Guidehouse

Innovative approaches to energy efficiency

Project Firefly

15 June 2020

Introduction

As part of Project Firefly, we explored innovative approaches to energy efficiency (EE) that UKPN could consider pursuing.

We generated a long-list of ideas by:

- Taking note of UKPN's innovation ideas
- Considering international examples and GB trials
- Running an internal workshop of Guidehouse experts to gather our international expertise and innovative thinking

A workshop with UKPN then took place to present and discuss the EE approaches, as well as UKPN's initial views on prioritisation.

This report summarises the workstream on innovative EE approaches outlined above.

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Characterising DNO roles in EE

DNO roles

	Role	Description
A	Information provider	Provides information to encourage consumers to improve energy efficiency
B	Deployer	Deploys energy efficiency solutions itself
C	Coordinator	Co-ordinates with third parties to deploy energy efficiency solutions
D	Gatekeeper / lobbyist	Sets (or lobbies for) standards that require energy efficiency solutions to be deployed
E	Product developer	Develops products which encourage consumers to use energy in an efficient manner

Characterising DNO roles in EE

Potential approaches for each DNO role

DNO Role	A **Information provider**	B **Deployer**	C **Coordinator**	D **Gatekeeper / lobbyist**	E **Product developer**
	Provides information	*Directly deploys EE measures*	*Co-ordinates third parties to deploy EE measures*	*Sets (or lobbies for) standards that require EE deployment*	*Develops products to encourage EE behaviour in consumers*
EE Approaches	1. Non-personalised information provision for consumers 2. Non-personalised information provision for trade allies 3. Personalised information provision	1. Direct install	1. Contracting for EE 2. Subsidies / grants for energy-efficient appliances 3. On-bill financing of EE devices	1. Lobby for improved building standards 2. Set EE standards for new and upgraded connections	1. Location-specific connection or delivery charges 2. Delivery charges based on access capacity and/or time-varying delivery charges 3. Managed connection products 4. Temperature-based products
Targeting methods	Vulnerable customers	Worst-performing properties	Congested locations	By sector	By heating fuel

Characterising DNO roles in EE

- The approaches shown in the table are intended to be EE measure-agnostic. In other words, they are general approaches that could be applied to a variety of different EE measures (e.g. insulation, lightning and building control).
- The approaches are not intended to be mutually exclusive. For instance, there are many possible combinations and overlaps between the *Information provider* and *Coordinator* roles that could make sense.
- The approaches could be targeted at a subset of customers using the *Targeting methods* shown at the bottom of the table. The implications in terms of benefits, costs and risks would need to be evaluated.

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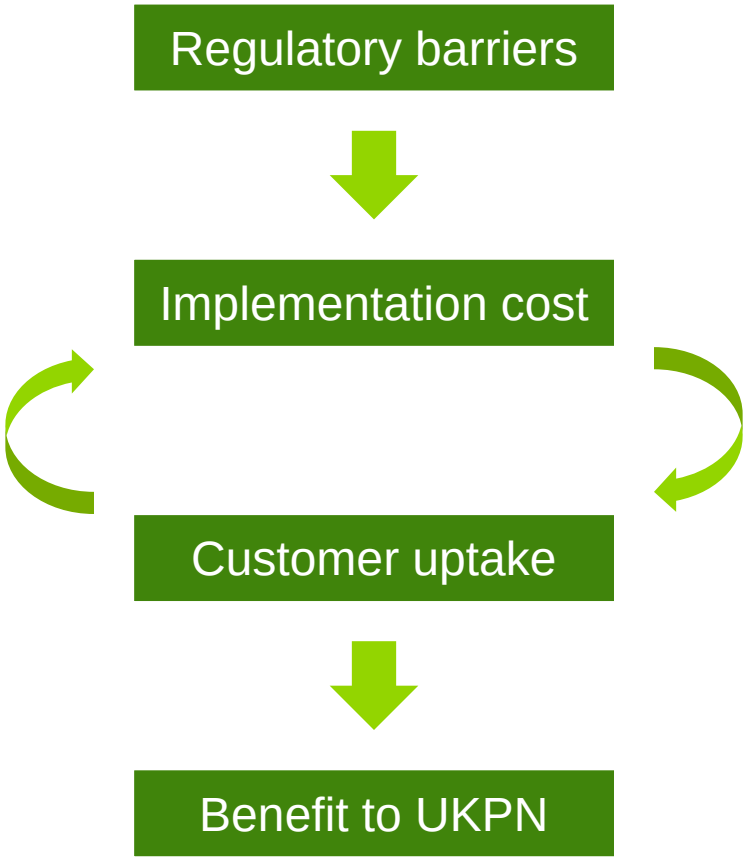
Long-list of potential EE approaches

In this section, the potential EE approaches are grouped according to the DNO role.

For each of the EE approaches outlined:

- How would **Ofgem** view this?
- How would the **UKPN business** view this?
- How would **consumers** respond?



DNO role:
A) Information provider

A1: Non-personalised information for consumers

Information provider

Description	Energy efficiency advertising campaigns, tips and advice; Websites that compare the energy efficiency of appliances; promotion of EE grants and opportunities;
Partnering requirements	UKPN could provide the information themselves or partner with an existing EE organisation (e.g. Energy Savings Trust).
Regulatory considerations	None
Difficulty of implementation	L - low cost and low effort as the information already exists
Benefits to customers	L - depends on customer acting on the information provided
Benefits to UKPN	L - customer adoption of the EE measures is uncertain, no guaranteed link between programme spend and EE outcomes delivered
Precedents	Common overseas and a component of innovation-funded projects in the UK (e.g. energywise, SAVE)

A2: Non-personalised information for trade allies

Information provider

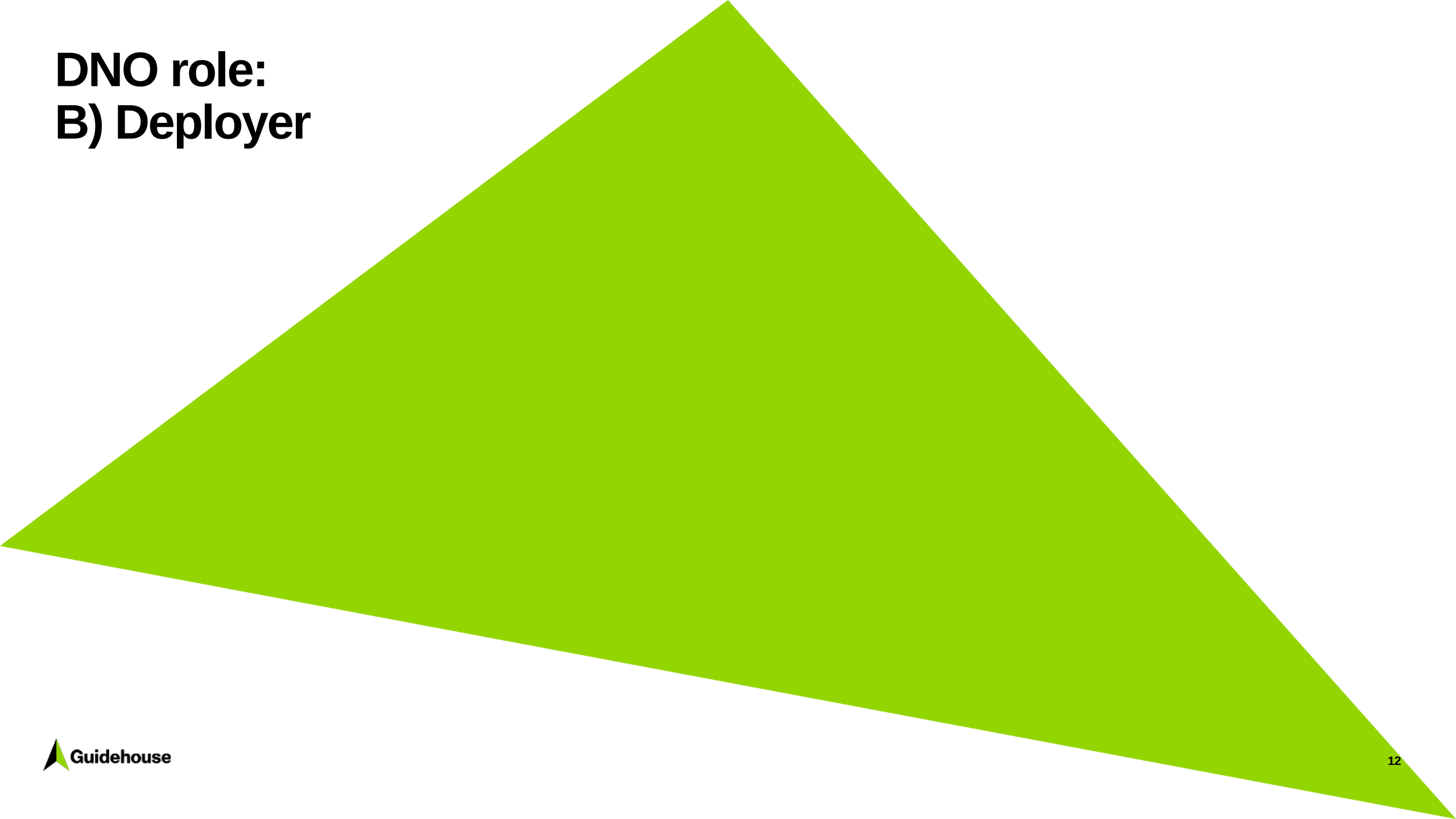
Description	Train trade allies (architects, builders, manufacturers, salespeople, repairers, etc.) to promote energy efficiency when consumers are making purchasing decisions
Partnering requirements	UKPN could provide the information themselves or partner with an existing EE organisation (e.g. Energy Savings Trust).
Regulatory considerations	None
Difficulty of implementation	L - low cost and low effort as the information already exists
Benefits to customers	L - depends on customer acting on the information provided
Benefits to UKPN	L - customer adoption of the EE measures is uncertain, particularly as customers not directly targeted, no guaranteed link between programme spend and EE outcomes delivered
Precedents	North America

A3: Personalised information provision

Information provider

Description	Energy efficiency audits and coaching (in-home or online); appliance support champion; real-time energy use dashboards featuring gamification, rewards, comparisons with neighbours
Partnering requirements	UKPN could provide the information themselves or partner with an existing EE organisation (e.g. Energy Savings Trust). Software aspects would require a third party software developer. Real-time energy dashboards would require partnership with suppliers (link to smart meter data).
Regulatory considerations	Use of customer energy use data would need to be consistent with privacy laws
Difficulty of implementation	M - an online-only approach would be less effort and cheaper, but likely less effective. An in-person approach would be more effort and cost but likely more impactful
Benefits to customers	L - depends on customer acting on the information provided
Benefits to UKPN	L - customer adoption of the EE measures is uncertain, no guaranteed link between programme spend and EE outcomes delivered
Precedents	Common overseas (e.g. Uplight) and a component of innovation-funded projects in the UK (e.g. energywise, SAVE)

DNO role:
B) Deployer

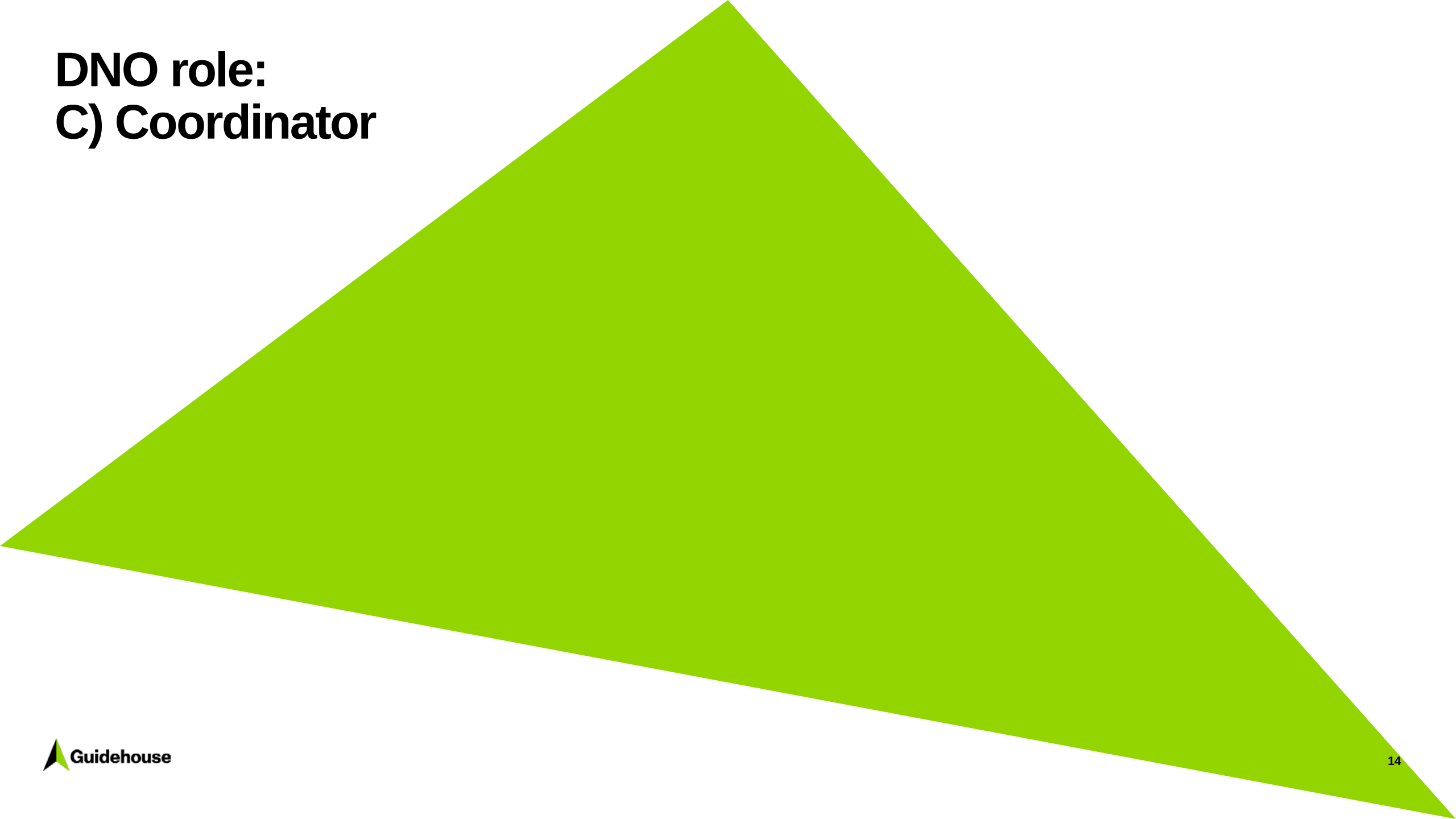


B1: Direct install

Deployer

Description	DNO provides and installs energy efficiency solutions in customer properties
Partnering requirements	None necessarily, though as in energywise, UKPN may find it more effective to partner with a supplier and/or community organisation
Regulatory considerations	UKPN would not own the assets once installed on customer premises. Potential cross-subsidization issue if programme costs are socialized while benefits are concentrated among participants, would likely need to show that shared benefits outweigh socialized costs
Difficulty of implementation	H - high cost and high effort. A significant departure from UKPN's existing role.
Benefits to customers	M - receive EE devices for free or reduced cost, leading to reduced bills and perhaps warmer homes (depending on what is installed)
Benefits to UKPN	L - while there is a direct link between spend and EE outcomes, the role is best suited for small, low-value installations
Precedents	Trialled in innovation projects such as energywise and SAVE

DNO role:
C) Coordinator



C1: Contracting for energy efficiency

Coordinator

Description	UKPN either pays third parties a unit rate to install EE measures, or contracts with third parties to deliver a certain level of peak demand savings from EE measures. Unit rate could be either based on kW saved or set by measure.
Partnering requirements	Third party installers to provide the service
Regulatory considerations	No barriers anticipated, can be viewed as analogous to contracting for flexibility
Difficulty of implementation	M – could build on flexibility tender process, but cost of achieving savings likely still high
Benefits to customers	H - customers receive lower bills or warmer homes
Benefits to UKPN	M - strong link to savings but likely high cost to achieve
Precedents	This is similar to flexibility tenders that UKPN currently runs

C1: Contracting for energy efficiency

Additional notes from UKPN workshop

- All participants agreed that this approach would ideally target constrained network areas.
- In theory, customers could deliver EE through existing flexibility mechanisms. Why hasn't this happened to date?
  - SSEN SCMZ project showed that customers struggled to deliver the 50kW response required through EE. As UKPN has now reduced the flexibility requirements down to 10kW, this might be more achievable.
  - High risk of non-delivery for smaller customers. It might be better to target larger customers at primary/grid substation level.
  - Measurement and verification can be costly.
- Ideas for trials
  - UKPN could offer *different payments* for installing insulation in a property with a gas boiler vs. a heat pump, for example, reflecting the value to UKPN.
  - UKPN could *partner* with a white goods retailer to subsidise EE equipment in specific (network-congested) postcodes. This approach would overlap with C2 (see next page).

C2: Subsidies / grants for energy-efficient appliances

Coordinator

Description	UKPN offers discounts / rebates on purchase prices for energy-efficient appliances on an approved list (e.g. via an online marketplace), or subsidised repairs / tune-ups of existing appliances.
Partnering requirements	Third parties retailers and repairers would need to be accredited to the programme
Regulatory considerations	Potential cross-subsidization issue if programme costs are socialized while benefits are concentrated among participants, would likely need to show that shared benefits outweigh socialized costs
Difficulty of implementation	M - less effort than direct installs but still high cost
Benefits to customers	H - customers receive lower bills or warmer homes
Benefits to UKPN	M - strong link to savings but likely high cost to achieve
Precedents	Common in the US (e.g. DTE marketplace)

C3: On-bill financing of EE measures

Coordinator

Description	Customers finance the cost of EE measures via an additional monthly charge on their energy bill
Partnering requirements	Third parties retailers and installers, suppliers as they hold the billing relationship, organisations that work with vulnerable customers
Regulatory considerations	Many issues, for example consumer finance and protection rules, not holding the billing relationship
Difficulty of implementation	H - complex to implement, especially as UKPN doesn't hold the billing relationship. Likely limited to owner-occupied properties
Benefits to customers	H - customers receive lower bills or warmer homes
Benefits to UKPN	M - strong link to savings, but without cost subsidies customer uptake may not be strong
Precedents	Arcadia Power (US), Green Mountain Power (US), Pay As You Save

DNO role:
D) Gatekeeper / lobbyist

D1: Lobby for improved building standards

Gatekeeper / lobbyist

Description	Lobby government for improved building standards such as insulation, smart home controls, heat pumps
Partnering requirements	None necessary, though may wish to align with organisations with common interests to strengthen the position
Regulatory considerations	n/a
Difficulty of implementation	L – low cost to lobby, but no guarantee of success
Benefits to customers	M – would only impact a small subset of customers who would enjoy lower energy bills and warmer homes, but increased spend to meet standards
Benefits to UKPN	M – no guarantee lobbying would be successful, would take time to deliver any benefits as would only apply to new or renovated properties, but cost to UKPN would be low
Precedents	Other countries have higher building standards than the UK

D2: Set EE standards for new and upgraded connections

Gatekeeper / lobbyist

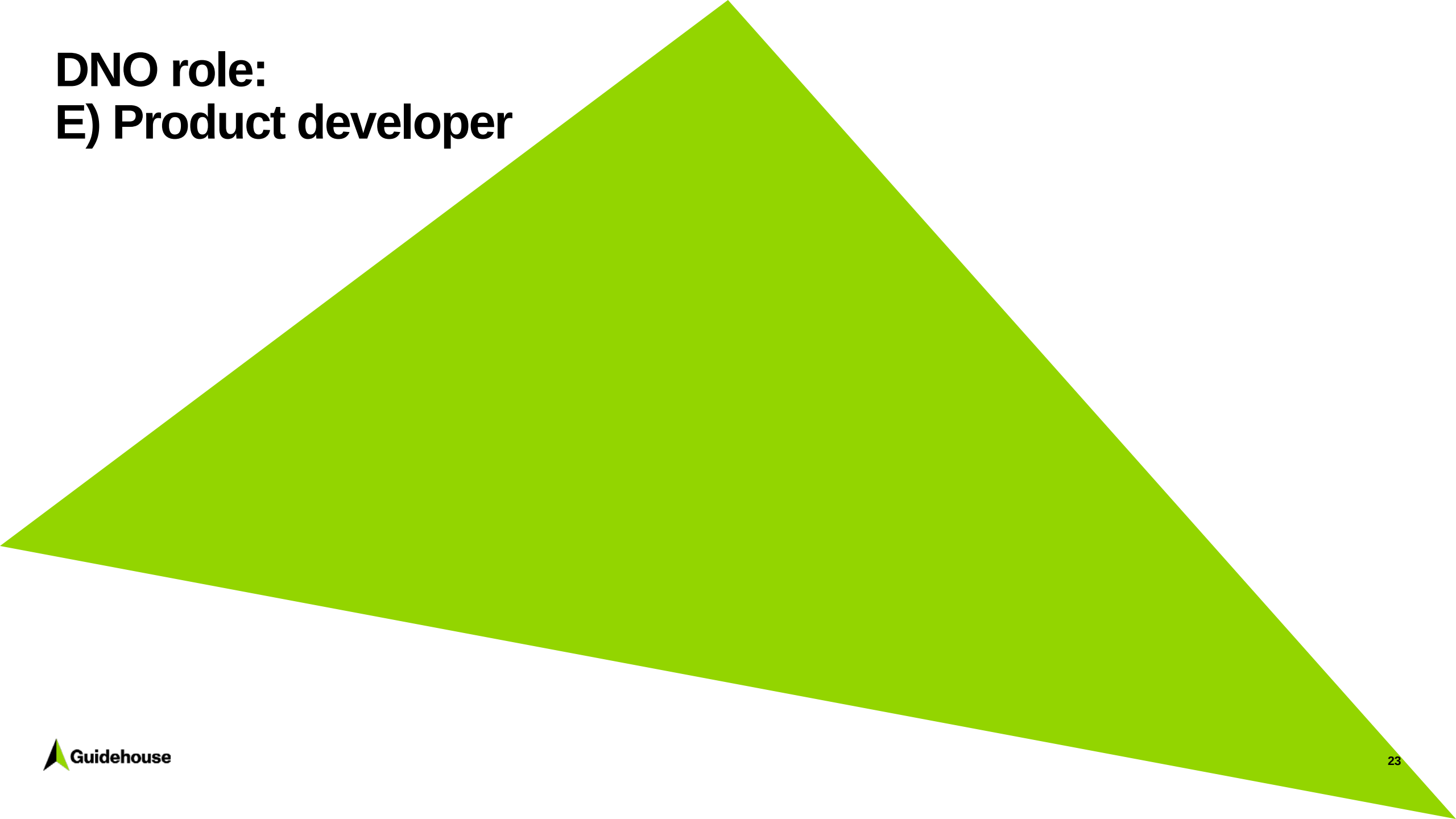
Description	UKPN sets requirements (akin to building standards) such as: 'you cannot install a heat pump unless you do X, Y, Z to improve the efficiency of your home' 'If installing an electric hot water system your maximum set point must be this' 'You must install smart home controls, solar, storage, …'
Partnering requirements	May need to partner with BEIS (or similar government agency)
Regulatory considerations	Unlikely that UKPN could implement this unilaterally, would need policy support from BEIS or similar
Difficulty of implementation	H - UKPN unlikely to be able to implement directly, may be politically challenging to convince government to implement, unlikely to be popular with customers
Benefits to customers	M - lower energy bill and warmer home, but spend to meet standards
Benefits to UKPN	H - guaranteed reduction in energy use (vs. no standards) at no cost to UKPN
Precedents	Similar in concept to building standards, but no precedent in Guidehouse's experience

D2: Set EE standards for new and upgraded connections

Additional notes from UKPN workshop

- **Example**: a customer decides to install a heat pump in a poorly insulated home. Because of the poor insulation, the heat pump requires large amounts of electricity to maintain the temperature within the home. The customer can afford the running costs, but the situation is undesirable from a societal point of view. Should the customer be allowed to install the heat pump without improving the efficiency of the home?
- All participants agreed that UKPN is *unlikely* to implement this approach. It would not be socially acceptable for UKPN to act as gatekeeper in this way. It could also lead to UKPN being perceived to be blocking the energy transition.
- The underlying issues can be addressed by applying *cost-reflective tariffs* and/or DUoS charges. This would provide the necessary incentives for customers to make the right choices (from a societal perspective). The approaches in section E (see next page) explore changes to pricing structures and incentives.

DNO role:
E) Product developer



E1: Location-specific connection or delivery charges

Product developer

Description	Connection and/or delivery charges that take into account available network capacity and charge more in congested areas
Partnering requirements	None
Regulatory considerations	Would require changes to charging methodologies, which are currently being considered
Difficulty of implementation	M - would require regulatory change and customer education
Benefits to customers	M – should drive more efficient use of the network and hence lower network costs over time, but also a redistribution of charges
Benefits to UKPN	M - would align network charges with costs and incentivise customers to take mutually beneficial actions
Precedents	Currently in UK there are different charges between licence areas but not within a licence area

E2: Delivery charges based on access capacity and/or time-varying delivery charges

Description	Customers pay a higher monthly standing charge for a higher capacity connection to the network and/or pay higher rates for usage at peak times (e.g. winter evenings)
Partnering requirements	None
Regulatory considerations	Would require changes to charging methodologies, which are currently being considered
Difficulty of implementation	M - would require regulatory change and customer education
Benefits to customers	M – should drive more efficient use of the network and hence lower network costs over time, but also a redistribution of charges
Benefits to UKPN	M - would align network charges with costs and incentivise customers to take mutually beneficial actions
Precedents	Already common for larger customers and time-varying charges available for domestic and small connections (but not the default charging option)

E3: Managed connection products

Product developer

Description	Connection options for all customers that allow the DNO to control power to certain appliances (e.g. hot water cylinder, heating or cooling system, EV charging) or control the property's voltage in exchange for reduced delivery rates
Partnering requirements	Technology providers to provide the controlling technology
Regulatory considerations	Would require changes to charging methodologies, which are currently being considered
Difficulty of implementation	H - would require regulatory change, customer education, technology installs on customer premises
Benefits to customers	M - those who opt-in would receive lower rates and lower likely not notice a reduction in level of service
Benefits to UKPN	H - would give UKPN direct control over customer load
Precedents	Hot water load control common overseas (e.g. Australia, New Zealand) and AC control common in the US. EV charging control becoming an option (e.g. Green Mountain Power)

E3: Managed connection products

Additional notes from UKPN workshop

- How could UKPN encourage customers to adopt these products? How would customers receive the benefit?
  - Customers could benefit through adjusted DUoS charges. These could be dynamic (i.e. time of use) or static. There is a lot of evidence for this in New Zealand, which has an opt-out system for managed control of hot water systems. South Africa has similar schemes.
- This approach could target constrained network areas.

E4: Temperature-based products

Product developer

Description	Delivery rates that vary by set-point temperature for hot water or heating systems, potentially approaching a heat-as-a-service offering
Partnering requirements	Technology providers to provide the monitoring or controlling technology
Regulatory considerations	Would require changes to charging methodologies and how UKPN defines the service it provides
Difficulty of implementation	H - verification of temperature may be challenging, would require regulatory change, technology installs, customer education
Benefits to customers	L - customers may like the simplicity of this charging approach
Benefits to UKPN	M - may be some natural load control benefits for UKPN if pricing structure reduces heating load
Precedents	Akin to Heat as a Service (HaaS), trialled by Bristol Energy

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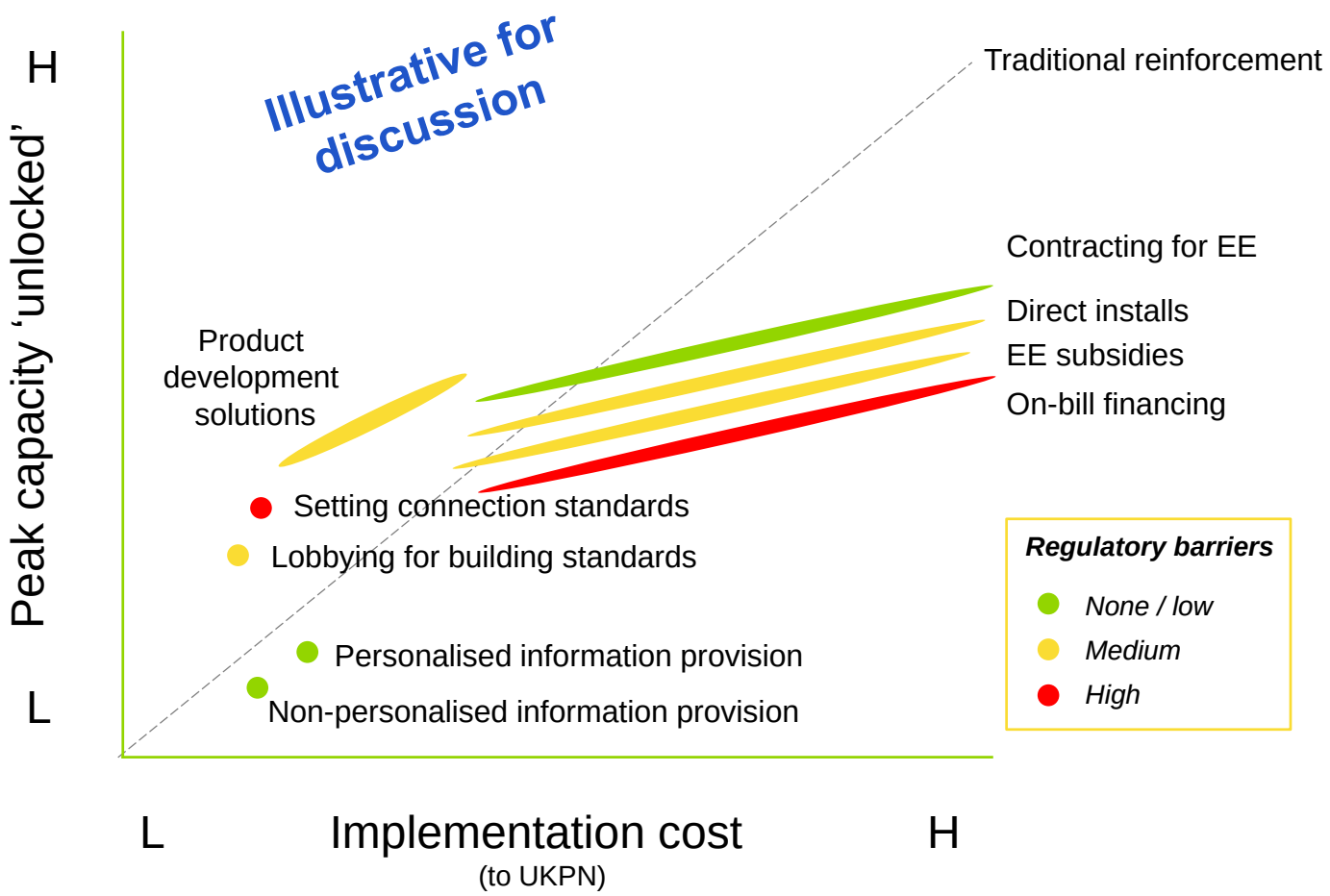
Prioritisation and next steps



Questions to consider for UKPN prioritisation

- What is UKPN's appetite for approaches that require *regulatory change*?
- What is UKPN's appetite in terms of *investment spend*?
- How *certain* or *reliable* do benefits need to be?
- How *measurable* do benefits need to be?
- How *quickly* does an approach need to deliver benefits?

Prioritisation and next steps

Notes from UKPN workshop

- All participants agreed that the prioritisation questions are good ones to consider. Initial thoughts:
  - There is an appetite to push for regulatory change, but it requires strong *evidence* that the solution is an excellent and high-impact opportunity for customers and UKPN.
  - UKPN's *investment* appetite is low. Keeping costs down is a top priority, even it means taking on more risk.
  - EE benefits need to be as reliable as those from *flexibility services*. Currently, flexibility services are quite unreliable, but this is expected to improve.
  - EE benefits should be measurable at the point of *constraint*.
- If visibility is a priority, low-cost approaches (e.g. non-personalised information provision) could be a quick, simple way to demonstrate that UKPN is getting involved in EE.
- Innovation projects and trials are needed to test and better understand the benefits, costs and risks of these EE approaches.
- To demonstrate that UKPN is exploring all options, trials for EE could be run in areas where UKPN was unable to attract sufficient MWs of flexibility services through existing mechanisms, which would also help set price points and the context for procuring EE.

Conclusions

- There is a broad variety of potential ways for UKPN to get involved in EE, ranging from information provision through to more complex coordinator, product developer and direct deployer roles. The roles are not mutually exclusive and can be combined in interesting and productive ways.
- In many cases, it would make sense to target an EE approach to a subset of customers – for example at constrained network locations, by property type, or by customer sector.
- Further work is required to confirm UKPN's priorities and expectations for what can be achieved through EE. For instance, workshop participants expressed an initial view that UKPN has an appetite to push for regulatory change (provided there is strong evidence that an EE solution is a high-impact opportunity for customers and UKPN) but very little appetite for investment spend.
- If visibility is a priority, low-cost EE activities such as non-personalised information provision could be a quick, simple way to demonstrate that UKPN is getting involved in EE.
- Innovation projects and trials are needed to test and better understand the benefits, costs and risks of these EE approaches. Trials could be particularly useful in areas where UKPN was unable to attract enough flexibility services through existing mechanisms.

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