

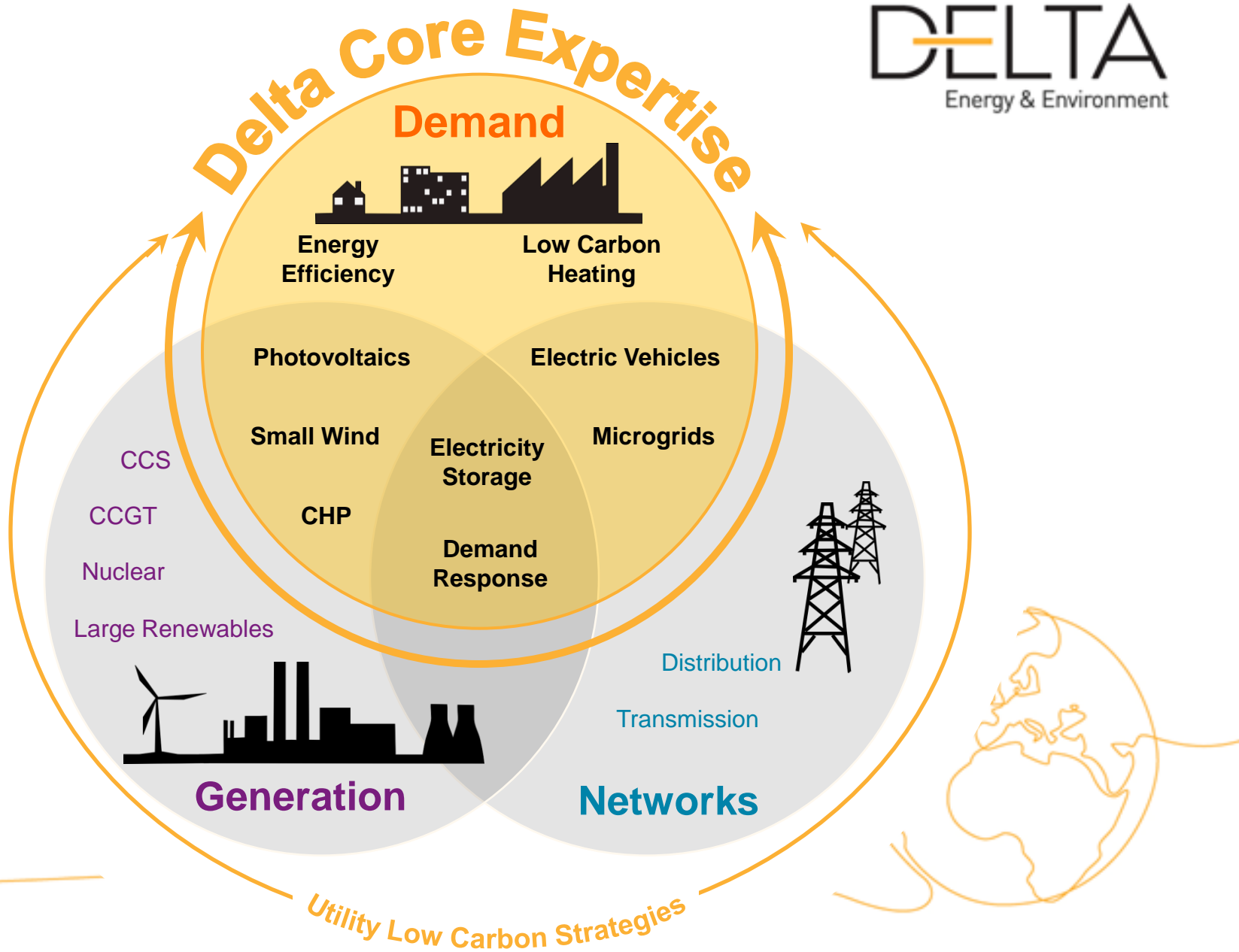
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# Micro-CHP in Europe: The Opportunities and Options

Sytze Dijkstra  
Delta Energy & Environment  
22 April 2009





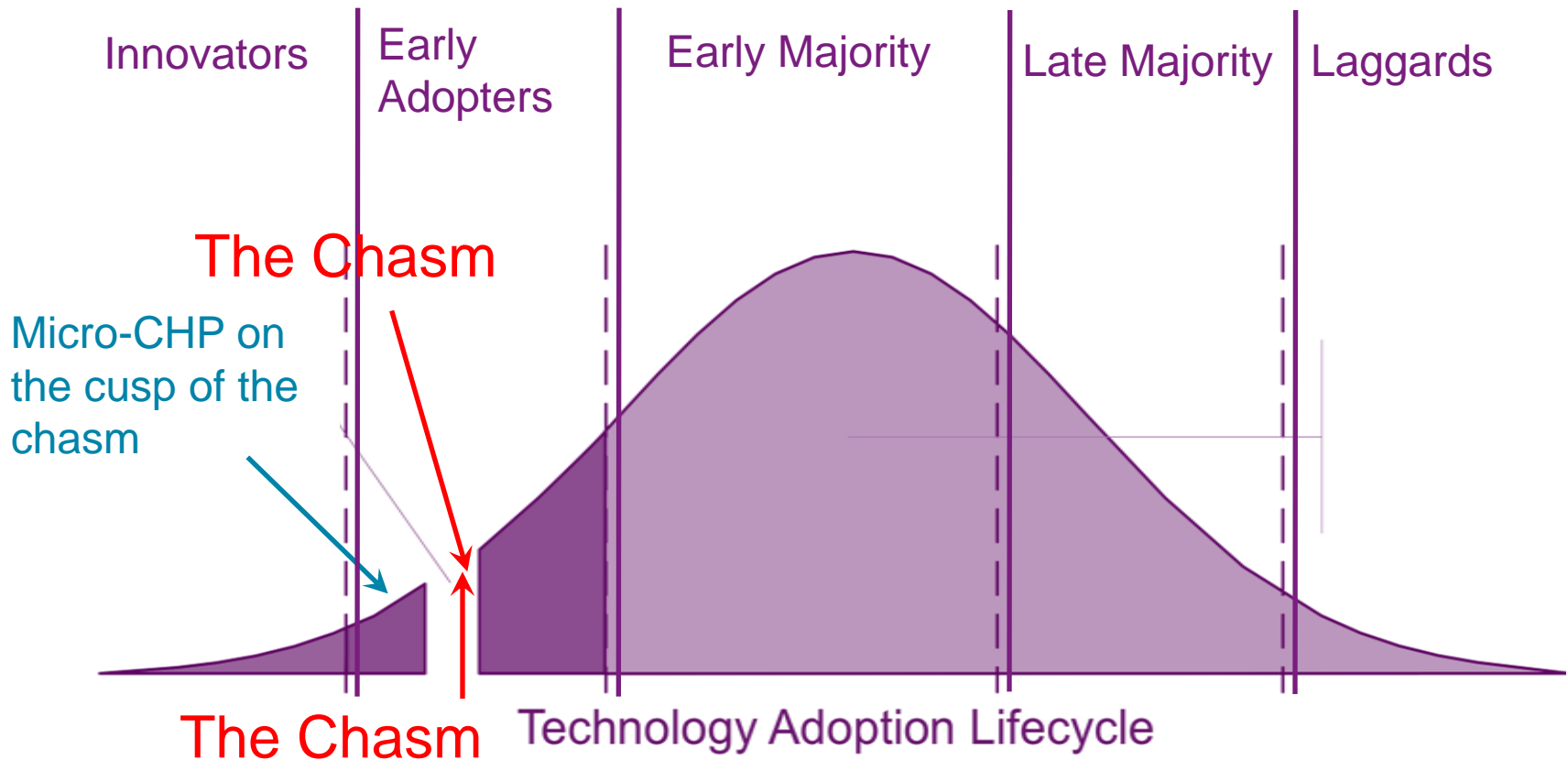
# Micro-CHP in Europe

## The Opportunities and Options

- Status and Opportunities
- Flavours of Micro-CHP
- Towards Mass-market

Where are we today?

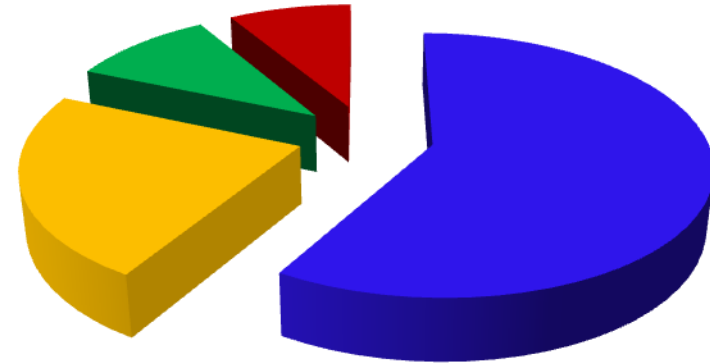
Will it cross the chasm  
...and reach mass market?



It's a big cake – and everyone wants a slice...



## Micro-CHP Sales



	<u>2010</u>	<u>2015</u>	<u>2020</u>
New microCHP installations ('000s)	117	540	938
Installed base (000's)	233	1950	5600
Reduction in carbon emissions (MtC/year)	0.0	0.4	1.1
Cumulative carbon saving (MtC)	0.1	1.1	5.0

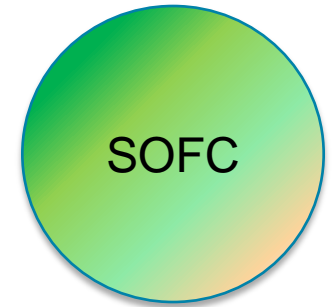
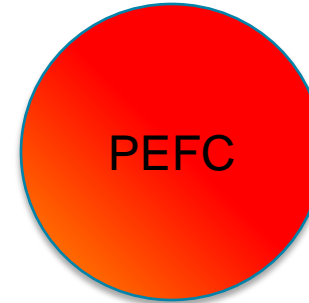
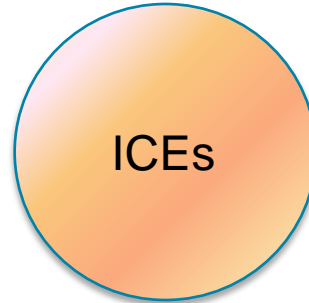
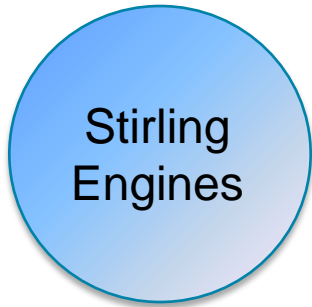
Micro-CHP Annual Sales	Upper Estimate	Lower Estimate
2009	6,000	5,000
2010	30,000	10,000
2011	90,000	20,000

# Micro-CHP in Europe

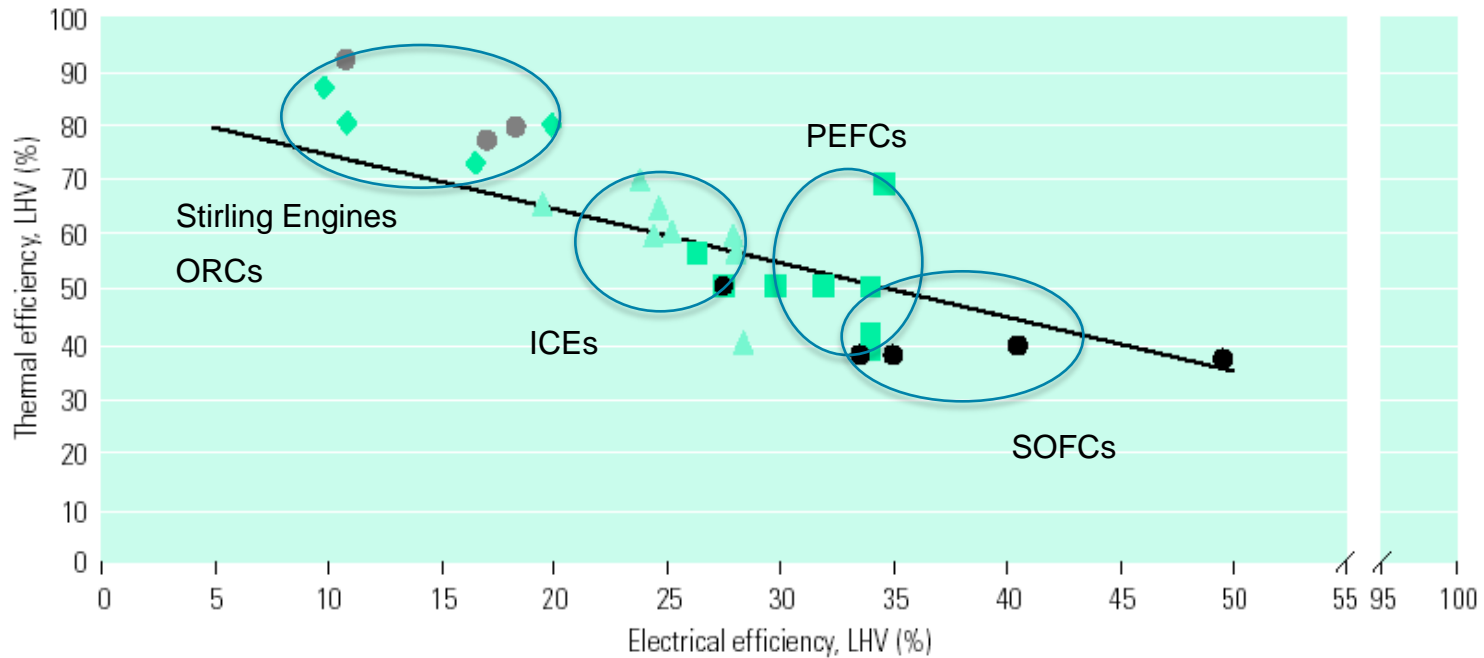
## The Opportunities and Options

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# Flavours of Micro-CHP



- ◆ Stirling engines
- ▲ Internal combustion engines
- Solid oxide fuel cells
- PEM fuel cells
- Rankine-cycle engines
- Reference showing 85% overall efficiency



# Flavours of Micro-CHP – Single-family house



Annual energy demand ~18,500 kWh

Heat 60% - 85%

Electricity 15% - 40%

Baxi - MEC



Stirling Engines



Whisper Tech / EHE



Ariston - ENATEC

Organic Rankine Cycle



Energetix

ICEs



Honda ECOWILL

# Flavours of Micro-CHP – Multiple-family house



Annual energy demand (4-family) ~75,000 kWh

Heat demand ~70%

Electricity demand ~30%

Stirling Engines



Sunmachine

ICEs



Power Plus Ecopower



SenerTec DACHS

# Flavours of Micro-CHP – Low-carbon house



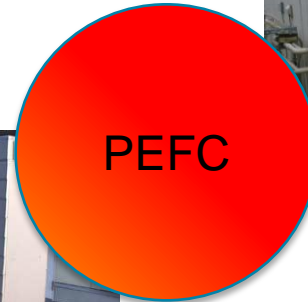
Annual energy demand	<10,200 kWh
Heat demand	~12%
Electricity demand	~88%



Tokyo Gas & Panasonic



Ebara Ballard



PEFC



Ceramic Fuel Cells



SOFC



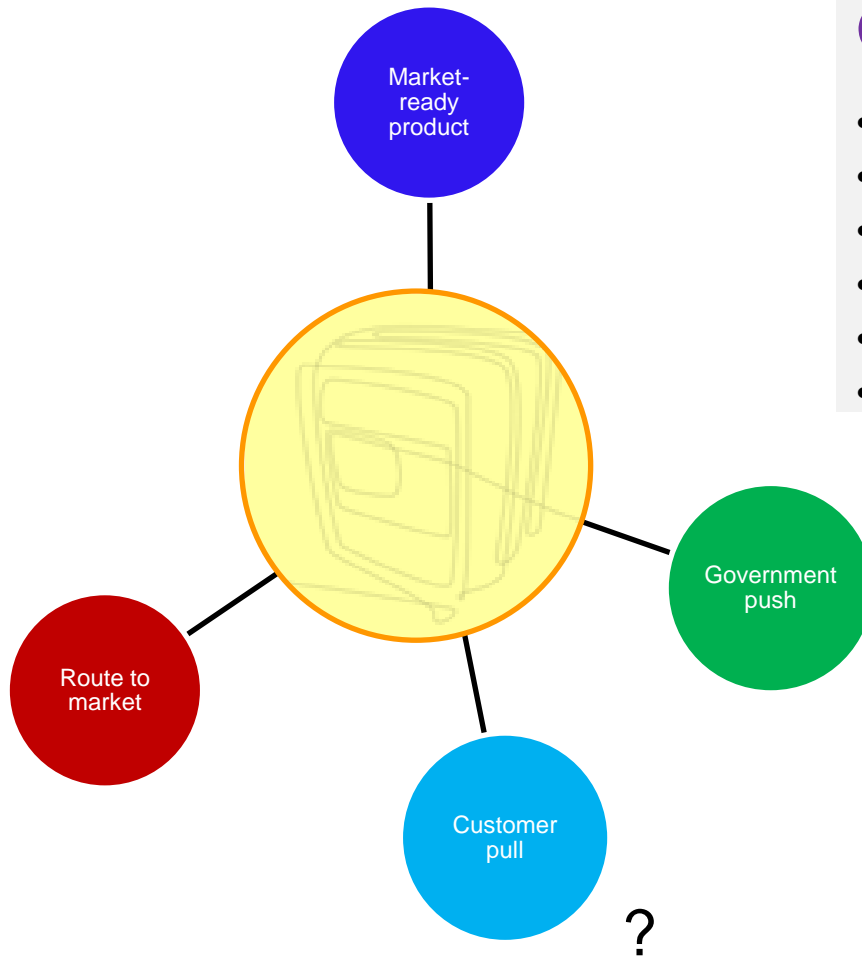
Hexis



Osaka Gas & Kyocera

# Micro-CHP in Europe The Opportunities and Options

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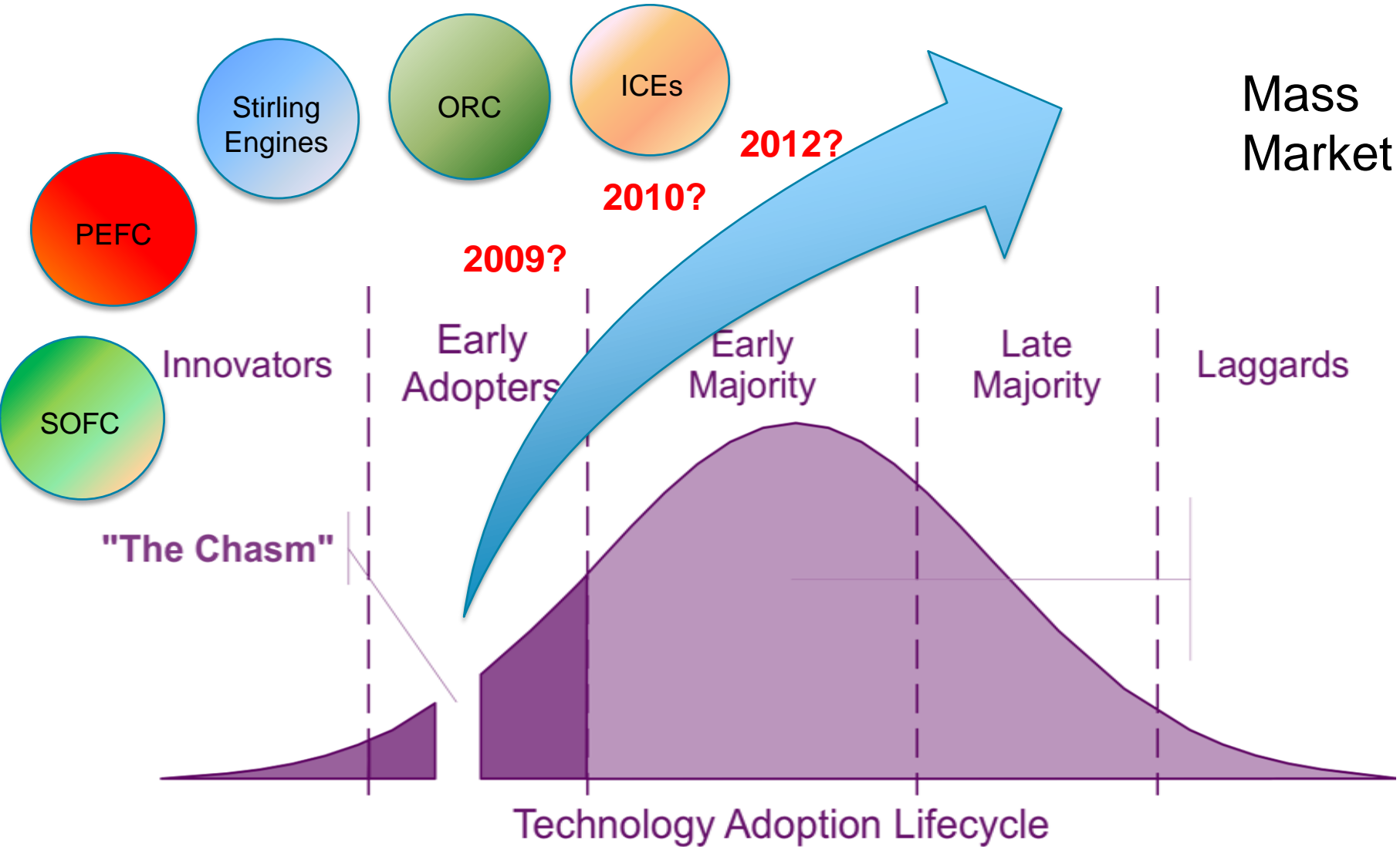
## Government Policy

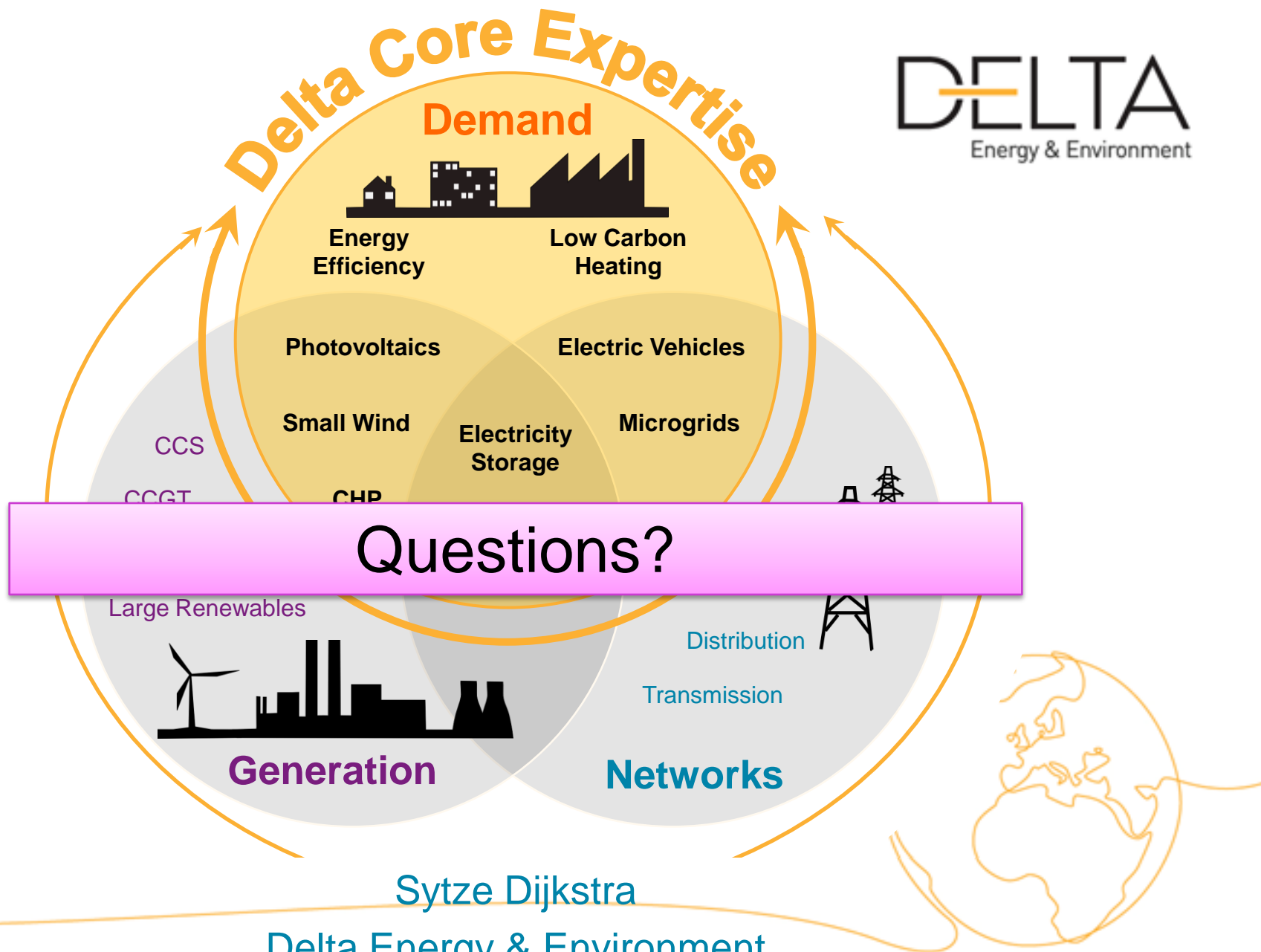
- Feed-in tariff
- Subsidies (capital grant, tax exemption)
- Energy supplier obligations
- Building / heating regulation
- R&D support
- Removing barriers (connection, etc..)

## Utility Interest

- Investment in product development
- Supporting commercialisation
- Field trials
- Taking product to market

# Micro-CHP: Towards the mass market...





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