Co-funded by
the European Union

Demand Response: moving beyond the technical and physical context of buildings.

DuneWorks

Sylvia Breukers (DuneWorks) and
Tracey Crosbie (Teesside)
Cagliari, June 7th, 2019

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

Co-funded by the European Union

About the DR BoB Project (March 2016-August 2019):

Aim: integrate existing technologies to create a scalable solution that enables DR operations in blocks-of-buildings

Why: support the deployment of RES on the energy network, by mitigating capacity issues on the distribution network and by enabling maximum self-consumption at the local level.

Why BoBs: offer more flexibility in the timing of energy use, local energy generation and energy storage than single buildings….

DR BoB develops and demonstrates suitable solutions for this (combining technologies and integrating them with existing building management systems)

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

Demand Response in Blocks-Of-Buildings: DR BOB

Introduction
The DR-BOB project

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

- Partners: Teesside University; Nobatek; R2M; CSTB; Gridpocket; Poliambulanza; Technical University of Cluj Napoca; Servelect, DuneWorks.

- Feb 2018 – Feb 2019: demonstration of DR solutions at 4 sites

- DuneWorks: user-related issues in DR; qualitative evaluation of the demonstration process

Co-funded by
the European Union

The pilots:

Technical University di Cluj Napoca - Romania

Teesside University – Middlesbrough (UK)

Poliambulanza Hospital – Brescia (IT)

Montaury District – Anglet (FR)

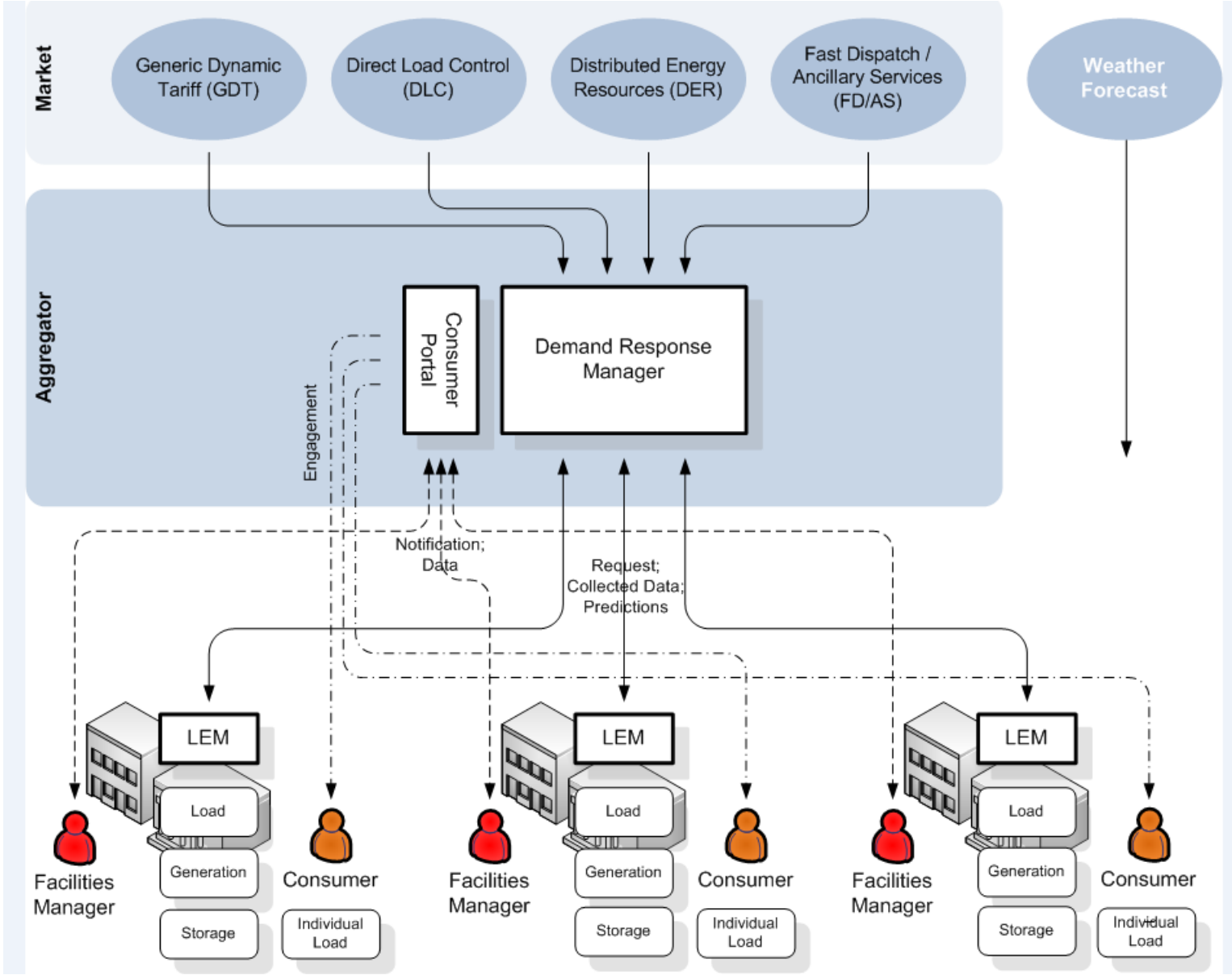
Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

The DR BoB Solution, the Designers' Perspective:

- A Demand Response Manager (DRM) provided by Siemens DEMS®
- A Local Energy Manager (LEM)
- A Consumer Portal

Together these tools provide an innovative scalable cloud based central energy management system for single and multiple blocks of buildings, which interacts with a buildings pre-existing systems and appliances, such as Building Management Systems (BMS), Heating, Ventilation, Air Conditioning (HVAC) systems, laboratory and office equipment, laptops, and lightning etc..



Crosbie, T., Short, M., Charlesworth, R., Broderick, J., and Dawood, M. (forthcoming) DEMAND RESPONSE TECHNOLOGY READINESS LEVELS FOR BLOCKS OF BUILDINGS, Sustainable Places 2017, June 27th -29th Teesside University, Middlesbrough UK

Content

- Challenges DR BoB – medium-level scale of DR
- Framework to analyse process-related challenges experienced at the demo-sites
- Comparative presentation of the findings
- Conclusions and recommendations

DuneWorks

Teesside University

Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

Challenge medium-scale DR like in BoBs

Socio-technical perspective on innovation: innovation is the result of non-lineair processes in which social, physical and institutional conditions mutually influence and shape one another.

The context in which DR is implemented matters: differences between industrial scale and medium-level scale of BoBs.

Large scale DR: changes in energy consumption patterns and volumes are rather straightforward and relatively easy to assess because of the participation of few large assets

Medium-scale DR at BoBs: multiple dispersed buildings, processes, assets, users and schedules and routines

How to deal with the dispersed and multifaceted/differentiated nature of BoBs?

Co-funded by the European Union

Context matters

- How do different contextual conditions affect the opportunities for DR?

CONTEXT:

- The **physical** context of the existing buildings, infrastructure, assets and technologies
- The **social** context in terms of the **organization**(s), their core processes (values and goals), the various users at different levels (from the building/facility/energy managers to the building occupants) – existing **situated practices and routines**
- The **institutional contexts**: the **rules** that affect what is possible – e.g. **market** structure, policies, norms within the organization, etc.

DuneWorks

Teesside University

Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

Phase matters

When DR is implemented in BoBs with their differentiated nature in terms of users, buildings, existing practices, organisational routines, this is not the end, but rather the beginning:

- of the next phase in which new routines, norms and ways-of-doing need to evolve and become 'the new BAU' in order to ensure a proper use of new interfaces, supportive technology, and responses to DR signals

- Attention for the engagement of users at different levels at a BoB from the outset until the use phase is needed to be able to understand how the DR solutions are being adopted and used (or not).

→ qualitative evaluation of the demo-site experiences

DuneWorks

Teesside University

Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

Method

Data collection

- Field work including stakeholder interviews on-site in the phase preceding the demos
- Interviews and informal talks the demo-site coordinators held with onsite users (building/facility/energy managers and building occupants)
- Interviews and informal talks before, during and after the demonstrations with the 4 demo-site coordinators at each site
- Extensive questionnaire/templite filled in by the 4 demonstration site coordinators (discussed and adapted)
- (Survey with users - hardly any useful responses)

DuneWorks

Teesside University

Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

Findings

DuneWorks

Teesside University

Findings: following a sociotechnical perspective, we structured the findings using the distinction between

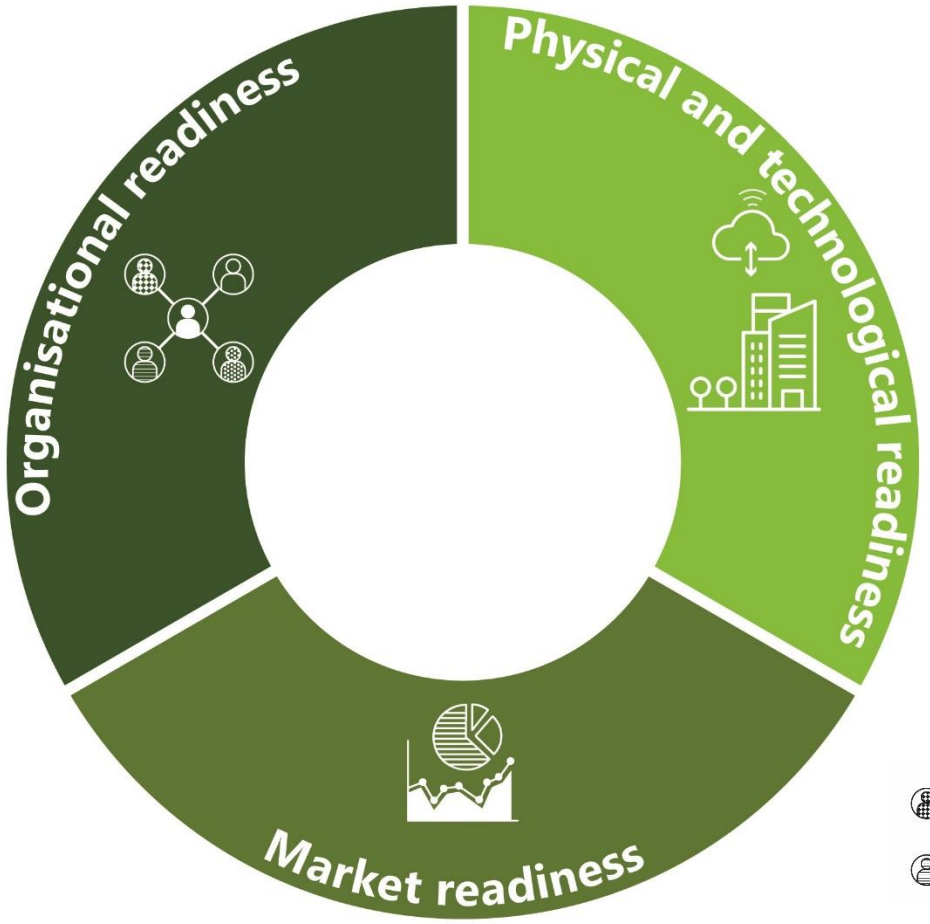
- physical and technological conditions;
- market-related conditions;
- organizational (and user-related) conditions

in order to qualify the process of preparing, demonstrating and evaluating DR at the demo-sites.

Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

Readiness levels:



Physical and technological readiness: The buildings, the technologies deployed in the buildings and their building management systems, controllable assets and energy metering. The characteristics of the buildings and their technologies, systems and assets affect:

- the implementation of the DR solutions and the running of the DR events.
- the fit with DR BOB software and hardware and what needs to be adapted and/or changed and how

Market readiness: The maturity of national DR markets and regulations varies significantly in different EU countries. This impacts on;

- The possibility for different stakeholders in the value chain for DR to realise economic and/or other benefits from implicit and explicit DR in BOBs,
- How the DR BOB solution allocates value to increase the attractiveness of the solution for market actors and potential customers

Organisational readiness:

organisational culture and dynamics, engagement and commitment, level of being informed or energy aware and mind-set of building management and building users. This impacts on:

- the extent to and ways in which DR fits and the successful deployment of DR.
- The extent to which direct users (BM/FM/EM) and indirect building users (building occupants) are likely to respond positively to DR.

Comparative analysis of the 4 sites on the readiness levels

	PHYSICAL AND TECHNOLOGICAL READINESS	ORGANISATIONAL READINESS	MARKET READINESS
ENGLISH PILOT	🟢	🟡	🟢
FRENCH PILOT	🟢	🟡	🟡
ROMANIAN PILOT	🟡	🟡	🔴
ITALIAN PILOT	🟡	🟡	🔴

NO CAPABILITY 🔴

PARTIAL CAPABILITY 🟡

FULL CAPABILITY 🟢

Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

Physical and technological readiness - recommendations:

- **1. Check if the systems and machines are DR-proof**

When planning for DR, it is important to assess not only the type of assets in the building but also their current functioning and their suitability to participate in DR (e.g. ability to operate with changes of loads). It takes time to make the systems ready to integrate the DR BOB solution: time is needed for internal fine-tuning, procurement of additional hardware and technical integration.

- **2. Check if the age, (monumental) status and function of the building allows for participation in a BoB-level DR programme.**

Not only the building characteristics themselves (e.g. old versus new buildings) but also the function of the buildings is important to consider for that will affect the extent to which DR is possible or acceptable.

Co-funded by the European Union

Market readiness - recommendations

- **1. Focus on benefits from power reduction and energy savings in non- or partially developed markets**

In the absence of a fully developed market for DR, the DR-BOB solution can start as an energy efficiency solution – allowing future participate in DR programs when the market is ready.

- **2. Quantitative monitoring and evaluation: the baseline**

The definition and calculation of baseline should take place at the beginning of pilot demonstration. This has implications for project planning and funding in that it needs to provide room to timely address the methodological challenges.

Co-funded by the European Union

Organisational Readiness - recommendations

- **1. Create energy awareness from the top to bottom in the BOB**

The implementation of DR actions and technologies is unlikely to be successful unless higher management and building occupants are enrolled in energy awareness within the broader organisation. It can therefore be useful to precede a DR intervention with a more general energy awareness campaign.

- **2. Focus on the multiple benefits of DR/make your DR solution a strategy for management to reach their goals**

It can be useful to provide support to reaching key organisational priorities before pushing forward DR solutions as a goal (e.g. a modular approach to support the BOB organisation in reaching a cost-efficient energy transition, whereby DR is only one part of the proposition).

Co-funded by the European Union

Organisational Readiness - recommendations

- **3. Comfort is key: check the current comfort levels before implementation and assess if building or asset improvements need to be implemented first.**

Before considering DR, it is useful to learn how building occupants currently evaluate comfort conditions – which can lead to the decision to address these issues first. EM/FM/BM hold a wealth of tacit, situated and experiential knowledge relating to comfort concerns of the building occupants.

- **4. Assign one single DR contact person for the building users**

Consider at the outset who is going to fulfil this intermediary role. This is to be someone with (direct access to) the relevant technical, energy-related, economic and user-related knowledge and who is able to communicate with various stakeholders. The energy manager could be a suitable person to adopt this role, but would need to get resources (e.g. time) allocated in order to be able to fulfil this role.

Co-funded by the European Union

Organisational Readiness - recommendations

5. Tailor your communication and involve the building users in this process

- Discussing with building occupants the preferred channels, level of detail and content of feedback in order to arrive at an effective communication strategy that distinguishes between different user groups. Being informed timely and clearly affects building occupants' awareness as well as their ability to participate. The use of an interface as provided by the Customer Portal is likely to increase if it provides tailored information to keep building occupants engaged and committed.

Co-funded by the European Union

Organisational Readiness - recommendations

6. Find out what the flexibility profiles and core processes of the building users are and tailor the DR events to match these

- Get to know the context in which the DR solution is going to be implemented, through talks with diverse building users and diverse levels of management. Building occupants' flexibility should not be assumed but discussed with them, in order to gain insight into the time frames that are most suitable for active or passive engagement of different groups of building occupants.

Co-funded by the European Union

Technological and physical readiness

1. Are the systems and machines are DR-proof
2. Age, (monumental) status and function(s) of the building

Market readiness

1. Benefits from power reduction and energy savings in non- or partially developed markets
2. Quantitative monitoring and evaluation: the baseline

Organisational readiness:

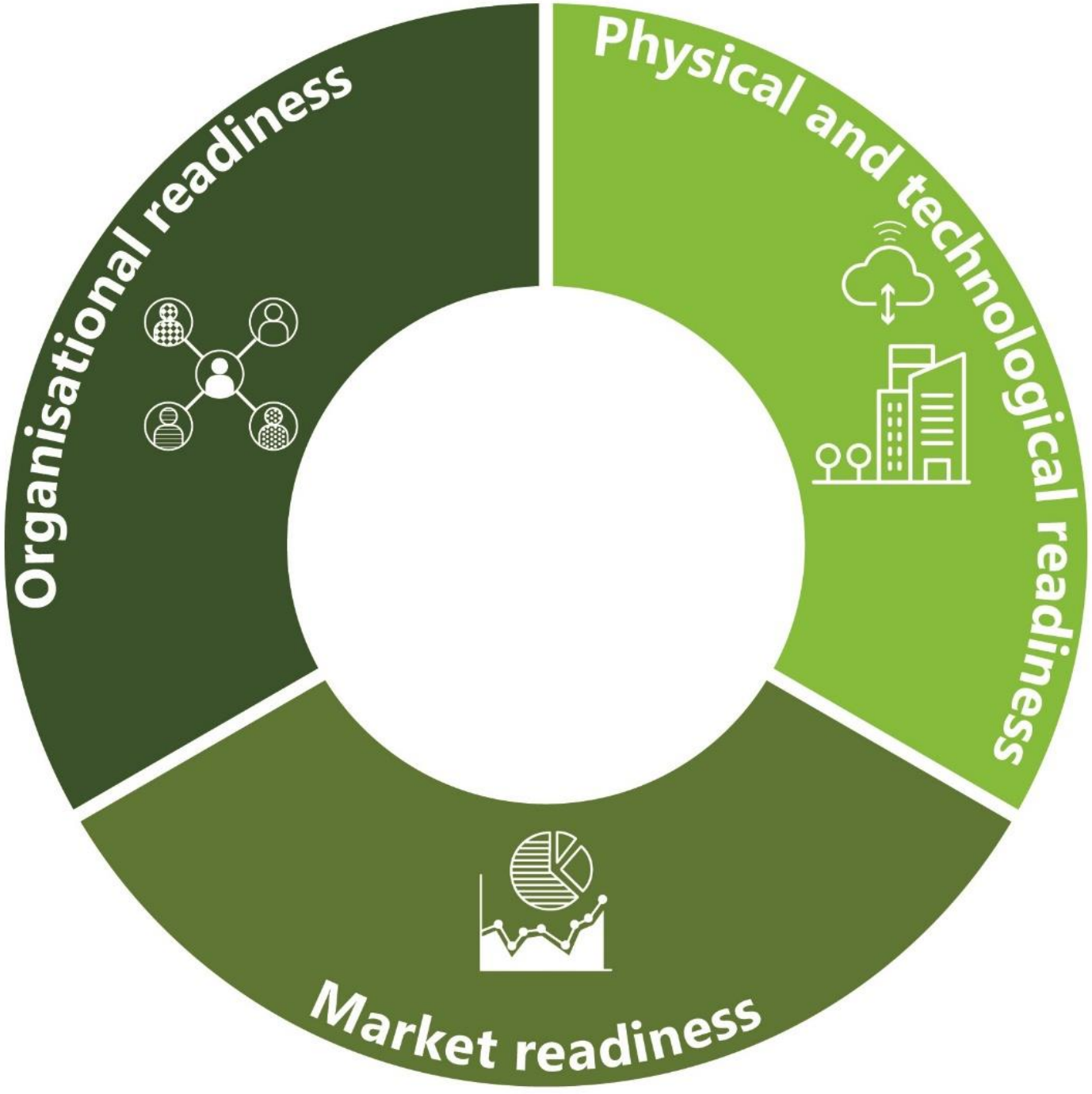
1. Energy awareness from the top to bottom in the BOB
2. Focus on the multiple benefits of DR: make the DR solution a strategy for management to reach their goals
3. Comfort is key
4. One single DR contact person – intermediary
5. Tailored communication to different building users' needs
6. Identify the flexibility profiles of the building users

DuneWorks

Teesside University

Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy



DuneWorks

Teesside University

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

Readiness assessment framework

NO CAPABILITY
PARTIAL CAPABILITY
FULL CAPABILITY

Physical & technological readiness

- a building/site does not have the physical and technical capability to enable the implementation of the DR-BoB solution
- a building/site has partial physical and technical capability to implement the DR-BOB solution
- a building/site has the physical and technological capabilities to fully enable all of the automated functioning of the DR-BoB energy management solution through tele-command signals, without requiring manual application of control (from a purely technical perspective)

DuneWorks
Teesside University
SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

Co-funded by the European Union

Readiness assessment framework

NO CAPABILITY
PARTIAL CAPABILITY
FULL CAPABILITY

Market readiness

- There is no market for either explicit or implicit demand response
- The markets of explicit and implicit demand response are partially open
- The market for both explicit and implicit demand response is fully open

Co-funded by the European Union

Readiness assessment framework

NO CAPABILITY
PARTIAL CAPABILITY
FULL CAPABILITY

Organisational Readiness

●	Senior management, middle management and the building occupants are not convinced of the value of DR for their organisation and their personal wellbeing
●	One or two of the following groups of stakeholders are not convinced of the value of DR for their organisation and their personal wellbeing but one or two are; Senior management, middle management, BM/FM/EM and the building occupants
●	Senior management, middle management and the building occupants are fully enrolled into the value of DR for their organisation and their personal wellbeing

Co-funded by the European Union

Conclusion

- Even when the technological and physical requirements for DR are in place and when the market enables both implicit and explicit DR response (like is the case in the UK), successful implementation of a DR BOB solution is not guaranteed unless the organisational challenges have been addressed as well.
- For the building users, Demand Response is not a goal, but at best a means to an end. And at worst a nuisance to the daily operations.
- For higher management, if DR is not something that contributes to their goals as an organization, there is little use trying to convince them that DR is the way to go

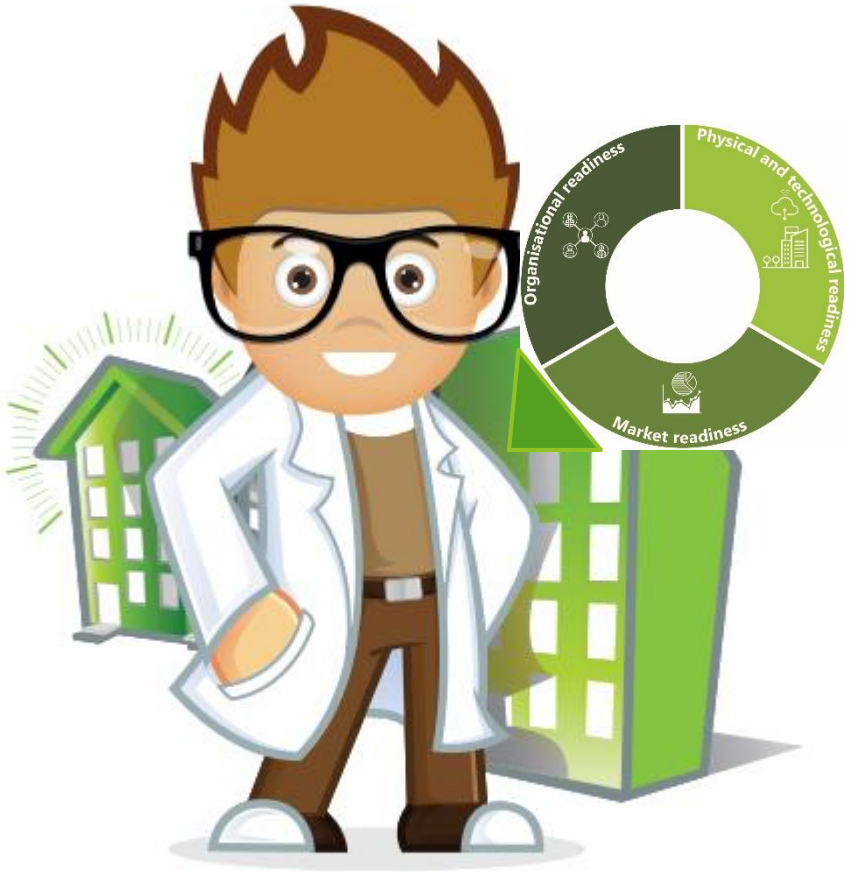
DuneWorks

Teesside University

Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy

THANK YOU!



DR-BOB

Sylvia Breukers (DuneWorks)

Tracey Crosbie (Teesside University)

sylvia.breukers@duneworks.nl
t.crosbie@tees.ac.uk

DuneWorks

Teesside University

Co-funded by the European Union

SUSTAINABLE PLACES 2019 June 5-7,2019 Cagliari, Italy