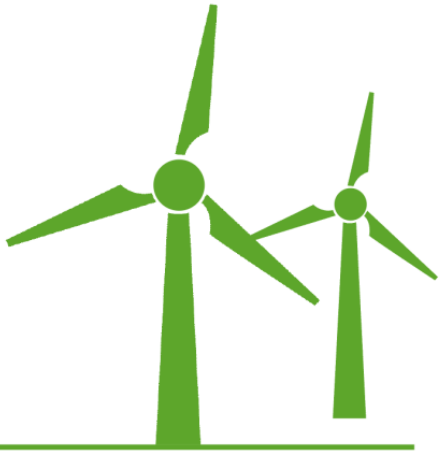
"Innovative Business Models for Market Uptake of Renewable Electricity unlocking the potential for flexibility in the Industrial Electricity Use"

Stakeholder Consultation Process

Deliverable 2.3
Final Report, 12th February 2016

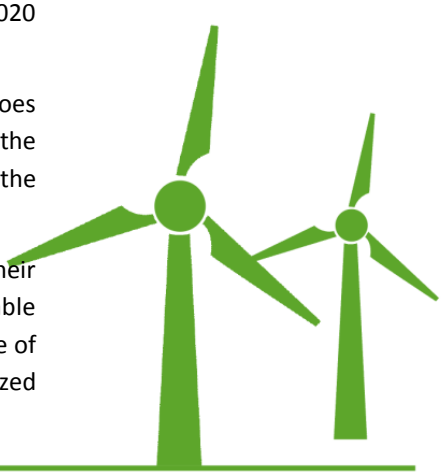


IndustRE

Acknowledgements

This report has been produced as part of the IndustRE project “Innovative business models for market uptake of renewable electricity unlocking the potential for flexibility in the industrial electricity use”. The logos of the partners cooperating in this project are shown below and information about them and the project is available under www.IndustRE.eu.

This deliverable has been written by Tomas Jezdinsky and Fernando Nuño from the European Copper Institute (ECI), with the valuable support from all other consortium partners to approach stakeholders through their particular networks.



IndustRE

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List of Abbreviations

AEEG	Autorità per l'energia elettrica il gas e il sistema idrico
AMR	Automatic Meter Reading
ARENH	Accès Régulé à l'Electricité Nucléaire Historique
BE	Belgium
BRP	Balancing Responsible Party
BSP	Balancing Service Providers
CfD	Contracts for Difference
CHP	Combined Heat and Power
CTA	Contribution tarifaire d'acheminement
DE	Germany
DNO	Distribution Network Operators
D(S)R	Demand (Side) Response
DSBR	Demand Side Balancing Reserve
DSO	Distribution System Operator
DUoS	Distribution Use of System
EC	European Commission
EDF	Électricité de France
EEG	German Renewable Energy Act
ES	Spain
EU	European Union
FCR	Frequency Containment Reserves
FID	Flexible Industrial Demand
FIT	Feed-in Tariff
FR	France
FRR	Frequency Restoration Reserves
FSP	Flexibility Service Provider
GB	Great Britain
GSE	Gestore Servici Energetici
GW	Gigawatt
GWh	Gigawatthour
HT/NT	Tarife mit Hauptzeit/ Nebenzeit

HV	High Voltage
ICT	Information and Communications Technology
IT	Italy
kV	kilo Volts
LCCC	Low carbon contract company
MMR	Manual Meter Reading
MV	Medium Voltage
MW	Megawatt
MWh	Megawatthour
NEBEF	Notification d'Echange de Blocs d'Effacement
NGO	Non-governmental Organisation
PPA	Power Purchase Agreements
PV	Photovoltaic
REE	Red Eléctrica de España
RES	Renewable Energy Systems
RIU	Rete Interna di Utenze
ROC	Renewable Obligation Certificates
ROI	Return on Investment
RR	Replacement Reserves
RTE	Réseau de Transport d'Electricité
SEU	Sistemi Efficienti di Utenza
SSPC	Sistemi Semplici di Produzione e Consumo
STOR	Short Term Operating Reserve
StromNEV	Stromnetzgeldverordnung
TNUoS	Transmission Network Use of System
TOU	Time-of-Use
TSO	Transmission System Operator
TW	Terawatt
UK	United Kingdom
VAT	Value Added Tax
VRE	Variable Renewable Energy

Executive Summary

Based on the working document "Regulatory and market framework analysis", an a-priori definition of business models and their feasibility assessment, a broad consultation process was designed to collect input from all relevant stakeholders - Industry representatives, Renewable energy generation sector, Network operators, other power market actors like regulators, aggregators, traders, BRPs and other stakeholder groups like policy makers, NGOs, research institutes, universities, consultancies, etc.

The aim of the entire consultation process was to present the a-priori defined business models to relevant stakeholders and explain our assessment of their applicability in the various target countries, identify the view of different stakeholders on the applicability or feasibility of the IndustRE business models based on the current market and regulatory frameworks, and gather input on which necessary changes to the current market and regulatory rules would be helpful.

The entire consultation process took place between July and December 2015 and was based on 3 key elements:

- Online questionnaire send-out to over 500 individual stakeholders,
- Workshop organized on October 27th in Brussels,
- 10 in-depth phone discussions with selected stakeholder.

In general, some business models, or elements of revenue streams, seems already be well recognized and part of the current interactions between FID and VRE, whereas others like for TSO service products the analysis of feasibility is much more complex and depending on specific rules. Universally we get a significant high overlap of the assessment of these knowledgeable stakeholders and can see confirmation into our analysis.

The barriers stated against our a priori business models might be further categorized for a closer look into: technical barriers, attitudes and behavioral barriers, price and remuneration unattractiveness or legal barriers.

We also should consider from which stakeholder group the claim for a specific change in the market and framework comes from, as there are obviously different interests and conflicts here represented.

From many stakeholders the hope and the need for more harmonized actions and common plans, within the horizon of the Energy Union, has been expressed.

This stakeholder consultation process reflects important needs and requirements to be considered when formulating how to include this feedback into conclusive policy recommendations.

1. Introduction

This report, as part of work package 2, will provide an overview on the stakeholder consultation process, by which channels and means feedback on the IndustRE business models has been gathered, as well as a summary and analysis of the collected input.

Starting from the working document "Regulatory and market framework analysis"[1] (deliverable D2.2 in work package 2 of the project), analyzing the regulatory and market framework in the six target countries (Germany, Belgium, UK, France, Spain and Italy) which has been developed by the team from Institute for Research in Technology (IIT), of Universidad Pontificia Comillas, a broad consultation process was designed to collect input from all relevant stakeholders.

The aim of the entire consultation process was to:

a) present the a-priori defined business models (developed in task 2.1, for further information see "Main variations of business models for Flexible Industrial Demand combined with Variable Renewable Energy"[2] to a larger audience among relevant stakeholders and explain our assessment of the applicability of the IndustRE business models in the various target countries;

b) identify the point of view of different stakeholders on the applicability or feasibility of the IndustRE business models based on the current market and regulatory framework, find out what factors might be limiting, plus explore which business models are the most attractive and why;

c) gather input on which necessary changes to the current market and regulatory framework would be helpful, specifically if the IndustRE business models seem not applicable or less attractive today, how to enable their feasibility in the future.

All feedback and suggestions from the stakeholders have been included into our synthesis and will now flow-back as further input for the report D2.4 on ***Updated business models and identification of barriers*** (issued by IIT-Comillas).

Stakeholder groups contacted cover a broad European panorama:

- Industry representatives (EU level associations, national associations, individual companies),
- Renewable energy generation sector (EU level associations, national associations, individual operators of RES),
- Network operators (EU level associations, individual TSOs and DSOs),
- other power market actors: regulators, aggregators, traders, BRPs,
- other stakeholder groups: policy makers, NGOs, research institutes, universities, consultancies, etc.

The entire consultation process took place between July and December 2015 and was based on 3 key elements, which will be described in detail in the following chapters:

- Online questionnaire send-out to over 500 individual stakeholders
- Workshop organized on October 27th in Brussels
- Bilateral in-depth phone discussions with selected stakeholder

The detailed feedback on our a priori business model classification in chapter 5) includes mainly individual contributions either from respondents from the online questionnaire or from the subsequent phone discussions, whereas the feedback gathered during the workshop meeting provided rather general ideas and questions around the current and possible future market and regulatory environment.

1.1 Contact Data Base

Since the first weeks of IndustRE project, ECI together with WIP has been developing a contact data base which includes to date over 300 individual stakeholders directly involved or at least potentially interested in topics regarding DSR, RES integration, market and policy recommendations. Various sources like web-directories, publication lists, as well as specifically the consortium's partners network contacts have been used to put together a useful tool to organize and monitor the execution of the stakeholder consultation process. This contact data base will be continuously updated and further used for other tasks of the IndustRE project.

2. Online Questionnaire

With the particular input from consortium's partners from WIP, Vito and Comillas, we have designed a comprehensive online questionnaire[1] launched on October 1st 2015. To reach out a larger community of interested stakeholders, the link to the web based survey has been disseminated using our **contact data base tool** through a) EU level associations of the various stakeholder groups, b) national associations and working groups, c) the consortium partners network contacts, d) newsletters of concerned interest groups, e) our IndustRE website and ultimately a large number of e) individual companies and entities. We estimate that by these multiple channels, our survey has been introduced to more than 500 individuals.

As respondents could remain anonymous, we cannot say with certainty which organization in which country provided the detailed feedback, but we can indeed confirm that we were able to collect relevant comments from all countries and stakeholder groups.

[1] The original survey has been closed on November 19th 2015, but the test link to the questionnaire will still be accessible until January 2017 here: Test Copy Online questionnaire stakeholder consultation Survey

The online survey has been closed on November 19th 2015 with **54 complete** individual answers. The following table shows the breakdown of respondents by stakeholder category and country:

Country / Stakeholder Category	DE	BE	FR	UK	ES	IT	Pan-EU (general view w/o country specific details)	Other countries	*total*
Industry	6	2			4	3		2	***17***
RES		2		1		2	1	1	***7***
TSO/ DSO	1	1	1	1	1	2		2	***9***
Other power actor: Aggregator, Energy Trader		2							***2***
Regulator, Policy makers			1		1			2	***4***
Others (Research, University, NGOs, etc)	4	3		1		2	1	4	***15***
Total	***11***	***10***	***2***	***3***	***6***	***9***	***2***	***11***	***54***

Table 1: Respondents in online survey

"Pan-EU" route was an option for respondents to provide feedback more related to the technical feasibility from a pan-European perspective without considering any country specific framework issues.

"Other countries" comprises feedback from respondents coming from countries out of the primary scope of IndustRE, e.g. Poland, Switzerland, Scandinavian countries, etc.

The relatively low number of inputs from France and the UK in the online survey induced to further back-up feedback through additional qualitative phone discussions with selected stakeholders.

2.1 Structure of the Online Questionnaire

The assessment of the feasibility of the different business models [1] shows significant differences across the target countries, as different regulations and market framework do apply. The following table summarizes the classification, where colours indicate:

- green = feasible, the business model is compatible with the current regulatory and market framework
- yellow = difficult, the present circumstances limit the full realization of the business model or make it unattractive
- red = today not viable, significant barriers exist that do not enable the business model

Business models	BE	FR	DE	IT	ES	UK
A.1 Time of use tariff or price rates	🟢	🟡	🟢	🟢	🟢	🟡
A2.1 FID shifting consumption in time	🟢	🟡	🟢	🟢	🟢	🟡
A2.2 Supplier owning VRE plants benefits from FID to balance generation portfolio / Direct bilateral sale of energy from VRE to FID	🟢	🟡	🟢	🟡	🟡	🔴
A2.3 On-site VRE and the possibility of netting demand with self-consumption	🟢	🟢	🟢	🟡	🔴	🟢
A.3 FID managing consumption in response to hourly wholesale market prices. With on-site VRE, excess energy sold in the market.	🟢	🟢	🟡	🟢	🟢	🟡
A.4 Reduced network charges by lowering peak demand. With on-site VRE, peak 'net demand' compensated with self generation.	🟡	🟡	🟢	🟡	🟡	🟢
B.1 FID offering reserve capacity, directly or through an aggregator	🟢	🟢	🟡	🔴	🔴	🟡
B.2 FID responding to signals sent by BRP to balance demand-generation portfolio	🟢	🟢	🟡	🟡	🟡	🟢
B.3 Other services to the system (e.g. load interruptibility, services to DSOs)	🟡	🟢	🟢	🟡	🟡	🟡

Table 2: Classification of business models, working document: "Regulatory and market framework analysis" [1]

To confront our a-priori classification with the views of key stakeholders in the online survey, we established a ***route by country*** to present these a-priori findings and our assessment of the IndustRE business models for each respondent according to his country selection: respondent could either fill-in his feedback for Belgium, France, Germany, Italy, Spain or the UK – plus the option[2] to provide feedback for "another country" (not predefined) or from a "pan-European" perspective. The questions itself and the structure of the online questionnaire however follow the same structure:

- Introduction
- Identification of the respondent – stakeholder group
- Description of the different business models
- Initial analysis of applicability in a specific country
- Feedback from stakeholders – evaluation of success factors and barriers for applicability
- Gather ideas for necessary market and regulatory framework changes needed to make business models attractive
- Identify further information needs

The summary of the detailed feedback of stakeholders by business model is presented in chapter 5 of this report.

[2] In this survey route "other country" / "pan-European perspective", there is obviously no a-priori classification but only an assessment from the respondent.

3. Public Stakeholder Workshop in Brussels

The workshop on "Innovative Business Models making use of Flexibility in Industrial Electricity Demand" was organized as part of the IndustRE project consultation process on the 27 of October 2015 in Brussels in the Metals Conference Center (100 rue du Duc, 5th floor, 1150 Brussels, Belgium).

The audience comprised about 40 experts from all relevant stakeholder groups: industry, VRE generation, aggregators, grid operators, regulators, research institutes and NGOs, policy makers including representatives from the European Commission. *(The agenda and attendance list is part of the detailed minutes of the workshop in Annex A)*

The aim of the workshop was to present a basic outline of the different possible business models for supplying variable renewable electricity to industrial users with a potential for flexibility in their demand.

After presentations from different IndustRE partners (WIP: general introduction, ECI: overview on stakeholder consultation process, Comillas: applicability of business models within the current regulatory and market framework, BBH: model contracts – *see presentations in Annex B*), in an interactive discussions, the invited experts provided their feedback on the applicability of these business models, stated their views on current barriers and the necessary changes and explored ideas for possible future policy developments.

A panel discussion with key stakeholder representatives concluded the workshop. *(The details of this feedback is part of the minutes of the workshop in Annex A)*

Generally, the statements of most workshop attendants confirmed that there is a large potential for flexible industrial demand.

However a central question mainly from industry representatives was to which extend the business models and identified solutions can be made cost-effective. The energy intensive industry is reluctant to invest in flexibility because the market and regulatory circumstances are still far from ideal.

RES have to be evaluated also under the aspect of cost competiveness, but it is undisputed that decarbonization of the EU economy is expected to continue, meaning that we will have to integrate a large penetration of variable renewable generation on the grid.

Finally, a positive signal came from a representative of the EU commission confirming that the forthcoming legislative package on electricity market design (end of 2016) aims to include all possible means to support industrial flexibility – starting with the most cost-effective ones.

4. Phone Interviews

Between mid November and mid December 2015, we conducted 10 more qualitative and open ended phone discussions with selected stakeholders from:

- Belgium (aggregator),
- France (industry representative),
- Germany (research institute),
- Spain (two representatives from heavy industry),
- UK (one representative from the chemical industry and one discussion with an expert on DSM at the TSO),
- plus in Italy (respectively one interview with an representative from the national regulator, with the TSO and with an regulatory affairs expert from a DSO) thanks to the support from our consortium member Valerio Cascio from SER who realized and summarized the latter three interviews.

The main objective was to have an in-depth discussion of barriers identified so far for the applicability of specific business model as well as to further explore ideas for potential changes in the market and regulatory frameworks of the countries in scope. In addition, based on a first high-level analysis of the feedback obtained through the online survey, some open issues could be clarified or stated more precisely.

The detailed comments from these discussions have been integrated into the synthesis in the following chapter 5.

Beside specific issues related to our business models and anticipated necessary changes for the market and regulatory frameworks, we gathered valuable comments to more general topics and interest regarding FID and integration of RES.

The following reflects the most relevant statements from these discussions:

- Although the respondents mostly agree that many business models are technically feasible, the need for a clear business case was expressed. Industrial consumers seem to see a conflict between using their flexibility in the manufacturing process to reduce electricity costs vs. the anticipated losses in output and overall efficiency, which let them question the applicability and the pay-off of some model.

- Industrial consumers would be more receptive to evaluate new business models using their FID but require mid-term stable conditions and pricing. The political situation should guarantee frameworks at least for the next 2-3 years for these

services and models, so that industry can consider to change their processes while not undergoing a risk that after the implementation a new framework will change the rules completely.

- The current technical preparation requirements and bidding rules and conditions for offering services to the system require a highly dedication and knowledge – which often is not present on industrial organizations or the resources here are limited. Hence the access for industry to participate and fully understand the opportunities and available products / remuneration schemes should become easier and more transparent

- The access to the capacity market for FID seems attractive and the opening in many countries where this is not yet established is requested, but rather seen in a harmonized pan-EU context.

- The role of independent aggregators which are not necessarily BRPs is under discussion and for some respondents considered as a way to facilitate or support the applicability of services in reserve and balancing markets, like balancing mechanisms should become more open and flexible to combine generation and demand.

- Ideas for opening the markets (e.g. less rigid tariffs and grid charges, less subsidies for RES, more access for FID in capacity and reserves) are expected to be pushed from EU commission rather than “voluntarily” realized on country level by TSOs and national governments.

5. Detailed stakeholder feedback on IndustRE business models

The following chapter synthesizes the outcome of the stakeholder feedback on the IndustRE business models. We show **for each individual business model by target country** our a-priori assessment of its feasibility (colour scheme green – yellow – red)[3] and then if and how the stakeholders' view correspond with our analysis. This overview also summarizes the main benefits perceived and further barriers identified by stakeholders – either gathered through the online survey or coming from the more open-ended phone discussions – as well as their suggestions on potential changes of the regulatory and market frameworks, as input for further elaboration on policy recommendations.

Throughout all business models presented, we can recognize a very high coincidence rate and hence correlation with our assessment of the feasibility of business models and the stakeholders view. The **correlation is between 48% and 60% coincidence**[4] with our rating. This means that we get a significant high overlap of the rating of these knowledgeable stakeholders and can see confirmation into our analysis. The divergence and other perspectives, specifically regarding barriers and needed market changes, do only enrich our vision and provide additional perspectives for further analysis.

However, the **individual feedback of any stakeholder in the following chapter by business model does not represent necessarily our views**, neither can be considered as an statement of any official body, and hence does reflect particular perceptions and opinions.

Nevertheless, even if these are perceptions of the situation in their respective country, these are worth more than single impressions and should be respected and recognized in public consultations at European level.

[3] See table 2 in chapter 2.1 of this report,

[4] XY% coincidence rate means how many stakeholders in these target countries provided the same color rating as our a-priori assessment.

A. Reduced energy bills by shifting consumption

In this category are included all business models that involve the flexible industrial consumer managing electricity consumption in response to price signals from the market or the regulated tariffs. The possibility of adjusting consumption by means of netting demand with self generation is considered as well. The structure of the tariffs and the final electricity prices, or the modes of buying electricity (through a retailer or directly in the market), the possibilities of net metering and self consumption and the charges associated to the installation of generation units play a significant role in this type of business models. Also the level of exposure of VRE to the market, which is related to the existing RES support schemes, determines the incentives for VRE operators and owners of selling energy bilaterally or in the market.

A.1 Time of use tariff or price rates, e.g. night rate offered by a supplier.

Our assessment in the target countries	BE	FR	DE	IT	ES	UK
A.1	●	●	●	●	●	●

Main benefits and enablers perceived:

- BELGIUM
  - FID has access to ToU, integrated in established contracts

- FRANCE
  - Historically not very common, as industry was focusing to negotiate long-term contracts and was benefiting from stable state price from nuclear power ("ARENH"). This pricing model became under pressure and is likely to be adjusted to become more market price oriented.
  - Regulated tariffs for industrial consumers ("tarif vert A, B, C")[5] will cease by Jan 2016, pricing then negotiated with suppliers will be much more dynamic and competitive, hence using more ToU tariffs will become interesting for large industry

- GERMANY – *(no specific feedback provided)*

[5] tarif vert: The suppression of the tariffs concerns a set of regulated tariffs, including the so-called "green" tariffs, which applies to customers with power needs above 240kVA

- ITALY
  - Scheme already in place. Lower tariffs at night-time and weekends flatten demand curves and allow savings for customers.

- SPAIN
  - Shift production to TOU zones is a-priori feasible, depending on production cycle. The more "modular industry"[6] tends to shift base load profile to cheaper time zones and sees a significant reduction in their energy bill
- UK
  - All premises with max demand > 100kW have already half hour retail meters. There is significant evidence of industrial and commercial users shifting load to avoid peak charges

Main barriers stated:

- BELGIUM
  - 24 different ToU tariffs seem too complicated to manage, might be reduced to max 6
  - Limitations by some industrial processes (production stability and efficiency losses might be more important)

- FRANCE
  - Industry still more interested in long-term negotiated price

- GERMANY
  - Grid access tariffs are not compatible with this model. Increased consumption in some hours following a reduction in previous hours can result in higher grid tariffs and wipe-out the profits
  - Industry running in base-load processes can hardly shift production, efficiency losses are too high

[6] An example for modular processes mentioned is electro-metallurgy.

- ITALY
  - Shifting consumptions on night-time and weekends could increase complexity in terms of logistics and industrial process, potentially leading to higher workforce costs (e.g. during weekend), or objections by the unions due to labour force legislation.
  - Changing the number/composition of time-bands to adapt to new scenarios (e.g. amount of PV installed) would imply significant costs and long implementation time, due to smart meters re-programming/re-setting.

- SPAIN
  - Certain industries with stable process (copper, steel, aluminium foundry) running almost in static base load profile, not able to shift to ToU tariffs

- UK -

Necessary changes suggested:

- BELGIUM
  - Support widespread roll-out of smart metering to refine time scale

- FRANCE
  - New state decree expected to limit old regulated tariffs, opening for completely market price oriented ToU

- GERMANY
  - Base-load industry would need subsidies for production shifting
  - Change in grid access tariffs (e.g. go towards temporary variable grid tariffs) and other network charges, like § 19 (2) StromNEV[7]

- ITALY -

- SPAIN
  - There are concerns that Spanish regulator can change the rules on access tariffs from year to year. Need to have at least mid-term

[7] At present, decisive for the network charge calculation of the atypical network use is the „Guide to the approval of individual network charge agreements as per § 19 para. 2 Section 1 and 2 StromNEV“ of December 2013.

contract guarantees (2-3 years stable conditions and tariffs) that industry would evaluate to use FID.
    - Reduce impact of the regulated portion of electricity price, specifically to remove non-energy based costs

- UK
    - Retail time band tariffs could be implemented now as metering for billing and settlement is in place. A lot of these customers have on-site Generation (specifically CHP) which with larger heat stores could be flexed to respond to banded pricing. Simple time band at first - Peak/Plateau/Trough, Weekdays/Sats/Suns, Summer vs Winter, etc.
    - Wholesale Market Traders need to be able to cope with a more dynamic Retail sector. Suppliers Billing systems may need updating.

Comments from other countries not in target of IndustRE:

- Potential benefits
    - Evens out the electricity generation daily profile, thus making the power stations more efficient. Cheaper rates means higher profitability for industry including water desalination plants. Less traffic in the morning rush hours, as more people will have to work on night shifts.
    - Larger price differentials between day and night, cost savings

- Potential barriers
    - Limitations for some industry segments running continuously. Or for industrial processes are not batched or timed, but generally linked together. This makes it very difficult to optimise processes to specific times of the day.

- Suggestions
    - This model must be implemented on a voluntary opt-in basis so that the potential beneficiaries of this plan would be able to make a self determination of the applicability and viability of the plan to their own plant's circumstances.

A.2.1 FID shifting consumption in response to dynamic pricing signals from the supplier.

Our assessment in the target countries	BE	FR	DE	IT	ES	UK
A2.1	●	●	●	●	●	●

Main benefits and enablers perceived:

- BELGIUM -
- FRANCE -
- GERMANY
  - With a flexible production of energy (CHP), industry could react to changing price signals quite fast.
- ITALY
  - Energy retailers are already offering energy tariffs indexed on national energy price or other energy indexes, even though dynamic rates can only be offered on the energy component of the energy price, accounting for around 50% of total energy cost (excluding taxes), while grid and system costs are fixed by law. The smart meters currently installed are capable of measuring energy consumed on a hourly basis, but in fact measures are collected by the central systems of the DSO on a monthly basis for invoicing purposes unless customers have a contractual power higher than 55 kW.
  - The main benefit is that consumers are encouraged to follow the real cost of energy on the market. Significant renewable power plant capacity in Italy led to a wholesale market price equal to zero in recent years, especially around mid-day, during sunny weekends with high PV production and low energy demand, opening interesting opportunities for FID. The main criterion for participation in Demand Response programs is a positive cost-benefit ratio. The attractiveness depends on automatic energy management systems availability at competitive prices, and on the possibility to have real time price signals or, better, reliable pricing forecasts, covering a forecast period that is comparable with that of flexible industrial processes.
- SPAIN -
- UK
  - Could accommodate more VRE

Main barriers stated:

- BELGIUM

- FRANCE
  - Only indirect participation in day-ahead prices through the NEBEF mechanism[8] in place since 2014, allows all consumers to react to spot prices, even though they don't have a specific retail price with their retailer.

- GERMANY
  - Increase in complexity of production processes, forecasting and planning. A question of reaction time on outside price signals. Most industries don't even detect the final electricity consumption during the production on each process step, hence they need sufficient forecast to adapt production.

- ITALY
  - Shifting consumptions on the basis of dynamic signals could be hardly implementable in large scale industrial facilities due to process dynamics. In case of a remunerative investment in demand side participation (positive outcome of a cost-benefit analysis) a further barrier may be the lack of awareness by the final consumers (non-economical barrier).
  - While it is true that electricity suppliers can offer prices indexed to national wholesale price or Brent, today they do not offer multi-hour daily prices, nor provide any real-time communication to the client about future price. Despite there are some basis for deployment of dynamic price signals, there is currently a lack of communication infrastructures to provide dynamic price values to the end user

- SPAIN
  - Electricity prices are not competitive in Spain, low competition due to market control by handful suppliers, spans between peaks and valleys are too small. Industry would require much more price dynamics to use FID to change the production cycles.

[8] The NEBEF Experimental Rules enable any consumer in mainland France to use its electricity demand reductions on the energy markets, either directly by itself becoming a Demand Side Management Operator (DSMO), or indirectly through a third party that is a DSMO. However, as a transitory arrangement, only those consumers connected to Distribution System Operators applying a generalised flow adjustment system (i.e. generalised profiling) can participate at the present stage of the mechanism (*source: RTEs customer area, http://clients.rte-france.com/lang/an/clients_distributeurs/services_clients/effacements.jsp)*

- UK
  - Dynamic signals programmes are typically related to ancillary services rather than supplier led programmes based on commodity purchasing. Suppliers will need to engage more with energy services capabilities rather than retaining the status quo where the majority of profit is made upstream.
  - UK Market remains led by small number of large suppliers. Increased competition would help accelerate dynamic pricing but this remains incompatible with vertically integrated utilities companies that are permitted to sell their energy directly to themselves.

Necessary changes suggested:

- BELGIUM
  - New production "design": Industry must invest in surplus production capacity and must rethink energy cost driven processes instead of product output driven production.
- FRANCE -
- GERMANY
  - Schemes to guarantee higher remuneration for industrial flexibility offered and a long-term stable political framework to guarantee acceptable ROI-periods for investments required to mobilize flexibility options
  - Reduce network charges
  - Profit/ margins gained from market price spreads between low and high cost period must compensate all other losses
- ITALY
  - In order to broaden the number of demand side resources, the regulation should be updated in order to measure all customers on a hourly basis, including those having a contractual power below 55 kW
- SPAIN
  - Pricing should take into account seasonality across the year, specifically in spring the availability of hydraulic power
- UK
  - Legislative change to enforce all generated electricity has to be sold via the open market

Comments from other countries not in target of IndustRE:

- Potential benefits
  - There are possible benefits in reduced energy costs, but these are generally associated with lower production as well. A case by case cost-benefit analysis would be required to determine applicability and possible benefits, based on estimated frequency, duration, etc of these shiftings.

- Potential barriers
  - Interdependencies of processes can create domino effects and overall process safety risks in some industries . This cannot be a mandated take-up agreement, but instead must be done on a case by case basis through a bottom up approach where each site has the option.

- Suggestions
  - Should lower the capacity charge levies

A2.2 A supplier owning VRE plants benefitting from the FID to balance their generation portfolio. Alternatively, direct bilateral sell of energy from VRE to FID.

Our assessment in the target countries	BE	FR	DE	IT	ES	UK
A2.2	●	●	●	●	●	●

Main benefits and enablers perceived:

- BELGIUM
  - FID channelled through an aggregator to balance generation portfolio of VRE on the other side is feasible
- FRANCE -
- GERMANY
  - The business model is feasible. But it is questionable if the bilateral contracts are efficient. The balancing function between production and demand is provided by the market. Nevertheless bilateral contracts are efficient in the case of small units that would not be allowed as a market player otherwise.
- ITALY
  - From a regulatory point of view loads and production units cannot be aggregated, but each operator can balance its own production and consumption on a pure economic basis as a result of the single unbalancing price applied.
  - Imbalance cost should be compared to the cost of adjusting the demand. Avoided unbalancing cost for the generator could be less than the incurred cost for shifting the consumption. Under the current regulatory framework, imbalance fees allow for an economic netting of the unbalance arising from injection from non-dispatchable plants and withdrawal of consumption units located in the same market zone (same single price).
- SPAIN
  - Aggregators like Fortia are starting to discuss with smaller VRE operators about bilateral contracts, still under exploration phase
- UK
  - Even if in this form not viable today, this could become more viable with a DSO being given the responsibility to manage local balancing and optimise distribution in a new framework

- Shows benefits if manage to overcome first the attitude of Distributed Generation (Industrial/Commercial) that they can only handle flat rate power purchase agreements

Main barriers stated:

- BELGIUM
  - Bilateral sales are not common in Belgium. All big suppliers have also VRE generation in their portfolio and do not want to offer bilateral agreements directly to industry for a RES as they fear competition to their traditional generation assets still to be utilized as much as possible.
  - Smaller independent VRE generator said not to have the skills, then bilateral energy sale is unfeasible because contracting, reliability, and hardware for metering/switching is missing. Renewable operators have to sell their produced VRE to the market anyway as they have no efficient storage yet.
  - A theoretical scenario is that if the portfolio of aggregators grows, gaming could take place. Aggregators could distort the balance in a portfolio of a balancing responsible party and then earn revenues to fix this unbalance.

- FRANCE
  - VRE are today not usually using bilateral agreements with industry as their guaranteed feed-in tariff are economically the better option, no incentives for VRE to approach FID
  - This model seems not to make sense: if both VRE and demand response were sold to the market, and not in bilateral contacts, the overall optimization would be better. The BRP's portfolio does not seem to be the relevant perimeter to balance these complementing energies.
  - Imbalance prices are rather low in France at present

- GERMANY -

- ITALY
  - Selling energy only to one final consumer makes less sense than looking time by time to the overall market opportunities, consequently this business model seems not to be consistent with a value maximization criterion. Flexible resources get more value if sold to the market other than being dedicated just to one or few operators.

- Economic compensation is not allowed for units located in different balancing zones, or in case of units eligible to ancillary services market because of a different (dual) unbalancing price applied. From a REGULATOR perspective It is important to not introduce any public incentive to self-balancing in order to avoid distortions in the dispatching choices.

- SPAIN
  - Bilateral contracts are today economically not interesting for FID, moreover there is no difference of origin of the electricity (no advantage consuming VRE)
  - In the wholesale energy market and balancing market, generation and consumption are settled separately (offers/bids)

- UK
  - This business model is currently in conflict with the legacy arrangements for centralised control of the system
  - The distributed generation needs to be more active. Enable first project assessment with variable incentives/PPAs and dynamic interaction with suppliers.

Necessary changes suggested:

- BELGIUM
  - Industrial consumer must partner with aggregators or other actors...or be themselves accredited as BRP to do balancing, but at present less than 10 companies/ sites are BRPs
  - Aggregators would like to get free access to day-ahead market without necessary bilateral contracts with BRPs, to react directly between VRE operators and industrial clients

- FRANCE
  - Single pricing for imbalances could help in making BRPs more aware of their portfolio imbalances and enhance the incentives to manage them

- GERMANY -

- ITALY -

- SPAIN
  - Pricing for bilateral contracts should include incentives to use VRE

- Balancing markets should combine both, generation and demand balancing mechanisms and remuneration under one scheme, DR seen as “negative load offer” in this market

- UK
  - A significant shift in the control hierarchy to defer control of distribution network would be necessary which can only be approved by the regulator. This would need to be done in parallel with new financial flows and changes of regulated responsibilities.
  - We need not just tariffs but also incentives (ROC/FIT/CfD) to be time and situation (with volatile main generation) based. The DSOs also need a smarter grid for monitoring and control.

Comments from other countries not in target of IndustRE:

- Potential benefits
  - In theory this would be very attractive and create a win-win situation, exploiting VRE and reducing market prices (with further environmental benefits)
  - Better deregulation of the local electricity market to allow direct selling and buying of electricity from third parties
  - There may be some secondary benefits in carbon accounting from renewable sources, but those would currently likely be offset by higher prices for the renewable energy in the first place. These may be subsidized currently, but this would create an uncontrolled risk point for when the subsidies would be removed.

- Potential barriers
  - Much depends on VRE type and variability as well as on FID profile and industry type: if VRE is based on PV, in absence of storage, this business model would be feasible only during daylight hours.
  - Added complexity of unknown generating periods to be matched with production forecast
  - Will only work where simultaneous demand for heat and electricity

- Suggestions
  - Incentives (also on storage), new carbon taxes, may make this business model more feasible

A2.3 On-site renewable energy and the possibility of netting demand with self-generation, or even net metering.

Our assessment in the target countries	BE	FR	DE	IT	ES	UK
A2.3	●	●	●	●	●	●

Main benefits and enablers perceived:

- BELGIUM
  - Industrial customers reduce their dependency on supplier and market exposure, as well as tariffs for grid access.

- FRANCE
  - Auto-consumption with VRE feasible, but industry will need a business case evaluating upfront investments in RES plus guaranteed feed-in tariffs for excess energy on one hand vs. the opportunities of procurement through possible negotiated long-term pricing now on a more dynamic market in France

- GERMANY
  - This is attractive only as long as VRE generation is cheaper than electricity from the grid, taken into account grid charges, taxes, etc.

- ITALY
  - The business model is compatible with the current regulatory framework conditions, both in the case of ownership of the renewable plant from industrial user of third party. In Italy both "behind the meter" solutions and net metering are in place and incentivized. It has to be noted that there is a limited rationale for an incentive, because public benefit is negligible or inconsistent.
  - At present, Italian law encourages development of efficient User's Systems (SEU[9]), a private connection between a VRE plant and one single (industrial) customer by reducing a part of network tariffs and other system's charges.

[9] SEU (Sistemi Efficienti di Utenza) are defined in D.Lgs. 115/ 2008 as modified by D.Lgs. 56/2010

- SPAIN -

- UK
  - While it is technically possible this has to be achieved in conjunction with a supplier contract to buy additional energy when renewable power cannot meet on site demands, and purchase agreements to sell any excess.
  - Will drive better and more efficient management of resources and general reduction in CO_2

Main barriers stated:

- BELGIUM
  - Possible but CHP preferred, as VRE (specifically Wind Turbines) have to overcome massive administrative burdens to get allowance for on-site installation, plus industrial sites often not the ideal locations to install VRE

- FRANCE
  - Unclear ROI to install VRE generation on-site vs negotiated pricing on the market

- GERMANY
  - Latest changes in "Renewable Energy Sources Act" (EEG 2014)[10] do not longer favour the auto-consumption at larger scale. Only existing on-site generation is still exempt from grid charges, levies and taxes, all new generation plants will pay 30% (in 2017: 40%) of the EEG surcharge. However, heavy consumers can still be reduced to a small fraction (CAP or Super-CAP)[11] of this levy, but taxes for all plants with more than 2MW will be applied. In addition the current outlook

[10] EEG novel 2014, see link here: http://www.bmwi.de/EN/Topics/Energy/Renewable-Energy/2014-renewable-energy-sources-act.html

[11] For an energy cost intensity of at least 20%, the EEG levy is limited to 0.5% of the average gross value added – this is known as the ***Super Cap***. For an energy cost intensity of under 20%, the EEG levy is limited to 4.0% of the average gross value added – this is known as the ***Cap***.

- 0,05 ct/kWh for companies for the production and initial processing of aluminium, lead, zinc and tin, copper
- 0,1 ct/kWh for other companies

beyond 2020 is rather pessimistic and likely that all existing on-site generation plants will come under this scheme plus gradually reach the full level of surcharges.

- RES generation said to be not competitive with other generation (e.g. CHP), investment costs vs. unclear feed-in tariffs (reduced subsidies) and taxes do not favour this model at present
- As soon as storages are being used to maximize the auto-consumption, storage losses can lead to an overall inefficiency. This is the case when the storage is filled with local VRE even though there is fossil electricity production in other parts of the grid available at low cost.

- ITALY
  - The model proposed with SEU and in general with SSPC[12], if adopted by many final customers, has the risk to reduce the portfolio of final customers that pay the general systems charges and produce many energy islands connected to the distribution grid which may jeopardize grid quality.

- SPAIN
  - Auto-consumption of on-site generated VRE is not longer attractive in Spain with recent Royal Decree 900/2015 (Oct 2015) [13], net-metering not feasible, and network charges and other taxes to be applied anyway (see ref. [3])

- UK
  - This will for larger users present a potential challenge of managing imbalance risks from their supplier depending on their contract type
  - On-site wind turbines said to cause legal and technical problems with planning and installation compared to build a CHP gas plant.

[12] For definitions of SEU and SSPC see AEEGSI n. 578/2013/R/eel

[13] See: https://www.boe.es/boe/dias/2015/10/10/pdfs/BOE-A-2015-10927.pdf

Necessary changes suggested:

- BELGIUM
  - Need change of grid tariffs to capacity terms, allowance of third party investment and reduction of complexity to obtain an direct line approval
- FRANCE -
- GERMANY
  - Long-term evolution of EEG is uncertain and causes concerns on industry side. EEG novel should be cancelled and all on-site generation considered under same schemes. Only if grid charges and taxes for auto-consumption remain at a low level, cap-ex and investments in future VRE generation at industrial sites makes sense.
  - In case the VRE plants are receiving public subsidies, detailed regulation should be put in place to make auto-consumption as efficient for the overall system as possible (reduction of storage losses). Also the grid charges have to be adapted: the more local VRE is being used the less grid charges should be applied. In some hours per year the industry might make use of the whole grid capacity nevertheless and should be charged accordingly.
- ITALY -
- SPAIN
  - Would need to change again latest regulation and allow exemption from system charges and taxes also to other RES, with current legislation only existing CHP are exempt until end of 2019 – however unlikely as current government in Spain said to discourage on-site RES and auto-consumption schemes based on their interest to pay-off historical debt with system operator and cover infrastructure costs by as many customers as possible
- UK
  - Potential impact of significant balancing code review P305[14] could increase the risk exposure for FID, need to be observed (see ref [4])

[14] See ofgem Balancing and Settlement Code (BSC) P305:
https://www.ofgem.gov.uk/sites/default/files/docs/2015/04/p305d_1.pdf

Comments from other countries not in target of IndustRE:

- Potential benefits
  - If this model can bring any benefit to the national electricity grid or producer. For example, if this model would reduce the carbon emissions of the power station, which would otherwise cause the power station to pay CO_2 tax.

- Potential barriers
  - Self-consumption is a valid option but network operator will most probably charge extra for security to have back-up from the network. In any case the Network costs have to covered by all, also by those with self-consumption and only backup (-tariffs).
  - In many markets this is already available, but is not necessarily cost competitive. Furthermore, for most chemical plants the energy needs are more than just electricity, but also heat or steam, and using a CHP is much closer to being economically viable and is a more reliable and efficient source of energy.

- Suggestions
  - Rejecting feed-in tariffs
  - Making net-metering accessible in all markets not only for VRE, but also for high efficiency CHP

A.3 Manage consumption in response to wholesale electricity prices by acceding directly to the market or through a supplier/aggregator. With on-site VRE, excess energy could be sold in the market.

Our assessment in the target countries	BE	FR	DE	IT	ES	UK
A.3	●	●	●	●	●	●

Main benefits and enablers perceived:

- BELGIUM -
- FRANCE
  - The largest industrial consumers can source directly from the wholesale market and thus use their FID to consume at a given time. For the others, the NEBEF scheme has allowed them to value their flexibility in the wholesale market through an aggregator since 2013.
- GERMANY
  - Already possible for large industrial players. The larger the electricity consumption, the larger the benefit from having dedicated in-house energy manager, who handles the electricity portfolio.
- ITALY
  - When accessing directly to the wholesale market, industrial users should be capable of forecasting their own consumptions at least one day in advance, then it is absolutely feasible to participate
- SPAIN -
- UK -

Main barriers stated:

- BELGIUM
  - Wholesale markets can only be accessed by BRPs. Independent aggregators hence have to become or associate with a BRP to sell flexibility in these markets. Secondly, an arrangement for the transfer of energy must be in place to compensate the BRP for the energy that he has put on the grid and was not consumed by the end-user, but shifted/rerouted to another party such as a BRP or TSO.
- FRANCE -

- GERMANY
  - Access limited to very large consumers to wholesale prices (e.g. consumption higher than 100.000 kWh per year, 50kW peak/ max. consumption)
- ITALY -
- SPAIN
  - Industrial consumer needs sufficient financial reserves (cash holdings) to face with price/ market volatility
- UK
  - ***Regarding excess VRE sales:*** relating to P305, the imbalance risk may present a compelling reason to avoid this type of activity

Necessary changes suggested:

- BELGIUM
  - Open wholesale market also to independent aggregators (not being a BRP)
  - Need to deploy a model for transfer of energy: When performing a flex-activation, an independent aggregator transfers energy from the BRP source or supplier to another market party. This transfer of energy must therefore be associated with fair compensation between the independent aggregator and BRP source or supplier (while preserving balancing incentives).
- FRANCE -
- GERMANY -
- ITALY -
- SPAIN -
- UK -

Comments from other countries not in target of IndustRE:

- Potential benefits
  - Provide better control of energy consumption and also provide a larger choice of options. Improves on competition in the electricity market.
  - A large price fluctuation may make this option more attractive than it is nowadays. Some elements of benefits of such flexible demand shift in a pan-European perspective (keeping total load constant, day by day) have been derived and highlighted in the European project GridTech - www.gridtech.eu. *(see papers for EEM2015, ref [5], IEEE PowerTech 2015, ref [6], and D4.2 report, ref [7]).*

- Potential barriers
  - Would most probably need storage which at current prices does economically not make sense. Price spread must be much higher.
  - ***Regarding excess VRE sales:*** Excess power production from on-site renewable generation could of course be sold on the power market. But this will likely be at low prices as excess power at one renewable generator is likely to coincide with excess power from others, and thereby an oversupplied power system.

- Suggestions
  - The regulatory approach in place should be adapted, depending on the single country/region regulation, especially to allow VRE excess market sale. Incentives to new technologies (including storage) might be needed.
  - Open intraday market in all EU countries

A.4 Reduced network charges by lowering peak demand. With on-site VRE, peak 'net demand' can be compensated with self-generation.

Our assessment in the target countries	BE	FR	DE	IT	ES	UK
A.4.	●	●	●	●	●	●

Main benefits and enablers perceived:

- BELGIUM
  - All AMR metered, and even MMR metered with peak registration, have a peak-power capacity factor (although too low) in the grid tariffs. So if they can reduce their peak consumption, they save money.
- FRANCE -
- GERMANY -
- ITALY
  - Peak demand reduction entail an economic benefit for the consumers in term of fixed component of distribution tariff. For customers below 16,5 kW the distribution tariff is calculated upon the contractual power without reference to the real peak power withdrawal. For customers over 30 kW installed, the same tariff is computed on the basis of the peak demand monthly measured by the DSO. Between 16,5 and 30 kW it is computed on the measured power, unless the case of a client with limitation device for the absorbed power (in this case the reference is the contractual power as for the clients below 16,5 kW). A reduction in the contracted/ real peak power for small/ big clients entails a saving in the distribution tariff. The saving is connected to a system benefit in terms of usage and need of connection capacity.
- SPAIN
  - For more "modular" industrial processes, capacity charge reduction and max capacity adjustments linked to TOU (P1 to P6) could be an option to lower their costs

- UK
  - Triads[15] are part of a charge-setting process. This identifies peak electricity demand at three points during the winter in order to minimise energy consumption. The Triad system is generally welcomed by large industrial users of electricity because they have an opportunity to reduce their overall energy bills. They do this by switching off plant at a time that might coincide with one of the three half-hour times of peak demand. If charges were based on energy use throughout the year then their bills would likely be much higher.
  - This is already a strategy that is employed by 1.2 to 1.5GW of demand in the UK for TNUoS avoidance. A far smaller capacity actively avoids the DUoS peak charges or 'RED PERIODS' but this is expected to increase.

Main barriers stated:

- BELGIUM
  - The peak capacity tariff is too low compared to all other costs on the bill, the peak capacity tariff is not time-dependant (if you consume your peak in summer, or at night, it still counts)
- FRANCE -
- GERMANY
  - Max peak shaving is said to be insignificant for heavy consumers as all larger plants have already optimized process consumption and base load profiles towards their max peak. Additional peak shaving is questioned to be cost effective compared to efforts and opportunity costs caused on industry, financial incentives are too low, general grid charge reductions up to 80% already possible for large consumers.
  - VRE generation to fill peak load shaving gaps in power supply is said to be unlikely: no guaranteed availability of VRE during peaks and high Cap-ex making them far from being cost competitive
- ITALY -

[15] The Triad refers to the three half-hour settlement periods with highest system demand between November and February, separated by at least ten clear days. National Grid uses the Triad to determine charges for demand customers with half-hour metering.

- SPAIN
  - Peak demand reduction said to be difficult for base load running industry as aluminium or steel, they already reduced their max capacity and adjusted to TOU as much as possible, further peak shaving would not bring much additional economic revenues but instabilize the production cycle

- UK
  - The DUoS charging structure is a blunt instrument that applies a single tariff for the whole year. This should be seasonal in order to target costs to the network from generation peaks during the summer as well as demand in the winter.
  - On-site generation for most sites means CHP in continuous generation profile running, not to avoid peak loads.

Necessary changes suggested:

- BELGIUM
  - Change the grid tariff structure to allow dynamic peak capacity pricing

- FRANCE -

- GERMANY
  - There should be a differentiated price signal for peak capacity price. Below the limits of the grid supplying electricity, a maximum of VRE should be used. Only if the grid reaches its maximum capacity in some hours the maximum grid charge should be applied.

- ITALY -

- SPAIN
  - Need also in Spain a charge for transmission/ distribution network which is more linked to the real consumption/ demand in the grid, like the Triad charging in the UK

- UK
  - Currently the single annual DUoS tariff has the impact of blunting the price signals at the extremes of demand and generation periods as well as incentivising generation for much of the year. During the summer it should be established as a cost that could fund incentives to encourage demand at times of excessive generation.

Comments from other countries not in target of IndustRE:

- Potential benefits
  - Lower peak rates for industry. Self-consumption of on-site RES electricity would help to avoid network congestion in areas where PV or Wind electricity generation is high.

B. Offering flexibility services to the power system

This category includes all business models that involve the explicit provision of flexibility services to the system by the FID, generally to the TSO or even to the DSO, either directly or through an intermediary. The requirements for qualifying as a balancing service provider are related to the market exposure and balancing responsibilities of VRE operators, and also whether loads are allowed to offer this type of services to TSOs. The existence of a specific interruptibility service for industrial demand or how imbalances are evaluated and priced are crucial factors that determine the feasibility of this type of business models. The following are distinguished:

B.1 FID offering reserve capacity, either directly or through an aggregator.

Our assessment in the target countries	BE	FR	DE	IT	ES	UK
B.1	●	●	●	●	●	●

Main benefits and enablers perceived:

- BELGIUM
  - Reserve products for primary (FCR) and tertiary (replacement reserve) are today open for FID to participate through open bids. Bidding system expected to become more transparent and easier for industry in the near future. Aggregators offer services that can be activated even in a few minutes and shorter
- FRANCE
  - Participation to primary and secondary reserves has been opened for FID since July 2014.
- GERMANY
  - Once an industry is prequalified, offering reserve capacity can contribute to a constant revenue.
- ITALY
  - Strategic guidelines for the period 2015-2018 and consultation documents from the Energy Authority are opening up to this possibility

- SPAIN
  - Conversation between TSO and industries had started with the objective to open primary and secondary reserves for FID

- UK
  - This is currently a growing market sector with a sizable number of participants (UK STOR)

Main barriers stated:

- BELGIUM
  - Free bids can only be offered to TSO via BRP. But end-users can directly or indirectly (via independent aggregator or FSP) offer their flex for FCR and mFRR.
  - In case, these signals come through an independent aggregator that is not a BRP, an arrangement must be in place to compensate the BRP/Supplier for the energy not consumed, that was sold as Flex Activation by this aggregator to a 3rd party (another BRP or TSO)

- FRANCE
  - Also theoretically since July 2014, FID could access to primary and secondary reserve services to the TSO, however this is still layout as a "symmetric service", meaning you need to have the same flexibility and guarantee to increase xy MW as to reduce xy MW, in the same time ranges. For most industrial processes it is much easier to reduce rapidly and then ramp-up again rather slowly, and not to increase immediately

- GERMANY
  - Smaller industries can not necessarily take part in this market due to restrictions concerning the minimal load accepted.
  - For negative system reserves demand resources needs to ramp up their demand but will be penalized by network charges when peaking their peak
  - Pre-qualification was developed for generation, is difficult for smaller FID. There are no standards for demand nor to pool demand yet, however the legal barriers are moving and requirements have been recently lowered by German ministry.

- ITALY
  - Load is currently not allowed to participate in ancillary services market in Italy. The only service load can access to is Interruptibility, with a remuneration scheme based on capacity auctions.
  - Remuneration should be binary tailored: capacity availability remunerated on a fixed €/MW basis and effective service provided remunerated on €/MWh variable basis. It is moreover a general problem of firmness: "*...does the TSO trust the firmness of the services provided by load?"*

- SPAIN -

- UK
  - Revenues are decreasing for industry over the last years due to tender competition
  - Min load required at present is 3 MW, but is expected to be reduced to 1 MW

Necessary changes suggested:

- BELGIUM
  - Aggregators wish for opening day-ahead and intra-day market access without bilateral agreements with BRPs
  - Need to have full access for FID to all reserve markets. Expecting a note from Belgian government early 2016, after a national stakeholder consultation on potential framework changes in 2017
  - Implementation of the bid ladder platform of TSO (Elia opening up free bids to industrials/aggregators). Implementation of the transfer of energy model between aggregators and the rest of the market. Extension of all models to the low voltage.

  - BRP-perimeter needs to be corrected + financial compensation to BRP, or BRP-perimeter is not corrected but then the positive imbalance price must be high enough to compensate the BRP for the risk of no correction. (Not correcting will push BRP in a long position -> positive imbalance price reward)

- FRANCE
  - Provide more evidence with reserve products and remuneration on expected availability of capacity needed, anticipated frequency of activation, estimated revenues possible to achieve for industry and any fixed amount guaranteed

- GERMANY
  - Smaller loads should get the possibility to offer non-symmetric loads (e.g. only positive or negative)
  - Existing regulatory power products should be adapted to industrial flexibility capabilities: 1h blocks instead of 4h blocks for tertiary reserve, 1h-blocks instead of HT/NT-periods for secondary reserve new products for high dynamics regulation requirements demand response incentives scheme with fixed premiums for a 20 years period to stimulate investments into flexibilization
  - Industrial loads should get the possibility to decide where to use DR, and be able to give-up contracted loads for reserve markets and switch to playing on intra-day price market if more attractive, Today bids for reserve capacities do bind loads and make alternative usage extremely difficult

- ITALY
  - Opening up of the ancillary services market to the load. Tailored made forward contract for ancillary services provided by load (as discussed above). Phasing-out of interruptibility services today in place.

- SPAIN
  - Need to negotiate with TSO tenders of blocks of 10MW (up or down on demand side) over a couple of hours: need to define a "product" and clear rules on availability, remuneration and reaction time

- UK
  - Need to open access to smaller loads, make the revenue scheme more transparent and more attractive to industry

Comments from other countries not in target of IndustRE:

- Considered as theoretically feasible, but questions regarding technical requirements for FID to participate here in practice and product attractiveness/ remuneration

- Which reserve / frequency services could become accessible for FID and how?

Country	Primary control - Frequency containment reserve	Secondary control - Frequency restoration	Tertiary control - Replacement reserve
BE	• in place: e.g. electrolyses processes • R1 via load infrequency range - 200mHz; - 100mHz -> linear /discrete load reduction once f < 49,99Hz.	• more difficult. Most likely a change of the product necessary (asymmetrical, automated control instead of manual TSO approach)	• already rolling • Profile modulation within 15' - last quarter h used as reference curve to measure activation
FR	• already possible • need asymmetric products	• already possible • need asymmetric products	• already possible
DE	• automatic control mechanism are required, prequalification to be standardized	• Already accessible today • prequalification to be standardized • in combination with on-site CHP	• Already accessible today • prequalification requirements easier to meet • need to offer 1h blocks
IT	• need of an automatic system to control absorbed power as a function of frequency • need firm commitment of being effectively consuming at the time of request	• hardly feasible due to relatively large bandwidth and short response time • need firm commitment	• Supply of tertiary reserve appears to be feasible, but of course it is related to duration, as the tertiary reserve could be needed for "unlimited" time
ES	• no	• no	• According to the TERRE[16] project for early implementation of

[16] Project TERRE (Trans-European Replacement Reserve Exchange) is a pilot initiative set up by ENTSO-E at the request of ACER, with the aim of exploring the feasibility of the concepts contained within the Network Code on Electricity Balancing. TERRE is currently the leading early pilot project for the Replacement Reserves (RR). see: https://www.entsoe.eu/news-events/events/Pages/Events/project-terre-event-brussels.aspx

			Balancing guidelines
UK	• Already demonstrable in the UK • Frequency control demand and embedded gen management	• Fast Reserve is currently not accessible to 3rd party providers in the UK but likely to be opened up • Instructed DER	• already demonstrable in the UK • Instructed DER

B.2 FID responding to signals sent by the Balancing Responsible Party (BRP), who tries to balance their demand-generation portfolio.

Our assessment in the target countries	BE	FR	DE	IT	ES	UK
B.2	●	●	●	●	●	●

Main benefits and enablers perceived:

- BELGIUM
  - Standard products do exist and BRP can pool this flex into a standard product
  - FID can today enter the balancing market, but this seems more feasible through aggregators, as they can effectively bundle capacities and loads not only in sum but also over the time scheme (taking FID availability on 2 days from site A here plus availability on other days on site B there, etc)

- FRANCE:
  - The French balancing mechanism has enabled demand response participation since 2003 (initially only for large consumers but now this option is also available for distributed DR).
  - Since 2014, a DR service operator can integrate into its portfolio a consumer supplied in energy by any energy provider. The NEBEF mechanism establishes the transfer of an energy block from the BRP of the consumer's energy provider to the demand response service operator and then to the target markets. The contribution of this mechanism is to allow the bid of demand response offering on the energy market by a third operator distinct of the energy provider.

- GERMANY -
- ITALY -
- SPAIN -
- UK -

Main barriers stated:

- BELGIUM
  - To participate directly in balancing market, FID must be accredited as BRP; today probably less than 10 companies in Belgium said to be BRPs (large steel or chemical plants), plus there are rarely new agreements between established BRPs and industry.
  - Issue for FID if directly participating on balancing market: will then be responsible for imbalances.
- FRANCE -
- GERMANY
  - Opportunity costs vs potential revenues. Utilization of this mechanism seems possible, however remuneration is presently too low to attract business volume
  - Current products do not fit to individual flexibility of demand
- ITALY
  - Loads currently are not allowed to participate to ancillary services market. Load and production (admitted to ancillary services market) units are charged independently for imbalances. Within the current regulatory framework conditions, there is no possibility to take advantage of load flexibility to cover imbalances of production plants admitted to ancillary services market.
- SPAIN
  - Generation and demand "portfolios" are separated
- UK -

Necessary changes suggested:

- BELGIUM
  - Transfer of energy guaranteeing confidentiality is needed to unlock full flex potential via aggregators who work independently from suppliers/BRP
  - Balancing should be in future more considered on regional panorama as “congestion management” involving DSOs and open up for FID loads to participate on regional level
- FRANCE

- Global balancing still centralized controlled by TSO (RTE) but decentralized approaches are under discussions

- GERMANY
  - Higher balancing cost for unbalanced accounts would increase the value of such services. Need a clear Cost-Benefits Analysis

- ITALY
  - Defining a balancing portfolio including all the resources (load, production and production admitted to ancillary services provision) under the control of one operator. Allowing the participation of the load to the ancillary services market.

- SPAIN
  - Balancing markets should combine both, generation and demand balancing mechanisms and remuneration under one scheme, DR seen as "negative load offer" in this market
  - Role of aggregators expected to become more relevant in Spain, particularly for balancing issues, if framework changes and "net balancing" of demand plus generation would be possible, at least aggregators could already help to bundle demand balancing offers

- UK
  - Need to establish flexible data interface from premises to Microgrids, which are half hourly metered: balancing position should also be informed to the DSO and SOs – currently only the suppliers see these information

Comments from other countries not in target of IndustRE:

- Potential benefits
  - To make this business model attractive for a FID much will depend on the type of signals sent by the BRP, otherwise the benefits may be more for the system than for the FID consumer
  - Bonus points that an industry accumulates and then these can either be used to have higher demand at peak production periods without incurring penalties.

- Potential barriers
  - For this business model, apart from the regulatory framework adaptation, all the necessary ICT means/technologies will be required for a continuous, on-line interaction between TSO, BRP and FID

B.3 Other services to the system, such as:

- Long-term generation investment deferral (e.g. capacity markets)
- Network congestion management
- Reactive power control
- Distribution system services.

Stakeholder assessment on the question:

Which of these services are accessible for the industry to offer to the system?

Services to the system	BE	FR	DE	IT	ES	UK
Interruptibility	🟢	🟢	🟢 - 🟡	🟢	🟢	🟢
Security of Supply and Capacity Remuneration Mechanisms	🟢	🟢	🟢 - 🟡	🔴	🟡 - 🔴	🟡
Network Congestion Management	🟡 - 🔴	🟢	🟢 - 🟡	🔴	🔴	🟡
Reactive Power Control	🟢 - 🟡	?	🟢 - 🟡	🔴	🔴	🟡 - 🔴
DSO services	🟡 - 🔴	🔴	?	?	🔴	?

Specific comments on the above mentioned "other services":

- BELGIUM
  - **Balancing mechanisms** might become more regional, controlled by DSOs to include **Network Congestion Management**
  - Interest stated on industry to access **Reactive Power Control**, said to be easy to implement

- FRANCE
  - **Capacity market** is under discussion in France since 2012 and expected that within 2016 there will be some openings accessible for FID

- GERMANY
  - In the last invitation for tender on **interruptibility** only 6 companies, which are all pre-qualified for reserves anyway, have submitted bids. German regulator is evaluating to cease this service and fully integrate into **Reserves mechanisms.**

- ITALY
  - Offering **interruptibility** services is possible for FID
  - The control of **reactive power** is not a service today. VRE producers are obliged by Terna Grid Code A.17 to produce with power factor between +0,95 and – 0,95. At present, wind farms have power monitor devices to keep power factor as close as possible to 1 in order to maximise active power and therefore profits. A control which brings power factor from 1 to 0,95 to produce reactive power implies to reduce active power, therefore profits. Today **reactive power** control is not paid.

- SPAIN
  - In the past, **Reactive Power Control** service was possible for RES, while for FID did exist just penalties for consumption depending on power factor

- UK
  - **Network congestion management** appears feasible to be open for FID in a context of new "local system balancing"
  - **DSO services** seen as possibility for FID to offer availability for short term interruptions, but remuneration does not compensate the risks today. In this context, FID is seen as an opportunity to offer local **DSO services** to local grid problems, when aggregated demand over several regions spread cannot respond, but again a different incentive scheme is requested by the industry.

- ***Comments from other countries not in target of IndustRE:***
  - **Interruptibility**, intended by TSOs as load management, is today available in several countries where interruptible loads have a dedicated tariff/contract of supply
  - For making **DSO Services** accessible for industry it is of high importance to increase coordination and communication at TSO-DSO interface, and to further develop smart grids

6. Conclusions

The above presented detailed comments by country show a variety of issues to be potentially addressed in the target countries to make these business models more feasible and specifically more attractive in the future.

The barriers stated might be further categorized for a closer look into:

- technical barriers (e.g. lack of smart metering today),
- attitudes and behavioral barriers,
- price and remuneration unattractiveness,
- legal barriers.

We also should consider from which stakeholder group the claim for a specific change in the market and framework comes from, as there are obviously different interests and conflicts here represented.

- Industry tends to highlight the aim for cost effective production and overall efficiency
- RES suppliers see a natural interest in selling their electricity and amortize the investments in assets
- Independent aggregators wish to enter day-ahead and intra-day markets and offer their “portfolio” services
- TSOs/ DSOs and regulator claim their focus on security of supply and network reliability issues

In general, business models, or elements of revenue streams, seems already be well recognized and part of the current interactions between FID and VRE (such as ToU contracts and in some countries the on-site generation supply model), whereas for TSO service products the analysis of feasibility is much more complex and depending on specific rules.

From many stakeholders the hope and the need for more harmonized actions and common plans, within the horizon of the Energy Union, has been expressed.

All these relevant comments which have been collected during our stakeholder consultation process result from important needs and requirements to be then considered when formulating the stakeholder feedback into conclusive policy recommendations. A final comprehensive report on the updated business models and first policy recommendations will be part of deliverable D 2.4.

7. References

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