UseCases

Based on IEC 62559-2 edition 1   
Generated from UML Use Case Repository with Modsarus® (EDF R&D Tool)

Use Cases U2Demo

Business Use Cases

PT: Future EC operation with ancillary services

Description of the use case

Name of use case

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
|  | Use Cases U2Demo | PT: Future EC operation with ancillary services |

Version management

Scope and objectives of use case

|  |  |
| --- | --- |
| ***Scope and objectives of use case*** | |
| ***Scope*** |  |
| ***Objective(s)*** | Increase energy literacy  Reduce energy invoice User Engagement in DR Increase use of renewables |
| ***Related business case(s)*** | Operation of the EC with flexibility/ ancillary services |

Narrative of Use Case

|  |
| --- |
| ***Narrative of use case*** |
| ***Short description*** |
| This Business use case (BUC) models a possible future scenario of the EC in Portugal. In this BUC the community is assumed to be capable of participating in mFRR markets. |
| ***Complete description*** |
| This BUC expands the BUC “Current EC operation*”* for a possible future scenario of the EC. In this BUC batteries will be available and connected to the EC member level. Scheduling will be optimized by the EC manager according to high-level preferences of the EC members (e.g. cost savings), the energy sharing models available and the day-ahead mFRR contracts established.  Summary of use case   * [**14 Day-ahead mFRR**](#{BB31E440-3C2F-43cd-8A09-329B0DC14CDD}) Description: In this scenario, there are three participating roles: TSO, MARI platform and EC manager. This scenario models the process of: (i) creating a mFRR auction, (ii) participating in the auction and (iii) contractualizing mFRR between ECs and the TSO through the MARI platform.   + 01. Technical Proposal for mFRR auction Description: indicates necessities of day-ahead mFRR and submits these to the european platform MARI. mFRR demands can be two-fold: scheduled activations or direct activations. Scheduled activations are activations already set for the next 15 minute period, while direct activations can result from unexpected unavailability of activations. The two demands can be expressed as elastic or inelastic. Elastic demands indicate price and quantity, while inelastic only indicate quantity (need to be satisfied for security or balancing reasons).   + 02. Publish auction Description: makes the auction details in the platform public.   + 03. Acknowledge mFRR requests Description: Acknowledges the mFRR requests made by the TSO.   + 04. Request NWP and meter data Description: Requests Numerical Weather Prediction data using a specific API and meter data from the DSO   + 05. PV and Consumption Forecast Description: Forecasts the consumption and production based on historical data.   + 06. Compute available headroom from EC batteries Description: Compute the available headroom from EC batteries   + 07. Request confirmation of participation on mFRR from EC members Description: Communicates the auction details to the EC members and requests offers (direction, maximum quantity, minimum quantity, price, service window).   + 08. Aggregation and placement of selling offer Description: Aggregates the participation offers from EC members and computes the aggregated offer that can submitted to MARI.   + 09. Market Clearing Description: evaluates all offers and selects winning bids based on the optimization used in the MARI platform. The two main objectives of that optimization are the maximization of inelastic demand satisfaction and economic surplus maximization. In case of infeasibility, the platform communicates to the TSO only the national offers and demands.   + 10. Process Market results Description: removes mFRR request and communicates the market clearing results to the TSO and participants.   + 10. Process Market results Description: removes mFRR request and communicates the market clearing results to the TSO and participants.   + 11. Publish Market clearing results Description: publishes the clearing results of the market and a description of the algorithm used by the MARI platform.   + 12. Organize information and send to the EC Members Description: The EC manager receives information from the TSO regarding the approval or rejection of the mFRR offer. If approved, the EC manager communicates the contract details to the EC members * [**15 Scheduling with Energy Sharing/P2P Model 3**](#{03B6CE20-FDD9-4507-A2CB-5690DAE09554}) Description: In this scenario, there are two participating roles: EC manager and EC member. This scenario models the scheduling of flexible loads and batteries at the member level based on the assumption of a predefined pricing mechanism set by the EC manager for internal energy exchange. Scheduling is carried out for flexible loads by the EC member and for batteries by the EC manager based on the price of energy sharing, price set by the Supplier, weather predictions, consumption production forecasts, the high-level priorities of the EC member and the contractualized mFRR with the TSO.   + 01. Request NWP Data Description: Request Numerical Weather Prediction using an API.   + 02. PV and Consumption Forecast Description: Forecast consumption and production based on historical data.   + 03. Request Retailer price and set EC internal price Description: Request the retailer price for the electricity to be bought from the grid and set the EC internal price.   + 04. Individual Look-Ahead Energy Resources Scheduling Description: Optimization of energy resources per house considering different objective functions based on high-level priorities, such as cost savings, green energy and comfort (decision support methods)   + 05. Battery Scheduling Description: Optimization of EC battery based on the optimization carried out for the EC members optimization   + 06. Organize scheduling information from EC members Description: Store scheduling data from EC members * [**15 Scheduling with Energy Sharing/P2P Model 4**](#{EB3BAF9F-29EC-41c7-A0DA-6DE6D69D89A2}) Description: In this scenario, there are two participating roles: EC manager and EC member. This scenario models the scheduling of flexible loads and batteries at the member level based on the assumption of a local market that accepts sell offers and buy bids from EC members and is cleared by the EC manager. Scheduling is carried out for flexible loads by the EC member and for batteries by the EC manager based on the prices resulting from the local market clearing, price set by the Supplier, weather predictions, consumption and production forecasts, the high-level priorities of the EC member and contractualized mFRR with the TSO.   + 01. Request NWP Data Description: Request Numerical Weather Prediction using an API.   + 02. PV and Consumption Forecast Description: Forecast consumption and production based on historical data.   + 03. Request Retailer price Description: Request the retailer price for the electricity to be bought from the grid.   + 04. Initial Individual Look-Ahead Energy Resources Scheduling Description: Optimize energy resources per house considering different objective functions. This optimization serves as a initial condition to get the surplus and shortages of each peer and is done based on high-level priorities, such as cost savings, green energy and comfort   + 05. Make offers and bids Description: Determine the offers and bids to make to the local market (pairs of price and quantity). The offers and bids can be made by resorting to decision support methods.   + 06. Aggregate offers and bids Description: Aggregate the offers and bids for further processing.   + 07. Market Clearing Description: Perform market clearing based on the offers and bids made.   + 08. Process results Description: Determine the offers and bids cleared, the corresponding members, the amount that each members needs to pay and be remunerated.   + 09. Ack. results Description: Acknowledge the results cleared by the market   + 10. Final Individual Look-Ahead Energy Resources Scheduling Description: Optimize energy resources per house considering the results obtained from market clearing and also the member's high-level priorities, such as cost savings, green energy and comfort.   + 11. Battery Scheduling Description: Optimization of EC battery based on the optimization carried out for the EC members optimization   + 12. Organize scheduling information from EC members Description: Store scheduling data from EC members. * [**16 Operation**](#{237A0550-AD75-444a-B185-9217E5DE2108}) Description: In this scenario, there are two participating roles: EC manager and EC member. This scenario models the control of flexible loads and batteries at the EC member level, the validation of equipment correct operation and the scheduling of performance evaluation, which in case of significant deviation from the expected scheduling requests a new scheduling.   + 01. Measurement System Description: Get information from meters on consumption and production using an API.   + 02. Control Flexible Loads Description: Actuation of flexible loads and charge/discharge of EC member batteries according the scheduling previously defined.   + 03. Control BESS Description: Charge/discharge of community battery according the scheduling previously defined   + 04. Store Measurement Data Description: Store measurement data   + 05. Validation of equipment correct operation Description: Validate the equipment correct operation based on the measurements obtained from meters and the expected control actuation on flexible loads   + 06. Scheduling Performance Evaluation Description: Evaluate deviations between real and forecasted data and the corresponding impact on the previously set scheduling.   + 07. Request New Scheduling Description: request new scheduling if the deviations between real and forecasted data had a significant impact on the expected scheduling performance. * [**17 Settlement and Billing**](#{EB7138DD-AECD-43de-A786-E7F1D7BCBCE3}) Description: In this scenario, there are three participating roles: TSO, EC manager and EC member. This scenario models the billing and settlement process for the payment of mFRR by contractualized between the TSO and the EC.   + 01. Requests and Aggregates monthly mFRR activations and consumption and production data Description: The TSO aggregates the activations of mFRR and aggregates monthly consumption and production data sent by the DSO   + 02. Performance computation of EC mFRR participation Description: Considering the mFRR activations and meter data, the EC participation in mFRR is computed.   + 03. Computation of the payment for mFRR measures to ECs Description: computes the total payment for the energy actually delivered upon activation by ECs.   + 04. Payment of mFRR measures Description: Pays each EC the price for the energy actually delivered upon activation.   + 05. Ack. payment Description: receives payment for mFRR activations carried out by the community.   + 06. Exchange payment by vouchers and distribute payment among EC members Description: The EC manager distributes the payment received from the TSO for mFRR among the EC members. Distribution is carried out after exchanging the payment by vouchers for Municipality services.   + 07. Ack. Vouchers Description: The EC members receive payment from the EC manager for mFRR activation |

Key performance indicators (KPI)

|  |  |  |  |
| --- | --- | --- | --- |
| ***Key performance indicators*** | | | |
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | Energy literacy of the EC members | *Increase the energy literacy >=* *50%* | [Increase energy literacy](#{D86F6664-738A-465f-AB3E-38C8493280C9}) |
| 2 | Energy bill of the EC members | *Reduce energy invoice: >= 10%* | [Reduce energy invoice](#{77BD224D-363D-4488-9534-6F468FE50924}) |
| 3 | vouchers | *Increase in revenue created from DER >= 25%* | [Reduce energy invoice](#{77BD224D-363D-4488-9534-6F468FE50924}) |
| 4 | Number of active consumers in Energy Community | *Increase the number of active consumers, willing to engage in ECs and/or DR programs: >=* *25%* | [User Engagement in DR](#{B31AC518-EA47-41f3-A6D7-92A7C0C541A2}) |
| 5 | Peak Consumption Reduction | Reduction of peak consumption by the participation in DR programs >= 15% | [User Engagement in DR](#{B31AC518-EA47-41f3-A6D7-92A7C0C541A2}) |
| 6 | Renewables production curtailment | Avoid renewables production curtailment: >= 25% (at pilot level) | [User Engagement in DR](#{B31AC518-EA47-41f3-A6D7-92A7C0C541A2}) |
| 7 | Use of DERs | *Increase in the use of DERs by active consumers >= 30%* | [Increase use of renewables](#{19DDECA8-C479-4c3f-9B96-7CD295AEF366}) |

Use case conditions

|  |  |
| --- | --- |
| ***Use case conditions*** | |
| ***Assumptions*** | |
| ***Prerequisites*** | |
| 1 | Assumptions:   * Batteries at the member level put operated by the EC manager * Flexible loads (smart appliances) at the EC member level * mFRR can be provided by the batteries and also by the actuation of the flexible loads. * Contracts established have a price for energy actually delivered upon activation (€/MWh). * Actuation from batteries and flexible loads is not optional when activation is requested |

Further information to the use case for classification/mapping

|  |
| --- |
| ***Classification information*** |
| ***Relation to other use cases*** |
|  |
| ***Level of depth*** |
|  |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
|  |
| ***Nature of the use case*** |
| BUC |
| ***Further keywords for classification*** |
| Portuguese regulations, Ancillary services, Energy sharing models (predefined pricing and internal auction model), Batteries on member level, Battery optimization on manager level , Battery optimization according to members preferences |

General remarks

Diagrams of use case

|  |
| --- |
| ***Diagram(s) of use case*** |
| BusinessUseCase1 - overview  BusinessUseCase1 - scenarios flowchart |

Technical details

Actors

|  |  |  |  |
| --- | --- | --- | --- |
| ***Actors*** | | | |
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
|  | |  | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| EC Manager | Business | The EC manager has a versatile role in the ECs.  In the case of the Italian and Belgian pilot, the EC manager collects the data needed for forecasting algorithms and calculates the forecast. Additionally, the EC manager creates a schedule for the flexible assets and gives advice to the EC members to guide their energy consumption behavior.  In the Italian pilot, the flexible assets are under the governance of each EC member. In this case, the EC manager schedules these assets and gives the result as an advice to the members.  In the Belgian pilot, the EC manager has control over the flexible assets, creates the schedule and controls the assets.  In both governance models, the EC manager monitors the operation, decides on possible rescheduling and sends the measurements to the EC members for monitoring purpose.  In the Italian pilot, the EC manager has control over the bank account of the community and acknowledges the incentives received for sharing energy.  In the Dutch pilot, the EC manager is responsible for settling the bill with the supplier and for the internal billing process. Additionally, the EC manager is active in the communication of the load profile of the EC to the DSO and in the process of offering flexibility services to the DSO. In the Portuguese pilot, the EC manager can take a more passive or more active role in the EC, depending on which entity makes the scheduling for the batteries. If the EC manager optimizes the scheduling of the batteries, then it is an active entity which considers community goals and participation in flexibility or in mFRR in the optimization. Otherwise, it plays a passive role, collecting and processes data only. This role is also responsible, in the Portuguese pilot, for exchanging money from energy sharing for Municipality vouchers to be distributed among EC members. |  |
| EC Member | Business | The EC member is an entity in the community which can act as a prosumer or a consumer. Depending on the governance model of the EC, the EC member has an active role and can control the own assets or has a passive role in which the EC member does not control these assets. |  |
| MARI Platform | Business | The MARI platform is a role used in the pilot site in Portugal.  This platform is an european platform used for the contractualization of mFRR. |  |
| DSO | Business | Distribution System Operators (DSO) are responsible for distribution and management of energy, starting at the TSO substations to the points of consumption.  The DSO plays an integral role in the management of energy communities. In the pilots in Italy, Belgium and Portugal, the DSO provides the official measurements of the consumption and injection data of EC members. Depending on country specific regulations and the configuration of the EC, the measurements are used in an internal billing process or for the billing process through a supplier.  In the Dutch pilot, the DSO does not provide the official measurements, but they are collected by a measurement company. The DSO then receives the data and drafts a bill for the grid usage of the EC. In the Italian pilot, the meter data is sent to the GSE, to compute the incentive for the shared energy, and to the suppliers of each EC Member, for the individual billing process.  In the Belgian pilot, the DSO computes the credit points for shared energy and shares the measurements with the suppliers and with Klimaan for the internal billing process.   Apart from consolidating the consumption and injection data, the DSO plays an important role in the flexibility market in the Netherlands, Italy and Portugal. The DSO evaluates the grid load and places flexibility requests, both on the DA flexibility market and on the ID flexibility market. In the Netherlands the flexibility market is managed through the platform GOPACS, in Italy and Portugal through Piclo Flex. |  |
| TSO | Business | The transmission system operator (TSO) is a role used in the pilot site in Portugal. This role submits mFRR requests to the MARI platform for auction and remunerates the activations. |  |

References

Step by step analysis of use case

Overview of scenarios

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | 14 Day-ahead mFRR | In this scenario, there are three participating roles: TSO, MARI platform and EC manager. This scenario models the process of: (i) creating a mFRR auction, (ii) participating in the auction and (iii) contractualizing mFRR between ECs and the TSO through the MARI platform. |  |  |  |  |
| 2 | 15 Scheduling with Energy Sharing/P2P Model 3 | In this scenario, there are two participating roles: EC manager and EC member. This scenario models the scheduling of flexible loads and batteries at the member level based on the assumption of a predefined pricing mechanism set by the EC manager for internal energy exchange. Scheduling is carried out for flexible loads by the EC member and for batteries by the EC manager based on the price of energy sharing, price set by the Supplier, weather predictions, consumption production forecasts, the high-level priorities of the EC member and the contractualized mFRR with the TSO. |  |  |  |  |
| 3 | 15 Scheduling with Energy Sharing/P2P Model 4 | In this scenario, there are two participating roles: EC manager and EC member. This scenario models the scheduling of flexible loads and batteries at the member level based on the assumption of a local market that accepts sell offers and buy bids from EC members and is cleared by the EC manager. Scheduling is carried out for flexible loads by the EC member and for batteries by the EC manager based on the prices resulting from the local market clearing, price set by the Supplier, weather predictions, consumption and production forecasts, the high-level priorities of the EC member and contractualized mFRR with the TSO. |  |  |  |  |
| 4 | 16 Operation | In this scenario, there are two participating roles: EC manager and EC member. This scenario models the control of flexible loads and batteries at the EC member level, the validation of equipment correct operation and the scheduling of performance evaluation, which in case of significant deviation from the expected scheduling requests a new scheduling. |  |  |  |  |
| 5 | 17 Settlement and Billing | In this scenario, there are three participating roles: TSO, EC manager and EC member. This scenario models the billing and settlement process for the payment of mFRR by contractualized between the TSO and the EC. |  |  |  |  |

Steps - Scenarios

14 Day-ahead mFRR

In this scenario, there are three participating roles: TSO, MARI platform and EC manager. This scenario models the process of: (i) creating a mFRR auction, (ii) participating in the auction and (iii) contractualizing mFRR between ECs and the TSO through the MARI platform.

|  |
| --- |
| Scenario1 - activities flowchart |

Scenario step by step analysis

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Scenario*** | | | | | | | | |
| ***Scenario name*** | | 14 Day-ahead mFRR | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 1.1 |  | 01. Technical Proposal for mFRR auction | indicates necessities of day-ahead mFRR and submits these to the european platform MARI. mFRR demands can be two-fold: scheduled activations or direct activations. Scheduled activations are activations already set for the next 15 minute period, while direct activations can result from unexpected unavailability of activations. The two demands can be expressed as elastic or inelastic. Elastic demands indicate price and quantity, while inelastic only indicate quantity (need to be satisfied for security or balancing reasons). |  | [TSO](#{3F0F40DD-C498-479b-B544-253165582EEE}) | [MARI Platform](#{8394FCAC-BC83-4a16-A08B-7C09D4C25284}) | [Info1-PT Future EC operation with mFRR services: Auction requirements](#{7950130B-1041-464f-9204-B4AB0E8871E5}) |  |
| 1.2 |  | 02. Publish auction | makes the auction details in the platform public. |  | [MARI Platform](#{8394FCAC-BC83-4a16-A08B-7C09D4C25284}) | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [Info1-PT Future EC operation with mFRR services: Auction requirements](#{7950130B-1041-464f-9204-B4AB0E8871E5}) |  |
| 1.3 |  | 03. Acknowledge mFRR requests | Acknowledges the mFRR requests made by the TSO. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 1.4 |  | 04. Request NWP and meter data | Requests Numerical Weather Prediction data using a specific API and meter data from the DSO |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 1.5 |  | 05. PV and Consumption Forecast | Forecasts the consumption and production based on historical data. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 1.6 |  | 06. Compute available headroom from EC batteries | Compute the available headroom from EC batteries |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 1.7 |  | 07. Request confirmation of participation on mFRR from EC members | Communicates the auction details to the EC members and requests offers (direction, maximum quantity, minimum quantity, price, service window). |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 1.8 |  | 08. Aggregation and placement of selling offer | Aggregates the participation offers from EC members and computes the aggregated offer that can submitted to MARI. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [MARI Platform](#{8394FCAC-BC83-4a16-A08B-7C09D4C25284}) | [Info2-PT Future EC operation with mFRR services: Response to auction](#{AEEABCCF-3D22-4910-8A58-1BAD3050AF95}) |  |
| 1.9 |  | 09. Market Clearing | evaluates all offers and selects winning bids based on the optimization used in the MARI platform. The two main objectives of that optimization are the maximization of inelastic demand satisfaction and economic surplus maximization. In case of infeasibility, the platform communicates to the TSO only the national offers and demands. |  | [MARI Platform](#{8394FCAC-BC83-4a16-A08B-7C09D4C25284}) |  | [Info3-PT Future EC operation with flexibility services: Flexibility Market Clearing Results](#{2BA5937F-8B2C-4401-9DCE-7C82943B0AE2}) |  |
| 1.10 |  | 10. Process Market results | removes mFRR request and communicates the market clearing results to the TSO and participants. |  | [MARI Platform](#{8394FCAC-BC83-4a16-A08B-7C09D4C25284}) | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [Info4-PT Future EC operation with mFRR services: EC results mFRR market](#{9BF71A10-3717-4c2b-B81C-504ECED1B1F9}) |  |
| 1.11 |  | 10. Process Market results | removes mFRR request and communicates the market clearing results to the TSO and participants. |  | [MARI Platform](#{8394FCAC-BC83-4a16-A08B-7C09D4C25284}) | [TSO](#{3F0F40DD-C498-479b-B544-253165582EEE}) | [Info5-PT Future EC operation with mFRR services: Auction results](#{960E0AFA-53A8-4dce-A57E-3E42E13CA802}) |  |
| 1.12 |  | 11. Publish Market clearing results | publishes the clearing results of the market and a description of the algorithm used by the MARI platform. |  | [TSO](#{3F0F40DD-C498-479b-B544-253165582EEE}) | [MARI Platform](#{8394FCAC-BC83-4a16-A08B-7C09D4C25284}) | [Info6-PT Future EC operation with flexibility services: Validation of market results](#{C80FB698-2968-424d-88BE-547F59C49F65}) |  |
| 1.13 |  | 12. Organize information and send to the EC Members | The EC manager receives information from the TSO regarding the approval or rejection of the mFRR offer. If approved, the EC manager communicates the contract details to the EC members |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |

* 1.1. 01. Technical Proposal for mFRR auction

Business section: 14 Day-ahead mFRR/01. Technical Proposal for mFRR auction  
indicates necessities of day-ahead mFRR and submits these to the european platform MARI. mFRR demands can be two-fold: scheduled activations or direct activations. Scheduled activations are activations already set for the next 15 minute period, while direct activations can result from unexpected unavailability of activations. The two demands can be expressed as elastic or inelastic. Elastic demands indicate price and quantity, while inelastic only indicate quantity (need to be satisfied for security or balancing reasons).   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation with mFRR services: Auction requirements](#{7950130B-1041-464f-9204-B4AB0E8871E5}) | InfoInstance |  |

* 1.2. 02. Publish auction

Business section: 14 Day-ahead mFRR/02. Publish auction  
makes the auction details in the platform public.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation with mFRR services: Auction requirements](#{7950130B-1041-464f-9204-B4AB0E8871E5}) | InfoInstance |  |

* 1.8. 08. Aggregation and placement of selling offer

Business section: 14 Day-ahead mFRR/08. Aggregation and placement of selling offer  
Aggregates the participation offers from EC members and computes the aggregated offer that can submitted to MARI.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation with mFRR services: Response to auction](#{AEEABCCF-3D22-4910-8A58-1BAD3050AF95}) | InfoInstance |  |

* 1.9. 09. Market Clearing

Business section: 14 Day-ahead mFRR/09. Market Clearing  
evaluates all offers and selects winning bids based on the optimization used in the MARI platform. The two main objectives of that optimization are the maximization of inelastic demand satisfaction and economic surplus maximization. In case of infeasibility, the platform communicates to the TSO only the national offers and demands.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation with flexibility services: Flexibility Market Clearing Results](#{2BA5937F-8B2C-4401-9DCE-7C82943B0AE2}) | InfoInstance |  |

* 1.10. 10. Process Market results

Business section: 14 Day-ahead mFRR/10. Process Market results  
removes mFRR request and communicates the market clearing results to the TSO and participants.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation with mFRR services: EC results mFRR market](#{9BF71A10-3717-4c2b-B81C-504ECED1B1F9}) | InfoInstance |  |

* 1.11. 10. Process Market results

Business section: 14 Day-ahead mFRR/10. Process Market results  
removes mFRR request and communicates the market clearing results to the TSO and participants.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation with mFRR services: Auction results](#{960E0AFA-53A8-4dce-A57E-3E42E13CA802}) | InfoInstance |  |

* 1.12. 11. Publish Market clearing results

Business section: 14 Day-ahead mFRR/11. Publish Market clearing results  
publishes the clearing results of the market and a description of the algorithm used by the MARI platform.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation with flexibility services: Validation of market results](#{C80FB698-2968-424d-88BE-547F59C49F65}) | InfoInstance |  |

15 Scheduling with Energy Sharing/P2P Model 3

In this scenario, there are two participating roles: EC manager and EC member. This scenario models the scheduling of flexible loads and batteries at the member level based on the assumption of a predefined pricing mechanism set by the EC manager for internal energy exchange. Scheduling is carried out for flexible loads by the EC member and for batteries by the EC manager based on the price of energy sharing, price set by the Supplier, weather predictions, consumption production forecasts, the high-level priorities of the EC member and the contractualized mFRR with the TSO.

|  |
| --- |
| Scenario1 - activities flowchart |

Scenario step by step analysis

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Scenario*** | | | | | | | | |
| ***Scenario name*** | | 15 Scheduling with Energy Sharing/P2P Model 3 | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 2.1 |  | 01. Request NWP Data | Request Numerical Weather Prediction using an API. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 2.2 |  | 02. PV and Consumption Forecast | Forecast consumption and production based on historical data. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [Info7-PT Future EC operation member level: Forecasts](#{6881A5A5-023C-483c-8947-F6D9C36EABAB}) |  |
| 2.3 |  | 03. Request Retailer price and set EC internal price | Request the retailer price for the electricity to be bought from the grid and set the EC internal price. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [Info8-PT Future EC operation member level: Electricity price information Model 3](#{88627B16-4E07-4040-B53E-7D71D6F8C6FB}) |  |
| 2.4 |  | 04. Individual Look-Ahead Energy Resources Scheduling | Optimization of energy resources per house considering different objective functions based on high-level priorities, such as cost savings, green energy and comfort (decision support methods) |  | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [Info9-PT Future EC operation member level: House Resources Scheduling](#{8820A0C5-9BED-4802-BCE0-A9C5A60382CD}) |  |
| 2.5 |  | 05. Battery Scheduling | Optimization of EC battery based on the optimization carried out for the EC members optimization |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 2.6 |  | 06. Organize scheduling information from EC members | Store scheduling data from EC members |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |

* 2.2. 02. PV and Consumption Forecast

Business section: 15 Scheduling with Energy Sharing/P2P Model 3/02. PV and Consumption Forecast  
Forecast consumption and production based on historical data.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation member level: Forecasts](#{6881A5A5-023C-483c-8947-F6D9C36EABAB}) | InfoInstance |  |

* 2.3. 03. Request Retailer price and set EC internal price

Business section: 15 Scheduling with Energy Sharing/P2P Model 3/03. Request Retailer price and set EC internal price  
Request the retailer price for the electricity to be bought from the grid and set the EC internal price.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation member level: Electricity price information Model 3](#{88627B16-4E07-4040-B53E-7D71D6F8C6FB}) | InfoInstance |  |

* 2.4. 04. Individual Look-Ahead Energy Resources Scheduling

Business section: 15 Scheduling with Energy Sharing/P2P Model 3/04. Individual Look-Ahead Energy Resources Scheduling  
Optimization of energy resources per house considering different objective functions based on high-level priorities, such as cost savings, green energy and comfort (decision support methods)   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation member level: House Resources Scheduling](#{8820A0C5-9BED-4802-BCE0-A9C5A60382CD}) | InfoInstance |  |

15 Scheduling with Energy Sharing/P2P Model 4

In this scenario, there are two participating roles: EC manager and EC member. This scenario models the scheduling of flexible loads and batteries at the member level based on the assumption of a local market that accepts sell offers and buy bids from EC members and is cleared by the EC manager. Scheduling is carried out for flexible loads by the EC member and for batteries by the EC manager based on the prices resulting from the local market clearing, price set by the Supplier, weather predictions, consumption and production forecasts, the high-level priorities of the EC member and contractualized mFRR with the TSO.

|  |
| --- |
| Scenario2 - activities flowchart |

Scenario step by step analysis

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Scenario*** | | | | | | | | |
| ***Scenario name*** | | 15 Scheduling with Energy Sharing/P2P Model 4 | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 3.1 |  | 01. Request NWP Data | Request Numerical Weather Prediction using an API. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 3.2 |  | 02. PV and Consumption Forecast | Forecast consumption and production based on historical data. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [Info7-PT Future EC operation member level: Forecasts](#{6881A5A5-023C-483c-8947-F6D9C36EABAB}) |  |
| 3.3 |  | 03. Request Retailer price | Request the retailer price for the electricity to be bought from the grid. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}), [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [Info10-PT Future EC operation member level: Electricity price information Models 4,5,6](#{593F3448-26BB-413c-8B8B-11870F3C194A}) |  |
| 3.4 |  | 04. Initial Individual Look-Ahead Energy Resources Scheduling | Optimize energy resources per house considering different objective functions. This optimization serves as a initial condition to get the surplus and shortages of each peer and is done based on high-level priorities, such as cost savings, green energy and comfort |  | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) |  |  |  |
| 3.5 |  | 05. Make offers and bids | Determine the offers and bids to make to the local market (pairs of price and quantity). The offers and bids can be made by resorting to decision support methods. |  | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [Info11-PT Future EC operation member level: Offers and bids information Model 4](#{68ADE6E0-5615-4d00-9B10-7CA3E22B05E1}) |  |
| 3.6 |  | 06. Aggregate offers and bids | Aggregate the offers and bids for further processing. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 3.7 |  | 07. Market Clearing | Perform market clearing based on the offers and bids made. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 3.8 |  | 08. Process results | Determine the offers and bids cleared, the corresponding members, the amount that each members needs to pay and be remunerated. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [Info12-PT Future EC operation member level: Energy Sharing Market Clearing Results](#{4DEAAE85-254C-4c1a-AE23-98DCB82994F6}) |  |
| 3.9 |  | 09. Ack. results | Acknowledge the results cleared by the market |  | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) |  |  |  |
| 3.10 |  | 10. Final Individual Look-Ahead Energy Resources Scheduling | Optimize energy resources per house considering the results obtained from market clearing and also the member's high-level priorities, such as cost savings, green energy and comfort. |  | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [Info9-PT Future EC operation member level: House Resources Scheduling](#{8820A0C5-9BED-4802-BCE0-A9C5A60382CD}) |  |
| 3.11 |  | 11. Battery Scheduling | Optimization of EC battery based on the optimization carried out for the EC members optimization |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 3.12 |  | 12. Organize scheduling information from EC members | Store scheduling data from EC members. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |

* 3.2. 02. PV and Consumption Forecast

Business section: 15 Scheduling with Energy Sharing/P2P Model 4/02. PV and Consumption Forecast  
Forecast consumption and production based on historical data.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation member level: Forecasts](#{6881A5A5-023C-483c-8947-F6D9C36EABAB}) | InfoInstance |  |

* 3.3. 03. Request Retailer price

Business section: 15 Scheduling with Energy Sharing/P2P Model 4/03. Request Retailer price  
Request the retailer price for the electricity to be bought from the grid.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation member level: Electricity price information Models 4,5,6](#{593F3448-26BB-413c-8B8B-11870F3C194A}) | InfoInstance |  |

* 3.5. 05. Make offers and bids

Business section: 15 Scheduling with Energy Sharing/P2P Model 4/05. Make offers and bids  
Determine the offers and bids to make to the local market (pairs of price and quantity). The offers and bids can be made by resorting to decision support methods.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation member level: Offers and bids information Model 4](#{68ADE6E0-5615-4d00-9B10-7CA3E22B05E1}) | InfoInstance |  |

* 3.8. 08. Process results

Business section: 15 Scheduling with Energy Sharing/P2P Model 4/08. Process results  
Determine the offers and bids cleared, the corresponding members, the amount that each members needs to pay and be remunerated.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation member level: Energy Sharing Market Clearing Results](#{4DEAAE85-254C-4c1a-AE23-98DCB82994F6}) | InfoInstance |  |

* 3.10. 10. Final Individual Look-Ahead Energy Resources Scheduling

Business section: 15 Scheduling with Energy Sharing/P2P Model 4/10. Final Individual Look-Ahead Energy Resources Scheduling  
Optimize energy resources per house considering the results obtained from market clearing and also the member's high-level priorities, such as cost savings, green energy and comfort.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation member level: House Resources Scheduling](#{8820A0C5-9BED-4802-BCE0-A9C5A60382CD}) | InfoInstance |  |

16 Operation

In this scenario, there are two participating roles: EC manager and EC member. This scenario models the control of flexible loads and batteries at the EC member level, the validation of equipment correct operation and the scheduling of performance evaluation, which in case of significant deviation from the expected scheduling requests a new scheduling.

|  |
| --- |
| Scenario3 - activities flowchart |

Scenario step by step analysis

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Scenario*** | | | | | | | | |
| ***Scenario name*** | | 16 Operation | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 4.1 |  | 01. Measurement System | Get information from meters on consumption and production using an API. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [Info13-PT Future EC operation member level: House Measurements](#{2AB90A0D-ACAF-48fc-AA79-B5887F058A19}) |  |
| 4.2 |  | 02. Control Flexible Loads | Actuation of flexible loads and charge/discharge of EC member batteries according the scheduling previously defined. |  | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) |  |  |  |
| 4.3 |  | 03. Control BESS | Charge/discharge of community battery according the scheduling previously defined |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 4.4 |  | 04. Store Measurement Data | Store measurement data |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 4.5 |  | 05. Validation of equipment correct operation | Validate the equipment correct operation based on the measurements obtained from meters and the expected control actuation on flexible loads |  |  |  |  |  |
| 4.6 |  | 06. Scheduling Performance Evaluation | Evaluate deviations between real and forecasted data and the corresponding impact on the previously set scheduling. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 4.7 |  | 07. Request New Scheduling | request new scheduling if the deviations between real and forecasted data had a significant impact on the expected scheduling performance. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |

* 4.1. 01. Measurement System

Business section: 16 Operation/01. Measurement System  
Get information from meters on consumption and production using an API.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation member level: House Measurements](#{2AB90A0D-ACAF-48fc-AA79-B5887F058A19}) | InfoInstance |  |

17 Settlement and Billing

In this scenario, there are three participating roles: TSO, EC manager and EC member. This scenario models the billing and settlement process for the payment of mFRR by contractualized between the TSO and the EC.

|  |
| --- |
| Scenario4 - activities flowchart |

Scenario step by step analysis

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Scenario*** | | | | | | | | |
| ***Scenario name*** | | 17 Settlement and Billing | | | | | | |
| ***Step No*** | ***Event*** | ***Name of process/activity*** | ***Description of process/activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirement, R-IDs*** |
| 5.1 |  | 01. Requests and Aggregates monthly mFRR activations and consumption and production data | The TSO aggregates the activations of mFRR and aggregates monthly consumption and production data sent by the DSO |  | [TSO](#{3F0F40DD-C498-479b-B544-253165582EEE}) |  |  |  |
| 5.2 |  | 02. Performance computation of EC mFRR participation | Considering the mFRR activations and meter data, the EC participation in mFRR is computed. |  | [TSO](#{3F0F40DD-C498-479b-B544-253165582EEE}) |  |  |  |
| 5.3 |  | 03. Computation of the payment for mFRR measures to ECs | computes the total payment for the energy actually delivered upon activation by ECs. |  | [TSO](#{3F0F40DD-C498-479b-B544-253165582EEE}) |  |  |  |
| 5.4 |  | 04. Payment of mFRR measures | Pays each EC the price for the energy actually delivered upon activation. |  | [TSO](#{3F0F40DD-C498-479b-B544-253165582EEE}) | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [Info14-PT Future EC operation with mFRR services: EC manager mFRR remuneration](#{649E275C-F8FC-4826-8AC7-CCB8C4531C50}) |  |
| 5.5 |  | 05. Ack. payment | receives payment for mFRR activations carried out by the community. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) |  |  |  |
| 5.6 |  | 06. Exchange payment by vouchers and distribute payment among EC members | The EC manager distributes the payment received from the TSO for mFRR among the EC members. Distribution is carried out after exchanging the payment by vouchers for Municipality services. |  | [EC Manager](#{BF6EE37F-C53B-469a-B171-2699A1A42E7F}) | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) | [Info15-PT Future EC operation with mFRR services: EC member mFRR remuneration](#{03D46213-3D05-4016-BC4B-11A93EDE8E6C}) |  |
| 5.7 |  | 07. Ack. Vouchers | The EC members receive payment from the EC manager for mFRR activation |  | [EC Member](#{D236E56F-8F7A-436e-917A-37A096594B02}) |  |  |  |

* 5.4. 04. Payment of mFRR measures

Business section: 17 Settlement and Billing/04. Payment of mFRR measures  
Pays each EC the price for the energy actually delivered upon activation.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation with mFRR services: EC manager mFRR remuneration](#{649E275C-F8FC-4826-8AC7-CCB8C4531C50}) | InfoInstance |  |

* 5.6. 06. Exchange payment by vouchers and distribute payment among EC members

Business section: 17 Settlement and Billing/06. Exchange payment by vouchers and distribute payment among EC members  
The EC manager distributes the payment received from the TSO for mFRR among the EC members. Distribution is carried out after exchanging the payment by vouchers for Municipality services.   
Information sent:

|  |  |  |
| --- | --- | --- |
| ***Business object*** | ***Instance name*** | ***Instance description*** |
| [PT Future EC operation with mFRR services: EC member mFRR remuneration](#{03D46213-3D05-4016-BC4B-11A93EDE8E6C}) | InfoInstance |  |

Information exchanged

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| Info1 | PT Future EC operation with mFRR services: Auction requirements | * Request ID * Elastic demands list: price (€/MWh) and quantity (MW) * Inelastic demand list: quantity (MW) |  |
| Info2 | PT Future EC operation with mFRR services: Response to auction | * Auction ID * EC ID * Direction (up/down) * Maximum quantity (MW) * Minimum quantity (MW) * Price (€/MWh) * Service window (Start-time timestamp, end-time timestamp) |  |
| Info3 | PT Future EC operation with flexibility services: Flexibility Market Clearing Results | * Flexibility Request ID * List of EC IDs for the flexibility request cleared   - EC ID - Flexible power cleared (MW) - Utilization fee cleared (€/MWh) - Availability fee cleared (€/MW/h) |  |
| Info4 | PT Future EC operation with mFRR services: EC results mFRR market | * EC ID * Auction ID * Direction (up/down) * Quantity cleared (MW) * Price cleared (€/MWh) * Service window (Start-time timestamp, end-time timestamp) |  |
| Info5 | PT Future EC operation with mFRR services: Auction results | * Request ID * Elastic demands cleared list: price cleared (€/MWh) and quantities (MW) * Inelastic demands cleared list: quantity (MW) |  |
| Info6 | PT Future EC operation with flexibility services: Validation of market results | * List of EC IDs validated   - EC ID - Validation status (Passed, Failed, Passed with lower (updated) flexible power) - Validated flexible power (MW) |  |
| Info7 | PT Future EC operation member level: Forecasts | * EC Member ID * Time Stamp * Time-series for the next 24 hours in 15 min steps:   - PV production (kWh) - Consumption (kWh) |  |
| Info8 | PT Future EC operation member level: Electricity price information Model 3 | * Time stamp * Time series for the day in 15 min intervals:   - Retailer price (€/kWh) - Internal EC price (€/kWh) |  |
| Info9 | PT Future EC operation member level: House Resources Scheduling | * EC Member ID * Time Stamp * Time-series for the next 24 hours   - PV Production per 15-min (kWh) - Consumption per 15-min (kWh) - Battery - State of Charge (%) |  |
| Info10 | PT Future EC operation member level: Electricity price information Models 4,5,6 | * Time stamp * Time series for the day in 15 min intervals:   - Retailer price (€/kWh) |  |
| Info11 | PT Future EC operation member level: Offers and bids information Model 4 | * EC Member ID * Time Stamp * Time series for the day in 15 min intervals:   - Offer quantity (kWh) - Offer price (€/kWh) - Bid quantity (kWh) - Bid price (€/kWh) |  |
| Info12 | PT Future EC operation member level: Energy Sharing Market Clearing Results | * EC Member ID * Time Stamp * Time series for the day in 15 min intervals:   - Offer quantity cleared (kWh) - Offer price cleared (€/kWh) - Bid quantity cleared (kWh) - Bid price cleared (€/kWh)   * Total amount to pay (€) * Total amount to be remunerated (€) |  |
| Info13 | PT Future EC operation member level: House Measurements | * EC Member ID * Timestamp * PV:   - S\_AC (VA) - S\_AC\_L1 (VA) - S\_AC\_L2 (VA) - S\_AC\_L3 (VA) - P\_AC (W) - P\_AC\_L1 (W) - P\_AC\_L2 (W) - P\_AC\_L3 (W) - Q\_AC (VAr) - Q\_AC\_L1 (VAr) - Q\_AC\_L2 (VAr) - Q\_AC\_L3 (VAr) - PF\_L1 (Real) - PF\_L2 (Real) - PF\_L3 (Real) - U\_AC\_L1 (V) - U\_AC\_L2 (V) - U\_AC\_L3 (V) - I\_AC\_L1 (A) - I\_AC\_L2 (A) - I\_AC\_L3 (A) - Ump\_DC\_St1 (V) - Imp\_DC\_St1 (A) - P\_DC\_St1 (W) - Ump\_DC\_St2 (V) - Imp\_DC\_St2 (A) - P\_DC\_St2 (W) - P\_DC (W) - f (Hz) - Temperature (ºC) - Inverter State (Integer)   * House   - S\_Imp (VA) - S\_Imp\_L1 (VA) - S\_Imp\_L2 (VA) - S\_Imp\_L3 (VA) - S\_Exp (VA) - S\_Exp\_L1 (VA) - S\_Exp\_L2 (VA) - S\_Exp\_L3 (VA) - P\_Imp (W) - P\_Imp\_L1 (W) - P\_Imp\_L2 (W) - P\_Imp\_L3 (W) - P\_Exp (W) - P\_Exp\_L1 (W) - P\_Exp\_L2 (W) - P\_Exp\_L3 (W) - Q\_Imp (VAr) - Q\_Imp\_L1 (VAr) - Q\_Imp\_L2 (VAr) - Q\_Imp\_L3 (VAr) - Q\_Exp (VAr) - Q\_Exp\_L1 (VAr) - Q\_Exp\_L2 (VAr) - Q\_Exp\_L3 (VAr) - PF\_L1 (Real) - PF\_L2 (Real) - PF\_L3 (Real) - U\_L1 (V) - U\_L2 (V) - U\_L3 (V) - I\_L1 (A) - I\_L2 (A) - I\_L3 (A) - f (Hz)   * BESS   - SOC (%) - Temperature (ºC)  - S\_Imp (VA) - S\_Imp\_L1 (VA) - S\_Imp\_L2 (VA) - S\_Imp\_L3 (VA) - S\_Exp (VA) - S\_Exp\_L1 (VA) - S\_Exp\_L2 (VA) - S\_Exp\_L3 (VA) - P\_Imp (W) - P\_Imp\_L1 (W) - P\_Imp\_L2 (W) - P\_Imp\_L3 (W) - P\_Exp (W) - P\_Exp\_L1 (W) - P\_Exp\_L2 (W) - P\_Exp\_L3 (W) - Q\_Imp (VAr) - Q\_Imp\_L1 (VAr) - Q\_Imp\_L2 (VAr) - Q\_Imp\_L3 (VAr) - Q\_Exp (VAr) - Q\_Exp\_L1 (VAr) - Q\_Exp\_L2 (VAr) - Q\_Exp\_L3 (VAr) - PF\_L1 (Real) - PF\_L2 (Real) - PF\_L3 (Real) - U\_L1 (V) - U\_L2 (V) - U\_L3 (V) - I\_L1 (A) - I\_L2 (A) - I\_L3 (A) - f (Hz) |  |
| Info14 | PT Future EC operation with mFRR services: EC manager mFRR remuneration | * EC ID * Energy remuneration:   - List of activation events - Total activated energy (MWh) - Total energy remuneration (€)   * Total remuneration for mFRR activation (€) |  |
| Info15 | PT Future EC operation with mFRR services: EC member mFRR remuneration | * EC member ID * Total payment for mFRR activations in vouchers (€) |  |

Requirements (optional)

Common terms and definitions

Custom information (optional)