Randstad 380kV

Visit Rotary Hillegom

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Stay tuned. Safety first!

For your safety as well as our own we would like to draw your attention to the following safety measures.

In case of an emergency, the following instructions also apply:

- Follow the escape route as indicated.

Use the stairs instead of the lift.

Go the assembly point.

Follow the instructions of the in-company emergency worker who is present at that moment.

Table of content

Randstad 380 kV – closing a ringstructure

Scope of the Randstad 380 kV project

- Connection of 80 kilometres
- Southern part: 20 kilometres (officially in service since 6th, 2013);
- Northern part: 60 kilometres (in service date scheduled for end 2018);
- A total investment of approximately EUR 650 mio (Northern ring);
- Approximately 20 kilometers of underground 380 kV cable and 30 km of 150 kV;
- Southern part: 34 pylons Wintrack
- Northern part: 151 pylons Wintrack
- 16 Municipalities, 2 Provinces and 4 Waterschappen (regional watermanagement authorities) were involved.

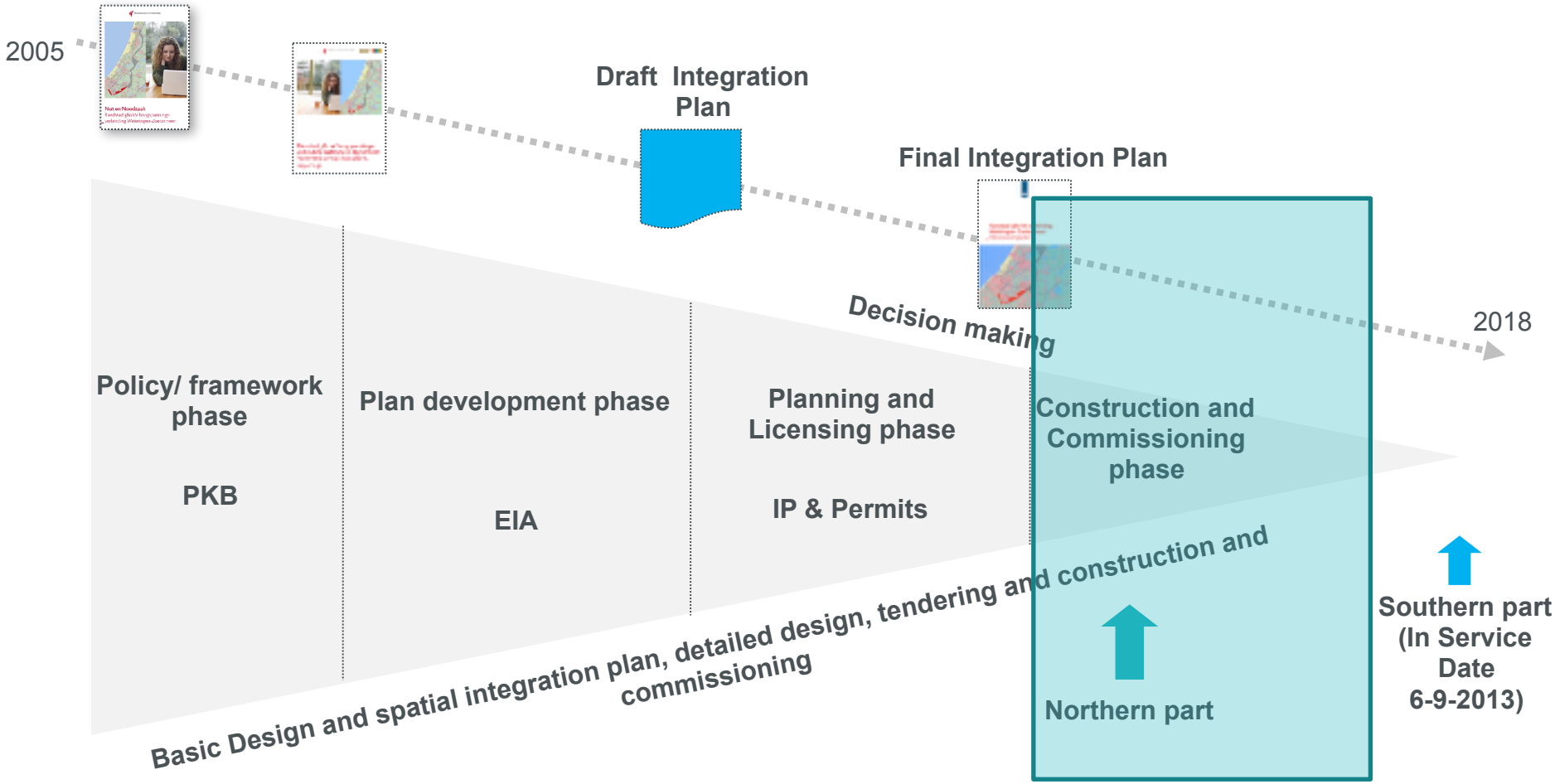
In one of the most densely populated areas in Western Europe!

Need & and Necessity

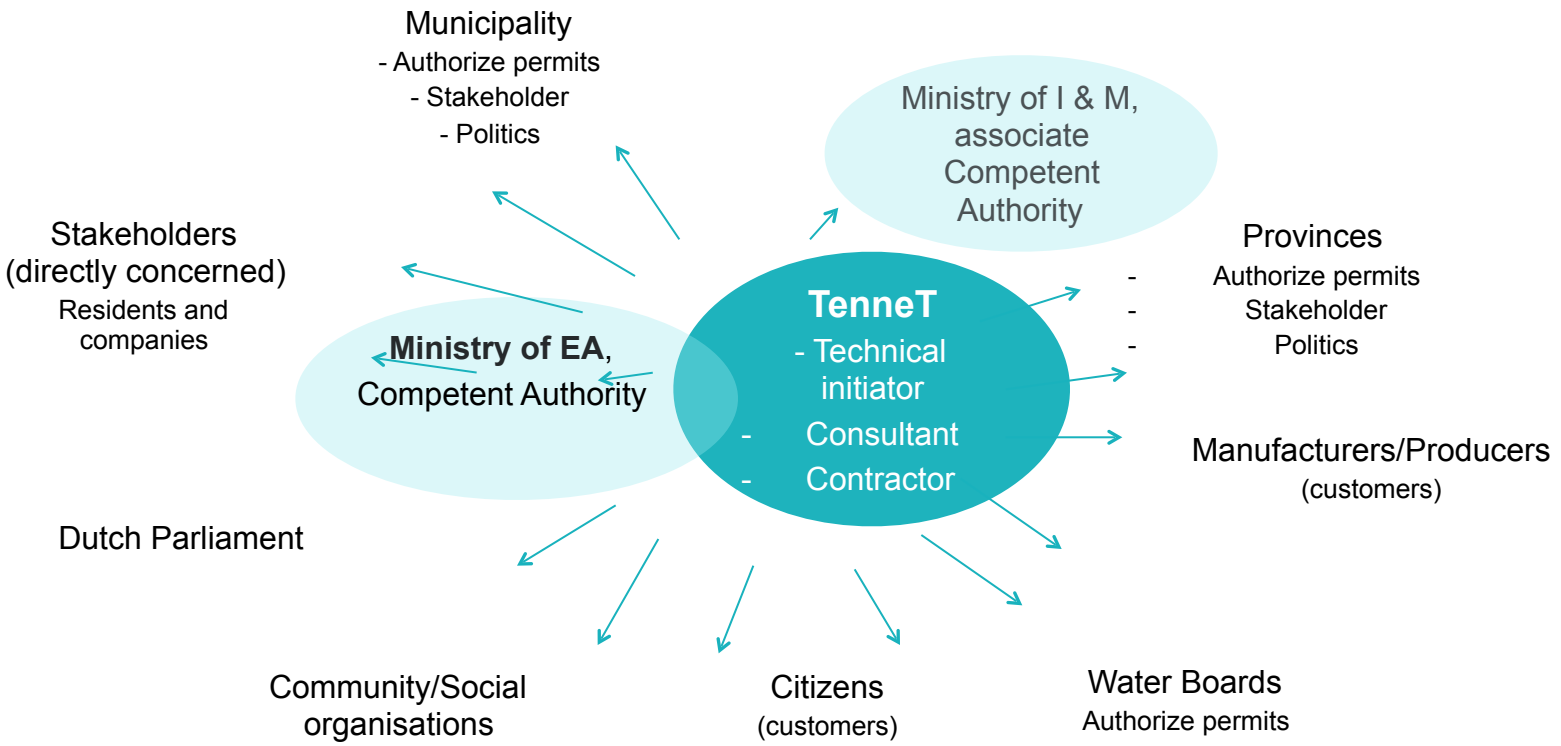
- **Secure reliability of electricity transport =**
  Solve grid constraints in the southern and northern part of the Randstad, and also in the vicinity of The Hague, Westland, Zoetermeer, Leiden, Amsterdam, Haarlemmermeer and Beverwijk.

- **Connection of production capacity =**
  transportation of production power (both conventional and renewable) of Maasvlakte and Velsen. (Electricity Act)

After a long period we are now executing



A lot of stakeholders are involved during the proces

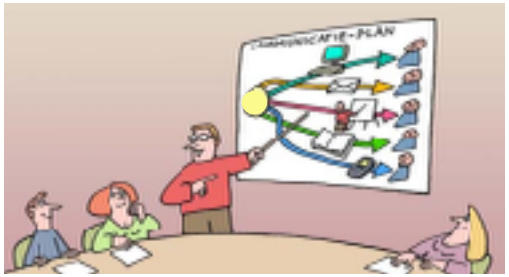


Still, some stakeholders have explicit opinions …

Limited space + public support: complex integration and innovation

Innovation in many ways

- Overhead line vs. underground cables
- Innovative pylons: Wintrack
- Stakeholder approach & communication
- Tendering & contracting
- Spatial integration & landscape plan
- Etc.

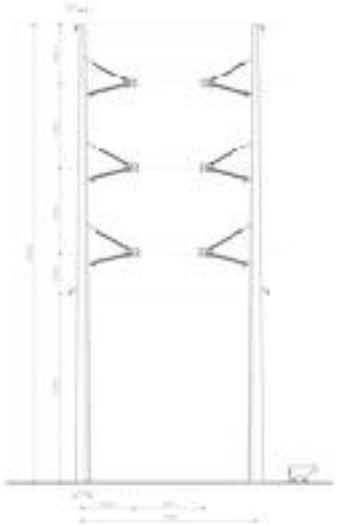


EPC
UAV-gc

Overhead lines versus underground cable

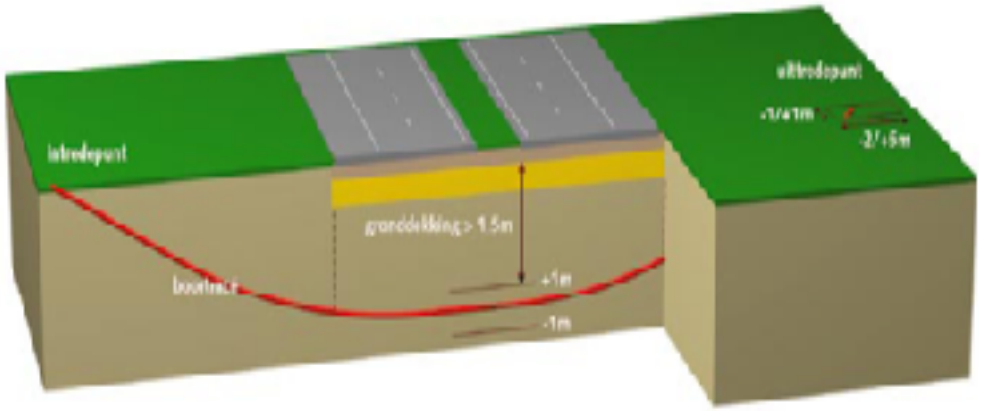
Overhead line

- Wintrack pylon; compact and a magnetic field of 100 instead of 300 metres (“Donaumast”)
- A new standard.



Underground cable

- By using open excavation and drillings (HDD = Horizontal Directional Drillings)
- Magnetic field 40 to 60 meters
- Used at complex spatial bottlenecks.



Considerations to use underground cables

Aspects

- More complexity in the grid-system by using underground cables for a 380 kV connection, this means introducing more risks;
- Limited international experience and unfamiliarity with these risks;
- Rising political demand for “underground solution” ;
- TenneT needs to innovate and will do further research.

Starting points for TenneT:

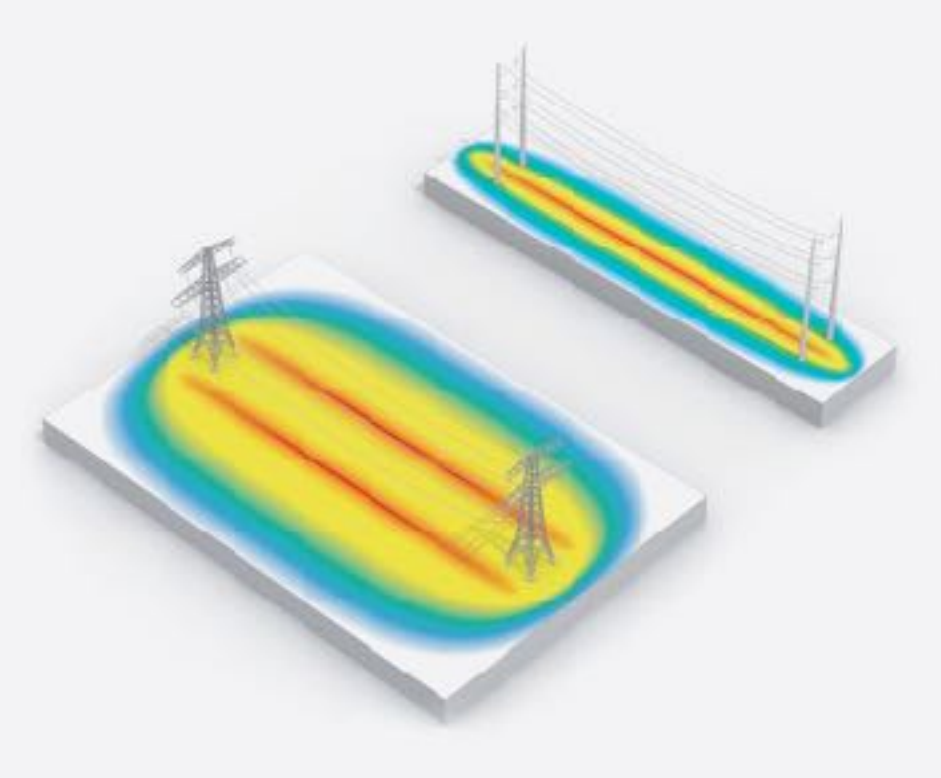
- Responsible for a solid and reliable network;
- Acceptable risks;
- Obligations within the EU-network of TSOs.

Innovative Pylons: Wintrack

Wintrack pylons

New type of electricity pylon

- Less visually disruptive to landscape
- Leads to smaller electro-magnetic fields (30-40%)



Spatial Integration

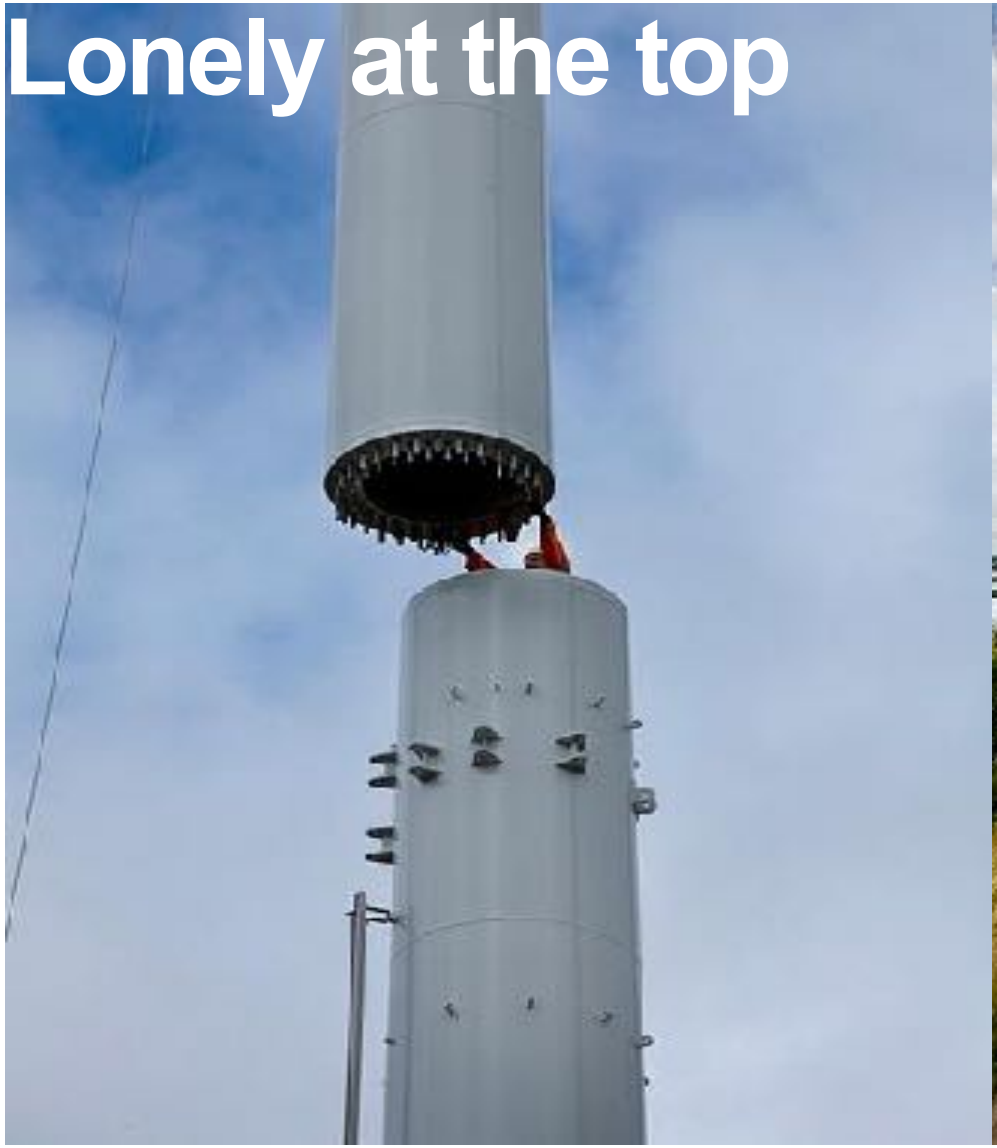
Temporary roads & sites

Foundation of Wintrack pylon

Use of farmers land

New and old pylons compared

Lonely at the top



Preventing aircraft collisions

Pulling high-voltage lines

Underground cabling

380 kV cables

Research programme into 380 kV cables

- Better understanding of line/cable/line configurations
- Research focuses on Randstad 380 kV South Ring: 10 km of 380 kV cable
- Randstad 380 kV North Ring: another 10 km of 380 kV cable
- New research into situational aspects of 380 kV cabling sections longer than 20 km across the grid
- Overhead lines are being replaced by underground cables
- High level of social acceptance

Cable bed

Horizontal guided drillings

Cable joints

Activities during jointing

Spatial Integration

Contest for Architects: Design of the fence, OSP Delft

Rehabilitation of land

Rehabilitation of a meadow with surplus heights

Any Questions?

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Taking power further