* + - 1. Generic Business Use Case: Manage the flexibility on electricity demand and generation within a smart home from market signals

***1 Description of the use case***

***1.1 Name of use case***

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area /Domain(s)/ Zone(s)*** | ***Name of use case*** |
|  | Area: Energy System  Domain: Smart Home | GBUC-Manage the flexibility on electricity demand and generation within a smart home from market signals |

***1.2 Version management***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Version management*** | | | | |
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 2014. 07.01 | EDF | First draft (short description, roles) | WD Working Document |
|  |  |  |  |  |

***1.3 Scope and objectives of use case***

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| --- | --- |
| ***Scope and objectives of use case*** | |
| ***Scope*** | The scope is restricted to the smart home.  Emergency signals are out of the scope of the Use Case. |
| ***Objective(s)*** | * Adapt the behaviour of the Smart Home following the reception of market signals. |
| ***Related business case(s)*** | * Manage the flexibility of the smart home |

**1.5 Narrative of Use Case**

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| ***Narrative of use case*** |
| ***Short description*** |
| The Generic Business Use Case describes how the client/Resident responds to market signals (price incentives or DR requests) and adapts the behaviour of the Smart Home. He may:   * Optimise the energy bill through anticipation of a dynamic peak period send by the Electricity Supplier through the grid, * Define the load management strategy and adapt it depending on a DR request – if the Client/Resident has subscribed a contract with a Flexibility Operators, * Opt-out of a planned or occurring automatic response after receiving a notification or while the execution of an automatic response that results from a price incentive or a DR request. In that case, the Smart Home will not apply a strategy that takes into account price incentives or DR requests or will apply a new strategy that matches the Client/Resident’s instructions. |
| ***Complete description*** |
| Clients/Residents of a Smart Home may contribute to reduce peak electricity consumption by responding to market signals. The flexibility of ecosystems can be controlled in different ways:   * Price incentives period corresponding to changes in electricity prices issued at the initiative of the Electricity Supplier to help anticipate, stop, reduce or postpone certain uses of ecosystems, * Flexibility requests.   The Client/Resident may decide to opt out of tariff incentives and demands of flexibility (according to the contract condition), if desired.    The client/resident opts-out to a planned or occurring automatic response after receiving a notification or while the execution of an automatic response:   * Entirely or to a given level, i.e. either not to take into account price or to apply an instruction that the client/resident wants, * Over different scopes: the whole Smart Home, one or several areas (rooms), one or several uses, one or several appliances.   Price incentives, client/resident customisations and possible opt-outs are taken into account so as to define the load management strategies.  Functions :   * **Before a peak and depending on the price levels of the next day**: anticipate if need be * **During a peak**: shut off or automatically reduce loads within the customer’s smart home * **After a peak**: switch back on loads if need be * **After a change in supplier index**: choose and execute a load management strategy * **Before a DR request if a notification is sent**: anticipate if need be and if possible * **Upon receipt of the DR request**: define and carry out a load management strategy * **At the end of the DR request period**: define and carry out a load management strategy by switching back on loads if need be * **Opt-out**   **Principles**  See related SUC |

**1.5  *Key Performance Indicators***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Key performance indicators*** | | | | |
| ***ID*** | ***Name*** | ***Calculation*** | ***Scope*** | ***Objective*** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

***1.6  Use case conditions***

|  |
| --- |
| ***Use case conditions*** |
| ***Assumption*** |
| * See related System Use Cases |
| ***Prerequisite*** |
| * The client has subscribed an electricity plan from the Electricity Supplier |
| * The client/resident may have subscribed a contract to make flexibilities available to a flexibility operator |
| * The client/ resident’s smart home is up and running |
| * The smart meter receives timed actions to be executed in order to announce a dynamic peak period (which means that beforehand, the Electricity Supplier has requested to activate a dynamic peak period for this client) |
| * The client/ Resident owns a least one UI |
| * If needed the Smart Home is configured to feedback data enabling to validate the activation of flexibilities (for example, the smart meter is configured in “load curve” mode) |
| * DR requests are received through the SGCP |

***1.7 Further information to the use case for classification / mapping***

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| --- |
| ***Classification information*** |
| ***Relation to other use cases*** |
| GSUC-Manage the flexibility on electricity demand and generation from prices incentives |
| GSUC-Manage the flexibility on electricity demand and generation from DR requests |
| GSUC-Manage opt-outs of automatic responses (only prices signal and DR requests, emergency excluded) including manual actions |
| ***Level of depth*** |
| Short version |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| Business Use Case |
| ***Further keywords for classification*** |
| Smart Home, Load management strategy, Price incentive, DR request |

**1.8 General remarks**

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| ***General remarks*** |
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**2 Diagrams of use case**

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| ***Diagram(s) of use case*** |
| *Use Case Overview diagram*    *BUC-SUC Relations diagram* |

***3 Technical Details***

***3.1 Actors***

|  |  |
| --- | --- |
| ***Actors*** | |
| ***Grouping*** | ***Group Description*** |
|  |  |

| ***Actor name*** | ***Actor type*** | ***Actor Description*** | ***Further information specific to this Use Case*** |
| --- | --- | --- | --- |
| Resident | Role |  |  |
| Client | Role |  |  |
| Producer client | Role |  |  |
| Electricity supplier | Role |  |  |
| Distribution Grid Operator | Role |  |  |
| Meter Operator | Role |  |  |
| Flexibility Operator | Role |  |  |
| Telecommunication Operator | Role |  |  |

***3.2 References***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***References*** | | | | | | |
| ***No.*** | ***References Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

***4 Step by step analysis of use case***

***4.1 Overview of scenarios***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-Condition*** | ***Post-Condition*** |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |

***4.2 Scenarios***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 1 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 2 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

***5 Information Exchanged***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirements IDs*** |
|  |  |  |  |
|  |  |  |  |

***6 Requirements (optional)***

|  |
| --- |
| ***Requirements (optional)*** |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

***7 Common Terms and Definitions***

|  |  |
| --- | --- |
| ***Common Terms and Definitions*** | |
| ***Term*** | ***Definition*** |
|  |  |
|  |  |

***8 Custom Information (optional)***

|  |  |  |
| --- | --- | --- |
| ***Custom Information (optional)*** | | |
| ***Key*** | ***Value*** | ***Refers to Section*** |
|  |  |  |
|  |  |  |

* + 1. Generic System Use Cases
       1. Generic System Use Case: Manage the flexibility on electricity demand and generation from price incentives

***1 Description of the use case***

***1.1 Name of use case***

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area /Domain(s)/ Zone(s)*** | ***Name of use case*** |
|  | Area: Energy System  Domain: Smart Home | GSUC-Manage the flexibility on electricity demand and generation from price incentives |

***1.2 Version management***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Version management*** | | | | |
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 2013.11.26 | EDF |  | WD Working Document |
| 0.2 | 2014.07.01 | EDF |  | WD Working Document |
|  |  |  |  |  |

***1.3 Scope and objectives of use case***

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| --- | --- |
| ***Scope and objectives of use case*** | |
| ***Scope*** | Automatic response of the Smart Home from price incentives.  Virtual dry contacts and short messages are out of the scope of this Use Case. |
| ***Objective(s)*** | * Control the flexibility of ecosystems :   + **Before a peak and depending on the price levels of the next day**: anticipate if need be   + **During a peak**: shut off or automatically reduce loads within the customer’s Smart Home   + **After a peak**: switch back on loads if need be   + **After a change in supplier index**: choose and execute a load management strategy. |
| ***Related business case(s)*** |  |

**1.5 Narrative of Use Case**

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| --- |
| ***Narrative of use case*** |
| ***Short description*** |
| The Generic System Use Case describes how the Customer Energy Management System optimises the energy bill through anticipation of a dynamic peak period and how the client/resident is informed. |
| ***Complete description*** |
| Functions :   * **Before a peak and depending on the price levels of the next day**: anticipate if need be * **During a peak**: shut off or automatically reduce loads within the customer’s Smart Home * **After a peak**: switch back on loads if need be * **After a change in supplier index**: choose and execute a load management strategy   **Principles**  **P2.** A price incentive relates to dynamic peak periods, fixed peaks and other supplier index changes (e.g.: going from “low rate hours” index to “high rate hours” index within a “high rate hours/low rate hours” subscription plan).  **P3.** This use case assumes that the CEM establishes a load management strategy and sends it to the DEM function(s) in order to be executed.   * This applies to a Customer energy management system (CEMS) and to the indirectly connected appliances (ICA) that it controls * This applies to a directly connected appliance (DCA) that is to say a smart appliance directly connected to a smart meter radio transmitter   **P4.** This use case considers the two followings cases:   * Case where the appliances can send information, * Case where the appliances cannot send information.   Short story:  At 4 P.M., The smart installation receives a price incentive via the external smart metering gateway.  At 8 P.M., the « dynamic peak period notification » timed action activates: a field of the RCI\* is then modified.  *This price incentive can be a dynamic peak period notification, a notification regarding price levels for the next day, a dynamic peak period start, a dynamic peak period stop, a change in supplier index or a change in the position of the physical dry contact.*  The Client/Resident’s customer energy management system (via its CEM function) reads the RCI\* and understands that the KWh price will be higher from 6 P.M. to 8 P.M. on the following day.  In order to optimize the Client’s energy bill, the customer energy management system decides to anticipate this dynamic peak period.  To do so, on the next day, a few hours before the peak, the customer energy management system queries a set of connected electric heaters in order to know their current status (local opt-out). Being returned that they run on low power, it modifies their instructions in order to implement an anticipation strategy from 5 P.M. to 6 P.M.  Before implementing an anticipation strategy, the Client is notified of the applied anticipation strategy via the energy manager’s display (CEM function) but also optionally by the appliances via a LED that switches on each of them.  *Client/Resident customisations and possible opt-outs are taken into account so as to define or adapt the load management strategy.* |

**1.5  *Key Performance Indicators***

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| --- | --- | --- | --- | --- |
| ***Key performance indicators*** | | | | |
| ***ID*** | ***Name*** | ***Calculation*** | ***Scope*** | ***Objective*** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

***1.6  Use case conditions***

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| ***Use case conditions*** |
| ***Assumption*** |
| * There are 3 SDPPDs (Standard Dynamic Peak Period Day), each of them being the description of a series of indexes over a finite duration. |
| * The way the dynamic peak period message is sent is based on metering information known to date. A dynamic peak period broadcast message can generate up to 3 timed actions for the meter. An example of a common scenario for a dynamic peak period (DPP) scheduled for day MM/08/YY between 6 P.M. and 8 P.M. would be:   **1. Simultaneous reception of 3 timed actions by the smart meter on day MM/07/YY at around 4 P.M.:**  Action A: « DPP1\* notification on day MM/07/YY at 8 P.M. »  Action B: « Dynamic peak period DPP1 start on day MM/08/YY at 6 P.M.»,  Action C: « Dynamic peak period DPP1 stop on day MM/08/YY at 8 P.M.»  **2. Activation of action A, on day MM/07/YY at 8 P.M.**  **3. Activation of action B, on day MM/08/YY at 6 P.M.**  **4. Activation of action C, on day MM/08/YY at 8 P.M.** |
| * A dynamic peak period can include one or many price periods, therefore possibly index changes. |
| * It is assumed in this use case that neither the Customer energy management system (CEMS), nor the directly connected appliances (DCA) necessarily have a the capability to get the price schedule. This is a possible but not compulsory option. |
| * The fields of the standard RCI\* allow to detect DPP notifications, DPP starts and DPP stops. |
| * The Client/Resident is informed locally and/or away from home via any medium (dedicated display, appliance display, LED, SMS, etc.) |
| * It is assumed that neither the Customer energy management system, nor the directly connected appliances necessarily have the capability to establish an anticipation strategy after receiving a DPP notification. |
| * If the UI is connected to the WAN, the data are exchanged between the Smart Home and the UI through a energy management gateway. The UI mentioned in the sequence diagrams is a local UI within the Smart Home. |
| ***Prerequisite*** |
| * The client has subscribed an electricity plan from the Electricity Supplier. |
| * The client/resident’s Smart Home is up and running. |
| * The smart meter receives timed actions to be executed in order to announce a dynamic peak period (which means that beforehand, the Electricity Supplier has requested to activate a dynamic peak period for this client). |

***1.7 Further information to the use case for classification / mapping***

|  |
| --- |
| ***Classification information*** |
| ***Relation to other use cases*** |
| GBUC-Manage the flexibility on electricity demand and generation within a smart home from market signals |
| ***Level of depth*** |
| Short version |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| System Use Case |
| ***Further keywords for classification*** |
|  |

**1.8 General remarks**

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| --- |
| ***General remarks*** |
|  |

**2 Diagrams of use case**

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| ***Diagram(s) of use case*** |
| *Macro-activities diagram*    **Timing**  **T1.** The activities described in the activity diagram are iterated all day long.  *Sequence diagram* |

***3 Technical Details***

***3.1 Actors***

|  |  |
| --- | --- |
| ***Actors*** | |
| ***Grouping*** | ***Group Description*** |
|  |  |

| ***Actor name*** | ***Actor type*** | ***Actor Description*** | ***Further information specific to this Use Case*** |
| --- | --- | --- | --- |
| Resident | Person |  |  |
| External SMG | Functional component |  |  |
| SM | Functional component |  |  |
| Internal SMG | Functional component |  |  |
| UI | Functional component |  |  |
| CEM | Functional component |  |  |
| DEM | Functional component |  |  |

***3.2 References***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***References*** | | | | | | |
| ***No.*** | ***References Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

***4 Step by step analysis of use case***

***4.1 Overview of scenarios***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-Condition*** | ***Post-Condition*** |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |

***4.2 Scenarios***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 1 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 2 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

***5 Information Exchanged***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirements IDs*** |
|  |  |  |  |
|  |  |  |  |

***6 Requirements (optional)***

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| --- |
| ***Requirements (optional)*** |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

***7 Common Terms and Definitions***

|  |  |
| --- | --- |
| ***Common Terms and Definitions*** | |
| ***Term*** | ***Definition*** |
|  |  |
|  |  |

***8 Custom Information (optional)***

|  |  |  |
| --- | --- | --- |
| ***Custom Information (optional)*** | | |
| ***Key*** | ***Value*** | ***Refers to Section*** |
|  |  |  |
|  |  |  |

* + - 1. Generic System Use Case: Manage the flexibility on electricity demand and generation from DR requests

***1 Description of the use case***

***1.1 Name of use case***

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area /Domain(s)/ Zone(s)*** | ***Name of use case*** |
|  | Area: Energy System  Domain: Smart Home | GSUC-Manage the flexibility on electricity demand and generation from DR requests |

***1.2 Version management***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Version management*** | | | | |
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 2013.11.26 | EDF | First draft (short description, roles) | WD Working Document |
| 0.2 | 2014.05.05 | EDF | Sequence diagram | WD Working Document |

***1.3 Scope and objectives of use case***

|  |  |
| --- | --- |
| ***Scope and objectives of use case*** | |
| ***Scope*** | Automatic response of the Smart Home from DR requests. |
| ***Objective(s)*** | * Give the possibility to the Resident to opt out of tariff incentives and demands of flexibility, if desired for reasons of comfort:   + **Before a DR request if a notification is sent**: anticipate if need be and if possible,   + **Upon receipt of the DR request**: define and carry out a load management strategy,   + **At the end of the DR request period**: define and carry out a load management strategy by switching back on loads if need be. |
| ***Related business case(s)*** |  |

**1.5 Narrative of Use Case**

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| --- |
| ***Narrative of use case*** |
| ***Short description*** |
| The Generic System Use Case describes how the CEM/DEM defines the load management strategy and adapts it depending on a DR request. The Resident is informed if necessary. |
| ***Complete description*** |
| **Principles**  **P1.** This use case considers that DR requests apply on a period.  **P2.** This use case considers DR requests intended for:   * A reduction or termination of loads or electricity generation * A rise in loads or electricity production * A modulation (power…)   **P3.** A DR request can be :   * A flexibility request indicating the start of a period and a duration * A first flexibility request message indicating the start of a period and then a second one indicating the end of the period   A notification can be sent to announce a future flexibility request. This notification is considered as a flexibility request message as well.  **P4.** This use case assumes that the CEM establishes a load management strategy and sends it to the DEM function(s) in order to be executed.   * This applies to a Customer energy management system (CEMS) and to the indirectly connected appliances (ICA) that it controls. * This applies to a directly connected appliance (DCA) that is to say a smart appliance directly connected to a smart meter radio transmitter.   **P5.** This use case considers the two followings cases:   * Case where the appliances can send information, * Case where the appliances cannot send information.   **P6.** The Resident can opt out of a flexibility request.  **P7.** Depending on its capability, the CEM function of the CEMS and DCA arbitrate between flexibility requests and price incentives.  **Common scenario**  The Smart Home receives a flexibility request notification or a flexibility request via the EMG or via the external smart metering gateway.    When a flexibility request notification is sent, the Smart Home can define a load management strategy, inform the Residents if necessary and execute new instructions if any.    When a flexibility request is sent, the Smart Home can adapt the load management strategy, inform the Residents if necessary and execute new instructions if any.    Price incentives, Resident customisations and possible opt-outs are taken into account so as to define or adapt the load management strategy. |

**1.5  *Key Performance Indicators***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Key performance indicators*** | | | | |
| ***ID*** | ***Name*** | ***Calculation*** | ***Scope*** | ***Objective*** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

***1.6  Use case conditions***

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| --- |
| ***Use case conditions*** |
| ***Assumption*** |
| * Flexibility requests are received via the Smart Grid connection point that is to say the external SMG or the EMG. |
| * Standard RCI fields enable to detect flexibility requests (flexibility requests messages received via the external SMG). |
| * A DR request notification can match a flexibility request message. |
| * The Resident is informed locally and/or away from home via any medium (dedicated display, appliance display, LED, SMS, etc.) |
| * The anticipation capability is an option. |
| * The client of Electricity Supplier is also a client of a Flexibility Operator |
| * If the UI is connected to the WAN, the data are exchanged between the Smart Home and the UI through a energy management gateway. The UI mentioned in the sequence diagrams is a local UI within the Smart Home. |
| ***Prerequisite*** |
| * The client has subscribed an electricity contract from the Electricity Supplier |
| * The client has subscribed a contract to make flexibilities available to a flexibility operator |
| * The client’s Smart Home is up and running |
| * The Smart Home is configured to feedback data enabling to validate the activation of flexibilities (for example, the smart meter is configured in “load curve” mode). |

***1.7 Further information to the use case for classification / mapping***

|  |
| --- |
| ***Classification information*** |
| ***Relation to other use cases*** |
| GBUC-Manage the flexibility on electricity demand and generation within a smart home from market signals |
| ***Level of depth*** |
| Short version |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| System Use Case |
| ***Further keywords for classification*** |
|  |

**1.8 General remarks**

|  |
| --- |
| ***General remarks*** |
|  |

**2 Diagrams of use case**

|  |
| --- |
| ***Diagram(s) of use case*** |
| *Macro-activities diagram*    **Timing**  **T1.** The activities described in the activity diagram are iterated all day long.  *Sequence diagram* |

***3 Technical Details***

***3.1 Actors***

|  |  |
| --- | --- |
| ***Actors*** | |
| ***Grouping*** | ***Group Description*** |
|  |  |

| ***Actor name*** | ***Actor type*** | ***Actor Description*** | ***Further information specific to this Use Case*** |
| --- | --- | --- | --- |
| Resident | Person |  |  |
| External SMG | Functional component |  |  |
| SM | Functional component |  |  |
| Internal SMG | Functional component |  |  |
| EMG | Energy Management Gateway |  |  |
| SGCP | Smart Grid Connection Point |  |  |
| UI | Functional component |  |  |
| CEM | Functional component |  |  |
| DEM | Functional component |  |  |

***3.2 References***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***References*** | | | | | | |
| ***No.*** | ***References Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

***4 Step by step analysis of use case***

***4.1 Overview of scenarios***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-Condition*** | ***Post-Condition*** |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |

***4.2 Scenarios***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 1 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 2 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

***5 Information Exchanged***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirements IDs*** |
|  |  |  |  |
|  |  |  |  |

***6 Requirements (optional)***

|  |
| --- |
| ***Requirements (optional)*** |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

***7 Common Terms and Definitions***

|  |  |
| --- | --- |
| ***Common Terms and Definitions*** | |
| ***Term*** | ***Definition*** |
|  |  |
|  |  |

***8 Custom Information (optional)***

|  |  |  |
| --- | --- | --- |
| ***Custom Information (optional)*** | | |
| ***Key*** | ***Value*** | ***Refers to Section*** |
|  |  |  |
|  |  |  |

* + - 1. Generic System Use Case: Manage opt-outs to automatic responses related to price incentives or DR requests

***1 Description of the use case***

***1.1 Name of use case***

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area /Domain(s)/ Zone(s)*** | ***Name of use case*** |
|  | Area: Energy System  Domain: Smart Home | GSUC-Manage opt-outs to automatic responses related to price incentives or DR requests |

***1.2 Version management***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Version management*** | | | | |
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 2013.11.26 | EDF | First draft (short description, roles) | WD Working Document |
| 0.2 | 2014.05.05 | EDF | Sequence diagram | WD Working Document |

***1.3 Scope and objectives of use case***

|  |  |
| --- | --- |
| ***Scope and objectives of use case*** | |
| ***Scope*** | Response of the Smart Home from price incentives or DR requests.  Emergency signals are out of the scope of this Use Case. |
| ***Objective(s)*** | * Give the possibility to the Resident to opt out of tariff incentives and demands of flexibility, if desired:   + To a planned or occurring automatic response after receiving a notification or while the execution of an automatic response   + Entirely or to a given level, i.e. either not to take into account price or to apply an instruction that the Resident wants;   + Over different scopes: the whole Smart Home, one or several areas (rooms), one or several uses, one or several appliances. |
| ***Related business case(s)*** |  |

**1.5 Narrative of Use Case**

|  |
| --- |
| ***Narrative of use case*** |
| ***Short description*** |
| The Generic System Use Case describes how the Client/Resident opts-out of a planned or occurring automatic response after receiving a notification or while the execution of an automatic response that results from a price incentive or a DR request. In other words, the Smart Home will not apply a strategy that takes into account price incentives or DR requests or will apply a new strategy that matches the Client/Resident’s instructions. |
| ***Complete description*** |
| **What for?**  **P1. Opt-out, entirely or to a given level, i.e.:**   * + Either **not to take into account** price incentives (related to a Dynamic Peak Period (DPP) for example),   + Or to **apply an instruction** that the Resident wants (only for a Dynamic Peak Period (DPP) for example).   **When?**  **P2. The resident opts-out of a planned or occurring automatic response after receiving a notification or while the execution of an automatic response.**  **For when?**  **P3. The time slot of application for a new instruction can be spread out between:**   * + - **2 timestamps (opt-out start and opt-out stop)** defined or customised (criteria-based customisation) by the Client/Resident.       * For the Resident, this implies to ask a **« set duration or criteria-based opt-out »**.     - **The time when the Client/Resident requests to start opting-out and the time the Resident requests to stop opting-out**:       * For the Resident, this implies a « **manual forcing** » (implemented case that has not been described in the diagrams).     - **The first price incentive related to a Dynamic Peak Period and a Dynamic Peak Period (DPP) stop.**       * For theClient/ Resident, this implies asking to **« opt-out for a current or upcoming DPP ».**   **Over what?**  **P4.** In all cases, depending on the capability of the Smart Home, the Resident can, depending on his needs, opt-out over different **scopes**: the whole Smart Home, one or several areas (rooms), one or several uses, one or several appliances.  **Where?**  **P5.** Locally, opting-out is expressed on a **CEM**, i.e. on a **DCA** or on a **CEMS**, not on a **DEM**. Opt-out on a **ICA** is a manual forcing that has not been described in the diagrams.  **P6.** Depending on the Smart Home capabilities, the Client/Resident can opt-out away from home.  **P7.** The Client/Resident must be given a way to modify the opt-out level and the scope to impact for a current or planned opt-out. He must be given a way to opt-out as many times as he wants.  **P8.** Contrary to energy behaviour customisation (not described in this use case), opting-out is a one-time event.  **P9.** The Client/Resident must be given a way to check the current status and the planned status for his appliances.  **Timing**  **T1.** Regarding a DPP, the Client/ Resident can request to opt-out as soon as he receives the notification message, until return to normalcy.    **Image1** |

**1.5  *Key Performance Indicators***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Key performance indicators*** | | | | |
| ***ID*** | ***Name*** | ***Calculation*** | ***Scope*** | ***Objective*** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

***1.6  Use case conditions***

|  |
| --- |
| ***Use case conditions*** |
| ***Assumption*** |
| * If the UI is connected to the WAN, the data are exchanged between the Smart Home and the UI through an energy management gateway. The UI mentioned in the sequence diagram is a local UI within the Smart Home. |
| ***Prerequisite*** |
| * The client has subscribed an electricity plan from the Electricity Supplier. |
| * The Client/Resident may have subscribed a contract to make flexibilities available to a flexibility operator. |
| * The Client/Resident’s smart home is up and running. |
| * The smart meter receives timed actions to be executed in order to announce a dynamic peak period (which means that beforehand, the Electricity Supplier has requested to activate a dynamic peak period for this client). |
| * The Client/Resident owns a least one UI |

***1.7 Further information to the use case for classification / mapping***

|  |
| --- |
| ***Classification information*** |
| ***Relation to other use cases*** |
| GBUC-Manage the flexibility on electricity demand and generation within a smart home from market signals |
| ***Level of depth*** |
| Short version |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| System Use Case |
| ***Further keywords for classification*** |
|  |

**1.8 General remarks**

|  |
| --- |
| ***General remarks*** |
|  |

**2 Diagrams of use case**

|  |
| --- |
| ***Diagram(s) of use case*** |
| *Macro-activities diagram*    *Sequence diagram* |

***3 Technical Details***

***3.1 Actors***

|  |  |
| --- | --- |
| ***Actors*** | |
| ***Grouping*** | ***Group Description*** |
|  |  |

| ***Actor name*** | ***Actor type*** | ***Actor Description*** | ***Further information specific to this Use Case*** |
| --- | --- | --- | --- |
| Client | Person |  |  |
| Resident | Person |  |  |
| UI | Functional component |  |  |
| CEM | Functional component |  |  |
| DEM | Functional component |  |  |

***3.2 References***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***References*** | | | | | | |
| ***No.*** | ***References Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

***4 Step by step analysis of use case***

***4.1 Overview of scenarios***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-Condition*** | ***Post-Condition*** |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |

***4.2 Scenarios***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 1 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 2 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

***5 Information Exchanged***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirements IDs*** |
|  |  |  |  |
|  |  |  |  |

***6 Requirements (optional)***

|  |
| --- |
| ***Requirements (optional)*** |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

***7 Common Terms and Definitions***

|  |  |
| --- | --- |
| ***Common Terms and Definitions*** | |
| ***Term*** | ***Definition*** |
|  |  |
|  |  |

***8 Custom Information (optional)***

|  |  |  |
| --- | --- | --- |
| ***Custom Information (optional)*** | | |
| ***Key*** | ***Value*** | ***Refers to Section*** |
|  |  |  |
|  |  |  |

* + - 1. Generic System Use Case: Customise automatic responses of the Smart Home (price incentives, DR requests, or emergency signals)

***1 Description of the use case***

***1.1 Name of use case***

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area /Domain(s)/ Zone(s)*** | ***Name of use case*** |
|  | Area: Energy System  Domain: Smart Home | GSUC-Customise automatic responses of the Smart Home (price incentives, DR requests, or emergency signals) |

***1.2 Version management***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Version management*** | | | | |
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 2013.04.11 | EDF | First draft (short description, roles) | WD Working Document |
| 0.2 | 2014.05.05 | EDF | Sequence diagram | WD Working Document |

***1.3 Scope and objectives of use case***

|  |  |
| --- | --- |
| ***Scope and objectives of use case*** | |
| ***Scope*** | Customisation of the Smart Home automatic responses to market signals and emergency signals.  This use case does not describe the warning involving outsourced monitoring. |
| ***Objective(s)*** | * Give to the Client/Resident the possibility to customise the Smart Home behaviour according to his comfort and savings preferences:   + Customise the automatic responses of the Smart Home     - Depending on the Smart Home capabilities and the Client/Resident needs, the customisation may be defined and applied to different scopes, that is to say: the whole Smart Home, one or several areas (rooms), one or several uses, one or several appliances.     - Depending on the Smart Home capabilities, the customisation may be defined and applied to different timescales:       * Price period,       * Standard day,       * Standard week,       * Standard season,       * Use/appliance consumption time slot.   + Customise warnings (events to be tracked) and specify the related emission channel     - The event to be tracked is exceeding an electricity data threshold in the Smart Home (such as a threshold of consumption in kWh)   + Notify that the new customisation has been taken into account   + Read the customisation |
| ***Related business case(s)*** |  |

**1.5 Narrative of Use Case**

|  |
| --- |
| ***Narrative of use case*** |
| ***Short description*** |
| The Generic System Use Case describes how the Client/ Resident customises the management of his appliance(s) namely during dynamic peak periods, as well as the monitoring of events. |
| ***Complete description*** |
| **Principles**  **P1.** The Client/Resident must be given a way to customise his **appliances’ automatic responses** at any time.  **P2.** The Client/Resident must be given a way to customise depending on the type of pricing incentive.  **P3.** The Client/Resident must be given a way to customise the energetic behaviour of his Smart Home via a **UI** connected either to a **CEM**, or a **DEM**. In other words via a **IID**, a **CEMS**, a **ICA** or a **DCA**.  This customisation is processed on site.  **P4**. A processing capability associated to the **CEM** is able to oversee the occurrence of an event. As a result, the customisation related to the monitoring can only be taken into account on the **CEM** function.  **P5.** Depending on the capabilities of the Smart Home, the Client/Resident can customise away from home.  **Requirements**  **R1.** The way an opt-out is taken into account must be consistent within a Smart Home.  **Common scenario**  A Client/ decides to customise the behaviour of some of his appliances, for example during dynamic peak periods. These appliances can be controlled by his Customer Energy Manager System.  To do so, he decides to switch to customisation mode and reads the current setting on a UI (User Interface) that is connected to a CEM (Customer Energy Management) or a DEM (Device Energy Management).  Depending on the Smart Home capabilities and the Client/ needs, he defines a new customisation via the UI.  His customisation will be applied on the scope he wants, for example the whole Smart Home, one or several areas (rooms), one or several uses, one or several appliances.  Once the customisation has been applied, a notification is sent to confirm that his new needs have been taken into account.  The Client/Resident can also customise the monitoring of events through the same activities. |

**1.5  *Key Performance Indicators***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Key performance indicators*** | | | | |
| ***ID*** | ***Name*** | ***Calculation*** | ***Scope*** | ***Objective*** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

***1.6  Use case conditions***

|  |
| --- |
| ***Use case conditions*** |
| ***Assumption*** |
| * Customisation does not have a set duration of application. |
| * Automatic management customisation is activated again after opt-out is over. |
| * Customisation is made via a **UI** (a **UI** that is only available locally). This assumption does not forbid to customise away from home but this is not described in this use case. This assumption is not incompatible with the identified flows between **EMG,** **UI** and **CEM.** |
| ***Prerequisite*** |
| * The **CEM** (**CEMS** or **DCA**) are customised during setup. |
| * The Client has subscribed to an electricity supply plan. |
| * The Client/Resident owns at least one **UI**. |
| * The client/resident’s Smart Home is up and running. |

***1.7 Further information to the use case for classification / mapping***

|  |
| --- |
| ***Classification information*** |
| ***Relation to other use cases*** |
| GBUC-Adapt the Smart Home behaviour to the Resident/Client’s preferences |
| ***Level of depth*** |
| Short version |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| System Use Case |
| ***Further keywords for classification*** |
|  |

**1.8 General remarks**

|  |
| --- |
| ***General remarks*** |
|  |

**2 Diagrams of use case**

|  |
| --- |
| ***Diagram(s) of use case*** |
| *Macro-activities diagram*    **Timing**  **T1.** The Resident must be given a way to customise at any time.  **T2**. Depending on the Smart Home capabilities, customisation can be applied in a time-delayed manner that the Resident specifies (profiles).  **T3.** Customisation can be made through successive iterations.  **T4.** The activities described in the diagram are iterated as many times as the Resident wishes.  *Sequence diagram* |

***3 Technical Details***

***3.1 Actors***

|  |  |
| --- | --- |
| ***Actors*** | |
| ***Grouping*** | ***Group Description*** |
|  |  |

| ***Actor name*** | ***Actor type*** | ***Actor Description*** | ***Further information specific to this Use Case*** |
| --- | --- | --- | --- |
| Resident | Person |  |  |
| Client | Person |  |  |
| UI | Functional component |  |  |
| CEM | Functional component |  |  |
| DEM | Functional component |  |  |

***3.2 References***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***References*** | | | | | | |
| ***No.*** | ***References Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

***4 Step by step analysis of use case***

***4.1 Overview of scenarios***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-Condition*** | ***Post-Condition*** |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |

***4.2 Scenarios***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 1 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 2 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

***5 Information Exchanged***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirements IDs*** |
|  |  |  |  |
|  |  |  |  |

***6 Requirements (optional)***

|  |
| --- |
| ***Requirements (optional)*** |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

***7 Common Terms and Definitions***

|  |  |
| --- | --- |
| ***Common Terms and Definitions*** | |
| ***Term*** | ***Definition*** |
|  |  |
|  |  |

***8 Custom Information (optional)***

|  |  |  |
| --- | --- | --- |
| ***Custom Information (optional)*** | | |
| ***Key*** | ***Value*** | ***Refers to Section*** |
|  |  |  |
|  |  |  |

* + - 1. Generic System Use Case: Provide a Third Party with enriched Smart Home electricity data

***1 Description of the use case***

***1.1 Name of use case***

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area /Domain(s)/ Zone(s)*** | ***Name of use case*** |
|  | Area: Energy System  Domain: Smart Home | GSUC-Provide a Third Party with enriched Smart Home electricity data |

***1.2 Version management***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Version management*** | | | | |
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 2013.04.11 | EDF | First draft (short description, roles) | WD Working Document |
| 0.2 | 2014.05.05 | EDF | Sequence diagram | WD Working Document |

***1.3 Scope and objectives of use case***

|  |  |
| --- | --- |
| ***Scope and objectives of use case*** | |
| ***Scope*** | The scope is restricted to the Smart Home. |
| ***Objective(s)*** | * Make the Smart Home’s electricity data locally available, * Make the Smart Home’s electricity data externally available, * Enhance the Smart Home’s electricity data with local or external data. |
| ***Related business case(s)*** |  |

**1.5 Narrative of Use Case**

|  |
| --- |
| ***Narrative of use case*** |
| ***Short description*** |
| The Generic System Use Case describes how electricity data regarding the electric behaviour of the Smart Home are made available externally or locally to a third party: a physical person (client, Resident) via a UI or to an automatism that uses these data. |
| ***Complete description*** |
| These data can be made available to a third party:   * a role embodied by a physical person (client, Resident) via a **UI**, * an automatism that uses these data.   These energy data are related to the electric behaviour of the Smart Home (at least global electricity data that can be enhanced by specific data in the Smart Home).  These electricity data are available locally and can be made available:   * **Externally, off-site** (sub-use case 1), * **Locally**, in the Smart Home(sub-use case 2).   These electricity data can be enriched with:   * **Data located in the Smart Home** (sub-use case 1 and sub-use case 2), * **Data located outside of the site** (sub-use case 2 only because in sub-use case 1, this enrichment is considered to be processed off-site).These data may be for instance:   + Dynamic peak notifications   + Weather forecast   + Consumption estimates   + …     **Principles:**  **P1.** « Global electricity data are collected via the **SMG**. |

**1.5  *Key Performance Indicators***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Key performance indicators*** | | | | |
| ***ID*** | ***Name*** | ***Calculation*** | ***Scope*** | ***Objective*** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

***1.6  Use case conditions***

|  |
| --- |
| ***Use case conditions*** |
| ***Assumption*** |
| * These data are made available via a **UI** (a **UI** only locally available on site or a **UI** connected to the WAN). If the UI is connected to the WAN, the data are exchanged between the Smart Home and the UI through a energy management gateway. The UI mentioned in the sequence diagram is a local UI within the Smart Home. |
| * This use case is generic and does not assume timing constraints. It can subsequently be made specific to timing constraints. |
| * Billing for making energy data available will be made according to contract terms (periodic…) and is not described in this use case. |
| ***Prerequisite*** |
| * The Electricity Supplier’s client has subscribed a plan to the Electricity Supplier. |
| * The client/Resident owns at least one **UI**. |
| * The client’s Smart Home is up and running. |
| * If necessary, the Smart Home is configured to feedback data. |

***1.7 Further information to the use case for classification / mapping***

|  |
| --- |
| ***Classification information*** |
| ***Relation to other use cases*** |
| GBUC-Provide enriched Smart Home data to relevant Parties in order to make the Resident/Client more active |
| ***Level of depth*** |
| Short version |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| System Use Case |
| ***Further keywords for classification*** |
|  |

**1.8 General remarks**

|  |
| --- |
| ***General remarks*** |
|  |

**2 Diagrams of use case**

|  |
| --- |
| ***Diagram(s) of use case*** |
| *Macro-activities diagram*    **Timing:**  **T1.** The activities described in the activity diagrams are iterated all day long.  *Sequence diagram* |

***3 Technical Details***

***3.1 Actors***

|  |  |
| --- | --- |
| ***Actors*** | |
| ***Grouping*** | ***Group Description*** |
|  |  |

| ***Actor name*** | ***Actor type*** | ***Actor Description*** | ***Further information specific to this Use Case*** |
| --- | --- | --- | --- |
| Resident | Person |  |  |
| External SMG | Functional component |  |  |
| SM | Functional component |  |  |
| Internal SMG | Functional component |  |  |
| EMG | Functional component |  |  |
| UI | Functional component |  |  |
| CEM | Functional component |  |  |
| DEM | Functional component |  |  |

***3.2 References***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***References*** | | | | | | |
| ***No.*** | ***References Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

***4 Step by step analysis of use case***

***4.1 Overview of scenarios***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-Condition*** | ***Post-Condition*** |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |

***4.2 Scenarios***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 1 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 2 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

***5 Information Exchanged***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirements IDs*** |
|  |  |  |  |
|  |  |  |  |

***6 Requirements (optional)***

|  |
| --- |
| ***Requirements (optional)*** |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

***7 Common Terms and Definitions***

|  |  |
| --- | --- |
| ***Common Terms and Definitions*** | |
| ***Term*** | ***Definition*** |
|  |  |
|  |  |

***8 Custom Information (optional)***

|  |  |  |
| --- | --- | --- |
| ***Custom Information (optional)*** | | |
| ***Key*** | ***Value*** | ***Refers to Section*** |
|  |  |  |
|  |  |  |

* + - 1. Generic System Use Case: Provide alarms related to the Smart Home electricity behaviour to the Client or Resident

***1 Description of the use case***

***1.1 Name of use case***

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area /Domain(s)/ Zone(s)*** | ***Name of use case*** |
|  | Area: Energy System  Domain: Smart Home | GSUC-Provide alarms related to the Smart Home electricity behaviour to the Client or Resident |

***1.2 Version management***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Version management*** | | | | |
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 2013.04.11 | EDF | First draft (short description, roles) | WD Working Document |
| 0.2 | 2014.03.07 | EDF | Sequence diagram | WD Working Document |

***1.3 Scope and objectives of use case***

|  |  |
| --- | --- |
| ***Scope and objectives of use case*** | |
| ***Scope*** | The scope is restricted to the Smart Home.  The sub-use case 3 does not describe the warnings that imply off-site monitoring. |
| ***Objective(s)*** | * Inform the Client/Resident of a local event associated with his Smart Home electricity data (consumption, production…):   + Monitor the occurrence of (the) event(s),   + Warn if an event occurs. |
| ***Related business case(s)*** |  |

**1.5 Narrative of Use Case**

|  |
| --- |
| ***Narrative of use case*** |
| ***Short description*** |
| The Generic System Use Case describes how the CEM monitors the occurrence of events and warns the Client/Resident if an event occurs. |
| ***Complete description*** |
| **Principles:**  **P1.** « Global electricity data are collected via the SMG.  **P2**. The Smart Home has a processing capability that can monitor the occurrence of an event. This function is associated to the CEM function and the Generic System Use Case: Provide a Third Party with enriched Smart Home electricity data describes how the electricity data are made available to the CEM.  **P3.** The use case “Customise automatic responses of the Smart Home” describes the configuration of the event to monitor and the configuration of the channel to send the alarm.  **P4.** The use case describes monitoring of a single event, but it is repeatable for several events.  **P5.** Threshold overrun of electricity data available on site is monitored (consumption threshold in kWh for example). |

**1.5  *Key Performance Indicators***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Key performance indicators*** | | | | |
| ***ID*** | ***Name*** | ***Calculation*** | ***Scope*** | ***Objective*** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

***1.6  Use case conditions***

|  |
| --- |
| ***Use case conditions*** |
| ***Assumption*** |
| * Electricity data available on site are made available via a **UI** (a **UI** only locally available on site or a **UI** connected to the WAN). |
| * This use case is generic and does not assume timing constraints. It can subsequently be made specific to timing constraints. |
| * Billing for generating alarm will be made according to contract terms (periodic…) and is not described in this Use Case. |
| * Alarm channels:   + A compatibility table ensures the consistency between the nature of alert (alert history for information, real-time alerts for action…) and the channel used to release it;   + The assumption is made that local alarms can have a real-time character and some alarms are issued requiring action and are also issued for information. The channels used for these various types of alarms shall be compatible with the alarms. |
| * If the UI is connected to the WAN, the data are exchanged between the Smart Home and the UI through an energy management gateway. The sequence diagram describes the case of a local UI within the Smart Home. |
| ***Prerequisite*** |
| * The Electricity Supplier’s client has subscribed a plan to the Electricity Supplier. |
| * The Client/Resident owns at least one **UI**. |
| * The Client’s site is up and running. |
| * If necessary, the Smart Home is configured to feedback data. |
| * The channel through which the alarms shall be issued, (number of mobile phone, e-mail addresses…) are configured and available. |

***1.7 Further information to the use case for classification / mapping***

|  |
| --- |
| ***Classification information*** |
| ***Relation to other use cases*** |
| GBUC-Provide enriched Smart Home data to relevant Parties in order to make the Resident/Client more active |
| ***Level of depth*** |
| Short version |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| System Use Case |
| ***Further keywords for classification*** |
|  |

**1.8 General remarks**

|  |
| --- |
| ***General remarks*** |
|  |

**2 Diagrams of use case**

|  |
| --- |
| ***Diagram(s) of use case*** |
| *Macro-activities diagram*    **Timing:**  **T1.** The activities described in the activity diagrams are iterated all day long.  *Sequence diagram* |

***3 Technical Details***

***3.1 Actors***

|  |  |
| --- | --- |
| ***Actors*** | |
| ***Grouping*** | ***Group Description*** |
|  |  |

| ***Actor name*** | ***Actor type*** | ***Actor Description*** | ***Further information specific to this Use Case*** |
| --- | --- | --- | --- |
| Resident | Person |  |  |
| Client | Person |  |  |
| UI | Functional component |  |  |
| CEM | Functional component |  |  |
| EMG | Functional component |  |  |

***3.2 References***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***References*** | | | | | | |
| ***No.*** | ***References Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

***4 Step by step analysis of use case***

***4.1 Overview of scenarios***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-Condition*** | ***Post-Condition*** |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |

***4.2 Scenarios***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 1 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 2 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

***5 Information Exchanged***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirements IDs*** |
|  |  |  |  |
|  |  |  |  |

***6 Requirements (optional)***

|  |
| --- |
| ***Requirements (optional)*** |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

***7 Common Terms and Definitions***

|  |  |
| --- | --- |
| ***Common Terms and Definitions*** | |
| ***Term*** | ***Definition*** |
|  |  |
|  |  |

***8 Custom Information (optional)***

|  |  |  |
| --- | --- | --- |
| ***Custom Information (optional)*** | | |
| ***Key*** | ***Value*** | ***Refers to Section*** |
|  |  |  |
|  |  |  |

* 1. Energy Storage (DCT7)
     1. Generic Business Use Cases
        1. Generic Business Use Case: Contribute to the efficient integration of intermittent renewable energies in the Electric Power System

***1 Description of the use case***

***1.1 Name of use case***

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area /Domain(s)/ Zone(s)*** | ***Name of use case*** |
|  | Area: Energy System  Domain: Energy Storage | GBUC-Contribute to the efficient integration of intermittent renewable energies in the Electric Power System |

***1.2 Version management***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Version management*** | | | | |
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 2014.03.10 | Joseph Maire, Gauthier Delille | First draft (name, short description) | WD Working Document |
| 0.2 | 2014.05.27 | Denis Bonneau | Complements | WD Working Document |
| 0.3 | 2014.07.24 | Joseph Maire, Gauthier Delille | Complements (scope, objective) | WD Working Document |
| 0.4 | 2014.09.18 | Gauthier Delille | Complements (complete description, Smart Grid Functions) | WD Working Document |

***1.3 Scope and objectives of use case***

|  |  |
| --- | --- |
| ***Scope and objectives of use case*** | |
| ***Scope*** | Use of an Electrical Energy Storage associated physically (hybrid plant) or not (virtual plant) to a solar or wind farm connected to the transmission or distribution network.  Small generation capacities (with a power inferior to 5MW for instance) are out of the scope of the Use Case. |
| ***Objective(s)*** | * Facilitate the integration of renewable energy sources onto the grid, by limiting their local impacts, enabling their contribution to the functioning of the electric power system, reducing their grid connection and access costs and delays, or balancing their intermittent power supply. |
| ***Related business case(s)*** | * Deliver EES services at best cost. |

**1.4 Narrative of Use Case**

|  |
| --- |
| ***Narrative of use case*** |
| ***Short description*** |
| The Generic Business Use Case describes how the EES Operator delivers services at the request of the Producer in order to facilitate the integration of a plant in the Electric Power System. |
| ***Complete description*** |
| Renewable Energy Sources such as solar or wind farms are variable and uncertain by nature, and for the most part, interfaced with power electronics convertors. These specificities limit their penetration in power systems in conditions ensuring system security and without implementing support measures that can be costly for the collectivity. Furthermore, a majority of these generation capacities are connected to distribution networks, which have historically not necessarily been designed to accommodate large shares of decentralised generation. This may lead to grid connection costs that can be very high for the collectivity.    Energy Storage can be used to mitigate the specificities of renewable energy sources and therefore facilitate their integration onto distribution networks and power systems more generally. Applications may include short-term fluctuations smoothing – which can impact the quality of supply (flicker) –, the valorisation of unavoidable energy with time shifting, reduced grid connection costs and delays with production peak shaving, or the balancing of intermittent power supply – especially in small or island power systems.  It should be noted that the applications described below are not necessarily exclusive but may be combined. For instance, a Producer may use an EES to optimize the value of renewable energy with time-shifting, while ensuring a constant power output.  ***1-Reduce the costs implied by the provision of ancillary services support***  In some systems, Producers may be required to provide ancillary services to System Operators in order to ensure system security. For instance, they may be asked to provide active power reserve to contribute to frequency regulation. In this case, part of the available renewable energy cannot be sold. To avoid this loss, storage can be used to provide control power, instead of a voluntary degradation of primary energy conversion. This service enables a Producer to maximise the use of his available power. In addition, its use allows the Producer to provide guaranteed control power to the system, which would not be possible otherwise because of the variability of renewable sources.  ***2-Limit local disturbances induced by the intermittent power supply of renewable energy sources***  Renewable energy sources are by nature uncertain and variable. Their intermittent power supply may cause operational challenges, such as flicker, particularly in weak grids. In such cases, storage can be used to absorb or inject active power in order to mitigate voltage fluctuations caused by short-term variations of the renewable energy source’s power supply. From the Producer’s standpoint, it offers an alternative to conventional options, such as the upgrade of circuits and/or transformers or the installation of capacitators or static VAR compensators.  ***3-Store unavoidable energy following a power limitation request***  Storage can be used to store energy produced by a renewable energy source which would not be supplied in case the Grid Operator requests the Producer to limit his power in order to prevent operational problems. The Producer may contract such a service with an EES Operator.  A power limitation request can be sent by the Grid Operator to the Producer upon detection of a constraint on the network (overcurrent, risk of violation of the voltage limits, etc.). The use of storage could allow the Producer to respond to the request with a limited generation loss.  The Producer requests the EES Operator to store the energy which cannot be exported because of the power limitation request. The EES Operator charges the storage and informs the Producer.  ***4-Valorise unavoidable energy with time shifting***  Storage can be used to store electric energy during off-peak periods and inject it during peak periods, when its price is high. This allows the Producer to maximise his profits while offering energy when it is most needed by the Power System.  ***5-Guarantee a production schedule elaborated before real-time operations (capacity firming)***  As described above, power output from renewable energy sources vary over short (ramping) or long periods of time. Storage can be combined with a renewable energy generation in order to make the power output somewhat-to-very constant. This may reduce the need for dispatchable generation capacity to accommodate these rapid changes or counterbalance forecasts errors. In other words, storage can be used to guarantee a generation schedule of otherwise as-available generation sources. The storage could in this case be an alternative to the use of on-site/local dispatchable generation, such as Diesel fuelled generators for instance.  The Producer elaborates short-term generation forecasts.  Based on these forecasts, the Producer elaborates a schedule (in day-ahead for instance) and sends it to the EES Operator.  The EES Operator uses the storage in real-time operations to reduce the difference between the schedule and real generation output. |

**1.5  *Key Performance Indicators***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Key performance indicators*** | | | | |
| ***ID*** | ***Name*** | ***Calculation*** | ***Scope*** | ***Objective*** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

***1.6  Use case conditions***

|  |
| --- |
| ***Use case conditions*** |
| ***Assumption*** |
| * Some of the services described in the Use Case require that regulatory mechanisms such as renewable energy power purchase obligation (feed-in tariffs) are not implemented. |
| * A contract between the Producer and the EES Operator is in place. |
| ***Prerequisite*** |
| * Real-time communication interface between the EES Operator and the Producer. |
| * Configuration of the EES. |

***1.7 Further information to the use case for classification / mapping***

|  |
| --- |
| ***Classification information*** |
| ***Relation to other use cases*** |
| GBUC-Make necessary contracts with customers and relevant parties |
| GBUC-Configure EES to be able to provide services to relevant parties |
| GSUC-Make measurements at PCC (f, V) |
| GSUC-Compute power reference in real-time |
| GSUC-Charge storage |
| GSUC-Discharge storage |
| GSUC-Make measurements of renewable sources instant power |
| GSUC-Perform renewable energy forecasts |
| GSUC-Elaborate a charge/discharge schedule |
| ***Level of depth*** |
| Short version |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| Business Use Case |
| ***Further keywords for classification*** |
| Renewable Energy Sources, ancillary services support, time shifting, capacity firming |

**1.8 General remarks**

|  |
| --- |
| ***General remarks*** |
| Some of the services described in the Use Case may not necessarily be relevant in large power systems, but have a particular interest in island power systems.  Besides, to be efficient from a technical and economic perspective, some of these services would require the use of large storage units.  Considering the current technological state of EES systems, some of these services may not be cost-efficient, their costs exceeding their overall benefits. The combination of EES services and their provision to various stakeholders of the Electric Power System may be considered as a cost-efficient solution to share the benefits of storage. |

**2 Diagrams of use case**

|  |
| --- |
| ***Diagram(s) of use case*** |
| *Use Case Overview diagram*    *Domain Overview diagram*    *BUC-SUC Relations diagram* |

***3 Technical Details***

***3.1 Actors***

|  |  |
| --- | --- |
| ***Actors*** | |
| ***Grouping*** | ***Group Description*** |
|  |  |

| ***Actor name*** | ***Actor type*** | ***Actor Description*** | ***Further information specific to this Use Case*** |
| --- | --- | --- | --- |
| EES Operator | Role |  |  |
| Producer | Role |  |  |
| Grid Operator | Role |  |  |
| System Operator | Role |  |  |

***3.2 References***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***References*** | | | | | | |
| ***No.*** | ***References Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

***4 Step by step analysis of use case***

***4.1 Overview of scenarios***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-Condition*** | ***Post-Condition*** |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |

***4.2 Scenarios***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 1 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 2 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 3 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

***5 Information Exchanged***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirements IDs*** |
|  |  |  |  |
|  |  |  |  |

***6 Requirements (optional)***

|  |
| --- |
| ***Requirements (optional)*** |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
|  |  | |

***7 Common Terms and Definitions***

|  |  |
| --- | --- |
| ***Common Terms and Definitions*** | |
| ***Term*** | ***Definition*** |
|  |  |
|  |  |

***8 Custom Information (optional)***

|  |  |  |
| --- | --- | --- |
| ***Custom Information (optional)*** | | |
| ***Key*** | ***Value*** | ***Refers to Section*** |
|  |  |  |
|  |  |  |

* + - 1. Generic Business Use Case: Help the Grid User or the Grid Operator improve the quality of supply

***1 Description of the use case***

***1.1 Name of use case***

|  |  |  |
| --- | --- | --- |
| ***Use case identification*** | | |
| ***ID*** | ***Area /Domain(s)/ Zone(s)*** | ***Name of use case*** |
|  | Area: Energy System  Domain: Energy Storage | GBUC-Help the Grid User or the Grid Operator improve the quality of supply |

***1.2 Version management***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Version management*** | | | | |
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 0.1 | 2014.03.10 | Joseph Maire, Gauthier Delille | First draft (name, short description) | WD Working Document |
| 0.2 | 2014.05.27 | Denis Bonneau | Complements | WD Working Document |
| 0.3 | 2014.07.24 | Joseph Maire, Gauthier Delille | Complements (scope, objective) | WD Working Document |
| 0.4 | 2014.09.18 | Gauthier Delille | Complements (complete description, Smart Grid Functions) | WD Working Document |

***1.3 Scope and objectives of use case***

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| ***Scope and objectives of use case*** | |
| ***Scope*** | Use of an Electrical Energy Storage in normal operating conditions or during faults to maintain quality and continuity of supply of a part of the distribution network near real-time operations (via active filtering, re-energisation of part of the network, etc..)  The provision of ancillary services to System Operators such as frequency regulation is out of the scope of the Use Case. |
| ***Objective(s)*** | * Allow the Grid User to avoid power outages and damages to electric equipments, as well as to respect his contractual obligations towards the Distribution Grid Operator, * Allow the Distribution Grid Operator to respect his contractual obligations towards Grid Users (by maintaining the power supply within ranges specified by authorities...). |
| ***Related business case(s)*** | * Deliver EES Services at best-cost. |

**1.4 Narrative of Use Case**

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| ***Narrative of use case*** |
| ***Short description*** |
| The Generic Business Use Case describes how the EES Operator uses an Energy Storage to help the Customer or the Distribution Grid Operator improve the quality and ensure the continuity of supply (via frequency regulation, energising a non-loopable feeder during an outage, etc.). The EES may be used to avoid load shedding or to compensate for electrical disturbances. |
| ***Complete description*** |
| The growing penetration of renewable energy sources and the development of new electricity usages such as Demand Response and Electric Vehicle tend to increase the complexity of the missions of Grid Operators, whose major responsibility is to ensure quality and continuity of supply in a cost-efficient way.  Quality of electricity can be defined as the ability to maintain the major characteristics of the waveform, i.e. voltage and frequency, within predetermined limits. Frequency is generally directly influenced by the balance between load and generation. Voltage (values and waveform) depends on the characteristics of the networks, on the operation of the grid equipment and protection systems, on external events, and on the characteristics and operation of loads or generators.  Maintaining power quality within acceptable ranges becomes more difficult as the size of the network decreases. Small power systems, such as island power systems for instance, can be particularly impacted by rapid variations of local generation or consumption.  Storage can be used to shift upward or downward the immediate consumption of active and reactive power in a very fast and controlled way. It can thus contributes to solve electrical disturbances or prevent power outages. Applications may include active filtering, re-energisation of a non-loopable feeder during an outage, or dynamic frequency control support.  ***1-Improve continuity of supply by re-energising part of the network during a power outage***  Storage can be used to restore supply and feed local loads following a power outage. Depending on the available energy capacity and on its initial state of charge, it can bring back-up power during the totality or only a part of the event. During such intentional islanding events, the electrical energy storage is used as a voltage source and not as a current injector synchronized to the mains.  Following the detection of a fault, the Grid Operator manages the reconfiguration of the grid and requests the EES Operator to start-up the electrical energy storage. At the end of the event, suitable procedures must be defined to ensure proper reconnection of the isolated grid powered by the storage to the rest of the network.    ***2-Perform active filtering for the Grid Operator***  Through their power conversion systems, energy storage devices can be used to perform active filtering: voltage and harmonic compensation, balancing between phases, etc. When ensuring power quality is particularly challenging, the Grid Operator can rely on such capabilities to meet its contractual obligations towards Grid Users. For this kind of services, storage is a competitor of more traditional options such as grid reinforcement, passive filters, etc.  ***3-Perform active filtering for the Grid User***  Through their power conversion systems, energy storage devices can be used to perform active filtering: voltage and harmonic compensation, balancing between phases, etc. When highly non linear loads generate high amounts of disturbances, the Grid User can rely on such capabilities to meet its contractual obligations towards its Grid Operator. For this kind of services, storage is a competitor of more traditional options such as passive filters, etc.  ***4-Avoid load-shedding in islands by performing dynamic frequency control support***  In electrical islands, frequency excursions are sizeable and automatic load shedding is often required in response to disturbances. Moreover, the displacement of conventional generation with wind and solar plants, which usually do not provide inertial response, further weakens these power systems. Fast-acting storage, by injecting power within instants after the loss of a generating unit, can back up conventional generation assets during the activation of their primary reserve, thus making it possible to reduce the need for load-shedding in weak systems. |

**1.5  *Key Performance Indicators***

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| ***Key performance indicators*** | | | | |
| ***ID*** | ***Name*** | ***Calculation*** | ***Scope*** | ***Objective*** |
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***1.6  Use case conditions***

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| ***Use case conditions*** |
| ***Assumption*** |
| * A contract is in place between the Grid User / Grid Operator and the EES Operator. |
| ***Prerequisite*** |
| * Configuration of the EES. |

***1.7 Further information to the use case for classification / mapping***

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| ***Classification information*** |
| ***Relation to other use cases*** |
| GBUC-Make necessary contracts with customers and relevant parties |
| GBUC-Configure EES to be able to provide services to relevant parties |
| GSUC-Make measurements at PCC (f, V) |
| GSUC-Compute power reference in real-time |
| GSUC-Charge storage |
| GSUC-Discharge storage |
| GSUC-Inject reactive power |
| GSUC-Consume reactive power |
| GSUC-Balance phases |
| GSUC-Perform harmonic compensation |
| GSUC-Perform blackstart and act as a voltage source |
| GSUC-Synchronise with the grid |
| ***Level of depth*** |
|  |
| ***Prioritisation*** |
|  |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| Business Use Case |
| ***Further keywords for classification*** |
| Quality of supply, continuity of supply, frequency regulation, power electronics |

**1.8 General remarks**

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| ***General remarks*** |
| Some of the services described in the Use Case may not necessarily be relevant in large power systems, but have a particular interest in island power systems.  Besides, to be efficient from a technical and economic perspective, some of these services would require the use of large storage units.  Considering the current technological state of EES systems, some of these services may not be cost-efficient, their costs exceeding their overall benefits. The combination of EES services and their provision to various stakeholders of the Electric Power System may be considered as a cost-efficient solution to share the benefits of storage. |

**2 Diagrams of use case**

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| ***Diagram(s) of use case*** |
| *Use Case Overview diagram*    *Domain Overview diagram*    *BUC-SUC Relations diagram* |

***3 Technical Details***

***3.1 Actors***

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| ***Actors*** | |
| ***Grouping*** | ***Group Description*** |
|  |  |

| ***Actor name*** | ***Actor type*** | ***Actor Description*** | ***Further information specific to this Use Case*** |
| --- | --- | --- | --- |
| EES Operator | Role |  |  |
| Grid User | Role |  |  |
| Grid Operator | Role |  |  |

***3.2 References***

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| --- | --- | --- | --- | --- | --- | --- |
| ***References*** | | | | | | |
| ***No.*** | ***References Type*** | ***Reference*** | ***Status*** | ***Impact on use case*** | ***Originator / organisation*** | ***Link*** |
|  |  |  |  |  |  |  |
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***4 Step by step analysis of use case***

***4.1 Overview of scenarios***

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| --- | --- | --- | --- | --- | --- | --- |
| ***Scenario conditions*** | | | | | | |
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-Condition*** | ***Post-Condition*** |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |

***4.2 Scenarios***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 1 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 2 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario name:** | | **No. 3 – X** | | | | | | |
| ***Step No.*** | ***Event*** | ***Name of process/ activity*** | ***Description of process/ activity*** | ***Service*** | ***Information producer (actor)*** | ***Information receiver (actor)*** | ***Information exchanged (IDs)*** | ***Requirements   R-IDs*** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

***5 Information Exchanged***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Information exchanged*** | | | |
| ***Information exchanged ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirements IDs*** |
|  |  |  |  |
|  |  |  |  |

***6 Requirements (optional)***

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| --- |
| ***Requirements (optional)*** |

|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
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|  |  |  |
| --- | --- | --- |
| ***Category ID*** | ***Categories for requirements*** | ***Category description*** |
|  |  |  |
| ***Requirement ID*** | ***Requirement description*** | |
|  |  | |
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***7 Common Terms and Definitions***

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| ***Common Terms and Definitions*** | |
| ***Term*** | ***Definition*** |
|  |  |
|  |  |

***8 Custom Information (optional)***

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| --- | --- | --- |
| ***Custom Information (optional)*** | | |
| ***Key*** | ***Value*** | ***Refers to Section*** |
|  |  |  |
|  |  |  |

* 1. Bulk Generation (DCT10)

*Domain under analysis – to be completed.*