Energy meets Intelligence.
The Smart Grid – Constant Energy in a World of Constant Change.

Answers for infrastructure and cities.
Constant Change …

Much of the world’s existing energy infrastructure was built in the era of black-and-white TV, isolated markets, and low cost, centralized power plants. There were fewer consumers with fewer devices, smaller cities and smaller economies, less distribution and less variety in production — it was, as they say, a more simple time.

Since these “good old days” a constant and reliable energy supply has been central to the growth of industries, vital to economic stability and crucial to social well-being. This hasn’t changed, but as the complexity of our world continues to increase, our energy system must adapt to contend with these new and dynamic challenges. In a word, our energy infrastructure needs to be “smarter”.

Siemens proudly invites you to experience the state of the art in energy systems.

... means a Constant Challenge

As energy consumption and generation increase world-wide, the percentage of electricity in the energy mix is automatically growing. The percentage of renewable energies is also increasing. The fluctuating and widely distributed output of these renewable sources adds complexity to the already pressured grids.

Changing infed patterns, aging infrastructure, non-technical losses, and capacity problems pose a challenge we have no choice but to face. The questions of capacity and controlling, of distribution and decentralization, of integration, storage and high-end IT are ones we will have to find answers for.

The matter is complex – cooperation and custom solutions are in demand. Intelligence in information and communication will be central to the future of energy.

How can the energy industry provide a reliable, sustainable, and affordable supply of constant energy in a world of constant change? How can existing energy grids be modernized and combined with new approaches? This is the challenge of our times.

A thriving and ever-changing world poses great challenges to all of us in the energy industry. Smart energy grids are an essential part of the answer.
The bigger the change, the bigger the challenge

To stay successful, the energy industry will have to adapt and transform its aging business models and technologies, and develop new ways of thinking. Here are some of the greatest challenges the energy industry is facing.

Renewable & Distributed Generation
The integration of renewable and distributed generation and traction power networks within existing networks causes particular problems in the control of power flow, power quality and protection.

Limited Generation & Grid Capacity
The increase in outlay means an increase in potential dangers. Brownouts and blackouts affect the general economy, banking, communications, traffic and security.

Aging & Weak Infrastructure
Much of today’s energy infrastructure is more than 60 years old, posing a potential threat to security of supply. Fundamental modernization is necessary.

Cost & Emissions of Energy Supply
As both prices and emissions have a growing financial impact, efficiency in both generation and distribution is the key to a strong return on investment.

Revenue Losses, Non-Technical Losses
A significant volume of electricity is lost through technical inefficiencies or theft, posing real and sometimes existential threats to businesses and whole economies.

The trickier the problem, the smarter the solution

In an ever more decentralized and diversified energy system, there are no easy answers. Smart Grid partners need a modular set of flexible solutions and a great deal of experience to guarantee constant energy. Here are some Smart Grid solutions.

Balance of Generation & Demand
An optimized balance of generation and demand (e.g. demand response, microgrids, virtual power plants) helps reduce the overall consumption of electricity by directly regulating devices or influencing consumer behavior by offering special tariffs. As a consequence, the need for costly peaker plants is also reduced. Decentralized, interconnected generators allow for more control and precise planning of supply. Smart information technologies and the smart use of economic mechanisms lower operating costs, ensure reliability and help establish predictability.

Load Management & Peak Avoidance
Specialized load control and load management applications shave or shift peaks to ensure maximum grid stability – even at times of peak demand. Shedding loads through legacy systems, calculating baselines and automating customer billing and settlement are absolutely necessary for the system to run effectively.

Automatic Outage Prevention & Restoration
Smart Grids allow real-time monitoring and self-assessment in combination with automated interfaces. Protective relays, fuses and sensor systems automatically anticipate overloads and disconnect components before damage can occur. Components are restored, safety and supply is improved.

Efficient Generation, Transmission, Distribution & Consumption
Removing inefficiencies through advanced automation, sensing and measurement, and improved interfaces from the point of energy generation onwards. Energy storage systems and demand-side management improve the overall system efficiency at the point of consumption. Synergies are significantly increased, costs substantially cut – advanced grid technology equals a price advantage.

Full Transparency on Distribution Level & Automated Loss Prevention
Substation condition monitoring and automated interfaces provide utilities with a real-time status overview of their distribution grids and automatically anticipate disturbances in a self-healing manner. This increases overall network efficiency and saves on operational costs.
Constant Energy:

Siemens Smart Grid provides a complete end-to-end spectrum of technologies, products, services and solutions, designed for all partners in the energy industry. Siemens works closely with energy producers, grid operators, industrial companies, multi-utilities, cities and rail operators to help them meet the challenges of the new era.

Siemens Smart Grid incorporates the industry’s most innovative IT solutions to optimize information and communication. The more intelligent these systems are, the more useful and valuable the information generated from field data becomes. Incorporating digital sensing and automated analytics across the entire energy system will revolutionize the industry.

Siemens Smart Grid transforms cities into prosumers and private households into energy dealers in a new, bidirectional energy system — moving towards a more efficient, reliable, resilient and responsive grid. Rail operators become energy suppliers as excess (brake) energy is fed back into the grid. The megacities of the future bear a huge potential to become efficiency leaders in generating and storing electricity.

Siemens Smart Grid enables a paradigm shift away from a centralized, reactive and producer-controlled network. The future of efficient power generation and delivery will come from decentralized, interactive and demand-controlled systems. Fundamental modernization of current installations is necessary to master growing demands and to operate safely in the increasingly complex environment of the future.

Siemens brings knowledge to power
Global Changes – Specific Requirements

Affordability, efficiency, reliability and climate protection – the basic system requirements are the same all over the world. However, power producers, grid operators, industrial companies, retailers, and sometimes even the consumers actually pay for the electricity they consume.

Transmission Applications
Transmission grids are the backbone of any modern energy infrastructure. A high degree of automation, optimal maintenance and avoidance of outages can largely ensure a functioning transmission infrastructure. Help minimize maintenance and avoid outages helps reduce overall operating costs.

Industrial & Utility Grid Applications
When a power blackout paralyzed a steel worker’s melting furnace, the damage can quickly impact the whole enterprise. Intelligent control and automation technology ensures that emergency generators start working, guarantees critical facilities remain operative and helps achieve independence.

Distribution Applications
Today’s distribution networks are not designed to handle growing power requirements in the increasing proportion of strongly fluctuating power generated from renewable resources. Intelligent hardware and software solutions help reestablish the balance of supply and demand as we create new business models for small facilities. But modernization alone will not suffice – new and smarter distribution grids will have to be installed.

Microgrid
Microgrids are a variant of miniature smart grids. They can be used as demand-driven power generation. Storage and consumption. They enable profitable, secure and cost-efficient operation of remote grids with a high share of fluctuating renewable generation. Microgrids are central to synchronizing supply and demand, processing collected data into useful information and thus allowing microgrid operators to make sound business decisions.

Smart Metering
Smart meters are able to measure, control and load shedding. With these devices, Siemens has the highest installed rate worldwide compared to competitors.

Operational IT
The Operational IT level consists of intelligent platforms for grid control and grid applications. By playing a key role in the management, control and regulation of the entire grid and the power flow within, these systems ensure the economic and secure operation of grids with notably lower emission rates, and are key for the sustainable integration of intermittent, renewable energy sources.

End-to-End Intelligence

The Siemens Smart Grid Suite
End-to-End Intelligence

The Siemens Smart Grid Suite is designed to provide the energy industry’s users and stakeholders with a complete roadmap to a smart grid. It covers all aspects of the energy industry – from supply through grid automation and transmission to system optimization and management of all voltage-level networks. The Siemens Smart Grid Suite provides energy utility Enterprise IT solutions for efficient data management and demand, processing collected data into useful information and thus allowing smart grid operators to make sound business decisions.

Siemens is the only company able to provide a real end-to-end portfolio for all stakeholders of the energy industry – from power producers and grid operators to consumers.

Field Equipment
Field Equipment is a range of technologies to monitor and assess the current status of the network and to communicate this information to the next higher level of a smart grid. Digital Line Carrier Systems and Wireless Communication Technologies help utilities and infrastructure operators start working, guarantees critical facilities remain operative and helps achieve independence.

Communication
Communication is key. All components of a smart grid are interconnected in a super-ordinate communication layer. Siemens can directly connect grids from generation units through to consumption points. The backbone communication technologies, power line carrier systems and wireless solutions of this layer support standard communication protocols.

Grid-specific Enterprise IT
Siemens provides power utility Enterprise IT alone or as part of a partner ecosystem. Already built on an unrivaled domain know-how and tailored to the individual needs of each customer, these solutions include business analytics and IT integration tools – software, services, analyzation and processes – to determine the amount of data to help utilities and infrastructure operators make sound business decisions.

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There is nothing permanent except change.

Heraclitus

From Buzzword to Business:

For utilities, industries, and rail operators:
Imagine a sharp climb in the cost of delivery infrastructure and the generation of operating energy. What if regulators demand market liberalization and an increased share of renewables? And consider that consumers are calling for more transparency and control of energy prices. Suddenly, utilities, industries and rail operators are under intense pressure to maintain profitable operations.

Siemens Smart Grid technologies help industrial partners transform from pure commodity to added-value service providers, positioning themselves as modern suppliers in the ever-changing world of energy services.

Constant Energy – Constant Success

For the economy:
So, there’s a small disturbance, a minor variance in the electricity supply and what happens? Huge costs are incurred. Can you take it? Or will you pass those costs on to your customers? You don’t have much choice but to increase your prices, but in doing so, you automatically make your products and services less attractive.

Today’s digital economy requires a higher level of power quality than ever before. In order to provide the reliability business demands, a state-of-the-art electricity infrastructure is necessary.

Siemens Smart Grid technologies provide an environment that is attractive to new investment and new jobs, fosters production and growth, and is ultimately central to our economic well-being.

For society:
How do we move forward? Nuclear power is phasing out and fossil resources are diminishing. The universal expectations of the energy system are enormous and complex, amounting to nothing less than absolute stability and flexibility of supply while creating minimal environmental impact.

Siemens Smart Grid technologies help society maintain stability and security of energy supply while stabilizing the overall costs of energy generation and delivery, establishing transparency and meaningful dialog.
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