Energy Management from SIEMENS
Challenges for the industry are growing worldwide

Siemens has the perfect answers to all the challenges of our customers in the manufacturing industry

- **Reducing the time to market**
  - Shorter innovation cycles
  - More complex products
  - Larger data volumes

- **Enhancing flexibility**
  - Individualized mass production
  - Volatile markets
  - High productivity

- **Increasing efficiency**
  - Energy and resource efficiency as key competitive factors

**Strengthening our customers’ competitiveness**
### Actual hurdles to overcome pain points

<table>
<thead>
<tr>
<th>Actual situation</th>
<th>Energy Data Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Missing transparency</td>
<td>Standardized approach</td>
</tr>
<tr>
<td>2. Heterogeneous infrastructure</td>
<td></td>
</tr>
<tr>
<td>3. Manual data collection</td>
<td></td>
</tr>
<tr>
<td>4. No real time data</td>
<td></td>
</tr>
<tr>
<td>5. Manual reporting</td>
<td></td>
</tr>
<tr>
<td>6. No Benchmarks</td>
<td></td>
</tr>
<tr>
<td>7. No cross-media and inter-divisional metering and reporting</td>
<td></td>
</tr>
</tbody>
</table>
### Energy Management vs Energy Data Management

#### Energy Management

Energy Management (EM) enables companies to determine, improve and analyze systematically and continuously their energy consumption. Within this optimization process economy as well as technical and legal aspects have to be considered.

#### Energy Management System (ISO 50001)

Standard ISO 50001: Energy management systems – Requirements with guidance for use

Process to “manage” energy topics systematically and sustainable. (implemented like ISO140001/ISO 9001 standards)

PDCA cycle: Plan – Do – Check - Act

<table>
<thead>
<tr>
<th>Energy Efficiency</th>
<th>Energy Data Management System</th>
<th>Energy Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy efficiency means reducing energy consumption without having to reduce the use of energy consuming plants and equipments.</td>
<td>Technical system (hw, sw) for the collection, analysis, documentation and visualization of energy data as well as regulation and controlling of energy consumption in plants and buildings.</td>
<td>Services for optimization along the whole energy value chain, from the production of energy up to the consumer.</td>
</tr>
</tbody>
</table>
Energy Data Management – Electrical as well as nonelectrical parameters.

Energy Data Management System to support plant wide energy management according to ISO 50001

**Energy Supply**
- Local Energy-production
- Energy-purchase
  - Power, Gas, Oil, Diesel…
  - Contract type
- Energy distribution

**Energy Media**
- Electricity
- Gas
- Steam
- Pressure
- Compressed air

**Production process**
- Machines
- Equipment
- Process
- Drives
- Water
- HVAC
- Compressed air
- Line-Metering
- Reports
- Production KPI

**Auxiliary process**
- Transport; storage
- Delivery, shipment
- Waste water preparat.
- Compressed Air
- Central cold, heat …

**Output**
- CO2 emissions
- Waste heat, steam
- Waste water
- Power
- Heat …

**Building**
- Industrial building
- Office building
- Interface to BMS
**Energy costs**

10% of electricity price (Ø '00-'15)

*... energy costs are a significant cost factor in production*

**Laws and climate protection**

2°C Limitation of the global temperature rise

*... to achieve the targets, legal measures are taken*

**Corp. Responsibility**

59% A green image is key to the purchasing decisions for a majority of those polled²

*... energy efficient production is a key marketing instrument*

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1 Prices including taxes, source: statista.com (Link); 2 Source: E.ON survey 2015 (Link)
Production-integrated Energy Management
Energy Management as integrated element on all levels

Energy Management on all levels

Totally Integrated Automation

Enterprise Level
- ERP
- PLM

Management Level
- MES

Operator Level
- SCADA

Control Level

Field Level

Energy Data Management

- Dashboard, Reporting, Planning
- Controlling (EnPI / EEnPI)
- Standard Templates for Import

Line-Monitoring incl. Energy Management

- Machine-oriented EnPI / EEnPI
- Standard PDI on SCADA level

Machine-oriented Energy Management

- Standard PDI per Machine

Integrated Energy Data Acquisition (all energy types)

- Energy consumption & machine status
- Integrated metering

PDI = Process Data Interface

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Sachin Soni / DF FA AS
Overview
Energy Management with SIMATIC

Energy Management
- purchasing
- planning
- archiving
- reporting
- visualization
- compression
- Limit-Monitoring
- communication
- Acquisition

Overall System
- B.Data (Energy Manager Pro)
  - Energy purchasing/planning
  - Energy controlling
  - Reporting/Monitoring
- SIMATIC powerrate (Energy Suite)
  - Visualisation
  - Achievement
  - Data processing
  - Loadmanagement
  - Energy acquisition

Field level
- SENTRON
  - Mesosquare
- SIMATIC ET 200
  - Decentralized Periphery
- SIMATIC Antaeus

Operational and企业管理 level
- PLC level
- Energy acquisition

Operational and procedural level
Overview – Energy Management with SIMATIC

Onsite solution
- Energy Management with SIMATIC -

- Operate an own energy data management system and profit from full flexibility
- Access to complete software
- Software is installed at customer’s site
- Licensing costs – onetime payment, Software-Update-Services possible

Complete flexibility through

Managed Service
- Energy Analytics -

- Energy data management as a service
- No access to software, B.Data web viewer
- Software is hosted outside of customer’s site
- Capex to Opex: Payment of monthly service charge depending on selected service package

No internal experts are necessary

Monitoring
- Transparency - display and exam your Energy

Machine / Field Level
- S7-1200, S7-1500, S7-300 Basic Panels, Comfort Panel, ...
- TIA Portal, WinCC V13, STEP7 V13

Supervising
- Analyze and control your Energy

Control / System Level
- S7-300, S7-,400 S7-1500, Industrial PC
- TIA Portal, SIMATIC WinCC V7, PCS7, SIMATIC Energy Suite

Managing
- Manage corporate Energy consumption

Management Level
- SIMATIC Energy Manager Pro

Energy Management System
- Transform your energy data into energy knowledge

Energy Analytics
- Entry, Basic, Advanced, Professional

Siemens Energy & Environmental Services

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Energy Analytics
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Siemens Energy & Environmental Services
## Energy Management with SIMATIC Electricity Metering

### SIMATIC ET 200SP AI Energy Meter & SIMATIC S7-1200 SM 1238 Energy Meter

<table>
<thead>
<tr>
<th>Feature / Function</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIMATIC-based metering (3-phase)</td>
<td>Savings through integration in the Automation (TIA)</td>
</tr>
<tr>
<td>Used along with other ET 200SP modules DI / AI / F / ...</td>
<td>One system for everything</td>
</tr>
<tr>
<td>Up to 60x ET 200SP AI Energy Meters per line</td>
<td>Space-saving in cabinets</td>
</tr>
<tr>
<td>Support for current and voltage transformers</td>
<td>Wide range of use</td>
</tr>
<tr>
<td>Accuracy class 0,5</td>
<td>High accuracy</td>
</tr>
<tr>
<td>Remanent meter reading storage</td>
<td>No value loss due to supply voltage failure</td>
</tr>
<tr>
<td>Up to 3x users (single-phase) per Energy Meter</td>
<td>Savings</td>
</tr>
</tbody>
</table>

Savings
**SIMATIC B.Data (Energy Manager Pro) – for corporate requirements**
Overview per click of mouse – tailor-made for corporate structure

<table>
<thead>
<tr>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>Procurement</td>
<td>Management</td>
</tr>
<tr>
<td>Energy Manager</td>
<td>Monitoring</td>
<td>Procurement</td>
</tr>
<tr>
<td></td>
<td>Measures</td>
<td>Facility Manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring</td>
</tr>
</tbody>
</table>

**Corporate view**
- Energy Planning
- EE measures (Corp)
- Reports (Corp)

**Regional view**
- B.Data Database
- SAP
- B.Data Client
- Web Clients

**Headquarter**
- Corporate Energy Data Management
  - CFO
  - CEO
  - Energy Manager

**Site 1**
- Energy Manager
- Management
- Procurement
- Monitoring
- Measures

**Site 2**
- Management
- Procurement
- Monitoring
- Measures

**Site 3**
- Facility Manager
- Procurement
- Monitoring
- Measures
SIMATIC B.Data (Energy Manager Pro) – Data collection
Interfaces covering all relevant sources

- Automatic data collection
- Mobile data collection
- Manual data entry

Communication with almost all systems possible

<table>
<thead>
<tr>
<th>ERP</th>
<th>XML</th>
<th>ODBC Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII</td>
<td>OPC Client</td>
<td>PCS 7/ WinCC/S7</td>
</tr>
<tr>
<td>CSV</td>
<td>others …</td>
<td></td>
</tr>
</tbody>
</table>
SIMATIC B.Data (Energy Manager Pro) – Web-Clients
Double-check plant efficiency from everywhere and at anytime

Windows Internet Explorer
Firefox
Apple’s Safari
Reduced Costs
Flexible integration saves investment

As part of SIMATIC-platform

- Management Level
  - SIMATIC B.Data
  - MES

- Operation Level
  - SIMATIC PCS 7 / WinCC

- Control Level
  - SIMATIC S7
  - SIMATIC HMI

- Field Level
  - Sensors
  - Actuators

As add-on for installed base

- Management Level
  - SIMATIC B.Data

- Operation Level
  - Autom. Systems
  - Data System

- Control Level
  - SIMATIC S7

- Field Level
  - PLC
SIMATIC B.Data (Energy Manager Pro) – for site/production requirements
Covers all requirements in compliance with ISO50001

1) Improve efficiency
- Energy Monitoring
  - Energy consumption overview
  - Discover energy-guzzlers
  - Support for load management
  - Identify relevant consumption
  - Improve stand-by-operation
- Energy Controlling
  - Discover potentials
  - Verify target fulfillment
  - Benchmarking
  - Target value tracking
  - Correlation between costs and production

2) Enhanced energy purchase
- Tariff Verification
  - Tariff simulation
  - Identify max. consumption per period
  - Identify max. power per period
  - Selection of suitable contracts
  - Bill verification
- Forecast
  - 3x methods:
    a) Regression
    b) Days/shifts
    c) Prod/Batch based
  - Basis for energy trading
  - Improved energy purchase
  - Forecast deviations
  - Basis for energy trading

3) Easier Energy Management
- Energy Efficiency Measures
  - Reporting
    - Management
    - Energy Manager
    - Personnel (Production, …)
  - Tenants billing
  - Environmental reporting
  - Track GHG-emissions
  - Track improvements
  - Basis for energy trading

Optimize day-to-day business
- Meter Management
- Measures Management (Basis for audit)
- Track improvements
- Value substituting methods
- Man. data entry
- Engineering optimized for Energy Managers
Production-integrated Energy Management
Equipment Energy Performance Indicator (EEnPI)

**EEnPI**

<table>
<thead>
<tr>
<th>Overall consumption</th>
<th>Energy consumption (e.g. kWh; kWh/to)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Change over / Mal-function / Stand-by / Missing part / Velocity / Rejects / Waste</td>
</tr>
<tr>
<td>Availability</td>
<td>Performance losses / Quality losses / Availability losses</td>
</tr>
<tr>
<td>Performance</td>
<td>Performance losses / Quality losses / Availability losses</td>
</tr>
<tr>
<td>Quality</td>
<td>Quality losses / Performance losses / Availability losses</td>
</tr>
<tr>
<td>Productive</td>
<td>Quality losses / Performance losses / Availability losses</td>
</tr>
</tbody>
</table>

Value-adding | Non-value adding

**Benefits of EEnPI with SIMATIC B.Data**

- "Reason tree" provides more precise indication of optimization potential
- Energy efficiency evaluation of machines analog to OEE performance model

**Energy Efficiency**

- Normalized Production: 3000 MWh
- Performance losses: 60 MWh
- Quality losses: 340 MWh
- Disturbance losses: 200 MWh
- Heating: 200 MWh

*Week values

**Energy Distribution**

- Normalized Production: 3000 MWh
- Performance losses: 60 MWh
- Quality losses: 340 MWh
- Disturbance losses: 200 MWh
- Heating: 200 MWh

*Week values

Reduction of non-value-adding energy consumption correlates with higher productivity
Energy management integrated in automation
… Energy transparency already during production
… Energy and production data - simple combination

Scalability
… from production machine up to factory wide energy management
… smooth link to SIMATIC Energy Manager PRO and SIMATIC HMI / SCADA

Investment protection
… Integration and continuous evolution with SIMATIC TIA-Portal
… use of standard components in HW and SW
… high data integrity with buffering in S7 and archiving in S7, SCADA

Economical
… reduced project costs through integrated energy metering and simple engineering
… one platform for automation and energy management
Customer benefit – System Integrator

1. **Competitive advantage through engineering efficiency**
   - Simple, intuitive engineering in TIA Portal
   - High flexibility to integrate different energy types and devices
   - Visualization in SIMATIC HMI / SCADA
   - Smooth link to SIMATIC Energy Manager PRO

2. **Investment protection**
   - Reduced project risk with energy management integrated in SIMATIC TIA Portal (compared to customer spec. solution)
   - Use of standard components in HW and SW with worldwide availability

3. **New business opportunities**
   - Energy transparency in production
   - Added value through intelligent combination of energy data with production data
   - Enhanced customer potential through scalability from production machine up to factory-wide energy management system
Investment protection

...Energy management integrated in SIMATIC TIA Portal to assure continuous evolution
...use of standard components in HW and SW with worldwide availability
...one engineering tool for automation and energy management
...no specific (energy management) knowhow
...global support (24/7)

Competitive advantage and new business opportunities

...Energy efficient and transparent machine as competitive advantage
...Provision of energy data as value add (“Ready for Energy Management”)
...Conformity!
Offer today to comply with tomorrow!
### Energy Data Management

#### Summary of Benefits

**Transparency**
- Transparency on energy & media consumption, costs,
- Allocation to consumer and cost center
- Predictability and target controlling
- Improved planning reliability and basis for decision making

**Energy Efficiency**
- Improvement of total plant efficiency
- Overview of optimization potential
- Tracking and reporting of efficiency projects

**Savings**
- Reduced energy costs due to reduced consumption
- Improved procurement conditions due to better predictability (Energy tariff model optimization)

**Awareness**
- Increased energy consumption- and cost awareness
- Prove of sustainability and green production

**Meet Legal Standards**
- Support of ISO 50001 process
- Sustainability reporting
- Reports for quality audits

**Sustainable Invests**
- Integration in existing systems & Scalable solutions
- Integration of existing measuring equipment
- Seamless concept (Totally Integrated Automation)
EDMS References in India

- Manual energy data collection is replaced by automation.
- Manpower requirement for collection of energy data is optimized now.
- Transparency of Cost and consumption of Utilities.
- Reporting features of B Data.
- Easy integration of existing energy meters with automation system.
- RT data for energy parameters
- Basic energy consumption Reports
- Easy Cost-analysis of every utility.
- Total energy management by Consumer-level Cost analysis of all production blocks.
Thank you very much!