Nord Stream 2 – A story of gas pipelines and GIS technology from the start

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Presentation - Outline

- Project Overview
- Initial GIS Project Setup
- Project Data
- GIS Portal:
  - Case study – Engineering Data Flow
  - Geoevent Server
- Future Applications
- Conclusions
The Pipeline Will Run Through the Baltic Sea – Along the Proven Nord Stream Route.

> A double 48” pipeline from Russia to Germany
> Approximately 1,200 km long
> Going through 5 countries EEZ and TW
> Pipelay began July 2018
> Route optimised for minimum impact on the environment
Advantages:
- GIS integrated from the start of the project.
- Possibility to specify data format from and to contractors (coordinate integrity).
- Direct contact with different departments and contractors.
- Ability to choose system setup and adapt is as we go.

Disadvantages:
- IT overhead
- Licensing costs
- Experience (small department)
**Out the box capabilities:**
1. On-site deployment and management
2. Create, develop, manage and share GIS web applications
3. Company wide access to GIS content
4. Future proof (long-term support)

**Value added capabilities:**
1. Interactive and engaging presentations (Story maps)
2. Geoevent Server and external data sources (Vessel Tracking AIS, AGOL)
3. Digital video integration - VisualGIS Server
4. Pipeline Specific Capabilities – ArcGIS Pipeline Referencing extension

**Initial – Single Machine Configuration**
Project Data - Digital Data Challenges

Common Project Challenges:
- Significant quantity of data (Geodetic Integrity)
- Number of different technical and non-technical departments and users
- Frequent updates to data revisions & data QC
- Non-GIS educated user base

Exceptional Project Challenges:
- Geographically extensive project (5 Countries & 3 UTM zones)
- Onshore & Offshore
- Schedule-driven project
- Scrutiny of project and data
- 2 person GIS department
Project Data - Sources

Before the project:
- Existing Pipeline and Cable Data
- Third Party Data (Protected and restricted areas, borders)
- Desk study Data

During the project (>90 TB):
- Design Data (Survey and Engineering)
- Third-party data
- Engineering and Construction data
- As-Built Data
- ...

After the project:
- Inspection and Maintenance survey
- ...
GIS Portal - Initial Setup

DATA INPUTS

Survey
Engineering
Construction
Permitting
Other Depts & Third Parties.

ETL – Extract Transform & Load (FME, ArcGIS)

ESRI GIS Portal - Reality

Internal Network & VPN

NSP2 GIS Databases
ArcGIS

AGS / GIS Portal

Document Management System

EXTERNAL USERS (AGOL)

EXTERNAL USERS
GIS Portal - How do we get the data to our users?

• Constantly updating datasets (route, KPs)
• Different data formats
• Few GIS expert users
• No dataset is perfect
• Different departments with different needs
GIS Portal – Department & Project Influence

- Project Management
- Construction
- Logistics
- Survey
- Document Control
- Materials
- Engineering
- Communications
- IT
- HSE
- Permitting
GIS Portal - GIS Capabilities Setup

GIS Department
- ArcMap
- ArcGIS Pro
- Global Mapper
- FME
- Geographic Calculator
- AutoCAD
- etc

Other Users
- DMS (Easy) & Sharepoint
- GIS Portal
GIS Portal Setup - Document Control System

Internal Network & VPN

ESRI GIS Portal - Reality

DATA INPUTS
- Survey
- Engineering
- Construction
- Permitting
- Other Depts & Third Parties.

ETL – Extract Transform & Load (FME, ArcGIS)

NSP2 GIS Databases ArcGIS

AGS / GIS Portal

Document Control System

EXTERNAL USERS (AGOL)

USERS
Advantages:
• Data is organised and traceable
• Updates are tracked
• Can be uploaded by contractors

Disadvantages
• **Non-spatial**
• Compiling can be complex
• Search can be difficult
Morning Cecile, I need to find the name of the closest Pre-lay berm next to Cable crossing UESF2 Line A and what are the lay restrictions?
Morning Cecile, I need to find the name of the closest Pre-lay berm next to Cable crossing UESF2 Line A and what are the lay restrictions?
Case study: Engineering Data Flow (GIS Portal)

FI-A1024 and +/- 2.5 from the centre line
Case study: Engineering Data Flow (GIS Portal)

Data treatment and transfer

- Data selection
- Set up processes for repeated data updates
- Set up priorities
- Maintain communication with different departments
- Introduce the users to the Portal
- Enable users to answer their own questions
Case study: Engineering Data Flow (GIS Portal) - ETL

DATA INPUTS
- Survey
- Engineering
- Construction
- Permitting
- Other Depts & Third Parties.

ETL – Extract Transform & Load (FME, ArcGIS)

Internal Network & VPN

ESRI GIS Portal - Reality

NSP2 GIS Databases ArcGIS

AGS / GIS Portal

Document Control System

EXTERNAL USERS (AGOL)

USERS

EXTERIAL USERS (AGOL)
Case study: Engineering Data Flow (GIS Portal)
Data processing and Aggregation

Unstructured Data
(xls, pdf, CAD)

ETL

QC

Publish with AGS to Portal

Portal Layers

GIS Portal
Case study: Engineering Data Flow (GIS Portal)
GIS Conversion: FME jobs
Case study: Engineering Data Flow (GIS Portal)
Themed applications

- **Permitting**
  - Protected Areas
  - Restricted Areas
  - Latest Route & Corridors
  - Country Overviews

- **Engineering**
  - Geotechnical Locations
  - Planned Rock Placement
  - Latest Route & Corridors
  - Bathymetry

- **Landfall**
  - Planned Plant Layout
  - Satellite Imagery
  - Latest Route & Corridors
  - Bathymetry
Case study: Engineering Data Flow (GIS Portal)

Engineering Application

- Search on crossings locations and zoom too result

- Identify by symbology colour the pre-lay berm, with ID

- Click on lay corridor to find out restrictions
Enables further questions to be answered

> How close is that UXO to the Route?
> What is the total area covered by pipe at the Karlshamm logistics port.
> Where is the planned rock berm FI-A1266?
> What does that UXO look like and where is the related report?
> Where is the pipelay vessel?
GIS Portal Setup: Geoevent Server

ESRI GIS Portal - Reality

Internal Network

DATA INPUTS
- Survey
- Engineering
- Construction
- Permitting
- Other Depts & Third Parties.

Surveying

Engineering

Construction

Permitting

Other Depts & Third Parties.

DATA INPUTS

ETL – Extract Transform & Load (FME, ArcGIS)

NSP2 GIS Database ArcGIS

AGS / GIS Portal

Document Control System

External Users (AGOL)

Users

AIS

Geoevent Server

EXTERNAL INPUT

Nord Stream 2 AG
Geoevent Vessel Monitoring

- Pipelay Vessel – Solitaire, with support vessels
- Pipelay and Dredging vessel spreads
Future development: Lifetime of the project

- Data consistency and continuity over the lifetime of the project
- High quality data that can be traced by users
- Inspection and Maintenance survey
- Adapt to the evolution of the project
Future development: VisualGIS Server

- ROV video to GIS and / or GIS to ROV video.
- Pre-lay, As-laid, Pre-commissioning, As-built, Inspection & Maintaince > 100TB of Digital Video to manage and share.
Future development – ArcGIS Pipeline Referencing

- Requirement to manage this large trunk line network and ensure the pipelines long term integrity.
- Manage pipeline geometry, events and monuments via existing GIS landscape with addition of APR.

DATA INPUTS
- Pipeline Surveys

Diagram:
- Pipeline Integrity Database
- ArcGIS Pipeline Referencing
- Document Control System
- AGS / GIS Portal

USERS
Conclusion

- Portal and GIS deliverables were initiated from the start of the project.
- Anticipating and adapting to user’s need has been key.
- Set up processes for data treatment.
- Successful information sessions have seen an increase in Portal use and ensure Portal limitations are known.
- Interaction with users helps to refine Portal content.
- Portal and GIS data can help ensure long-term data integrity.
END