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Value proposition and innovative business models for Demand Response enabled by the DR-BOB solution

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Innovation
Energy Services & Sustainability
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DR-BOB

Agenda

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Introduction
The DR-BOB project

http://www.dr-bob.eu/
https://vimeo.com/176786849

DR-BOB is a H2020 EU-funded project which states for *Demand Response in Blocks of Buildings*. The project started in March 2016 and seeks to integrate existing technologies to create a scalable solution that enables DR operations in buildings consisting of different blocks.

THE PROBLEM

The increasing penetration of intermittent and **non-controllable renewable energy sources** and their decentralised nature is causing serious **stability problems** to the energy network, resulting in high cost for ancillary services in many EU countries, especially during **peak periods**.

THE SOLUTION

Globally **Demand Response** would support the penetration of RES on the energy network, would mitigate capacity issues on distribution network, maximise self-consumption at local level and would reduce the required generators margins procured by TSOs, DSOs and BRPs to guarantee grid stability.

Blocks of buildings offer more flexibility in the timing of energy use, local energy generation and energy storage than single buildings, but a lack of suitable products and technologies makes this problematic.

The DR-BOB solution has the potential to unleash the DR capabilities of Block of Buildings and enable both price-based and incentive-based DR operations

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Introduction

The DR-BOB project

The key functionality of the DR-BOB Demand Response energy management solution is based on the **real-time optimisation** of the local energy production, consumption and storage.

The solution will be **intelligent** in the sense that it is automated and can adapt to fluctuations in the energy demand or production, subject to dynamic price tariffs and changing weather conditions.

The DR-BOB solution will be implemented by integrating the following tools and technologies to provide an innovative scalable cloud-based management system, supported by a local real-time energy management solution which communicates with individual BMSs and generation/storage solutions within a block a buildings:

- **Virtual Energy Plant (VEP)** – Siemens DEMS® & Siemens DRMS
- **Local Energy Manager (LEM)** – Teesside University IDEAS project Product
- **Consumer Portal (CP)** – GridPocket EcoTroks™

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Introduction

The DR-BOB project - Pilots

Technical University di Cluj Napoca - Romania

Teesside University – Middlesbrough (UK)

Poliambulanza Hospital – Brescia (IT)

Montaury District – Anglet (FR)

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Introduction

DR Market Context

No DR Market

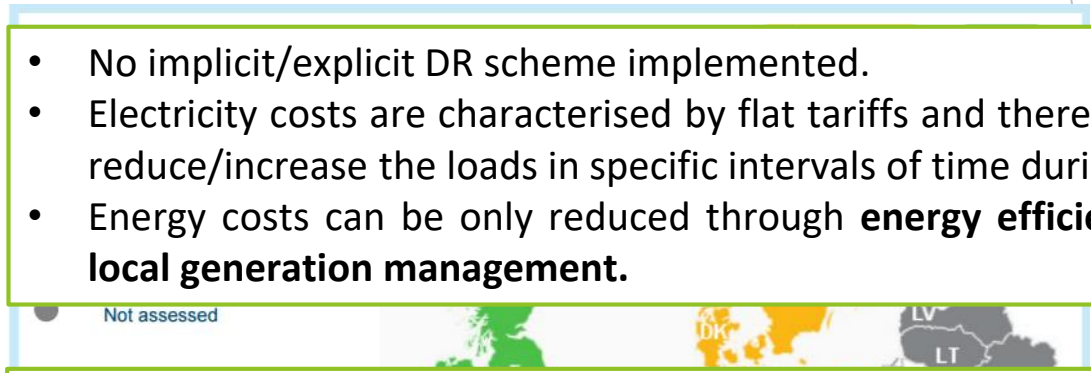
- No implicit/explicit DR scheme implemented.
- Electricity costs are characterised by flat tariffs and there is no incentive to reduce/increase the loads in specific intervals of time during the day.
- Energy costs can be only reduced through **energy efficiency measures** or **local generation management.**

Partially-developed DR market

- Some **Implicit DR schemes** implemented. These includes **ToU tariffs** which incentivise the users to consume more when electricity costs less.
- Enterprises have started to build their businesses around energy efficiency measures, monitoring systems and asset management.

Fully-developed market

- Regulated and non-regulated bodies have established/implemented **both implicit and explicit DR schemes**. Some schemes for implicit DR involves **dynamic tariffs** or tariffs varying according to some specific conditions. Among explicit DR programs, final users are asked to reduce/increase their load during specific intervals of time during the day and are paid for doing so.
- This scenario sees **many companies competing with each other for providing DR products and services** within the various schemes.



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Introduction
DR Market context

In fully-developed markets DR services are limited to **direct assets control** for industrial assets. A single asset is equipped with a piece of hardware + software that switch on/off the asset based on market requests and pre-defined local constraints. The asset is part of a portfolio managed by an aggregator.

Country	Product/Service name	Product/Service Provider	Reference scheme(s)	Product/Service Description	Customer segments	Revenue rationale
UK	Dynamic Demand[2]	Open Energi	All balancing services	A single asset or a set of similar assets is equipped with an actuating device remotely controlled based on market requests and local constraints	Industrial and large commercial	Open Energi participates in DR schemes using the flexible capacity provided by its customers. The customer receives a monthly payment for participation agreed with OpenEnergi
UK	Endeco's tool for DR[3]	Endeco Technologies	All balancing services	A single asset or a set of similar assets is equipped with an actuating device remotely controlled based on market request and local constraints	Industrial and large commercial (only significant size assets)	Endeco participates in DR schemes using the flexible capacity provided by its customers. The customer receives a monthly payment for participation agreed with Endeco
UK	Limejump's tool for DR[4]	Limejump	All balancing services	A single asset or more assets can be individually controlled manually or remotely based on a market request and local constraints	Industrial and large commercial (all sizes assets)	Limejump participates in DR schemes using the flexible capacity provided by its customers. The customer receives a monthly payment for participation agreed with Limejump
France, UK, Germany, Benelux	FlexPond™[5]	REstore	Some balancing services	FlexPond™ creates clean Virtual Power Plants that enable utilities to balance their BRP portfolio or bid into reserve markets, ranging from capacity markets over tertiary	Utilities (to be then used by industrial and large commercial)	N/A

[2] http://openenergi.com, accessed 14/12/2016
[3] http://www.endeco-technologies.com/our-technology, accessed 28/12/2016
[4] http://www.limejump.com/ , accessed 28/12/2016
[5] https://www.restore.eu/en/solutions accessed 28/12/2016

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Introduction
DR Market context

There are already some examples of DR solution in Blocks of Buildings, but these are only limited to **Direct Asset control**

DR example	Provider	Description	Source
Oxford Brookes University	Open Energi	Real-time control of 71 water tanks and 300 on-campus electric heaters using smart devices, enabling 700 kW of flexible demand constantly available and up to 8 MW for emergency situations.	EDIE[10]
Royal United Hospital - Bath	Flexitricity	Two 800 KW standby diesel generators used to provide occasional reserve energy to the UK TSO. Control is fully automated.	EDIE[10]
Time Inc. - London	Kiwi Power	Time Inc. UK is Britain's leading publisher of print and digital magazine content. The company recently partnered with KiWi Power to design a process which enables their London office to reduce load and increase power available to the National Grid at peak hours with the push of a single button. KiWi power installed real-time smart meters which fed data back to its control room allowing the configuration of three separate trials of demand response in order to find the optimum energy reduction strategy with the least disruption to staff. The Time Inc. UK offices managed to deliver more than 200 kW of power in less than four minutes of demand reduction.	EDIE[10]

http://www.edie.net/news/6/10-projects-that-show-demand-response-is-the-future-of-energy-efficiency/

open energi

Flexitricity

KiWiPOWER
demand management

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Introduction

Challenges for business models development

KEY OUTCOMES OF MARKET ANALYSIS

- Different DR market maturity levels in Europe => Different customer needs and different evolutions expected;
- Market currently oriented towards low-risk direct asset control solutions;
- Implicit DR vs Explicit DR;
- Occupants engagement often fundamental to ensure profitability;
- Customer needs different according to building type;
- Assets of small size are not eligible for DR

- In many countries DR does not exist or it is not seen as a need by stakeholders;
- In other countries the lack or uncertainty of the regulatory framework is the most relevant barrier.

- Aggregators are not particularly interested in the building sector. They prefers low-risk assets.

- Flexibility can be used for both implicit and explicit DR, but not at the same time

- In buildings the role of occupants is much more relevant than in industries. This both from a user's comfort perspective and in terms of participation in DR

- DR might not be suitable for all buildings

- Asset of small size and limited DR capabilities are not generally considered for DR (even if aggregated) since not easily controllable and/or too risky

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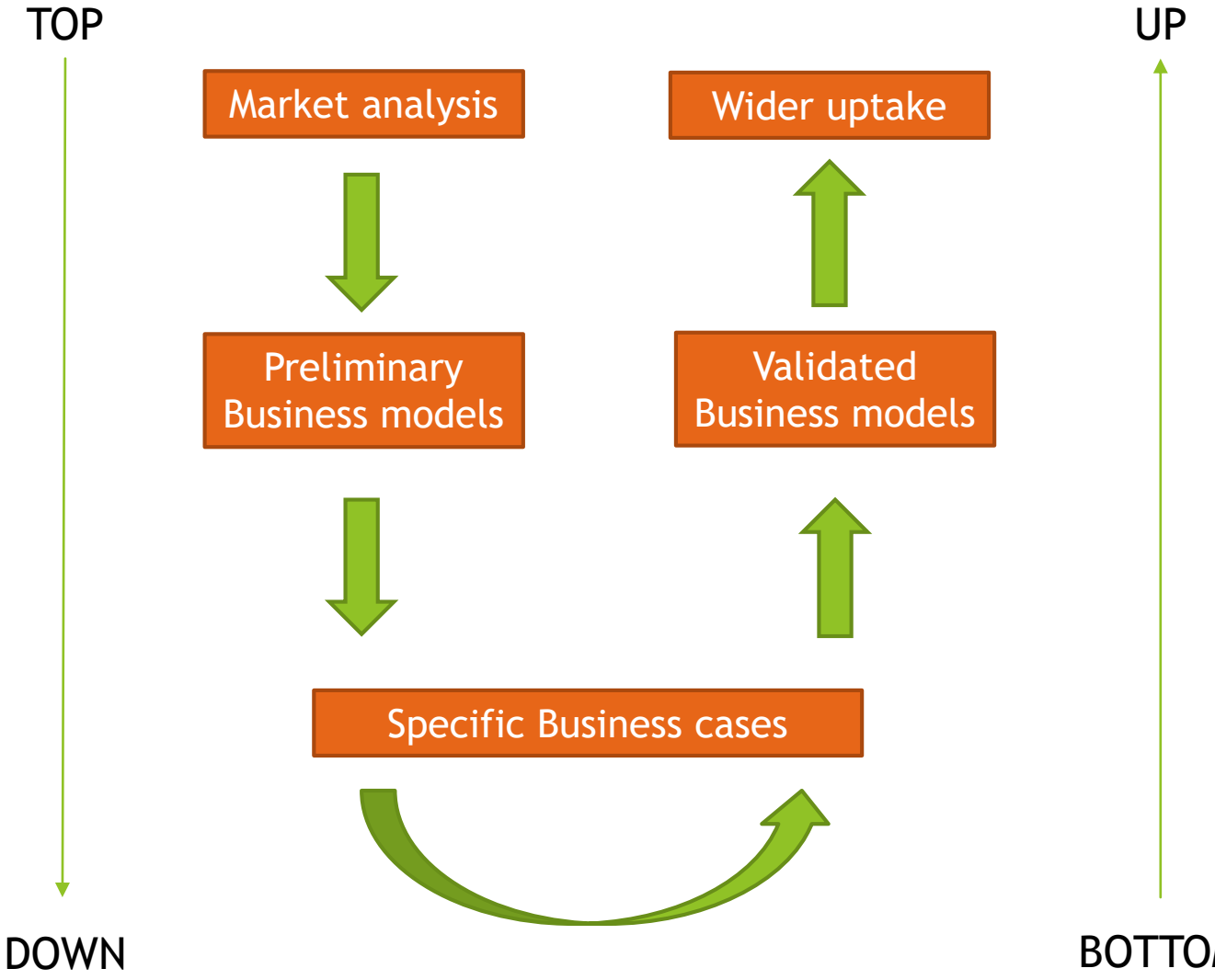
Introduction
Methodology used



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Introduction

Methodology used

METHODOLOGY FOR BUSINESS MODEL DEVELOPMENT

1) Definition of DR-BOB solution **added value**

2) Identification of DR-BOB **customer segments**

3) Development of **Value Proposition Canvases**

4) Development of preliminary **Business Models** using Business Model Canvas methodology

5) **SWOT Analysis**

6) Development of **DR-BOB Value Chain**

7) Conduction of **interviews** to refine Value Proposition

Where we arrived so far

8) **Implementation** of the DR-BOB solution in the 4 pilot sites

9) Development of **specific business cases** to assess profitability of the DR-BOB solution in real scenarios

10) Feedback on **main challenges** (technical, operative, economic, etc.) experienced

11) Extensive **conduction of interviews** of all stakeholders involved in the DR value chain

12) Collection and **abstraction** of results and feedbacks

13) Development of **final version of Business Models**

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The DR-BOB value proposition

Added Value

Feature	Description
DR enabling technology	DR-BOB allows BoBs to participate directly or indirectly (with an aggregator) in **both implicit and explicit DR schemes**.
Flexibility & Scalability	DR-BOB is a **flexible solution** that enables both implicit and explicit DR in BoBs. It is made of components that can be used individually or jointly to provide a wide range of services to different customer segments. The **solution can be integrated in existing BMSs** and is **scalable**, i.e. new components can be added once DR schemes are enabled. As a consequence, the solution can be applied to different types of buildings and in markets with different DR maturity levels.
Smarter DR service in BoBs	DR in buildings is currently limited to direct asset control. **DR-BOB adds intelligence at BoB level**, thus enabling **multiple assets control in presence of a DR request**. DR-BOB always finds the most effective solution in terms of assets management, where effectiveness does not only involve technical aspects, but also financial, environmental and comfort ones.
New eligible assets for DR	Small building assets (e.g. with capacity lower than 0.5 MW) so far have not been eligible for participation in explicit DR schemes (even through direct asset control) due to technical and economic reasons. This limit is even stricter when participation involves acting on complex control strategies (e.g. for HVAC systems). By adding control at BoB level, **DR-BOB extends participation to these assets**, which become fully capable of providing DR services.
Extended DR potential in BoBs through smarter control strategies	Direct asset control is generally done through simple control algorithms based on fixed set-points (e.g. an electric water heater can be switched on-off freely, provided that the water temperature is always above a certain value). **The DR-BOB solution allows more complex control strategies** and also control based on varying conditions (e.g. weather), thus maximising flexible load availability on a real-time basis.
Engagement of building occupants	**DR-BOB enables the participation of building/facility managers** so that changing local circumstances can be taken into account to ensure that local conditions are not compromised. In addition, the **engagement of building occupants** can support the creation of awareness and support more energy efficient behaviours at the workplace

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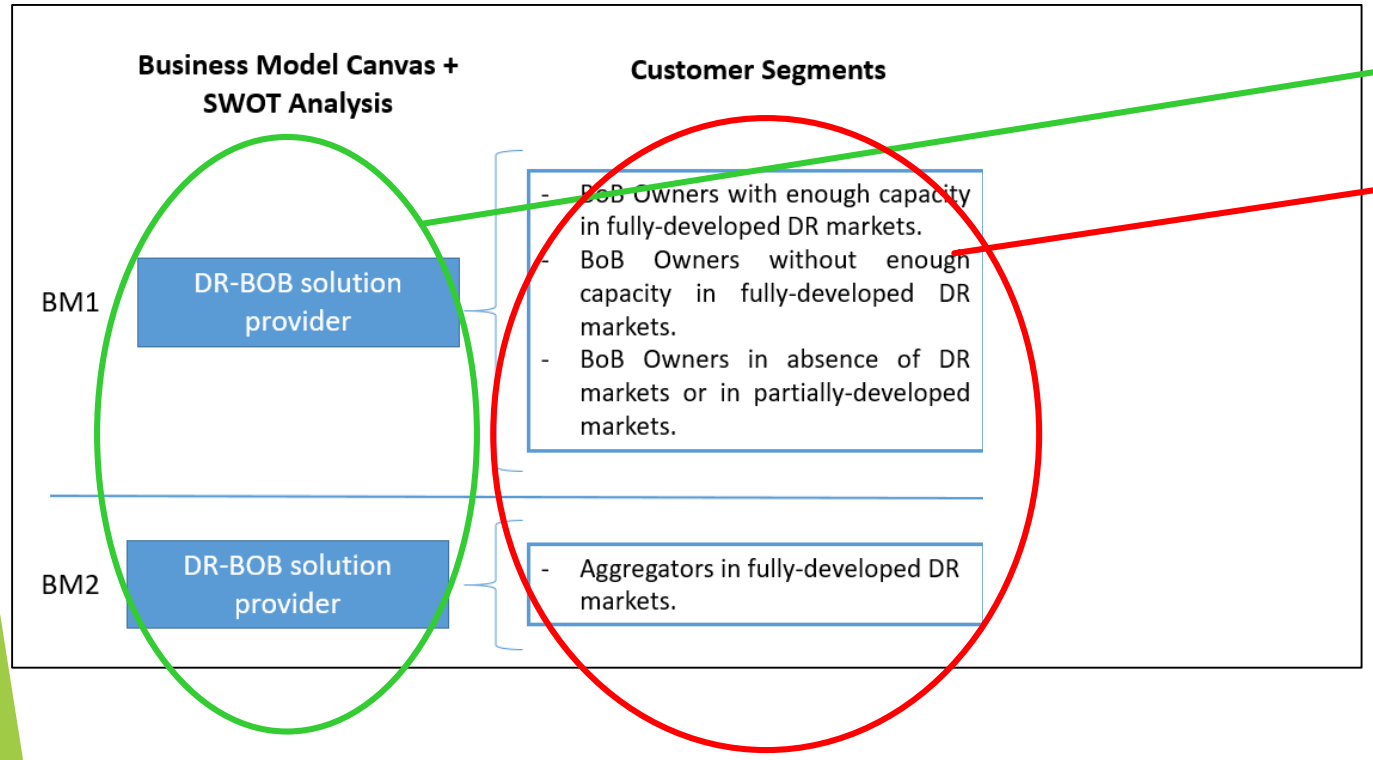
The DR-BOB value proposition

Customer segments



BMs reflect the ambition and value proposition of the **DR-BOB solution provider**

4 targeted customer segments:

1) BoB Owners with enough capacity to fully participate in explicit DR in fully-developed DR markets
2) BoB Owners without enough capacity to fully participate in explicit DR in fully-developed DR markets
3) BoB Owners in not-developed or partially-development DR markets
4) Aggregators in fully developed DR markets

Other customer segments such as ESCOs, municipalities, local DNOs, DSO, retailers could be easily assimilated to those listed above

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The DR-BOB Business models

Business Model 1

DR-BOB Solution Provider for BoB Owners in Europe

Value Proposition

Benefits:

- Enable revenue through explicit DR
- Enable cost-savings through implicit DR
- Enable cost-saving through enhanced building management
- Reduce building maintenance costs
- Reduce energy costs through occupants' engagement

Customer Segments

FULLY DEVELOPED DR MARKETS

- BoB Owners with technical requirements to participate to DR markets
- BoB Owners without technical requirements to participate to DR markets

PARTIALLY / NO DEVELOPED DR MARKETS

- BoB Owners with technical requirements to participate to DR markets
- BoB Owners without technical requirements to participate to DR markets
- BoB Owners in absence of DR markets or in partially-developed markets

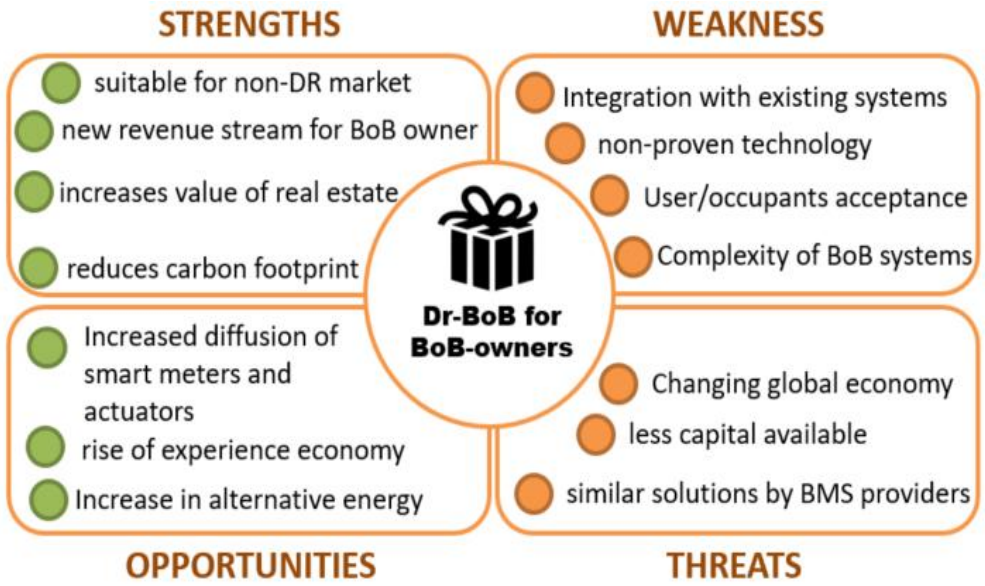
Revenue Streams

PRODUCT - BASED

- Direct sale of products
- Provision of services associated with the products (installation, consultancy, customer support)
- Maintenance and upgrades services
- Training to facility managers and building occupants

SERVICE - BASED

- Subscription fee, AND/OR
- Share of explicit DR scheme compensations, AND/OR
- Share of implicit DR services cost-saving
- *Installation, maintenance and customer support services included*



The DR-BOB Business models

Business Model 2

Dr-BoB SOLUTION provider for aggregators in fully-developed markets

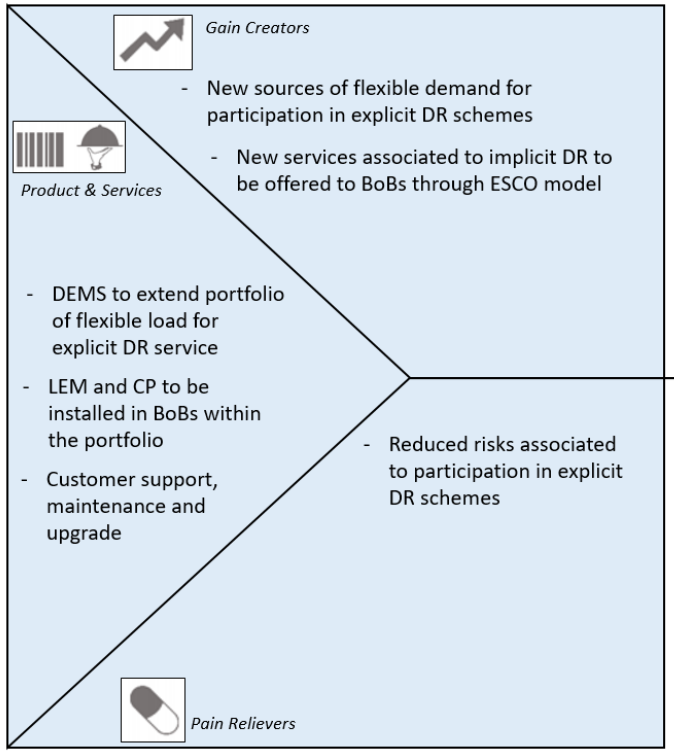
Value Proposition

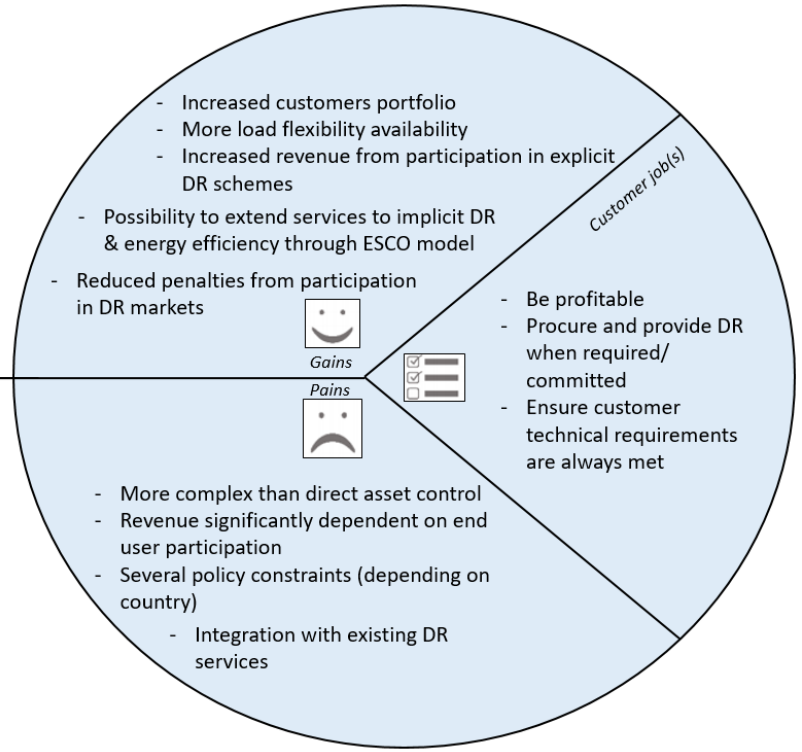
Benefits:

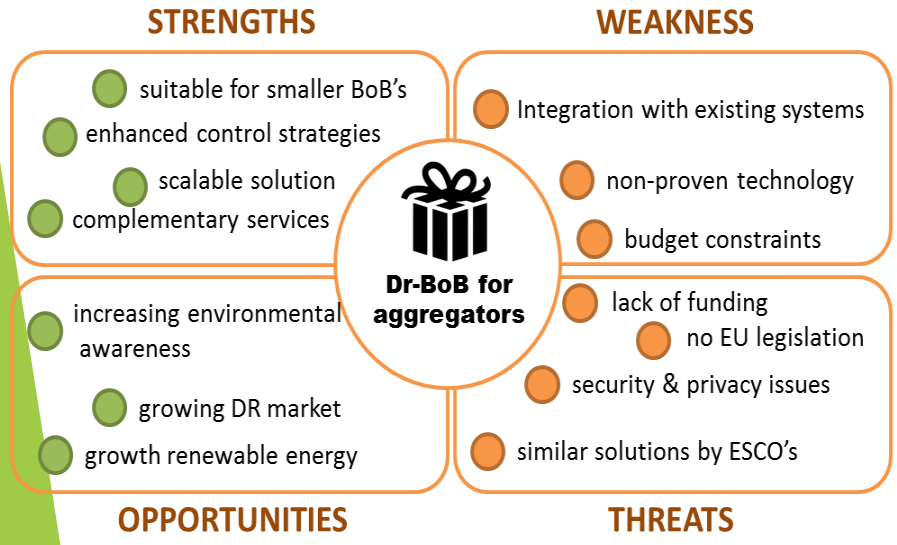
- Extend portfolio to include BoB and more building assets
- Reduce risk when participating to DR markets
- Enhance clients retention through provision of additional services

Customer Segments

- Demand aggregators in fully-developed markets in Europe







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The DR-BOB Business models

Key Elements & discoveries

1) ***Importance of DR market maturity***

Development of DR services is progressing at different rates in EU countries. This impacts significantly all aspects of a business model, starting from the value proposition and moving to revenue streams, channels and key activities.

2) ***Importance of customer segmentation***

The business model presented are referred to general customer segments, i.e. any type of building within the BOB category. The results of the interviews showed that value proposition and customer needs may vary significantly from a building type to the other and that in some cases this could completely re-shape the DR-BOB solution provider business model.

3) ***Importance of building users and occupants***

Building users and occupants will be the DR-BOB end users, but also part of the DR-BOB enablers. Without an accurate understanding of their needs and the reasons behind their engagement in DR it will be difficult to fully unlock the DR potential of BOBs and come out with a profitable solution.

4) ***Need to highlight benefits of the DR-BOB solution***

To better reach BOB owners, in particular in not-developed and partially developed DR markets, the benefits of the DR-BOB solution should be clearly shown in comparison with other cost-saving solutions (e.g. energy efficiency). This is to be done by structuring the DR-BOB cost-benefit analysis in a way that enables clear comparison with other cost-saving measures (e.g. payback time), but also takes into account the potential benefits associated to DR market evolution (e.g. scenario-based Life Cycle Cost Analysis*).*

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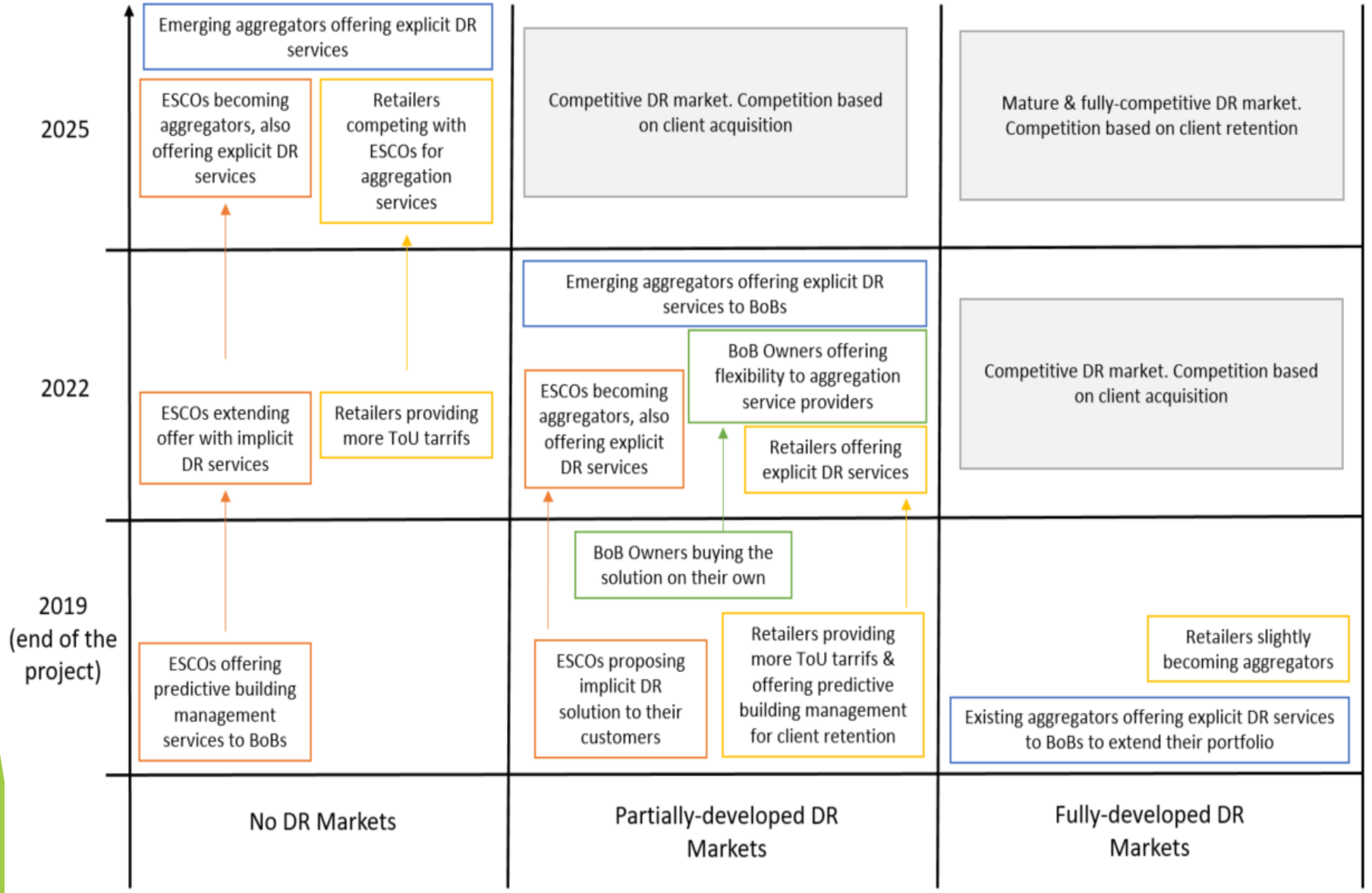
The DR-BOB Business models

Key Elements & discoveries – DR market evolution scenarios



Question time

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Thank you!

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