



The DELTA project has received funding from the EU's Horizon 2020 research and innovation programme under grant agreement No 773960



# DELTA

Project Acronym: **DELTA**  
Project Full Title: **Future tamper-proof Demand rEsponse framework through seLf-configured, self-opTimized and collAborative virtual distributed energy nodes**  
Grant Agreement: **773960**  
Project Duration: **42 Months**

**DRAFT DELTA WHITE PAPER 1**  
High level demand response regulations in Europe

Work Package	<b>WP8 – Dissemination, Communication &amp; Exploitation Activities</b>
Task	<b>T8.2 – Exploitation Plan &amp; Policy Guidelines</b>
Document Status:	<b>Draft v0.1</b>
File Name:	<b>DELTA Whitepaper 1</b>
Submission Date:	<b>24 July 2021</b>
Lead Beneficiary:	<b>Carr Communications</b>

**Dissemination Level**

Public X  
Confidential, only for members of the Consortium (including the Commission Services)

## Contributors List

Leading Contributor				
First Name	Last Name	Beneficiary	Contact e-mail	
Dawn	Lonergan	CARR	dawn@carrcommunications.ie	
Co-Contributor(s)				
#	First Name	Last Name	Beneficiary	Contact e-mail
1	Dimitrios	Thomas	JRC	Dimitrios.THOMAS@ec.europa.eu
2	Antonios	Marinopoulos	JRC	Antonios.MARINOPOULOS@ec.europa.eu
3	Antonio	De Paola	JRC	Antonio.DE-PAOLA@ec.europa.eu
4	Gillian	Arigho	CARR	garigho@carrcommunications.ie
5	Apostolos	Tsolakis	CERTH	tsolakis@iti.gr
6	Angelina	Bintoudi	CERTH	bintoudi@iti.gr
7	Lampros	Zyglakis	CERTH	zyglakis@iti.gr
8	Paschalis	Gkaitatzis	CERTH	pgkaidat@iti.gr
9	Guntram	Pressmair	E7	guntram.pressmair@e-sieben.at
10	Alba	Fernandez Izquierdo	UPM	albafernandez@fi.upm.es

## Legal Disclaimer

The DELTA has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773960. The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the Innovation and Networks Executive Agency (INEA) or the European Commission (EC). INEA or the EC are not responsible for any use that may be made of the information contained therein.

## Copyright

© Carr Communications Ltd, 24 Fitzwilliam Place, Dublin 2 D02 T296 Copies of this publication – also of extracts thereof – may only be made with reference to the publisher.

## 1. Introduction

DELTA is a three-year Research and Innovation Action project commencing 01 May 2018 and running until 31 October 2021. The project team comprises 10 organisations from 8 countries. The project coordinator is CERTH, based in Greece.

The project name, DELTA, is a shortened form of the long title:

*“Future tamper-proof Demand rEsponse framework through seLf-configured, self-opTimized and collAborative virtual distributed energy nodes”.*

DELTA proposes a Demand-Response (DR) management platform that distributes parts of the Aggregator’s intelligence into a novel architecture based on Virtual Power Plant (VPP) principles. It will establish a more easily manageable and computationally efficient DR solution and will deliver scalability and adaptiveness into the Aggregator’s DR toolkits. DELTA is made up of two technical innovations; the DELTA Virtual Node (DVN) and the Fog Enabled Intelligent Device (FEID).

## 2. Current Regulations and Directives

In light of DELTA's work, below is a brief analysis of the corresponding articles in the Regulations and Directives of the EU and searched information about key interest domains of the DELTA project, such as **demand response, smart metering, data management, blockchain, smart contracts, prosumers, and flexibility**. The results, as one can see below, show that terms like demand response, flexibility and smart metering are common within both Regulations and Directives. However, terms like blockchain, smart contracts, prosumers, etc., are rare or even not mentioned at all. This indeed implies the existence of gaps in the current policy, which need to be addressed, so that key elements of projects such as DELTA could be implemented in reality.

### Regulation (EU) 2019/943

The European Union approved the Regulation of 5 June 2019 on the *internal market for electricity*. In its preliminary points, the EU lays down the fundamental principles driving the legislative action on energy for final customers: **safety, security, sustainability, competitiveness and affordability**. These key objectives shall be pursued in the context of a changing electricity system that is rapidly moving away from the traditional vertically integrated paradigm with large nuclear or fossil fuel plants and towards new distributed and flexible resources. The internal electricity market, which has been progressively implemented since 1999, is a fundamental element of this transition, with new opportunities and challenges arising for all market participant, as a result of the ongoing decarbonisation effort. In this context, and taking also into consideration the transformation to a more digital era, it becomes crucial to develop new forms of consumers' interaction, enabling their participation in the electricity market and empowering them in the management of their energy consumption, while ensuring the abovementioned key objectives.

You can view this regulation in full [here](#).

### **The main findings and comments of the Regulation are presented below:**

*Article 3* highlights that market rules should enable the development of new sustainable and flexible resources, including **demand response**. The aggregation of loads from different demand response facilities should be promoted, in order to facilitate the participation of final customers and small enterprises, while enabling an efficient dispatch of the new resources. In addition, investment incentives should be enhanced so as to contribute to the spread of demand response activities and long-term hedging products should be available to reduce the price volatility risks of the market participants.

*Article 6* refers to balancing markets, stating that these should foster non-discrimination rules for customers to facilitate **demand response** participation individually or through aggregation. The different technical needs are taken into consideration.

*Articles 12 and 13* describe the dispatching and re-dispatching of generation and **demand response**. Market-based mechanisms should be the basis for selecting **demand response** resources. Non-market-based mechanisms are only allowed in case of a limited number of available **demand response** facilities. In addition, the Transmission System Operators (TSOs) and Distribution System Operators (DSOs) shall report at least annually to the competent regulatory authority, on the measures taken to reduce the need for the downward re-dispatching of generating installations using Renewable Energy Sources (RES) or high-efficiency co-generation in the future including investments in digitalisation of the grid infrastructure and in services that increase **flexibility**.

*Article 18* addresses the charges on the network and in general the usage of the network. It is stated that network charges should not be a negative incentive for **demand response** users. On the other hand, such charges should not be either a positive incentive for aggregation. Tariff methodologies shall reflect the fixed costs of transmission and distribution system operators and shall provide them with appropriate incentives to increase efficiencies, including energy efficiency, to foster market integration and security of supply, to support efficient investments, to support related research activities, **and to facilitate innovation in interest of consumers in areas such as digitalisation, flexibility services and interconnection.**

*Article 23* refers to the European resource adequacy assessment, an analysis periodically conducted by ENTSO-E<sup>1</sup> to verify the adequacy of the European system to supply current and projected demands over a 10-year period. Such evaluation will explicitly consider the contributions of energy storage and demand **response** solutions in the context of a multi-scenario analysis performed at a bidding-zone level.

*Article 55* states the tasks of the EU DSO entity. Among others, it is stated that the EU DSO should facilitate **demand side flexibility and response** and **distribution grid users' access to markets.**

*Article 57* focuses on the necessity of cooperation between the TSOs and DSOs for the achievement of coordinated access to resources, including **demand response**. Furthermore, Article 59 discusses the establishment of network codes to enforce uniform conditions over multiple aspects of the electricity system, including rules on aggregations. The Commission can adopt delegated acts on network connection rules regarding the connection of demand units used to provide **demand response.**

#### Directive (EU) 2019/944

This Directive, introduced on 05 June 2019, focuses on common rules for the *internal market for electricity*. In its preliminary points, it emphasizes the necessity to adapt the Union rules to a rapidly changing market framework, accelerating the completion of an internal market for electricity that rewards flexibility and innovation.

You can view this regulation [here](#).

#### **The main findings and comments of the Directive are presented below:**

*Article 3* highlights the need for competitive, **consumer-centred, flexible** and non-discriminatory electricity markets. It also mentions that alternatives to the construction of new generating capacity, like **demand response** solutions should be considered. In addition, final customers should receive all relevant **demand response data.**

*Article 15* states among others that Member States shall ensure that **active customers** are entitled to participate **in flexibility schemes** and energy efficiency schemes. In addition, the active customers owning an **energy storage** facility **are not subject to any double charges**, including network charges, for stored electricity remaining within their premises or **when providing flexibility services to system operators.**

---

<sup>1</sup> <https://www.entsoe.eu/>

*Article 17* addresses **demand response** through aggregation. It is mentioned that Member States should facilitate the participation of customers in **demand response** programs through aggregation. TSOs and DSOs should establish the technical requirements for participation of **demand response** in all electricity markets; such requirements should cover participation through aggregated loads. In addition, Member States may require electricity undertakings or participating final customers to pay financial compensation to other market participants or to the market participants' balance responsible parties, if those market participants or balance responsible **parties are directly affected by demand response activation**. Such financial compensation **shall not create a barrier to market entry for market participants engaged in aggregation or a barrier to flexibility**. In such cases, the financial compensation shall be strictly limited to covering the resulting costs incurred by the suppliers of participating customers or the suppliers' balance responsible parties during the activation of **demand response**.

*Articles 19, 20 and 21* refer to **smart metering** systems. Member States shall ensure the deployment in their territories of **smart metering** systems that assist the active participation of customers in the electricity market. Where the deployment of **smart metering systems** is assessed positively, **at least 80 % of final customers** shall be equipped with **smart meters** either within seven years of the date of the positive assessment or by 2024 for those Member States that have initiated the systematic deployment of smart metering systems before 4 July 2019. Where the deployment of smart metering systems has been negatively assessed as a result of the cost-benefit analysis referred in Article 19(2) and where smart metering systems are not systematically deployed, **Member States shall ensure that every final customer is entitled on request to a smart meter, while bearing the associated costs**.

*Article 23* deals with **data management**. Member States shall organise the **management of data** in order to ensure **efficient and secure data access and exchange**, as well as data protection and data security. Independently of the data management model applied in each Member State, the parties responsible for **data management** shall provide access to the data of the final customer to any eligible party. Eligible parties **shall have the requested data** at their disposal in a non-discriminatory manner and simultaneously. **Access to data shall be easy and the relevant procedures for obtaining access to data shall be made publicly available**.

*Article 32* refers to the regulation of the incentives for the use of **flexibility**, particularly in **distribution networks**. The Member States should provide the correct incentives to DSOs in order to foster **demand response** programs. Apart from the provision of flexibility services, the DSOs should ensure that energy efficiency measures are put into practice, which contribute to the upgrade of the electrical system. Non-discriminatory measures should be followed for such services to be adopted. In addition, coordination is necessary between the TSOs and DSOs for the optimal utilization of resources in order to ensure the efficient operation of the system. In addition, Article 51 mentions that the TSO should consider the potential role of **demand response** as an alternative to system expansion in the development of its ten-year network development plan.

### 3. Insights and Analysis

Through the analysis performed on both documents, the main identified gaps in existing policy regulations for demand response in Europe, are: 1) Market Access, 2) Market process and coordination, and 3) Privacy and Security. Further details and recommendations as to these gaps are outlined below:

#### 1. Market Access

There are different standards and prequalification methods followed across Europe, which is a barrier for the deployment of **demand response**. There is no clear framework for the integration of **implicit and explicit demand response**, and there is also a lack of a uniform framework for deployment, installation and management of smart metering infrastructure for accessing energy markets in general, as well as allowing participation to more dynamic transactions, such as DR (instead of just requesting from MS for ensuring systematic deployment).

*There are different standards followed across Europe.*

#### ***Why it's a gap:***

Standard heterogeneity leads to a plethora of different equipment and software solutions that hinder the communication and integration of DR solutions. A characteristic example is the vast availability of smart meters which interact with their environment (i.e., installation premises, cloud) following completely different communication protocols and data models, leading to serious communication difficulties. In particular, the measurements follow various data formats, the sampling frequency is up to the manufacturer to decide, while the measurement accuracy fluctuates significantly. All these facts impose high heterogeneity in regards to the collection of measurements, which is a cornerstone for the application of exploitation of any DR schema. Furthermore, going beyond metering infrastructure, access to devices, appliances, etc. is also extremely important and introduces enhanced complexity that needs to be standardised, especially in cases of explicit DR and Direct Load Control.

#### ***Recommendations to address it:***

- Open European standards shall be encouraged to be used (like OpenADR, EEBUS, IEC 61850, IEC 62559) which shall indicate the technical-non technical/ functional, non-functional requirements of hardware and software solutions (e.g. smart meters), destined to be deployed in any type of consumer/ prosumer. Standards shall be followed also with profiles that include details on the communication protocol, data format, security specifications, etc. Interconnection then of different data models can be done by ontologies (like SAREF4ENER<sup>2</sup>) facilitating the interoperability between devices without hampering innovation. . Furthermore, European standards are supported by working groups, which maintain, update and extend the standards according to regulatory and technological requirements
- A certification entity shall be made available for vendors to certify their products (software or hardware) in terms of smart readiness<sup>3</sup> and standard conformity. Every deployed solution

<sup>2</sup><https://digital-strategy.ec.europa.eu/en/library/digitalising-energy-sector-common-language-consumer-centric-world>

<sup>3</sup> For comparison reasons, see for example the Smart Readiness Indicator for buildings as the official EU tool to support the digitisation and modernisation of buildings in Europe, <https://op.europa.eu/s/pcDg>

shall be certified before made available for commercial purposes so that the level of interoperability or/and flexibility shall be known to the consumer.

-----

*There is a lack of a clear framework for providers of **flexibility**, like the aggregators, which should be tackled.*

***Why it's a gap:***

Flexibility of energy use has gained an entirely different dimension after the introduction of prosumers. By now, it is possible to ad-hoc change either consumption or generation, towards meeting the same objectives. This complicates the overall situation, which is not yet presented at EU level, but it's mainly handled at National level, nevertheless following different approaches. Furthermore, the aggregation mainly refers to loads, and not all available assets at customer's side that could also include generation and storage assets.

***Recommendations to address it***

- Clear definition of what “flexibility” stands for, how it is calculated for all foreseen types of customers and energy market participants, in general
- Clear definition of how flexibility can be provided to the markets from stakeholders, such as Aggregators, as well which are the stakeholders that can actually deliver DR services.
- Clear rules of engaging while protecting customers
- Financial incentives (EU & National Level)
- Clear definition of a baseline methodology
- Clear definition of guidelines regarding remuneration, especially for consumption

-----

*There is no clear framework for the integration of **implicit and explicit demand response**.*

***Why it's a gap:***

There is no clear understanding in the markets (both for market players and end-customers) of how Implicit and Explicit DR are integrated to the markets. This also includes the stakeholders involved, the markets where they are allowed or required, as well as additional technical and financial details. Currently, at commercial scale, only explicit DR that targets large entities and in the form of static long-term contractual agreements is available in EU MS.

***Recommendations to address it***

- Clear definition of Customers for DR covering consumers, producers, and prosumers.
- Clear definition of stakeholders' roles and responsibilities
- Clear regulatory framework for introducing Explicit & Implicit DR for energy markets (including pricing and incentive guidelines).
- Suggestions for the inclusion of customers regardless of size and type, both residential and non-residential shall be covered, e.g. by introducing the concept of Virtual Power Plants or (Local) Energy Communities
- Clear definition of a baseline methodology

- Clear definition of guidelines regarding remuneration, especially for consumption.

There is a lack of a uniform framework for **deployment, installation and management of smart metering infrastructure** for accessing energy markets in general, as well as allowing participation to more dynamic transactions, such as DR.

**Why it's a gap:**

There are quite a lot of different national approaches for energy metering across EU MS, not only in terms of the actual equipment, but also considering the processes for charging and providing for credible transactions among engaged stakeholders. Even in cases where utilities, aggregators, or even the customers' themselves are able to deploy their systems/infrastructure, it is not clear how this equipment should be accessed, maintained, or secured. In fact in some MS, even if the equipment exists it cannot be used for the actual financial transactions, where there is an obligation to use measurements deriving from legacy equipment.

**Recommendations to address it**

- Define the specific needs in terms of smart metering infrastructure for DR programs
- Identify and define the stakeholders that are responsible for covering the need in smart metering infrastructure (e.g. TSO, DSO, Aggregators, etc.)
- Propose and adopt an open and common standard for smart metering infrastructure and data sharing so that all stakeholders can operate in the same context. All customers participating in DR programs should be equipped with certified smart metering equipment.

2. Market Process and Coordination

**Market accessibility** is a barrier, especially to small customers, and to overcome it, an EU framework should be created in order to have a fair level playing field for all providers of **flexibility** resources in the market.

*Market accessibility differs by the size of prosumers due to regulatory access barriers.*

**Why it's a gap:**

With the current status of the markets, it is not possible for all small and most medium customers to participate in DR programs. As the markets become more and more dynamic, the traditional contract paradigms have not changed and the provision of flexibility is accompanied by significant constraints.

**Recommendations to address it**

- Enable easy participation of all customers, regardless of size and type of DR markets, through specific market stakeholders, such as aggregators, flexibility traders, etc. This shall be made available under specific rules and guidelines towards MS so that all parties can be allowed to participate under fair conditions.
- Introduce automated and secure schemes that will further facilitate and accelerate transaction related to DR requests, supporting highly dynamic contracts.

- Further clarify the roles of each stakeholder in the markets, especially for novel ones like aggregators and energy communities.
- Specify the processes different market parties are responsible for, such as clear schemes for the “fair compensation” between BRPs involved in independent aggregation. Clear guidelines on EU level could increase confidence for new market participants to enter the market and reduce regulatory uncertainty.

*Market fragmentation is an issue to be encountered;*

***Why it's a gap:***

In current markets, there are different authorities, different rules, and different (pre)-qualification criteria to be met from stakeholders, in order to participate in. Such heterogeneity makes it difficult not only to scale up market participation from multiple diverse entities, but also it creates certain challenges in terms of coordination and monitoring.

***Recommendations to address it***

- An integrated system approach, which includes coordination between all market players, could bridge this gap.
- There should be a code of conduct for consistently setting prequalification criteria among EU MS, facilitating access for aggregators active in different EU member states.
- Clearer participation rules for all stakeholders shall be provided,
- Markets rules shall be made simpler and more transparent so that more parties can efficiently participate.
- Minimum size of aggregated flexibility pools should be reduced in most markets to enable participation of bundled small- and medium sized prosumers.
- Markets that are specifically relevant for smaller prosumers in the distribution grid, which are especially DSO congestion management markets, should be fostered and further institutionalized.

## ***Privacy and security***

It is required to define in a clear way **who owns/manages and who has access to data**. In addition, the routes of access need to be specified. It is also necessary to define, clearly, which information should be made transparent and available in the energy sector. All rules on encryption should be applied. Data protection should take place at source, in transit and at rest, whereas data should be destroyed equivalently when necessary.

***Why it's a gap:***

With an increasing number of market stakeholders and the generation of a lot more data through smart ICT technologies deployed, their handling becomes cumbersome, especially in terms of traceability and transparency

***Recommendations to address it***

- Guidelines to all stakeholders shall be provided towards presenting clear information on data access, data editing and sharing.
- Specific rules shall be drafted for the traceability of data so that their access can be monitored
- Besides regulations, a standardised approach shall be introduced, with the respective certification process, for ensuring compliance to regulations, beyond arbitrary statements.

---

*It is also necessary to define, clearly, **which information should be made transparent and available** in the energy sector.*

***Why it's a gap:***

Through new technologies, either software or hardware, a lot more energy-related information is generated and distributed, either, for example, in terms of measurements, actions, or transactions. However, it is not clarified which information is actually used and how, or which level of information should be transparent and to who.

***Recommendations to address it***

- Clear definition of the minimum data required shall be introduced for DR programs, and any additional information shall be bound by specific regulations.
- Clear definition of the information that needs to be transparent and available, in an anonymized and privacy-ensuring manner to the energy sector
- All rules on encryption shall be applied.

***Data protection** should take place at source, in transit and at rest, whereas data should be destroyed equivalently when necessary.*

***Why it's a gap:***

- Nowadays cybersecurity has been proven to be one of the most significant challenges, especially during the transition to a more digital era. As the energy sector becomes more and more connected to the Internet (e.g. by deploying huge quantities of Internet of Things) the need for improved data protection (and not only) becomes apparent.

***Recommendations to address it***

- Data Security and Data Integrity shall be covered in the regulations with special focus on the customer's side
- Minimum requirements shall be proposed for DR-related equipment, for ensuring both data security and integrity.

---

***Data sharing** is vital and correct data access as well, meaning that these are areas where the rules should be defined in a clear way.*

***Why it's a gap:***

The way data are shared does not follow a standardised approach around EU and makes it more difficult for vendors and service providers to adjust to different countries' and markets' requirements. In addition, besides interoperability, privacy and security aspects should be carefully identified so that all participating stakeholders can be protected at any given time.

There is a large discrepancy among DR communication protocols, data formats, and models that are used to express the data needed by DR stakeholders, marketplaces, vendors, and utilities. The fact that different models are used in DR systems hinders the interoperability between them and, consequently, hinders the exchange of data.

***Recommendations to address it***

- Data Sharing shall be thoroughly covered in future regulations, introducing standardised methods that will not only facilitate information exchange but also secure and protect all parties involved in the process, with special focus on the customers' side.
- Data quality should also be addressed, given the critical aspects covered (i.e. energy measurements). False information could prove to be fatal for the network.
- The use of ontologies (e.g., the DELTA ontology) defines a common vocabulary for the DR domain that supports semantic interoperability among DR systems.
- DR standards should have associated an ontology (e.g., the OpenADR standard and the OpenADR ontology) to provide a common understanding of the structure of information among people or software agents.
- DR standards should use a middleware to exchange information (e.g., the DELTA CIM middleware), when the source of information provides data not expressed according to an ontology the middleware must be able to translate, i.e., normalised, such data. Similarly, if the target of a certain information is not able to handle data expressed according to an ontology the middleware must be able to translate such data in a format and model understandable by the target.

#### 4. Conclusions

In conclusion, this paper provided a brief analysis of the corresponding articles in the Regulations and Directives of the EU and searched information about key interest domains of the DELTA project, such as **demand response, smart metering, data management, blockchain, smart contracts, prosumers, and flexibility**. The results showed that terms like demand response, flexibility and smart metering are common within both Regulations and Directives. However, terms like blockchain, smart contracts, prosumers, etc., are rare or even not mentioned at all. This indeed implies the existence of gaps in the current policy, which need to be addressed, so that key elements of projects such as DELTA could be implemented in reality