Realization of intelligent networks in the Netherlands

The information need of the energy eco system

oct 2012
Alliander

Electricity
  Customers : 3 million
  Grid : 94,700 km
  Stations : 48,000

Gas
  Customers : 2.6 million
  Grid : 36,900 km
  Stations : 15,000

Revenue : 1.4 billion euro
Asset Value : 12 billion euro
Employees : 6000
Digitisation of the grid

Smartgrid: the expectation
How consultants see it
What utilities probably will need
Digitisation: From Analogue to Digital
Development of the microprocessor

740 KHz
24-pin ceramic DIP
Digital watches
From Vinyl to CD to MP3 to Spotify & iTunes
Office automation
Word en co
From coins to figures on the screen
From Silver to JPG
Digitisation: Base layers of future E-networks
The layout of the electricity network

**HV**

**MV**

**LV**

**MS stations**

**HS stations**

**LS connections**

**(milli) seconds**

**seconds**

**minutes**

**days**

**LS- home**

**SM**

**SM**

**SM**

**SM**
Medium Voltage Components

transformer area

Medium Voltage

MV/LV

MV/LV

MV/LV

MV/LV

MV/LV

MV/LV
Medium Voltage connections:

- CHP power plant
- Wind turbines
- Solar plant
- Battery storage
- Heat pumps
- EV charging points
- Office buildings
- Transportation (rail)
- C&I
- Data centers
- Cold store
- Hospitals
- Residential area
- Combinations
Functions of the Medium Voltage network:
1) Grid Stability

- uninterrupted power supply with the
- right frequency and the
- right voltage

- Measurements
  - voltage,
  - current,
  - PQ,
  - temp,
  - status

- Corrective measures:
  - Switch / self healing grids
  - Control voltage, ...

- Preventive measures
  - change position grid opening
  - Control
Functions of the Medium Voltage network: 2) Market Facilitation

- commercial decentralised generation and storage
- new technology developments (EV quick charger)
- new products and service (islanding, peakshaving)
- publication of grid measurements
- publication of market information (price signals)
- ack/nack availability of distribution capacity (DSM, VPP)
- dynamic asset allocation
Functions of the Medium Voltage network: 3) Supporting functionality

- Information management
  - autodetect new stations
  - monitoring communication infrastructure
  - configuration management
  - access control
  - registration of legal/contractual constrains

- Asset management
  - life time monitoring
  - planning and designing
  - outage registration and penalty fee administration
Liander LiveLab: A permanent test and learn environment

Intelligence

Interconnect

Instrumentation

Liander LiveLab Management

Data analysis

Data distribution

Control room

Field installation
The Liander Livelab chain

Controlled and conditioned LAB environment

- Telecom
- RTU / PLC
- Sensor / Actuator
The Liander Livelab chain

Controlled and conditioned LAB environment

- Sensor / Actuator
- RTU / PLC
- Telecom
- Collection server
- Service bus
- SCADA
The Liander Livelab chain

- Instrumentation
  - Sensor / Actuator
  - RTU / PLC

- Interconnect
  - Telecom
  - Collection server
  - Service bus

- Intelligence
  - SCADA
  - Network intelligence

- Business applications

Controlled and conditioned LAB environment
The Liander Livelab chain

Controlled and conditioned LAB environment

- Business applications
- Network intelligence
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Data path

- Security
- Configuration management
- Data management
- Workforce management

Titel van de presentatie
The MS-Livelab chain

Controlled and conditioned LAB environment

- Business applications
- Network intelligence
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- Service bus
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- Telecom
- RTU / PLC
- Sensor / Actuator

Operation and administration

Data path

- Security
- Configuration management
- Data management
- Workforce management
- LiveLab Control and Operations

Titel van de presentatie
The Liander Livelab chain

Controlled and conditioned environment

- Business applications
- Network intelligence
- SCADA
- Service bus
- Collection server
- Telecom
- RTU / PLC
- Sensor / Actuator

Operation and administration

- Security
- Configuration management
- Data management
- Workforce management
- LiveLab Control and Operatie
- Requirement management
- Business case
- Testing
Three different areas in Zaltbommel:

- **Urban**
- **Mixed**
- **Rural with DCO**
MV transformer station

Possible measuring points

MV

Transformer

LV
MV transformer station

Possible measuring points

transformator
MV transformer station

- Temperatuur: TEMP_BUITEN_MSR
- Temp: TEMP_BINNEN_MSR
- Vochtigheid: HUM_BINNEN_MSR
- Video: CAM_BINNEN_MSR
- Status: ST_DEUR_MSR
- Luchtstrooming

Temperatuur: TEMP_IN_MSR

Status: ST_DEUR_MSR
Variant 1: Compact ruimte diabolo
Variant 2: Compact ruimte C3P/TB/Gr2
Variant 5: Betreedbare ruimte / Nieuwe MS + oude LS
MS-LiveLab

Interconnect

- Direction
- Data analysis
- Data distribution
- Control room
- Field installation
Titel van de presentatie

Datacollection

Dataprocessing

SCADA

Monitoring

Datacollectie - resolutie 0,1 - 1 seconde

Dataset met

Configuratie
RealTime
Historie
Asset Management

Configuration
Real Time
History
Asset Management

Protocol
Overdracht < 2 seconden > 10K waarden per seconde
OPC Interface

Protocol
Overdracht < 2 seconden > 10K waarden per seconde
OPC Interface

Alarm Parameters Status

Buffer

MS LiveLab

Tables
Augmented Reality
Mobile
WebSites
Citrix Client
Internet

Citrix server
DMZ

SAP ECC
GIS
Kantoorn Automatisering

KLAK
DMZ

Citrix server

Technische Automatisering

MS LiveLab

Telecom Manager

DFR trigger parameter

MSR Box

RTU

Sensor

RTU

Sensor

RTU

Sensor

RTU

Sensor

1850 (E)

Fabrikant Specifiek
Protocol

Trafo/Kabel/Schakelaar

SysteemLandschap v0.2
Network- en asset analyse

What are the questions LiveLab Livelab is going to give an answer:

Which methods are needed to get the information out of the data?

Which measurements are relevant; how many measurements are necessary?

Which requirement should be put on the data like interval, periods, accuracy?

Themes:
- Optimal net performance
- Consumer/customer and his environment
- Granularity and accuracy
- Central versus decentral processing
Information from data
MS-LiveLab

MS LiveLab Management

Data analysis

Data distribution

Control room

Field installation
Liander LiveLab is a permanent test- and evaluation environment for medium voltage

Positioning Liander LiveLab

Innovation

Idea → Concept

MS-LiveLab

Demonstration & Validation

Pilot

Roll-out

Operation

Production

Operation and Support

Research, evaluation project

Research, evalutatie project

Liander LiveLab (base)

New Projects

Results
Liander-LiveLab is het stadium van PowerPoint voorbij: MSR 1 en 2 opgeleverd in April 2012
Liander-LiveLab is het stadium van PowerPoint voorbij: MSR 3 en 4 in juli 2012 gerealiseerd.
Smart Grid key players: Information sharing
from NISTIR 7628 Smart Grid Cyber Security Strategy and Requirements, Annabelle Lee

Figure 2.1 Information sharing components of the Smart Grid
“NIST Spaghetti Diagram”
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Thank you for your attention

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