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Digitising district heating grid infrastructure

September 26 2018

1. Withthegrid & digitisation

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1. Dutch tech startup focusing on district heating

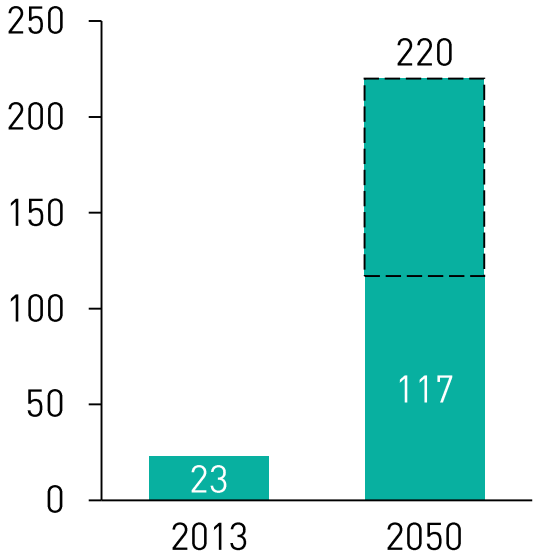
2. Remote monitoring devices and analytics

3. Production and grid optimisation

Why now?

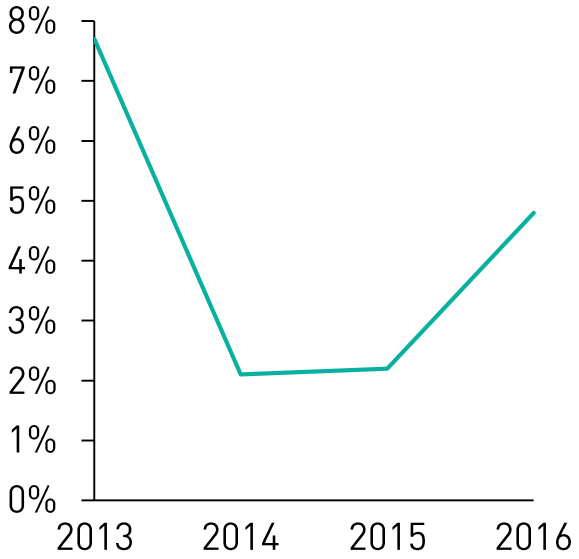
1. District heating is expected to grow by 4-7%/year

[PJ/year in NL]



2. Current profitability levels are low; so cost reduction measures impact profitability significantly

[ROIC]



3. Digitisation is a key topic in district heating industry

EU projects (H2020):

STORM DISTRICT ENERGY CONTROLLER

FLEXYNETS

FLEXYNETS
Fifth Generation, Low Temperature, High Exergy Heating and Cooling Network

DIGITAL HEAT
THE conference on digitalisation in DHC

Era of district heating

Source: Industry growth rates from CE Delft, Ecofys, PBL, McKinsey; ACM rendementsmonitor 2017 warmtebedrijven

Optimisation engine & maintenance platform

Optimisation

- Static data
- Product and grid data
- External data (e.g. temp. forecasts)

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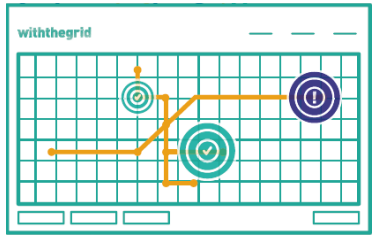
- **Optimisation engine** based on linear programming and **machine learning** algorithms



- Demand forecasting
- Dispatch optimisation
- Network visualisation
- Capacity improvement

- Withthegrid asset monitoring devices:
  - Leak detection
  - Cathodic protection
  - Vacuum monitoring
  - Temp./pressure monitoring

Maintenance

- **Predictive maintenance platform** based on continuous asset monitoring through withthegrid devices

- Thresholds
- Alerts
- Route optimisation
- Audit trail

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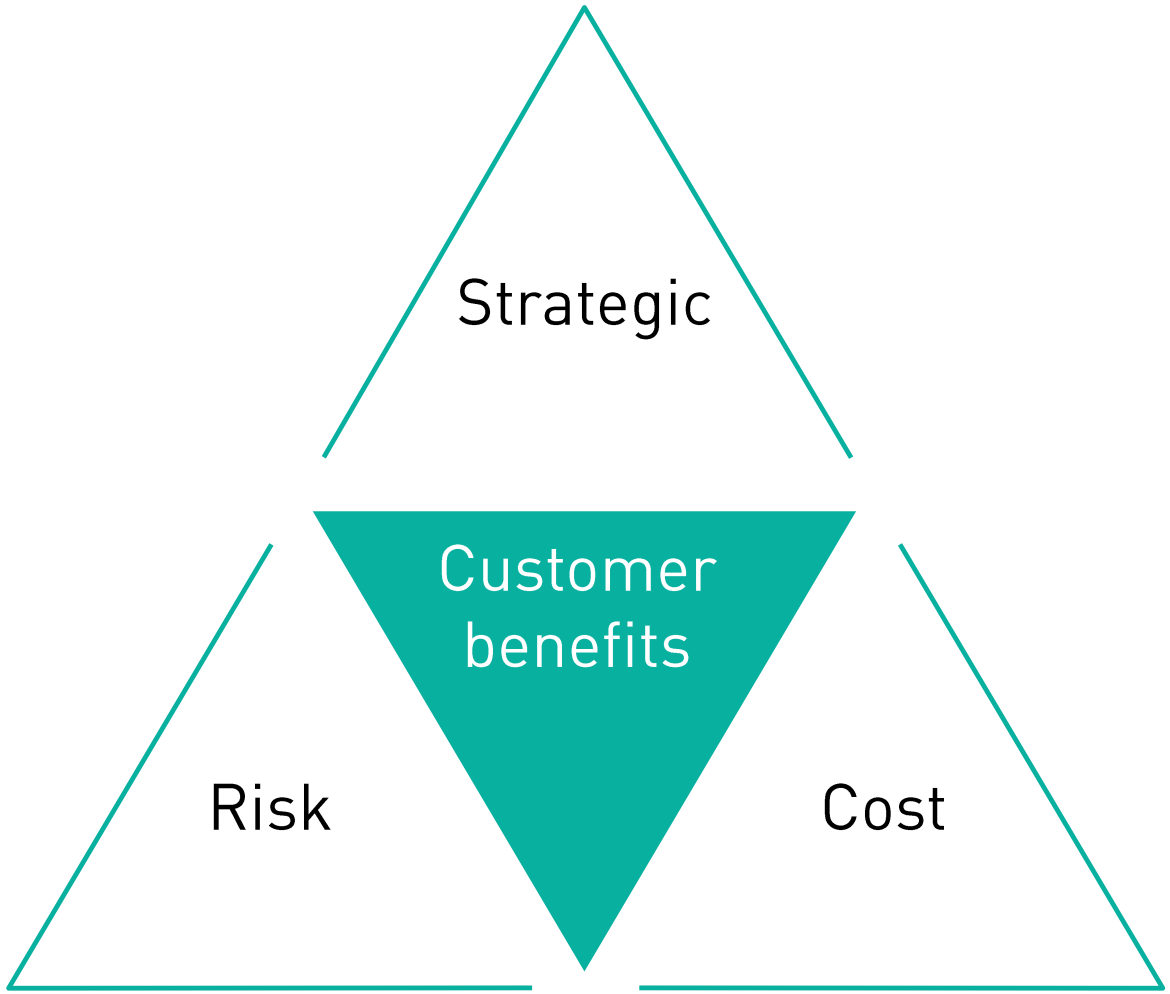
Benefits



Strategic:

- Predictive maintenance
- Solution for growing technical labor shortage
- Clear audit trail
- Digitisation of operational processes

Risk:

- Increase grid safety
- Increase grid quality
- CO_2 reduction

Cost:

- **Energy savings (Opex) up to 10%**
- Fewer manhours (Opex)
- Reduction in damages (Opex/Capex)
- Fewer outages (Opex/Capex)
- Lifetime extension (Capex)

2. Impact of optimisation on DH sector

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Extrapolating potential to EU

Energy savings

- Source: Euroheat country by country reporting (GWh used)
- Assumption: Low scenario 4%, High scenario 10%
- Unit: Energy sold and used in GWh

Cost savings

- Source: Euroheat country by country reporting and European district heating price series
- Assumption: Energy costs 50% of total revenue
- Unit: EUR

CO_2 emissions savings

- Source: Euroheat country by country reporting
- Assumption: Where emission factor was not known, EU average was taken
- Unit: ton CO_2/TJ

- For countries with all data (18 in total, >90% of market)

Potential savings in district heating with optimisation

Studied countries

Base		Low [4%]	High [10%]
1840 PJ_{used}	Energy savings	74 PJ	- 184 PJ
Energy costs: EUR 11.5 bn	Cost savings	EUR 460 m	- EUR 1,150 m
90 m ton CO_2	CO_2 emissions savings	3.6 m ton CO_2	- 9 m ton CO_2

Source: Energy use from: STRATEGO WP2 - Background Report 4 - Heat & Cold Demands (Appendix table5); GJ price from EU DH price series, Professor Sven Werner (Halmstad University) (table 3 page 20); CO2 emissions from Euroheat country by country reports (for Bulgaria, Estonia, Romania, Slovenia, UK the average figure wat used for CO2 emissions); withthegrid analysis

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Thank you

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