<p align="center">**Hours ahead load optimization**</p>

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

Hours ahead load optimization to reduce transmission congestion due to weather forecast fluctuation.

1.2 Function ID

IECSA identification number of the function T.B.D.

1.3 Brief Description

Describe briefly the scope, objectives, and rationale of the Function.

Contingency analysis determines that there is likelihood that there is congestion that can be reduced through load management when a new weather forecast is published.

1.4 Narrative

A complete narrative of the Function from a Domain Expert's point of view, describing what occurs when, why, how, and under what conditions. This will be a separate document, but will act as the basis for identifying the Steps in Section 2.

There is usually a fault or periodic contingency analysis application, "calculator".

We have monitoring devices throughout the system by the SCADA system. Network analysis applications determine current and expected network state.

In France as in many places in Europe, we are in N-1 level of contingency.

There is a forecasted reduction in capacity due to a sudden drop in weather forecasted temperature. The weather forecast changed within a few hours ahead – so there is some time to respond.

The lines are all constrained and the only way to solve the problem is to ask some area at the distribution level to reduce the level. No additional available power or transmission capacity. Some customers have subscribed to a rate that will allow curtailment or usage of generation capability. This is the first level of addressing of such a problem. If insufficient, more drastic measures would have to be taken. In exchange for the rate the customer makes available a set of loads and load control equipment that can be used when power consumption must be constrained.

We have some form on online continuous contingency calculator that would produce a strategy for alleviating the problem through its execution.

Inputs to the calculator include the optimization functions and their ordering (which may be dynamic depending on other variables). Other inputs will include measurement data, system topology, power flow, critical load database, load behavior prediction or load shapes (what you expect the consumption to look like over time).

We have the choice control transmission or distribution connected load. For transmission, there are people under contract for interruptible options once or twice a year in exchange for attractive rate. Within that class there is a prioritization of those customers.

For example:

1) New weather forecast comes in

2) Contingency analyzer makes new computation that triggers need for demand response

3) Load control strategy is devised.

4) Strategy is approved by transmission system operator if less severe

5) Strategy is approved by government operative if more severe

6) Initiate load control – via a control signal (almost instantaneous) or human contact via phone by the dispatcher (could take minutes)

7) Measure or deduce response. If you don't get expected response, go to 2) with new information.

8) Audit process verifies individual customer compliance with tariff.

9) Also audits the edf services to validate that proper procedure was followed.

10) Restore as soon as possible

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
SCADASystem	System	Provides real time power flow information and system
WeatherService	System	Provides temperature and other environmental data predictions as a function of time.
NetworkAnalysis	System	

Grouping (Community) '		Group Description
Actor Name	**Actor Type (person, device, system etc.)**	**Actor Description**
System		
Customer	Entity	
ControllableCustomerLoad	Device	
CustomerLoadController	Device	
ContigencyAnalysisSystem	System	
TransmissionSystemOperator	Person	
Government operative	Person	
Dispatcher	Person	
edf services	Organization	Sub organization responsible for carrying out contingency plan
AuditingPersonnel	Organization	Responsible for verifying proper operation of the contingency plan from the perspective of the customer site behavior, and, the EDF services performance.
RevenueMeterDevice	Device	
EMSLoadController		

Replicate this table for each logic group.

1.6 Information exchanged

Describe any information exchanged in this template.

Information Object Name	Information Object Description
Weather forecast	
Measurement set	Results provided by SCADASystem
State Estimator / Power Flow Results	
Load Control Strategy	
Customer tariff	
Customer Data	Account information
Customer Load Profile	Expected load behavior of customer
Meter data	Instantaneous and historic
Critical load data	Curtailment constraints on customer devices
Load Control Signals	Load shed and service restoration signals
Audit results	Summary of system and customer performance
"Phone conversation"	May be conveyed and / or archived. This is a vocal message, as opposed to a computer encoded one.

1.7 Activities/Services

Describe or list the activities and services involved in this Function (in the context of this Function). An activity or service can be provided by a computer system, a set of applications, or manual procedures. These activities/services should be described at an appropriate level, with the

understanding that sub-activities and services should be described if they are important for operational issues, automation needs, and implementation reasons. Other sub-activities/services could be left for later analysis.

Activity/Service Name	Activities/Services Provided
Load Control	Based on control strategy, send load control signals over various media to customer load control equipment

1.8 Contracts/Regulations

Identify any overall (human-initiated) contracts, regulations, policies, financial considerations, engineering constraints, pollution constraints, and other environmental quality issues that affect the design and requirements of the Function.

Contract/Regulation	Impact of Contract/Regulation on Function
Customer Tariff	
Terms for government involvement	Conditions under which it is necessary to achieve government approval

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 (Preconditions and Assumptions, Steps normal sequence, and Steps alternate or exceptional sequence, Post conditions)

2.1   Steps to implement function

Name of this sequence.

2.1.1   Preconditions and Assumptions

Describe conditions that must exist prior to the initiation of the Function, such as prior state of the actors and activities

Identify any assumptions, such as what systems already exist, what contractual relations exist, and what configurations of systems are probably in place

Identify any initial states of information exchanged in the steps in the next section. For example, if a purchase order is exchanged in an activity, its precondition to the activity might be 'filled in but unapproved'.

Actor/System/Information/Contract	Preconditions or Assumptions
Tariff in place	

2.1.2 Steps – Normal 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.

The numbering of the sequence steps conveys the order and concurrency and iteration of the steps occur. Using a Dewey Decimal scheme, each level of nested procedure call is separated by a dot '.'. Within a level, the sequence number comprises an optional letter and an integer number. The letter specifies a concurrent sequence within the next higher level; all letter sequences are concurrent with other letter sequences. The number specifies the sequencing of messages in a given letter sequence. The absence of a letter is treated as a default 'main sequence' in parallel with the lettered sequences.

Sequence 1:

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1.1 - Do step 1
1.2A.1 - In parallel to activity 2 B do step 1
1.2A.2 - In parallel to activity 2 B do step 2
1.2B.1 - In parallel to activity 2 A do step 1
1.2B.2 - In parallel to activity 2 A do step 2
1.3 - Do step 3
1.3.1 - nested step 3.1
1.3.2 - nested step 3.2
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Sequence 2:

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2.1 - Do step 1
2.2 - Do step 2
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#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
#	*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	Trigger Load Control	*EMSLoadController*	Issue load control	The signal to control the load and supporting is generated and distributed to appropriate	*EMSLoadController*	CustomerLoadController	Load Control Signals		Control Center / Customer Equip

2.1.3 Steps – Alternative / Exception Sequences

Describe any alternative or exception sequences that may be required that deviate from the normal course of activities.   Note instructions are found in previous table.

Control load

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments

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

2.1.4 Post-conditions and Significant Results

Describe conditions that must exist at the conclusion of the Function. Identify significant items similar to that in the preconditions section.

Describe any significant results from the Function

Actor/Activity	Post-conditions Description and Results

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..

Microsoft Excel
Worksheet

2.3 Diagram

For clarification, draw (by hand, by Power Point, by UML diagram) the interactions, identifying the Steps where possible.

3 Auxiliary Issues

3.1 References and contacts

Documents and individuals or organizations used as background to the function described; other functions referenced by this function, or acting as "sub" functions; or other documentation that clarifies the requirements or activities described. All prior work (intellectual property of the company or individual) or proprietary (non-publicly available) work must be so noted.

ID	Title or contact	Reference or contact information
[1]		
[2]		

3.2 Action Item List

As the function is developed, identify issues that still need clarification, resolution, or other notice taken of them. This can act as an Action Item list.

ID	Description	Status
[1]		
[2]		

3.3 Revision History

For reference and tracking purposes, indicate who worked on describing this function, and what aspect they undertook.

No	Date	Author	Description
0.			

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