Receiving consumption, price or environmental information for further action by consumer or a local energy management system

Link to explanations, examples and the selection list for indicated fields, please refer to document "Use Case Description draft ver0.55"

<http://www.cen.eu/cen/Sectors/Sectors/UtilitiesAndEnergy/SmartGrids/Pages/default.aspx>

Version of Template: 0.55, Sept 2011

# Description of the Use Case

* + *General*
  + *Name of Use Case*

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| ***ID*** | ***Domain*** | ***Name of Use Case*** | ***Level of Depth***  *Cluster, High Level Use Case, Detailed Use Case* |
| WGSP-2110 - High level use case | Smart Home/Commercial/Industrial/DR-Customer EMS | Receiving consumption, price or environmental information for further action by consumer or a local energy management system | High-level Use Case |

* + *Version Management*

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| ***Changes / Version*** | ***Date*** | ***Name  Author(s) or Committee*** | ***Domain Expert*** | ***Area of Expertise / Domain / Role*** | ***Title*** | ***Approval Status***  *draft, for comments, for voting, final* |
| 0.4 | 30/07/2012 | ESMIG - Willem Strabbing &Tim sablon | Primary | AMI | - | Proposed |
| 0.5 | 12/11/2012 | ESMIG - Willem Strabbing &Tim Sablon | Primary | AMI | - | Validated |

* + *Basic Information to Use Case*

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| ***Source(s) / Literature*** | ***Link*** | ***Conditions (limitations) of Use*** |
| - | - | - |

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| ***Relation to Higher Level Use Case*** | |
| ***Cluster*** | ***Higher Level Use Case*** |
|  | Primary use case - Information regarding power consumption / generation / storage of individual smart devices |

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| ***Maturity of Use Case*** *- in business operation, realized in demonstration project, realised in R&D, in preparation, visionary* |
| - |
| ***Prioritisation*** |
| - |
| ***Generic, Regional or National Relation*** |
| Generic |
| ***View*** *- Technical / Business* |
| Technical |
| ***Further Keywords for Classification*** |
| - |

* + *Scope and Objectives of Use Case*

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| ***Scope and Objectives of Function*** |
| • Make consumers aware of their energy consumption  • Providing external market roles with information on (forecasted) energy consumption  • Enable consumers or their Energy Management System to react on (changes in) energy prices, thus supporting consumers to optimize their consumption to use cheaper or greener energy (depending on personal preferences)  • Send warnings to the consumer to keep consumption below a certain (contracted) level  • Enable external actors to retrieve the state of in home smart devices |

* + *Narrative of Use Case*

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| ***Narrative of Use Case*** |
| ***Short description*** *- max 3 sentences* |
| This use case describes how information regarding price and environmental aspects is sent from upstream actors to CEM and how information regarding energy consumption or generation as well as smart device statuses are being sent back to the consumer and upstream actors. |
| ***Complete description*** |
| This high level use case comprises four different primary use cases:  1. WGSP 2111 - Information regarding power consumption or generation The Smart Meter makes available the information on total power consumption or generation in the house. The CEM receives this information but can also receive consumption / generation information per smart device. The rate of update of the information must be proportional to the rate of change in the power drawn.   This use case scenario consists of two scenarios:  • Sending information regarding (future) power consumption or generation of individual smart devices. This information is provided by the smart device to CEM, which may aggregate it and use it to forecast consumption/generation and send this to the display and external actors. As the CEM can be a function integrated in smart devices in the customer premises, more than one CEM in the house may execute this scenario. In this case, one CEM does not have the total house consumption, but only partial information.  •  Sending information regarding total power consumption or generation. This information is provided by the smart meter, sent to the CEM that may use it to make a forecast of consumption/generation and forward this to the display and external actors.  Note that several use case scenarios may work together in an iterative way. E.g. there might be a negotiation which uses the price (WGSP2112) to get a forecast (WGSP2111), then adapting the price, which might be binding from there on.   Also note that the consumption information can be transferred via different channels to actor A, B and to the consumer or in-home devices. This implies that the use case could effectively be split up into three sub-use cases, each with its own goal (sending the information to Actor A, sending the information to Actor B and sending the information to the Simple External Consumer Display).   2. WGSP 2112 - Price and/or environmental information Actor A will send information (e.g. price, meteorological, environmental, cost related information, warning signals) to the consumer or his smart devices via the Energy management gateway; Actor B may do the same via the Smart Metering gateway. The goal is to make the consumer or his devices aware of the amount and cost of consumed energy and the amount and income for selling energy back to the grid, or of other elements relevant to energy management (e.g.: the percentage amount of green power). The consumer can also receive a notification that the tariff has been changed.  To move out peak loads, an external actor can propose a tariff of electricity higher during certain periods of the day or during certain days in order to invite his customers to delete or shift various uses or lower their consumptions in its housing during these periods. These periods and days may not be fixed in advance, but rather determined on the flexibility needs of the smart grid. When such a higher cost period occurs, the customers are notified in advance, so that they can be ready to react to these price signals. Smart devices can be parameterised or managed by the CEM to start when the energy costs less or when the relative amount of green energy is over a set level or to temporarily lowers its power consumption and/or shifts its operation before or after a peak consumption period.  The parameterization of the CEM and smart devices are the responsibility of the consumer.  The price information can be either real-time price, real time combined price and volume signals or a fixed tariff schedule. Note that dynamic pricing requires a metering system that is able to provide the information for, or to calculate the cost of energy based on, a flexible tariff scheme. This implies that price related changes in the CEM by actor A or B may be combined with a tariff update in the smart meter; this is described in use case BI.03. of the Smart Meters Coordination Group use case repository.   The communication functionalities described in this use case may also be used to send warning messages from an external actor to the consumer, warning him that emergency load control will happen within a certain period of time, unless changes in consumption / generation take place.  Note that several use case scenarios may work together in an iterative way. E.g. there might be a negotiation which uses the price (WGSP2112) to get a forecast (WGSP2111), then adapting the price (WGSP2112), which might be binding from there on.   Also note that the information may be provided by Actor A or Actor B alternatively, which implies that this use case could be effectively split up in two sub-use cases.   3.    WGSP 2113 - Warning signals from CEM/smart device This primary use case scenario consists of two scenarios:  • A warning signal is generated by the smart device after estimating that the power consumed during its next operation will exceed maximum contracted power. The Smart Device receives information from the CEM on total house consumption and maximum contracted power. The Smart Device estimates the maximum power that will be consumed during its next operation (ex: cycle). If there is a risk to exceed the threshold of the maximum contracted power, a warning is generated and displayed on the smart device or other customer interfaces (e.g. other devices or the simple external consumer display). The threshold is based on limits received from the CEM, which can be limits for instant power or accumulated energy consumption.  • The warning signal is generated by the CEM after noticing that contracted power is exceeded, based on information from the smart meter. Note that the CEM may also take action to lower the consumption of smart devices; since these actions are not in scope of this use case and the work of the SG-CG, this scenario only describes how the warning signals are being sent.  The limits (for instant power) can include not only upper limits (for example, when the customer is close to the limit of his contracted power) but also lower limits (for example, the remaining usual instant power consumption when the customer is out or during night time).    4.    WGSP 2114 - Retrieve status of smart devices This use case describes how an external actor retrieves the state of a smart device directly from the CEM. This real time information may be retrieved by en external actor who has a business relationship to the customer, having guaranteed that some of his smart devices are (exclusively) controlled by the external actor.  Another alternative is that the customer himself retrieves the state of smart devices via the display, in which case the information is not necessarily sent to actor A or B. |

* + *Actors: People, Systems, Applications, Databases, the Power System, and Other Stakeholders*

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| ***Actor Name*** | ***Actor Type*** | ***Actor Description*** |
| Actor B (external actor) | - | External actor (Smart Grid Market Role) interacting with the system functions and components in the home or home automation network through the metering communication channel. This actor is responsible for collecting metering data. Examples of such market roles are the DSO, metering company, etc. |
| HES | - | Responsible for acquiring the reads from meters and/or from data concentrators Delivers the raw meter reads to MDM Repeats the reading for any missing reads Is the short-term interim data storage (1-3 months) for meter reads Pushes the event information upwards to MDM Supports the specific protocols of the concentrators and meters Contains some topology information and aggregation functionality for plug &br/>play solutions |
| Actor A (external actor) | - |  |
| Smart appliance Generator ( external actor) | - | The smart appliance with integrated EM, directly receiving data from the grid, through the SGCP. The appliance may contain of be connected to a Plug in electricity meters that measures individual appliance consumption or output. Since the smart appliance / generator is outside the scope of the SGCG, it must be seen as an external actor |
| Simple external consumer display | - |  |
| Neighbourhood Network Access Point (NNAP) | - | The Neighbourhood Network Access Point is a functional entity that provides access to one or more LNAP’s, metering end devices, displays and home automation end devices connected to the neighbourhood network (NN). It may allow data exchange between different functional entities connected to the same NN. |
| Smart meter | - | The metering end device is a combination of the following meter-related functions from the Smart Metering reference architecture: â€¢  Metrology functions including the conventional meter display (register or index) that are under legal metrological control. When under metrological control, these functions shall meet the essential requirements of the MID; â€¢    One or more additional functions not covered by the MID. These may also make use of the display; â€¢    Meter communication functions. |
| Smart Metering gateway (LNAP) | - | An access point (functional entity) that allows access to one or more metering end devices and, when equipped with an interface, to advanced display / home automation end devices connected to the local network.  A LNAP also may allow data exchange between different functional entities connected to the same LN. The LNAP may act simply as a router transferring messages between the metering end device and/or display/home automation devices and the Neighbourhood network of wide area network.  It may also provide services including protocol conversion, device management, security and service capabilities. Services may be provided as functions of the LNAP itself or provide proxy services on behalf of limited capability devices connected to the local network |
| Energy management gateway | - | An access point (functional entity) sending and receiving smart grid related information and commands between actor A and the CEM, letting the CEM decide how to process the events. The communication is often achieved through an internet connection of through a wireless connection.  This gateway may also provide services including protocol conversion, device management, security and service capabilities |
| Customer Energy Management System (CEMS) | - | In this usecase, the CEMS functionality is a part of the SGCP |

* + *Issues: Legal Contracts, Legal Regulations, Constraints and others*

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| ***Issue -*** ***here specific ones*** | ***Impact of Issue on Use Case*** | ***Reference -*** *law, standard, others* |
| - | - | - |

* + *Preconditions, Assumptions, Post condition, Events*

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| ***Actor/System/Information/Contract*** | ***Triggering Event*** | ***Pre-conditions*** | ***Assumption*** |
| ***-*** | - | - | - |

* + *Referenced Standards and / or Standardization Committees (if available)*

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| ***Relevant Standardization Committees*** | ***Standards supporting the Use Case*** | ***Standard Status*** |
| - | - | - |

* + *General Remarks*

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| ***General Remarks*** |
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# Drawing or Diagram of Use Case

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| ***Drawing or Diagram of Use Case*** ***- recommended "context diagram" and "sequence diagram" in UML*** |
| http://www.usecases-picture.de/wgsp-2110.html |

# Step by Step Analysis of Use Case

| **S.No** | **Primary Actor** | **Triggering Event** | **Pre-Condition** | **Post-Condition** |
| --- | --- | --- | --- | --- |
| 1a-Use case scenario: Information regarding power consumption or generation of individual appliances/generators | Smart appliance / Generator | New consumption / generation information is available in the smart appliance / generator | Communication connection between all actors is established | (forecasted) consumption / generation is received by actor A and/or actor B and/or display |
| 1b-Use Case Scenario | - | New consumption / generation information is available in the smart appliance / generator | Communication connection between all actors is established | (forecasted) consumption / generation is received by actor A and/or actor B and/or display |

* + ***Steps - -***

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| ***Scenario*** ***Name:*** | | ***1a-Use case scenario: Information regarding power consumption or generation of individual appliances/generators*** | | | | |
| ***Step No.*** | ***Event*** | ***Description of Process/Activity*** | ***Information Producer*** | ***Information Receiver*** | ***Information Exchanged*** | ***Technical Require-ments ID***  *see* *Annex A Selection List* |
| 1 | New consumption / generation information is available in the smart appliance/generat or | 1-Smart appliance / generator sends information regarding consumption to the CEMS | Smart appliance Generator ( external actor) | Customer Energy Management System (CEMS) | Individual appliance consumption generation |  |
| 2 | CEMS received consumption / generation information per individual appliance | 2-The CEMS aggregates and/or forecasts total consumption and sends this information to the display | Customer Energy Management System (CEMS) | Display | Total and/or forecasted house consumption / generation |  |
| 3 | CEMS received consumption / generation information per individual appliance | 3a-The CEMS aggregates and/or forecasts total consumption and sends this information to the Energy Management Gateway (alternative) | Customer Energy Management System (CEMS) | Energy management gateway | Total and/or forecasted house consumption /generation |  |
| 4 | Energy Management Gateway received (forecasted) consumption / generation | 3b-Energy Management Gateway forwards information to Actor A | Energy management gateway | Actor A (external actor) | Total and/or forecasted house consumption / generation |  |
| 5 | CEMS received consumption / generation information per individual appliance | 4a-The CEMS aggregates and/or forecasts total consumption and sends this information to Smart Metering Gateway (LNAP) (alternative) | Customer Energy Management System (CEMS) | Smart Metering gateway (LNAP) | Total and/or forecasted house consumption /generation |  |
| 6 | Smart Metering Gateway (LNAP) receives (forecasted) consumption / generation | 4b-The CEMS aggregates and/or forecasts total consumption and sends this information to Smart Metering Gateway (LNAP) (alternative) | Smart Metering gateway (LNAP) | HES | Total and/or forecasted house consumption /generation |  |
| 7 | HES receives (forecasted) consumption / generation | 4c-HES forwards information to MDM | HES | MDMS | Total and/or forecasted house consumption / generation |  |
| 8 | MDM receives (forecasted) consumption / generation | 4d-MDM forwards information to Actor B | MDMS | Actor B (external actor) | B Total and/or forecasted house consumption / generation |  |

* + ***Steps - -***

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| ***Scenario*** ***Name:*** | | ***1b-Use Case Scenario*** | | | | |
| ***Step No.*** | ***Event*** | ***Description of Process/Activity*** | ***Information Producer*** | ***Information Receiver*** | ***Information Exchanged*** | ***Technical Require-ments ID***  *see* *Annex A Selection List* |
| 1 | New consumption / generation information is available in the smart appliance/generator | 1-Smart appliance / generator sends information regarding consumption to the CEMS | Smart appliances | Customer Energy Management System (CEMS) | Individual appliance consumption generation |  |
| 2 | CEMS received consumption / generation information per individual appliance | 2-The CEMS aggregates and/or forecasts total consumption and sends this information to the display | Customer Energy Management System (CEMS) | Display | Total and/or forecasted house consumption / generation |  |
| 3 | CEMS received consumption / generation information per individual appliance | 3a-The CEMS aggregates and/or forecasts total consumption and sends this information to the Energy Management Gateway (alternative) | Customer Energy Management System (CEMS) | Energy management gateway | Total and/or forecasted house consumption /generation |  |
| 4 | Energy Management Gateway received (forecasted) consumption / generation | 3b-Energy Management Gateway forwards information to Actor A | Energy management gateway | Actor A (external actor) | Total and/or forecasted house consumption / generation |  |
| 5 | CEMS received consumption / generation information per individual appliance | 4a-The CEMS aggregates and/or forecasts total consumption and sends this information to Smart Metering Gateway (LNAP) (alternative) | Customer Energy Management System (CEMS) | Smart Metering gateway (LNAP) | Total and/or forecasted house consumption / generation |  |
| 6 | Smart Metering Gateway (LNAP) receives (forecasted) consumption / generation | 4b-Smart Metering Gateway (LNAP) forwards information to HES (optional: signal is sent through NNAP) | Smart Metering gateway (LNAP) | HES | Total and/or forecasted house consumption / generation |  |
| 7 | HES receives (forecasted) consumption / generation | 4c-HES forwards information to MDM | HES | MDMS | Total and/or forecasted house consumption / generation |  |
| 8 | MDM receives (forecasted) consumption / generation | 4d-MDM forwards information to Actor B | MDMS | Actor B (external actor) | Total and/or forecasted house consumption / generation |  |