	American Electric Power	4.2 Demand Response	Document ID: **Use case # 4.2.1**
	Title: **DR HAN Pricing & Event Customer Opt-Out Use Case**		

Subject Matter Expert:	Author:	Reviewed by:
Margaret Goodrich	Muhammad Irfan Razzak	Tim Simmons

DR HAN Pricing & Event Customer Opt-Out

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

Version History			
Rev.	Date	Author	Change description
A	03/04/2011	Muhammad Irfan Razzak (MIR)	Initial Release
B	03/07/2011	MIR	Add alternate sequences and incorporate new schema from “IEC-Part9-Profiles-2nd-Edition 2”
C	03/13/2011	MIR	Updated sequence flows, diagrams, assumptions and interface list based on Margaret’s feedback.
D	08/08/2011	AEP Workshop	Various updates
E	9/15/2011	Tim Simmons	Implement various updates
F	10/12/11	Brian D. Green	Add Narrative, Interface Diagrams and updates to steps and Actors
G	10/20/2011	Barry Peirce	Changes Tracked

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Summary:

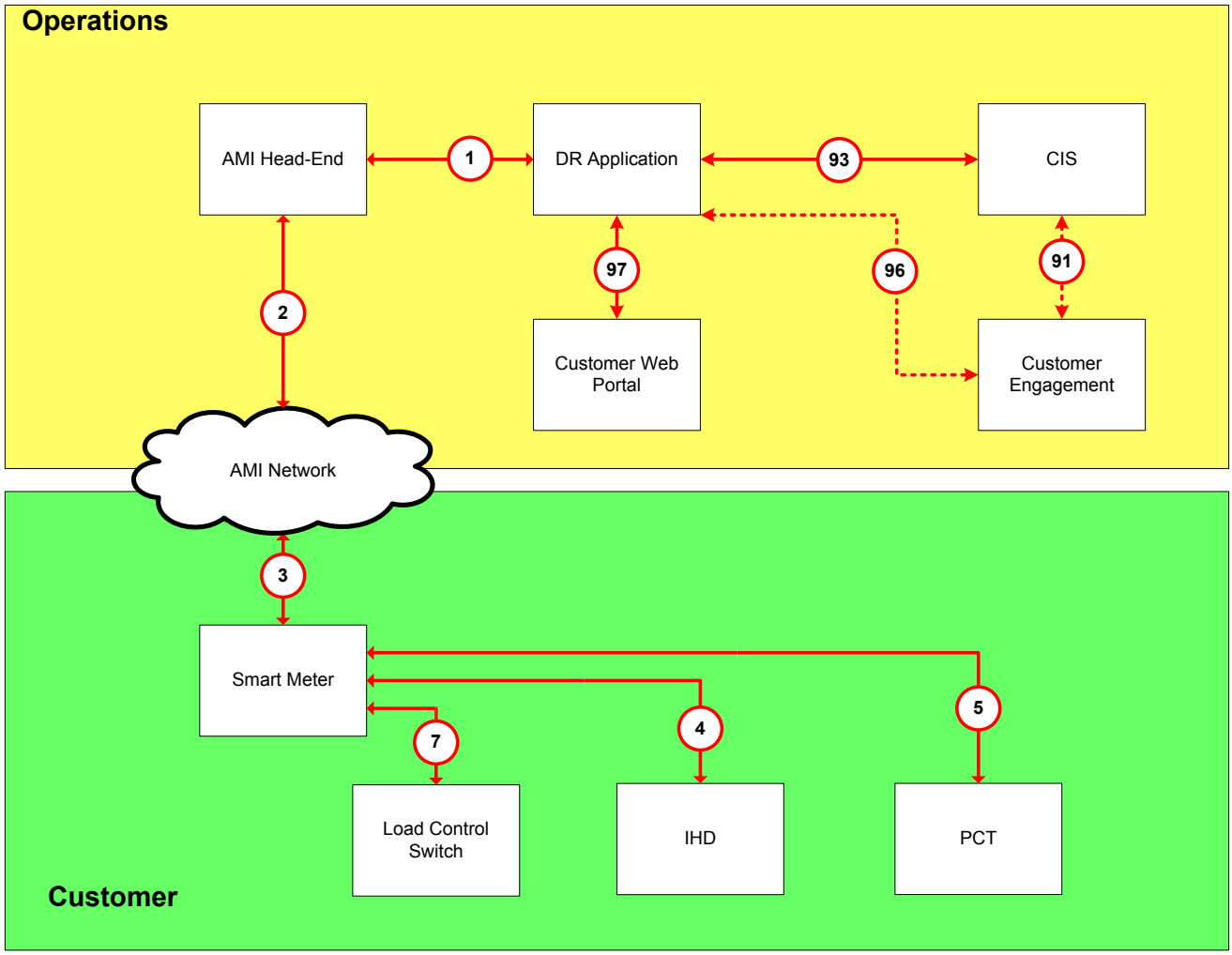
This use case discusses how the current Critical Peak Pricing (CPP) and Direct Load Control (DLC) program pricing data, along with DLC and Demand Response (DR) event messages get passed to the (Home Area Network (HAN)) Devices along with the Customers acceptance or opt-out responses to program event messages being sent back to the back office systems.

Narrative:

The ***Customer Engagement (CE)*** interacts with the ***Customer Information System (CIS)*** and the ***Demand Response Application*** (**DR Application**) to send either current tariff CPP or DLC pricing data to the appropriate HAN Devices e.g. ***PCT***, ***Load Control Switch***, ***Smart Meter***, ***In-Home Display*** (***IHD***) appropriate to the CPP or DLC program ***Customer*** enrolled and joined ***HAN Devices*** via the ***AMI Head-End*** to ***ESI*** (a component in the ***Smart Meter)***.

CPP, DLC (DR event messages) are sent by the ***CE*** via the ***DR Application*** via the ***AMI Head-End*** via the ***ESI*** to the appropriate customer program joined ***HAN Devices***. The customer decides whether to participate in the DLC event or to opt-out of that specific program event. That customer choice (DR event acceptance or opt-out) message response, is sent from the appropriate CPP or DLC ***HAN Device*** via the ***ESI*** to ***AMI Head-End*** to ***DR Application***. ***DR Application*** sends to ***Customer Information System*** (***CIS***) the customers' DLC event acceptance or opt-out messages to ***CIS*** for appropriate DLC program customer billing adjustments. ***DR Application*** sends the CPP program and DLC event information to the ***Customer Web Portal*** where that information is provided to the customers enrolled in those CPP or DLC programs.

Interface Diagram:



Note(s):

The HAN Devices can be one or more Programmable Communicating Thermostats (PCT) or a Load Control Switch or an In-Home Display.

The NIC and ESI are parts of the Smart Meter.

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
AMI Head-End	The AMI Head-End is the back office system that controls the Advanced Metering Infrastructure.
CIS	System of record for customer data and billing.
Customer Engagement	Provide customers with valuable information via customized text messaging via the PCT.
Customer Web Portal	InteractiveWeb-site that is accessible via the Internet that enables the exchange and display of information for the customer
DR Application	Demand Response Application. This is the system for managing Demand Response and devices for load control, pricing, and messages
ESI	HAN network interface component with NIC within the Smart Meter
IHD	In Home Display presents basic information to the customer such as consumption data, price information or demand response signals
Load Control Switch	Electric switch than can be remotely commanded to open or close
NIC	AMI network interface component with Meter Metrology Board within the Smart Meter.
PCT	Programmable Communicating Thermostat
Smart Meter	A 2-Way communicating digital meter used in measuring watts, vars, var-hours, volt-amperes, or voltage-amperer-hours. Includes meter metrology board, NIC, and may include a service switch and ESI. It is located on the customer premise.

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
CIS	Customer data and billing system	Records all customer contact CPP Pricing Historical Customer Billing Information (Rate / TOU / Moves / Registration etc).
AMI	Advanced Metering Infrastructure. Energy monitoring and recording, load control capability, tariff/rate data collection.	Energy monitoring and control, configuration of advanced meters, offers new rate programs, distribution automation, Meter Readings, Meter Events and Alarms.
CE	Customer Engagement, Utility personnel responsible for providing valuable information to customers.	Provide customers with valuable information via customized text messaging that will in turn be displayed via the HEM or PCT
DR Application	Demand Response Application	The DR Application provides Demand Response services and management such as Pricing including issuing both scheduled and unscheduled pricing signals, Rate/Tariff Plans, and Device Management including dispatching Load Control commands. Enrollment and HAN Device Management is also provided through this system.
Customer Web Portal	Customer portal for viewing account information and interacting electronically with Utility for services	Interactive web-site that is accessible via the internet that enables the exchange and display of information for the customer
HAN Device	An appliance with Load Control and/or display features. For Example an in-home display or module that can initiate load control.	Executes load controls and/or display features.

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 DR HAN Pricing & Event Customer Opt-Out use case.
- All CPP, DLC program prices are as specified in published utility commission approved tariffs.
- The Customer CPP or DLC program enrollment (join) and the appropriate HAN Device provisioning has been successfully completed.
- Customer DLC event participate or opt-out actions are in scope for this use case.
- This use case is premised on ZigBee SEP 1.0.
- This use case correlates to section 4.2.3 of the AEP IOP document.

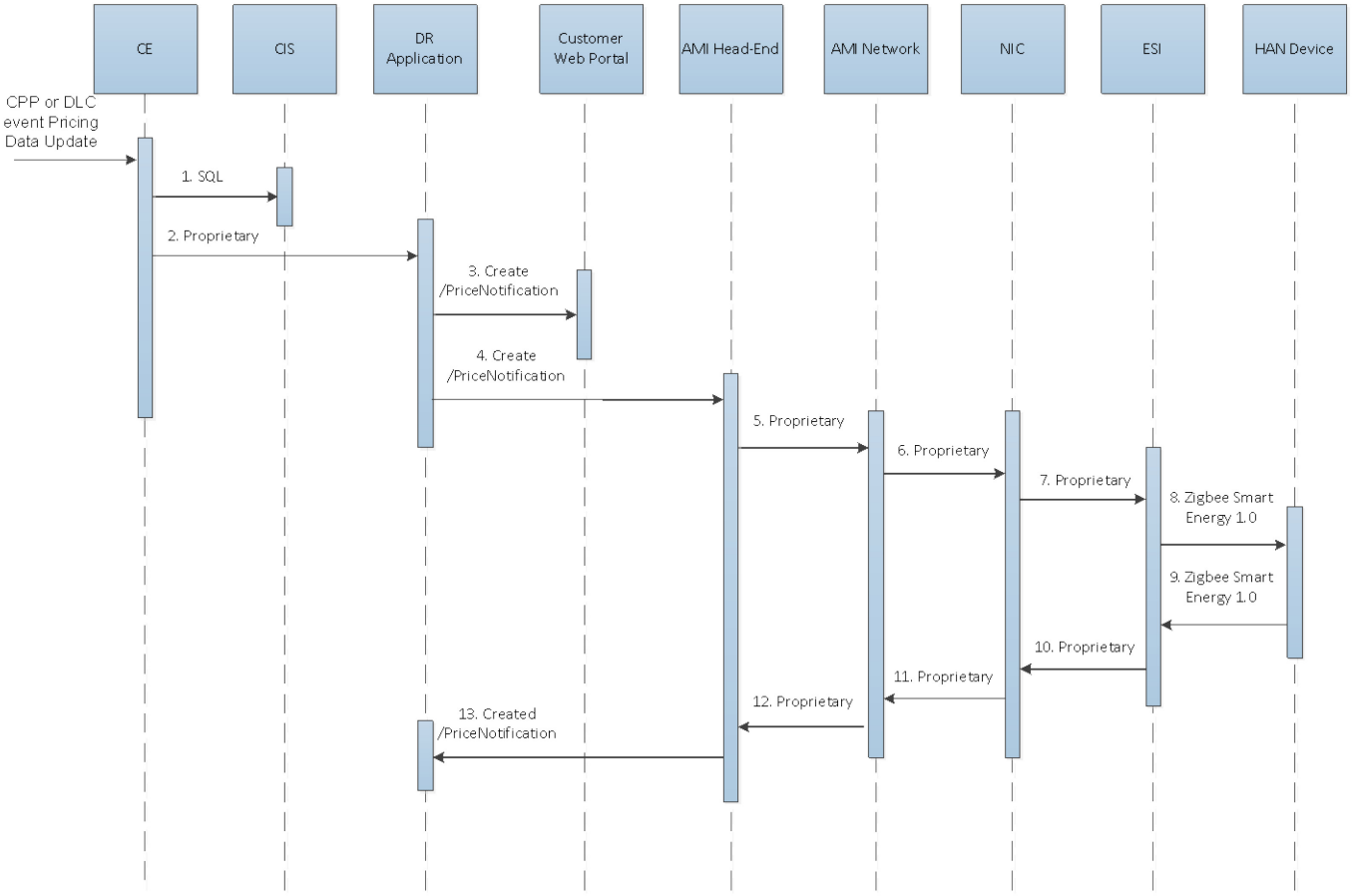
Normal Sequence:

The sequences of events, showing the order in which they ocurr 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.

S1: CPP, DLC Program Pricing Data sent to Customer program enrolled HAN Devices.

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
1	CPP or DLC event Pricing Data Update	Customer Engagement (CE) receives a CPP or DLC Price Data change (update) that needs to be processed	Query	CE	CIS	SQL
2		CE enters CPP or DLC Price data to DR Application	Energy Prices	CE	DR Application	Proprietary
3		DR Application sends CPP and DLC Price Data to Customer Web Portal	Energy Prices	DR Application	Customer Web Portal	Create /PriceNotification
4		DR Application sends CPP and DLC Price Data to AMI Head-End	Energy Prices	DR Application	AMI Head-End	Create /PriceNotification

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
5		AMI Head-End sends CPP or DLC Price Data to AMI Network	Energy Prices	AMI Head-End	AMI Network	Proprietary
6		AMI Network routes CPP or DLC Price Data to NIC	Energy Prices	AMI Network	NIC	Proprietary
7		NIC sends CPP or DLC Price Data to ESI	Energy Prices	NIC	ESI	Proprietary
8		ESI sends CPP or DLC Price Data to enrolled HAN Device	Energy Prices	ESI	HAN Device	ZigBee Smart Energy 1.0
9	Received CPP or DLC Price Data	HAN Device sends acknowledgment of DLC Price Data receipt to ESI	DLC Price Data Receipt Ack	HAN Device	ESI	ZigBee Smart Energy 1.0
10		ESI sends DLC Price Data Receipt ACK to NIC	DLC Price Data Receipt Ack	ESI	NIC	Proprietary
11		NIC sends DLC Price Data Receipt Ack to AMI Head-End	DLC Price Data Receipt Ack	NIC	AMI Network	Proprietary
12		AMI Network routes DLC Price Data Receipt Ack to AMI Head-End	DLC Price Data Receipt Ack	AMI Network	AMI Head-End	Proprietary
13		AMI Head-End sends DLC Price Data Receipt Ack to DR Application	DLC Price Data Receipt Ack	AMI Head-End	DR Application	Created /PriceNotification



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
AMI Head-End	• AMI Network • DR Application
HAN Device	• ESI
DR Application	• CIS

Pre-conditions:

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

- CPP, DLC program utility commission approved tariffs already in place with documented pricing.
- CPP or DLC program Customer Enrolled HAN Devices have successfully completed the provisioning process and are communicating.
- Customer is enrolled in any combo of CPP or DLC programs and is registered within DR Application and CIS.

Post-conditions: None

Exceptions / Alternate Sequences:

S2: S2CPP, DLC, DR event messages and Customer Participation Responses.

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
1	CE receives CPP or DLC event notification request	Customer Engagement (CE) enters CPP or DLC event (DR Event) notification data into DR Application	DR Event Notification	CE	DR Application	Proprietary
2		DR Application identifies HAN Devices in-scope for the DR Event	Internal process	DR Application	Internal	Proprietary
3		DR Application sends DR Event Notification data to AMI Head-End	DR Event Notification Data	DR Application	AMI Head-End	Create /EndDeviceControls
4		AMI Head-End sends DR Event Notification Data to NIC	DR Event Notification Data	AMI Head-End	AMI Network	Proprietary
5		AMI Network routes DR Event Notification Data to NIC	DR Event Notification Data	AMI Network	NIC	Proprietary
6		NIC sends DR Event Notification data to ESI	DR Event Notification Data	NIC	ESI	Proprietary
7		ESI sends DR Event Notification Data to enrolled HAN Devices	DR Event Notification Data	ESI	HAN Device	ZigBee Smart Energy 1.0
8	Receipt of DR Event Notification Data	Customer reads/decides to participate or opt-out of the DLC event (or as proxied by preconfigured event response) via the HAN Device	internal process	HAN Device	Internal	Internal

Use Case Step	Triggering Event	Description Of Process	Information To Be Exchanged	Producer	Receiver	Message Type
9		HAN Device sends DLC Event Participation Response to ESI	DLC Event HAN Device Participation Response	HAN Device	ESI	ZigBee Smart Energy 1.0
10		ESI sends DLC Event Participation Response to NIC	DLC Event HAN Device Participation Response	ESI	NIC	Proprietary
11		NIC sends DLC Event Participation Response to AMI Network	DLC Event HAN Device Participation Response	NIC	AMI Network	Proprietary
12		AMI Network routes DLC Event Participation Response to AMI Head-End	DLC Event HAN Device Participation Response	AMI Network	AMI Head-End	Proprietary
13		AMI Head-End sends DLC Event Participation Response to DR Application	DLC Event HAN Device Participation Response	AMI Head-End	DR Application	CIM message?
14		DR Application sends DLC Event Participation Response to CIS	DLC Event HAN Device Participation Response	DR Application	CIS	CIM message?

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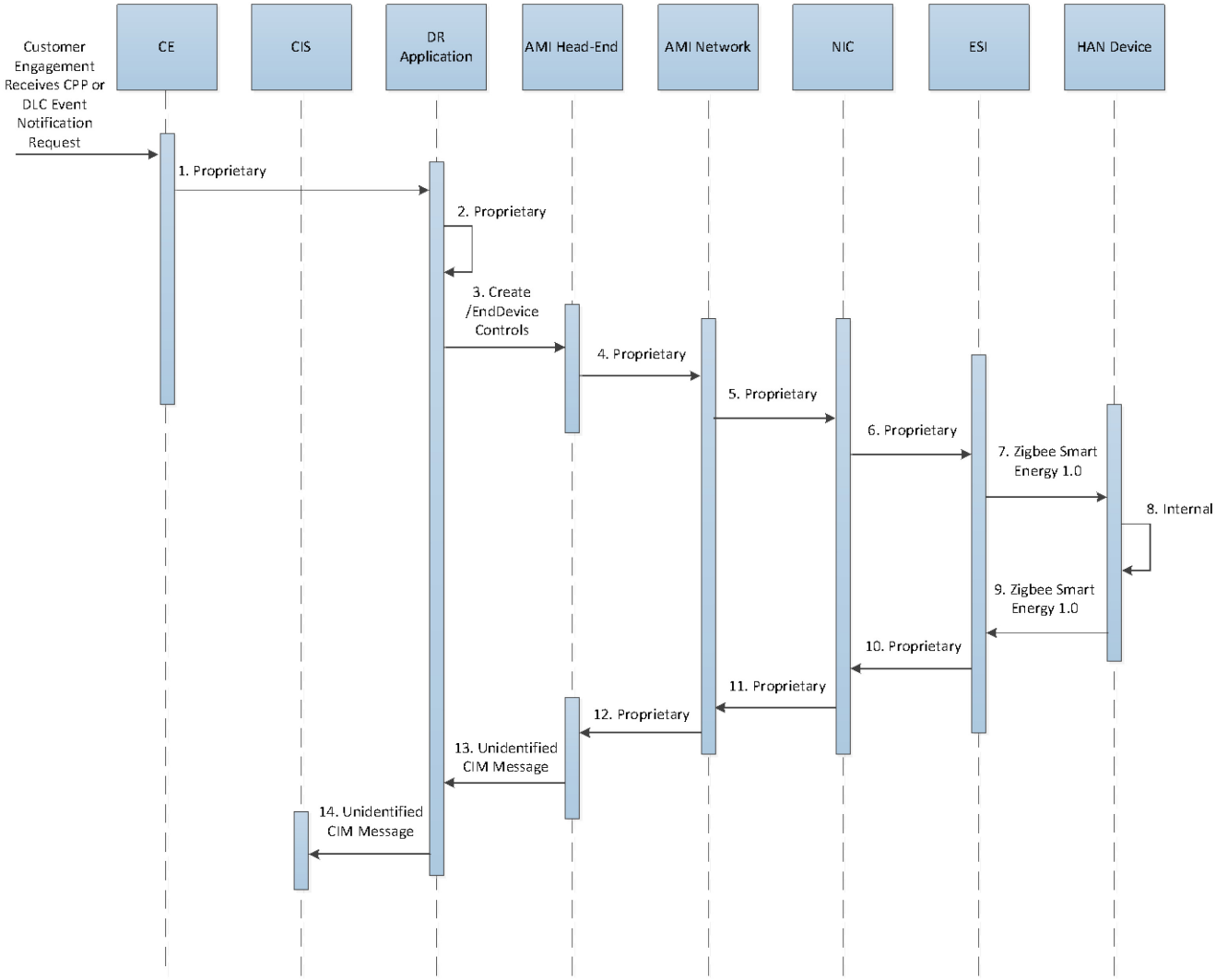

Message Type(s) Diagram: None

An 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.

Note: All messages will be linked using the Message.Header.correlationID. A requesting application will be assigning a correlationID.

References:

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

- **20100625 AEP Ohio Interoperability Plan V1.docx**
- **20100625 Use Cases EPRI Report_V2.4.docx**
- **61968_9_MeterReadingAndControl_2ed-working-draft-20110215.docx**

Issues: None

ID	Description	Status

Miscellaneous Notes: None