



# Ceramic Fuel Cells

## AGM PRESENTATION

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## Company Objectives 2014

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- Maintaining high levels in health & safety
- Reducing operating costs and maintaining strong cash management
- Increasing sales through
  - Large-scale, projects particularly in the UK social housing sector
  - Expansion of distribution network in Europe
- Implementing a cost-down strategy that enables sales into other markets and offers value proposition to customers
- Increasing life and improving the robustness of existing fuel cell stack
- Developing new products – smaller and larger products for existing and new markets
- Exploring the potential to secure partnerships to develop business opportunities
- Creating a profitable fuel cell company without reliance on subsidies



## Commercial Update

# Challenge of the Energy Industry

Large, centralized,  
isolated (coal, gas, etc)

Small, decentralized,  
connected



**BlueGEN can perform a fundamental role in the transformation of the energy industry, complementary with renewable energy sources**

# Deployment Update



*CERAMIC FUEL CELLS*

Market  
Announcement

Friday 12 September 2014

## **Operations Update: CFU leads marketing of fuel cell products in Europe**

**500 units installed and over 5 million operating hours accumulated**

Ceramic Fuel Cells Limited (ASX / AIM: CFU), a leading developer of generators that use fuel cell technology to convert natural gas into electricity and heat for homes and other buildings, is pleased to announce that it has achieved an important technical and commercial milestone. On 11 September its service partner, Eneco, commissioned a BlueGEN unit in the Netherlands, representing the 500<sup>th</sup> unit in the installed and commissioned fleet of systems based on the Company's world leading SOFC technology. Earlier this month, the fleet passed the milestone of 5 million accumulated operating hours with demonstrated high levels of reliability and availability.



## Commercial Update UK:

- UK feed-in-tariff available; CFC is only MCS accredited fuel cell product
- First commercial ESCO model with UK distributor iPower
- Project based approach providing benefits for all stakeholders



Market Announcement

17 November 2014

### **First fully funded BlueGEN programme in conjunction with iPower**

Ceramic Fuel Cells Limited (ASX/AIM: CFU) is pleased to announce the commencement of the first fully funded BlueGEN programme, where the BlueGEN is installed at no cost to the end user. The programme, comprising a 100kW fleet of BlueGENs (a minimum of 65 units) is targeted primarily at public sector organisations that can take advantage of the significant carbon and energy savings BlueGEN has to offer.

The innovative funding structure allows BlueGENs to be installed in end user premises at no upfront cost. End users pay for the costs of gas and BlueGEN maintenance and receive the benefits of the electricity generated and the heat recovered for hot water.

This programme has been developed and will be run by one of CFCL's UK distributors, iPower Energy Limited (iPower).

## **Opportunities for similar projects in the pipeline**



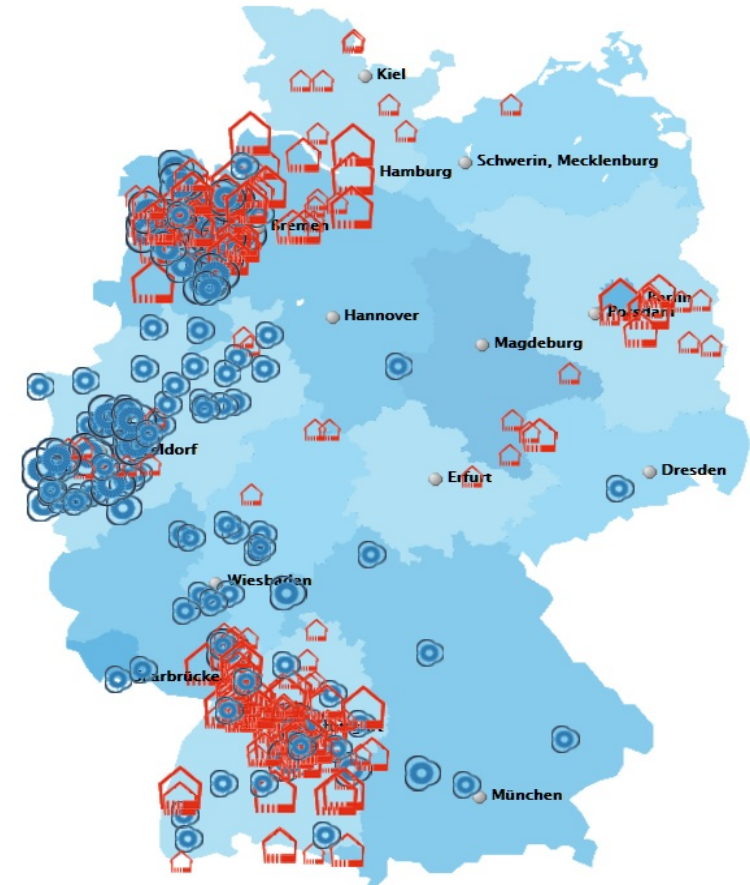
# Commercial Update Germany: Capital Subsidies



State programs are first step; momentum is building for federal program

## Commercial Update Germany: Market share

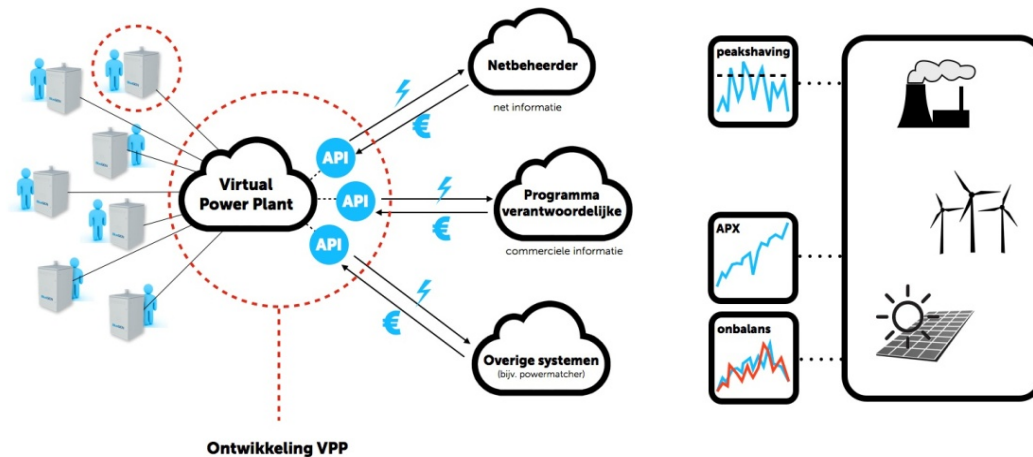
- According to the German Fuel Cell Initiative (IBZ); 669 m-CHP units, based on fuel cells, have been installed in Germany so far.
  - About 45% of these are CFCL products
- Concentrating resources on selling through distribution partners and installers
  - 95+ partners established in Germany



Source: IBZ Website

**Increase in partners, together with incentives, enables expansion of market penetration into Germany**

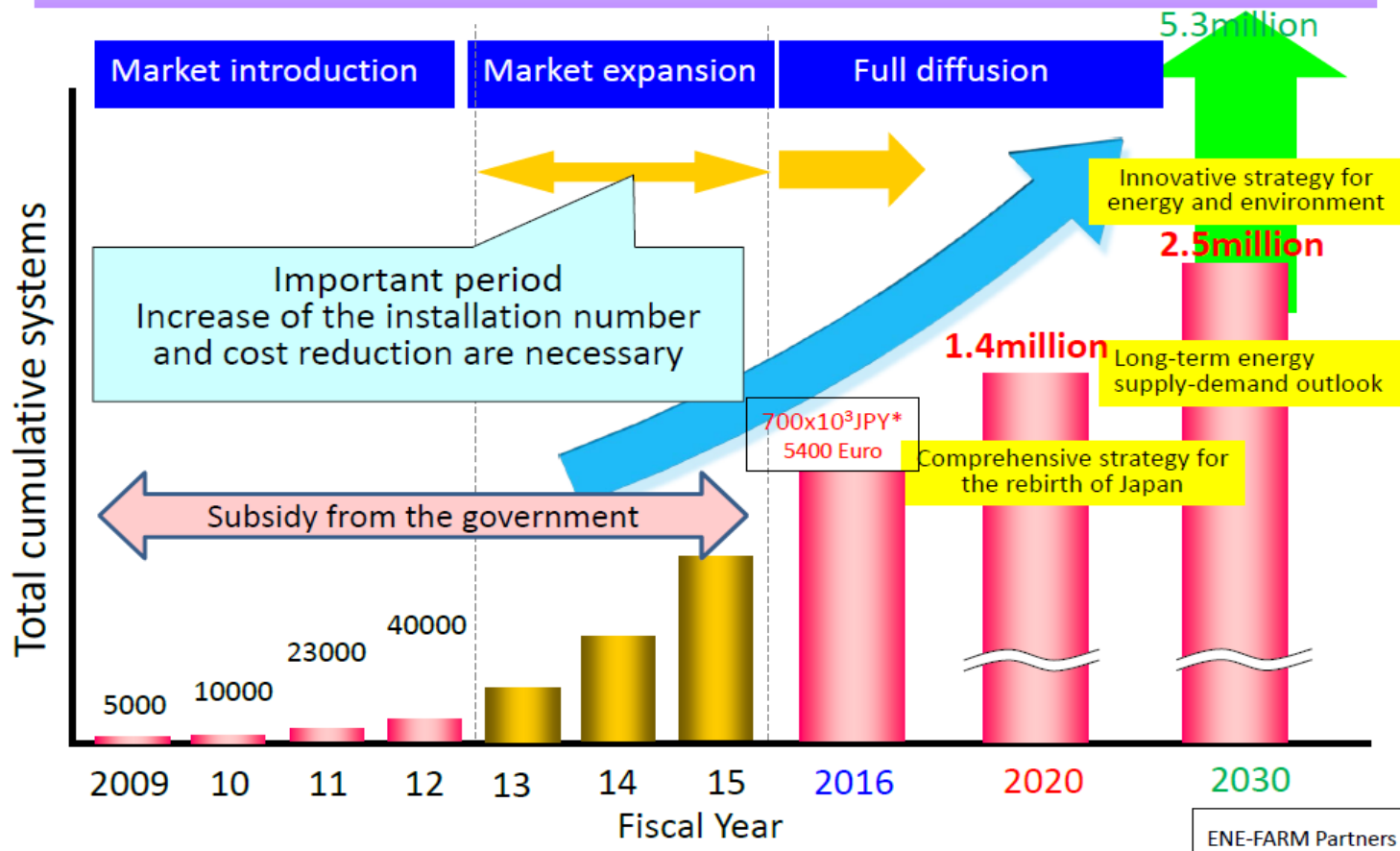
# Virtual Power Plant: The Ameland Project



- Ameland (NL) aims to be carbon neutral and energy independent by 2020
- Integrated with wind and solar, the BlueGEN driven Virtual Power Plant will take care of net-balancing, peak shaving and energy trading
- Project duration: 5 years with strong potential to expand
- Opportunities to participate in similar VPP projects

# Market Projections - Japan

## Expected diffusion of residential fuel cells



**This growth rate is directly transferrable to other markets**

## Survey

### VDMA

- Survey conducted in 2012/2013
- Participants: manufactures & system developers

### IFEU, FFE, GWS

- Combined figures of export and domestic
- Assumption that fuel cells will contribute >15% to the boiler market share In 2020
- Exports have been set at 50%

### NIP

- The German government implemented the NIP to promote market development of hydrogen and fuel cell markets
- NIP has determined market targets for stationery fuel cell systems

## Predictions

	<u>2013</u>	<u>2015</u>	<u>2020</u>
Sales estimates p.a. of stationery fuel cell devices	1,700	21,000	210,000

Sales estimates p.a. of	<u>2020</u>
Standard fuel cells heaters <5 KW <sub>el</sub>	165,000
Fuel cells power generators	150,000

	<u>2025</u>
Stationary fuel cell system under operation	500,000
Installed generation capacity [MW <sub>el</sub> ]	1,000

**Forecast indicates a market of 315,000 mCHP per annum in 2020**

**CFCL was first to market and have sold the most product in German mCHP market**

**With this advantage, CFCL has potential for significant market share**



## Operations Update



## Productivity Improvements: Stack Assembly

- Stack sintering productivity transformed from single to multi-stack process
- Fully validated process with production yields > 99%
- Current capacity: about 1,700 stacks per year
- Planning phase for next up-scale completed (5,000 per year)



Single stack furnaces



16-stack furnace



# Manufacturing Facility - Heinsberg



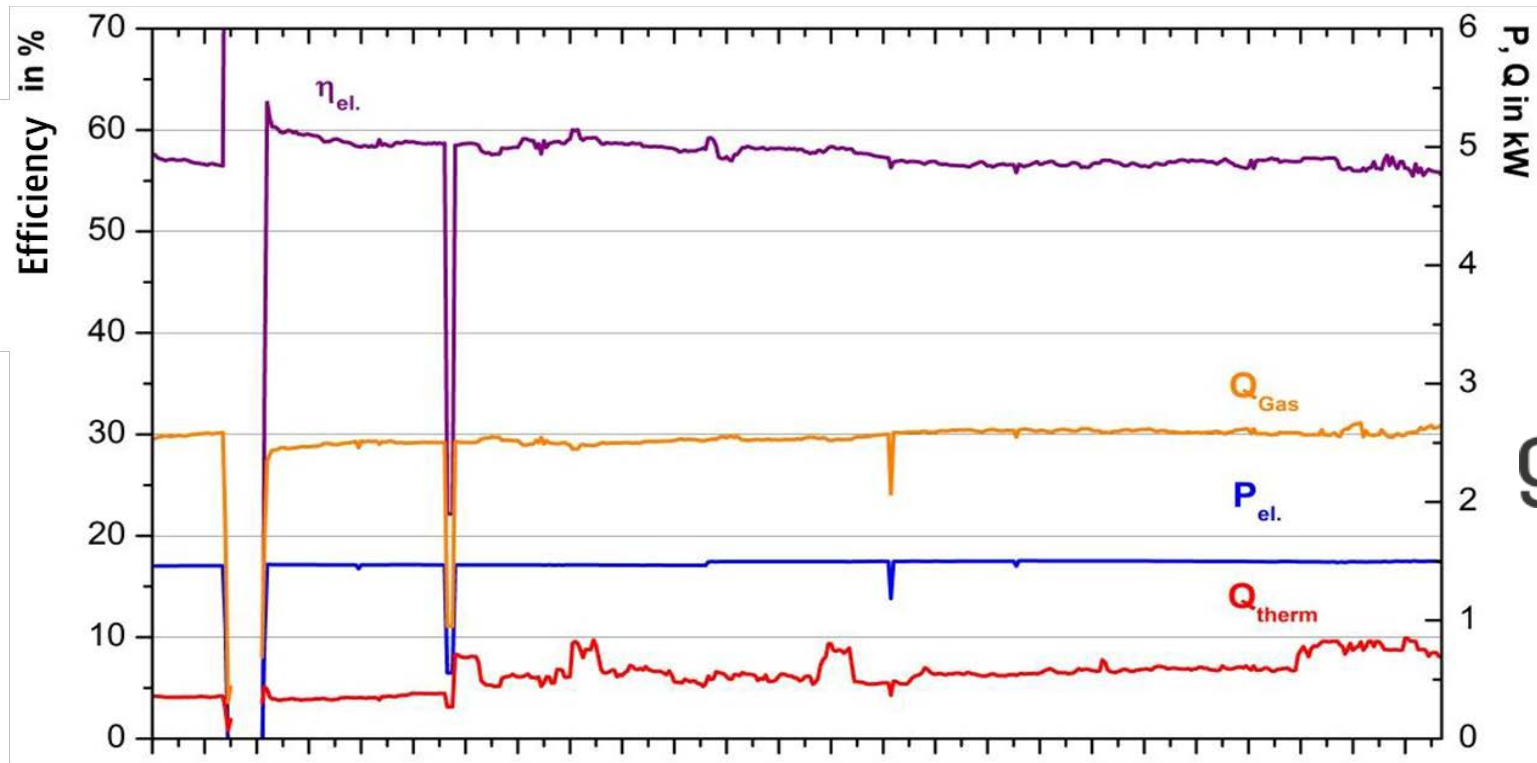
## Cost Down Strategy

- Standard unit cost reduction of 29% achieved since 2012
- Detailed cost reduction strategy developed and under implementation:
  - Volume orders
  - Cost effective / high quality component sourcing
  - Value-engineering
  - Process improvements
  - Outsourcing program
- Potential to become attractive for other markets (e.g. China)

**Clear cost reduction strategy to enhance commercial viability and drive new markets**

# Customer Experience – Performance and Life...

Customer: “17000hr failure free operation at degradation of 0.5%/1000hr”



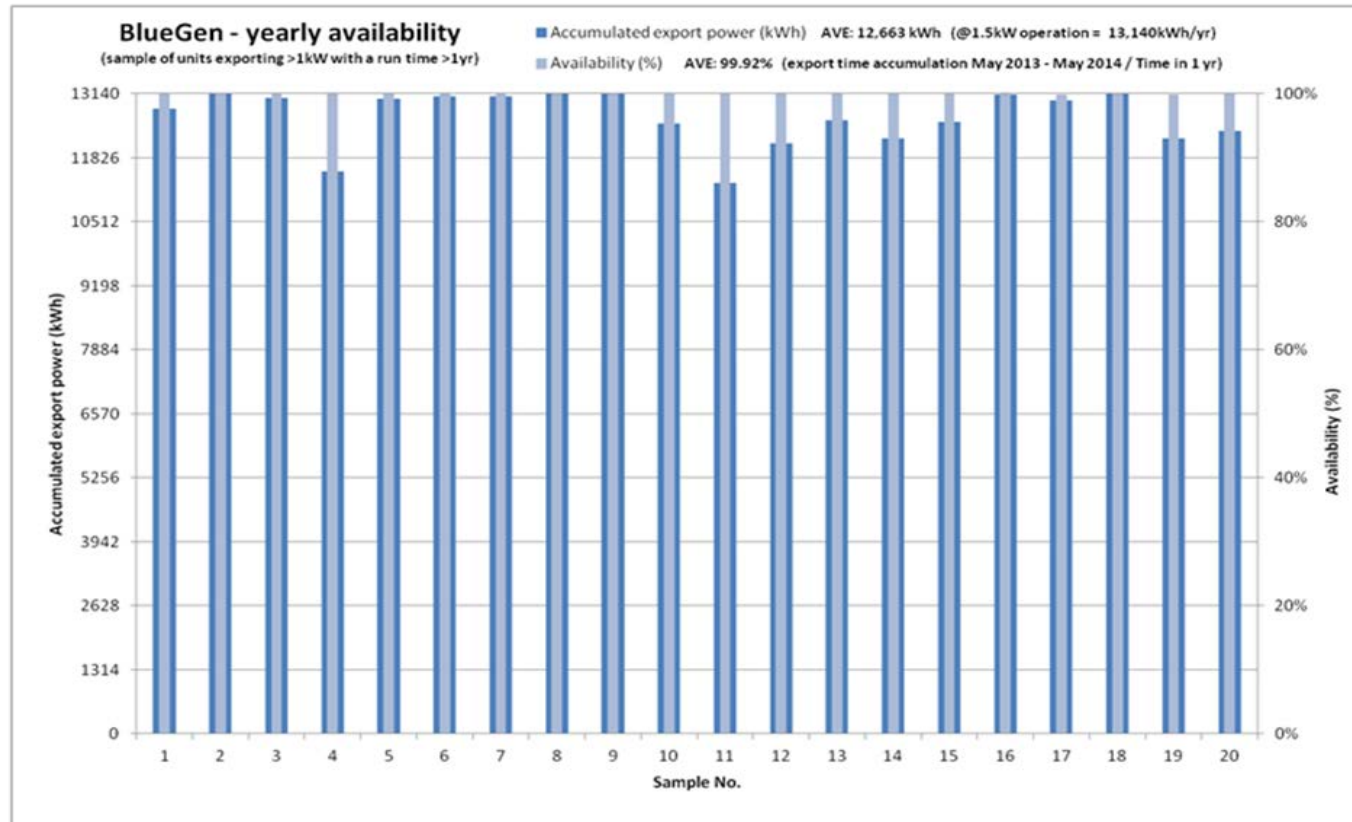
August 2010 – September 2012

Customer:



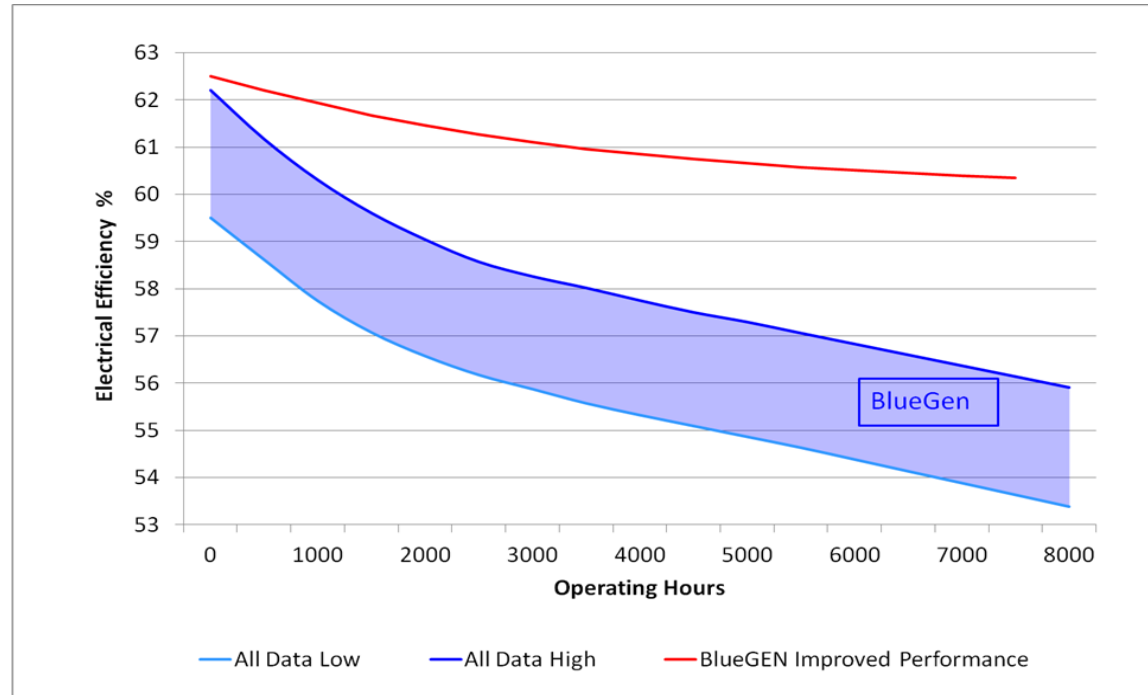
## Reliability...

- Availability on average  $\geq 99.9\%$  (on average 7hrs of outage per year)



- Alarms/fault conditions from 5.5 million operating hrs are recorded in Quality Management system and actioned to continuously improve product reliability

## Improvements - Proof in customer system...

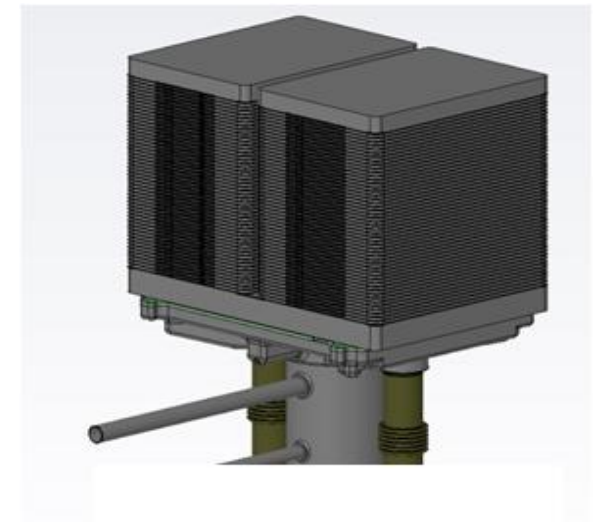


- Voltage degradation reduced by 70% improving anticipated life to 5 years
- Fully validated and proven in customer system
  - After 8000 hours the electrical efficiency still remains above 60%!
- Solution patented and transferred to production

**Proven path to target stack life of 10 years**

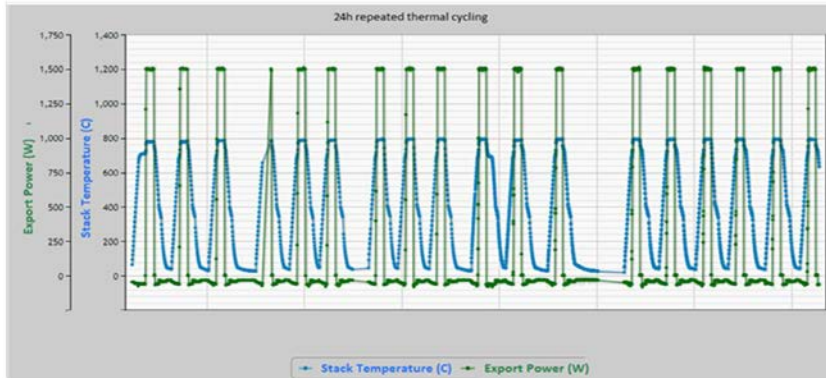
## Thermal Cycling Improvements

- BlueGEN is optimised for ultra-high electrical efficiency and is not designed as a start-stop system
- Increased robustness to thermal cycling events is important for the long life of the fuel cell stack
- Development program to improve robustness to thermal & power cycling of the fuel cell stack is in progress
  - Lower stress configuration
  - Improved glass formulation
- A limited number of stacks have commenced being produced in the Heinsberg facility for field testing at selected customer sites

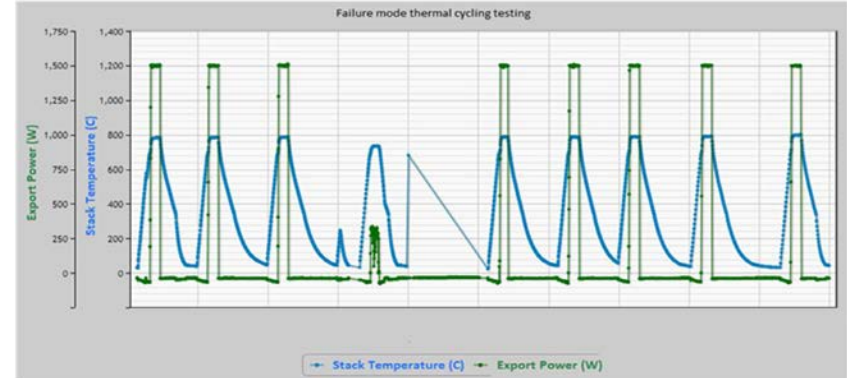




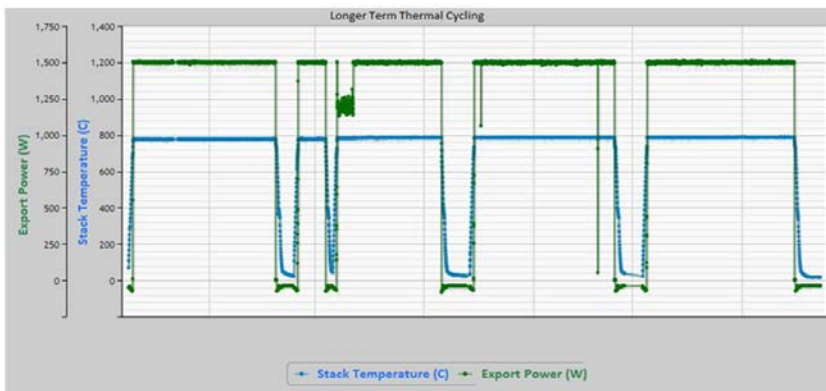
# Thermal Cycling Improvements Cont...



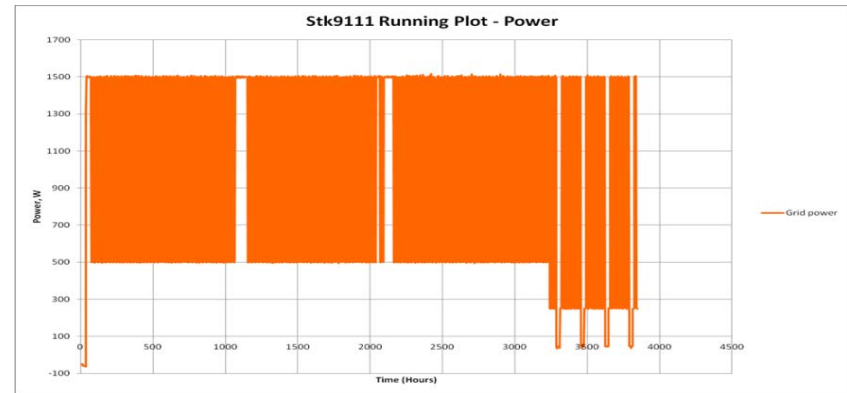
24 hour cycling testing



Failure mode testing



Longer term cycling



Power cycling

**Testing of enhanced stack technology has demonstrated successful thermal and power cycling under a range of operating conditions**





## Company Objectives 2015

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- Maintain Health, Safety and Environmental standards to a high level
- Secure significant increases in sales through project based sales strategy
- Increase sales in Germany through expanded coverage by distribution partners
- Continuing lobbying for fiscal and European Union support
- Achieve recognition for the BlueGEN brand (not a household name yet!)
- Continue to concentrate on unit cost reduction
- Deliver further product performance improvements
- Continue to explore the potential to secure partnerships to develop business opportunities (financial, distribution, manufacturing)
- Develop new products – smaller and larger products for existing and new markets
- Maintain strong cash management