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Smart Grids and Smart Water Metering in The Netherlands

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EC – ICT for Water Management – June 11th, 2010

Agenda

Introduction to smart grids, smart metering and smart water metering in the Netherlands

- Smart grids / smart metering (electricity)
  - Introduction and business case
  - Architecture
- Smart metering water
  - Business case
  - Architecture
- Challenges
- Background / contact

Smart grids - introduction

- Smart grids
  - Use of sensors, digital communications, and embedded digital processing to make the grid *observable* (able to measure the states of all grid elements), *controllable* (able to affect the state of any grid element) and *automated* (able to adapt and self-heal).

Smart grids - introduction

- Smart metering
  - Automated Meter Reading (AMR) Originally a “one-way” automated meter reading solution, sending usage data back to the utility. More advanced AMR solutions have evolved but stop short of the AMI functionality.
  - Advanced Metering Infrastructure (AMI) – “two-way” solution that creates a network between the meters/devices and the utilities’ information systems. Data flows both ways facilitating not only remote meter reading but ability to remotely activate meters/devices and enables the use of variable pricing.

Smart grids – business drivers

Regulatory Mandate

- EU and US climate change **legislation is forcing companies to implement smart technology**
- United Kingdom mandate for residential **national roll-out of smart metering** by 2020
- **US$ 4.5 billion US fiscal stimulus** allocated to smart grid – number of states now planning pilots
- Rapidly developing **EU policy** re. Smart Grid

Future Gen Mix

- Deployments of **renewables and distributed generation** technologies will affect the design and operation of the distribution network leading to increasing need for automation
- **Plug-in hybrid vehicles** are likely to further increase the stress on the distribution network
- **Low-carbon technologies** will mean the energy grid will need to be able to deal with **intermittent generation and drive need for demand management**

Ageing Grid and Reliability

- **Massive investment** will be needed to upgrade the transmission and distribution grid over the next 10 years to meet new low-carbon energy requirements
- All new network upgrades will include the introduction of **sensors and controls** to enable efficiency and improved management
- "The total estimated annual cost to the US economy from **power outages** and **power quality disturbances** is over US$ 100 billion…" which can be saved through smart technologies

Customer Needs

- Under **rising costs of energy**, customers are likely to demand a more granular level of information to **reduce their bills**
- Consumer energy awareness and demand for **sustainability** will require an enhanced ability to measure and **manage use**
- The use of more **flexible pricing mechanisms,** such as Time of Usage and Critical Peak Pricing, will **require automation**

Environmental Impact

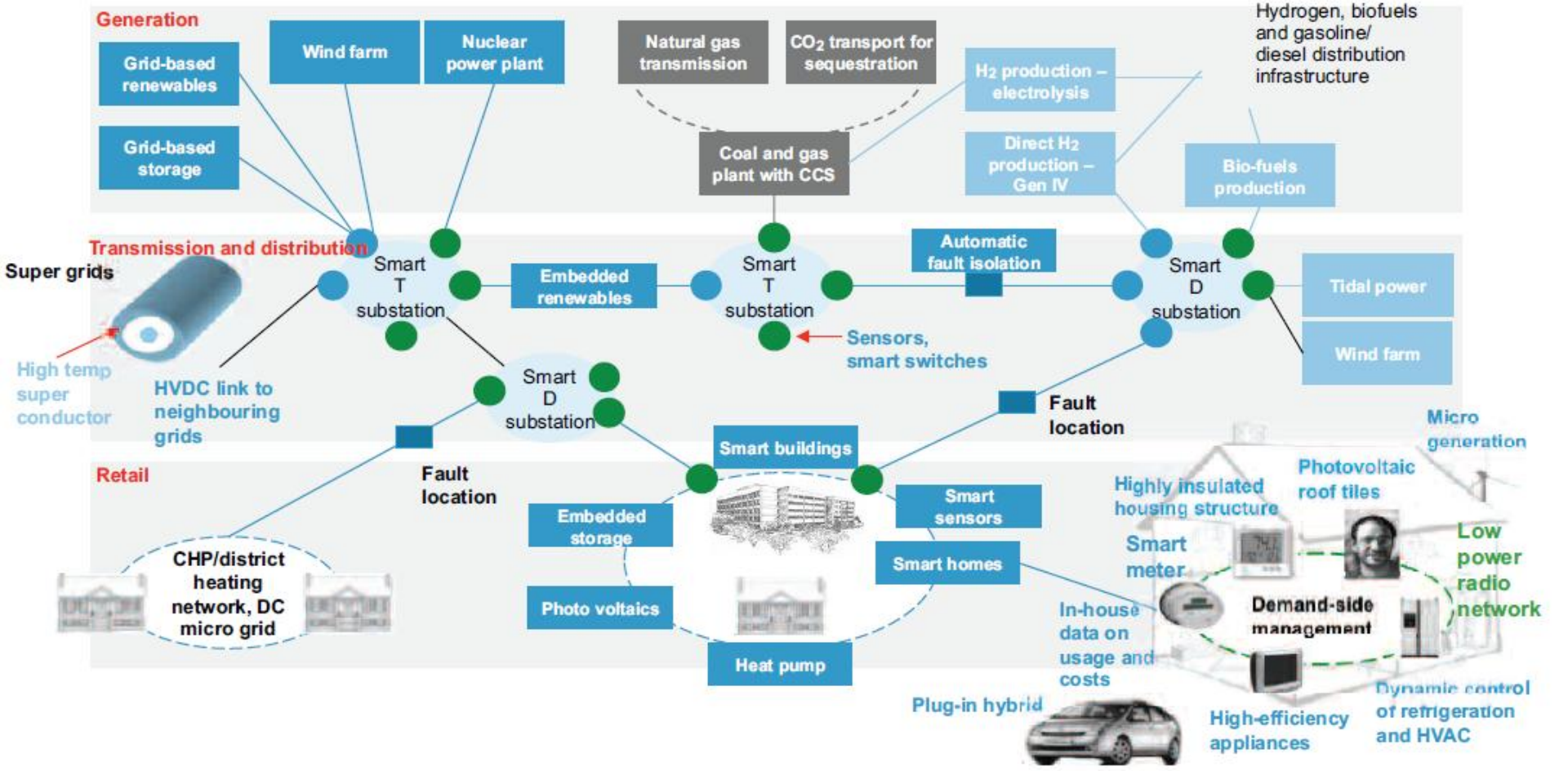
- The enabling of energy demand management to reduce consumption – **peak shaving and load shifting** will require more control in the home
- **Carbon emissions reduction will** drive the need for more information to enable energy efficiency
- Government refunds will require more **monitoring of carbon emission** savings for auditing purposes

Technology Evolution

- Increased use of smart technology is increasing data volumes and driving the need for high-speed analytics
- Automated meter reading is quickly becoming **obsolete** as energy companies move to advanced metering infrastructures
- In the face of new capital investment, **smart grid components** are becoming **increasingly cost competitive**

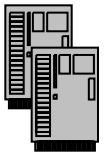
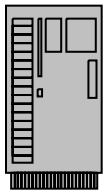
Source: – World Economic Forum, "Accelerating Smart Grid Investments"

Architecture – Holistic view

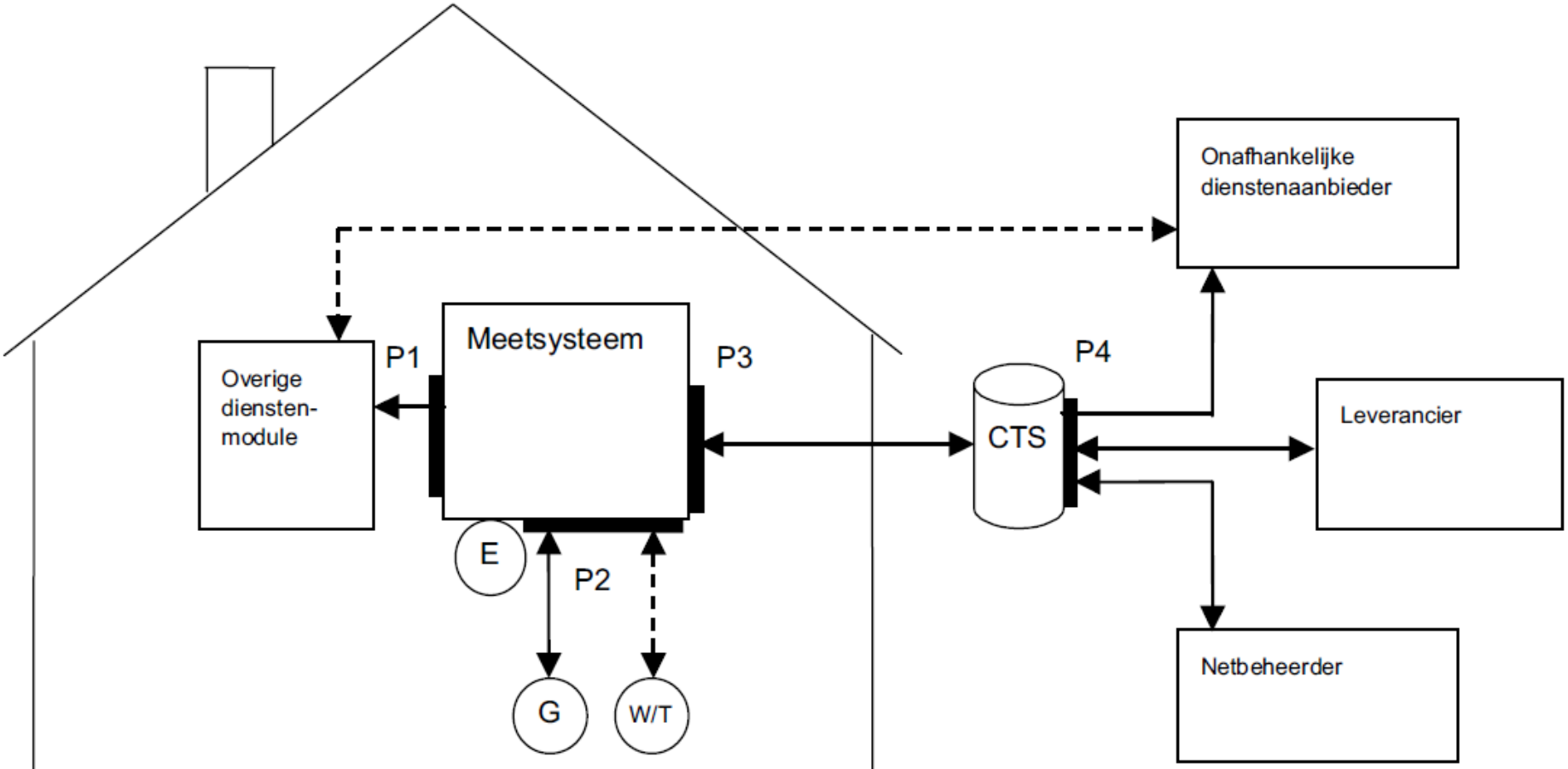


Source: – World Economic Forum, "Accelerating Smart Grid Investments"

Architecture – Smart Meter

Retail	Premise Equipment		Meter & Communications Infrastructure[1]				MDMS		Billing
									
Consumer Products	Endpoint Devices	Home Area Network (HAN)	Meter	Local Area Network (LAN)	Concentrator	Wide Area Network (WAN)	Head end	MDMS	
Description									
Integration with home devices Provides platform for renewables and new services	Devices in the home that can be remotely updated and controlled by the utility	Transmits data between the meter and premise devices No defined standards	Measures, collects, transmits and stores end-user consumption Can be remotely configured	Transmits data between meters and the collector Solution specific protocols. Standards emerging	Collects, stores and transmits messages to and from multiple meter points Solution-specific devices	Transmits data between concentrator and utility head end Solution specific protocols	Interfaces AMI solution to back office systems Solution specific system	Central repository for meter data that can be accessed by a large number of groups and systems	Interface with MDMS and drives control messages for meter. Uses (register) reads for billing processes
Communication		PLC, Wireless		PLC, Fixed line, GPRS, Wireless		GPRS, Fixed line, Wireless			

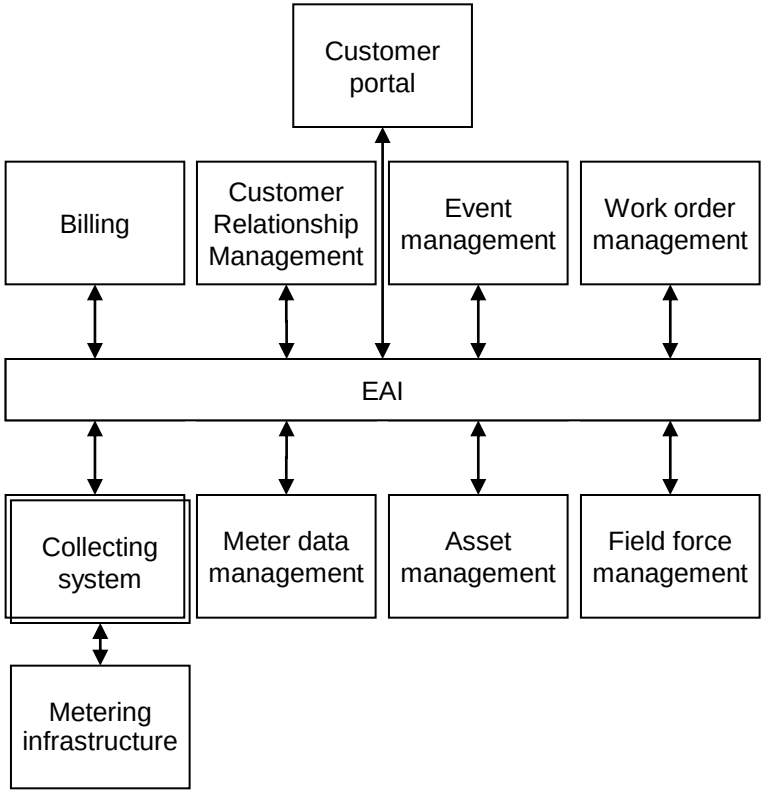
Architecture – Smart Meter NL



Source: NTA 8130

High level IT architecture

Typical IT structure in Smart Metering where the EAI aims to facilitate interaction between systems and therefore reduces the need for the systems to be able to interact directly with each other*



***Important to have in mind*: Single data repository is crucial to the functionality and integration between the applications interacting through the EAI**

Metering Infrastructure

Measures, collects, transmits and temporarily stores end-user consumption. Transfer frequency, not necessarily the same as reading resolution, can be adjusted to optimize transfer cost by batching. If concentrators are used, transfer frequency can differ between the LAN and the WAN

Collecting System

Collects data from the Metering infrastructure. Often outsourced to third party

Meter data management

Central repository for meter data that can be accessed by other systems. Interface between meter values and corporate applications to effectively manage meter data. Used for balance settlements and calculations if value for billing is missing. Often used to follow up service levels of suppliers if a collecting system has been outsourced

Asset management

Single point of storage for meter identification data (i.e. meter and device register) and meter management. Could also handle utilization optimization, distribution, transmission, planning etc when AMI services are implemented

Field force management

Manages work orders that cannot be handled remotely for field crew. Could be external if the service is provided by a supplier

Billing

Makes sure that customers receive accurate bills at the right time. Billings could include relevant feedback about consumption

Customer relationship management

Includes the customer database and takes care of customer communication including marketing and sales

Event management

Stores and handles events like alarms, power outages, missing meter values, quality of energy distributed

Work order management

Where internal work orders are posted, communicates with field force management through the integration platform. Handles the logistics, scheduling and reporting related to work orders

Customer portal

Often web based portal for customer to log on to in order to get feedback on consumption, see their bills, project future energy consumption etc

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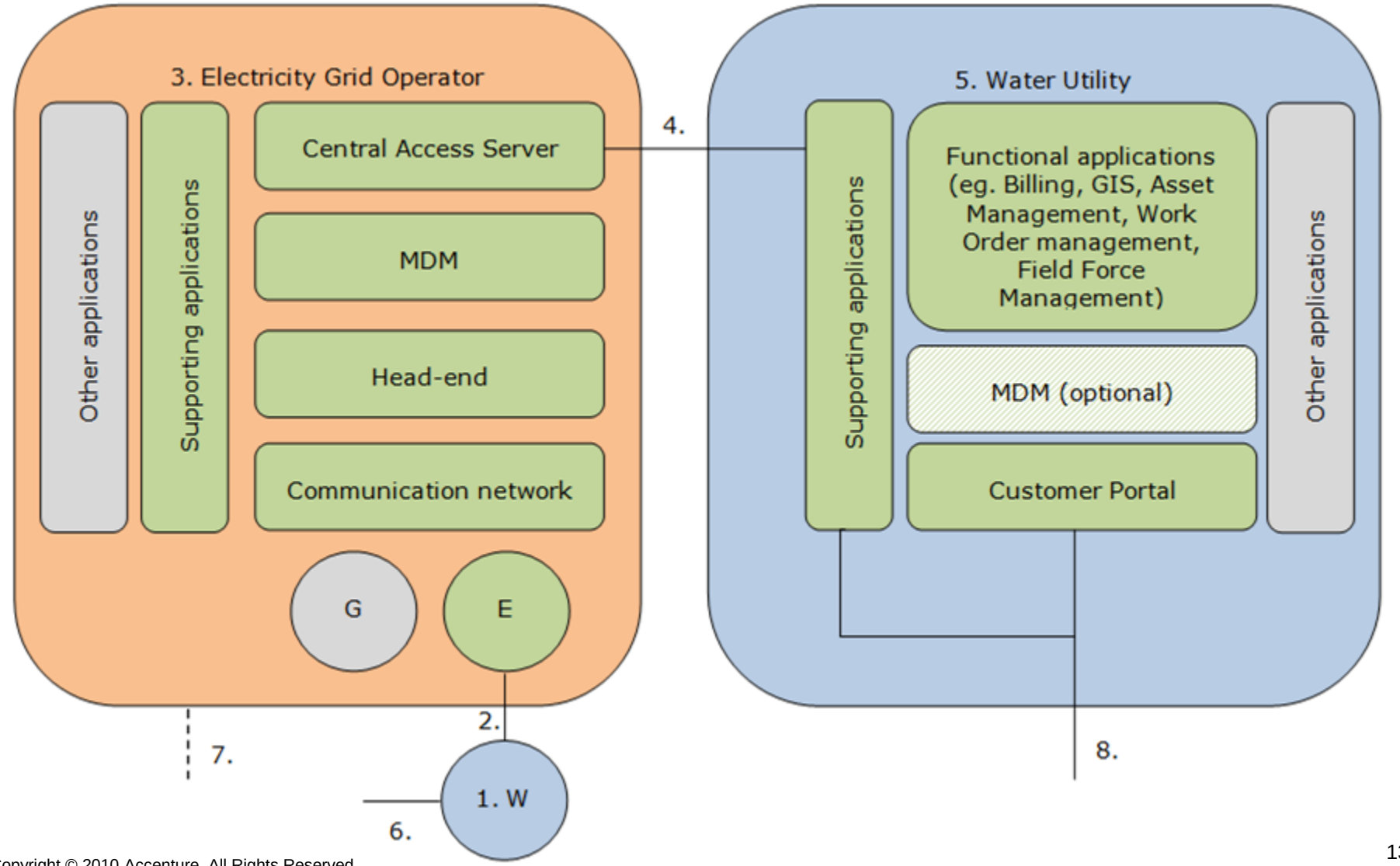
Smart water meter – business case

- Improve administrative processes
  - Meter reading (channels, customer contact)
  - Periodic billing based on actual consumption
  - Move in move out readings
  - Fewer estimations
- Fraud detection
- Leak detection (local and regional)
- Distribution network planning
- Costs
  - Significant cost reduction when partnering with grid operators
    - Rollout, Communications infrastructure, Meter data management

Smart water meter – Proposed functionality (NTA8027)

- Meter reading
  - On demand, Periodic, etc.
- Monitoring quality (eg. Temperature, pressure)
- Event handling
  - Errors, Fraud, leak, backflow
- Commands
  - Disconnect/reconnect, Messages, pricing
- Derived functionality
  - Billing, consumption patterns, distribution network developments, customer propositions, pricing, demand side management
- Based on NTA8027 (water) and NTA8130 (electricity)

Smart water meter – example architecture with grid operator



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Challenges

- Business case
  - Customer propositions / pricing / availability
  - Value for water utility
- Business model
- Cooperation
  - Between water utilities / Between other utilities
- Policy / regulation
  - Privacy / security / encryption
- Standards (technology, protocols)
  - National
  - International
- Technology Architecture
  - Components / systems (integration) / communication / local vs. global event handling
- Water quality measurements

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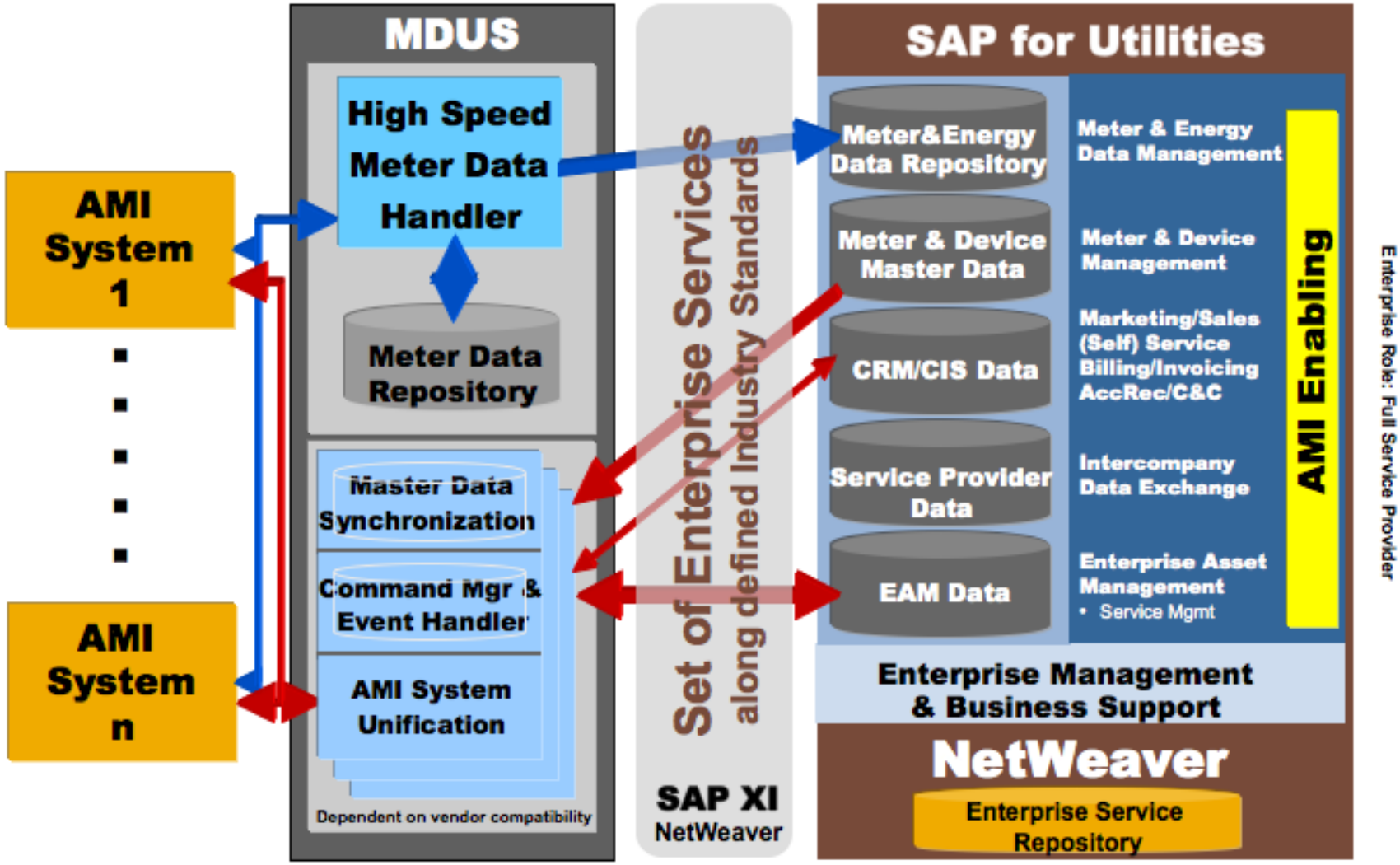
Background -
Example SAP AMI Achitecture



Background - Accenture services for smart grids

- Management Consulting
  - Visioning / Strategy
  - Develop business cases
  - Program / project management
  - Change management
- Technology
  - Systems integrator
  - Technical architecture
- Outsourcing
  - Business processes (eg. asset management)
  - Application outsourcing (eg. IT architecture)

- *Accenture has partnerships with key players in the market*
- *Smart grid / smart metering offerings and credentials available*

Background - Contacts

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