Nedstack fuel cell technology

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Company Profile

• Founded in 1999

• Based in The Netherlands

• Independent fuel cell stack manufacturer
  - Supplier to system integrators, serving world-wide markets
  - Installed base in Europe, US, Africa, Asia
  - Extensive system integration know-how

• Member of a Dutch-based group with over 40 years worldwide experience in prime power, power generation and UPS-solutions
Unique features of the Nedstack PEM fuel cell stack

Unique features

- Product range allows for fit for purpose choice:
  - Power range: 2-10 kW per stack
  - HP for low cost and back-up: > 4,000 hr & > 1250 start-stops
  - XXL for long life: > 20,000 hr

- Liquid cooled
- High power density
- High fuel efficiency
- Low parasitic losses
- Easy to integrate, reliable and robust
Nedstack system integration track record

Over 700 telecom back-up stations since 2007

5 kW off-grid telecom power supply

14 kW off grid power supply demonstration unit FC with ethanol reformer

70kW demonstration power plant running >50,000 hrs since 2007

1MW plant at Solvay chlorine plant
Nedstack’s commercial focus

- Telecom power supply
- Grid equipment back-up and P2P
- Transport
- Industrial CHP
Nedstack business model

**Description**

- Raw materials and component supply
  - Carbon
  - Membrane
  - Electrode
  - Assemblies
  - Aluminum parts

- Fuel cell stack production
  - Produce cell plates
  - Assemble fuel cell stacks
  - Provide system integration know-how
  - Create market pull from end user

- System integration
  - Design fuel cell system (application)
  - Assemble systems
  - Sell and install systems
  - Service systems
  - (Run fuel supply chain)

- End user
  - Run the system
Nedstack in transport initiatives

E-trucks Europe

First Chinese car (chery SUV)

HyMove bus with:

30 kWe range extender
70 kW PEM demonstration Power Plant

At AkzoNobel’s Delfzijl chlorine plant

• > 50,000 hours on grid
• Stack life in field conditions over 23,000 hours
• Reliable operation, low maintenance costs
• Fully automated, remote monitoring
• Mobile set-up
FCS-XXL stacks: stable performance, long life

- Unique stack performance and lifetime under real, industrial conditions (Delfzijl)
Cogeneration of AC-power and heat

Hydrogen

Fuel cells

DC power

Inverter: 400 VAC

Transformer

Heat 65 °C

AC Power (6-10 kV)
System overview

- System can be remotely monitored and operated
Monitoring of stack performance

- All stacks in the plant can be individually monitored:
2 MWe PEM Power Plant - China
Preliminary performance data

**Plant performance**

- Nominal fuel cell output: 2000 kW
- Fuel cell efficiency (LHV): 55 %
- Auxiliary consumption: 120 kW
- BoP efficiency: 90 %
- Electrical efficiency: 50 %
- Available heat @ 60°C: 950 kW
- Total efficiency: 77 %

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**Stack performance: plant vs. QC test**

![Graph showing stack performance comparison between QC and 2MW plant]
Business case for a MW PEM Power Plant
Depends largely on local situation

1) Assuming hydrogen would otherwise be burnt and now will have to be substituted by natural gas
Hydrogen Market Overview
Thank you

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