Innovations beyond Smart Metering

Wolfgang Jöbstl, Portfolio and Sales Manager
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Table of Contents

• Smart Meter Deployment and Status in Austria
• Siemens Smart Meter Solutions Portfolio
• Synergies and Extensions of the Smart Meter Infrastructure
• Innovation Topics
Smart Meter Deployment
Status in Austria
Status of Smart Meter Deployment in Austria

Consumer options *):

Opt-In: 96 values per day 7,6%
Standard: one value per day 91,0%
Opt-Out: one value per year 1,4%

E-Control Report issues every october for last year, Report from Oct 2018 for End of 2017 *):

Total Smart Meter: 6,1 Mio
Meters deployed or ordered 20,9%
Target for 80% end of 2020
with PLC communication >99%

*) Source: Bericht zu Einführung von intelligenten Messgeräten 2018, e-control

Current information in German language from Oesterreichs Energie: https://oesterreichsenergie.at/die-welt-des-stroms/stromnetze/smart-meter/roll-out.html
Unified Rollout System for Austria, based upon EnergyIP
Integration of Components from other Vendors

- G3-PLC (PLC = PowerLine Communication)
- P2P Mobile Communications
- End2End Security acc. to Austrian requirements

Billing
- SAP: SAP MDUS Adapter + FlexSync
- SDK: EnergyIP FlexSync
- E2000: EnergyIP FlexSync and FileSync

Head-End System
- UDIS: Integration with EIP UAA for IDIS compatible meters
- Sagem: Adapter based on EIP SDK for SagemCom and comp. meters
- Honeywell: Gateway management

G3-PLC Gateway
- Siemens SGW1050 and Honeywell Beacon

Smart Meters
- Siemens IM-x50
- Landis+Gyr, Iskraemeco, SagemCom, Kaifa
EnergyIP – Flexible scalable platform for smart grid applications

- Powerful Smart Meter and IoT-platform for management of data from millions of distributed assets in near real time
- Efficient IT-OT integration between IT-applications and field devices
- Utility data model to interpret data from energy assets
- Bi-directional, closed-loop communication
EnergyIP – Proven leadership in energy data management

Siemens EnergyIP MDM continues to be the world leader in the Gartner’s Magic Quadrant for Meter Data Management

- 80,000,000 intelligent meters contracted
- >500,000 smart meters operated by one MDM proven at 5 utilities
- 4,500,000 meters operated at an ISO with daily reads in 60 min interval data
- Near real-time data access in 15 min interval data

80 EnergyIP installations
SGW 1050
Substation Gateway for the smart distribution grid

• Compact Plastic Housing (IP52, 184*144*69 mm, -20° to +60° C)
• Integrated power supply (220-240V AC, 3-phases + N)
• Future Proof Hardware: Linux OS with up to 1GB RAM

• Built-In LTE Cat1/4 modem, 3 Ethernet Prots (LAN,WAN,MTC)
• New Functions with Applications (Apps) Download
• Cyber Security by design
  • Integrated Hardware Security Module (HSM)
  • Interface-bound role-based access (RBAC)
• Protocol Support
  • DLMS/COSEM (IEC 62056) for smart meter communication
  • ModBus TCP with OPC UA PubSub for IoT communication
  • HTTPS, TLS, SNMP, NTP
  • G3-PLC Dual Band (Cenelec A and FCC)
G3-PLC Smart Meter Family IMx50 with additional functionality

Single / Three Phase / CT Smart Meter IM150 and IM350

Four Quadrant Active and Reactive Energy

- Interoperability
- Compliant to standards (dlms/COSEM, G3-PLC ...)

- Integrated breaker
- Consumer interface (unidirectional, DSMR/CII)
- Submetering: M-Bus (wired, EN13707, OMS 4.0.2 Mode)

Integrated Load management to replace ripple control receivers

- Switching with internal breaker
- Control with up to TWO load switch contacts
- Load Output with up to 5 digital pulse outputs

End-to-End Security as per guidelines of Österreichs Energie, e.g.

- Role based access
- Cryptographic methods
- Certified by ENCS

European Network for Cyber Security

ENCS
Synergies and Extensions of Smart Meter Infrastructure

How an existing Smart Meter infrastructure can be used for future topics
Create New Value with existing Smart Meter System

- Add new consumer centric services for available meters and devices (i.e. electric heating, car charging and photovoltaics)
- Add new applications and protocol support to read available devices
- Read low range radio services

Data and Events from Smart Meter can be aggregated to meet GDPR and creates analytics use cases to support grid operations and SCADA

- App enabled device with high speed uplink in every LV transformer station with free ports
- Multi functional smart Meter with submeter and load management interface
- Add new consumer centric services for available meters and devices (i.e. electric heating, car charging and photovoltaics)

Color Code: Siemens Products
Create New Value with existing Smart Meter System

- in the IT Center

- provide consumption data for energy retailers and Energy savings consultants

- Improve clearing quality with daily or 15 min values

- Analyze grid events, forward to SCADA, provide reports

Aggregate grid data for advanced analytics:

- Equipment Load Management
- Load Forecasting
- Power and Grid Quality
- Asset Topology Mapping
- Revenue Protection, Grid Loss Detection together with Security Incident Monitoring
Create New Value with existing Smart Meter System

- in the Low Voltage Grid

- Read out water, gas meters and other information available at consumer premise
- Analyze PLC performance data to better understand low voltage grids and cabling issues
- Re-use P2P communication link into low voltage transformer station for the following applications:
  - Automate and telecontrol Transformer station with SCADA
  - Read available and new sensor data into MDM/IoT Platform
  - Radio: extend for other communication media – i.e. LoRA, M-Bus
- Congestion management with ripple control applications in the smart meter to control heating, photovoltaic systems and car charging stations
- Read out water, gas meters and other information available at consumer premise
Innovation Topics
Selected Use Cases
With AMI Data and additional Sensors
New Applications Evolve at Meter and Grid Level

Asset Connectivity Model, Asset Parameter, SCADA Data, Asset Location Data

Equipment Load Management
Power Quality
Load Forecasting
Grid Loss Detection
Asset Topology Mapping

Meter Data
Revenue Protection
Evolution of “Trailing Pointer“ Functionality

Analogue „Trailing pointer“

- Only one maximum value per year

Digital „Trailing pointer“

- Average values every 2.5 min
Sensors in the grid provide extensive status information

Determine system health precisely through **analysis of voltage, reactive power, and outage data** from available sensors and smart meters. Benefit from getting detailed and granular insights into momentary outages and **reports**.
Extending „Smart Meter Gateway - SGW1050“ with IoT-Applications

Connecting devices even from 3rd-party vendors

Transformer Station
MindSphere Dashboard using MindConnect
EnergyIP Analytics – Equipment Load Management

Combines AMI consumption data with distribution grid topology and equipment ratings to identify **load on distribution transformers** and to intervene **before** an overload occurs.
Build Your List of “At-Risk” Assets

Creates a prioritized list based on name plate rating as well as the current load conditions, such as extent and duration of overload.
EnergyIP Analytics – Equipment Load Management

Where is the main area of my problem?

Understanding Geographical Dispersion
EnergyIP Analytics – Equipment Load Management

Drill down into individual transformer stations

Very interactive and intuitive user interface – makes it easy to go from big picture to details and vice versa.

Saves time and effort.
G3-PLC performance provides additional grid status information:

- Quantity of connected Smart Meter
- Communication topology
- Number of hops and quality for communication link
- Percentage of successful / missed communication attempts

G3-PLC PAN Coordinator has a lot of detailed information:

- Quantity of connected Smart Meter
- Communication topology
- Number of hops and quality for communication link
- Percentage of successful / missed communication attempts
EnergyIP Analytics – Power and Grid Quality

Where is the likely source of a majority of momentary outages?

Creates a prioritized list based on the specific power quality metrics and combines with other key derived metrics.
EnergyIP Analytics – Load Forecasting

Not just what the peak will be but also who the key contributors will be.

Provides load forecasts at every level of the low-voltage grid – enables reliable identification of the source of variance.
Local Grids – Key Element for “Energy Revolution”

Decentralized load control based on on-site transformer monitoring…

- **E-Mobility (first use-case)**
- Decentralized generation
- Heat pumps

DSO specifies the connection requirements
DSO is able to **ramp down amount of load**
(selective load control) at charging locations

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Page 27 12-13 SEP 2019
W. Jöbstl / SI DG CS&D APS
Siemens offers EnergyIP powered by MindSphere a future proof solution platform for the all-electric, digitalized energy world
Contact information

Wolfgang Jöbstl
Portfolio Manager
EM SI DG CS&D APS

Siemensstraße 90
1210 Vienna

Mobile: +43 (664) 615 1339
E-Mail: wolfgang.joebstl@siemens.com

E-Mail: siemens.at/var