AEP	American Electr	ic Power	4.2 Demand F	Response	Document ID: Use case # 2.6
Title: Direct Load Cont			Event		
Subject Matter Expert:			Author:	Reviewed by:	
J.R. Cote Br		Brian D. C	Green	John Simmins	

Direct Load Control Event

"Acknowledgment: This material is based upon work supported by the Department of Energy under Award Number DE-OE0000193."

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Versio	Version History					
Rev.	Date	Author	Change description			
1.1	3/22/2010	Brian D. Green	Initial Use Case			
1.2	3/24/2010	J.R. Cote	Actor Name Review			
1.3	3/30/2010	Brian D. Green	Clean up Diagrams			
2.0	4/11/2020	John J. Simmins	Fill in some blanks			
3.2	5/6/2010	Brian D. Green	Minor Changes and add activity diagrams			

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®	Title: Direct Load Control Event				
Subject Matter Expert:		Author: Revi		Revie	wed by:
J.R. Cote Bria		Brian D. C	Green	John Simmin	S

Summary:

The DR solution shall provide the ability to manage direct load control programs. It accomplishes this by managing the transmission of direct load control actions to HAN devices, shown as PEV, Programmable Communicating Thermostat (PCT), load control switch and smart appliances. This solution will also provide interactions with customers to convey direct load control information via in home display (IHD).

FERC states that further development of key standards around Demand Response will enhance interoperability and communications between system operators, demand response resources (also called curtailment resources), and the systems that support them. The following Use Cases on Demand Response supports DOE's request to identify use cases and relevant standards, particularly around dispatchable curtailment to address loss or unavailability of other resources or shifting consumption to non-peak times.

Demand Response is a temporary change in electricity consumption by demand control devices in response to market or reliability conditions. Demand control devices control loads capable of measurably and verifiably providing temporary changes in demand. Demand Response may be used to support electricity demand or supply management opportunities for reliability or economic reasons. By managing loads through Demand Response the opportunity exists to:

- Engage the consumer by allowing market participation and consumption/billing choices;
- Introduce new markets for aggregators, micro-grid operators, distributed generation;
- Control peak power conditions and limit or remove brownout/blackout instances;
- Flatten consumption curves or peaks and shift consumption times;
- Respond to temporary grid anomalies;
- Maximize use of available power and increase system efficiencies through time-of-use (TOU) and dynamic pricing models.

Narrative:

There are three scenarios described in this use case. Scenario #1 details a Demand Response (DR) event using a meter centric approach. (DR via AMI. No **EMS**.) Scenario #2 details a DR event using an **EMS** centric approach with the AMI system. (DR signals travel through the **Smart Meter** to the **Customer EMS** and back through the **Smart Meter**.) Scenario #3 details a DR Event using a **Customer EMS** centric approach with **Internet Gateway**. (DR signals travel from the **DR Application** through the internet, to the **Internet Gateway**, to the **EMS**. The Information travels from the **HAN Devices** to the **Customer EMS**, to the **Internet Gateway**, through the Internet, back to the **DR Application**.)

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Scenario #1 - The Demand Response (DR) solution shall provide the ability to manage direct load control programs. It accomplishes this by managing the transmission of direct load control actions to *PEV*, *Load-Control Switch, HAN Device*, and *Smart Appliances*. This solution will also provide interactions with customers to convey direct load control information using an *In Home Display (IHD)*. The initiation of a DR event is triggered by the *DR Application* (a module) of the AMI System, shown as logically separated. The *AMI Head-End* module sends the DR command/message through the *AMI Network* to the *Smart Meter* where is it is transmitted through the *Home Area Network (HAN)* to the direct load control devices. These commands and messages can include:

- The DR profile which can include
 - Temperature change
 - o On/off parameters
 - Pricing information (CPP, TOU)
 - Informational messages
- Curtailment requests (direct load control)



Note(s):

The NIC, ESI, Meter Metrology Board and the Internal Meter Switch are all parts of the Smart Meter.

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Scenario #2 - The DR solution shall provide the ability to manage direct load control programs. It accomplishes this by managing the transmission of direct load control actions to *PEV*, *Load-Control Switch*, *HAN Device*, and *Smart Appliances*. This solution will also provide interactions with customers to convey direct load control information using an *IHD*. The initiation of a DR event is triggered by the *DR Application* (a module) of the AMI system, shown as logically separated. The *AMI Head-End* module sends the DR command/message through the *AMI Network* to the *Smart Meter*. The *Smart Meter* relays the information, needed by the *Customer Energy Management System* (*Customer EMS*) which acts as the home control center for electricity consumption. The *Customer EMS* provides various facilities for the home owner to track his consumption verify trends and be savvier with his electricity consumption. The *Customer EMS* transmits through the *HAN* to the direct load control devices. These commands and messages can include:

- The DR profile which can include
 - Temperature change
 - On/off parameters
 - Start & Duration
 - Pricing information (CPP, TOU)
 - Informational messages, other SEP1.0 DRLC cluster parameters
- Curtailment requests (direct load control)



Note(s):

The NIC, ESI, Meter Metrology Board and the Internal Meter Switch are all parts of the Smart Meter.

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Scenario #3 - The DR solution shall provide the ability to manage direct load control programs. It accomplishes this by managing the transmission of direct load control actions to *PEV, Load-Control Switch, HAN Device,* and *Smart Appliances*. This solution will also provide interactions with customers to convey direct load control information using an *In Home Display (IHD)*. The initiation of a DR event is triggered by the *DR Application* (a module) of the AMI system, shown as logically separated. The *smart meter* relays simple meter data needed by the home *Customer Energy Management System* (*Customer EMS*). The DR application, through the internet and *Internet Gateway* transmits DR commands to the *EMS* which acts as the home control center for electricity consumption. The *Customer EMS* provides various facilities for the home owner to track their consumption verify trends and be savvier with his electricity consumption. The *Customer EMS* transmits through the *HAN* to the direct load control devices. These commands and messages can include:

- The DR profile which can include
 - o Temperature change
 - On/off parameters
 - Pricing information (CPP, TOU)
 - Informational messages
- Curtailment requests (direct load control)



Note(s):

The NIC, ESI, Meter Metrology Board and the Internal Meter Switch are all parts of the Smart Meter.

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Actor(s):

The list of the actors and the roles that are participating in this use case described in the table below.

Name	Role description
Access Point	The Access Point is a sub-system within the AMI system that performs high volume data transport capabilities.
NOC	The NOC is the Network Operations Center for Telecom activities
AMI Head-End	The AMI Head-End is the back office system than controls the Advanced Metering Infrastructure.
AMM Module	Automated Meter Management (predecessor to the DR module of the AMI Head-End)
Customer	Customer of the Electric Service Provider. Contracts with the ESP to receive quality electrical service. Agrees to participate in Demand Response program. May or may not (at time of system operation) choose to participate
Customer EMS	A logical or physical device typically located at the customer facility that acts as a home electricity control center. The EMS is typically connected to the HAN and sends/receives information from various communications means depending on the customer scenario.
Customer Web Portal	Interactive Web-site that is accessible via the internet that enables the exchange and display of information for the customer.
Distribution Management	Organization within the utility in charge of the distribution of electricity.
Distribution Operations	Organizational Group within the utility responsible for the operations of the distribution system.
DR Application	Demand Response Application is a sub-system of the AMI System used to issue demand response commands.
DR Service Provider	
ESI	HAN network interface component with NIC within the Smart Meter
ESP	Energy Service Provider
EVSE	Electric Vehicle Supply Equipment (EVSE) manufacturers are delivering Smart charging stations for electric vehicles. These smart charging stations will typically be located at customers' premises, or at other private and public parking facilities.
EVSE Radio	The radio within the EVSE that sends and receives information through the HAN
HAN	Home Area Network (Network of communicating energy consuming devices)
HAN Device	Device owned by customer, utility or third party that is registered on the Home Area Network (HAN). It communicates in a secure way between other HAN devices.



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Name	Role description
IHD	In-Home Display presents basic information to the customer such as consumption data, price information or demand response signals.
IHD Radio	The radio with the IHD that receives and sends the data to the HAN.
Load Control Switch	Electric switch that can be remotely commanded to open or close.
Load Control Switch Radio	The radio that sends and receives data between the controller and the LCS
Meter	A smart meter electronically tracks how much electricity is used and when it is used. The smart meter is also equipped to send and receive information from/to the AMI network and also from/to the HAN
Metering Department	The Department within the utility in charge of metering electricity consumption
Metering System	Also called Advanced Metering Infrastructure it is the collection of devices (such as smart meters), systems (such as MDM) and sub- systems (such as relays or Access points) that enable the automated metering solution
NIC	AMI network interface component with Meter Metrology Board within the Smart Meter.
PCT	Device on the Home Area Network that is programmable and controllable.
PCT Radio	The radio that sends and receives data between the HAN and the PCT
PEV	Plug-In Electric Vehicle
PEV Radio	The radio with the PEV that sends and receives information through the HAN
Relay (AMI)	A sub-system of the AMI system that typically relays the data using radio signals between the meters and the access points.
Smart Appliance	Smart Appliances can react to remote management, whether to price, grid integrity, or other energy management signaling.
Smart Appliance Radio	The radio that sends and receives data between the smart appliance and the HAN
Smart Meter	A digital meter used in measuring watts, vars, var-hours, volt-amperes, or volt-ampere-hours. The Smart Meter is a 2-way communicating device that includes a NIC and is part of an advanced metering infrastructure (AMI). It is located on the customer premise and owned by the distributor or retail provider.

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Participating Business Functions:

The participating business function, its acronym and what they provide in this use case are detailed in the table below.

Acronym	Business Function/Abstract Component	Services or Information Provided

Assumptions / Design Considerations:

 Standard International Electrotechnical Commission (IEC) 61968 Message Definition format will be followed to provide the Header, Request, Reply, and payload used when defining the messages for the design specifications. For the purpose of the use cases identified in this document these have been omitted as they are to be provided in the design specification for the Direct Load Control Event use case.

Normal Sequence:

The sequences of events, showing the order in which they occur during the typical progression of this use case are provided in the table below. The Sequence Diagram that graphically depicts the events is presented immediately following the table.

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
1.1	Energy Service Provider (ESP) determines that the available generation is inadequate to fulfil the system loads	ESP contacts Distribution Operations to report inadequate generation resources	Inadequate generation resources	ESP	Distributio n Operation s	

S1: Demand Response (DR) event using a meter centric approach. (DR via AMI. No EMS.)

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4.2 Demand Response

Title: Direct Load Control Event

Subject Matter Expert:Author:Reviewed by:J.R. CoteBrian D. GreenJohn Simmins

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
1.2		Distribution Operations calls a Direct Load Control Event using the DR Application (demand response event).	Direct Load Control Event	Distributio n Operation s	DR Applicatio n	
1.3		DR Application creates appropriate transactions (to send to Customers and Customer's Devices) to send to the AMI Head- End	(1) Data elements to trigger for Direct Load Control	DR Applicatio n	AMI Head-End	The AMI is ultimately passing data thru the meter to the HAN to the Controllable Devices
1.4		AMI Head-End sends Data elements to trigger for Direct Load Control Event to the NIC via the AMI Network	(2) Data elements to trigger for Direct Load Control Event	AMI Head-End	AMI Network	
1.5		AMI Network routes Data elements to trigger for Direct Load Control Event to the NIC	(2) Data elements to trigger for Direct Load Control Event	AMI Network	NIC	
1.6		NIC send Data elements to trigger for Direct Load Control Event to the ESI	(2) Data elements to trigger for Direct Load Control Event	NIC	ESI	
1.7A. 1		ESI sends Data elements concerning DR Event for IHD to IHD Radio	(3) Data elements concerning DR Event for IHD	ESI	IHD Radio	
1.7A. 1.1	Receives Data elements concerning DR Event	IHD Radio receives the signal and sends a Communications Acknowledgement to the ESI	Communications Acknowledgeme nt	IHD Radio	ESI	
1.7.A .2		IHD Radio sends Data elements concerning DR Event for IHD to IHD	(3) Data elements concerning DR Event for IHD	IHD Radio	IHD	



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Title: Direct Load Control Event

Subject Matter Expert:	Author:	Reviewed by:
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Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
1.7A. 3		IHD displays information for DR Event	Information for DR Event	IHD	Internal	
1.7B. 1		ESI sends Data elements to trigger for Direct Load Control Event to PCT Radio	(4) Data elements to trigger for Direct Load Control Event	ESI	PCT Radio	
1.7B. 1.1	Receives Data elements concerning DR Event	PCT Radio receives the signal and sends a Communications Acknowledgement to the ESI	Communications Acknowledgeme nt	PCT Radio	ESI	
1.7B. 2		PCT Radio sends Data elements to trigger for Direct Load Control Event to the PCT Controller	(4) Data elements to trigger for Direct Load Control Event	PCT Radio	PCT Controller	Cycling vs. temperature control - ???
1.7B. 3		PCT functions accordingly	(4) Data elements to trigger for Direct Load Control Event	PCT	Internal	
1.7C. 1		ESI sends Data elements to trigger for Direct Load Control Event to Smart Appliance Radio	(5) Data elements to trigger for Direct Load Control Event	ESI	Smart Appliance Radio	
1.7C. 1.1	Receives Data elements concerning DR Event	Smart Appliance Radio receives the signal and sends a Communications Acknowledgement to the ESI	Communications Acknowledgeme nt	Smart Appliance Radio	ESI	
1.7C. 2		Smart Appliance Radio sends Data elements to trigger for Direct Load Control Event to Smart Appliance Controller	(5) Data elements to trigger for Direct Load Control Event	Smart Appliance Radio	Smart Appliance Controller	
1.7C. 3		Smart Appliance responds accordingly	(5) Data elements to trigger for Direct Load Control Event	Smart Appliance Controller	Internal	



4.2 Demand Response

Title: Direct Load Control Event

Subject Matter Expert: Reviewed by: Author: J.R. Cote Bri John Simmins

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
1.7D. 1		ESI sends Data elements to trigger for Direct Load Control Event to the Load Control Switch Radio	(6) Data elements to trigger for Direct Load Control Event	ESI	Load Control Switch Radio	
1.7D. 1.1	Receives Data elements concerning DR Event	Load Control Switch Radio receives the signal and sends a communications acknowledgement to the ESI	Communications Acknowledgeme nt	Load Control Switch Radio	ESI	
1.7D. 2		Load Control Switch Radio sends Data elements to trigger for Direct Load Control Event to Load Control Switch Controller	(6) Data elements to trigger for Direct Load Control Event	Load Control Switch Radio	Load Control Switch Controller	
1.7D. 3		Load Control Switch Radio responds accordingly	(6) Data elements to trigger for Direct Load Control Event	Load Control Switch Radio	Internal	
1.7E. 1		ESI sends Data elements to trigger for Direct Load Control Event to EVSE Radio	(7) Data elements to trigger for Direct Load Control Event	ESI	EVSE Radio	
1.7E. 1.1	Receives Data elements concerning DR Event	EVSE Radio receives the signal and sends a Communications Acknowledgement to the ESI	Communications Acknowledgeme nt	EVSE Radio	ESI	
1.7E. 2		EVSE Radio sends Data elements to trigger for Direct Load Control Event to EVSE	(7) Data elements to trigger for Direct Load Control Event	EVSE Radio	EVSE	
1.7E. 3		EVSE responds accordingly	(7) Data elements to trigger for Direct Load Control Event	EVSE	Internal	



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Title: Direct Load Control Event

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Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
1.8		ESI collects and delivers Communications Acknowledges to NIC	Communications Acknowledgeme nts	ESI	NIC	
1.9	NIC Receives Communica tions Acknowledg ements	NIC delivers Communications Acknowledgements to the AMI Head-EndDR Application via the AMI Network	Communications Acknowledgeme nts	NIC	AMI Network	
1.10		AMI Network routes Communications Acknowledgements to the AMI Head-End	Communications Acknowledgeme nts	AMI Network	AMI Head-End	
1.11	AMI Head- End Receives Communica tions Acknowledg ements	AMI Head-End delivers Communications Acknowledgements to the DR Application	Communications Acknowledgeme nts	AMI Head-End	DR Applicatio n	
1.12		DR Application displays updates	System Updates	DR Applicatio n	Internal	



Direct Load Control Scenario 1 Sequence Diagram

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S2: DR event using an Customer EMS centric approach with the AMI System. (DR signals travel through the Smart Meter to the Customer EMS and back through the Smart Meter.)

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
2.1	Energy Service Provider determines that the available generation is inadequate to fulfill the system loads	ESP contacts Distribution Operations to report inadequate generation resources	Inadequate generation resources	ESP	Distributi on Operatio ns	
2.2		Distribution Operations calls a Direct Load Control Event using the DR Application (demand response event).	Direct Load Control Event	Distributi on Operatio ns	DR Applicati on	
2.3		DR Application creates appropriate transactions (to send to Customers and Customer's Devices) via AMI Network	(1) Data elements to trigger for Direct Load Control	DR Applicati on	AMI Head- End	
2.4		AMI Head-End sends Data elements to trigger for Direct Load Control Event to AMI Network	(2) Data elements to trigger for Direct Load Control Event	AMI Head- End	AMI Network	
2.5		AMI Network routes Data elements to trigger for Direct Load Control Event to the NIC	(2) Data elements to trigger for Direct Load Control Event	AMI Network	NIC	



4.2 Demand Response

Title: Direct Load Control Event

Subject Matter Expert: Author: Reviewed by: John Simmins J.R. Cote

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Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
2.6		NIC send Data elements to trigger for Direct Load Control Events to the ESI	(2) Data elements to trigger for Direct Load Control Event	NIC	ESI	
2.7		ESI send Data elements to trigger for Direct Load Control Events to the Customer EMS	(2) Data elements to trigger for Direct Load Control Event	ESI	Custome r EMS	
2.8A .1		Customer EMS sends Data elements concerning DR Event for IHD to IHD Radio	(3) Data elements concerning DR Event for IHD	Custome r EMS	IHD Radio	
2.8A .1.1	Receives Data elements concerning DR Event	IHD Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	IHD Radio	Custome r EMS	
2.8. A.2		IHD Radio sends Data elements concerning DR Event for IHD to IHD	(3) Data elements concerning DR Event for IHD	IHD Radio	IHD	
2.8A .3		IHD displays information for DR Event	Information for DR Event	IHD	Internal	
2.8B .1		Customer EMS) sends Data elements to trigger for Direct Load Control Event to PCT Radio	(4) Data elements to trigger for Direct Load Control Event	Custome r EMS	PCT Radio	
2.8B .1.1	Receives Data elements concerning DR Event	PCT Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	PCT Radio	Custome r EMS	
2.8B .2		PCT Radio sends Data elements to trigger for Direct Load Control Event to the PCT	(4) Data elements to trigger for Direct Load Control Event	PCT Radio	РСТ	Cycling vs. temperature control - ???



4.2 Demand Response

Title: Direct Load Control Event

Subject Matter Expert: Reviewed by: Author: J.R. Cote John Simmins reen

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Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
2.8B .3		PCT functions accordingly	(4) Data elements to trigger for Direct Load Control Event	PCT	Internal	
2.8C .1		Customer EMS sends Data elements to trigger for Direct Load Control Event to Smart Appliance Radio	(5) Data elements to trigger for Direct Load Control Event	Custome r EMS	Smart Applianc e Radio	
2.8C .1.1	Receives Data elements concerning DR Event	Smart Appliance Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	Smart Applianc e Radio	Custome r EMS	
2.8C .2		Smart Appliance Radio sends Data elements to trigger for Direct Load Control Event to Smart Appliance	(5) Data elements to trigger for Direct Load Control Event	Smart Applianc e Radio	Smart Applianc e	
2.8C .3		Smart Appliance responds accordingly	(5) Data elements to trigger for Direct Load Control Event	Smart Applianc e	Internal	
2.8D .1		Customer EMS sends Data elements to trigger for Direct Load Control Event to the Load Control Switch Radio	(6) Data elements to trigger for Direct Load Control Event	Custome r EMS	Load Control Switch Radio	
2.8D .1.1	Receives Data elements concerning DR Event	Load Control Switch Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	Load Control Switch Radio	Custome r EMS	



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Title: Direct Load Control Event

Subject Matter Expert:Author:Reviewed by:J.R. CoteBrian D. GreenJohn Simmins

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
2.8D .2		Load Control Switch Radio sends Data elements to trigger for Direct Load Control Event to Load Control Switch Controller	(6) Data elements to trigger for Direct Load Control Event	Load Control Switch Radio	Load Control Switch Controlle r	
2.8D .3		Load Control Switch responds accordingly	(6) Data elements to trigger for Direct Load Control Event	Load Control Switch	Internal	
2.8E .1		Customer EMS sends Data elements to trigger for Direct Load Control Event to EVSE Radio	(7) Data elements to trigger for Direct Load Control Event	Custome r EMS	EVSE Radio	
2.8E .1.1	Receives Data elements concerning DR Event	EVSE Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	EVSE Radio	Custome r EMS	
2.8E .2	Sends Communic ations Acknowled gement to the Customer EMS	EVSE Radio sends Data elements to trigger for Direct Load Control Event to EVSE	(7) Data elements to trigger for Direct Load Control Event	PEV	EVSE	
2.8E .3		EVSE responds accordingly	(7) Data elements to trigger for Direct Load Control Event	EVSE	Internal	
2.9		Customer EMS delivers Communications Acknowledgements to ESI	Communications Acknowledgeme nts	Custome r EMS	ESI	



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Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
2.10		ESI collects and delivers Communications Acknowledgements to NIC	Communications Acknowledgeme nts	ESI	NIC	
2.11	NIC Receives Communic ations Acknowled gements	NIC delivers Communications Acknowledgements to the AMI Head-End via AMI Network	Communications Acknowledgeme nts	NIC	AMI Network	
2.12		AMI Network routes Communications Acknowledgements to the AMI Head-End	Communications Acknowledgeme nts	AMI Network	AMI Head- End	
2.13	AMI Head- End Receives Communic ations Acknowled gements	AMI Head End delivers Communications Acknowledgements to the DR Application	Communications Acknowledgeme nts	AMI Head- End	DR Applicati on	
2.14		DR Application displays updates	System Updates	DR Applicati on	Internal	



Direct Load Control Scenario 2 Sequence Diagram

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S3: DR Event using an Customer EMS centric approach with Internet Gateway. (DR signals travel from the DR Application through the internet, to the internet gateway, to the Customer EMS. The Information travels from the devices to the Customer EMS, to the internet Gateway, through the internet, back to the DR Application.)

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
3.1	Energy Service Provider determines that the available generation is inadequate to fulfil the system loads	ESP contacts Distribution Operations to report inadequate generation resources	Inadequate generation resources	ESP	Distributi on Operatio ns	
3.2		Distribution Operations calls a direct load control or demand response event using the DR Application.	Direct Load Control Event	Distributi on Operatio ns	DR Applicati on	
3.3		DR Application creates appropriate transactions (to send to Customers and Customer's Devices) to send to the Internet Gateway via the Internet	(1) Data elements to trigger for Direct Load Control	DR Applicati on	Internet	
3.4		Internet routes the appropriate transactions (to send to Customers and Customer's Devices) to thr Internet Gateway	(1) Data elements to trigger for Direct Load Control	Internet	Internet Gateway	
3.5		Internet Gateway sends transactions to the Customer EMS	(2) Data elements to trigger for Direct Load Control Event	Internet Gateway	Custome r EMS	



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Title: Direct Load Control Event

Subject Matter Expert:	Author:	Reviewed by:
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Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
3.6A .1		Customer EMS sends Data elements concerning DR Event for IHD to IHD Radio	(3) Data elements concerning DR Event for IHD	Custome r EMS	IHD Radio	
3.6A .1.1	Receives Data elements concerning DR Event	IHD Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	IHD Radio	Custome r EMS	
3.6A .2		IHD Radio sends Data elements concerning DR Event for IHD to IHD	(3) Data elements concerning DR Event for IHD	IHD Radio	IHD	
3.6A .3		IHD displays information for DR Event	Information for DR Event	IHD	Internal	
3.6B .1		Customer EMS sends Data elements to trigger for Direct Load Control Event to PCT Radio	(4) Data elements to trigger for Direct Load Control Event	Custome r EMS	PCT Radio	
3.6B .1.1	Receives Data elements concerning DR Event	PCT Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	PCT Radio	Custome r EMS	
3.6B .2		PCT Radio sends Data elements to trigger for Direct Load Control Event to the PCT	(4) Data elements to trigger for Direct Load Control Event	PCT Radio	PCT	Cycling vs. temperature control - ???
3.6B .3		PCT functions accordingly	(4) Data elements to trigger for Direct Load Control Event	PCT	Internal	
3.6C .1		Customer EMS sends Data elements to trigger for Direct Load Control Event to Smart Appliance Radio	(5) Data elements to trigger for Direct Load Control Event	Custome r EMS	Smart Applianc e Radio	



4.2 Demand Response

Title: Direct Load Control Event

Subject Matter Expert:Author:Reviewed by:J.R. CoteBrian D. GreenJohn Simmins

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
3.6C .1.1	Receives Data elements concerning DR Event	Smart Appliance Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	Smart Applianc e Radio	Custome r EMS	
3.6C .2		Smart Appliances Radio sends Data elements to trigger for Direct Load Control Event to Smart Appliance	(5) Data elements to trigger for Direct Load Control Event	Smart Applianc e Radio	Smart Applianc e	
3.6C .3		Smart Appliance responds accordingly	(5) Data elements to trigger for Direct Load Control Event	Smart Applianc e	Internal	
3.6D .1		Customer EMS sends Data elements to trigger for Direct Load Control Event to the Load Control Switch Radio	(6) Data elements to trigger for Direct Load Control Event	Custome r EMS	Load Control Switch Radio	
3.6D .1.1	Receives Data elements concerning DR Event	Load Control Switch Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	Load Control Switch Radio	Custome r EMS	
3.6D .2		Load Control Switch Radio sends Data elements to trigger for Direct Load Control Event to Load Control Switch	(6) Data elements to trigger for Direct Load Control Event	Load Control Switch Radio	Load Control Switch	
3.6D .3		Load Control Switch responds accordingly	(6) Data elements to trigger for Direct Load Control Event	Load Control Switch	Internal	



4.2 Demand Response

Title: Direct Load Control Event

Subject Matter Expert:	Author:	Reviewed by:
J.R. Cote	Brian D. Green	John Simmins

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
3.6E .1		Customer EMS sends Data elements to trigger for Direct Load Control Event to EVSE Radio	(7) Data elements to trigger for Direct Load Control Event	Custome r EMS	EVSE Radio	
3.6E .1.1	Receives Data elements concerning DR Event	EVSE Radio receives the signal and sends a Communications Acknowledgement to the Customer EMS	Communications Acknowledgeme nt	EVSE Radio	Custome r EMS	
3.6E .2		EVSE Radio sends Data elements to trigger for Direct Load Control Event to the EVSE	(7) Data elements to trigger for Direct Load Control Event	EVSE Radio	EVSE	
3.6E .3		EVSE responds accordingly	(7) Data elements to trigger for Direct Load Control Event	EVSE	Internal	
3.7	Customer EMS Receives Communic ation Acknowled gements	Customer EMS collects and delivers Communication Acknowledgements to Internet Gateway	Communication Acknowledgeme nts	Custome r EMS	Internet Gateway	
3.8		Internet Gateway delivers Communication Acknowledgements to the Internet	Communication Acknowledgeme nts	Internet Gateway	Internet	
3.9		Internet routes Communication Acknowledgements to the DR Application	Communication Acknowledgeme nts	Internet	DR Applicati on	

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2.6Reviewed Control EventTitle: Direct Load Control EventSubject Matter Expert:Author:Reviewed by:
J.R. CoteJ.R. CoteBrian D. Green

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
3.10	DR Application Receives Communic ation Acknowled gements	DR Application displays updates	System Updates	DR Applicati on	Internal	

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®	Title: Direct Load Control Event					
Subject Matter Expert:			Author:	Revie	wed by:	
J.R. Cote		Brian D. C	Green	John Simmin	S	

Integration Scenarios

Adapters will use the Common Information Model (CIM) in Extensible Markup Language (XML) to send and receive messages and events.

The following are the points of integration that must be tested for this use case. Other non-CIM message interfaces may be testable in this use case.

Actor	Interface Points
DR Application	AMI Head-End
AMI Head-End	AMI Network
NIC	• ESI
	IHD Radio
	PCT Radio
ESI	Smart Appliance Control Radio
	Load Control Device Radio
	EVSE Radio

Pre-conditions:

The following conditions that MUST be met before this use case can occur.

- It is understood that the Network Interface Card (NIC) is inside the Smart Meter.
- It is understood that the ESI is part of the Network Interface Card (NIC) inside the Smart Meter.
- There is a functional Internet Gateway.

Post-conditions:

The following events or actions that may happen after or be caused by the completion of the normal use case events, as well as the exceptions or alternative sequences are:

• The load control event is successfully implemented by Distribution Operations.

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Exceptions / Alternate Sequences:

There are no exceptions, unusual events or alternate sequences defined for this use case.

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type

Message Type(s) Diagram:

The following XML Schema Definition (XSD) diagram shows the normative and informative parts of the message. Not all of the International Electrotechnical Commission's (IEC) – CIM message optional elements must or will be used in the use of IEC – CIM for this specific use case.

References:

Use Cases or other documentation referenced by this use case include:.

Issues: None

ID	Description	Status

Miscellaneous Notes: None