Digital Transformation of Energy Systems

A holistic approach to digitization of utility system operations through effective data management
DNV GL: Global classification, certification, technical assurance and advisory company

Mission: ‘To safeguard life, property and the environment’
Digital Transformation of Energy Systems will allow utilities to improve:

- How they serve their customers → Improved engagement
- How they run their operations → Using their data and applying big data analytics
- The products and services that they offer → Smart, cloud, social media, mobile, web
Digital transformation in Energy -> Digital Disruption?

Google's DeepMind is in talks with National Grid to apply artificial intelligence to energy use.

Disruptive technologies: Advances that will transform life, business, and the global economy.

AutoGrid
There's Big Money In Energy Big Data

What does Disruption really mean?

""""""90% of companies will be using data-driven business insight by 2020.""""
who embraced change
The Potential of Digital Transformation at Utilities is huge

Forecasted cumulative global spending on power utility digitalisation will grow up to an annual spend of $3.8 billion globally by 2020

Internet of Energy – Data intake
Examples of Digitization in Energy

- Operation decision support
- System situational awareness
- Fault location and root cause analysis
- System oscillations detection (using PMU data)
- Real-time voltage stability monitoring
- Alarm processing and filtering
- Renewable energy generation forecasting analytics
- Weather caused damage prediction
- Asset health assessment analytics
- Predictive asset maintenance analytics
- Outage restoration analytics
- Power quality analytics
- Peak load management analytics
- Load research analytics
- Vegetation management analytics
- Non-technical loss analytics
- Cyber security assessment analytics

Is the cable operating as expected and can I predict when and where it will fail?
How does my retail energy offer compare with others in the competitive market?
How is this customer using energy throughout the day?
Where are the best locations in a region to place renewable assets?
Example of a disruptive technology: Blockchain

- Blockchain is an emerging digital technology acting as a distributed ledger to record transactions.
- It removes the need for centralized third-party intermediaries and supports cryptocurrencies that function similar to cash (e.g. Bitcoin) which are exchanged immediately.
- As the energy internet of things (eIoT) evolves, blockchain may facilitate payments and other information exchanges among customers and service providers.
- Applications of Blockchain in Energy could be in the area of energy trading, digital trust and cyber security.

**BLOCKCHAIN HOLDS KEY TO REINVENTING ENERGY GRID**

An industrial blockchain platform powering digital transformation

Blockchain For Cybersecurity: Protecting Infrastructure, Data, Telecommunications
Data is the new raw material of business .... but, how to manage it?
Typical Project execution

% Time used

- Administration: 30%
- Preparation: 60%
- Execution: 10%

Sustainable target:
- Preparation: 0%
- Execution: 0%
- Reporting: 0%

Tasks:
- Administration
  - Discuss business case
  - HW, DB and software preparation
  - Collect and import/access
- Preparation
  - Metadata and Ontology
  - Prepare views and calculations
  - Build dashboards and...
- Execution
  - Analytics
  - Discuss findings
- Reporting
  - Dissemination
In Data Driven projects 70 % of the time is spent in import, data preparation, quality management and data improvement.
Data reality in utilities

Reality in utilities:
1. Data is stored in silos
2. Data definition is not harmonised
3. Data reference model is not shared
4. Only system IDs: no 'Globally Unique Identifier'
5. Poor data quality control
6. Intensive search needed to acquire needed information
7. Intensive maintenance work on data quality and data interfaces

Ideal situation
1. Single definition of data
2. Single Point of Truth: no redundancy
3. Integration of distributed data
4. Defined data lifecycle
5. System independency in data
6. Sufficient data quality level: complete, right and up-to-date
7. Sufficient data retrieval performance

Poor Data ➔ Poor Decisions
Corporate Data Governance takes a long term focus
The CIM is an international IEC standard that models the information exchanges required in electric utilities.

It is independent of any individual application, middleware, or message protocols used for data exchange.

The interoperability enabled by the CIM standards is a key factor for achieving the Smart Grid vision.
Holistic Data management for Electric Utilities
How to focus on reducing the ‘70%’

- **Data modeling**
  - Remove data silos by adoption of a standardized (CIM based) enterprise logical datamodel

- **Data quality assessment**
  - Assess and manage the quality and ‘truthfullness’ of the data

- **Enterprise architecture for analytics**
  - Solution for capturing of large datasets from different sources
  - Ability to work with a variety of types of data
    - data warehouses vs data lakes
    - cloud vs on-premise
  - Solution for handling streaming data (analyze close to the source)
  - Create Proof-of-Concepts in a ‘Data development and discovery lab’
  - Digital Twin concept
  - Hardware in the loop testing
DNV GL can help in unlocking the power of digitalization
Partial Discharge in a 10 kV cable

Smart Cable Guard: Predictive analytics solution for cable failures

PD pulse  Synchronization pulse

Warning level  Raw data

Server

up to 16 km

defect
Just launched: DNV GL’s Veracity industry data platform
... reducing friction between data sets and stakeholders...

Veracity

Data Management Services

HRS
Viewer and builder for the HRS dataset
more dataset info
Viewer
Builder
Sensor browser

Energy Statnett demo
Frequency and weather data
more dataset info
Viewer
Builder
Sensor browser

Statoil WHF demo
Wellhead fatigue visualization
more dataset info
Viewer
Builder

PMU Nordic power grid
Gothia Power
more dataset info
DQD (External link on Azure)
Holistic Data management will enable Digital Transformation in Energy

Project manager of a data-driven project in a utility that is taking its data governance serious
DNV GL can help in unlock the power of Digital Transformation in Energy
Come visit us at our booth or in our Live Demo Lab

Theo.Borst@dnvgl.com
Business Director Digital Transformation of Energy Systems
www.dnvgl.com

SAFER, SMARTER, GREENER