CES – Energy Dispatch

Version 3.1

May 14th, 2010

1 Descriptions of Function

All prior work (intellectual property of the company or individual) or proprietary (non-publicly available) work should be so noted.

1.1 Function Name

CES – Energy Dispatch

1.2 Function ID

IECSA identification number of the function

1.3 Brief Description

To date, the only significant bulk electricity storage technology has been pumped storage hydroelectric technology. Distributed storage exists (e.g. local storage for UPS systems, etc.) but it is not aggregated or available for any system benefits. New storage technologies are under development and in some cases are being deployed, and could also potentially provide substantial value to the electric grid.

Electric storage is recognized to have value at all levels in the modern power system, from central generation to point of use. Examples of storage functionalities are:

- At Generation level – frequency control, spinning reserve, supply-ramping, demand-leveling, minimum loading
- At Transmission level – stability, VAR support, power quality and transfer-leveling, and reliability
- At Substation/Distribution – peak shaving, voltage support, power quality, capacity investment deferral, and reliability
- At End-Use level – demand control, interruption protection, voltage support and power quality

1.4 Narrative

The ***CES Controller*** polls the ***CES Units*** according to a pre-determined schedule. The ***CES Units*** return data as to the capacity and availability of energy of each unit. The ***CES Controller*** also polls the circuit breaker in the substation through the master ***RTU***. Based on the values received, the ***CES Controller*** initiates a load following event when the load exceeds a certain level discharge. The ***CES Controller*** determines the level of participation of each ***CES Unit*** and issues device commands to each ***CES Unit***. At every device command issued by the ***CES Controller***, each participating ***CES Unit*** issues an acknowledgement back to the ***CES Controller***. The ***D-SCADA*** system is constantly polling the ***CES Controllers*** and picks up information from the ***CES Controllers*** for display within ***D-SCADA*** and delivery to the ***Historian***.

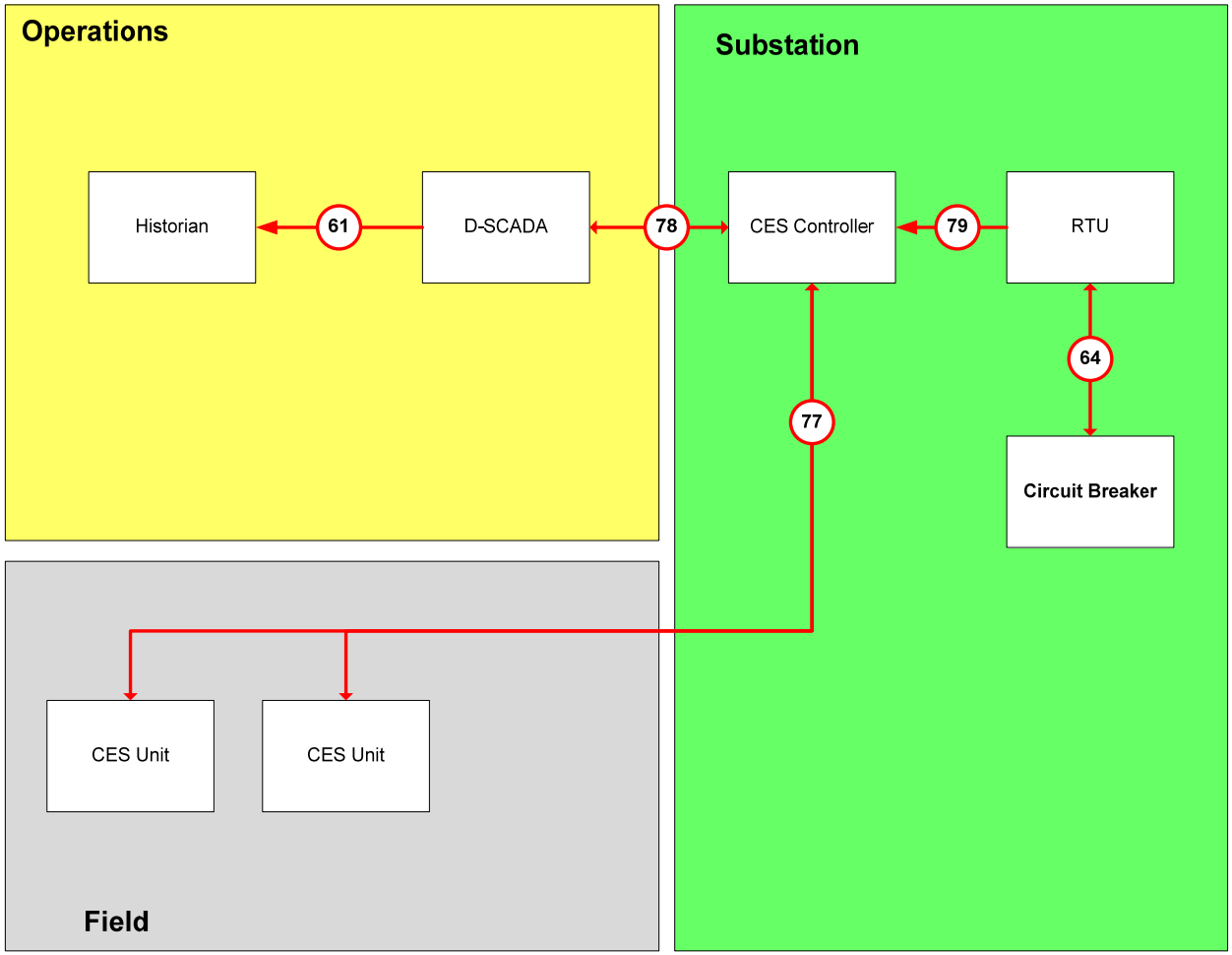


Figure 1-1
Context Diagram for CES Energy Dispatch

1.5 Actor (Stakeholder) Roles

Describe all the people (their job), systems, databases, organizations, and devices involved in or affected by the Function (e.g. operators, system administrators, technicians, end users, service personnel, executives, SCADA system, real-time database, RTO, RTU, IED, power system). Typically, these actors are logically grouped by organization or functional boundaries or just for collaboration purpose of this use case. We need to identify these groupings and their relevant roles and understand the constituency. The same actor could play different roles in different Functions, but only one role in one Function. If the same actor (e.g. the same person) does play multiple roles in one Function, list these different actor-roles as separate rows.

Grouping (Community)		***Group Description***
Actor Name	***Actor Type (person, device, system etc.)***	***Actor Description***
CES Unit	Device	Community Energy Storage – Distributed Energy Storage supporting the several customers connected to a single distribution transformer. Provides load following for the substation and islanding for the connected customers.
CES Controller	Device	Community Energy Storage Controller Device that resides at the substation providing communications, control and dispatching function with the CES Unit.
RTU	Device	Remote Terminal Unit – RTUs are end-points within a SCADA system that sends and receives various measurements and statuses.
DSCADA	Sub-System	Distribution Supervisory Control and Data Acquisition System. DSCADA is a sub-system of the DMS.
Historian	Sub-System	Archive of CES System performance and event data.

1.6 Information exchanged

Information Object Name	*Information Object Description*
Poll	A request for data from another system or device
CES Unit Metering/Energy Data	Individual system status data from each CES Unit
Circuit Breaker Data Request	A request for individual system status data for each circuit breaker
Circuit Breaker Data	System status data for each circuit breaker
Initiates Circuit Level Load Following	The CES Controller will initiate functionality according to the energy needs of the system.
Device Commands – Note each CES Unit receives it's own commands	Device commands for each CES Unit, may include discharge, discharge rate, length of time, charge, etc.
Communication Acknowledgement	An acknowledgement that the communication signal has arrived at its intended source.
CES Unit Energy Dispatch Log Entry	A log entry verifying the CES Unit Energy Dispatch has taken place

1.7 Activities/Services

Activity/Service Name	*Activities/Services Provided*

1.8 Contracts/Regulations

Contract/Regulation	*Impact of Contract/Regulation on Function*

Policy	*From Actor*	*May*	*Shall Not*	*Shall*	*Description (verb)*	*To Actor*

Constraint	*Type*	*Description*	*Applies to*

2 Step by Step Analysis of Function

Describe steps that implement the function. If there is more than one set of steps that are relevant, make a copy of the following section grouping (Steps to implement function, Preconditions and Assumptions, Steps normal sequence, Post-conditions) and provide each copy with its own sequence name.

2.1 Steps to implement function – Name of Sequence

CES – Energy Dispatch

2.1.1 Preconditions and Assumptions

Actor/System/Information/Contract	*Preconditions or Assumptions*
CES Controller	Configured for load following energy dispatch
CES Controller	Load information and energy states already known by the CES Controller
CES Units	CES Units do not communicate with each other

2.1.2 Steps – Name of Sequence

Describe the normal sequence of events, focusing on steps that identify new types of information or new information exchanges or new interface issues to address. Should the sequence require detailed steps that are also used by other functions, consider creating a new "sub" function, then referring to that "subroutine" in this function. Remember that the focus should be less on the algorithms of the applications and more on the interactions and information flows between "entities", e.g. people, systems, applications, data bases, etc. There should be a direct link between the narrative and these steps.

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environment
#	*Triggering event? Identify the name of the event.*[1]	*What other actors are primarily responsible for the Process/Activity? Actors are defined in section0.*	*Label that would appear in a process diagram. Use action verbs when naming activity.*	*Describe the actions that take place in active and present tense. The step should be a descriptive noun/verb phrase that portrays an outline summary of the step. "If …Then…Else" scenarios can be captured as multiple Actions or as separate steps.*	*What other actors are primarily responsible for Producing the information? Actors are defined in section0.*	*What other actors are primarily responsible for Receiving the information? Actors are defined in section0.* *(Note – May leave blank if same as Primary Actor)*	*Name of the information object. Information objects are defined in section 1.6*	*Elaborate architectural issues using attached spreadsheet. Use this column to elaborate details that aren't captured in the spreadsheet.*	*Reference the applicable IECSA Environment containing this data exchange. Only one environment per step.*
1.1	Periodic poll of CES Units by CES Controller	CES Controller	CES Controller poll of units	CES Controller polls the CES units at a predetermined time frame.	CES Controller	CES Unit	Poll	DNP3	
1.2		CES Unit	CES Unit collects Metering/Energy Data	CES Unit collects CES Unit Metering/Energy Data	CES Unit	CES Unit	CES Unit Metering/Energy Data	DNP3 Voltage Real and Reactive Power Available Energy	

[1] Note – A triggering event is not necessary if the completion of the prior step – leads to the transition of the following step.

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environment
1.3		CES Unit	CES Unit provides data	CES Unit delivers Metering/Energy Data to the CES Controller	CES Units	CES Controller	CES Unit Metering/Energy Data	DNP3 Voltage Real and Reactive Power Available Energy	
1.4.1		CES Controller	CES Controller polls the RTU	CES Controller polls the RTU for a Circuit Breaker Data Request	CES Controller	RTU	Circuit Breaker Data Request		
1.4.2		RTU	RTU requests Circuit Breaker Data	RTU requests Circuit Breaker Data from the Circuit Breakers	RTU	Circuit Breaker	Circuit Breaker Data		
1.5		CES Unit	Circuit Breaker collects Metering/Energy Data	Circuit Breaker collects Circuit Breaker Data	Circuit Breaker	Circuit Breaker	Circuit Breaker Data	DNP3 Voltage Real and Reactive Power Available Energy	
1.6.1		Circuit Breaker	Circuit Breaker provides Circuit Breaker Data	Circuit Breaker provides Circuit Breaker Data to the RTU	Circuit Breaker	RTU	Circuit Breaker Data		
1.6.2		RTU	RTU provide Circuit Breaker data	RTU provide Circuit Breaker Data to the CES Controller	RTU	CES Controller	Circuit Breaker Data		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environment
1.7	Time of day is realized (Start Time and End Time) by the CES Controller	CES Controller	Circuit Level Load Following initiated	The CES Controller Initiates Circuit Level Load Following at a certain time when load exceeds a certain level. (real power of the fleet under control of this CES Controller).	CES Controller	CES Controller	Initiates Circuit Level Load Following	DNP3	
1.8		CES Controller	Issues Device Commands	CES Controller determines participation of CES Units and issues Device Commands	CES Controller	CES Units	Device Commands – Note each CES Unit receives it's own commands	DNP3	
1.9		CES Unit	Receive Device Commands	CES Units receive Device Commands and send Communication Acknowledgement to the CES Controller	CES Unit	CES Controller	Communication Acknowledgement	DNP3	
1.10		CES Unit	Respond Accordingly	CES Unit Responds accordingly	CES Unit	CES Unit	Device Commands – Note each CES Unit receives it's own commands	CES Unit Status will be picked up during the next scheduled CES Controller poll	

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environment
1.11		CES Controller	DSCADA polls CES Controller	DSCADA polls CES Controller for the CES Unit Energy Dispatch Log Entry	CES Controller	DSCADA	CES Unit Energy Dispatch Log Entry		
1.12		DSCADA	DSCADA delivers information	DSCADA delivers the CES Unit Energy Dispatch Log Entry to the Historian	DSCADA	Historian	CES Unit Energy Dispatch Log Entry		

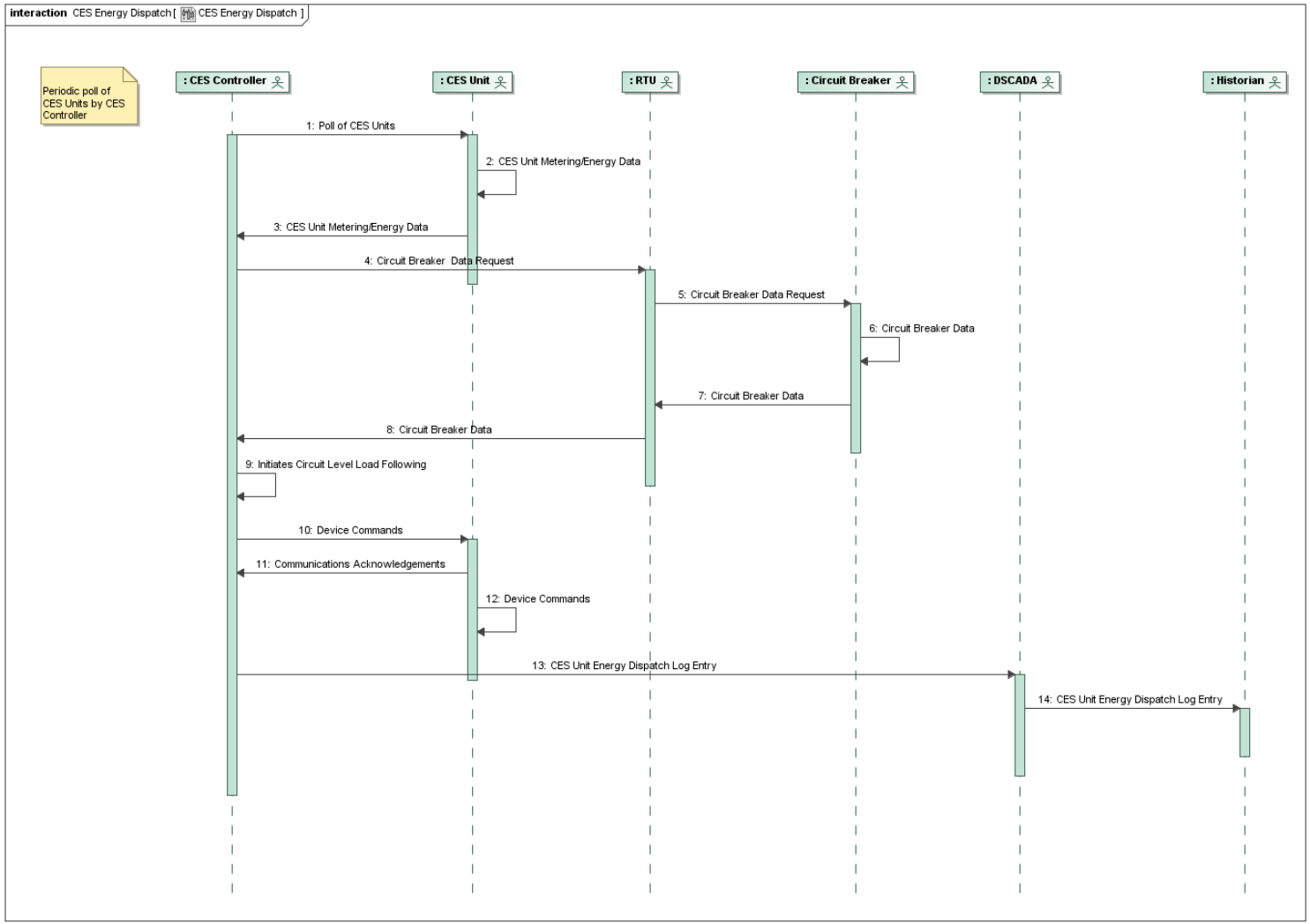
2.1.3 Post-conditions and Significant Results

Actor/Activity	*Post-conditions Description and Results*
CES Unit	CES Unit is able to charge/discharge according to the system needs

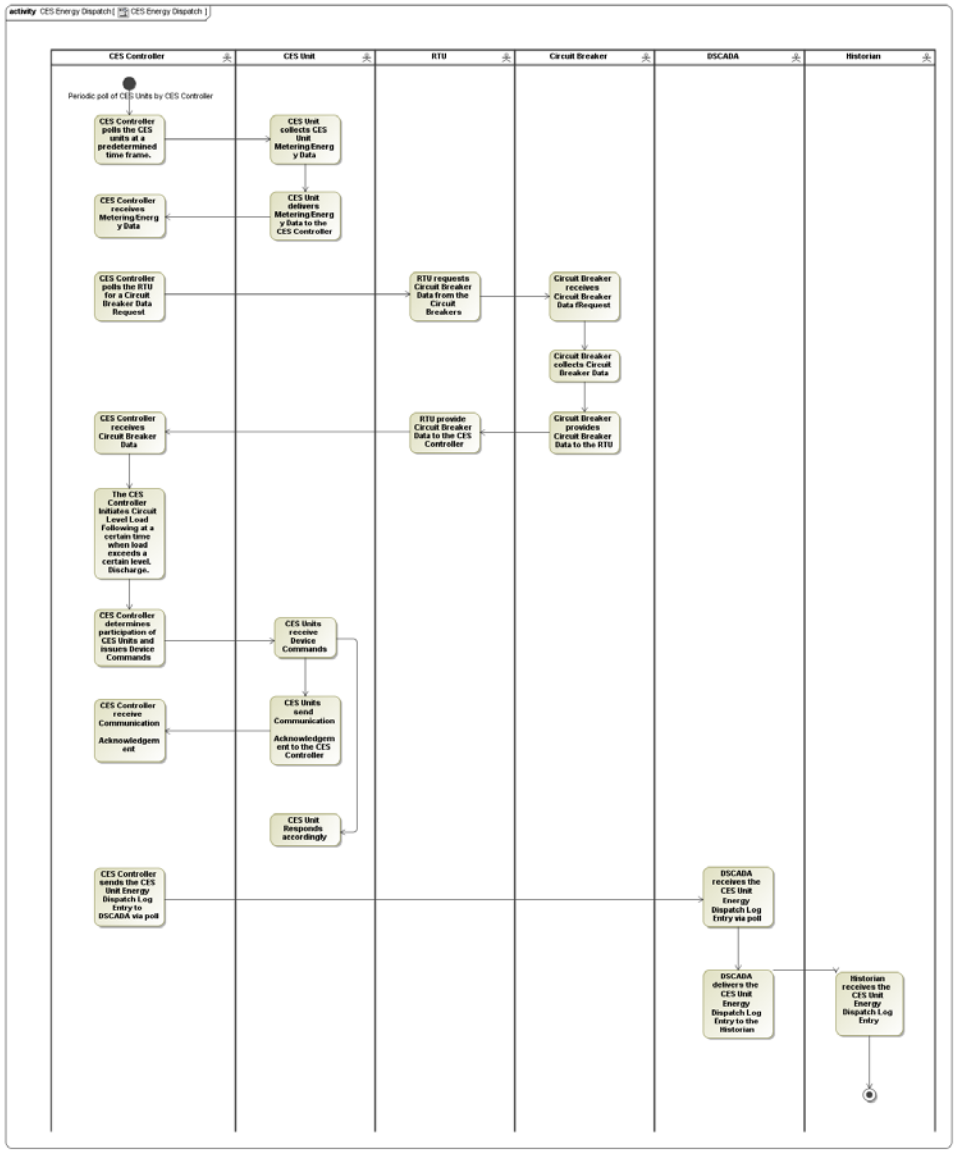
2.2 Architectural Issues in Interactions

Elaborate on all architectural issues in each of the steps outlined in each of the sequences above. Reference the Step by number.

2.3 Diagrams



CES Energy Dispatch Sequence Diagram



CES Energy Dispatch Activity Diagram

3 Auxiliary Issues

3.1 References and contacts

ID	Title or contact	Reference or contact information
[1]		

3.2 Action Item List

ID	Description	Status
[1]		

3.3 Revision History

No	Date	Author	Description
2.0	4-11-2010	John Simmins	Original Use Case
3.0	5-11-2010	Brian D. Green	Revisions and add diagrams
3.1	5-14-2010	Brian D. Green	The Utility’s Revisions