Scottish Enterprise

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The International Market Opportunity for the Scottish Low Carbon Heat Sector

Including major Country Profiles of China, France, Sweden and the USA (with a UK comparison) and summary Country Scorecards for Germany, Italy, Poland and Turkey

Report prepared by Delta Energy & Environment and commissioned by Scottish Enterprise, with the support of Highlands and Islands Enterprise.

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Contents

List of Acronyms & Glossary

AC	Air Conditioning
BEMS / HEMS	Building / Home Energy Management Systems
CHP	Combined Heat & Power
DH / DC	District Heat / District Cooling
EODB	Ease Of Doing Business
HEM	Home Energy Management
HP	Heat Pumps
HVAC	Heating, Ventilation, Air-Conditioning
IEA	International Energy Agency
IMF	International Monetary Fund
kWh	Kilowatt Hour
LCH	Low Carbon Heat
MWe	Megawatts of Electric Capacity
PA	Per Annum
SDI	Scottish Development International
TOU	Time Of Use
TWh	Terawatt hour

The report focuses on four clusters (see p.4)

C	Cooling
EM	Energy Management
HD	Heat Distribution
HG	Heat Generation

Spark Spread	The difference between gas and electricity prices. The greater the spark spread, the greater the incentive to invest in high efficiency gas-fired CHP. Note that a high spark spread generally disincentivises heat pumps.
Delta-ee's adapted global EODB rankings	The World Bank produces regularly updated global rankings of countries based on 'ease of doing business'. Ten main ranking criteria are used in that overall ranking. For the purposes of this report, Delta-ee selected only those rankings that were relevant for this particular assessment – export market attractiveness. For example, in the Delta-ee adaptation, *Dealing with construction permits* has been excluded. The original World Bank source is at: http://www.doingbusiness.org/rankings

Introduction & Methodology - 1

The aim of this report

This report aims to provide an independent view of the most attractive overseas export markets for Scottish businesses involved in 'low carbon heat'. We do this by identifying some specific international opportunities, both in terms of geography and technologies, which have export potential.

Low carbon heat

For the purposes of this report, 'low carbon heat' is defined as those technologies that provide renewable heat or cooling, and any technology that improves the efficiency of providing, distributing or using heat or cooling. The table below summarises the various technologies and products that are captured by this definition. In summary, we have grouped the various technologies into four Clusters: *Heat Generation, Cooling, Energy Management* and *Heat Distribution:*

The four Clusters

Heat Generation (HG)	Cooling (C)	Energy Management (EM)	Heat Distribution (HD)
Heat pumps		Controls	District heat
Efficient heat (including from fossil fuels eg CHP / fuel cells)		Sensors	Heat storage
Geothermal	Heating, ventilation and efficient air conditioning	Heat modelling	Waste heat recovery
Burning organic matter, biomass	Refrigeration	Energy monitoring	-
Solar thermal	-	Demand management	-

Introduction & Methodology - 2

Context

This report builds on the results of a recently completed **Company Capability Analysis**, undertaken by Innovas, which determines the strengths and potential capabilities of Scottish companies involved in the low carbon heat sector. Innovas identified 227 Scottish companies operating in this sector. This report broadens the findings of that analysis **to define the most attractive international opportunities**.

By matching the Scottish company strengths assessed in the Capability Analysis with companies export capability; three clusters (Heat Generation, Energy Management and Cooling) are well represented in Scotland; the cluster with the weakest representation is Heat Distribution (including district heating).

Methodology

There have been three principal stages to our research, the goal of which has been to identify four potentially attractive export markets and to detail the opportunities in those countries:

1. The first stage was to identify a 'top 8' group of attractive export markets for low carbon heat. To do this we identified the world's leading 50 countries by GDP, on the confident basis that none of our final four would be outside this group (country 51 is Peru). We applied 11 measurable criteria to this list, gave a weighting to each criterion and rated each country. The criteria included GDP, low carbon regulatory push, energy prices, ease of doing business, etc. This produced a 1-50 ranking of the countries which, with Scottish Enterprise, we reviewed and validated. Thus, this first stage identified the 'top 8' as follows: *China, France, Germany, Italy, Poland, Sweden, Turkey, USA.*
2. We then undertook more detailed research of these 8 countries in order to produce a series of information-rich one page Scorecards, presented in the Annex to this report. We again identified and agreed a series of criteria for rating each country, and assessed each country against those criteria. The aggregated ratings for each country highlighted two for clear inclusion in a 'final four': France and the USA. Further discussion with Scottish Enterprise then enabled two further countries, Sweden and China, to emerge for deeper analysis in the third stage.
3. The final stage involved the deeper analysis of the 'final four': China, France, Sweden and the USA, including elaboration of the specific technology export opportunities, recommendations for trade show participation, details of policy incentives, etc. These 3-page country profiles are presented on pp 7-18.

Contents

China - 1

A potentially vast opportunity for Scottish companies with some major, but surmountable, challenges to market entry

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Delta-ee view:

- **China is a potentially vast opportunity for Scottish businesses, but with major challenges to successful market entry.**
- **Heat / cooling demand and markets will grow strongly, based mainly on air quality concerns that are driving new State and provincial incentives.**
- **On some other counts, China scores poorly, including on energy prices.**

Market drivers

Overview – *we expect three clusters to grow strongly: HG, C and EM.*

- **EM:** This is where we see fastest market growth - energy efficiency is a central platform of the current 12th 5-year Plan
- **HG:** Clear growth opportunities across all technologies, including solar thermal and CHP
- **C:** By 2020, China will likely be the 2nd largest cooling / AC market (behind the US).
- **HD:** A more mature market, and the cluster with the weakest future growth rates.

Policy & regulatory environment – *strengthening incentives driven by air quality concern*

Energy Management:

- The 12th 5-year plan includes an objective to reduce energy intensity (energy use / GDP) by 16%, especially challenging now that the very lowest 'hanging fruit' has gone. A new *Top 10,000 Program* targets this many companies for major efficiency improvements.
- All new buildings are subject to increasingly stringent codes, although compliance is patchy. E.g, the revised State Energy Conservation Law has a distinct section on Construction Energy Conservation, including seven Articles on building codes.
- In industry, there are strict requirements for energy audits – we estimate the opportunity for industrial efficiency investment is 5-6 times that of non-industrial sectors.

Heat Generation:

- Renewable heat development will surge. Solar thermal systems have benefitted from high capital grants for years. The IEA projects that the use of renewable heat in buildings will double by 2020, and its deployment will account for 60% of total global growth.
- China intends to replicate the US shale gas boom for itself. This reinforces Delta-ee forecasts that efficient CHP deployment will grow by >50% by 2020, and will likely be the world no. 4 market by then. Shanghai City and Sichuan Province provide incentives.

Cooling:

- Not only will cooling demand continue to surge, but AC efficiency will also have to increase sharply – for example there have been recent tightening of AC efficiency requirements.

Energy price trends – *to rise steadily from a very low base, with high regional variation*

- Gas prices are relatively low by global standards, but rising. There is wide variation here, ranging from €c1.8/kWh in the west to €c4.5/kWh on the coast.
- Power prices are even lower, relatively, with much less national variation. Subsidised residential prices range from around €c3/kWh in Sichuan to €c4/kWh in Guangdong.
- We expect all prices to rise steadily, favouring market growth for all four LCH clusters.

Scottish export capability and experience

Moderate-to-high: fast emerging markets for the 3 clusters with the best fit for Scotland: EM, HG and C are all Scottish strengths and correspond well to growth opportunities in China.

Energy Management

$120 bn was invested in energy efficiency during the 11th 5-year Plan. The IEA forecasts this will increase to $200 bn for the current Plan – far in excess of any other country.

- Engineering, procurement and construction (EPC) activity is now among the highest in the world, creating abundant EM opportunities. EPC investment was $12 bn in 2013, producing 17 million tonnes of oil equivalent of annual energy savings.

Heat Generation

- We expect CHP growth around the main cities and close to the expanding natural gas infrastructure.
- The heat pump market is stronger in the cooler northern region, while the solar thermal market is faster growing in the sunnier south.

Cooling

- While the AC market has many local players, cooling demand will double by 2020, with very strong demand across the country, even in the north.

Ease of doing business

This is by far the weakest link for this market, and any exporter will face multiple and significant challenges.

- China scores poorly for business investment across all key EODB metrics. The country is fraught with risk for exporters.
- It scores very badly for protecting investors, better for enforcing contracts. Either way: take guidance from one of the 4 SDI offices (see p.9).
- For example, businesses need to take legal advice to ensure patents are valid in China and to protect IP. Those who are succeeding have consistent advice: take a long-term view and set up your own office.

China - 2

Three clusters will see strong growth - China is likely to be the world's leading market for low carbon heat investment by 2020

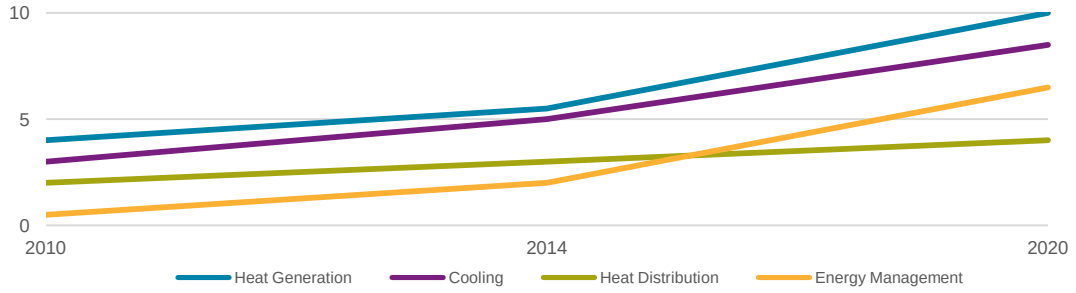
Market size by cluster

(a value of 10 corresponds to the world's leading market for that cluster in 2020)

Strong growth across most clusters:
China will show high growth across 3 of the 4 clusters: HG, C and EM. HD is already more mature and slower growing. Possibly surprising to many, we expect China to be one of the world's largest low carbon heat economies by 2020.

HG & EM will show the fastest growth
The most significant market growth is likely to come from the HG and EM clusters. The strongest growth is likely to develop during the period of China's 13th 5-year plan, 2016 to 2020.

The C cluster will approach that of the US in market size
We expect the C cluster to grow substantially also, from a lower base. China's climate, even in the north, drives high demand for AC – almost year round in the south. Finally, a major new DC scheme is currently planned for Hong Kong (also HD).



Economic growth and heat / cooling demand

- The outlook is for China to be the fastest growing market for heat and cooling demand growth, driven by a very large economy (2nd in the world) and one of the fastest growing of all major economies (~7% annual GDP growth forecast in the period 2015 to 2020).
- China is already the largest heat market and will remain so to 2020. Significant growth will also occur within the cooling sector, with China likely to be the second largest market (behind the USA) by 2020.
- The great majority of LCH and cooling investment is likely to originate from within the '*Top 10,000*' Chinese industries which are being targeted for energy efficiency gains within the current 12th 5-year plan (2011 to 2015).

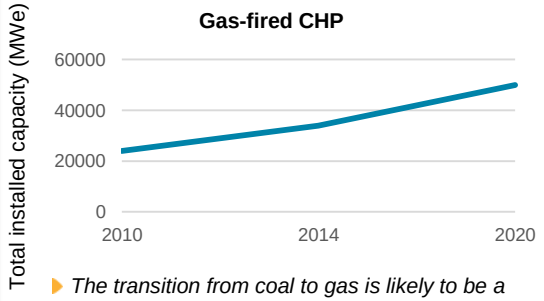
Competitive environment

An increasingly competitive environment

- Across all clusters, there is evidence of growing competition from local players – often with inferior products – but also from foreign-owned companies who are seeking to invest and partner with Chinese enterprises
- Companies seeking to enter China are advised to partner with local companies to help alleviate some of the EODB challenges and to benefit from tax/support regimes which favour majority Chinese-owned JVs.

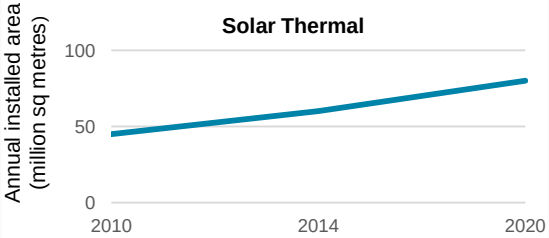
Market opportunity for selected technologies

Gas-fired CHP



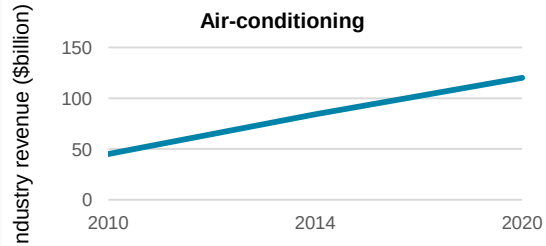
- *The transition from coal to gas is likely to be a significant driver for increased uptake of gas-fired CHP, especially in the industrial and DH sectors.*

Solar Thermal



- *China is the largest market in the world for solar thermal and will remain so to 2020. Delta-ee projects that the market will double in size in the period 2010 and 2020.*

Air-conditioning



- *Tightening regulations around AC efficiency, and a growing demand for cooling, will see robust sector growth, particularly post-2015.*

China - 3

Several LCH industry events are establishing themselves. Attendance is important for those serious about market entry

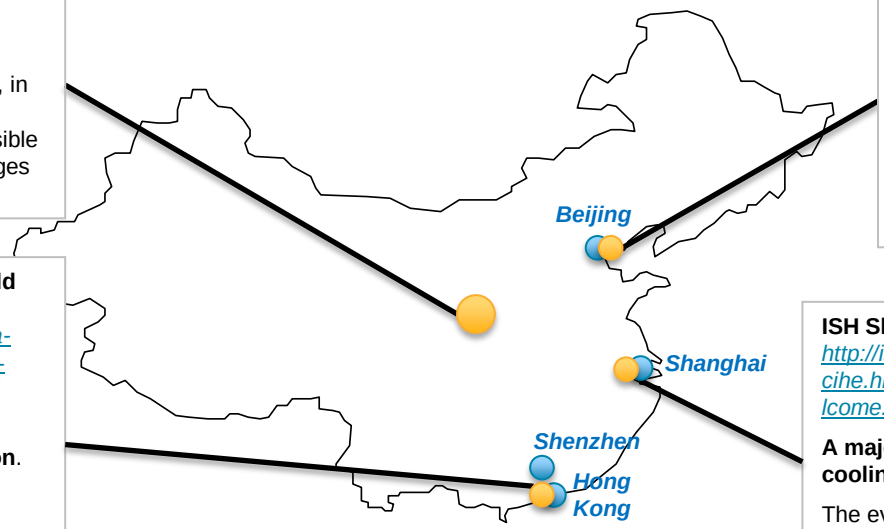
Learning Journey - option

We recommend consideration of a *Learning Journey* to China, perhaps associated with a relevant trade event, in order to identify potential in-country partners and to learn as much as possible how to overcome the inherent challenges to doing business.

Eco Expo Asia, Hong Kong (last held 29 October – 1 November 2014)
http://www.hktdc.com/fair/ecoexpoasia-en/Eco-Expo-Asia-International-Trade-Fair-on-Environmental-Protection.html

A major trade fair focussing on air quality and environmental protection.

With categories including 'Energy Efficiency' and 'Eco-friendly Building Products' the event hosts >300 exhibitors and is especially relevant for the EM cluster.



Example event / conference

SDI Offices *(Beijing, Hong Kong, Shanghai, Shenzhen)*

Solar Thermal China, Beijing, 1-3 April 2015
http://www.solarthermalchina.com

A B2B trade fair dedicated to the solar thermal market.

With over 70 manufacturers represented, the 3-day event acts as trading platform for Chinese and foreign industry players. It forms part of the larger Clean Energy Expo China.

ISH Shanghai, Shanghai, 23-25 September 2015
http://ishs-cihe.hk.messefrankfurt.com/shanghai/en/visitors/welcome.html

A major trade fair event for heat, ventilation & cooling.

The event showcases to East and Central China the latest HVAC solutions from around the world with exhibitors from over 20 global countries/regions and a strong European presence.

Route to Market Overview

- In 2013, a 'Low Carbon Technology' MoU was signed between the Scottish Government and the Hong Kong Science & Technology Parks Corporation. This was brokered by SDI and one of the expected benefits is a source of commercial and export assistance for companies wishing to access the Chinese market.
- There are no shortcuts for market entry in China. All the evidence suggests that homework, preparation, time, patience and persistence will be required in abundance. We recommend that strong consideration is given to target location, e.g. C ideally in the south / HG ideally in the north / EM potentially anywhere.
- Other relevant guidance to developing export activity to China includes the following:
  - [From a LCH company]. The company started out using good agents and distributors, but now have their own employees and operate on a regional basis given the size of the country. In some ways, they have found China easier to operate in than Europe or N. America, for example less strict equipment inspection criteria. But boiler equipment nonetheless requires licences and securing these can be a time consuming process. Emission limits in Beijing are soon to become very strict to combat poor air quality.
  - [From a non LCH UK company] "We take a long-term view of business, whereas agents focus on what they can sell today. We set up a temporary office through Regus, and then sought out local staff. We found our senior Vice President via a head-hunter in China. He's Chinese, but speaks English and understands British business culture."
  - [From a non LCH UK company] "I was approached at a trade fair in Germany by a Chinese company that was already selling goods in our industry, who wanted to act as our agent in China. We carried out some basic due diligence, found them to be credible. The most important thing is to build up trust and to socialise with clients and partners. If they want to take you to a Chinese opera, then go. If you are offered snake's head soup, then eat it."

France - 1

A strong and nearby opportunity driven by world leading policy incentives, but the state of the economy is a constraint

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Delta-ee view:

- **France offers a strong opportunity in most clusters, especially HG – but big economic doubts are weakening heat and cooling demand growth**
- **Key drivers include relatively large market size and some of the most ambitious LCH targets in the world**
- **Its proximity to Scotland and its high scoring for EODB also adds to the attractiveness of the French market**

Market drivers

Overview – ***large market opportunities for HG and EM in particular***

- **HG:** we see strong growth opportunities for heat pumps, solar thermal and biomass (wood pellet stoves & CHP) in all end use sectors – both in retrofit and (even more) in new build.
- **EM:** A definite growth market driven by ambitious government energy efficiency legislation and an increasing share of inflexible power generation in the energy mix.
- **C:** A clear opportunity for reversible HPs and passive cooling – most potential in the south.
- **HD:** A relatively small opportunity for this cluster – we do not recommend it highly.

Policy & regulatory environment – ***ambitious targets and strong government support***

General:

- The *Energy Transition Bill* proposes a hugely ambitious aim to reduce 2050 energy consumption by 50% in comparison with 2012 levels. France also aims to cut the nuclear share from 70%+ of total power generation to 50%, with intermittent renewables to benefit.

Heat Generation:

- This Bill also proposes a target of 38% of *all* heat to be derived from renewables by 2030.
- Loans, subsidies and tax benefits are now available for biomass, solar thermal, air / ground source heat pumps. The renewable heat tax credit recently doubled to 30%.
- National thermal regulations *(RT: Réglementation Thermique)* mandate that new residential buildings must have either a solar water heater, an HP water heater or a micro-CHP boiler and have at least 5 kWh/m^2/yr produced by a renewable energy technology.
- We expect the cut in nuclear generation to also boost the replacement market for gas-fired CHP in industry and buildings. We forecast 300-400 MWe of new installations to 2020.

Energy management:

- France has aggressive energy efficiency programmes for industrial, commercial and residential sectors. It ranks 3rd in the *2014 International Energy Efficiency Scorecard*.
- For example, RT 2012 limits energy consumption for new residential buildings from 150 to 50 kWh/m^2. Mandated energy monitoring will drive demand for BEMS, HEMS and controls.

Energy price trends – ***very low electricity prices and average gas prices will steadily rise***

- Electricity prices are much lower than the EU average (residential and industrial are around €c13 and €c7 / kWh respectively, compared to EU median of €c17 and €c8+). Gas prices are closer to the EU median, eg industrial prices of €c3.2 / kWh, the EU median is €c3.5.
- Thus, very low but rising power prices, and average and rising gas prices, will increasingly incentivise LCH (even HPs) and EM in particular.

Scottish export capability and experience

A strong fit: growing opportunities for many LCH technologies within HG, EM and C (and to a much lesser extent, **HD**). These are all growth markets and there is a strong correlation between these and overall Scottish capability.

Heat Generation

- The most attractive technology markets are likely to be solar thermal, heat pumps and biomass, all of which potentially play to Scottish strengths.

Energy Management

- There is very likely a growth market for HEM products (priced <€300) and BEMS. We see fast emerging Scottish capability here, as well as for wider demand response and grid balancing solutions.
- We also expect there to be a strong growth market for 'smart' HG technologies (eg HPs) that integrate with EM.

Cooling

- We see more modest growth for the C cluster, with most focus in the south. However, markets for reversible high efficiency heat pumps and low energy cooling (i.e. passive cooling) will likely flourish.

Ease of doing business

France rates highly as an export market presenting few obstacles to trade. As such, it is already Scotland's 3rd largest market for goods and services

- France is 14th in the Delta-ee adapted global EODB rankings and scored very highly for enforcing contracts.
- However, it has a relatively low rating for protecting investors.
- France is Scotland's 3rd biggest export market (£2.1 bn pa) and has the additional advantage of being an EU Member State, with all its consequent benefits. For example, goods manufactured in the UK are exempt from import duties.
- Overall, we see no major challenges, of the 'trade barrier' variety, to the rapid expansion of LCH export to France.

France - 2

Two clusters (HG and EM) in particular will enjoy strong growth – France will likely be a LCH leader in Europe by 2020

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Market size by cluster

(a value of 10 corresponds to the world's leading market for that cluster in 2020)

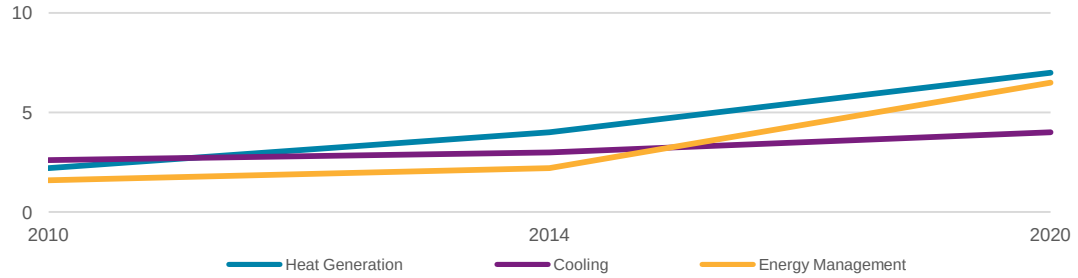
Strong growth for both HG and EM clusters

The HG market for both commercial and residential buildings is already significant, likely > €3 bn pa (the industrial opportunity is much smaller). We see this growing steadily, but not spectacularly, to 2020 based on the drivers highlighted on the previous page. By 2020 LCH will make up around 35-40% (€1.56 billion) of the entire residential heat market.

EM sales will be led by BEMS, HEMS, smart meters and other energy controls. Smart meters already help optimise HP performance and will increasingly be driven by national energy efficiency objectives and strongly increasing value in demand response, across all sectors.

The market for high efficiency cooling (C) will continue to grow at more modest rates

Cooling is included in the RT 2012 energy consumption limit of 50 kWh/m2 and thus there will be growing demand for high efficiency cooling products, including reversible heat pumps.



Economic growth and heat / cooling demand

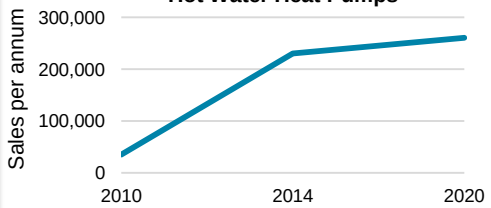
- Overall heat and cooling demand levels are likely to remain flat or reduce as a consequence both of the very poor economic outlook and the policy emphasis on energy efficiency.
- The French economy continues to struggle to recover. The IMF's latest GDP forecast has reduced the 2014 growth forecast from 0.8% to 0.4%, with the medium-term outlook remaining fairly weak at 1% growth in 2015.
- Nonetheless, France remains a major world economy and as such ranks highly both for industrial and buildings heat demand. To achieve its efficiency objectives will require major market growth for HG, EM and efficient C products.

Competitive environment

- The French heating market has unique characteristics because of the major role of electricity. This has led to a small number of major national players (e.g. Atlantic, Schneider) now having a strong hold on the wider LCH market. While competing with these players will certainly be possible, partnering may be a more effective route.
- However, direct entry by non French players is commonplace: of the top five HP manufacturers, only two are French companies.

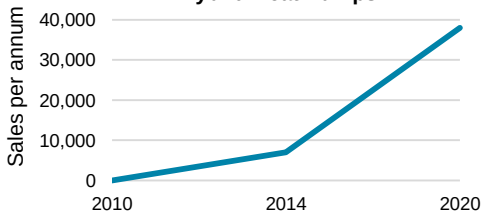
Market opportunity for selected technologies

Hot Water Heat Pumps



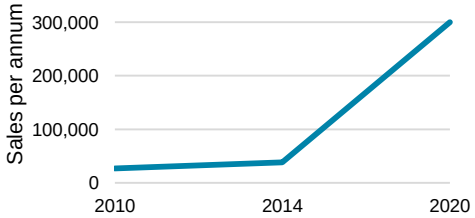
- *HWHPs are already becoming a key technology. They offer a high growth opportunity in an emerging market – surging to almost 0.25m pa by 2014.*

Hybrid Heat Pumps



- *We expect sales to grow from around 7,000 pa in 2014 to around 40,000+ in 2020, driven by RT 2012, and with a price point around €6,000.*

Home Energy Management Systems <€300



- *Sales will grow rapidly, from around 30,000 in 2014 to 300,000 in 2020, mostly driven by the new build regulations and the emerging demand response market.*

France - 3

There are several LCH industry event options, particularly around HG and EM

Congrès Français des Pompes à Chaleur (French Congress of Heat Pumps). Held in September.
Contact: **eveline.julien@cetiat.fr**

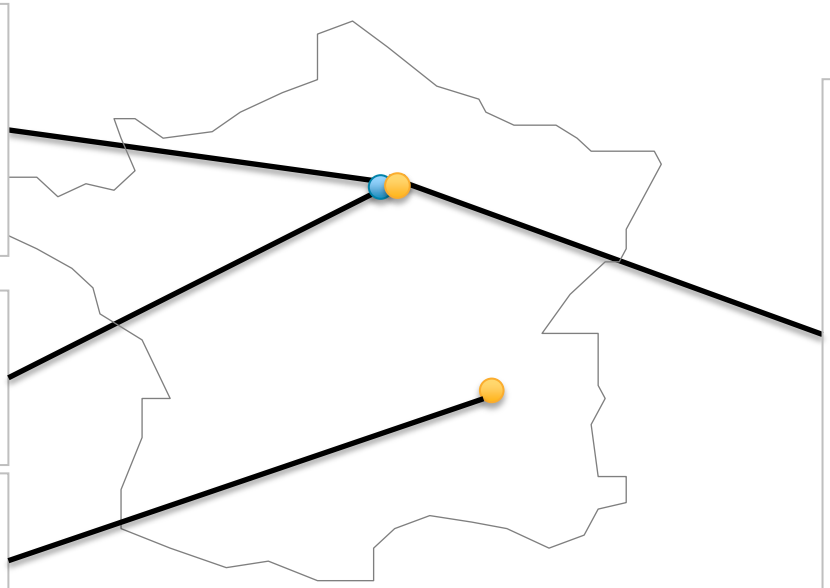
With a strong R&D focus, INPAC organises the annual French Congress of Heat Pumps (for all sectors – residential / commercial / industrial), to better disseminate the results of research and technological development. [The conference will be in French.]

Trade Mission or Learning Journey - option

The majority of the relevant companies are based in Paris and / or have offices there. It is therefore likely that Paris would be the best place for any trade mission or learning journey.

Pollutec, Lyon (last held 2-5 December 2014).
http://www.pollutec.com/GB.htm

The 26th international exhibition of environmental technologies and services, with a major energy component.



Example event / conference

SDI office *(Paris)*

Interclima + Elec, Paris. 2-6 November 2015.
http://www.interclimaelec.com/

This flagship event in Paris is made up of 3 shows; *Interclima + Elec, Batimat* and *Idéobain*. Together they showcase materials, equipment and tools, technologies, solutions and services relating to energy use and generation in industry and buildings.

There are around 2,600+ exhibitors and over 350,000 attendees – probably an essential event for any company wishing to identify a large number of prospects, showcase their expertise and highlight their innovations.

Route to Market Overview

- No special 'rules' exist for entering the French market – indeed, it is more open than many others to non national players. It should hardly need to be said, and applies also in most other countries, but there is a critical need to have strong local language capability.
- For all clusters, a potential route to market would be to partner with a company already established in or exporting to France, or with one of the two major energy utility players in France - EDF or GDF Suez - both of which are building up their competence in HG and EM in particular.
- There are challenges. The energy market tends to be dominated by a few major players, including the utilities. The HG cluster is growing fast but is already competitive, although four of the top 5 manufacturers in the market are from outside France. Clear opportunities exist for hot water heat pumps or hybrid heat pumps.
- The EM cluster will be easier to break into due to the relative infancy of the market and the potentially explosive growth. Again, we recommend partnership, whatever the part of the value chain.
- For all clusters, tenders tend to be onerous but rewards are high and at the time of writing there are tenders available for companies to help develop smart metering systems. Tenders are published at these sites: http://www.businessopportunities.ukti.gov.uk/, http://ted.europa.eu/TED/main/HomePage.do.
- Overall, therefore, we recommend a potential trade mission or learning journey, which will almost certainly have to include Paris. The French office of SDI has strong contacts with relevant national LCH organisations, including the *Syndicat des Energies Renouvelables,* a policy lobbying association which has many relevant industry members that could be potential partners for Scottish businesses.

Sweden - 1

A strong export opportunity – while a very small market, it is a world leader in the promotion of low carbon heat

DELTA Energy & Environment

Delta-ee view:

- **A world leader in the promotion of low carbon heat, Sweden's only major limitation as a market opportunity is its small size.**
- **It has one of the highest global ratings for EODB, alongside a highly favourable regulatory framework for most clusters.**
- **HG and EM are the top two growth opportunity clusters for Scottish players, but the competitive environment is challenging.**

Market drivers

Overview – ***two strong clusters (EM & HG) in a strong but relatively small economy***

- **EM**: A growing market driven in part by growing renewable (intermittent) electricity generation.
- **HG**: A continuing growth market, largely thanks to sales of heat pumps.
- **HD**: A more mature, slow growing market, but with remaining biomass heat opportunities
- **C**: We see no major market opportunity for this cluster.

Policy & regulatory environment – ***strong, both at national and local levels***

Energy Management

- Continuing heavy investment in energy efficiency based on a world leading 2020 national objective of increasing efficiency by 20% compared to 2008 levels.
- The national goal of phasing out net GHG emissions by 2050 is also driving strong growth in passive housing (low or zero emission buildings requiring sophisticated EM controls).
- The strong renewable targets (see below) will lead to increased energy production from wind and PV. The resulting intermittency will lead to a strongly increased importance for EM technologies.

Heat Generation

- The core driver of HG technologies is the targeted use of energy taxation - Sweden has the world's highest carbon and energy taxes.
- These taxes are deployed to penalise carbon and incentivise LCH. The country aims to phase out fossil fuel heat and achieve a 50% renewable share in final demand by 2020.
- Heat pumps (to replace existing electric heating, see next page), and biomass heat are two of the strongest HG technology segments, both driven by tax incentives. For example, in 2013, the taxation of heat supplied from biomass CHP was eliminated altogether.
- Sweden is already a very high user of waste-to-energy in industry, growing at 3-4% pa, driven by bans on landfill (from 2002) and organic waste (from 2005). Waste imports are at around 800,000 t/yr (mainly from UK, Norway), which suggests that it could become more valuable as a source of energy in the future.

Energy price trends – ***remaining high***

- Sweden has high end use energy prices as a result of the high level of taxation (more than 40% for residential users). It is the only country in Europe where gas is currently more expensive than electricity, leading to a negative spark spread for CHP.
- It is a similar story in the commercial sector, with one of the most expensive gas prices in Europe while electricity prices remain relatively low, favouring larger heat pump deployment.
- We expect to see some growing flexibility in future energy prices as a result of the introduction of ToU tariffs, although prices will remain relatively high due to high taxation.

Scottish export capability and experience

Moderate-to-high: there are established / growing markets for 2 of the top 3 Scottish clusters (HG, EM)

Heat Generation

- HG will continue to grow, as a result of Sweden's ambitious renewable targets.
- It is a relatively established and mature market, with a strong emphasis on HPs. Local players such as NIBE and IVT are in a strong position.

Energy Management

- The EM cluster is likely to grow strongly in Sweden, given the expected growth in renewable energy generation and its requirements for advanced energy monitoring/management controls. Furthermore, the availability of ToU prices in Sweden gives Home Energy Management systems an opportunity in association with HPs.

Heat Distribution

- In Sweden, DH accounted for 93% and 83% of heat for multi-dwelling buildings and non-residential premises respectively, in 2011. It could experience an extra boost from plans to phase out residential electric heat and replace it with biomass-fired CHP or DH.

Ease of doing business

Easy: Sweden is just outside the top 10 of Delta-ee's adapted global EODB rankings.

- An EU Member State and a geographical hub in the Nordic region.
- English is widely used as a business language.
- Ranks especially high when it comes to trading across borders. As for other aspects, such as enforcing contracts and protecting investors, it ranks 25th and 34th respectively.
- Sweden is Scotland's 20th largest export market.

Sweden - 2

The EM cluster will see by far the strongest growth; HG will continue to grow but less rapidly

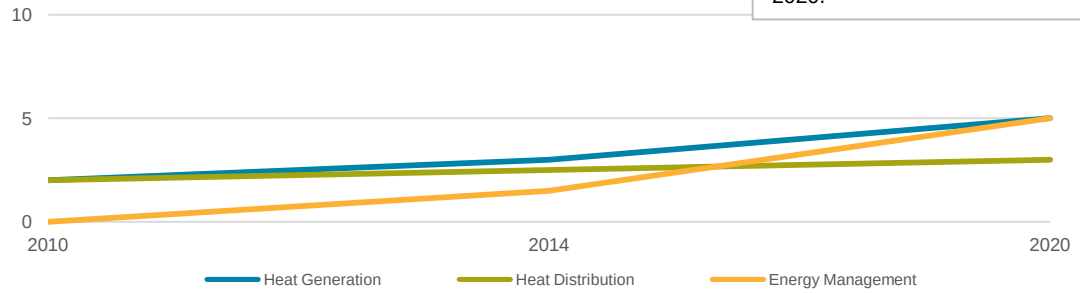
Market size by cluster

(a value of 10 corresponds to the world's leading market for that cluster in 2020)

DH remains the main form of HD in Sweden.
The demand for DH will grow slowly and may even reduce beyond 2020 as a result of increased energy efficiency measures being implemented in buildings.

In terms of HG, it is a HP story.
The market for HPs is likely to stabilise with sales of 120,000 pa by 2020. Biomass-fired CHP could play its part, given the plan to phase out electric heat from the residential sector.

In the EM cluster, we expect to see a strong growth from 2010.
Driven mainly from sales of Home Energy Management systems and smart / connected home products looking to take advantage of ToU prices. Sales of products may reach 80,000 - 120,000 units pa by 2020.



Economic growth and heat / cooling demand

Very limited growth, if any, in heat demand (but high growth in *renewable* heat demand) based on aggressive gains in energy efficiency

- Given the high level of energy efficiency targets in place, we do not expect heat demand to grow (with the possible exception of industrial heat).
- There is a strong possibility that demand will begin to fall, whatever the GDP growth rates. For now, the IMF forecasts GDP to grow by 2.6% pa in 2015 and beyond, relatively high for the EU.
- Its small size is a factor but not a showstopper for exporters: Sweden still ranks 21st in GDP rankings, and is in the top 10 for GDP per capita.

Competitive environment

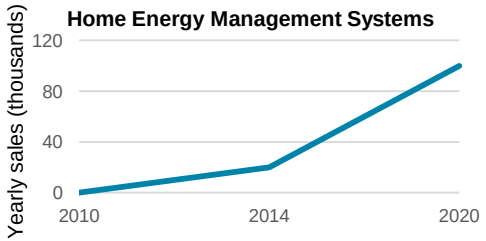
An already competitive market for the fast emerging EM cluster

- This is a new, growing market driven by growing value for demand response (DR) in industry and buildings. Already, there are several players (eg Greenwave), from Sweden and elsewhere.
- The HG cluster is more crowded, with IVT and NIBE being the front runners among HP players.

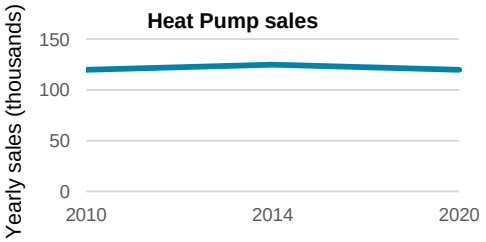
A tougher competitive environment for HD

- There is already a long-established district heat market, largely based on biomass (>80 pellet production facilities).

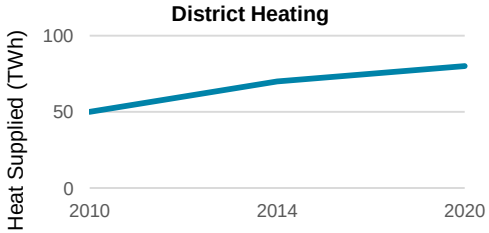
Market size for cluster sub-technologies



- *HEM sales have experienced a strong growth in recent years and likely to grow further as a result of growth in renewable energy generation and availability of ToU tariffs.*



- *While growth will likely be flat, this is already a highly attractive market.*



- *DH could grow stronger in Sweden, given the large amount of biomass available. Furthermore, Sweden imports over 800,000 tonnes of solid waste to convert to energy.*

Sweden - 3

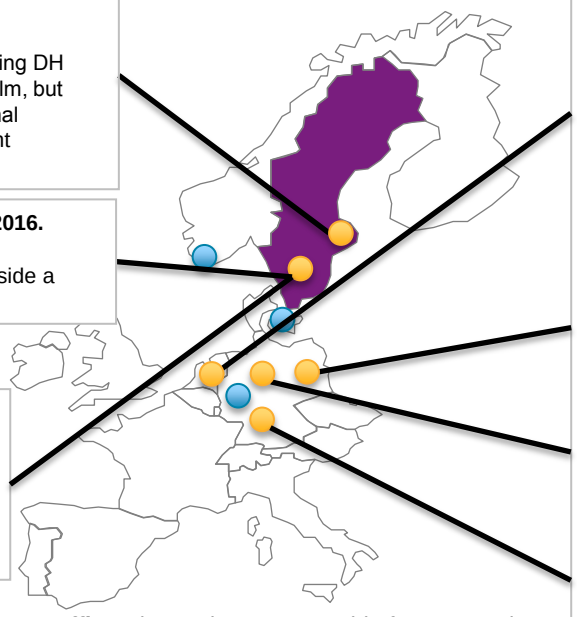
Many relevant trade events will be outside of Sweden and so we propose a carefully targeted trade mission

14th International Symposium on District Heating and Cooling, Stockholm (last held 6-10 September 2014).
http://www.svenskfjarrvarme.se/DHC14
Although a slow growth cluster, this is one of Europe's leading DH events. This year's event has already been held in Stockholm, but next year's will also be an excellent national and international opportunity with more than 250 participants from 24 different countries.

Nordic DH Fair, Jonkoping, Sweden, 27-29 September 2016.
http://www.elmia.se/en/fjarrvarmemassan/
The Swedish DH Association is organising this event alongside a Water and Wastewater Fair and *Elmia Waste & Recycling.*

Trade Mission / Learning journey - option

We recommend consideration of a trade mission or learning journey to Sweden (and possibly also Finland, Norway, Denmark), perhaps associated with a relevant trade event, in order to identify what may be niche opportunities in an increasingly competitive market.



SDI Offices *(Copenhagen, Dusseldorf, Stavanger)*

Example event / conference

Pan-European / global events (relevant to Sweden and other countries)

European Utility Week, Amsterdam-NL, annual event (last held 4-6 November 2014).
http://www.european-utility-week.com/
Europe's leading annual event in terms of energy management & smartness/connectivity within appliances.

International Passive House Conference, Leipzig, 17-18 April 2015.
http://www.passivehouseconference.org/
Leading manufacturers of passive house components will be represented at this annual international exhibition.

Hannover Messe, Hannover, 13-17 April 2015.
http://www.hannovermesse.de/en/exhibition/energy-environmental-engineering/energy/
A major international trade show which includes an 'emerging energy' theme focussing on decentralised power and heating products & technologies.

ISH Energy, Frankfurt. 10-14 March 2015.
http://ish.messefrankfurt.com/frankfurt/en/besucher/messeprofil/energy.html
Covers the full spectrum of innovative building energy technologies, with a focus on efficient and renewable heating systems.

Route to Market Overview

- For the EM cluster, one route to market option is through a partnership agreement with a Swedish energy utility, eg Vattenfall or E.ON. This could enable the opportunity to take full advantage of the increasing availability of ToU tariffs in Sweden. HP manufacturers such as NIBE and IVT have already made a start by integrating connectivity within their HPs in order to take advantage of ToU prices once they start to be fully promoted by Swedish utilities.
- Other smart/connected heating appliances could be bundled and offered through one of the utilities. For example, E.ON in Sweden has partnered with Greenwave Systems, a US based smart home solutions provider, and is currently trialling different products. We recommend exploration of this opportunity, as this emerging segment of the market, i.e. energy connectivity and 'smartness' of electric appliances through ToU, is still relatively open.
- Other relevant guidance to developing export activity to Sweden includes the following:
  - [From a non LCH UK company] "Sweden, Norway and Finland haven't suffered as much as other markets from the recession. It's also quite a stable country which has companies that are expanding. British companies should be able to cope with Scandinavia. Don't be afraid to pick up the phone, as most people speak English. It's a good first market for entrepreneurs to aim for when expanding overseas."
  - In terms of business culture, Swedish business people, and other Nordics, are more consensual by nature than in Scottish / UK businesses. This can delay decision-making and means closing a deal on the spot is harder. With so many involved in internal decision-making, delay can be inevitable.

USA - 1

A major, strategic opportunity for Scottish companies, but with significant state-by-state variations

DELTA Energy & Environment

Delta-ee view:

- **The US offers exciting possibilities, especially for the HG & EM clusters. But it's vital to pick opportunities carefully, owing to state policy variances.**
- **Key drivers include overall large market size; strong, emerging incentives in several major States; and the very high rating for EODB.**
- **Gas-fired CHP is particularly favoured on account of strong spark spread, grid backup power needs, and gradual coal phase-out.**

Market drivers *(note use of State abbreviations, all of which are shown on p. 18)*

Overview - ***the market opportunity varies dramatically by cluster and state***

- **HG:** Several LCH growth opportunities, led by gas-fired CHP (including district heat).
- **EM:** A growth market which includes demand-side flexibility and controls.
- **C:** While the US has one third of global cooling demand, it's mature and competitive.
- **HD:** A relatively static market, with large, incumbent players.

Policy & regulatory environment – ***weak federal but strong State incentives***

Heat Generation:

- At federal level, boiler efficiency rules and the Environmental Protection Agency's proposed Clean Air Act on CO_2 emissions, utilities and industry have new incentives towards renewables and CHP.
- 10-15 States have strong incentives for renewable heat, eg OH and MA for ground-source HPs, and CA's Property Assessed Clean Energy Financing Programme.
- Delta-ee research indicates the ≥400 kWe gas CHP market will grow from ~300 MWe / year in 2013 to ~600 MWe / year in 2020, growth of 12% / year.
- The ideal scenario of CHP-supportive policy and future spark spreads applies most strongly in: CA, CT, MA, NJ, NY, OH and TX, but also consider: IL, NC, OR, PA, WA and WI.

Energy Management:

- The core driver of the EM market is the need for greater grid reliability and system balancing.
- Since the 2003 Northeast Blackout, and to better integrate intermittent renewables, the Federal Energy Regulatory Commission (FERC) has initiated reforms to improve system reliability and flexibility. Storm Sandy in 2012 is accelerating this process.
- Several states / regions lead the way. For example, CA is aggressively pursuing a renewables energy mix ("Renewables Portfolio Standard", or RPS) of 33% by 2020, which places an obligation on supply companies that at least one third of their electricity must originate from renewable energy. TX and nearby States are experiencing rapid renewables deployment and surging demand during peak hours.
- There is also some emerging policy support for WHR (waste heat recovery), which starts from a very low historic base. Despite massive potential for WHR from industrial processes, waste heat has been ignored in many support programmes. However, out of the 29 States with binding RPS, 9 now include WHR as a qualifying technology: NV, CO, MI, PA, OH, CT, WV, NC, HI.

Energy price trends – ***low but rising***

- Gas prices are low but rising. This will increasingly favour renewable heat technology, though we still expect favourable spark spreads for gas CHP, around 3.3:1 in 2020, high by global standards.
- There is a diverse State-by-State dynamic for power prices. They will remain highest in the NE. SE States (eg AZ, UT) will see the fastest increases as low cost coal plants retire: and prices are likely to rise here as more expensive gas-fired plants take over. In other States, eg CA and TX, fast uptake of wind / PV renewables will also push prices up.

Scottish export capability and experience

Moderate-to-high: a good fit between Scottish companies' abilities and potential opportunities.

Both **HG and EM** are Scottish strengths and correspond well to growth opportunities in the US.

Heat Generation

- For example, we estimate a technical potential of ~2 GWe of gas-fired CHP growth in CA and TX, and ~1 GWe installed capacity: NY, OH, PA, IL.
- For biomass heat, the main opportunities are CA, NY, TX. For solar thermal, CA, TX. For HPs, OH and MA.

Energy Management

- Key targets map to areas of grid weakness, e.g. CA, TX and NE States.
- EM may also benefit from CHP's potential for backup power, particularly where renewables usage is high, so this technology could play into two clusters at once.

Cooling & Heat Distribution: not recommended

- The C & HD clusters will be far more challenging, with established local players holding strong cards.

Ease of doing business

- The US offers an extremely supportive environment for business investment across all EODB metrics.
- Language and culture are also unlikely to present problems.
- The US remains the number 1 export market overall for Scotland - equal to Germany and France combined.
- A major issue encountered in our research was in obtaining work visas. Costs can be prohibitive (one firm charged a large sum for a failed application – see Star Refrigeration's story on page 18). Adequate help is hard to find.
- Trade fairs / conferences are natural ways into the market, with knowledgeable attendees offering opportunities for potential sales and/or partnership.
- Establishing a presence is not challenging for companies with in-demand solutions, but it can take time. Star's 18 months to first sale is not untypical.

USA - 2

The HG and EM clusters will see by far the strongest growth, owing to policy drivers; but C and HD will flat-line.

Market size by cluster

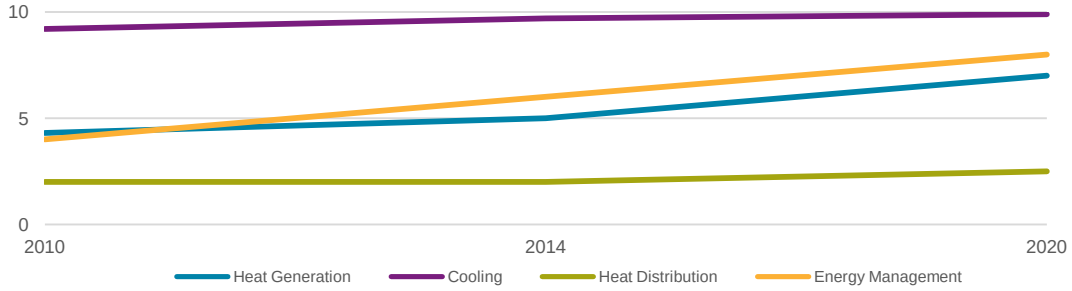
(a value of 10 corresponds to the world's leading market for that cluster in 2020)

Very strong growth is expected within two clusters.
The US energy market will show strong overall growth, as a result of ambitious state-level policy drivers pushing two sectors very hard: EM and HG.

In contrast, C and HD are established, mature markets without strong policy drivers, and with major entrenched competition.

State-by-state variations favour a selective, focussed approach.
There are significant regional variations in legacy technologies, fuel price trends and policy specifics, so it's important to cherry-pick the best opportunities.

Long-term themes underpin the policies: so there is no reason to fear a change of direction.
The long-term demise of coal, the need to strengthen grid assets, the success of shale gas, and the inexorable rise of renewables are all firmly entrenched long-term trends. Market direction is therefore assured.



Economic growth and heat / cooling demand

- **The outlook is for a steadily growing economy (2-3% pa) driving new growth in demand for both heat and cooling in buildings, despite efficiency improvements.**
- While the IMF has revised its previous 2014 GDP forecast down from 2.8% to 1.7%, the medium-term outlook remains strongly positive (3.0% for 2015).
- The US is by far the world's largest cooling market, and the 2nd highest heat market (after China).
- Most energy demand growth is in the residential and commercial buildings sectors: the IEA forecasts that building heat & cooling demand is likely to grow by 15-20% by 2020, but industrial energy demand will be flat.

Competitive environment

A weak competitive HG environment…

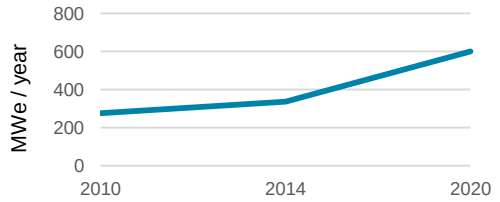
- HG, eg gas-fired CHP and renewables, are fast emerging growth markets in some regions, eg the NE and Midwest, with continuing scope for new entrants.
- European players Ener-g and 2G have recently successfully entered the CHP markets, the former through acquisition, the latter through direct entry

… but stronger competition in EM, C, HD:

- These clusters have been established for years, with numerous strong local players.

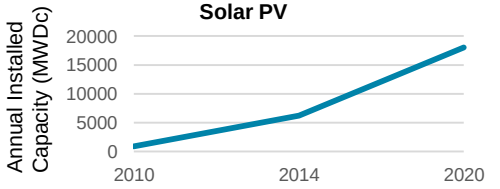
Market opportunity for selected technologies

Gas-fired CHP



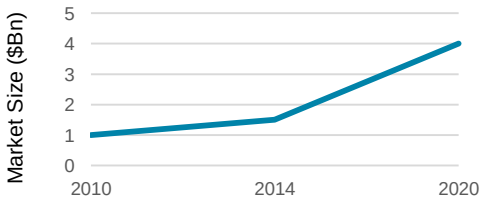
- *Strong, stable growth is expected in all gas-fired CHP ranges ≥400 kWe, with long-term supportive spark spreads providing confidence for investors.*

Solar PV



- *Southern States offering domestic-scale renewable incentives will stimulate a natural market, with possible acceleration towards the end of the decade to achieve compliance targets.*

Home Energy Management Systems (HEMS)



- *Innovative offerings will extend already-growing HEMS smart home market to provide value via energy system balancing & demand response.*

USA - 3

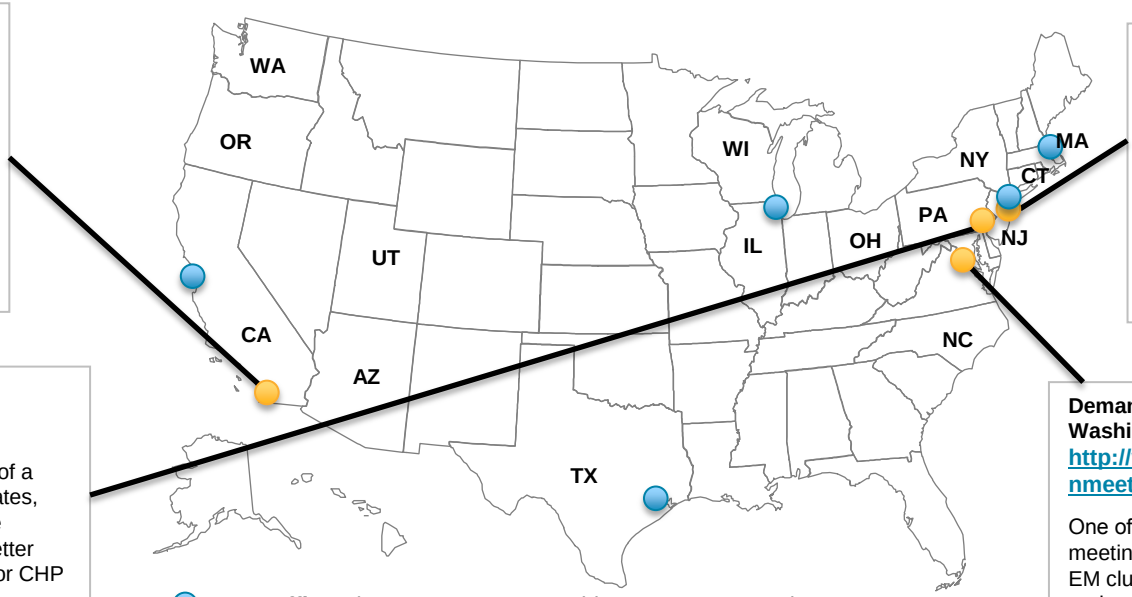
Several of the world's most important LCH events occur in the US, providing a natural gateway into the marketplace

Solar Power Generation USA 2015.
http://www.solarpowergenerationusa.com/

Leading solar power conference in San Diego, with strong networking opportunities with local utilities & financiers. Next event 4-5 Feb 2015.

Trade Mission or Learning journey - option

We recommend consideration of a trade mission to several NE states, perhaps in conjunction with the DistribuGen event, to gain a better understanding of local needs for CHP and grid balancing services.



SDI Offices *(San Jose, Houston, Chicago, NYC, Boston)*

Example event / conference

DistribuGen, NYC (2015 date tbc).
www.distribugen.org

The major conference & trade show for the gas-fired CHP sector. The October 2014 event was probably the country's leading marketing event target for US and non-US players.

Demand Response & Smart Grid, Washington DC, 26-28 May 2015.
http://www.demandresponsetownmeeting.com/

One of the country's major annual meetings representing the fast growth EM cluster, with combined conference and exhibition.

Route to Market Overview – One Company's Story

Star Refrigeration is establishing a wholly owned subsidiary business, Azane Inc. Star did consider partnership but desired to keep full control. Graham Stuart (MD) explained to Delta-ee that a 'go-it-alone' approach is part of Star's culture. 18 months after starting, Azane is now incorporated, has a company website (www.azane-inc.com) and has its first order. Star regards this as a 'fair' timescale, with much of the lead-time imposed by compliance and market development.

Star has been successful at building its 'authority status' by joining appropriate cold store federations, attending relevant trade fairs, & participating in panel discussions.

Most of the barriers have been non-technical, with obtaining a visa for key personnel being the single biggest headache with legal costs of $20,000 for an application that was ultimately rejected.

The incorporation, supplier certification, and tax registration processes all proved long-winded but achievable and ultimately acceptable, with Star receiving a lot of free advice from US divisions of some of their existing suppliers. Excitingly, the general approach the company has taken to market building is paying off, and supports other evidence we have that: understanding State-level policy; establishing authority status; then aiming to fit class-leading solutions to local problems, is the right overall strategy here.

However, although the US is a familiar and generally welcoming country for many Scottish citizens, Star warns that nobody should assume that doing business there will be easy, and new entrants should expect the unexpected. For instance, do not underestimate the time, documentation requirements and expense of establishing the legal entity and obtaining visa approval for any transferring staff.

UK - 1

Drivers in the UK are fairly positive, with a mix of innovative policy incentives and generally favourable energy price trends

DELTA Energy & Environment

Delta-ee view:

- **The UK offers a good opportunity in most clusters, especially HG, driven mainly by innovative policy and less so by energy price trends**
- **Scotland, in part through its cooler climate and through some stronger policy intervention, is likely to see faster market growth rates than the UK as a whole, for example in renewable heat and district heating development.**

Market drivers

Overview – *likely solid, but not spectacular, market growth opportunities for HG and HD in particular*

- **HG:** We see policy and/or energy price trends driving several HG technologies in residential and commercial buildings – both in retrofit and in new build.
- **HD:** District heat, in both the UK as a whole and especially in London and Scotland, is becoming a strong policy focus. The main uncertainty here is whether government is prepared to introduce the incentives necessary to create a long-term opportunity across the country.
- **EM:** A promising market for HEMS / BEMS and new heating control products, driven by rising energy prices and strong product promotion by, for example, energy utilities (aiming to strengthen customer retention) and Nest, the automated thermostat company now owned by Google.

Policy & regulatory environment – *generally good and innovative policy support, but in the UK there is often uncertainty as to whether this will be sustained*

- The UK government generally takes its lead from the EU, for example in relation to renewable energy goals. The UK aims to source 15% of all energy demand from renewables by 2020, including renewable heat (12% for the UK, 11% Scotland). However, we do not see the UK as an EU leader in the incentivisation of LCH.

Heat Generation:

- The Renewable Heat Incentive (RHI) is, according to DECC, the world's first long-term financial support system for renewable heat. It was introduced for non-domestic buildings in 2011, and for residential buildings in 2014. Delta-ee believes that the RHI will enable tens of thousands of new domestic installations per year by 2020, and several thousand non-domestic installations.
- The non-domestic RHI applies to: biomass, HPs (ground, water and air source), deep geothermal, solar thermal collectors, biomethane / biogas, renewable CHP. The domestic RHI applies to biomass, HPs (all types) and solar thermal. There is currently a modest feed-in tariff incentive for micro-CHP.
- There are no government targets for gas-fired CHP and support is modest. It includes Enhanced Capital Allowances and the Carbon Floor Price exemption. Non-domestic building regulations are a driver, and CHP can be used to increase BREEAM (Building Research Establishment Environmental Assessment Method) ratings.

Heat Distribution:

- DH is fast moving up the policy agenda, but there are few specific incentives so far. DECC is providing funding support for DH development in several cities.
- In Scotland, the Draft Heat Generation Policy Statement (HGPS) has set a target for 1.5 TWh of DH delivery and 40,000 homes to be connected by 2020, and there is a government DH Loan Scheme with £2.5m available. Scottish Enterprise also has a Renewable Energy Investment Fund which includes support for community renewables and renewable district heating.

Energy management:

- There are no formal UK energy efficiency targets (although Scotland aims to reduce final energy consumption by 12% by 2020), but there are a range of measures to incentivise efficiency, including the Carbon Reduction Commitment for private/public organisations and the Green Deal for the residential sector.

Energy price trends – *relatively high electricity prices, and relatively low gas prices, will likely persist*

- Spark spreads are among the most attractive in Europe – good for high efficiency CHP, less good for HPs. UK average electricity prices for medium size customers are *above* the EU average, at about 9.5p / kWh. But (and less good for some LCH) gas prices for medium size users are *below* the EU average, at about 3p / kWh.
- The outlook for electricity prices is likely upwards to 2020, but gas prices will be generally flat. Overall, this will favour some HG and EM, but less so DH and HPs.

UK - 2

Two clusters (EM and HG) will likely experience some good growth. HD prospects depend on the extent of government intervention

Market size by cluster

(a value of 10 corresponds to the world's leading market for that cluster in 2020)

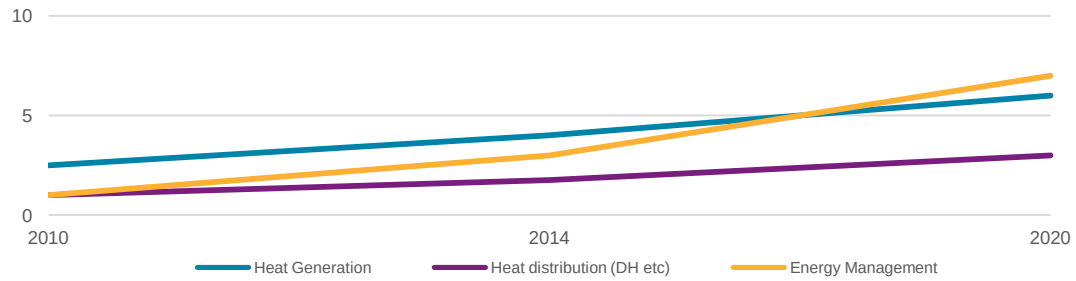
Moderate growth for both HG and EM clusters

The HG market for the non-residential sector is growing strongly from the RHI – mostly biomass based. LCH deployment in the residential sector is at about 80,000 installations pa, rising to 200,000 pa by 2020.

EM sales, as in other countries, will be led by BEMS, HEMS, smart meters (full roll out by 2020) and other energy controls. We see this cluster as the fastest growing, based on rising energy costs and high deployment of the many emerging energy management products for 'smart' buildings.

The market for the HD cluster will also grow, but more modestly

HD growth will be modest without stronger incentives for DH. Market growth in Scotland may well exceed that of the UK as a whole. WHR sales will likely not exceed the low hundreds by 2020.



Economic growth and heat / cooling demand

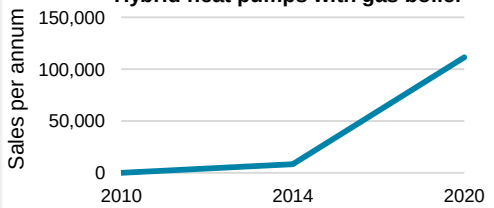
- Heat demand growth is likely to fall, or remain flat at best, due to policy emphasis on energy efficiency. The UK's cooling market, conversely, is projected to grow gradually, albeit from a very low base.
- Some upward pressure on heat demand derives from the UK economy. The outlook for economic conditions looks stable and relatively healthy. IMF forecasts growth of 3.2% in 2014 and 2.7% in 2015.
- The UK has among the highest levels globally of both industrial and building heat demand. To achieve governmental efficiency objectives will require major market growth for all clusters.

Competitive environment

- The renewable HG market is becoming more competitive as new entrants join in response to the RHI. The market will grow to accommodate them – unless the RHI is cut or withdrawn.
- There is likely room for new entrants in the small-scale CHP market, as the field is covered by only a small number of major players.
- The DH market is small, with several developers ready to move in if more projects go ahead.
- The EM market is emerging rapidly, with scope for new entrant players with innovative product or customer offerings.

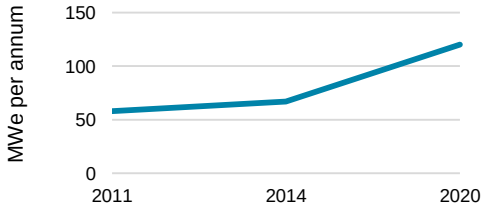
Market opportunity for selected technologies

Hybrid heat pumps with gas boiler



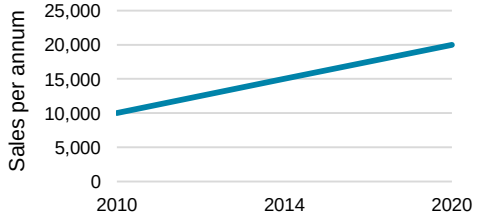
- *Delta-ee forecasts that the market for hybrid heat pump sales will grow dramatically to >100,000 pa in 2020, driven mainly by the RHI.*

Gas engine based CHP >400 kWe



- *This market will continue to trend upwards, driven mainly by the UK's attractive energy price spark spread.*

Building Energy Management Systems



- *Delta-ee forecasts that sales will rise to around 20,000 pa in 2020, driven by rising energy costs, new build regulations, BREEAM and, to a lesser extent, by demand response market activity.*

UK - 3 *'Heat' is gaining momentum across the energy industry and in government, with corresponding growth in the number of trade events*

Scottish Renewables, 24-25 March 2015, Edinburgh.
http://www.scottishrenewables.com/events/

The conference event is focused on the development of renewable energy in Scotland. The exhibition has ~50 exhibiting organisations. The network dinner should be attended by 300+ renewable energy professionals.

All Energy, 6-7 May 2015, Glasgow.
http://www.all-energy.co.uk/Conference/

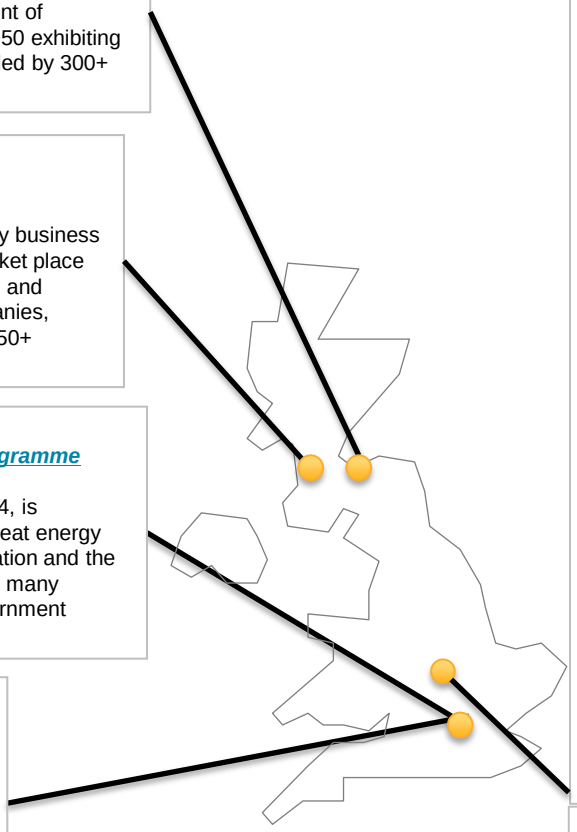
The UK's largest renewable energy event. It is a key business platform in the UK for reaching the renewables market place and an industry hub for exploring new opportunities and networking. Free-admission. 450+ exhibiting companies, visitors from 48 countries. 350 experts speaking in 50+ conference sessions.

Heat Conference, London.
http://www.heatconference.co.uk/index.php/programme

This annual conference, last held in November 2014, is dedicated to policy, delivery and lessons from the heat energy economy. The event is hosted by the CHP Association and the Energy Institute (attended by >200 people). Hence, many attendees are those involved in CHP/DH from government bodies to manufacturers.

Ecobuild, 3-5 March 2015, London.
http://www.ecobuild.co.uk

Ecobuild includes seminars, conferences, and a showcase of sustainable construction and energy products (with > 1,300 exhibitors) and is a major event for sustainable design, construction and the built environment. It had 45,000 attendees in 2014.



Example event / conference

Other relevant events and Scottish based industry associations:

Scottish Enterprise Showcase Heat Conference.
https://www.b2match.eu/low-carbon-heat-showcase-2014

The networking event, last held in November 2014, provides a platform for Scottish-connected technology, engineering and solutions companies to demonstrate their LCH products and services to customers (facilities and plant managers).

Scottish Hydrogen and Fuel Cell Association (SHFCA).
http://www.shfca.org.uk/

The SHFCA promotes and develops Scottish expertise in fuel cells and hydrogen technologies.

Power Scotland Conference, 25 March 2015.
http://www.ipa-scotland.co.uk/

Hosted by the Industrial Power Association which represents companies that operate in all areas of the power and energy related industries.

Heat Network Partnership.
http://www.districtheatingscotland.com/content/about-us-0

The Scottish Government, Scottish Futures Trust, Energy Saving Trust, Scottish Enterprise, and Resource Efficient Scotland are working to accelerate Scotland's district heating activities. Below is a link to an interactive Scotland heat map. Businesses, developers, housing associations and communities can find out about the heat demand and supply opportunities.
http://heatmap.scotland.gov.uk/

Nextgen – incorporating the European Bioenergy conference & expo, 7-8 October 2015, Stoneleigh Park.

http://ebec.nextgenexpo.co.uk/
Billed as 'the UK's leading bioenergy and renewable energy generation event for both urban and rural communities'.

UK - 4 *Route-to-market overview*

Route to Market Overview

- The UK market is one of the most open in the world, and as most non UK players have good English language capability (often a constraint for UK players in foreign markets), they tend to be present sooner or later if the market looks promising. Generally, therefore, as indicated previously, the UK market is rarely uncrowded. But where the incentives are present and the LCH markets are growing, we see continuing opportunity across the various value chains.
- The value chains vary considerably between clusters and between residential and non-residential applications. And in some cases they may change dramatically in the future, for example if product manufacturers develop their own direct channels to end users, by-passing installers.
- In the HG cluster, product manufacturers depend on merchants, installers, specialist development companies or utility partners to provide their channels to market. Utility interest and activity is growing sharply, but it is too early to be confident that they will make a success of their new services businesses.
- The DH market is nascent, with many engineering and project firms jostling for position in what remains a modest market, often driven by local authorities. Scotland likely offers some of the most promising opportunities here, and we recommend DH players to be alert to new grant and planning initiatives across Scotland.
- The EM cluster is more established in the commercial / industrial markets, but still taking shape in the residential sector. For the former, facilities management companies and the major controls players (eg Siemens, Honeywell) are secure in the value chains and aiming to extend their positions. In the latter, energy utilities are partnering with HEM players to support customer retention. But there is little evidence as yet as to whether this will work, and any one of a range of routes to market may yet turn out to be successful.

Contents

China

Delta-ee rating: ★★★☆☆

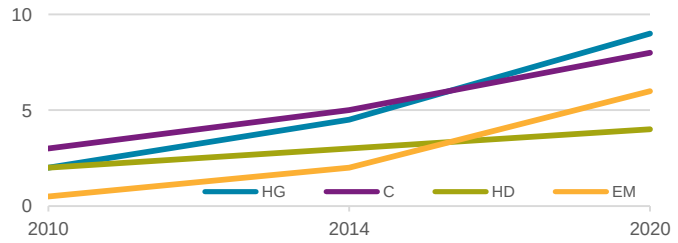
Delta-ee view

- **Were it not for sheer market size, we deem China as likely too tough a market to enter successfully, based on the EODB, competitive environment. But can it be ignored?**
- **We expect heat / cooling demand and markets to grow more aggressively here than any other country, based in part on governmental incentives.**
- **On other counts, China scores poorly, including on energy prices.**

Market drivers ★★★☆☆

- **Strong emerging drivers for all four clusters, albeit from a low base**
  - We expect a growing market opportunity in all 4 clusters, driven by a rapidly rising economy and fast emerging government recognition of the need to improve energy efficiency, air quality and to ensure a secure energy supply.
- **Policy & regulatory environment – there is growing evidence of accelerating incentives:**
  - Policy is driven less by carbon emissions and more by air quality concerns and the importance of limiting dependence on energy imports – reducing coal burn and increasing end-use efficiency are national priorities. Policy is often Province rather than State driven.
  - For example, solar thermal systems have been strongly promoted for years, and new building codes apply to envelopes and HVAC efficiencies. Shanghai has a long tradition of promoting gas-fired CHP (Delta-ee forecasts >50% expansion in CHP by 2020).
  - Space cooling demand in non-res buildings will be faster than any other application. We expect China to respond further with more stringent efficiency requirements on AC etc.
- **Energy price trends – to rise steadily from a very low base; high regional variation**
  - Energy prices are highly regulated and power prices (€c8/kWh) in particular are subsidised and among the very lowest globally. Gas prices are also low but relatively higher globally (€c4/kWh). The Government knows it must increase prices. All expectations are that energy prices will rise further, but will remain relatively low on a global basis.

Market size by cluster



- All 4 clusters are shown, we expect them all to be sizeable.
- HD will see weakest growth, it is a mature market and not a major target for policymakers or investors.
- We expect HG and EM to see fastest growth, with 2020 market sizes approaching those of the US.

Heat / cooling demand growth ★★★★★

- **All indicators suggest China is becoming the world's fastest growing market for heat and cooling demand**
  - The Chinese economy is both very large (2nd in the world) and the fastest growing of any major economy.
  - Wide climatic diversity across China means that demand for both heat and cooling is very high.
  - We expect the heat / cooling markets to overtake those of the US between 2020 and 2030.

Competition ★★☆☆☆

- **High competition in all clusters from local players …**
  - All clusters bar DH are growing with high competition from local, often inferior, products.
- **… and from foreign players**
  - Everyone wants to be there, despite it being tough to enter - but the prize is huge. Scottish players that are / intend to export to China include Nuwave (HG) and Omni (EM).

Ease of doing business ★☆☆☆☆

- **Weak: China ranks easily the lowest of all countries assessed**
  - It ranks 64th globally, based on the Delta-ee index – this market is fraught with risk for exporters.
  - It ranks 98th for protecting investors.
  - It ranks highly, 19th, for enforcing contracts.
  - There are four SDI offices in China, including Hong Kong.

Technical fit ★★★★☆

- **Moderate-to-high: fast emerging markets for the 3 clusters with best fit for Scotland – but few companies appear to have interest**
  - We see most growth and opportunity in HG, EM and C – the top 3 clusters for Scottish capability.
  - However, based on the Innovas survey, only four Scottish players currently export to China, and only 3 more intend to.

France

Delta-ee rating: ★★★★☆

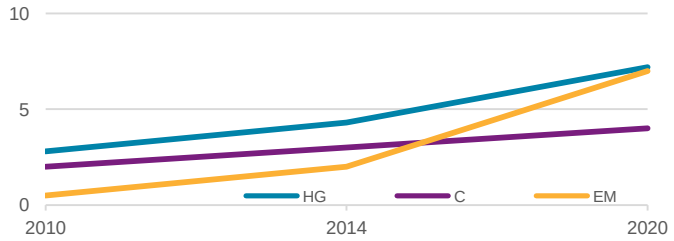
Delta-ee view:

- **Proximity to Scotland and excellent fit with Scottish capability help make France an attractive target export market.**
- **We expect strong market growth for most clusters based on ambitious national targets. We also see high potential for energy management solutions.**
- **Barriers include low power prices (favouring HPs only) and weak economic growth.**

Market drivers ★★★★☆

- **Two large clusters (HG and EM) in a relatively large market**
  - Delta-ee projects that LCH appliance sales will increase from 77,000 per year (9% of the 850,000 sold) to 160,000 per year in 2025. The majority of these will be heat pumps as this is the most established LCH technology in France; we also expect growth in the market for other HG technologies.
  - We expect France to be an attractive market for EM products based on its inflexible nuclear fleet and commitment to strong energy efficiency measures (see below).
- **Policy & regulatory environment – we expect continued commitment to energy efficiency and renewable energy (RE)**
  - France ranks 3rd in the *2014 International Energy Efficiency Scorecard*, meaning little low hanging fruit remains, but the policy commitment remains strong. For example, there will be ongoing updates to the Energy Transition Bill (i.e. subsidies for the construction of energy positive public buildings). The most recent revisions to the Réglementation Thermique mean all new commercial and domestic buildings must have smart energy meters. Coupled with a high new build construction rate, this highlights the potential for energy management.
- **Energy price trends – continuing upwards, but power prices will remain relatively low**
  - Residential electricity prices are relatively low but will gradually rise. Industrial electricity is below the EU average price but also gradually rising. Residential gas prices are also steadily rising and are roughly consistent with the average price for Europe.

Market size by cluster



- EM is a fast growing market from a low base, but we expect growth to accelerate towards 2020.
- HG and efficient cooling grow more slowly from higher bases, driven by rising energy prices and the positive policy regime – but limited by the slow rate of economic growth.

Heat / cooling demand growth ★★☆☆☆

- **Slow recovery means growth in heat and cooling demand has stalled, but likely temporarily**
  - We expect slow/flat growth in both heat and cooling demand based on average GDP growth prospects for 2015 and beyond.
  - Growth of GDP is currently very low at 0.2 % but the IMF forecasts 1.6 % GDP growth next year, in line with the predictions for the EU.

Competition ★★★☆☆

- **For now, an uncrowded EM market**
  - Energy management is a market in its infancy and there is potential to 'get in early'. Schneider is likely to be a strong national competitor for many EM products.
- **Stronger competition in other clusters**
  - More established markets for HG and C could be hard to break into, but at least there is no major bias against foreign producers.

Ease of doing business ★★★★☆

- **Quite easy:**
  - France is 14th in the Delta-ee adapted global EODB rankings and scored well for enforcing contracts. It has a low rating for protecting investors.

Additionally:

- France is Scotland's 4th biggest export market and is an EU Member State.

Technical fit ★★★★★

- **High: established heat generation and cooling markets and large potential for energy management**
  - HG and C - the top 2 clusters for Scottish capability have established markets and are continuing to grow despite the economic downturn.

Germany

Delta-ee rating: ★★★☆☆

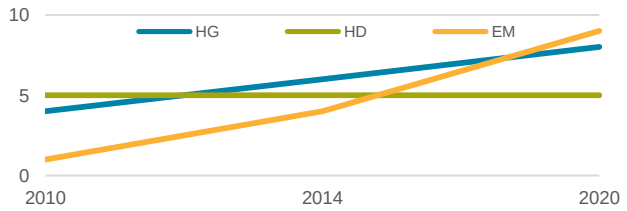
Delta-ee view:

- **Germany is one of the world's largest low carbon heat markets and we expect this to remain the case in the period to 2020.**
- **A largely favourable regulatory framework and persistently high energy prices make Germany a highly attractive market for many low carbon technologies.**
- **But the country is tough to export to, with strong in-country competition.**

Market drivers

- **Two strongly growing clusters - heat generation and energy management**
  - For energy management, Germany is likely to be a world-leading market by 2020.
- **Policy & regulatory environment – one of the most supportive policy frameworks**
  - Policy is linked to the *Energiewende,* which includes the closure of nuclear plants.
  - Germany will remain one of the world's most supportive regulatory frameworks for many LCH clusters and technologies – and likely Europe's leading HEM market in 2020.
  - Germany will continue to be a world leader in both renewable heat and gas-fired CHP. It is also a leading market for innovative technologies such as biomethane grid injection and hydrogen conversion. Incentives include investment subsidies, low interest loans, tax allowances and tax breaks to offset operational costs.
  - Future policy support is likely to be largely stable in order to promote investor confidence, markets for German products and to meet national targets.
- **Energy price trends – high and likely to remain so**
  - We expect wholesale prices to remain low, but high non-commodity costs (e.g. VAT, renewable energy surcharges) result in end-consumers paying high energy prices
  - High energy prices will drive further investment in energy-efficient technologies
- **Intermittent renewables will drive demand-side management and flexible generation:**
  - Energy management will therefore be a strongly growing sector.

Market size by cluster



- Germany is one of the world's leading markets for low carbon heat generation – and likely to remain so to 2020.
- Significant growth is especially likely within the EM cluster in the next 5 years.
- C and HD cluster growth rates will remain much more modest.

Heat /cooling demand growth

- Stable / falling heat demand will be likely as energy efficiency offsets a slowly recovering economy. Heat demand is already relatively low within buildings due to efficient building fabrics.
  - Germany's annual GDP growth has fluctuated between 0 – 2 % in the last 4 years.
  - The IMF forecasts a very modest 1.7% GDP growth in 2015, but we expect this to pick up subsequently.

Competition

- **Strong markets for all clusters means many players, most of which are home market players**
  - A large number of German-based companies already operate – especially in the HG and HD spaces.
  - There is a little less competition within C and EM. With EM, there is increasing activity due to the amount of intermittent renewable capacity.

Ease of doing business

- **Easy: Germany ranks highly in the Delta-ee adapted global EODB rankings**
- Doing business in Germany is relatively easy, especially as a member of the EU. Germany scores particularly highly for enforcing contracts.
- However, foreign companies can find it difficult to compete with German incumbents operating in the same field since German consumers tend to favour domestic suppliers.

Technical fit

Moderate: **still growing / mature markets for HG and HD clusters. The most attractive growth opportunity may come from the EM sector.**

- Although well established, the HG and HD clusters will continue to grow, enabling continued opportunities for Scottish exporters.
- EM will likely prove to be an attractive sector to exploit over the next 5 years.

Italy

Delta-ee rating: ★★★☆☆

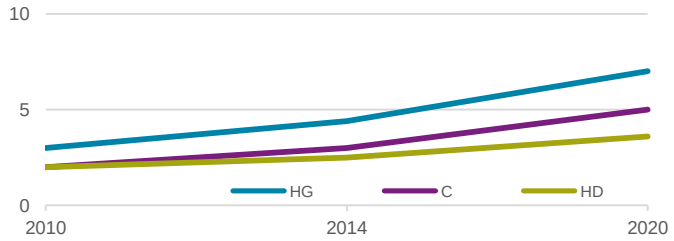
Delta-ee view:

- **We rate Italy as a moderately attractive export market target, and likely to become more so over the next few years.**
- **The main positive drivers for this are persistently high energy prices and likely continuing policy measures to promote renewables and energy efficiency.**
- **However, the country is still in recession, and growth may be low for years.**

Market drivers ★★★★☆

- **Large overall cluster market sizes:**
  - Italy is a large and relatively prosperous economy, with two strong clusters in particular, HG and HD. Delta-ee predicts the annual sales of residential low carbon heat appliances will grow from 120,000 per year to 190,000 units per year over the next 11 years .
  - This is a diverse energy market, with heat demand in the north and cooling in the south. This has led to a demand for a wide range of efficient HG and C products and growing demand from installers for whole house solutions.
- **Policy & regulatory environment – remaining strong 'on paper', but abundant red tape**
  - Regulations for the deployment of energy products is notoriously difficult to get through… and not everybody complies.
  - While political uncertainty is always high, energy efficiency and renewable energy incentives are becoming increasingly important for new build, which will continue to drive deployment.
- **Energy price trends – Italy will continue to have very high energy prices for end users**
  - For all end users, energy prices are amongst the highest in Europe, favouring most LCH technologies, including waste heat recovery systems (HD).
  - For industrial consumers prices peaked in the latter half of 2012 and have gradually declined, but we expect this to be temporary and prices will continue to rise in the long term.
  - Residential electricity prices have experienced a steep rise and we see no reason why this will not continue. Gas prices are also among the highest in Europe.

Market size by cluster



- High energy prices and good incentives will drive a consistently strong market for HG products.
- The C cluster will grow more modestly based on high power prices, while HD will likely remain a low growth market.
- As GDP begins to grow again, markets may pick up speed.

Heat / cooling demand growth ★★☆☆☆

- **We expect low / no growth**
  - Very slow economic growth, alongside energy efficiency trends, means likely no / low growth in heat & cooling demand. But replacement rates for boilers and air conditioning remain high.
  - Currently in recession. The IMF predicts a growth of only 1.1% pa till 2019, well below global averages.

Competition ★★★☆☆

- **Large market with relatively low LCH penetration but strong competition from traditional heating methods:**
  - There are a few established solar thermal, manufacturers. The air conditioning market is mature and generally saturated in the south – and dominated by Japanese companies.
  - For new HG products there could be big potential, with little competition from the boiler manufacturers who are traditionally slow to move.

Ease of doing business ★★★☆☆

- **Moderately easy:**
  - Italy is ranked 41st in the Delta-ee adapted global EODB rankings. It is moderately good at protecting investors, trading across borders and resolving insolvency, but is notably quite poor at enforcing contracts.
- **Additionally:**
  - Italy is Scotland's 11th largest export market and is an EU Member State.

Technical fit ★★★☆☆

- **Moderate:**
  - Moderately established markets for HG & C fit well with Scotland's technical capability. Italy has the second biggest gas boiler market in Europe and heating system replacement rate is high.
  - The attractive HD market, however, does not fit strongly with Scottish capability.

Poland

Delta-ee rating: ★★☆☆☆

Delta-ee view

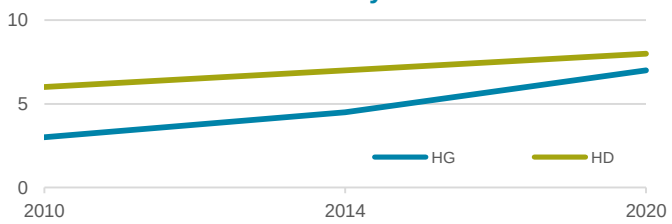
- **Poland is a relatively weak export target, with the main opportunity likely to be for the HG cluster. CHP and biomass-based heat are the most likely opportunities.**
- **The main positive driver is the overall macro-economic situation: Poland is likely to be one of the fastest growing heat markets in Europe for years to come.**
- **However, on other counts, Poland scores poorly, eg on energy prices.**

Market drivers

★★☆☆☆

- **Two large clusters (HG & HD) in a relatively small market:**
  - Poland scores very low on overall size of the economy and, alongside Sweden, is the smallest of the group. However, it has two strong and growing clusters, HG and HD
  - For HG (mainly biomass and CHP) and HD (mainly district heat), PL is a world leader.
- **Policy & regulatory environment – we are not confident of strong low carbon incentives:**
  - On low carbon policy, Poland is fast gaining a reputation for high promise and low delivery. Its highly ambitious targets for 2030, presented in 2009, show no sign of implementation.
  - There is no national strategy for low carbon heat.
  - We expect that national policy for the 2 clusters will remain as they are today – moderate (Delta-ee forecasts 15-20% annual growth rates for CHP if incentive plans are implemented). Both sectors are well established and will remain so, but Poland is looking largely to nuclear power and shale gas to achieve its long-term carbon goals.
  - Alongside the UK, Poland is committed to fast-tracking shale gas extraction, and using the gas for high efficiency CHP and power generation to displace its fast aging coal plants.
- **Energy price trends – power prices will remain low, gas prices will rise even further:**
  - The main driver of electricity prices is the coal price, which remains relatively low compared to other fuels. Gas prices, based on imports from Russia and with a monopoly player (PGNiG), will remain high until shale gas comes on stream – likely after 2020.

Market size by cluster



- Only HG, HD are shown. PL is not a major market for EM, C.
- Poland is already a world leader in HD, district heat especially.
- HG, mainly biomass-based and CHP, are likely to see attractive growth.

Heat / cooling demand growth

★★★☆☆

- **Continuing steady growth in heat demand**
  - We expect continuing growth in heat demand based on strong GDP growth prospects for 2015 and beyond. If the energy efficiency objectives outlined in 2009 are implemented, this growth will slow, but this is unlikely.
  - The EU forecasts 2.5 – 3.5% GDP growth over the next 3-4 years. Poland weathered the Crisis better than the rest of the EU.

Competition

★★☆☆☆

- **A highly competitive environment for HD, especially in district heat**
  - District heat is well established and the main challenge is upgrade, refurbishment and efficiency improvements. Polish, Nordic and German players are all already present in this market.
- **CHP & biomass heat markets are more open**
  - These markets are far less mature and still emerging (CHP is still to emerge).

Ease of doing business

★★★★☆

- **Globally, Poland is only middle ranking for EODB - this is in part mitigated by its EU membership**
  - Its scores are fairly even across the indices, ranking around 40th – 50th globally in each case. This is borne out by anecdotal evidence – having deep roots is a big advantage.
  - Poland is not a major export target for Scotland – and is outside the top 20.

Technical fit

★★☆☆☆

- **Low-to-moderate: established markets in only 2 clusters**
  - HG and HD are strong and growing clusters, but the latter is also the weakest for Scottish technical capability.
  - The HD cluster will also likely be too competitive.

Sweden

Delta-ee rating: ★★★☆☆

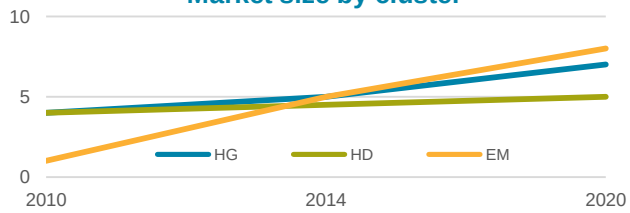
Delta-ee view:

- **Although it has a very small overall market size, we rate Sweden relatively highly.**
- **It has one of the highest figures in Europe for GDP per capita, alongside a highly favourable regulatory framework for most clusters.**
- **However, the level of competition in EM and HG will prove challenging for new entrants, and there is now little low hanging fruit for energy efficiency investment.**

Market drivers ★★★★☆

- **Two large clusters (HG & EM) in a strong but small economy**
  - The gradual phase-out of nuclear energy (currently approx. 50% of Sweden's total energy production) will lead to increased energy production from renewable sources (wind, PV, etc.). The resulting intermittency will most likely lead to a strongly increased importance for energy management.
- **Policy & regulatory environment – strong, both at national and local levels:**
  - Strong and aggressive renewable energy targets for 2020 and beyond.
  - Continuing heavy investment in energy efficiency.
  - In terms of HG, in Sweden, it is much more a heat pump story rather than a CHP one.
- **Energy price trends – remaining high:**
  - Sweden has high end user energy prices as a result of high level of taxes (more than 40% for residential users). It is the only country in Europe where gas is currently more expensive than electricity, leading to a negative spark spread for CHP.
  - It is a similar story in the commercial buildings sector, having one of the most expensive gas prices in Europe, while electricity prices remain relatively low, favouring larger heat pump deployment.
  - We expect to see some variability in future energy prices as a result of the introduction of ToU tariffs, although prices will remain relatively high due to taxation.

Market size by cluster



- The key clusters are HG, HD and EM (the C cluster is weak)
- The EM cluster likely to grow fastest as a result of increasing intermittent renewable generation and a high share of nuclear.
- The HG cluster is strong through sales of heat pumps and this is likely to continue. We expect these sales to stabilise at around 120,000 / year by 2020.
- For EM solutions (HEM products such as smart thermostats), we forecast sales to reach 200,000-400,000 units by 2020.

Heat / cooling demand growth ★★☆☆☆

- **Very limited growth in energy demand based on high efficiency**
  - Given the high level of energy efficiency targets in place, heat and cooling demand will likely not experience growth – they may even fall.
  - This will more than offset the IMF forecasts for Sweden's GDP to grow by 2.6% pa in 2015 and beyond.
  - It is ranked in the top 10 for global GDP per capita.

Competition ★★☆☆☆

- **Growing competition in the emerging EM cluster**
  - This is a new and growing market driven by growing intermittent generation and the availability of ToU tariffs. Already, there are several players.
  - The HG cluster is even more crowded, with IVT and NIBE being the front runners.
- **A tougher competitive environment for HD**
  - There is already a long-established DH market, largely based on biomass.
  - This is presenting a rapidly growing market for pellet production (more than 80 factories).

Ease of doing business ★★★★★

- **Easy: Sweden is just outside the top 10 of Delta-ee's adapted global EODB rankings.**
  - It is an EU Member State and ranks especially high when it comes to trading across borders. For other aspects, such as enforcing contracts and protecting investors, it ranks 25th and 34th respectively.
  - Sweden is Scotland's 20th largest export market – relatively high for its size.

Technical fit ★★★★☆

- **Moderate-to-high: there are established / growing markets for 2 of the top 3 Scottish clusters (HG, EM)**
  - Overall, the HG and HD clusters will continue to grow, as a result of Sweden's ambitious renewable targets
  - With a high growth potential, and despite emerging competition, the EM cluster remains potentially attractive.

Turkey

Delta-ee rating: ★★☆☆☆

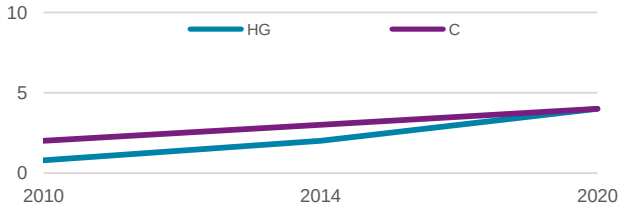
Delta-ee view:

- **Despite being a high growth economy, Turkey is a weak export target, with low carbon technologies generally representing low growth opportunities.**
- **The main positive drivers are fast growing energy demand and corresponding upward pressure on energy prices, stimulating some investment in energy efficiency technologies (e.g. CHP). Most other market drivers are weak.**

Market drivers ★★☆☆☆

- **Two growing clusters – HG and C - in a buoyant economy**
  - With a fast growing economy, both clusters are likely to exhibit growth – in particular, low carbon heat through CHP.
- **Policy & regulatory environment – weak with only modest improvements likely to 2020**
  - Turkey offers little policy support today for low carbon heat and cooling technologies – by far the lowest of the eight countries.
  - The most significant driver within the residential sector is 'new build' regulation which requires a minimum energy standard for heat and cooling efficiency before a building permit is awarded. This is driving, for example, some limited solar thermal uptake.
- **Energy price trends – moderate and rising - an increasing driver for energy efficiency**
  - Energy prices in Turkey have risen considerably in the last ten years due to a strongly growing economy and, in turn, a rapidly increasing demand for electricity and gas.
  - Price rises are unlikely to continue at the same rate in the period to 2020 but with a high reliance on Russian gas imports, and the Turkish Lira remaining weak, price volatility remains a high risk. Increasing energy prices are driving some industrial and commercial players to invest in energy efficiency.
- **Improving gas infrastructure – the Turkish gas network is expanding fast**
  - We expect growing uptake of efficient gas technologies such as CHP, gas-driven heat pumps.

Market size by cluster



- Turkey has strong growth prospects in both low carbon **HG** (some technologies) and **C** sectors to 2020.
- **HD** and **EM** are likely to remain largely insignificant to 2020.
- Delta-ee forecasts the Turkish CHP market will grow by ~50% in the period 2014 to 2020.

Heat / cooling demand growth ★★★☆☆

- **We expect continuing high growth in demand**
  - Over the last 10 years (2002 to 2012), Turkey's annual GDP has grown at an average rate of 5%, and consequent high energy demand growth.
  - Continued strong growth is likely: the World Bank forecasts 3.3% annual GDP growth in the period 2014-2016.
  - This is likely to translate to a growing demand for low carbon heat and cooling technologies to 2020.

Competition ★★★★☆

- **A weak competitive environment for most low carbon heat and cooling technologies**
  - This is especially true for **EM** and **HD,** which are not at all established in Turkey to date.
  - For **HG**, and CHP in particular, there is fast growing competition, driven largely by foreign manufacturers.
  - The cooling market is much more competitive, with increasing power prices driving more efficient products.

Ease of doing business ★★☆☆☆

- **Moderate: Turkey comes out as average in the Delta-ee adapted global EODB rankings**
  - Overall, some important challenges here, but not a showstopper for market entry.
  - Turkey is increasingly adopting 'EU standard' regulations which should benefit Scottish suppliers.
  - The country is particularly weak on 'resolving insolvency', ranking 130th globally.

Technical fit ★★★☆☆

- **Weak-to-moderate: only an emerging HG cluster could be well suited to Scottish capability**
  - **HG** is a growing cluster which is a good match for Scottish expertise.
  - **C** is also likely to provide significant growth opportunities to 2020, but this is a weak cluster for Scottish capability.
  - We believe it unlikely that **HD** and **EM** will see substantial market growth to 2020.

USA

Delta-ee rating: ★★★★☆

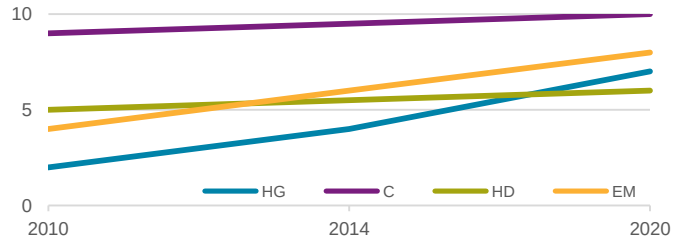
Delta-ee view:

- **The US represents a strong and growing opportunity, especially the HG & EM clusters.**
- **The main positive drivers include the overall very large market size, strongly emerging incentives in several major States, and the very high rating for EODB.**
- **However, persistently low gas prices will act against energy efficiency and some HG technologies (although this will incentivise gas-fired CHP).**

Market drivers ★★★☆☆

- **Large overall cluster market sizes:**
  - The US has the largest global economy and among the highest global GDP per capita. The market sizes for all 4 clusters will remain among the highest in the world.
  - E.g. for cooling systems, the USA is far and away the world's largest cooling market, around 1,200 TWh / yr and growing (compares with Japan at around 150 TWh / yr).
- **Policy & regulatory environment – weak federal but some strong State incentives:**
  - We expect federal policy for the 4 clusters will remain weak. For example, the US ranks worse than Poland on the American Council for an Energy Efficient Economy efficiency rating. This may change: in Sept 2014, the Department of Energy proposed efficiency standards for commercial AC, the most aggressive standard ever issued.
  - Also 10-15 States will continue to have strong incentives and / or targets for efficiency standards, CHP and renewable heat. Examples include OH and MA for geothermal HPs.
- **Energy price trends – low but rising:**
  - The US is fundamentally characterised by very low, but rising, energy prices, especially for natural gas, oil and electricity. This will favour high efficiency CHP (our forecasts show the US being a world top 3 market to 2020) but not generally renewables or energy efficiency.
  - There are several regional power grid pinch points where energy demand management is of growing importance, especially the NE and SW of the country.

Market size by cluster



- All 4 clusters are shown and they all represent growth markets.
- We expect HG to see most growth, based on a low base and fast emerging incentives.
- With a stressed power grid, we also expect the EM cluster to grow strongly.

Heat / cooling demand growth ★★★★☆

- **Continuing moderate growth in heat and cooling demand**
  - We expect continuing growth in both heat and cooling demand based on strong GDP growth prospects for 2015 and beyond, despite high scope for further energy efficiency investment.
  - The IMF forecasts 3.0% GDP growth this year, double that of the EU.

Competition ★★★★☆

- **A weak competitive environment in HG …**
  - HG, eg CHP and renewables, are emerging high growth markets in some parts of the US, with continuing scope for new entrants.
  - E.g. European players Ener-g and 2G have recently entered the CHP markets. Maybe also an opportunity for the Wood Fuel Co-op.
- **… but stronger competition in EM, C and HD:**
  - These clusters have been established for years, with numerous strong local players.

Ease of doing business ★★★★★

- **Easy: the US is 4th in our EODB rankings**
  - It scores especially highly across the board, and especially for protecting investors and enforcing contracts.
  - The US is also the number 1 export market overall for Scottish goods and services, and around the same in scale as the German and French markets combined.
  - SDI office locations correspond well with the best regions for LCH market opportunity.

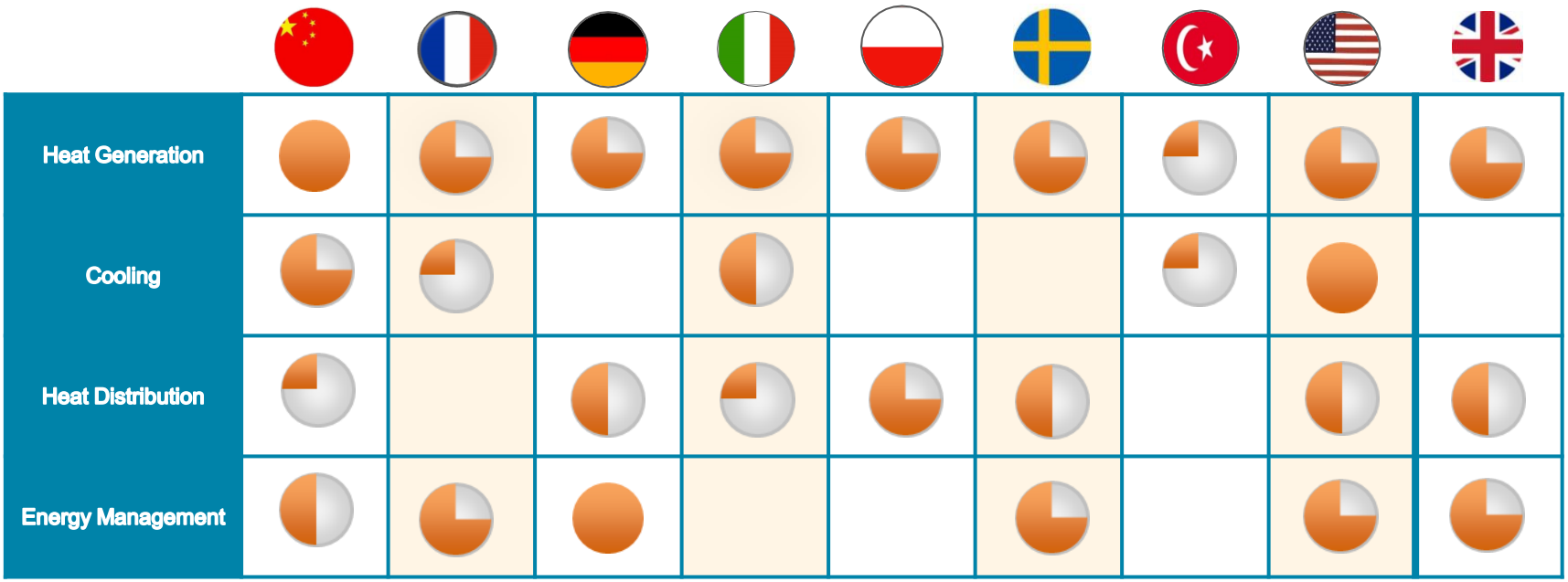
Technical Fit ★★★☆☆

- **Moderate-to-high: established markets for all 4 clusters, but high variance in market attractiveness**
  - Two of the top 3 clusters for Scottish capability represent, we believe, good growth opportunities in the US.
  - But market attractiveness varies greatly – high for CHP and renewable heat in some States only. The C and HD clusters will likely be too competitive.

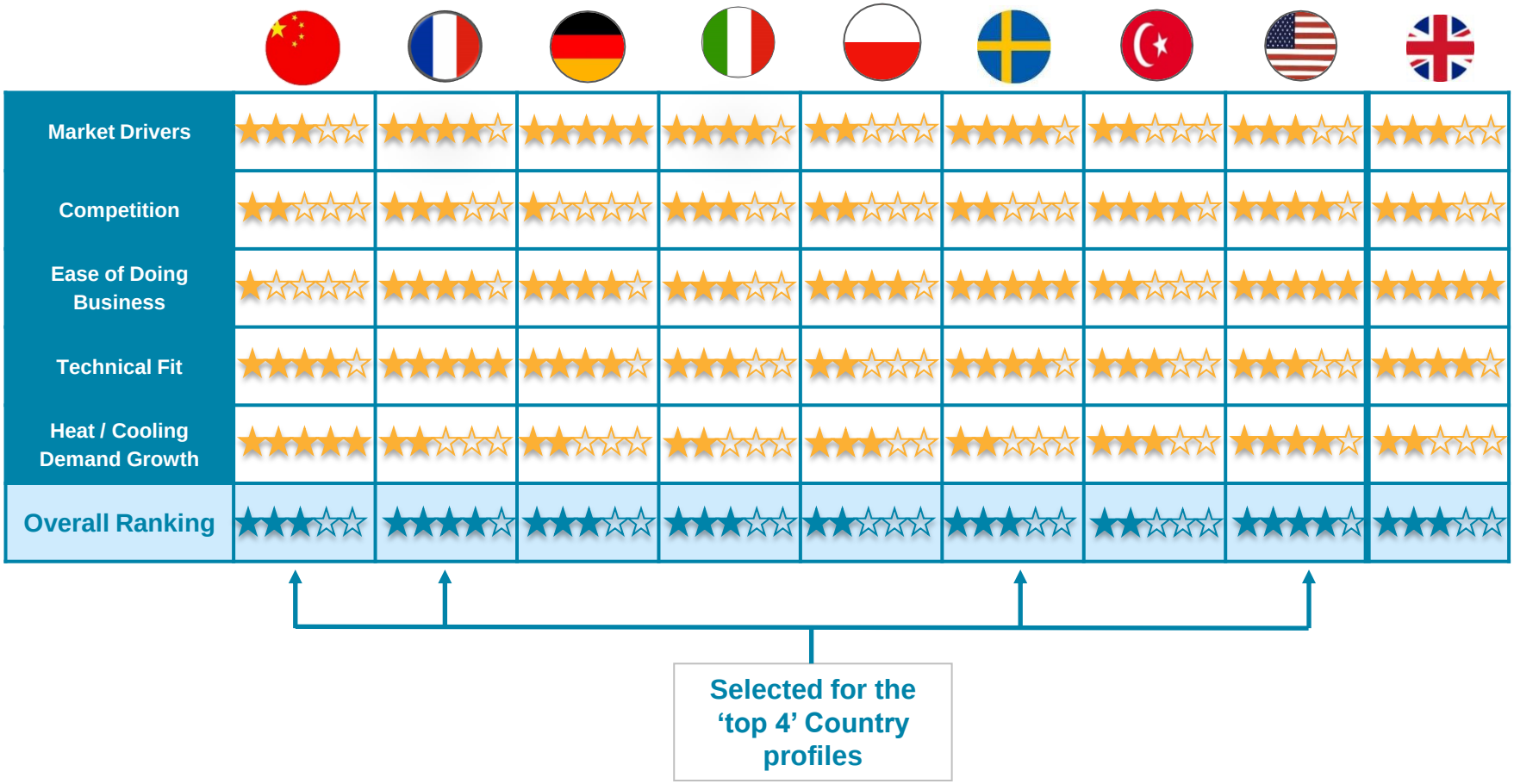
The eight Scorecards: summary of market size by cluster & country, with a UK comparison

Summary of the market opportunities for each cluster, as shown on each country graph.

Note: When no allocation has been made, that cluster has not been taking into consideration, as a result of its lack of significance.



The eight Scorecards: summary of country ratings, with a UK comparison



What can Scottish Enterprise / SDI offer?

Scottish Enterprise/SDI in partnership with Highlands and Islands Enterprise, UK Trade and Investment, Globalscot, Talent Scotland, Scotland Europa and the Enterprise Europe Network can deliver a range of international support including:

- Promote the capability of Scottish companies through SDI's 29 overseas offices and international networks such as UK Trade and Investment and Globalscot.
- Market awareness events.
- Preparing to export programmes.
- Support for specific technical issues e.g. documentation, delivery, certification, finance, customs, specific markets, products and codes, supply chain logistics.
- Market entry research and assistance; for example international strategy development, market information and identifying potential partners/ distributors.
- Subject to eligibility, possible financial contribution towards the cost of market visits.
- SDI led missions, exhibitions and learning journeys to overseas markets.

Further information on the services provided by SDI can be found on Scottish Enterprise's website:

http://www.scottish-enterprise.com/services/do-business-outside-scotland

If you would like to find out more about export opportunities in low carbon heat, please contact your Scottish Enterprise Account Manager or Business Gateway Advisor. Alternatively contact us on enquiries@scotent.co.uk or call our helpline on 0845 607 8787.

Scottish Enterprise

Disclaimer

Important

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