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Disruption to heat business models: from shifting boxes to selling comfort

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Abstract

While heat pumps are gaining ground in the new build market in Europe, the replacement market remains challenging. Emerging alternative business models - like 'Heat as a Service' – tackle key consumer barriers and promise to open up new market opportunities in retrofit for technologies like heat pumps. The authors assess how alternative propositions are gaining traction in Europe, assess customer response to such models based on our own primary research, and discuss what this trend means for the heat pump industry.

Keywords: heat pump; Europe; business model; alternative propositions; heat as a service; asset leasing; services; consumers; overcoming barriers; market opportunities; replacement market; retrofit.

1. Introduction

The heat pump market in Europe has shown >10% growth per year for the past 4 years [1] but it is far from reaching its potential. There are ~12 million heat pumps installed in Europe [1], a number dwarfed by the more than 100 million fossil fuel boilers installed [2]. This is primarily because of limited success in the retrofit (existing buildings) market, where heat pumps continue to struggle to gain traction against "traditional" heating systems (primarily fossil fuel boilers). Alternative, service-based customer propositions for heat are emerging, in particular Heat as a Service, which promise to overcome some of the retrofit challenges, and could enable heat pumps to capture a greater share of the existing buildings market.

Such propositions typically involve a residential building occupier signing up to a contract for heating provision and/or heating equipment (plus related services and maintenance) for a fixed (or variable) monthly fee, rather than purchasing their heating appliance outright. Similar heat contracting business models based on ongoing rather than upfront fees are already common in the commercial and industrial sectors, where heating and hot water demand is relatively more predictable than in the domestic sector, reducing the risk to the provider.

1.1 Heat pumps are established in new build – but existing buildings remain the biggest challenge

Heat pumps are already the heating system of choice for housing developers in many markets – in markets such as France and Germany, heat pumps account for 40-50% of heating systems in new single family homes (and in Sweden this is >90%) [2]. Tightening building regulations, and political goals to phase out the use of fossil fuels in new homes promise a bright future for heat pumps in new build, even in gas-dominated markets such as the Netherlands and UK [3]. But the majority of heating systems are installed in existing buildings, and it is here that heat pumps need to gain traction. In some of Europe's biggest heating markets (UK, Netherlands, Germany) heat pumps capture just a 1 - 5% share of the retrofit single family home market – which should be the initial target for heat pumps. This is compared to a >90% share for fossil boilers. A combination of low end-user awareness of heat pumps, lack of end-user trust in heat pumps and entrenched

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preference for ‘like-for-like’ replacement, and economic concerns, make gaining traction in retrofit very challenging.

1.2 What are the challenges to the growth of heat pumps in existing buildings, and how can ‘Heat as a Service’ help to overcome these?

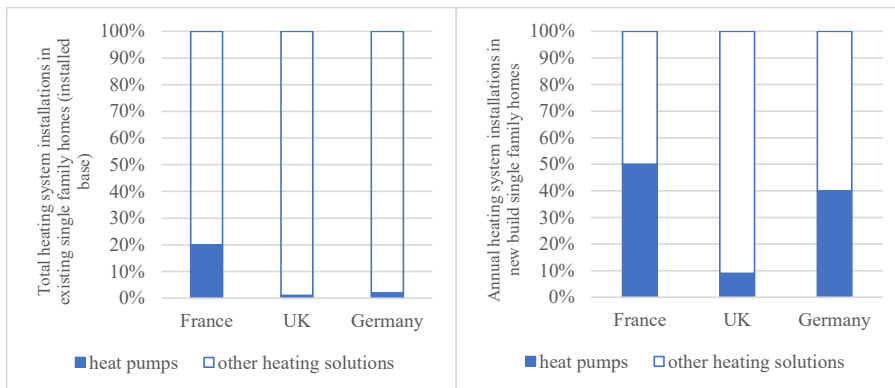


Figure 1: Share of heat pumps in existing (left) and new (right) single family homes

Source: [2], [1]

There are many barriers for heat pumps in displacing traditional heating systems (usually fossil boilers) in existing homes, in particular:

- Upfront cost of heat pump to end-user (can be 2-4 x the upfront cost of a new boiler, and more if heat distribution systems need to be replaced)
- Running costs compared to a boiler (varies by market, but high electricity prices versus gas & oil is a critical issue in many markets, and uncertainty about future energy prices make the idea of switching fuel risky for the end-user)
- End-user confidence/trust in heat pumps’ ability to perform (though there are exceptions in markets such as Sweden and Switzerland, end-users are still cautious about switching from a familiar heating system like a boiler, to an ‘unknown’ system like a heat pump – despite the fact the technology is well-established)

‘Heat as a Service’ type models, by reducing the amount of risk taken on by the end-user, can potentially help to overcome some of the retrofit barriers:

- Upfront cost of heat pump to end-user: ‘Heat as a Service’ removes – or reduces - the upfront cost barrier, as the cost is borne by the service provider rather than the end-user. The service provider can get better economies of scale, and potentially get volume discounts for purchase of many heat pumps at once.
- Running costs compared to a boiler: ‘Heat as a Service’ usually gives a fixed rate heat cost to the end-user, meaning there is less uncertainty about running costs. There are also various ways the service provider might reduce heat pump running costs – through for example including microgeneration for self-consumption such as PV, and through optimisation of the heat pump running times to run when electricity is cheaper.
- End-user confidence/trust in heat pumps’ ability to perform: ‘Heat as a Service’ removes the risk of poor heat pump performance and break-downs from the end-user, by providing maintenance, remote monitoring, and guaranteeing the heat outcome

‘Heat as a Service’: A definition

‘Heat as a Service’ usually means either/both of the following:

- *Paying an ongoing monthly fee rather than a one-off upfront fee* (the monthly fee usually includes payment for the heating system, the heat delivered, and the ongoing servicing)
- *Paying for outcomes rather than inputs* (paying for heat or comfort delivered rather than fuel input)

Delta-EE defines ‘Heat as a Service’ as a service where the provider takes on the following ‘risks’ usually borne by the end-user:

- *financial risk* – The service provider takes on credit risk by providing a heating appliance for a monthly fee and little or no upfront payment.
- *technical risk* – The monthly fee charged by the service provider includes: routine maintenance, repairs, and appliance replacement if necessary within the contract period.
- *performance risk* – The service provider charges per unit of output (heat) or for the outcome (warmth) provided by the heating appliance (or guarantees savings on heating costs).
- *energy price risk* – The service provider offers a fixed price per unit of heat or warmth generated for a period of time, typically a year.
- *behaviour risk* – the service provider charges for the outcome (warmth) provided, thereby taking on the risk that customers use heating inefficiently by, for example, opening windows.

Sub categories of ‘Heat as a Service’ exist, where the provider takes on only some (but not all) of the above risks. These include:

- Asset leasing
- Efficient asset leasing
- Energy payment plan
- Warmth payment plan

There are also further developments possible, beyond ‘Heat as a Service’, including:

- *Comfort as a Service*: where the outcome is a level of year-round thermal comfort in a home, including providing cooling in summer, when needed
- *Energy as a Service*: where the offer to the customer includes energy use for other appliances (e.g. including other electricity needs).

2. The ‘Heat as a Service’ landscape in Europe – who is doing what?

Over the past 3-5 years, an increasing number of new ‘Heat as a Service’ type offerings have emerged in the domestic sector, being offered from providers including energy suppliers, heating manufacturers and specialist start ups. The majority of these are still pre-commercial and at trial stage, but several have been commercialised successfully, and we estimate that the number of customers currently using a Heat as a Service type model is in the low 1,000s across Europe [4]. Figure 2 highlights some of the main activity in Heat as a Service offerings in the domestic sector. Heating systems employed in these offerings include heat pumps, hybrids (heat pump & boiler), and traditional heating systems, sometimes packaged together with building fabric renovation, PV and other technologies. It should be noted that heat contracting business models, based on ongoing rather than upfront fees, are already common in the commercial and industrial sectors (where heating and hot water demand is relatively more predictable than in the domestic sector, reducing the risk to the provider).

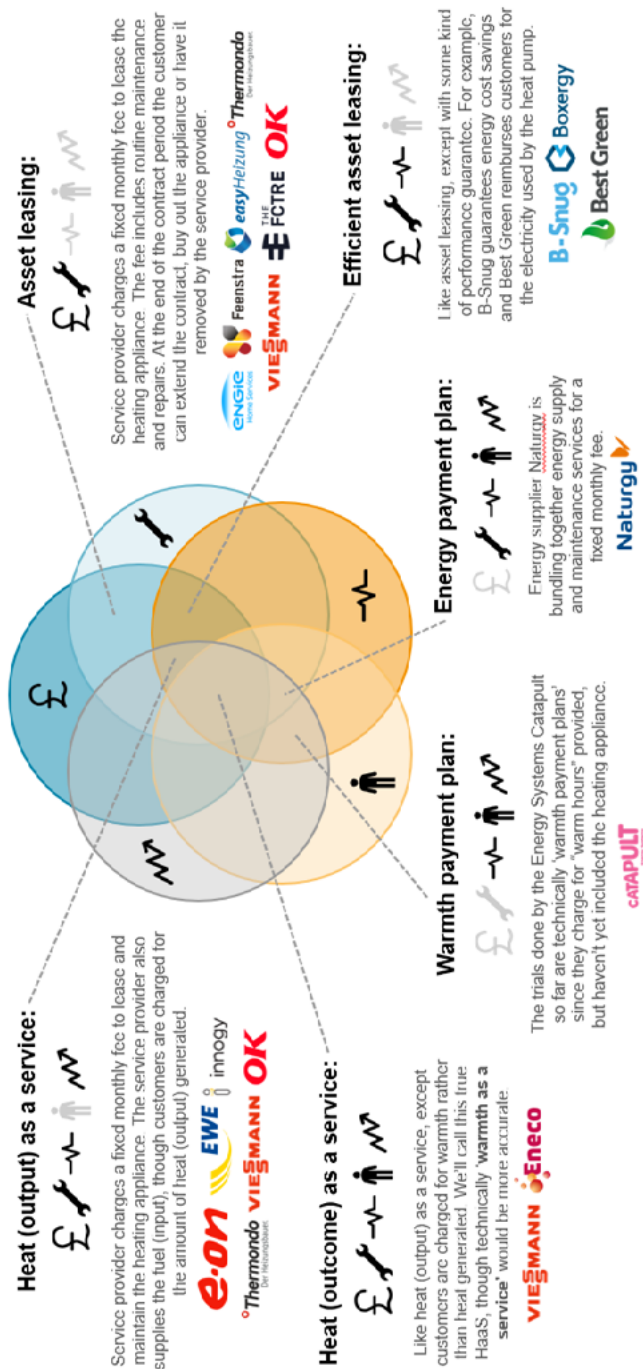


Figure 2: The 'Heat as a Service' landscape. Source: [4].

We highlight examples of three of these models in the case studies below – from specialist service provider The FCTR E in the Netherlands, oil supplier OK in Denmark, and heating manufacturer Viessmann in Germany. (Please note that the use of these examples does not represent an advertisement for any of the companies mentioned, or show any form of endorsement).

CASE STUDY: The FCTR E “e-home” package – Efficient Asset Leasing, moving towards Energy as a Service

Type of provider: Independent service provider

Stage of development: Commercial

Location: Netherlands

Heating appliance: Air-to-water heat pump with water tank and solar PV

Initial target customers: Larger, privately-owned homes (typically 150m² or above)

Number of installations: Aiming for 1,000 in 2019

The FCTR E is a Dutch company established in 2016. It replaces gas heating with a package of electric technologies for a fixed monthly fee, at no upfront cost.

The FCTR E could ultimately offer relatively low-risk ‘Energy as a Service’. With its customers needing little to no residual electricity* from the grid (as the solar PV is sized to match the heat pump’s expected needs), the FCTR E has limited electricity price risks, so user behaviour risks are less of a concern. If it can include electricity supply at a fixed fee as planned, it will be an example of true Energy as a Service.

Key details:

FCTR E e-home package	
Price:	Fixed monthly fee, typically ~€250, property dependent. No upfront cost.
Contract:	1 year, automatically renewed unless cancelled more than 3 months before contract ends. On cancellation, customers can: <ul style="list-style-type: none"> Pay the residual value to purchase the equipment; Pay for the equipment to be removed; Transfer the contract free of charge.
Includes:	1) Design and installation of “e-home” system, including a NIBE heat pump, water tank, solar PV (optional) and smart controls. 2) Routine maintenance and repairs.
Savings:	Total cost ~25% less than current energy bill (not guaranteed).

The average system equipment costs ~€35k. This is financed by banks and the company founders.

Contracts are calculated based on a 15 year equipment lifespan, but are **effectively indefinite**.

EV charging and battery storage options are also available.

Residual electricity supply is not currently included, but the FCTR E is planning to white label electricity supply in 2019/20 to meet customer demand. **

The FCTR E is looking into **additional services** it can provide, such as home energy management and grid services.

* Residual electricity means the additional electricity required from the grid, on top of that produced by onsite PV.

** White labelling is where the service supplier has an agreement with another company e.g. the electricity supplier, to sell electricity on its behalf. In this case, the service supplier (The FCTR E) would buy electricity from the electricity supplier and sell it on to the end-user – so the end-user relationship remains with the service supplier.

CASE STUDY: OK – Leasing and Heat (output) as a Service*Type of provider:* Oil supplier*Stage of development:* Commercial*Location:* Denmark*Heating appliance:* Air-to-water heat pump*Initial target customers:* Privately-owned homes; often those currently using oil for heating*Number of installations:* 500/year for leasing model (launched in 2012), 200/year for Heat as a Service model (launched in 2017).

OK offers heat pump leasing and subscription packages, including energy supply for a fixed monthly fee (revised annually based on heat use) and a complete end-to-end service for heat pumps including the design, planning and installation of heat pumps. Customers are offered the options to:

- Buy the heat pump upfront, for a cost of around 100k-120k DKK;
- Lease the heat pump from OK
- Get the heat pump on a subscription service that includes energy supply.

Key details:

	Heat pump leasing	Heat pump subscription
Price:	<ul style="list-style-type: none"> Upfront fee of DKK 25,000 or DKK 50,000 for installation. Monthly rental fee from DKK 995, depending on contract length and heat pump capacity. 	<ul style="list-style-type: none"> Upfront fee of DKK 20,000 for installation. Fixed monthly usage fee for kWh heat consumed, around 2,000 DKK.
Contract:	Flexible contract period, up to 10 years.	15 years. Contract can be transferred to a new owner if moving house, or customers can buy themselves out by paying the residual value of the heat pump.
Includes:	<ol style="list-style-type: none"> 1) Installation of a heat pump. 2) Routine maintenance and repairs. 	<ol style="list-style-type: none"> 1) Installation of a <u>Velund</u> or Vaillant air source heat pump. 2) Routine maintenance and repairs. 3) Energy supply for the heat pump.
Savings:	Can be calculated.	Can be calculated.

The leasing model has been popular, particularly for distress purchases.

The monthly usage fee is **revised annually** based on actual heat use.

OK has a [Heat Pump Calculator](#) that shows customers the cost to buy and operate a heat pump, and the energy cost savings over 15 and 20 years (including a 30% discount on electricity prices that customers can apply for).

CASE STUDY: Viessmann –Heat (output) as a Service

Type of provider: Heating manufacturer

Stage of development: Commercial

Location: Germany

Heating appliance: Gas boiler

Initial target customers: Privately owned homes, and private landlords

Number of installations: Offer launched in late 2019; trial of 200 homes already completed.

Viessmann’s Heat Fix package is the first commercial offering taking on all five ‘risks’ by offering a fixed price for energy, albeit with gas boilers rather than low carbon alternatives. As part of Viessmann’s aim to realign itself as an “integrated solutions provider for the entire living space”, the company has launched three new heat packages in Germany:

- **Heat Basic:** gas boiler and maintenance for a fixed monthly price (asset leasing);
- **Heat Flex:** Heat Basic + gas supply with variable billing;
- **Heat Fix:** Heat Basic + gas supply for a fixed monthly price (Heat (output) as a Service).

Key details:

Viessmann Heat Fix	
Price:	No upfront cost; fixed monthly base price for appliance and maintenance; fixed monthly price for gas consumption.
Contract:	10 years, automatically extended for a further 5 years unless customer gives notice. If notice is given, the customer can: <ul style="list-style-type: none"> ▪ Pay the residual value to buy the appliance; ▪ Have it removed; or ▪ The contract can be transferred to a new property owner/tenant
Includes:	1) Installation of new gas boiler. 2) Routine maintenance and repairs, including chimney sweep costs, and replacement if necessary. 3) Gas supply.
Savings:	Example shows lifetime cost savings of 30%.

The fixed monthly price is calculated on a **case-by-case basis** by the installer at the start of the contract. Changes in consumption are likely accounted for in annual price adjustments.

Installation services are delivered through Viessmann’s strong network of **independent installers**, who also handle the subsequent maintenance work. This way installers earn the same for installation and maintenance as they would normally.

Installers find they can also achieve higher conversion rates by offering the heat packages as financing options.

Viessmann sources gas from both local and national energy suppliers, enabling it to get the **best gas prices**.

3. Will ‘Heat as a Service’ offerings engage end-users and fulfil their potential in driving the growth of low carbon heating such as heat pumps?

Experience from the market and feedback from customer research indicates a strong potential role for ‘Heat as a Service’ in driving decarbonisation in existing buildings – though there are barriers to implementation to overcome, and considerations to be made regarding how to manage the risk(s) borne by the provider.

Offerings currently being trialled and commercialised show generally positive responses from participants (with no known cases where a customer has asked to end the contract early). But the numbers of customers currently using Heat as a Service-type offerings across Europe is in the low 1,000s, compared with the tens of millions of customers across Europe who have bought heating systems upfront.

Delta-EE has carried out primary customer research across ~800 end-users in the UK, France, Germany, Italy and the Netherlands [5], who currently do not have such a service, assessing their attitudes to different heat propositions (Figure 3). This research shows that, while the majority still prefer the traditional payment upfront option, around 30% of all participants stated that they would be likely to take up a ‘Heat as a Service’ proposition if available, and this proportion increases with younger participants (to closer to 50%). This is a positive indication of the potential attractiveness of such models – and their growth potential.

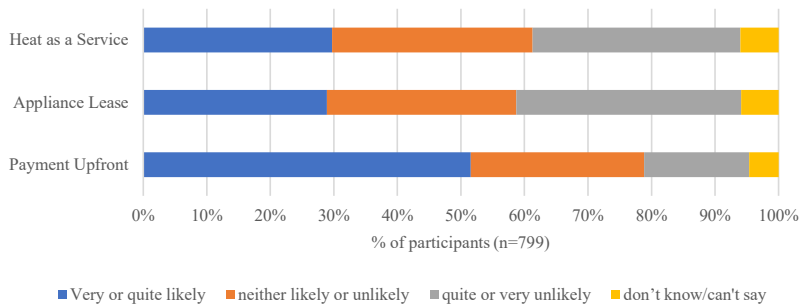


Figure 3: How likely would you be to take up one of the following propositions if it was available to you?

Source: [5]. Based on a sample of 799 domestic customers in the UK, France, Germany, Italy and the Netherlands. (Survey restricted to those who own their home outright or with a mortgage, and make decisions jointly or solely about the heating system in the household).

To develop a more detailed view of the optimal proposition designs, Delta-EE carried out Focus Groups with participants in the UK, the results of which are highlighted in Table 1 below. Ultimately, a flexible approach to proposition design is necessary, to meet the widest range of customer needs and expectations. But the research indicates that key pillars of the proposition should - ideally - be:

- a heat contract length of under 5 years
- offer bundled with maintenance and repairs plus an energy supply contract
- and guaranteed running cost savings, or lowest tariff guarantee.

Table 1. High level results from Delta-EE Focus Groups exploring proposition design

What participants liked in a proposition	What participants did not like in a proposition
<ul style="list-style-type: none"> • Having maintenance and insurance included in the monthly fees • Bundling in other services/solutions like solar panels or insulation • Paying a fixed monthly fee for pre-energy/heat 	<ul style="list-style-type: none"> • Long contract periods – over 5 years is not appealing to many customers • Being tied into an energy supply contract so it could be difficult to switch energy supplier • Paying extra to use heating outside of pre-set hours

Source: [6]. Based on focus groups with 38 domestic customers in the UK (all home-owners).

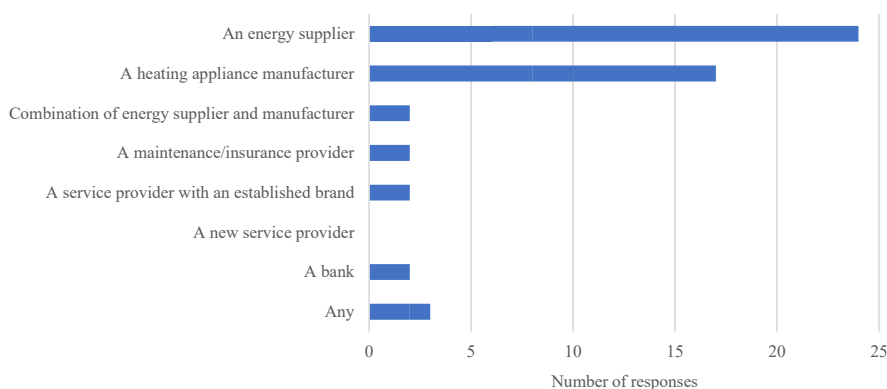
4. What does Heat as a Service mean for the heat pump industry?

‘Heat as a Service’ shows promise as an enabler of growth for low carbon technologies like heat pumps in the existing building market, for the following reasons:

- The concept is already well-proven: many have been commercialised for a number of years, and trials are yielding further insights into the ideal proposition designs.
- Such service models can overcome some key end-user barriers to uptake of new technologies, such as the relatively high upfront cost compared to the typical heating appliance, and concerns over performance or running cost.
- The concept is appealing to a significant share of end-users, according to our customer research. Awareness of these concepts is currently low (due to the limited number of commercial offerings available today in each country), so familiarity is also low. It is conceivable that as familiarity with these offerings rises, the appeal could also grow.

‘Heat as a Service’ offers a new opportunity for manufacturers, either as equipment suppliers to a service provider, or as a service provider themselves. While the majority of offerings on the market today are from energy suppliers (and specialist start ups), Delta-EE’s focus groups research indicate that a heating manufacturer could be an appealing provider, along with energy suppliers (Figure 4).

Figure 4: Who would you choose to purchase a ‘Heat as a Service’ type package from?



Source: [6]. Based on focus groups with 38 domestic customers in the UK (all home-owners).

5. Recommendations & Conclusions

There is a huge opportunity for innovative ‘Heat as a Service’ models to enable real growth in the heat pump market – particularly in retrofit, where heat pumps generally still struggle to compete. To capture this opportunity, the heat pump industry can prepare by, for example:

- Identifying a ‘Heat as a Service’ provider to supply – potentially taking part in trials. This would provide manufacturers with additional equipment sales, and could potentially offer additional opportunities to installation & maintenance partners.
- Considering the product functionalities which will best meet the service providers needs - e.g. connectivity, interoperability of the heat pump and other appliances/controls in the home, minimising maintenance requirements and costs, and providing remote diagnostics. Focussing on these aspects could provide heat pump manufacturers & suppliers with a competitive edge over rivals, in securing equipment supply contracts with service providers.
- Making a strategic decision to become the organisation offering Heat as a Service-type offerings - providing a service to end-users, rather than shifting boxes. This will likely require action on some or all of: identifying partners; strengthening installation and maintenance networks and supply chains; arranging necessary financing and developing customer-facing

tools like billing and support. While this option requires the most effort (and involves the most risk) it also has the potential to bring the highest rewards (through providing the most opportunities for revenue generation, and strengthened brand positioning).

The implementation of 'Heat as a Service' models could be a critical step in unlocking parts of the extensive European domestic retrofit heat pump market to heat pumps, because it would overcome some of the biggest end-user barriers for heat pumps – high upfront cost, risk of high running costs, and lack of trust in the technology. The concept is well-proven, and is gaining ground in the domestic heat pump market, with several large players engaging. We expect this type of model to become much more widespread in the future heating market – and heat pumps can be one of the key beneficiaries.

References

- [1] EHPA, European Heat Pump Market and Statistics Report, EHPA 2019
- [2] Delta-EE, European Heating Market Database 2019
- [3] Delta-EE, Viewpoint: The end of the road for fossil fuel boilers in new build? Delta-EE Heat Services, November 2019
- [4] Delta-EE, Heat as a Service report, Delta-EE Heating Business Service, August 2019
- [5] Delta-EE, European Customer Research Report, Delta-EE Electrification of Heat Service, September 2019
- [6] Delta-EE, Heat as a Service Focus Groups Report, Delta-EE Heating Business Service, August 2019