



BestRES

Best practices and implementation
of innovative business models
for renewable energy aggregators

Draft Minutes of the BestRES&IndustRE workshop
EU PVSEC, Amsterdam, 26th September 2017



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1. Technical references

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2.

- * PU = Public
- PP = Restricted to other programme participants (including the Commission Services)
- RE = Restricted to a group specified by the consortium (including the Commission Services)
- CO = Confidential, only for members of the consortium (including the Commission Services)

v	Date	Beneficiary	Author
1.0	04/10/2017	WIP	Silvia Caneva
2.0	05/10/2017	WIP	Michael Papapetrou

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3. Summary of the presentations

Introduction to the workshop

The workshop organized in Amsterdam, The Netherlands, on 26th September 2017, had the aim to disseminate the project results related to the improved business models and the first steps for their implementation and, at the same time, to further support the cooperation with the IndustRE Consortium.

The workshop took place at the RAI Congress Center, Europaplein 2, in Amsterdam, The Netherlands, on the occasion of the EU PVSEC, the European Photovoltaic Solar Energy Conference and Exhibition.

During the workshop, the BestRES project partners provided the participants with an overview on the BestRES project, on results already obtained during the on-going WP3 “Testing of improved business models” and the first months of implementation of WP4 “Implementation and monitoring of improved business models”.

The workshop was very interactive. The BestRES partners obtained valuable input from the IndustRE partners to further improved the business models assessed within the project, and also on the other way round.

All presentations and related documentation shown during the workshop have been sent to the participants. The list of registered participants is attached to these minutes. The agenda of the workshop is also provided as an Annex.

Silvia Caneva (WIP) and Michael Papapetrou (WIP) welcomed the participants to the BestRES&IndustRE workshop providing them with an overview of the respective projects.



Figure 1 - BestRES & IndustRE workshop

The workshop has been structured in the following two sessions moderated by Silvia Caneva (WIP) and Michael Papapetrou (WIP):

- Session I related to the business models developed under the respective projects on PV electricity aggregation, for BestRES, and for flexible electricity demand by large industry, for IndustRE
- Session II focused on the implementation of the business models, specifically on the savings on the development and operation of the power system resulting from increased demand flexibility examined by the IndustRE project and the economics and barriers related to the implementation of the business models developed within the BestRES project

The workshop was closed by an interactive panel discussion moderated by Michael Papapetrou (WIP) which involved as panellist partners from the BestRES and IndustRE Consortium and also Michael Schmela from Solar Power Europe.

Session I: Business models providing flexibility to the energy market

Business models for the aggregation of PV electricity

Georg Lettner (TUW), from the BetRES Consortium, has focused his presentation on business models related to the photovoltaic technology as the workshop was co-located with the European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC).

He highlighted the drivers for the aggregation of PV electricity:

- Strengthen of the Merit-Order Effect of renewable energies (so-called „cannibalism of PV“)
- Increasing curtailment of RES-E due to grid congestion
- Decreasing subsidies
- New legal and regulatory framework for common use of decentralized RES-E generation

He provided then the participants with the definition aggregation focusing then the rest of the presentation on practical examples of PV electricity aggregation. He highlighted that aggregators will play a significant role in market and grid integration for flexibilities and storage. Innovative aggregation concepts are crucial for a successful market and system integration of PV.

Business models for large industrial electricity users and necessary policy improvements

Pablo Frías (COMILLAS), from the IndustRE Consortium, has provided the participants with the details of the methodology adopted by the IndustRE Consortium while assessing the business models for large industrial electricity users and developing the related policy recommendations. Five business models were defined, considering the possible savings and revenues for providing flexibility with industrial demand and renewable generation.

The actual implementation of the previous business models faces some regulatory barriers, according to an assessment carried out for the IndustRE target countries: Belgium, France, Germany, Italy, Spain and United Kingdom.

The assessment led to three possible cases:

- Business case is viable in existing regulatory framework
- Business case limited viability / restricted in current regulatory framework
- Business case impossible in existing regulatory framework

In line with the Clean Energy Package, several policy recommendations were proposed, structured in five main sectors: market access, ancillary services provision, tariff design, provision of balancing services and on-site renewable generation.



Figure 2 - Pablo Frías (COMILLAS)

Table 1 - Policy recommendations developed by the IndustRE Consortium

Countries	BE	FR	DE	IT	ES	UK	Winter Package
Market access							
Aggregation fully allowed	Green	Yellow	Yellow	Red	Red	Green	MARKET prop new dir. - Art 13
Direct access intraday/day-ahead markets	Yellow	Green	Green	Red	Green	Red	MARKET prop new dir. - Art 15,17
Reserves open for DR	Green	Green	Green	Red	Red	Green	
Ancillary services							
Procurement to real-time	Yellow	Green	Green	Red	Green	Red	
Symmetric Products	Yellow	Red	Yellow	Red	Red	Green	
Minimum-bid size	Green	Yellow	Yellow	Yellow	Yellow	Red	
Distribution connected demand can participate	Yellow	Green	Yellow	Red	Red	Green	MARKET prop new dir. - Art 32
Load-interruptibility competitive	Green	Yellow	Yellow	Red	Red	Green	
Tariffs							
Regulated charges in kWh	Red	Red	Red	Red	Red	Red	
Peak-coincident capacity component	Red	Red	Red	Red	Yellow	Green	
Extra charge for self-generation	Green	Green	Red	Green	Red	Green	RES prop new dir. - Art. 21
Balancing							
Single or Double pricing	S	S	S	S/D	D	S	
VRE balancing responsible party	Green	Red	Yellow	Yellow	Green	Green	
On-site generation							
Abandon net-metering	Yellow	Green	Yellow	Red	Green	Red	

An interactive discussion took place between the BestRES and IndustRE partners focused on the policy recommendations related to the status of aggregation of generation and demand facilities, in the respective target countries.

Session II: Practical experience and potential savings

Savings from being flexible: for the power system and for the industrial electricity users

Dimitrios Papadaskalopoulos (Imperial College London), from the IndustRE Consortium, opened his speech highlighting the challenges for the European power system, which is under-utilized and could be therefore better deployed to balance renewable energy variability, to avoid renewable energy power curtailment and to cover the peak demand.

In this contest, the industrial electricity users can play a relevant role by providing demand flexibility, which can:

- Support system balancing
- Limit peak demand levels
- Enable cost-effective transition to low-carbon future

He has then provided the participants with an overview on the models used by Imperial College London to define the benefits of demand flexibility. The benefits have been quantified both for the system as a whole and also for the case of an individual industrial consumer.

The main findings of the analysis highlighted that there are numerous benefits in the deployment of industrial demand flexibility:

- Reduction of system operation costs by enabling higher utilisation of renewable and cheaper energy sources and providing balancing services (reserves, frequency response)
- Reduction of generation and network investments by limiting peak demand levels and limiting the required generation flexibility

Moreover, synergy between renewable generation and industrial demand flexibility highlight that:

- Industrial demand flexibility increases the utilisation of renewable generation
- System cost and industrial consumers' cost savings are more significant under higher renewable generation levels

Assessment of the economics of and barriers for implementation of improved BMs

Ruben Verhaegen (3E), from the BestRES Consortium, has provided the participants with an overview of the results obtained until now in the BestRES project focusing afterwards his presentation on the methodology adopted to select the business models ready for implementation. The methodology was based on economic viability and barriers analysis which led to the classification of the business models into the three groups shown in Figure 3.

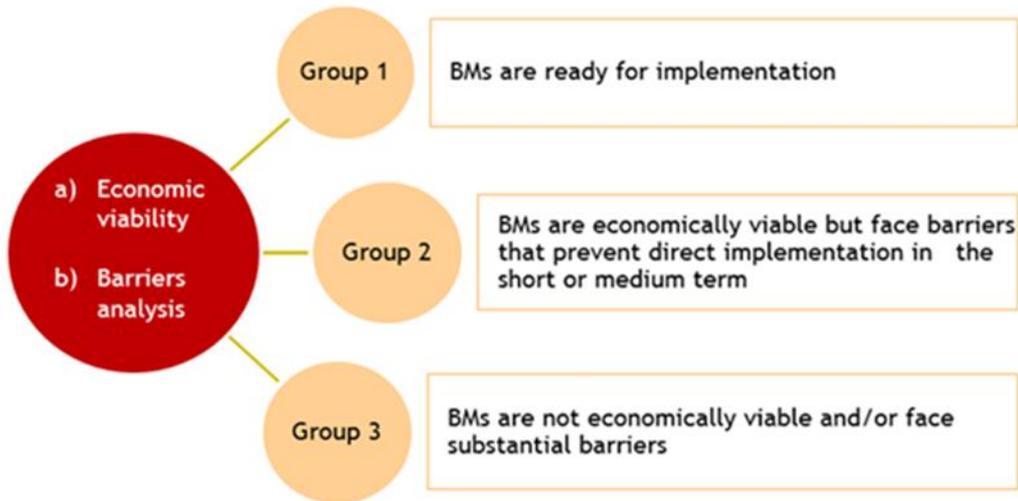


Figure 3 - Classification of the BestRES business models

In total 13 business models in 9 target countries have been analysed.

Table 2 Improved business models developed by the BestRES Consortium

Aggregator	Improved business model
Good Energy (UK)	Automation and control (BM1)
	"Peer-to-peer" (local) energy matching (BM2)
Next Kraftwerke Germany (Germany)	Dispatch flexible generation under changing market design on multiple markets (BM3)
	Supplying "mid-scale" customers with time variable tariffs including grid charges optimization (BM4)
Next Kraftwerke Germany (France)	Providing decentralized units access to balancing markets (BM5)
Next Kraftwerke Germany (Italy)	Market renewables on multiple market places (BM6)
Next Kraftwerke (Belgium)	Trading PV and Wind power (BM7)
	Using flexibility of customers as third party (BM8)
Oekostrom AG (Austria)	Demand Side flexibilization of small customers (BM9)
	Invest and market distributed generation of customers in apartment houses (BM10)
EDP (Portugal)	Activation and marketing of end user's flexibility (BM11)
	- Day-ahead energy sourcing optimization - Imbalance optimization
EDP (Spain)	Activation and marketing of end user's flexibility (BM12)
	- Day-ahead energy sourcing optimization - Imbalance optimization
FOSS (Cyprus)	Pooling flexibility for local balancing market and energy service provision (BM13)

The economic and barriers analysis identified the following six business models as economically viable and with no barriers preventing their implementation.

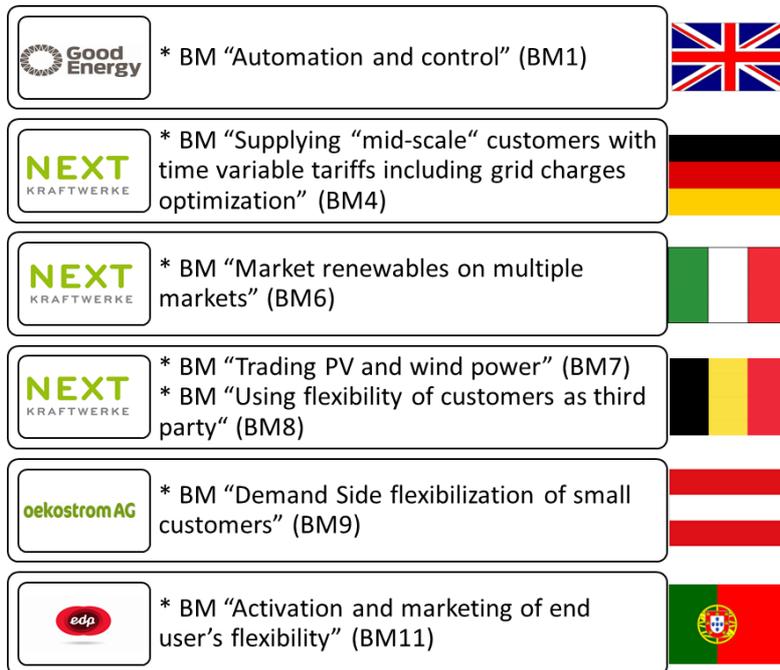


Figure 4 - Business models ready for the implementation (Group 1)

The analysis highlighted that for all other business models that are not yet ready for implementation, the main hurdles were related to:

- Regulatory barriers in the short to medium term: group 2
- Regulatory barriers in the long run: group 3

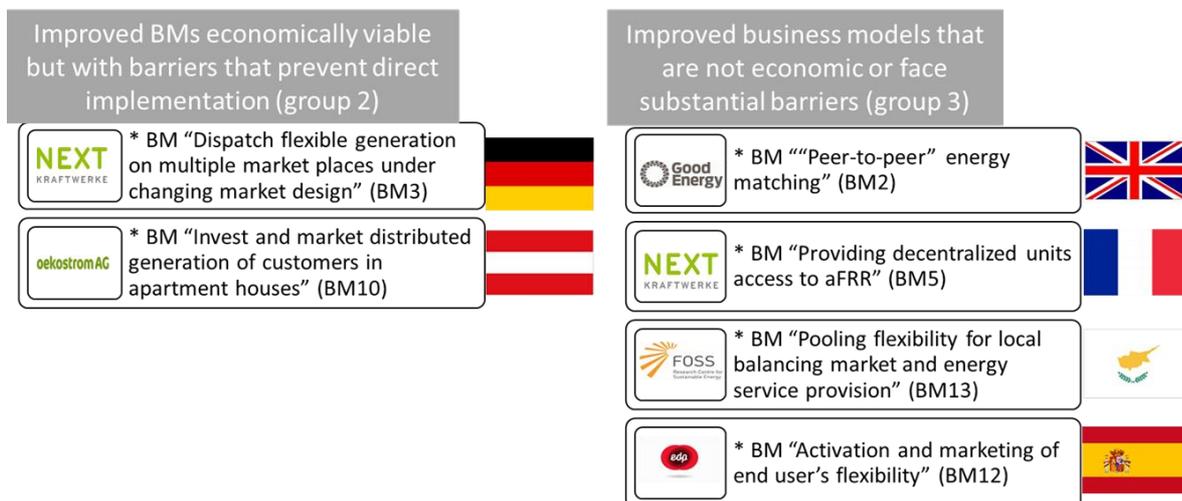


Figure 5 - Business Models not yet ready for the implementation (Group 2 and Group 3)

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Ruben Verhaegen (3E) closed his presentation highlighting that the BestRES consortium will provide the appropriate support to the aggregators to ensure a successful implementation.

Panel discussion

The panel discussion was moderated by Michael Papapetrou (WIP).

The panelists were:

- Maximilian Kloess,
oekstrom
- Michael Schmela,
SolarPower Europe
- Dimitrios Papadaskalopoulos,
Imperial College London
- Pablo Frias, COMILLAS
- Paul Kreutzkamp, Next
Kraftwerke Belgium



Figure 6 - Panel discussion

During the panel discussion, aggregators, representatives of PV generators and research experts had the opportunity to further discuss about the limits and benefits of flexibility and balancing.

The aggregators oekstrom and Next Kraftwerke Belgium provided the audience with an overview of their strategy to approach customers and the drivers that get them engaged. Next Kraftwerke Belgium highlighted the added value of having aggregators as intermediary even though bilateral contracts between renewable energy generators and flexible industrial users is an option.

Michael Papapetrou (WIP) mentioned that nowadays several innovation companies such as Google, Apple and Facebook are powered 100% by renewable energies. From one side this can be seen as good news, but, on the other hand, becomes a missed opportunity since renewable energy generators provide in this way cheap electricity 100% renewable to corporations without asking back for balancing. The flexibility of this large and well-known electricity users could have been better deployed also to support the generators of variable renewable energy in becoming responsible for their imbalances.

Dimitrios Papadaskalopoulos (Imperial College London) explained that in order to define how much flexibility is available we need to understand on a case-by-case basis the extent to which we can interfere with the core production process or auxiliary energy consuming processes within the industries. Pablo Frías (Comillas) added that the design of the electricity tariff can affect the feasibility of on-site or off-site renewable energy supply to the end-users. Paul Kreutzkamp (Next Kraftwerke Belgium) added that while talking about coupling variable generation and demand flexibility it is relevant to define what are the differences in having both “behind the meter” and having them on different sites and use the network in between.

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Michael Papapetrou (WIP) closed the workshop at 12h00 informing the participants that the minutes and presentation will be available soon on the respective project's websites www.bestres.eu and www.industre.eu

4. List of participants

Surname	First Name	Organisation
Abdallah	Gorti	Advisor
Alonso	Pablo	WIP Renewable Energies
Anagnostopoulos	Ioannis	RAE
Anisie	Arina	IRENA
Arancón	Sofía	WIP Renewable Energies
Arnaud	Christophe	SolarPower Europe
Caneva	Silvia	WIP Renewable Energies
Challet	Simon	WIP Renewable Energies
Cherret	Pierre-Jean	items international
Choquepuma	Jose Miguel	SIDERPERU
Cordella	Mauro	JRC
Crabtree	Thomas	European Utility Week
Davis	Carol	SRC
Doenhoff	Benedikt	TUM-BW
Dorregaray	Americo C.	Advisor
Espeche	Juan Manuel	R2M Solution
Fouquet	Döerte	Becker Büttner Held
Frias	Pablo	IIT - ICAI, Universidad Pontificia Comilla
Ghebrial	Beshoy	Webhostnu
Grare	Luc	QWAY energy
Hügel	Casper	Spectral Utilities
Kloess	Maximilian	oekostrom
Koizumi	Reginald M.	Sustainalytics
Kretz	Julian	Next Kraftwerke GmbH
Kreutzkamp	Paul	Next Kraftwerke Belgium BVBA
Laga	Jan	Jan Laga
Leblanc	Elvire	CEA
Lettner	Georg	TU Wien
Makrides	George	University of Cyprus
Montina	Michelet	US-African and European Business Group
Nallacheruvu	Vamsi Krishna	TU Delft

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Nikkels	Hans	TenneT
Okur	Özge	Delft University of Technology
Papadaskalopoulos	Dimitrios	Imperial College London
Papapetrou	Michael	WIP Renewable Energies
Pause	Fabian	SUER Foundation for Environmental Energy Law
Rasendramalala	Volahasina	YNCREA/HEI
Saltos Aráuz	Wilber M.	Universidad Técnica de Manabí
Schmela	Michael	Solar Power Europe
Schwabeneder	Daniel	TUW EEG
Sieben	Bram	USEF Foundation
van Leijen	Berry	Smarp
van Noord	Michiel	Esam AB
Vandesande	Jan	janCONSULT
Verhaegen	Ruben	3E
Weiss	Ingrid	WIP Renewable Energies
Yu	Hyun Jin Julie	CEA/I-tese

5. Agenda of the workshop

09:00 - 09:10	Arrival & welcome	
Session I: Business models providing flexibility to the energy market		
09:10 - 09:20	Introduction to the workshop	Silvia Caneva & Michael Papapetrou, WIP Renewable Energies
09:20 - 09:35	Business models for the aggregation of PV electricity	Georg A. Lettner, TUW
09:35 - 09:50	Business models for large industrial electricity users and necessary policy improvements	Pablo Frias, COMILLAS
09:50 - 10:00	Q&A	
10:00 - 10:30	Coffee break	
Session II: Practical experience and potential savings		
10:30 - 10:45	Savings from being flexible: (a) for the power system and (b) for industrial electricity users	Dimitrios Papadaskalopoulos, Imperial College London
10:45 - 11:00	Assessment of the economics of and barriers for implementation of improved aggregator BMs	Ruben Verhaegen, 3E
11:00 - 11:10	Q&A	
Panel discussion (Moderator: Michael Papapetrou, WIP Renewable Energies)		
11:10 - 11:50	<ul style="list-style-type: none"> • Maximilian Kloess, oekostrom • Michael Schmela, SolarPower Europe • Dimitrios Papadaskalopoulos, Imperial College London • Pablo Frias, COMILLAS • Paul Kreutzkamp, Next Kraftwerke Belgium 	
11:50 - 12:00	Wrap-up & conclusion	