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FUEL CELL
SYSTEMS

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Convion

- Convion Ltd. has taken over the Wärtsilä fuel cell development program from 1.1.2013
- Convion will provide fuel cell solution for distributed power generation applications
- By commercializing 50 - 300kW products based on SOFC technology



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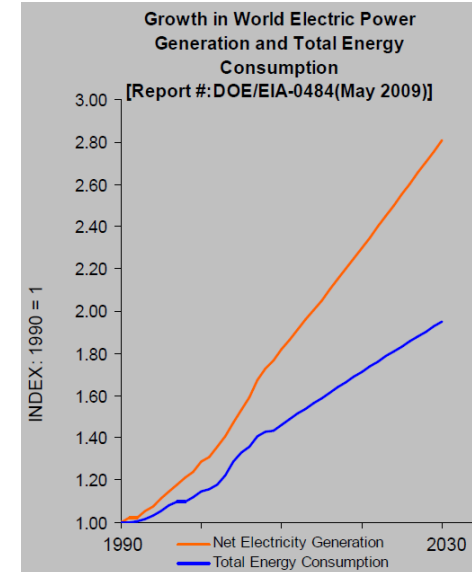
Energy – A global challenge and opportunity

Energy market is changing, 2009 – 2035

- Energy demand + 41%
- Gas consumption + 55%
- Electricity consumption + 180%

Challenges

- Climate change
- Local polutions and health issues
- Power security
- Dependency of fossil fuels



Source: WEO 2011



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Opportunities for clean energy

... If a device can provide

50% better electrical efficiency

Fuel flexibility; Natural gas, Biogas and Hydrogen

Zero NOx, SOx and particulate emissions

Independent and secure power source

... would it have market potential ?



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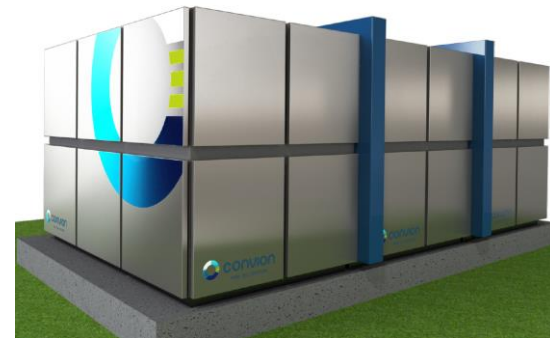
Convion products fulfill the Need

Efficient, Secure and Sustainable power

- ✓ Scalable power range >50kW
- ✓ Electrical efficiency between 55 – 60% net AC
 - ✓ Total energy efficiency > 85%
 - ✓ Natural gas, Biogas and Hydrogen
- ✓ Zero NO_x, SO_x and particulate emissions
- ✓ Distributed and independent power source



C50, 50kW fuel cell power unit



3x C50, 150kW fuel cell power unit

Convion Background

- Over 15000h cumulative operating hours on NG, BG and methanol



WFC20 20kWe
α-Prototype
NG
ηe 41%

WFC50 50kWe
Laboratory units
NG, Biogas
ηe ~47%



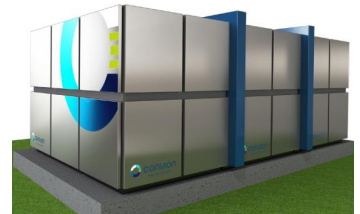
WFC20
NewEnergy
Land fill gas
ηe > 49%

Convion 50 kW
50kW
NG
ηe target >53%



WFC20
Methapu
Methanol
ηe > 43%

Xoo concept
Xoo kWe
NG, Biogas
ηe > 55%

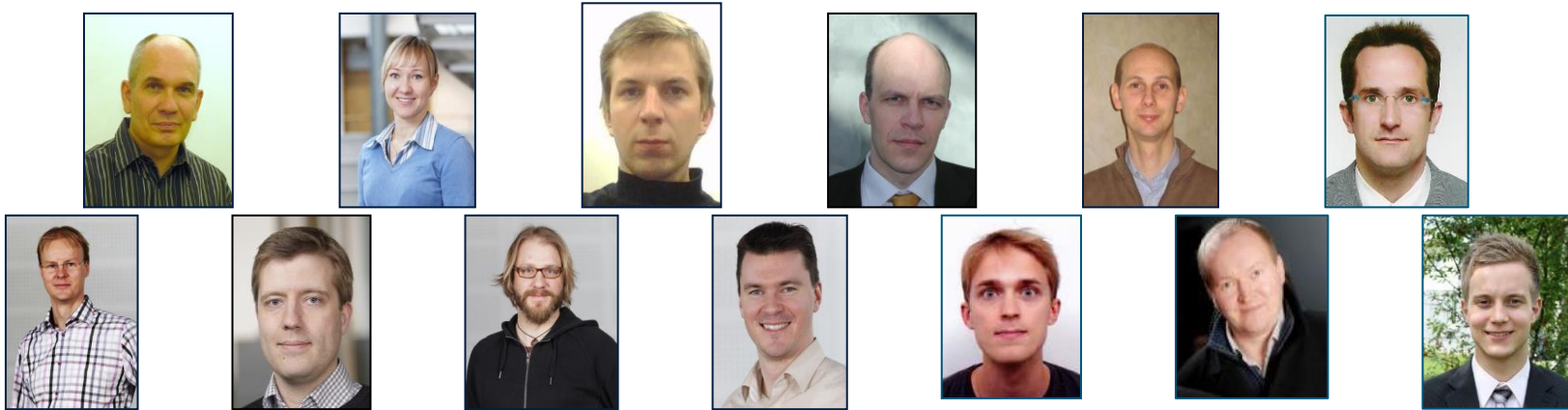




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Convion team



- Convion team has 13 professionals
- Solid track record based on six validated systems
- Unique IPR protected by 38 patented inventions
- 270 man years of experience in SOFC system development

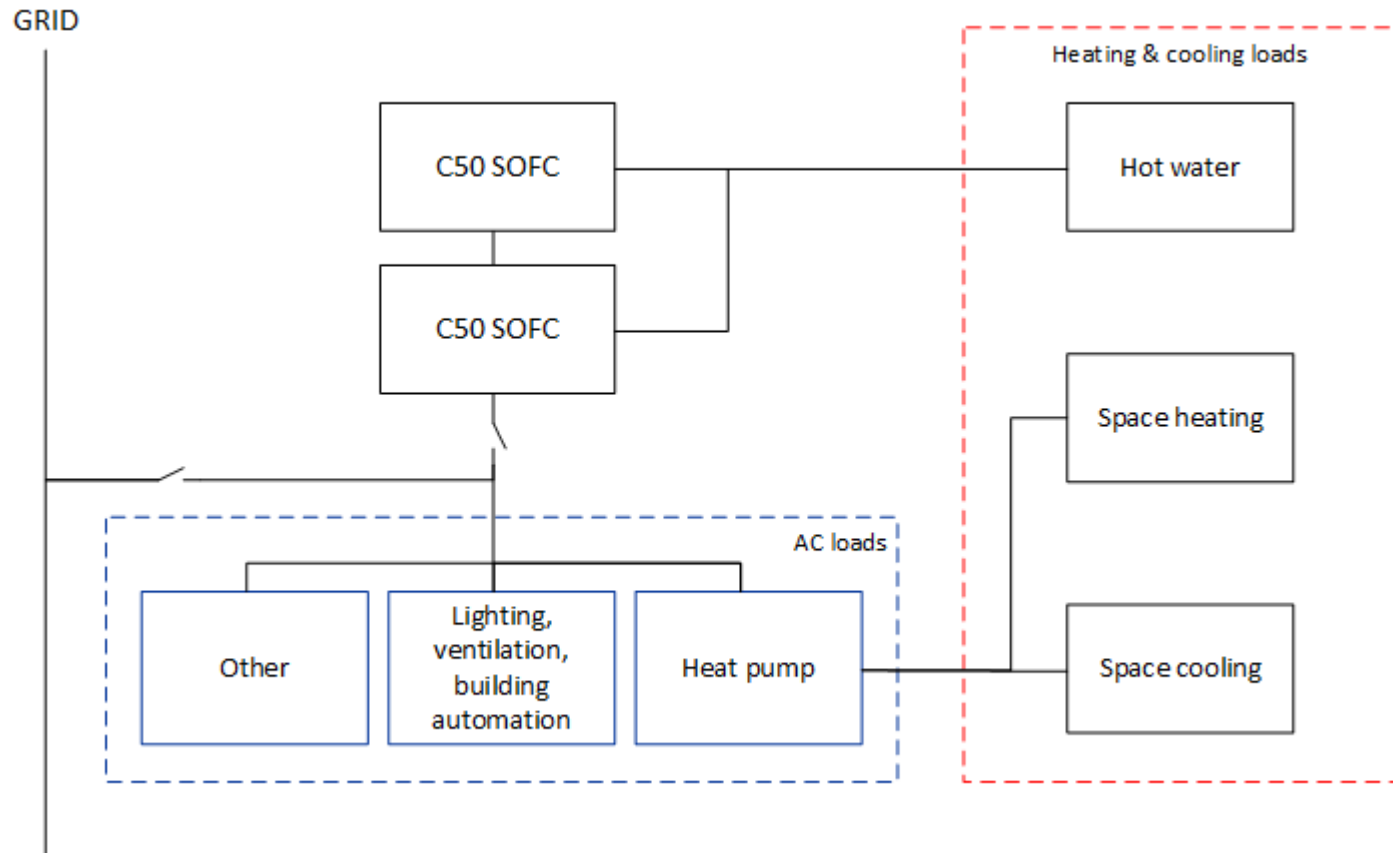


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Case: building integration with high efficiency

- Hot exhaust of SOFC is suited for warming of hot water
- High heat pump efficiency can be achieved when ΔT is relatively low e.g in space heating





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Convion fuel cell combined with heat pump

Heat Pump Performance

Compressor power, kW	29
Heating power, ground heat source, kW	107
COP, EN 14511 0/35 °C	3.7
Cooling power when connected to ventilation, kW	103
COP _c , 12/7 °C, 36/42°C	2.7

- Flexibility between heating, cooling and power supply
- Increased power security for cooling
- Up to 60% reduction in CO₂ emissions compared with district heating



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Thank you