Integration of DG in MV-grids: Challenges Encountered by the Grid Operator

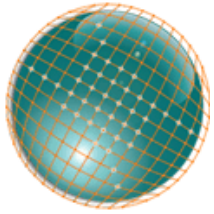
Dr. Edward Coster &

Dirk van Houwelingen MSc

Stedin BV, the Netherlands

edward.coster@stedin.net

dik.vanhouwelingen@stedin.net



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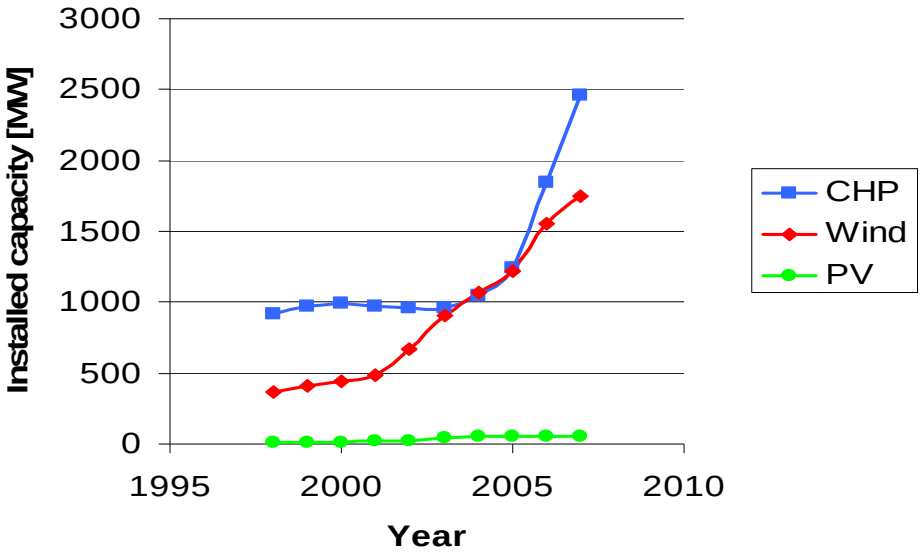
Contents of the presentation

- DG in the Netherlands
- Planning problems
- 3 Stedin projects:
  - Tinte
  - Oostland 1
  - Oostland 2
- Some other projects
- Conclusions

Distributed generation in the Netherlands

DG consists mainly of wind and combined heat power plants

Small and medium sized CHP in the agricultural sector.



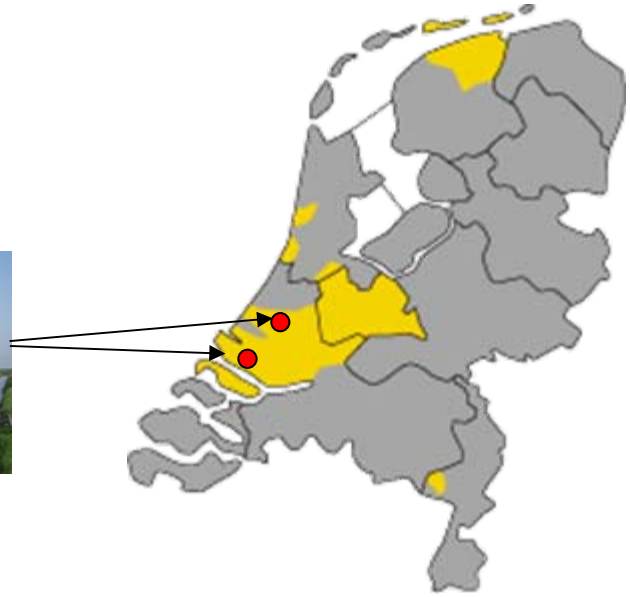
Total load in the Netherlands: ca 15000 MW

Agricultural CHP concentrated in designated glasshouse areas

Distributed generation in the Netherlands

Stedin is a grid company, responsible for safe and reliable transport of electricity and natural gas. Stedin takes care of gas and electricity transport in the Randstad (the western part of the Netherlands) for almost 2 million residential, business and governmental customers.

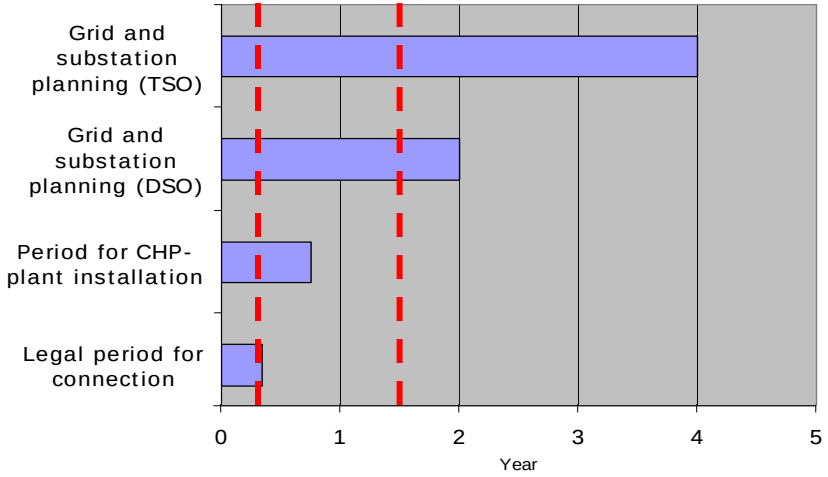
Major glass house areas in the Stedin grid are shown on the map



Planning problems

Legal obligation: connect within 18 weeks after application

no long term transport limitation (long = 1 – 2 years)



Planning permissions: up to 1 year

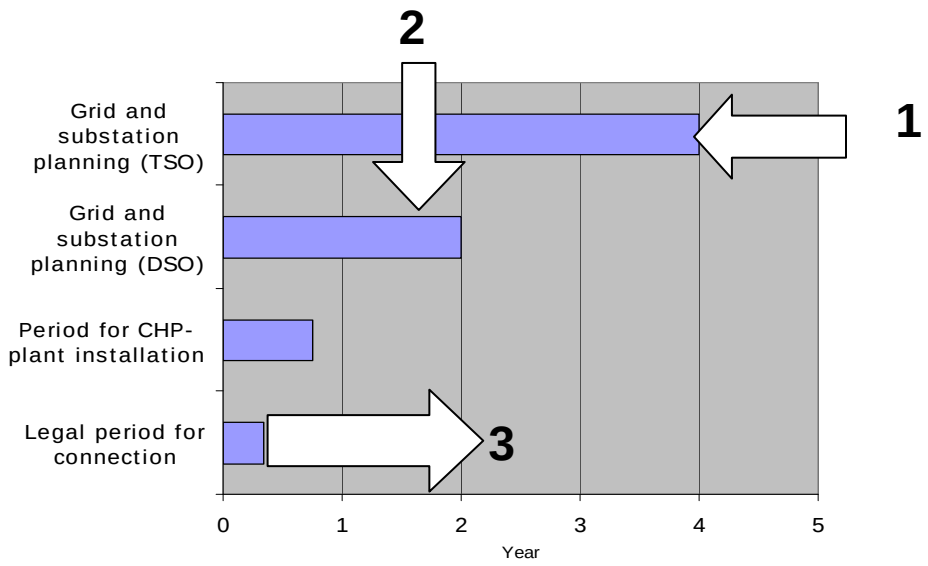
Construction times substations: 2 – 4 years

Approaches

1: Reduce construction times (project Tinte)

2: Eliminate need for HV (project Oostland 1)

3: Pro-active investments (project Oostland 2)



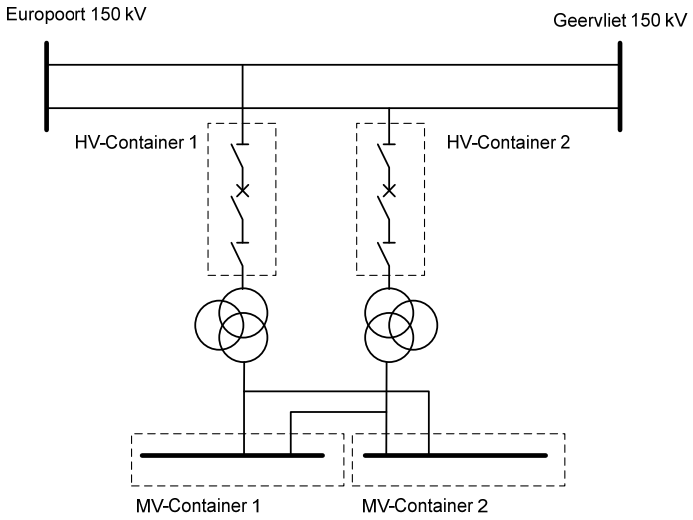
Project 1: Reduce construction times (Tinte)

Standardization of substation equipment
Prefabricated parts in containers
Simple shed building at the end of process

Construction time down to 2 years
Prefab done during planning permission time

Use of existing 150 kV line
Up to 120 MVA

Re-use of parts is possible



Project 2: Eliminate need for HV (Oostland 1)

Integration in local MV Network:

- Replace transformers (13 -> 22 MVA)
- Expand MV installations
- Replace existing cables (240 -> 630 mm2)

Also:

- some new cables
- change in operation (fault levels)
- increase voltage level (10 -> 23 kV)

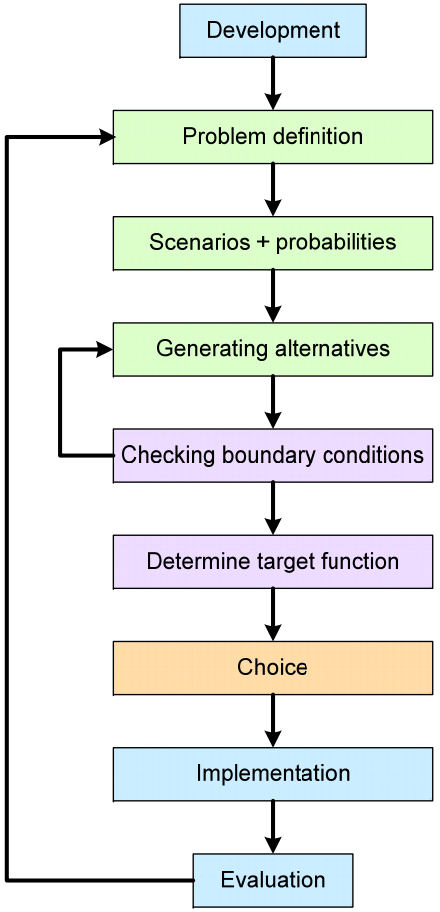
Enough load in the area needed

Project 3: Pro-active investments (Oostland 2)

Pro-active building based on scenarios

Stedin/KEMA methodology:

- Problem definition
- Scenario development
- Generate solutions to fit all scenarios
- Evaluate solutions using boundary conditions
- Choose solution with target function



Project 3: Pro-active investments (Oostland 2)

Scenarios based on expert knowledge and marketing intelligence

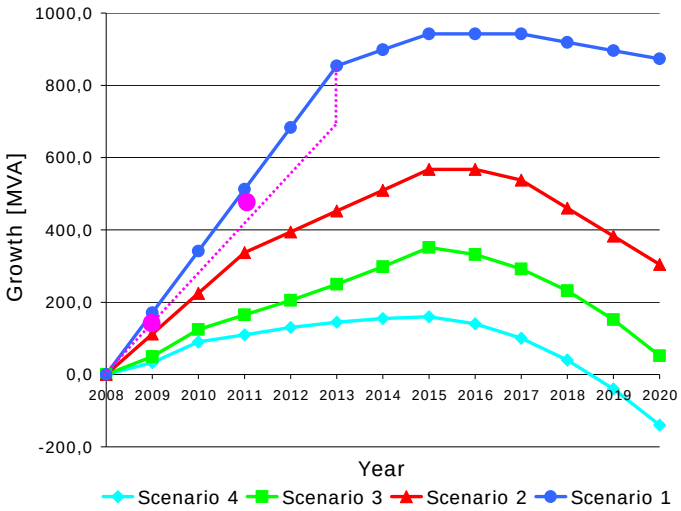
Number of feasible solutions limited due to TSO limitation

Target function: minimum project costs

Need time for study phase

Decision making under uncertainty is a difficult and complex process

Suitable for very high level of DG



Project 3 (Oostland-2) Influence of economic crisis

Market forecast much lower.

change from scenario 1 to scenario 3.

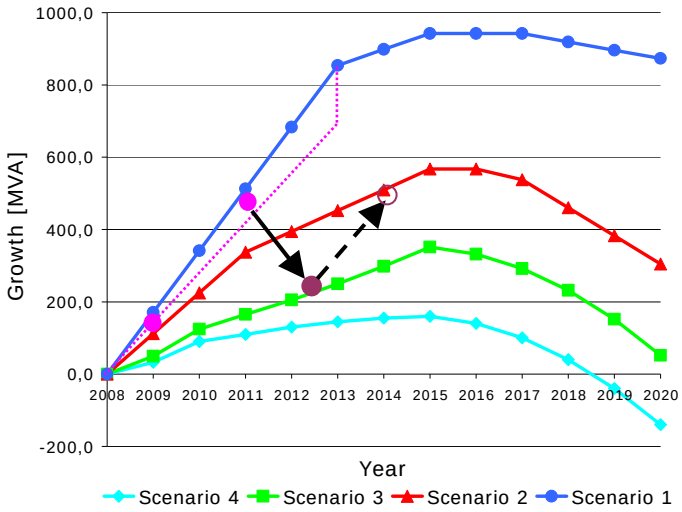
Reduce present investment in grid.

Hidden potential in the scenarios:

N-1 vs N in MV-grid

Pitfall:

Stop preparing for the next economic boom



Some other projects in the Netherlands

- Liander : new 150 kV substation Agriport near Medemblik. *Reduced construction time (1)*
- Enexis Noord : new 110 kV substations near Luttelgeest, IJsselmuiden and Klazienaveen. *Reduced construction time (1)*
- Enexis Zuid: expansion of MV grid near Helmond to accommodate CHPs. *MV integration(2)*
- Westland Energie: expansion of 150 kV substation Westerlee and expansion of MV grid in Wateringen. Reduced construction time and MV integration (1&2)

  (It more or less failed, Westland Energie had to rely on congestion management for over a year)

Conclusions

- Feasible grid developments mainly determined by HV-substations, because they have the longest realization time
- Different approaches are possible depending on present load situation and MV-grid
- Modularization and standardization can reduce project time
- Planning permit procedure time acts as a minimum project time
- Scenario based methods indicate problems and suggest solutions in a pro-active way.
- Scenario based methods take a longer time and more complicated decision process.
- Scenario based methods are necessary with high levels of penetration of DG

Q & A

Questions ?

Thank You!