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Business models and financing arrangements for the commercialization of stationary applications of fuel cells

Technology validation in stationary applications (Panel 3)

FCH JU Programme Review Days, 24 November 2017

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Project Team:

Who is Delta-ee

Delta-ee is a leading provider of advisory services for helping you succeed in the transition from 'old' energy to 'new' energy.

The Transition

'Old' energy		'New' energy
Centralised	⇨	Distributed
Carbon intensive	⇨	Low carbon
Commodity sales	⇨	Service based
Meter points	⇨	Customer centric
Upstream value	⇨	Downstream value

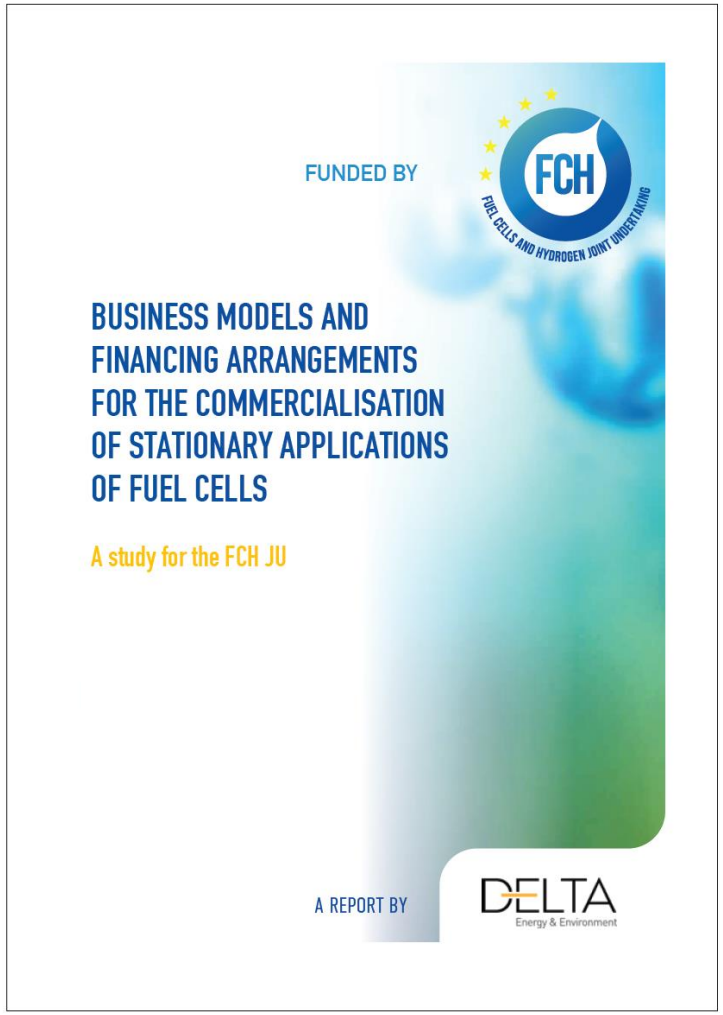
Selected Clients

A major new study on commercialising stationary fuel cell

Helping to **move the market forward** by its **identification of the most appropriate business models** - for taking deployment levels from today levels, **towards the first stages of mass market**.

Available on the FCH JU website soon.

Project Team:



Agenda

- **The need** for business model innovation
- About **the study**
- Our **approach**
- The **findings**

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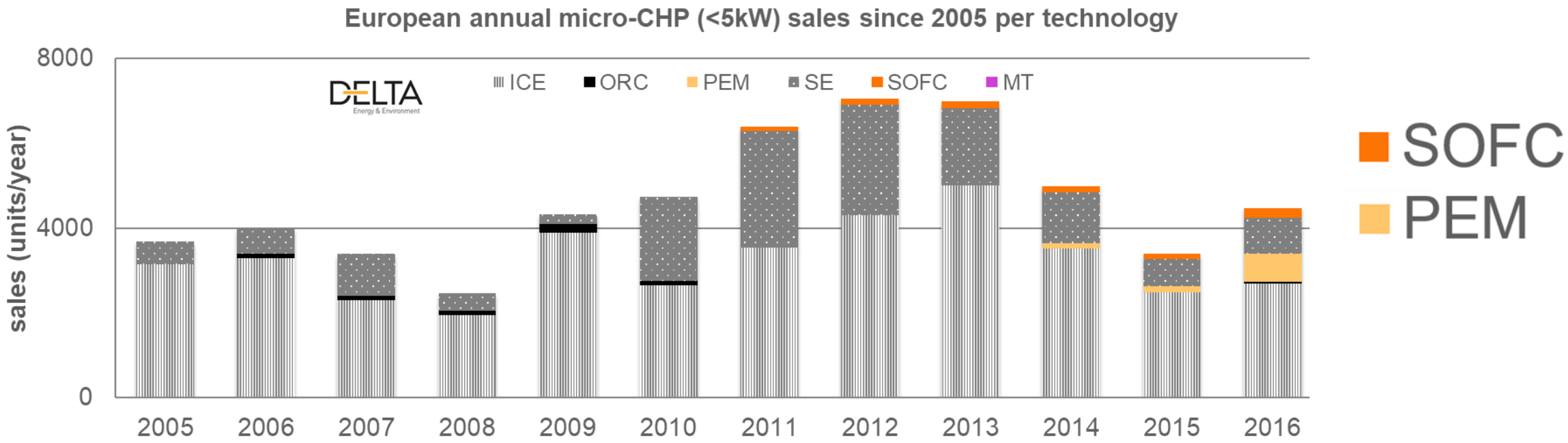
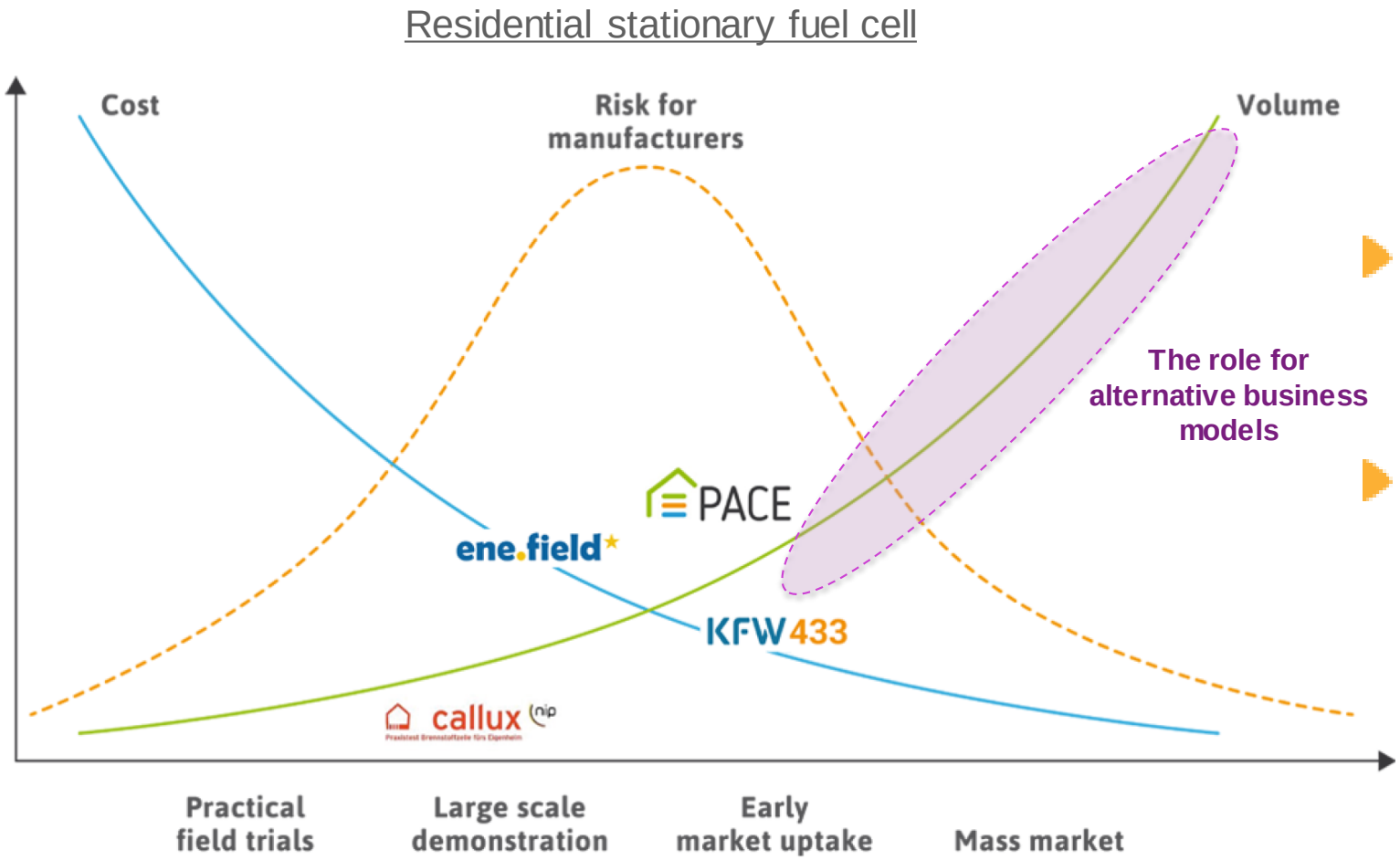
Why is business models innovation important for a product like stationary fuel cell?



Acronyms: **ICE** (internal Combustion Engine) **ORC** (Organic Rankine Cycle **PEM** (PEM Fuel Cell)
SE (Stirling Engine) **SOFC** (Solid Oxide Fuel Cell) **MT** (Microturbine)

From today's trials to tomorrow's market



- **Trials and demonstrations** have fulfilled an important role for increasing volume and reducing cost.
- **An important step** towards volume is therefore well underway.
- However, **identifying the right early markets and matching with the right business models will be critical** for growing volumes

Why has the market struggled for stationary fuel cell?

Drivers

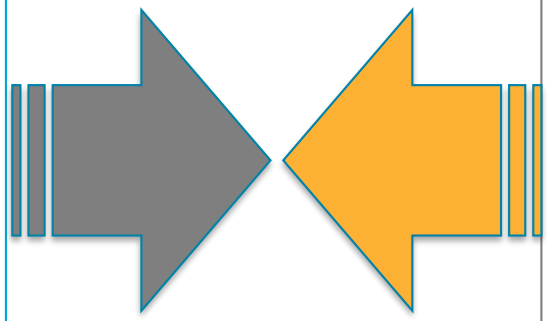
Stationary fuel cell is well placed to play an **important role in decarbonisation**:

Binding GHG reduction targets (40% by 2030, >80% by 2050) – **decarbonisation of buildings will be critical.**

Growing **RE penetration**.

Need to use gas in most efficient way possible.

A credible pathway exists for heat decarbonisation: gas → decarbonised gas (bioenergy, hydrogen).



Market reality

Still **much more expensive** compared with conventional competing products.

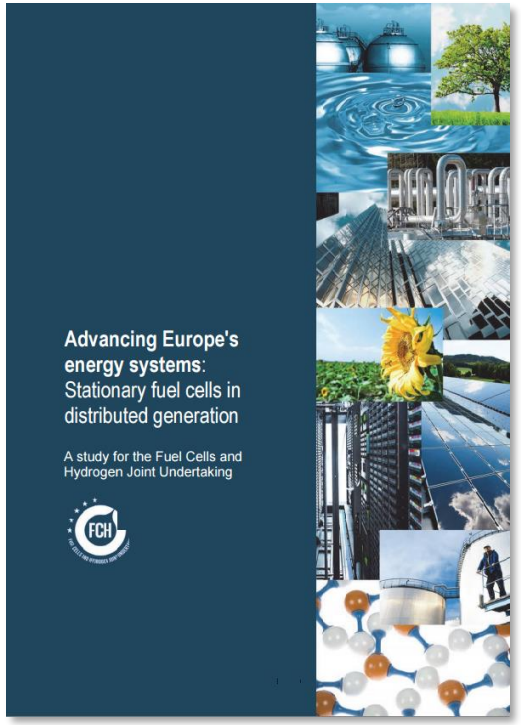
It is **much less mature** which carries a **greater perception of risk**.

The products and the value proposition are **unfamiliar to customers**.

Policy support has been patchy and disjointed.

Existing business models and sales channels are proving **incapable of achieving meaningful sales** volumes.

The previous study



Roland Berger Strategy Consultants / FCH JU (published 2015)

Previous study:

- Stationary fuel cell can be competitive against other technologies at volume.
- Quantified the environment and energy efficiency benefits.

Outstanding questions:

- Markets struggling to grow – why and how to overcome?
- New & innovative business models emerging – which can be attractive for fuel cell?

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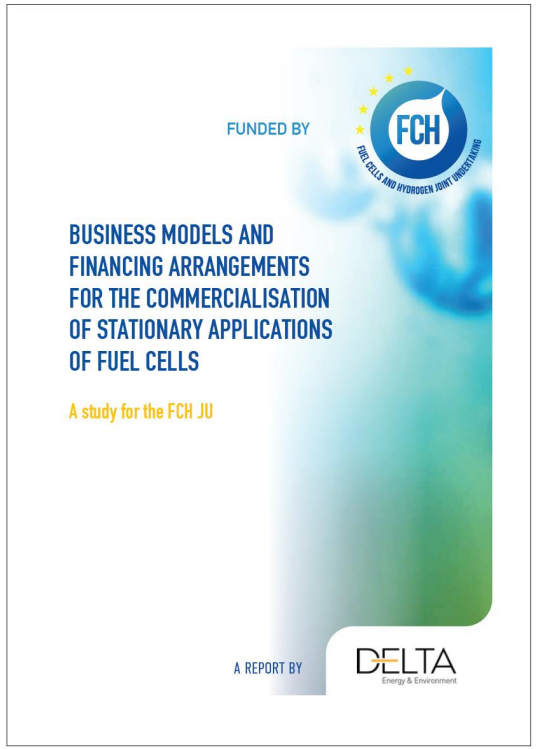
About the study– a snapshot

Snapshot

- ~ 100 business models assessed
- More than 60 interviews
- Consortium of leading industry players
- Series of interdisciplinary workshops
- 18 action orientated recommendations

Project Team

DELTA Energy & Environment
elementenergy
COGEN EUROPE
mpw



Consortium Members

Associations
Bundesverband Kraft-Wärme-Kopplung e.V.
synnogy
ehi
Hydrogen Europe
DENEFF
ade
COGEN
HHIC
Scottish Hydrogen & Fuel Cell Association

Networks
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FLUXYS
GasTerra
Verbundnetz Gas AG
nationalgrid

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FCH FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

What we set out to do

To explore and define the business models and financing arrangements that will seek to enable stakeholders to unlock the market opportunity for stationary fuel cell in Europe.

Main objectives of the project:

Identifying & Informing:
To analyse and evaluate existing and future potential end-to-end business models and associated contractual and financing arrangements.

Actioning:
To derive action orientated recommendations for policy-makers and for industry-wide business model innovation.

Capacity Building & Collaboration:
To foster close collaboration among value chain actors to enable new business models to be successfully and commercially deployed.

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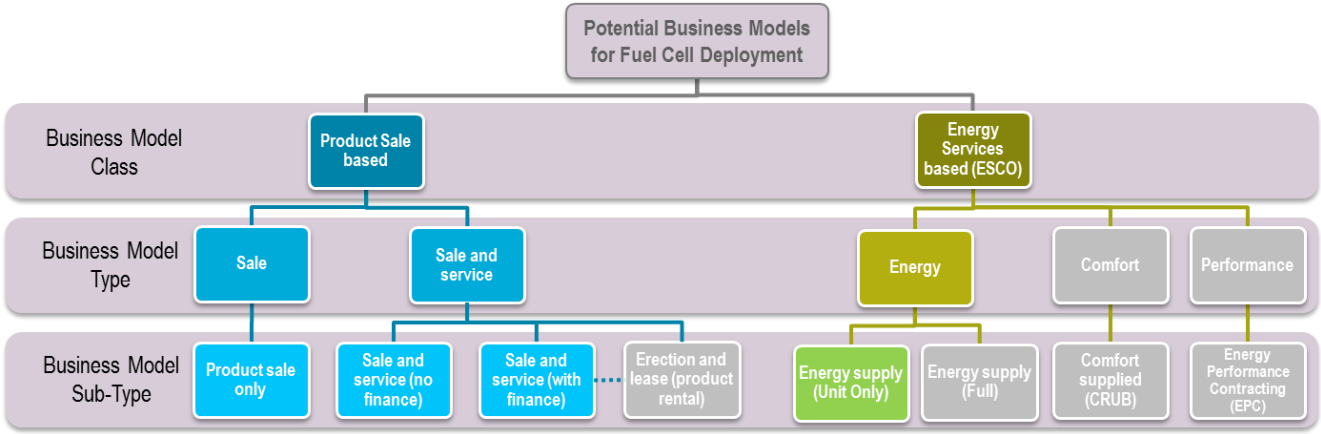
3 priority business models were identified and evaluated in this context, from a long list of ~100.



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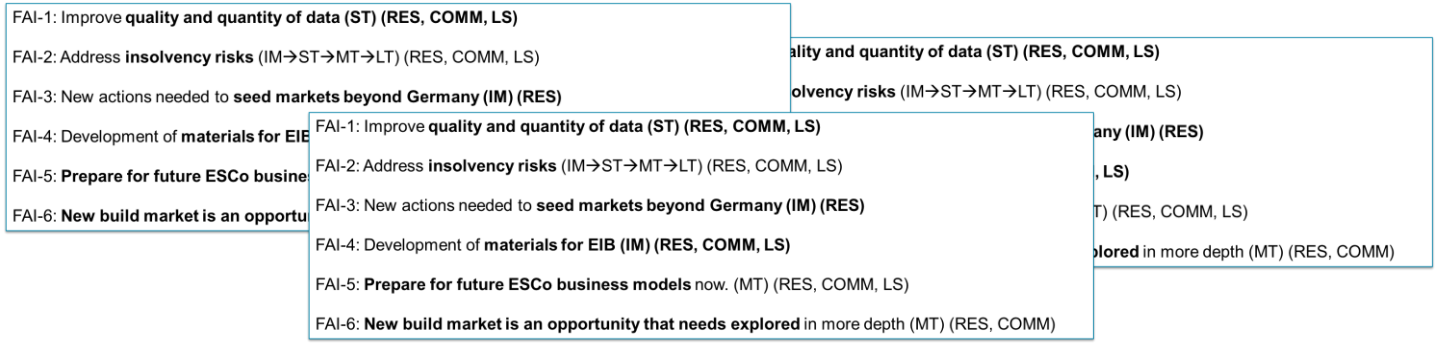
18 main recommendations (29 supporting actions) were detailed - all are specific & targeted.



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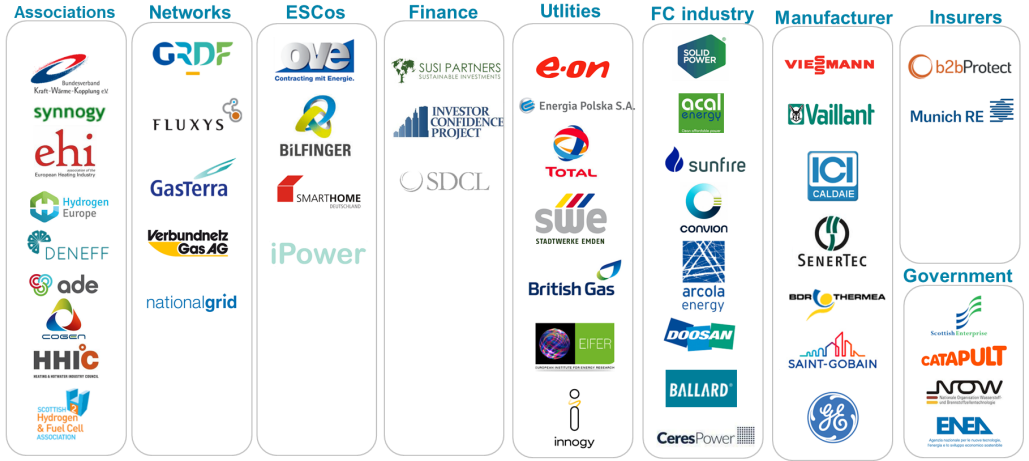
A consortium was brought together comprising 8 different types organisation – all among the leaders in their field.



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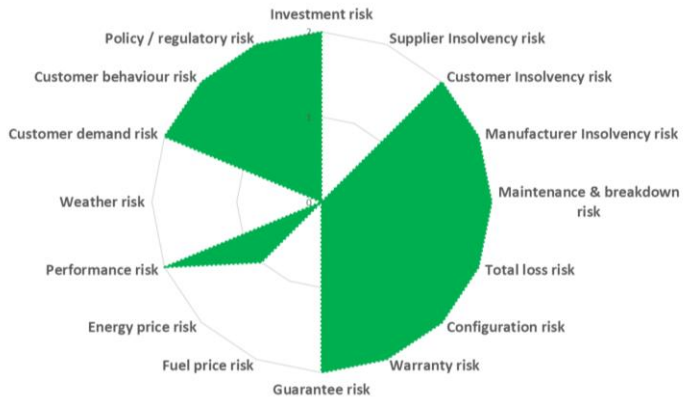
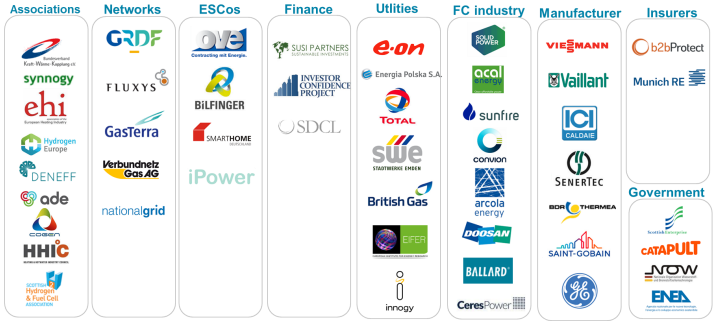
How we defined the business model types

Business model scan: A global scan of energy services business models, learnings from other sectors and technologies, and harnessing ideas from within the fuel cell industry. **A comprehensive set of business model options were developed.**

Risk profiling: Barriers identify risks that a supplier/customer is not willing to take – and business models are the tools to shift risk from one party to another. **Risk allocation challenges led to solutions in the form of an alternative business model**

Multidisciplinary working groups: To develop end-to-end business model and further evaluate viability, expectations and interfaces among key actors needs to be well understood. **Collaborative working gave key actors in the value chain a chance to engage in creative problem solving and establish new relationships.**



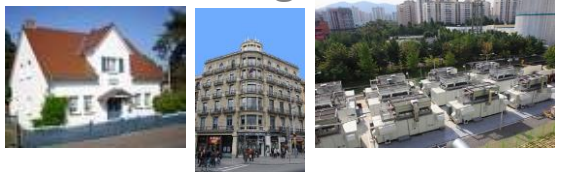


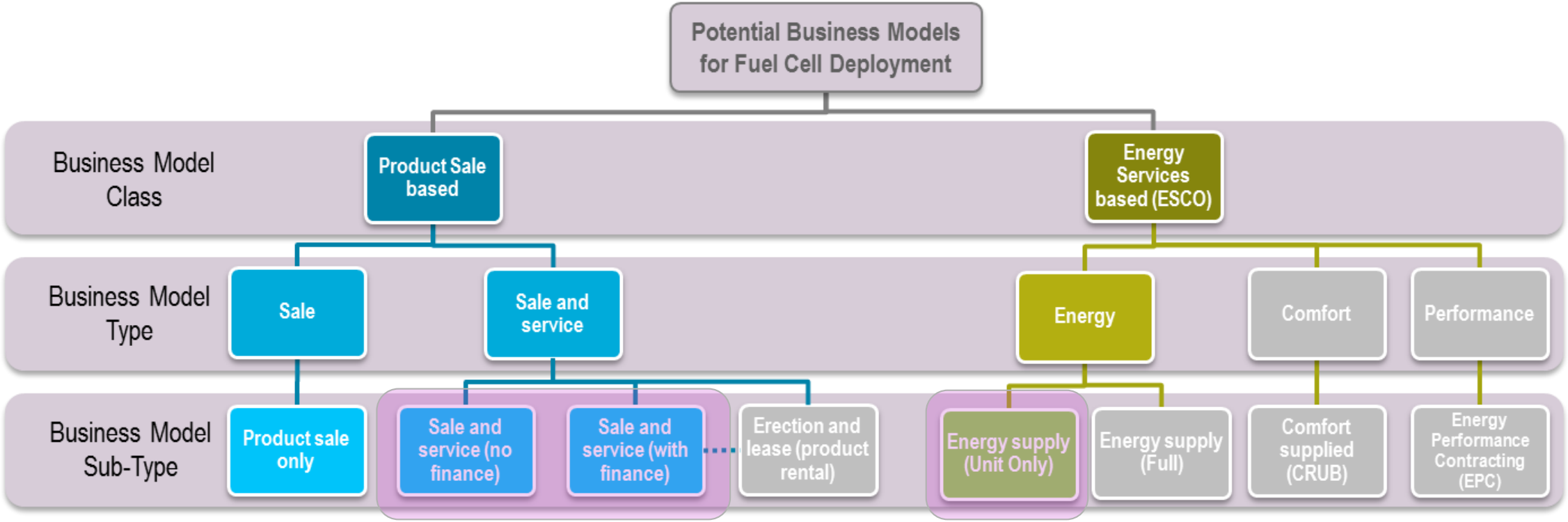
3 resultant business models were assessed to be the most promising

3 priority business model types

- Sale and Service
- Sale and Service (with finance)
- Energy supply (unit only)

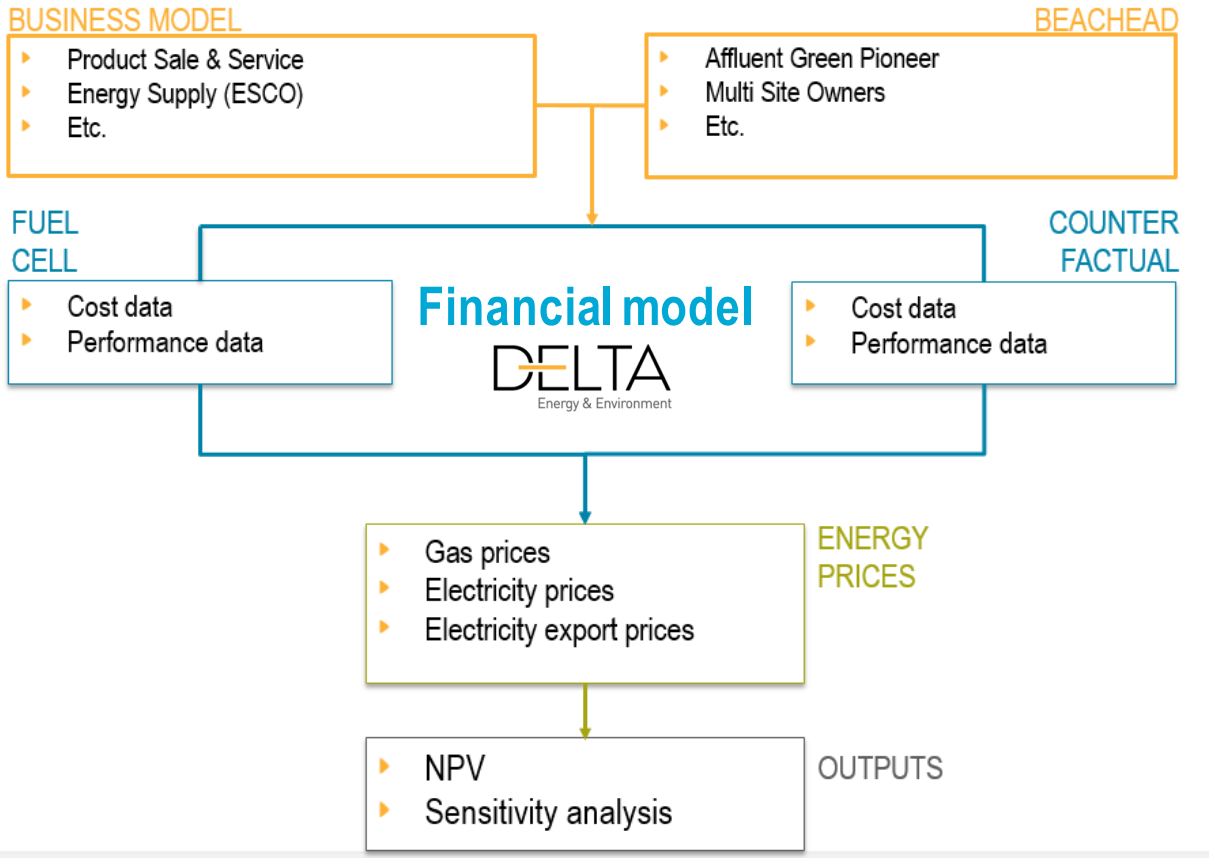
For 3 segments





Our approach – categorising and prioritising the business models

To characterise the business models and find suitable beachhead customer groups, costs & revenues associated with the different business model types were generated by the financial model.



- **A financial model was created** that enabled the exploration of the impact of varying volumes / costs, value chain margins, and discount rates on the financial proposition of fuel cells.
- This was from the **perspective of Customer and Supplier**, in NPV terms.

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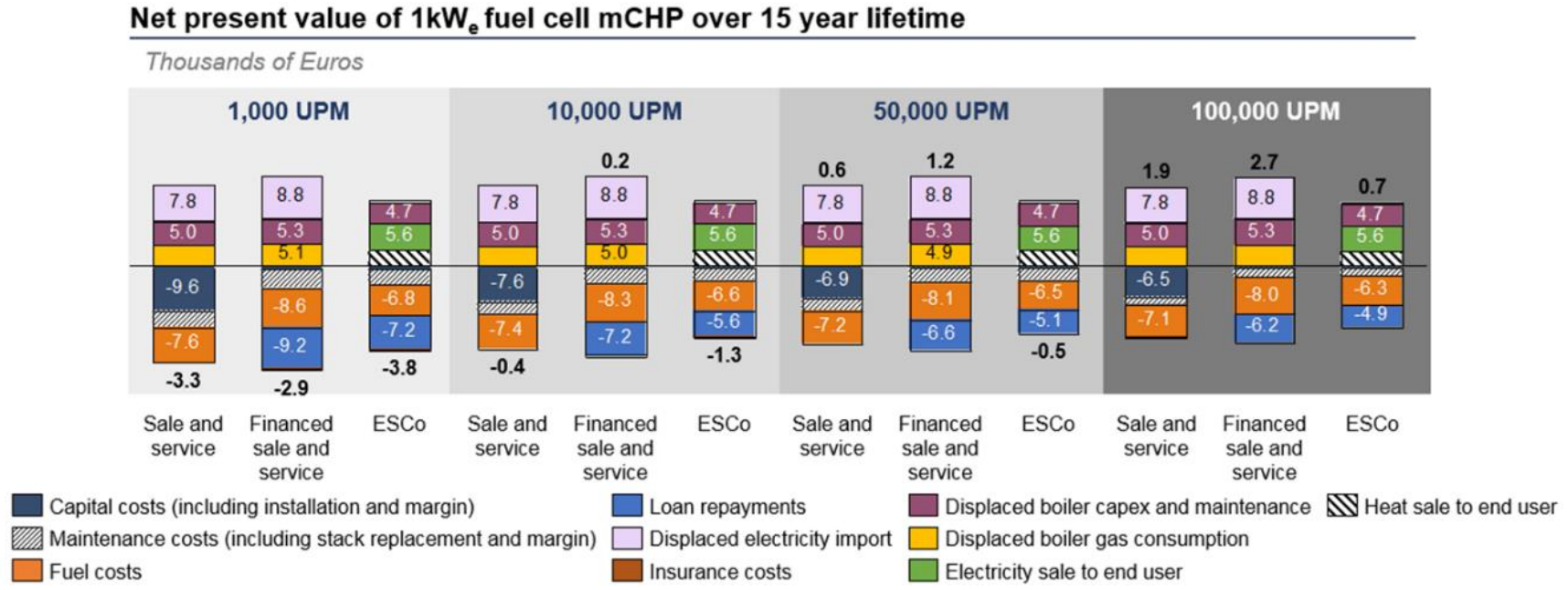
ESCO business models are more suited to high **volumes.**

1 kWe Residential Fuel Cell

The bars ***above*** the horizontal line represent fuel cell ownership revenues.

The bars ***below*** the horizontal line represent the fuel cell ownership costs.



Bold, black numbers ***above*** the stacked bars = +ve NPV

Bold, black numbers ***below*** the stacked bars = -ve NPV

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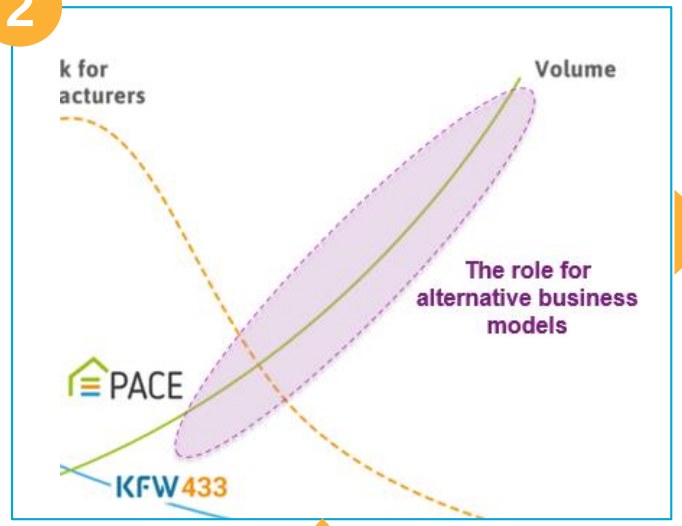
Illustration of a pathway to higher deployment volumes

(*extract from 'Residential'*).

2



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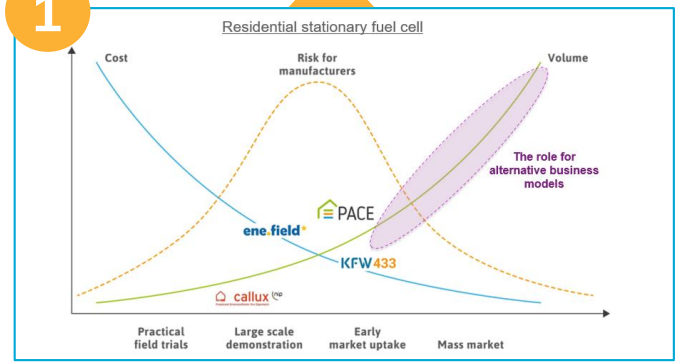
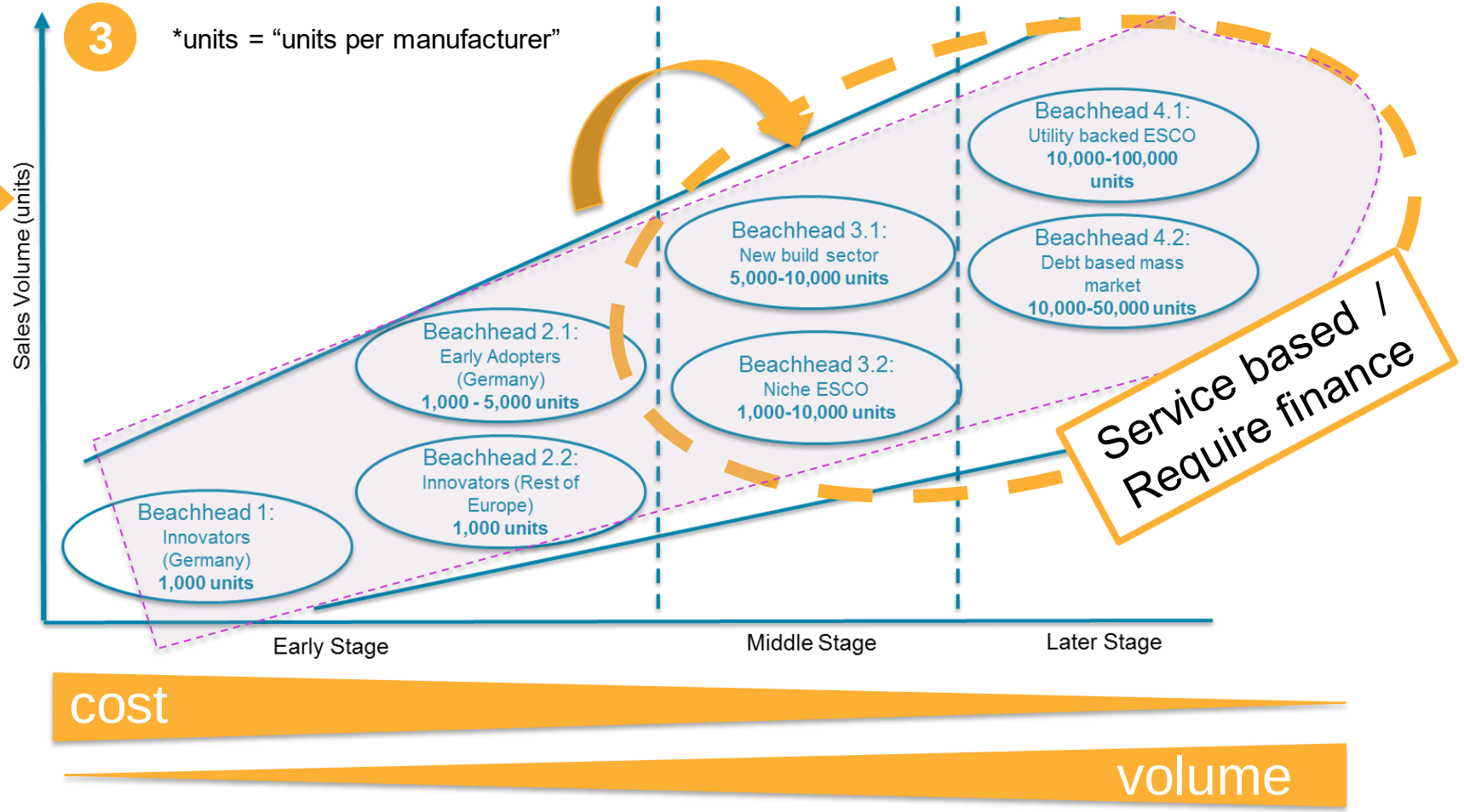


3

*units = "units per manufacturer"



A summary of what we found

Service based: **The business model types** that emerged as most promising all had "services" at their heart.

Targeted innovation: There is still considerable **room for innovation with these business models** (e.g. using data to drive engagement while also improving value chain efficiencies).

Exposed risk: For the business models to be effective, **they do require numerous risk management measures** (and we identified these).

Commercialisation path: **We do see viable pathways emerging** - but sticking to cost and performance objectives is critical (and we identified these potential business model/customer group combinations).

Key recommendations: **Important ones involving some previously overlooked stakeholder groups** – particularly customers, as well as insurance and finance industries.

Acknowledgements

Thanks to all those in the consortium, those we interviewed, those who attended the workshops, and the steering committee, and the FCH JU.

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