

Residential MicroCHP in Europe

Whisper Tech

November 2005

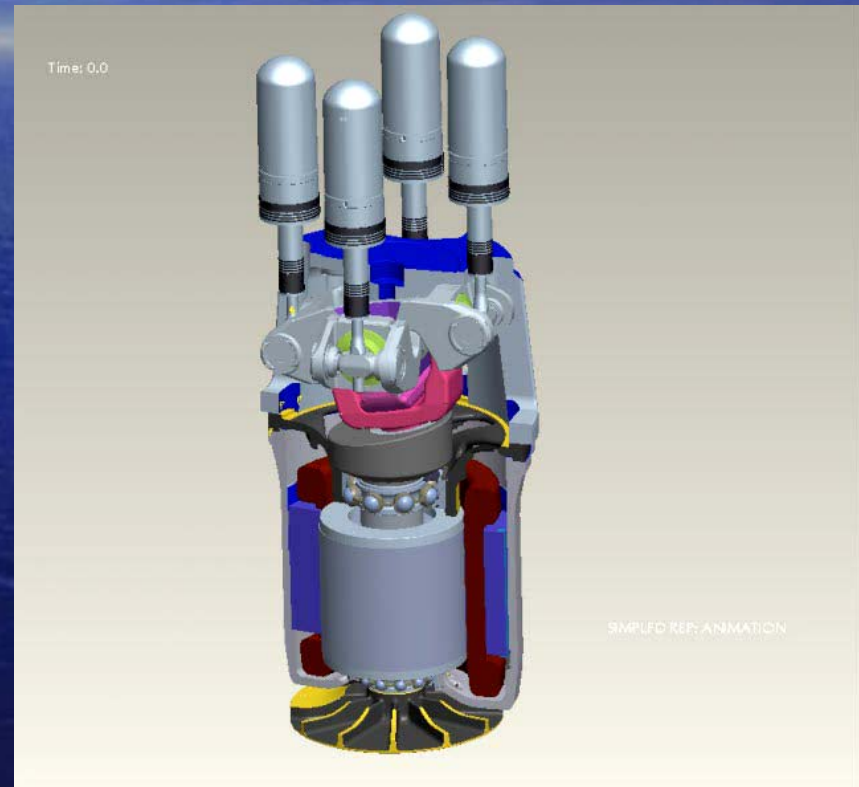


The objective: “Make MicroCHP Mass Market”

- Developing a Stirling based microCHP system that can replace the existing boiler gives access to a market
- Bringing the cost down through mass manufacturing allows customers to choose for microCHP instead of the standard boiler
- Changing the rules & regulations ensures insecurity over market access is removed

The Stirling is but “the tip of the iceberg”

- The key is to develop a working Stirling engine.
- But that is probably only about 10% of the task of making a “commercially successful” Stirling engine .

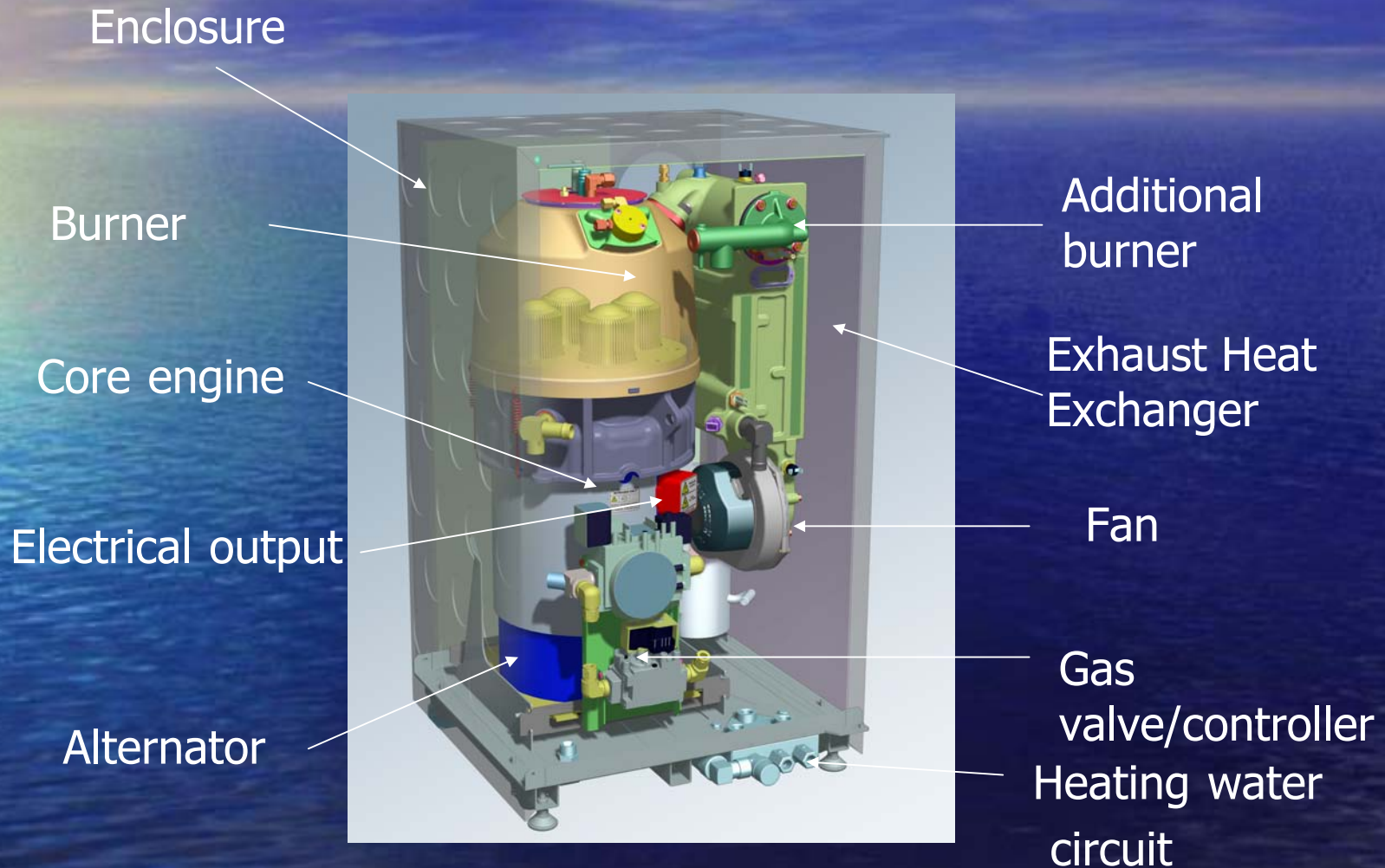


Whisper Tech four cylinder, double acting kinematic Stirling engine

So a successful engine must be part of a commercial system

- A Stirling engine will not be a commercial success as a Stirling engine but rather because it is part of a successful “system”. The engine must have a viable use.
- In Whisper Tech’s case the Stirling engine we have developed is used in a microCHP (mCHP) system.

WhisperGen Stirling mCHP system



MicroCHP application

- Boiler replacement which satisfies a home's heat requirement and generates by-product electricity for use in the home or "export" back to the electricity grid.
- As such key requirements are for something which behaves like a boiler – efficiency, noise, life, service, size, reliability etc.
- Potential massive >6m boilers sold in Europe pa.
- So how do you tailor a system for an application?



Trials, trials and more trials

Typical product development cycle (which tailors the system to the application) involves:

- Prototype development
- Laboratory trials
- Sheltered field trials
- Product certification and initial accreditation
- Technology field trials
- Market evaluation tests
- Commercial launch

Whisper Tech UK Trial History

- Partner relationship with EoN UK (formerly TXU).
- Technology trialing in UK lasted 5 years.
- Initial laboratory trials 1999.
- 6 units in homes 2000 (Sheltered Field Trials).
- 20 units 2001 (Alpha Trials).
- 30 units 2002 (Beta Trials).
- 400 units 2004 (Market Tests).
- Commercial Launch 2005.

Design Evolution

- MK I WhisperGen
For Lab trials
and sheltered field trials
- MK II WhisperGen
Alpha trials
- MK III WhisperGen
Used for Beta Trials -
1st CE Marked Product
- MK IV WhisperGen
Market Tests
- MK V Commercial
launch



Whisper Tech EU Trials

- Netherlands
 - Commercial trial with MK IV [running] & MK V [starting]
- Ireland
 - Commercial trial with MK IV Whispergen
- Germany
 - Beta trials with MK IV & MK V
- Other countries
 - Beta trials with MK IV & MK V WhisperGen

Whisper Tech Trials Netherlands

- Gasunie trialled microCHP MK II, MK III and MK IV
- 50 MK IV's installed throughout the country in a trial with all 10 energy companies
- Units placed directly in end-user homes
- Installers vary for each company, giving different results

Netherlands Trial Results

- Electricity consumption in the house 50% - 80% [$\sim 70\%$]

- Production just over 2000 kWh

- Demand curves coincide

Tolbert

- For 1 location gas consumption did NOT increase

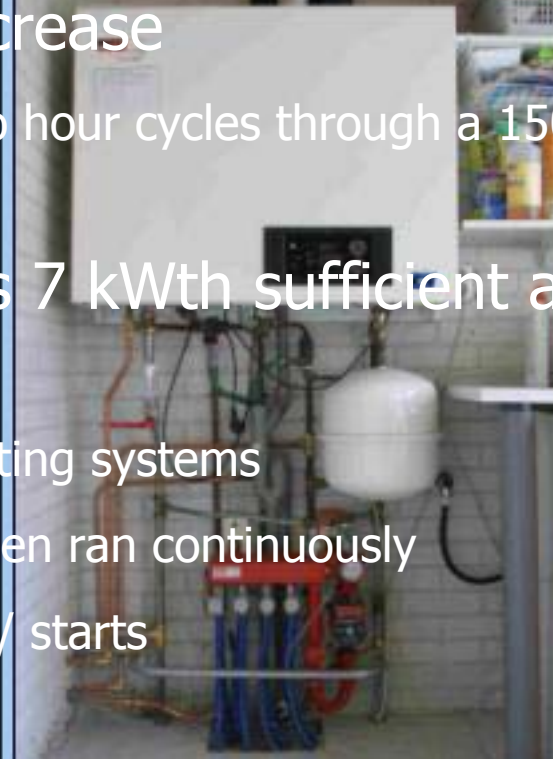
- Long, two hour cycles through a 150 litre buffer

- 2 locations 7 kWth sufficient at -20°C

- Floor heating systems

- WhisperGen ran continuously

- No stops / starts



Whisper Tech Trials Netherlands

- Know your Customer
 - Household heat load
 - Optimise system efficiency simply by control mechanism
- Understand Local Practice
 - Formal approval grid connection still lacking
 - Metering process not in place
- Manage Expectations
 - Quick response times

Major Issues/Surprises

- Grid issues
- Expectations
- Perceptions
- Installers
- Geographical issues
- Takes longer than expected
- General enthusiasm for concept
- Standard of UK heating systems generally

“Barriers to Entry”

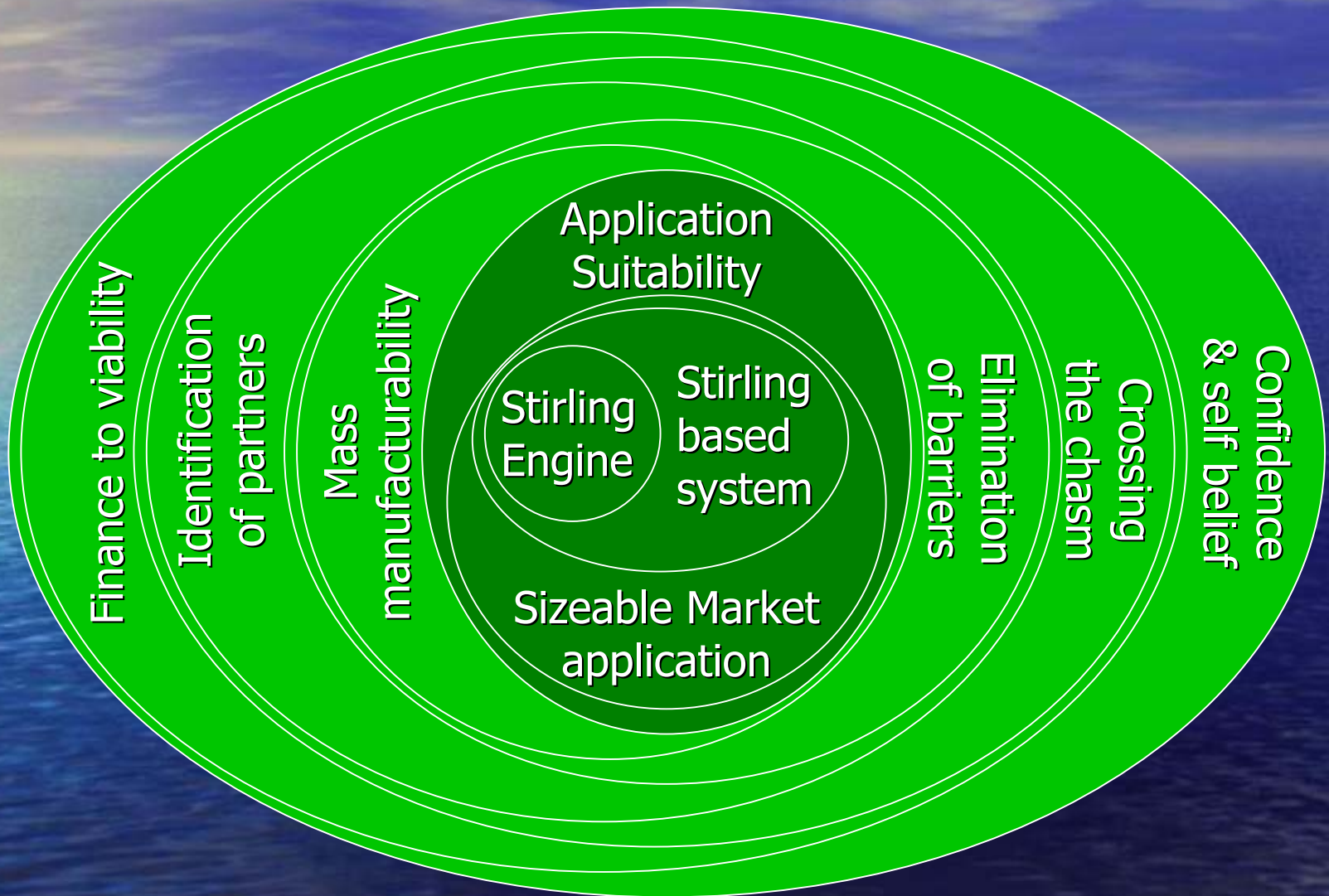
- To succeed in the application the barriers to entry must be addressed/removed.
- Disruptive products challenge existing players (channels, manufacturers and technologies).
- For microCHP issues of right to connect to grid, ability to export electricity, sale of export electricity, metering etc.
- Challenging major players in energy, manufacturing and installation fields requires significant courage.
- Barriers force compromise.

So the work is now done to:

- Develop the engine,
- Integrate it into a system,
- Prove that system's suitability for a commercial application,
- Demonstrate the market opportunity; and
- Ensure the system is mass manufacturable.

So What's the issue now?

Requirements for Commercial Success



Summary

- A Stirling based microCHP system has been developed that can replace the existing boiler, and gives access to a huge market [$>6m$ pcs pa]
- The rules & regulations continue to improve for mCHP thereby improving market security
- Trials have proven technology in all major EU markets [UK, NL, IRE, D, FR, etc]
- Mass manufacturing and volume roll-out are now next steps
- Solid service organisation required to manage successful implementation