advantage: **Your bottom line**

Make investment decisions based on data

Finding the right technology, opting for a customizable solution that will address your challenges, as well as financial resources, are all top of mind when choosing an energy-savings solution. Keeping your business nimble means staying ahead of the market in every area, including energy optimization.

High frequency sampling is the key to revealing energy consumption and asset behavior. Along with the need for scalability of data storing and analytics. You need a system that grows with you. As your volume of data increases with new assets and facilities connected, your system must ensure speed in retrieval and analysis. Keeping cybersecurity at the forefront to ensure the safety of your data.

Analytics built for your needs, not your neighbors, is paramount. We realize that each and every customer and industry is different and therefore requires a different set of analytics. Customized analytics allow you to tap into big opportunities for optimization – some obvious, some more elusive. Monitor, analyze, and optimize your business with Siemens EEA.

Four ways to save

1. **Big data and the cloud:**
   Gain insights into your energy consumption. Benchmark vendors against each other and compare facilities.
2. **Flexible financing:**
   Take advantage of Siemens Financial Services to avoid CAPEX.
3. **Customized application:**
   Scale and adapt your energy-savings application to your requirements. Receive an individualized metering concept along with a potential-savings forecast based on your business.
4. **Managed service:**
   Decide whether you want to use your own resources or use our experts for service delivery. The choice is yours.

Monitor, analyze, and optimize your business with **Siemens Energy Efficiency Analytics (EEA)**.

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