THE UTILITY NETWORK FOR POWER GRIDS
- DONG ENERGY CASE STUDY PRESENTATION

Jesper Vinther Christensen & Signe Bramming Andersen
Wednesday the 12th of July 2017
Abstract

The Utility Network for Power Grids
– DONG Energy Case Study Presentation

DONG Energy experiences with:
- Defining a domain model - Migrating data from the existing data model
- Implementing the first applications managing designs covering all processes from the first idea to commissioning
- Integrations with operational and asset perspectives (ADMS, SAP)

After this session you will know how the Utility Network solves the demand for a more accurate and rich representation of the grid and support for planning, maintenance, and operation processes
DONG Energy develops energy systems that are green, independent and economically viable

- EBITDA (2016): DKK 6.5 bn
- Exploration and production of oil and gas
- Focused position with activities in Norway, Denmark and UK
- High quality, low-cost core assets
- Process to exit Oil & Gas initiated

Wind Power
- EBITDA (2016): DKK 11.9 bn
- Global leader in offshore wind with 3.6GW installed
- Active in all parts of the value chain - develops, constructs, owns and operates offshore wind farms
- Robust and visible build-out plan of 3.8GW towards 2020
- Differentiated partnership model

Distribution & Customer Solutions
- EBITDA (2016): DKK 7.1 bn
- Distributes power and sells energy solutions to our customers
- Largest power distributor in Denmark with 1 million customers
- Largest utility with 900,000 residential and industrial customers in Denmark

Bioenergy & Thermal Power
- EBITDA (2016): DKK 0.1 bn
- Generates heat and power at central heat and power stations
- #1 in Danish heat and power generation with a strong and increasing biomass position

Oil & Gas
- EBITDA (2016): DKK 6.5 bn
- Exploration and production of oil and gas
- Focused position with activities in Norway, Denmark and UK
- High quality, low-cost core assets
- Process to exit Oil & Gas initiated

Revenue (2016): DKK 61bn
EBITDA (2016): DKK 19.1bn
~6,200 employees
Active in Scandinavia, United Kingdom, Germany, The Netherlands, USA and Taiwan

1. Continuing operations
2. One-offs from renegotiations of long-term gas contracts: DKK 4.3 bn
3. Discontinued operations
DONG Energy has a strong presence in Northwest Europe with positions in USA and Taiwan.
State of the climate 2016

- The concentration of greenhouse gas emissions in the atmosphere has never been higher
- Warmest year ever recorded
- The extent arctic sea ice is lowest ever recorded
- Water levels in the oceans are the highest ever recorded
- Areas in ‘severe’ drought rose dramatically

Source: The World Meteorological Organization
Structural transformation of European power

Production from renewables forecasted to more than double in the European power mix by 2040

%  

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal</th>
<th>Gas</th>
<th>Oil</th>
<th>Nuclear</th>
<th>Hydro</th>
<th>New renewables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>41%</td>
<td>11%</td>
<td>9%</td>
<td>28%</td>
<td>2%</td>
<td>7%</td>
</tr>
<tr>
<td>2014</td>
<td>27%</td>
<td>28%</td>
<td>12%</td>
<td>8%</td>
<td>12%</td>
<td>14%</td>
</tr>
<tr>
<td>2040</td>
<td>19%</td>
<td>19%</td>
<td>8%</td>
<td>25%</td>
<td>0%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Multiple factors driving European transition away from fossil fuels

- De-carbonisation
- Replacement of aging capacity
- Security of supply
- Local job creation

Source: IEA 2016, World Energy Outlook; European Union, New Policies Scenario
DONG Energy is transforming its business model

**Business mix transformed**
Share of capital employed
DKK billion¹

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil &amp; Gas</td>
<td>35%</td>
<td>22%</td>
</tr>
<tr>
<td>Utility²</td>
<td>43%</td>
<td>16%</td>
</tr>
<tr>
<td>Wind Power</td>
<td>84%</td>
<td>58%</td>
</tr>
</tbody>
</table>

**Operating profit doubled**
EBITDA, DKK billion¹

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil &amp; Gas</td>
<td>8,1</td>
<td>19,1</td>
</tr>
<tr>
<td>Utility²</td>
<td>1%</td>
<td>56%</td>
</tr>
<tr>
<td>Wind Power</td>
<td>99%</td>
<td>44%</td>
</tr>
</tbody>
</table>

**Increasing return**
Adjusted ROCE, %¹

**Earnings quality increasing**
Share of regulated EBITDA, %¹³

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market price exposed</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Contracted</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>Regulated &amp; quasi-regulated</td>
<td>95%</td>
<td>93%</td>
</tr>
</tbody>
</table>

1. Continuing operations
2. Includes Bioenergy & Thermal Power and Distribution & Customer Solutions
3. Excluding one-offs and Gas Distribution EBITDA
Early shift towards renewables has driven strong shareholder returns

2015 generation from new renewables in % of total power generation

<table>
<thead>
<tr>
<th></th>
<th>E.ON</th>
<th>RWE</th>
<th>Centrica</th>
<th>Engie</th>
<th>Verbund</th>
<th>Fortum</th>
<th>EDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>New renewables</td>
<td>17%</td>
<td>6%</td>
<td>5%</td>
<td>5%</td>
<td>4%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Renewables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total shareholder return (29 Nov 2013 to 2 Feb 2017)

<table>
<thead>
<tr>
<th>Company</th>
<th>EDPR</th>
<th>EDP</th>
<th>Enel</th>
<th>Iberdrola</th>
<th>SSE</th>
<th>E.ON</th>
<th>RWE</th>
<th>Centrica</th>
<th>Engie</th>
<th>Verbund</th>
<th>Fortum</th>
<th>EDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return</td>
<td>137%</td>
<td>54%</td>
<td>14%</td>
<td>42%</td>
<td>30%</td>
<td></td>
<td>-35%</td>
<td>-54%</td>
<td>-25%</td>
<td>4%</td>
<td>5%</td>
<td>-57%</td>
</tr>
</tbody>
</table>

Source: FactSet, Company reports and other publicly available information. Peer group is composed of the largest listed European energy companies.
1. New renewables include onshore wind, offshore wind, solar PV, and bioenergy.
2. Renewables as share of total generated heat and power.
DONG Energy has emerged as a mid-sized European energy player

Market cap of largest European energy groups
DKK billion

Source: FactSet, 2 Feb, 2017
Strong performance in 2016

EBITDA
DKK billion

Oil & Gas  Continuing operations

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>8.6</td>
<td>8.7</td>
<td>8.7</td>
</tr>
<tr>
<td>2015</td>
<td>9.8</td>
<td>18.5</td>
<td>18.5</td>
</tr>
<tr>
<td>2016</td>
<td>23.0</td>
<td>25.0</td>
<td>25.6</td>
</tr>
</tbody>
</table>

+39%
2016 was a very good year

- **EBITDA**: DKK billion¹
  - 2015: 8.7
  - 2016: 19.1

- **Adjusted ROCE**: %¹
  - 2015: 5.9%
  - 2016: 24.4%

- **Net profit**: DKK billion¹
  - 2015: 1.0
  - 2016: 12.2

- **Free cash flow**: DKK billion¹
  - 2015: -3.2
  - 2016: 5.4

- **Renewable share of generation**: %²
  - 2015: 49%
  - 2016: 50%

- **Customer satisfaction**: Scale (1-100)
  - B2B: 2015: 75, 2016: 76
  - B2C: 2015: 76, 2016: 76

- **Safety performance**: LTIF¹,³
  - 2015: 2.0
  - 2016: 1.8

- **Employee satisfaction**: Scale (1-100)¹
  - 2015: 74
  - 2016: 76

---

1. Continuing operations
2. Renewables as share of total generated power and heat
3. # of lost-time injuries within a given accounting period relative to the total # of million hours worked in the same accounting period
DONG Energy’s strategic direction remains clear

Group

- Lead the market in the transition to sustainable energy
- Compete from market-leading positions and grow through innovation
- Leverage existing strongholds and build long-term growth options

WP

Fuel global market leadership and profitable growth – ambition of 11-12GW capacity by end of 2025

BTP & DCS

Transform BTP and DCS to smart, green and growing businesses

O&G

Drive value and strength of Oil & Gas and prepare for new ownership
Business Units’ objectives support strategic direction

**Wind Power**
- Maintain the position as global market leader
- Support profitable growth by realising our current build-out plan for the period towards 2020
- Expand installed capacity to 11-12GW (ambition) by 2025 provided that the risk and return profile is sound
- Continue to reduce the cost of electricity for offshore wind through industrialisation, economies of scale and innovation

**Bioenergy & Thermal Power**
- Continuously strengthen operational excellence
- Continue the conversion of Danish CHP plants to sustainable biomass
- Phase out the use of coal and stop using coal from 2023
- Continue the commercial development of our enzymatic waste technology REnescience

**Distribution & Customer Solutions**
- Maintain a high level of security of supply and customer satisfaction in our distribution business
- Further strengthen competitiveness and customer satisfaction among residential and business customers in our sales business
- Optimise our energy portfolio and provide competitive market access

**Oil & Gas**
- Adapt to new market realities
- Transform Oil & Gas into a lean cash-generating business to fund investments in renewables
- Prepare for new ownership
Return targets extended towards 2023

### Average ROCE target 2017-2023

<table>
<thead>
<tr>
<th>Segment</th>
<th>Target Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>DONG Energy</td>
<td>12-14%</td>
</tr>
<tr>
<td>Wind Power</td>
<td>13-15%</td>
</tr>
<tr>
<td>Distribution &amp; Customer Solutions</td>
<td>9-11%</td>
</tr>
</tbody>
</table>
Significant decarbonisation of heat and power production – ambition to be coal-free by 2023

DONG Energy’s reduced emissions of greenhouse gasses

$\text{g CO}_2$ equivalents / kWh

- **Actual**
- **New target (2017)**
- **Old target (2013)**

---

1. $\text{CO}_2$ equivalents is the standard unit for greenhouse gas emissions. The new definition includes all greenhouse gasses from thermal production, i.e. $\text{CO}_2$, $\text{N}_2\text{O}$ and $\text{CH}_4$ in accordance with the Green House Gas Protocol. This means that for example the $\text{CH}_4$ emissions are converted into similar $\text{CO}_2$ emissions based on the greenhouse gas potential of $\text{CH}_4$ and added to the $\text{CO}_2$ emissions.
Smart Energy is about implementing a data and process centric strategy.

- Defining a transparent and communicated **master data management strategy**, delegating the responsibility of data ownership for each data component.

- Having aligned **business processes** across business units, integrating the Planning, Maintenance and Operation of the Critical Infrastructures into unified processes.

- Implementing a **seamless integration** between software platforms ensuring process support and maintaining high data quality.
Smart Grid Architecture – From an IT-perspective

That support the **Planning, Maintenance** and **Operation** of *Electric Power Systems*
DONG Energy Smart Grid Projects

- MDM/AMI & Smart Meter Roll-out
- New Esri Utility Network
- Outage Management System
- Merge of DMS & OMS
- GridHub Analytics
- Advanced Distribution Management System
- Low Voltage ADMS*
- Integrated SCADA Platform + HV ADMS*

* Future possible projects - Not decided
Objectives & Goals:

- Cost Reduction
- Low cost maintenance and agile development
- The data model is the best possible representation of reality
- The data model supports all relevant business processes
- Data is collected as close to the origin as possible
- GIS data is easy available across processes and applications
- GIS supports enrichment and quality assurance of data in all steps of the data value chain
Project Scope – supporting more business processes

Phase 1: Implementing the Utility Network
- Creating a Utility Network Data Model
- Migration Tool & Migration
- Design Tool & QA
- Task List
- Editing Tools
- Reporting Tool
- Integration to DMS and OMS
- Integration to SAP
- Integration to Work Manager & Geo.e

Later phases: Possible Projects
- Automating import of as-build information
- Supporting Design Sketches
- Adding simple load estimation to designs
- Adding Price Calculations to designs
- Evaluate Contractor Invoices
- Managing Estimates to Contractors
- Support Condition Based Maintenance
- Support Grid Value Estimation
- Support full Project Life Cycle
- Support for future LER requirements
- Support field crews with schematics information
<table>
<thead>
<tr>
<th>Work Items – Topics to be addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Data Models</strong></td>
</tr>
<tr>
<td>• Domain models ability to represent the needed grid configurations</td>
</tr>
<tr>
<td>• Will the expressiveness of rules meet the requirement form</td>
</tr>
<tr>
<td>• How can versioning and temporal aspects of the model cover the grid change processes?</td>
</tr>
<tr>
<td><strong>2. Business Process Support</strong></td>
</tr>
<tr>
<td>• What constructs for modelling business processes will be available?</td>
</tr>
<tr>
<td>• How can these be customized and extended?</td>
</tr>
<tr>
<td>• Will where be Utility Specific workflow supported natively, e.g. will end to end construction projects be supported?</td>
</tr>
<tr>
<td>• How is install and un-install processes supported?</td>
</tr>
<tr>
<td><strong>3. User Experience</strong></td>
</tr>
<tr>
<td>• What can we expect from Esri in term of user interfaces covering typically utility production processes?</td>
</tr>
<tr>
<td>• How can we extend and combine delivered UI's to cover specific needs?</td>
</tr>
<tr>
<td><strong>4. Programming Interfaces</strong></td>
</tr>
<tr>
<td>• How can be build applications on top of the Utility Model?</td>
</tr>
<tr>
<td>• Which strategy should we use to deploy the same or similar functionality on several platforms?</td>
</tr>
<tr>
<td>• What part of the SDK and API's would should we start out with?</td>
</tr>
<tr>
<td><strong>5. Integrations</strong></td>
</tr>
<tr>
<td>• How will the overall system architecture be?</td>
</tr>
<tr>
<td>• Which data should be distributed across multiple platforms, and</td>
</tr>
<tr>
<td>• How will we do this?</td>
</tr>
<tr>
<td>• Which tools will be included to exchange data with 3rd party systems</td>
</tr>
<tr>
<td><strong>6. Migration</strong></td>
</tr>
<tr>
<td>• What tools will be available to support the migration?</td>
</tr>
<tr>
<td>• How can we keep up with model changes in the mapping to the Utility Model?</td>
</tr>
<tr>
<td>• What is the recommended migration strategy and process?</td>
</tr>
</tbody>
</table>
Project Milestone Plan

- H1 2017: First productive delivery from East
- H1 2018: Project Kickoff
- April 2018: First productive delivery from East
- June 2018: Second productive delivery from East
- Sep 2018: Design and Project Execution Plan Approved
- Oct 2018: Go-live of merged OSM platform
- Sep 2018: Third productive delivery from East
- September 2018: Go-live of new GIS platform

**Phases:**
- Project Preparation
- Analysis
- Maturation
- Execution
- Evaluation
The Utility Network:

- Implements the next generation geospatial platform for Utilities
- With a responsive data model capturing both Asset and Operational aspects of the infrastructure
- Using a completely new multi-threaded, 64bit, service based architecture
- And leveraging the advanced technologies to all part of the Esri Technology Stack, including desktop, web, cloud, and mobile technologies.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Functionality</th>
<th>Business Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Is optimized for high-performance and is scalable to very large utilities</td>
<td>- Models how every component of the grid is connected</td>
<td>- Supports end-to-end business processes</td>
</tr>
<tr>
<td>- Represents dense area of the grid without map clutter</td>
<td>- Enforce data integrity and reduce data entry errors</td>
<td>- Reduces the cost and increase the quality of documentation processes</td>
</tr>
<tr>
<td>- Enables advanced analytics on the grid</td>
<td>- Gives a comprehensive view of the grid</td>
<td>- Contributes to the operational efficiency of the grid</td>
</tr>
<tr>
<td>- Supports long term planning</td>
<td></td>
<td>- Optimizes the maintenance processes reducing the overall cost</td>
</tr>
</tbody>
</table>

[Diagram showing desktop, mobile, and web connections to a utility network]
The Utility Network – the model

Utility network contains

- Domain network (one or several) that is organized into hierarchical
  - Tiers (one or several) that contain
    - Subnetworks (many) which are comprised of
      - Feature classes (five) that apply a
        - Type classification to define
          - Features which have
            - Terminals (optional) and
              - Fields with values constrained by
                - Attribute domains

- Structure network (one) that is organized into
  - Feature classes (three) that apply a
    - Type classification to define
      - Features which have
        - Fields with values constrained by
          - Attribute domains

Connectivity established in a network topology
Schematic visualization with diagrams

Domain network
- Feature classes: Electric Distribution, Device, Switchgear
- Tiers
- Subnetworks
- Feature classes: Assembly, Structure
- Attribute domains

Structure network
- Feature classes: Line, Structure, Junction
- Tiers
- Subnetworks
- Feature classes: ConnectionPoint, Splice, CabinetNode, LineEnd
- Attribute domains

Is Attacked To
Is Explicitly Connected To
Contains
IsConnectedTo

Electric Distribution
- Component: Electric Distribution Line
- Feature classes: ActiveLineSegment, ServiceLine, Busbar

Device
- Feature classes: Transformer, LoadBreakSwitch, Disconnector
- Attribute: ServiceDeliveryPoint, FaultIndicator

Switchgear
- Feature classes: Switch, Switchboard
- Attribute: Station, Cabinet

Structure Junction
- Feature classes: StructureLine, Duct, Trench
Feature Classes, Asset Groups & Relationship Types

Electric Distribution
- Device
  - Transformer
  - Fuse
  - LoadBreakSwitch
  - Disconnector
  - Breaker
  - ServiceDeliveryPoint
  - ServiceLocation
  - FaultIndicator
  - Generator

AcLineSegment
ServiceLine
Busbar

Electric Distribution Assembly
- Switch
- Switchgear

Electric Distribution Junction
- ConnectionPoint
- Splice
- CabinetNode
- LineEnd

Structure Junction
- Switchboard
- Station
- Cabinet

Structure Line
- Ductbank
- Duct
- Trench

Is Attacked To
Is Explicitly Connected To
Contains
IsConnectedTo
Asset Groups, Asset Types and Relationships – An example

- **Busbar** (EDL)
- **Switchboard** (StructureJunction)
- **Station** (StructureJunction)
- **Switch** (Assembly)
- **Switchgear** (Assembly)
- **FaultIndicator** (EDD)
- **LoadBreakSwitch** (EDD)
- **AcLineSegment** (EDL)
- **LineEnd** (EDJ)

Relations:
- **Is Attacted To**
- **Contains**
- **Is Connected To**
- **Is Explicitly Connected To**

Diagram showing connections and relationships between asset groups and types.
Data migration

Mapping configuration

Existing GIS Database

Migration Tool

New Data model

New Database with the Utility Network
Migrated data – examples
Supporting complex projects
Patch or incremental exports

- To support the life-cycle of projects, incremental changes or patches are used to describe added or removed components, that will be energized in one operation.

Full Feeder Export

- Full feeder export from GIS and SAP supports migration of data to DMS and will also be used for initial export of new feeders and to validate GIS and DMS model against each other.
Managing Long Transactions between multiple loosely coupled systems

**Project manager**
- Plans the work to be carried out
- Delivers plans to GIS documentation department
- Delivers final documentation when the job is carried out.

**GIS documentation**
- Documents the plans for the project in GIS.
- Creates patch exports for DMS.
- Posts changes in GIS when project is in production in DMS.
- Documents final implementation once information is received from project manager.

**DMS Model Manager**
- Evaluates patches and approves them for later energization or rejects them and returns them to GIS for corrections.
- Draws schematic layout in DMS.
- Ensures that new data sent to DMS is correct.
- Handles full feeders containing final documentation of the network.

**Grid operator**
- Controls the switching state of the network
- Communicates with the field crew during commissioning or decommissioning of equipment.
- Energizes patches in DMS which updates the electric model and triggers feedback to GIS.

**Field crew**
- Follows the orders of the grid operator.
- Carries out the work planned by the project manager.
- Delivers information for final documentation of the finished project to the project manager.

---

Plan  
Document  
Prepare  
Commissio

---

32
Case: New Transport Hub in Høje Taastrup
Network patch introducing new substations to the network
Smart Grid Integration Architecture

- **GIS Adaptors**
  - Geodatabase
  - Create
  - Version
  - Post

- **GIS WFM**

- **FeederSync Services**
  - FeederSync Repository

- **SEW State Engine**
  - CTOOL Services

- **DMS**
  - CIM Import File Share
  - CIM Import Adaptor
  - CTOOL Adaptor

- **OMS**
  - SAP PM
  - SAP BO/HANA

- **SAP PO**
  - CIM Export File Share
  - SAP Platform

- **ADMS Platform**
Supporting future field crew

Further integration of maintenance processes across technology platforms
Extend the use of GIS to analyze, explore and visualize data
Streamline the current integration and dataflow
Support new business process for asset management and "Smart" Maintenance
Supporting future asset management
System Support for Asset Management

Strategic Asset Management

- SAP
- GIS
- ADMS

Un/installBreaker() (Orchestration)

Un/installBreaker() SAP PM
Un/installBreaker() ArcGIS
Un/installBreaker() ADMS

Switching Plan:
1) Breaker1 Done
2) Ground Cable1 Done
3) Breaker2 Relaunched
4) Ground Cable2 LOCK

ConfirmOperation() ADMS
Asset Management Optimization involves all processes

Which breaker should I maintain first?

Why am I maintaining all breakers?

How can I update the data in the Asset Information Systems?
Can we half the number of the substations inspected each year?

Substations what haven’t been maintained for a long time

Substations what if failing will impact critical customers

Substations impacted from environmental conditions (e.g. close to the sea or dusty roads)

Substations of a type that are known to fail

Substations that have been impacted from extreme operational conditions
MAINTENANCE STRATEGIES

**Time-based maintenance (TBM):**

TBM is performed at regular and scheduled intervals, loosely based on the service history of a component and/or the experience of service personnel. This maintenance policy can be expensive and may not minimize the annualized cost of equipment.

**Condition-based maintenance (CBM):**

CBM periodically evaluates the *state of equipment deterioration* expressed quantitatively as a *score or failure risk*, and maintains equipment when the condition falls below acceptable thresholds. Additionally, CBM approaches rank assets within a given asset group with respect to each other, thereby enabling a prioritization of investments.

**Reliability-centered maintenance (RCM):**

RCM considers *both the probability of equipment failure and the system impact should a failure occur*. RCM approaches rely on frameworks for estimating network reliability indices based on the failure rates of the different components. Most commonly, such frameworks operate at the level of individual feeders and can be divided into *analytical* and *simulation* approaches.
High Level System Architecture – Some Ideas

- ArcGIS Server
- Reporting Services
- Integration Services
- Back-end Services
- Non-Spatial Data
- ARC-SDE
- Spatial Data Warehouse
- SAP PO
  - ADMS
  - HAS
  - MDM
  - SPC

- SAP PM
- SAP PO
- SAP ISU

- SAP PO
  - SAP PO
High Level System Architecture

Application Space

- Extensions to ArcGIS Pro
- ArcGIS Pro
- ArcGIS Online Applications
- Custom Application

Back-end Services

Integration Services

ArcGIS Server

Reporting Services

Non-Spatial Data

ARC-SDE

Spatial Data Warehouse

SAP PM

SAP PO

SAP ISU

DMS

HAS

MDM

SAP PO

Custom Application

Applications

Custom Application

Extensions to ArcGIS Pro

ArcGIS Pro

ArcGIS Online Applications

Spatial Data Warehouse

Non-Spatial Data

ARC-SDE

Integration Services

Back-end Services

ArcGIS Server

Reporting Services
Credits goes to….
Signe Bramming Andersen, Senior Manager, Head of Asset & Energy Management, Group IT, DONG Energy. Responsible for implementing IT-platforms for supporting DONG Energy’s Smart Energy Programmes including Utility Network, ADMS, Wind Farm Management, Power Hub (VPP).

Signe has worked with DONG Energy since 1999 and holds a Master in Economics & Business Administration. Contact: sigba@dongenergy.dk

Jesper Vinther Christensen, founder and Owner of SIMILIX, Esri & OSIsoft partner. Jesper is currently working as partner/advisor on UN implementations on the DONG Energy as well as other customers and as architect on several projects.

Jesper holds a Ph.D. in GeoScience & Computing Science and has 20 years of experience with IT-projects, especially with System Integration, Enterprise Architecture and Geographic Information Systems. Contact: jesper@similix.dk