



Leveraging the Industrial Internet of Things to  
Automate Demand Response Participation

# Defining the Industrial Internet of Things

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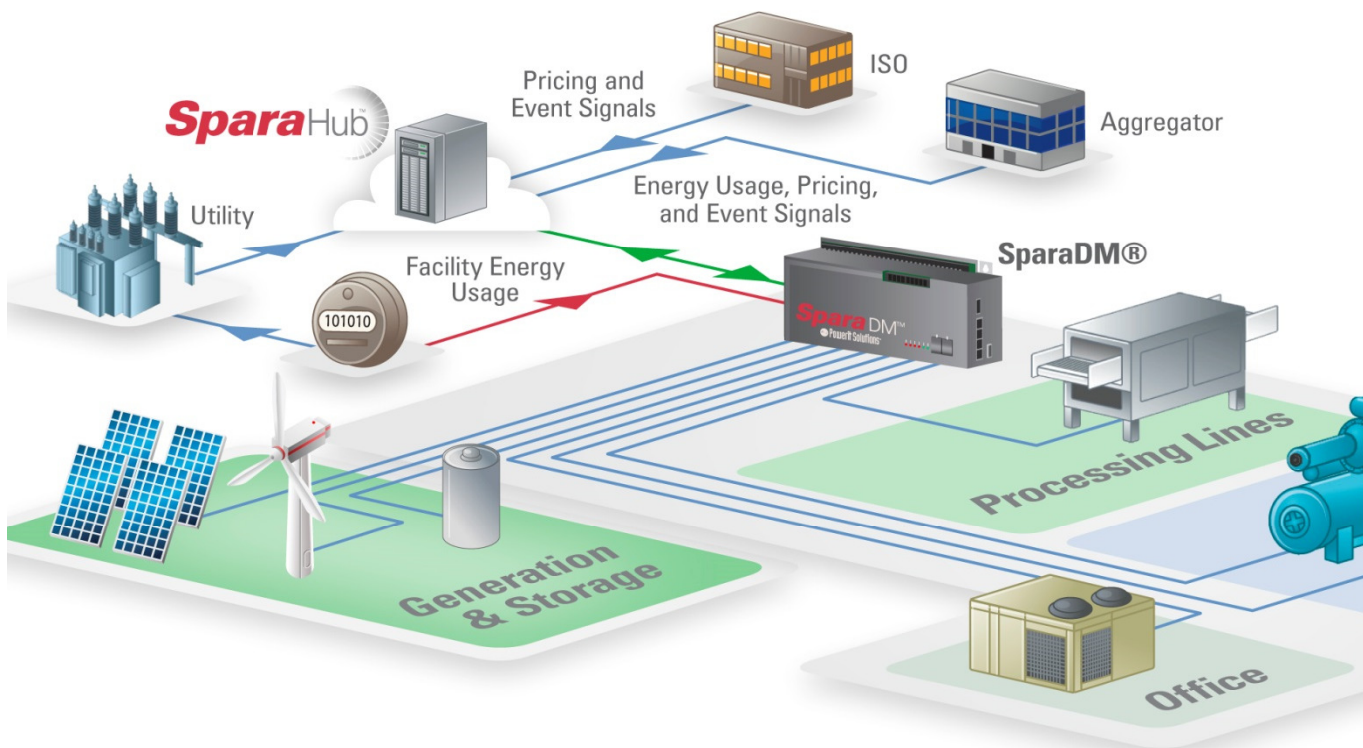
- The **Internet of Things (IoT)** is the interconnection of uniquely identifiable embedded computing devices within the existing **Internet** infrastructure - Wikipedia
- The **Industrial Internet of Things** is a network of physical objects, systems platforms and applications that contain embedded technology to communicate and share intelligence with each other, the external environment and with people - Accenture

# The Challenge and Opportunity

To take full advantage of the Smart Grid, we have to drive intelligence into the production and consumption of energy at the factory level

This means:

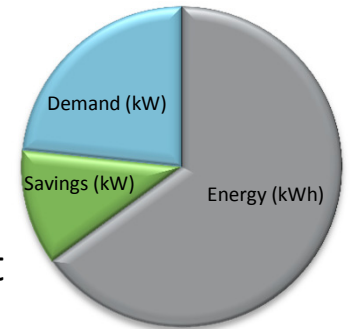
- Developing smarter equipment
- Developing smarter plants
- Developing smarter manufacturing lines with cloud-based technologies
- Connecting plants with Smart Grid pricing and signaling
- Building the industrial Internet of Things (IIoT)



# Five Steps

- 1** **Install demand management software in factories** to slow the growth of peak energy demand and take advantage of demand-side flexibility to reduce the need for new supply

Peak-demand charges often represent up to 30 percent of an energy-intensive's industrial facility's energy bill, and **automated demand management can reduce these charges by up to 30 percent** without compromising product quality or output



- 2** **Take a continuous flow of data from our smart plants, smart equipment and smart assembly lines and turn it into information for decision makers at energy-intensive companies**, so they can make informed and real-time financial decisions about energy use for their businesses
- 3** **Develop an energy-pricing stream for industrial companies that will allow plants and facilities to reliably plan their usage in advance, based on accurate and predictive cost modeling**

# Five Steps

## 4 Develop applications that help factories integrate storage and other sources of energy – such as solar and wind – into the data management mix

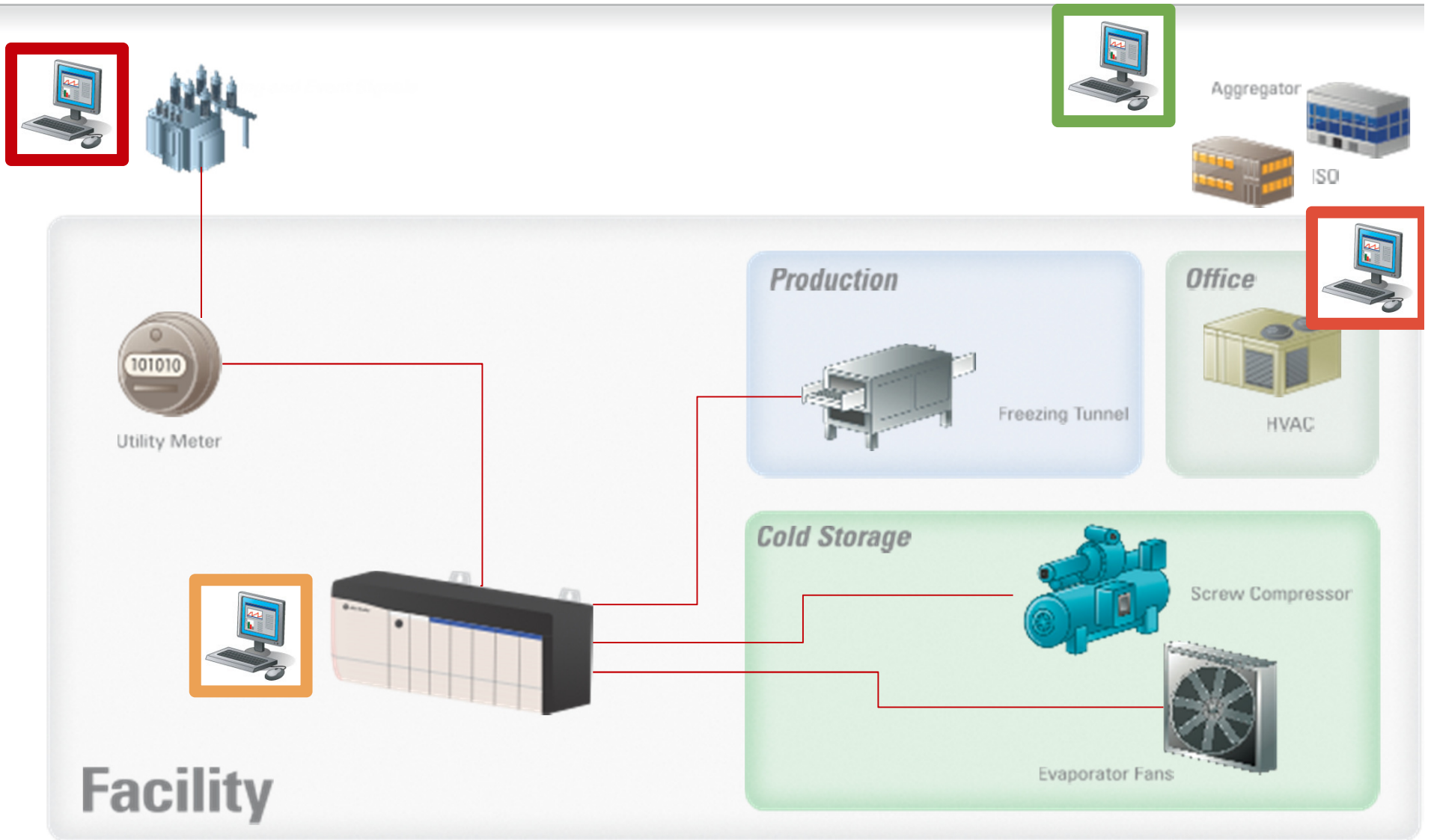
Right now, it's all about electricity consumption. We must broaden our horizons to reflect changing 21st century energy portfolios .



## 5 Develop applications and platforms that integrate all of a facility's operations with energy data. This enables plant managers to better understand and assess the total cost of production, as well as operator and equipment efficiency and practices.



# The Real Problem



The diagram illustrates a smart grid system for a facility. The system components and their connections are as follows:

- Utility Meter:** A circular meter with the number 101010, connected to the SpiraDM Power Switcher.
- SpiraDM Power Switcher:** A central device that receives data from the Utility Meter and the ControlLogix PLC. It is connected to the PowerMonitor, the PowerFlex Drive, and the HVAC unit.
- ControlLogix PLC:** A rack-mounted PLC that receives data from the SpiraDM and the PowerFlex Drive. It is connected to the SpiraDM and the PowerFlex Drive.
- PowerMonitor:** A device that monitors power usage and is connected to the SpiraDM and the Freezing Tunnel.
- Freezing Tunnel:** A large industrial machine connected to the PowerMonitor.
- HVAC:** A heating, ventilation, and air conditioning unit connected to the SpiraDM.
- PowerFlex Drive:** A drive unit connected to the ControlLogix PLC and the Screw Compressor.
- Screw Compressor:** A large industrial machine connected to the PowerFlex Drive and the Evaporator Fans.
- Evaporator Fans:** A large industrial fan connected to the Screw Compressor.
- Server:** A rack-mounted server that receives data from the SpiraDM and the PowerMonitor. It is connected to the SpiraDM, the PowerMonitor, and the Aggregator.
- Aggregator:** A device that receives data from the server and is connected to the ISO.
- ISO:** An Independent System Operator, represented by a building icon.
- Computer:** A desktop computer connected to the server.

The diagram shows the flow of data and power between these components, with red lines indicating data flow and blue lines indicating power flow.

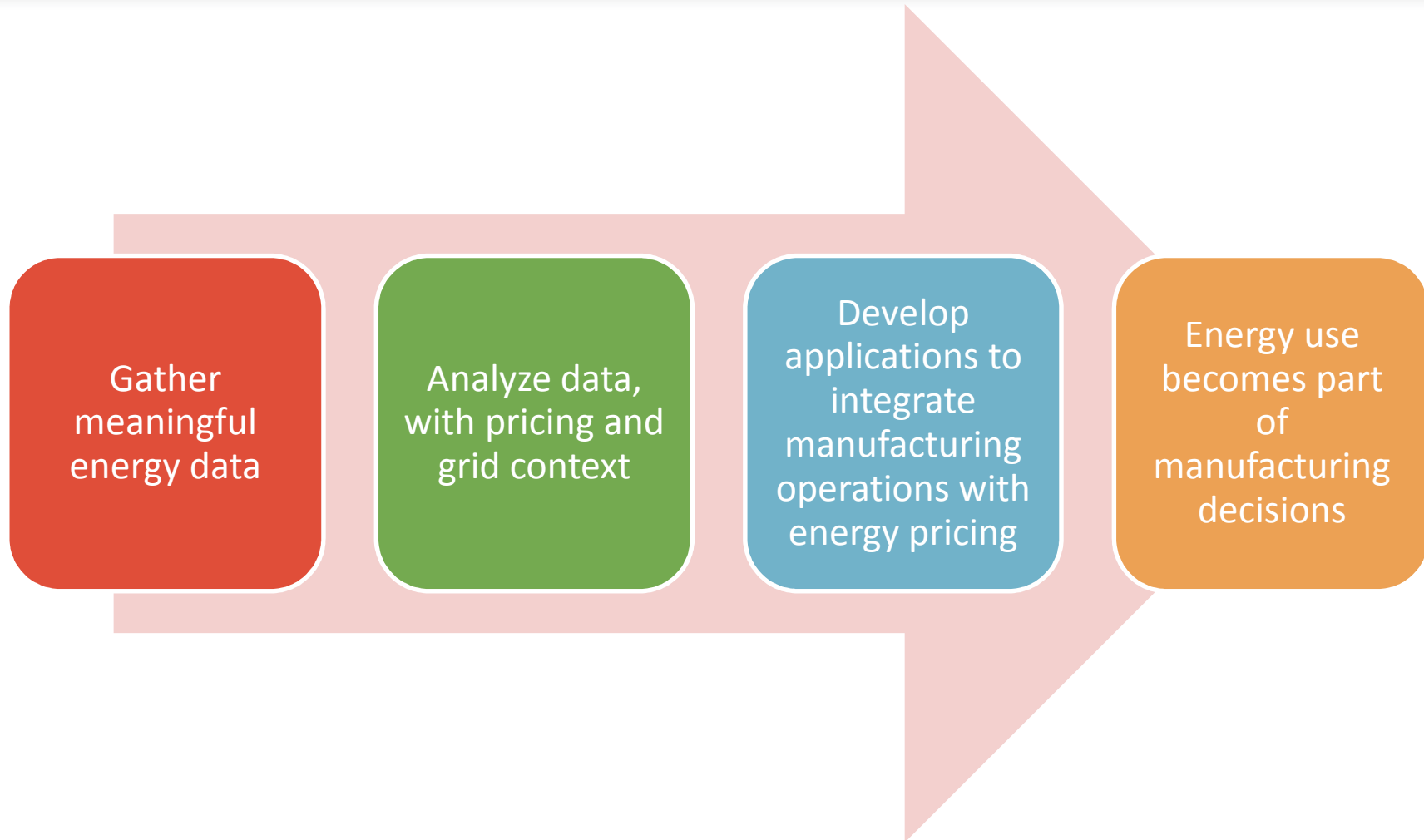
# Four Key Questions

**Manufacturers need to take the energy data that's at their disposal and ask themselves four key questions:**

- 1** What are my KPIs, and are they the right ones?
- 2** What's a good energy consumption baseline for my company – and for my specific industry?
- 3** What's driving my energy costs?
- 4** When it comes to energy usage, what can I control, and what can't I control?

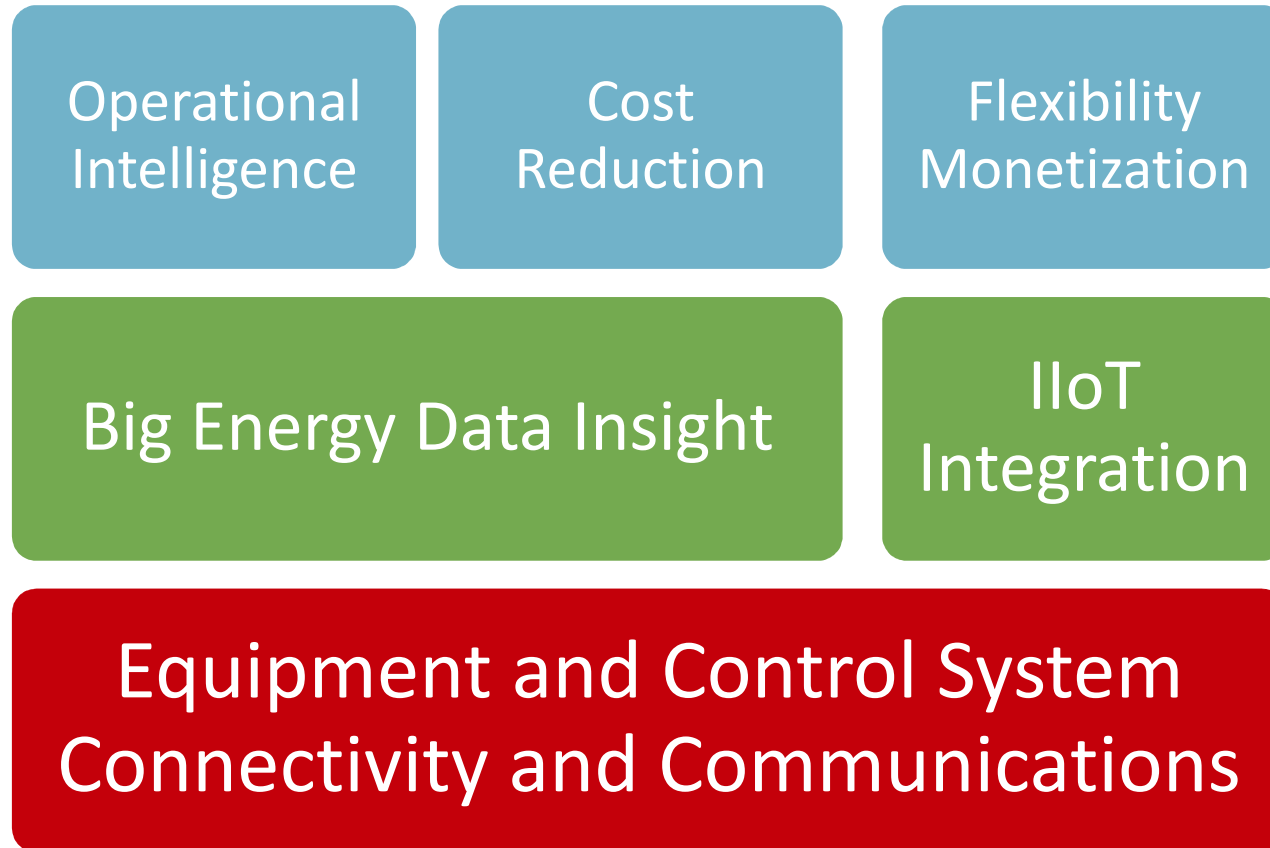


# Achieving Energy Intelligence

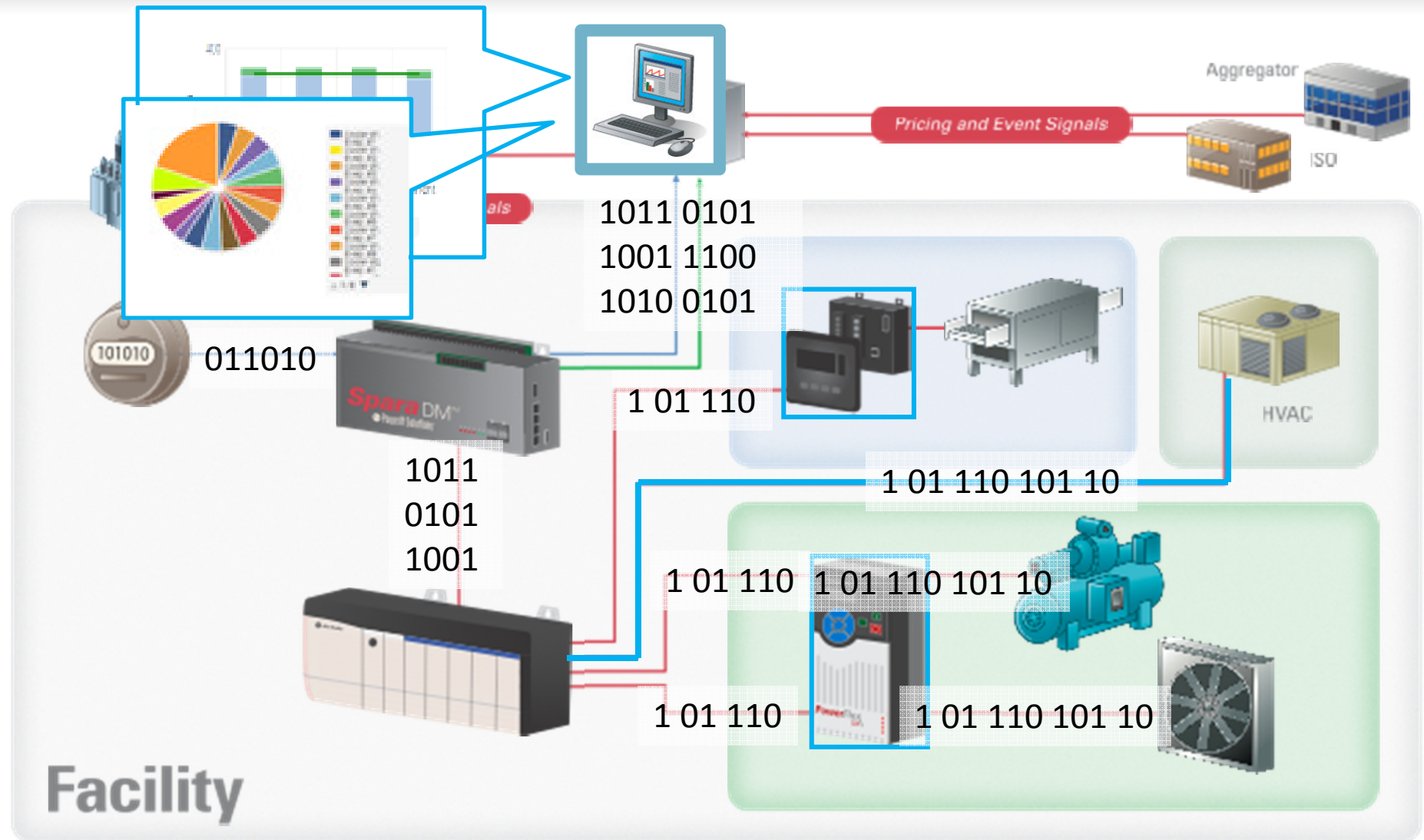


# The Rich Payoff: IoT is Smart Business

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# Micro Machine Data and the Macro Facility View



# Emerging Standards in Industrial Communications

- Industry groups have defined emerging energy communications standards within industrial communications protocols. Defined load “energy objects” make energy management more seamless
- Control systems can incorporate manufacturer defined constraints and profiles into an optimization engine
- At last count, **these industry groups are supporting over 200 open standards**



# Three Crucial Requisites

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- 1** **Energy-intensive equipment is most critical to connect and control, because it helps facilities take advantage of the flexibility inherent in their operations, balance usage within the facility, and then optimize energy use with respect to the greater utility grid**
- 2** **Utility regulation will ultimately help define program changes that incent manufacturers to become more flexible in the way that they use energy**
- 3** **The sooner we can reach a paradigm where there are programs and platforms that allow energy trading from the consumption as well as generation side, the sooner we can reach a truly efficient smart grid**



# Attacking Demand Response Hurdles

Facilities managers need to control the impact of DR participation on their business

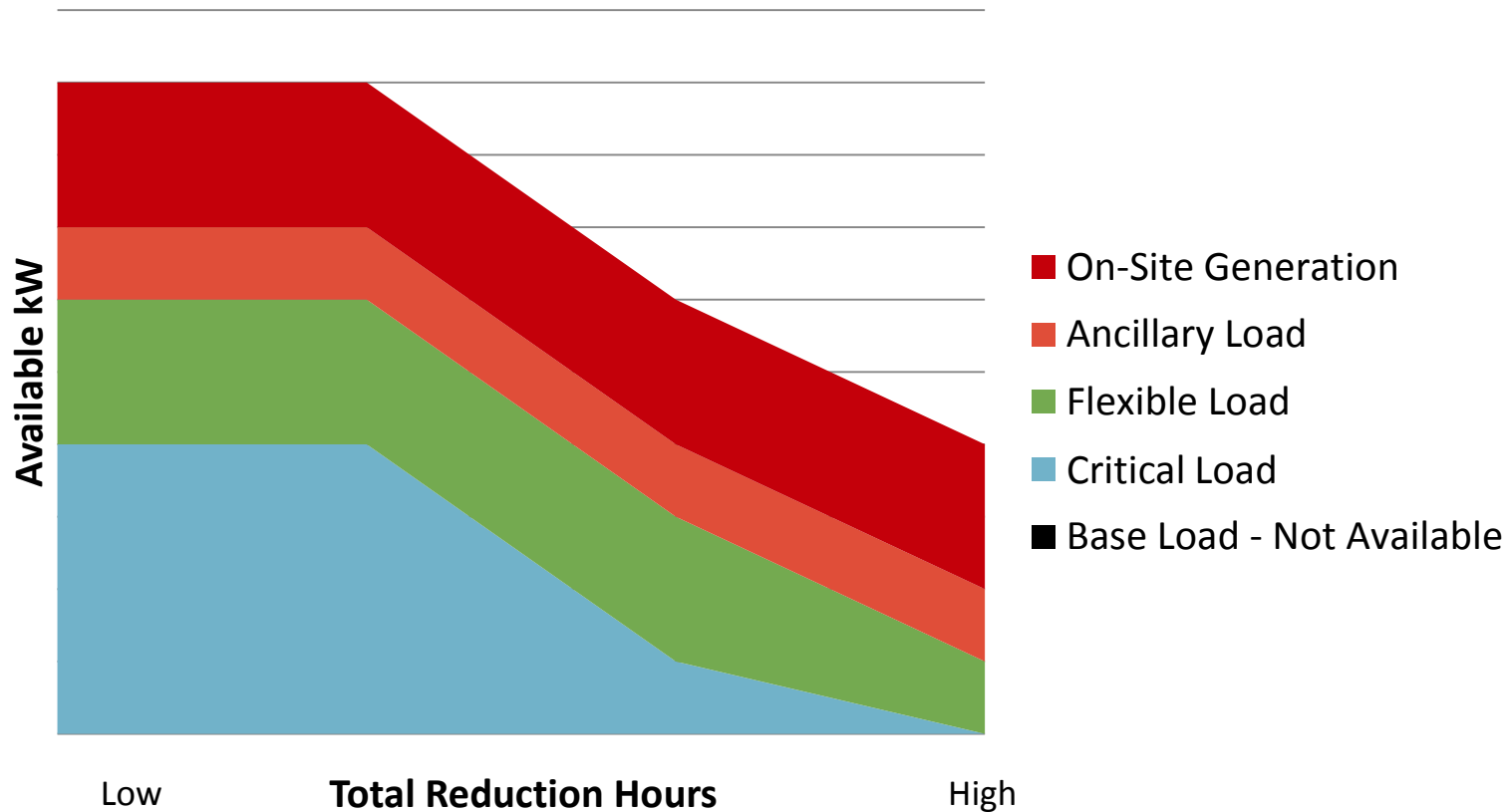
Automating participation improves reliability, enables fast DR, protects equipment and process, benefits the facility and the utility

Technology that puts the facility in control will allow them to balance and optimize DR participation, and monetize energy flexibility

This will expand C&I load availability as a valuable resource to help balance the grid

# Load Participation Opportunities

- Automated DR increases the availability of C&I loads to participate in different styles of DR programs



# IIoT Expands and Improves DR Participation

