

## Use Case – Process NOMCR

### COPS.P01ModelManageData\_UseCase\_ProcessNOMCR\_V0.14

**Name: NOMCR Process - Incremental Model Update**

**Summary:**

Send all additions, deletions or modifications that apply to the Network, Generation or SCADA models to the ERCOT modeling group using a CIM/XML Incremental file attached to a Network Operations Model Change Request. The NOMCR consists of the change data (CIM/XML file) plus a summary file (the NOMCR form). The sending entity is responsible for providing any model or other associated dependencies or information (such as Outage Scheduling or Contingency Definition changes) in the file that is required to accurately implement the change.

**Acronyms:**

<b>MC</b>	<b>ERCOT Model Coordinator</b>
<b>ERCOT</b>	<b>Electric Reliability Council of Texas</b>
<b>NOMCR</b>	<b>Network Operations Model Change Request (AKA: Project Files)</b>
<b>NMMS</b>	<b>Network Model Management System</b>
<b>NMG</b>	<b>Network Model Group</b>
<b>CIM</b>	<b>Common Information Model</b>
<b>XML</b>	<b>Extensible Markup Language</b>
<b>IEC</b>	<b>International Electrotechnical Committee</b>
<b>MIS</b>	<b>Market Information System</b>
<b>MP</b>	<b>Market Participant</b>

**Actor(s):**

<b>Name</b>	<b>Role description</b>
ERCOT Model Coordinator (the receiving entity) – Network Modeling Group	NOMCRs containing incremental changes are received from the Market Participants for Processing. All changes are received at least three (3) months prior to scheduled implementation. (See section 3.10.1 of the Nodal Protocol for submittal time-line.) These changes are input into the model with the Energize date contained within the NOMCR. All changes must be tested using validation tools and advanced applications (e.g., contingency analysis, state estimation, power flow, etc.) to validate the changes specified in the NOMCR. Each incremental file contained in the NOMCR needs sufficient data to identify the model changes, when the changes should be entered into the model and where those changes are to be inserted. Either full or incremental CIM/XML model files will be posted for other receiving systems after the change received is tested.
ERCOT Model Tester - Network Modeling Group	Once the NOMCRs are approved, the Model Tester is responsible for testing the set of NOMCRs for a given date. The Model Tester will generate one or more models based on the scheduled Energization dates of the NOMCRs.
EMS Model Administrator /Tester	Receives the model from the Network Modeling Group and loads it into the EMS Offline Test System. After testing is complete the Administrator loads the model onto the

	Production System
Market – REP or Wholesale (Traders)	Uses the model and incremental changes posted to the MIS Web site for the Market Test and reports any issues, corrections, etc. to the Network Modeling Group.
MP (the sending entity)	Generate and send model updates to the MC. These updates may be CIM/XML Incremental files that meet the specifications of IEC 61970-552-4 or a pre-approved ERCOT format (see the Pre-Conditions section of this use case for a list of possible formats). These updates may include adds, deletes or changes to the Network, SCADA, or Generation models.

### Participating Systems:

System	Services or information provided
The EMS and Planning systems or third party tools at the MP. If the MP does not elect to purchase a tool to generate the CIM/XML file, the file must be generated by hand (see issue 1 below).	Identify changes to the model(s) that will occur three (3) months or more from the relative date per the schedule defined in Nodal Protocols Section 3.10.1, produce NOMCRs with attached CIM/XML incremental file(s) containing the incremental changes for each scheduled deployment date and initiate the model update transfer. A separate NOMCR with the associated CIM/XML incremental file must be provided for each change that will be implemented on a given date.
The NMMS System at ERCOT	Receive NOMCRs and send a notification of receipt automatically when MC changes the status of NOMCR to received. Maintain the status of each NOMCR, and generate a CIM/XML incremental file each time the status of NOMCR is changed. Store the CIM/XML file and the NOMCR form in a folder after creating the folder based on NOMCR_<name>_<date/Time of status change>_<status>. Validate the CIM/XML file for connectivity and initial data ranges and notify the MP that the NOMCR is approved, requires additional data, or is rejected. If rejected, provide details surrounding the problems encountered and post the rejection to notice to MIS. Once a NOMCR is approved, process the change into the NMMS database with the correct status and complete all testing to ensure the incremental changes are accurate and ready to be included in the Network Operations Model. This must be accomplished no later than 45 days from the relative date per the schedule defined in Nodal Protocols Section 3.10.1 based on Energize Date contained within the NOMCR. The testing will continue for an additional 45 days prior to submitting the model to operations. Per the Nodal Protocols, Section 3.10.4 paragraph 4, interim updates to the Network Operations Model caused by unintentional inconsistencies of the model with the physical transmission grid may be made. If an interim update is implemented, ERCOT shall report these changes with the reason for the change to the PUCT staff and the Wholesale Electric Market Monitor (WEMM). The change and the reason for the change will be posted to the MIS Secure Area within two Business Days following the report to the PUCT staff and WEMM.
Network Model Test Bed at ERCOT	Prepare test models as required to test the NOMCRs. Load flow, contingency analysis, state estimator, and LMP

	calculation packages will be utilized for testing the NOMCRs. NOMCR dependencies and sequencing will be reviewed during the test process. ERCOT shall compare the current and new model and post the differences on the MIS Secure Area. The differences shall include, but not be limited to, the differences in device parameters, missing or new devices and status changes.
The EMS Model Support Test	Provide tested model to EMS Support for loading into the Production EMS system. EMS will test the model as required.

### **Pre-conditions:**

The MP can provide NOMCR changes to ERCOT using one of the following methods:

1. The MP has access to an NMMS Thin Client to enter changes into the ERCOT system.
2. The MP produces a CIM/XML Incremental File for submission to ERCOT and attaches the file with the NOMCR form and submits using Thin Client

ERCOT has an existing power system model and can receive CIM/XML Incremental files.

The NMMS full model has been processed such that the changes received for that model can be interpreted and inserted.

The CIM/XML file produced complies with the IEC 61970-552-4 standard entitled CIM/XML Model Exchange Format Rev6 20050505. This specification is located on the CIM User's Group Web Site.

### **Design Considerations:**

- These same systems may also be involved in full or partial model transfers.
- Unique identifiers are required, as well as consistent naming between the incremental model changes received, existing models and subsequent updates.
- Sufficient model data is provided to unequivocally identify where the model has changed.
- Real time network data (e.g., status, generation, load) needed for running advanced apps (e.g., contingency analysis, power flow) will be obtained via ICCP.
- ICCP Object IDs and local SCADA identifiers are included in the incremental model transfer file.

### **Examples of incremental model changes are:**

- Add a transformer
- Add new line or modify existing line
- Add, delete or move a load

Sample files containing the above listed changes are located on the CIM/XML e-group under the following names:

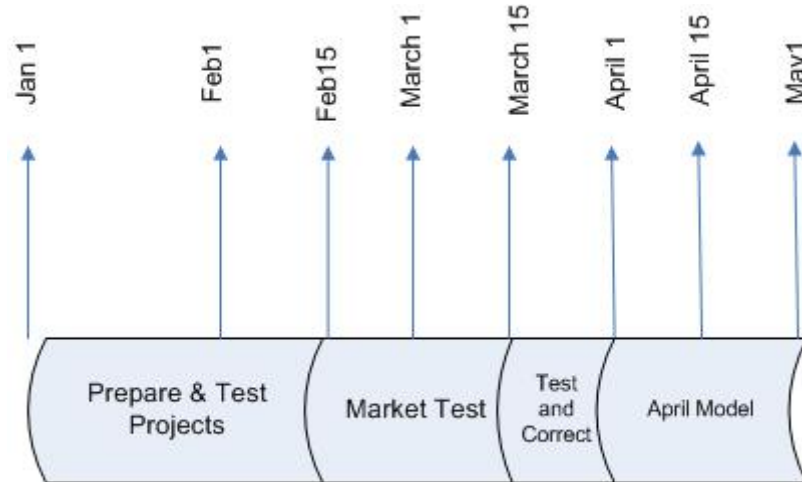
1. co\_acline\_mod.rdf – contains incremental changes to modify an ac line segment
2. co\_acline\_add.rdf – contains incremental changes to add an ac line segment
3. co\_load\_add.rdf – contains incremental changes to add a load
4. co\_pt\_add.rdf - contains incremental changes to add a transformer
5. co\_load\_move.rdf - contains incremental changes to move a load
6. co\_load\_del.rdf - contains incremental changes to delete a load

Other examples of incremental model changes are:

- Replace existing transformer with a new transformer with different ratings
- Delete an existing line
- Change rating or setting

### **Known assumptions, limitations, constraints, or variations that may affect this use case:**

- Timing requirements – all standard NOMCRs are received a minimum of three (3) months prior to being energized. The following diagram shows the complete timeline for standard NOMCR processing
- For Data changes that are not entered by the MP, MC must enter the data manually using graphic editor and L1 validation will occur at this stage



- Timing requirements for non-standard NOMCR processing – These NOMCRs are known as Interim Update Requests and may be used to submit the following changes:
  1. Unplanned In or Out of Service Requests
  2. Impedance Changes
  3. Corrections to a NOMCR required by the Network Modeling Team
  4. Special Action Modeling Requests (SAMRs) such as requests to process Contingency Lists, RAPs, SPSs, Rating Methodology etc.
  5. Changes to Analog or Status Telemetry points
  6. Changes to unit capability curves
  7. Changes to Static and/or Dynamic Ratings
  8. Changes to Switch status
  9. Changes to tap position
  10. Changes to load distribution factors
  11. Changes to model configuration or re-configuration of equipment
- Additionally, any Dynamic Ratings changes received via NOMCR or other request will be processed immediately and sent to the Production Model for immediate implementation.
- Frequency of use – The NMMS is used on a daily basis and will produce a new version of the model every day. During operation, the NOMCRs received will be validated, processed, tested and posted. The time line above depicts the processing that occurs during each 3 month cycle.
- Currently, the number of tools that will import or export a CIM/XML incremental file is limited.
- MPs capability to supply CIM/XML incremental files
- CIM requirements not explicit to the degree required by ERCOT software.
- When the data changes associated with a NOMCR are submitted in CIM/XML format but the RDF IDs of instances do not match with the RDF IDs of same instances in ERCOT NMMS database, NMMS (Name Service) replaces the RDF IDs with corresponding ERCOT RDF IDs
- For any change of status of a NOMCR a CIM/XML file is generated with the incremental change of that NOMCR and the NOMCR form with status and the CIM/XML file is put in a directory created based on NOMCR\_<name>\_<date/time>\_<status>. The status change is done by changing the status of NOMCR in Project manually except for submission of NOMCR that changes the status automatically to 'Submitted'.
- NMMS Status Notifications include:
  - a. Submitted (NOMCR status when it is Submitted from the Thin Client. NOMCR has passed Level 1 Validation.)

- b. Received at ERCOT (Model Coordinator “acknowledges the receipt” of the NOMCR that was submitted. Automatic Immediate Notification by NMMS to MP.)
- c. Complete as submitted to ERCOT (This is the “Approved” status as noted in the Protocol and is sent to the Market Participant after level 1 and level 2 validation is complete. The Model Coordinator notifies the Model Tester that the NOMCR is ready for test.)
- d. Incomplete as submitted to ERCOT (An incomplete notification is sent to the Market Participant after level 1 & level 2 validation is complete but no problem report is generated yet. A Market participant has 15 days from deadline of submission date to act on this status)
- e. Requires additional data with problem report included. (This status signals that a Problem Report has been sent to the Market Participant)
- f. Testing (NOMCR being tested)
- g. Ready for test (The Model Tester has completed the test of the NOMCR and it is ready for Market Test.)
- h. Modeled (NMG testing complete)
- i. MP Test complete (The Market Test is complete. Pre-production test)
- j. Approved for energizing on scheduled date. (The NOMCR is approved for inclusion in the real-time model and energizing will occur on the scheduled date.)
- k. Actual In-service Date (Approval to Energize from receipt)
- l. Closed (NOMCR is now in production EMS Real Time Database)
- m. Project requires Operations update (ERCOT requests a NOMCR based on a submitted PMCR and the PMCR is converted to an NOMCR(s) that reference the PMCR ID that is converted.)
- n. Other status as required by ERCOT (two of these are Cancel and Reject)

#### Normal Sequence:

Use Case Step	Description	From - To	Information Content
Step 1	<p>MP prepares a NOMCR containing data required according to the ERCOT procedure. The changes defined in the NOMCR are identified and placed into a CIM/XML incremental file prepared in accordance with the IEC 61970-552-4 standard. This CIM/XML document may be prepared manually or with any one of several software tools available on the market today as long as the resulting file meets the IEC standard.</p> <p>NMMS conducts automatic validation including:</p> <ol style="list-style-type: none"> <li>1. connectivity and data range checking (i.e., level 1 validation) against the NOMCR and CIM/XML file, performs automated CIM/XML semantic and syntax checking,</li> <li>2. performs automated connectivity and data range checking (i.e., level 1 validation) against the Data changes for a New NOMCR, if the MP creates the NOMCR using the graphic interface</li> </ol> <p>NMMS conducts the following actions on submission of NOMCR</p> <ol style="list-style-type: none"> <li>1. Puts the CIM/XML file and the NOMCR form in a specified directory in NMMS after creating the directory based on Date/Time of NOMCR</li> </ol>	(from) at MP (to) MC	<p>NOMCR and CIM/XML model file containing incremental model updates. NOMCR contains a header with the date/time of the NOMCR, a description of the NOMCR, the date the change takes effect, any outage information surrounding the request and the CIM/XML Incremental file containing the change. The change information may include Network, SCADA or Generation information. CIM/XML files must contain</p>

	<p>submission.</p> <ol style="list-style-type: none"> <li>2. Sends an automatic email to MC that the NOMCR is submitted</li> <li>3. Changes the status of NOMCR to 'Submitted' automatically</li> </ol>		<p>sufficient information to uniquely identify where updates fit into the overall model. This file may be generated manually or with a software tool</p>
Step 2	<p>MC receives a NOMCR and CIM/XML incremental file for implementation and modifies the status of NOMCR as 'Received'. NMMS sends an automatic Notification of Receipt to the sending MP immediately</p> <p>If the NOMCR is not submitted through NMMS Thin client, the MC enters it into NMMS and Level 1 Automatic validation is performed. When the data changes associated with a NOMCR are submitted in CIM/XML format but the RDF IDs of instances do not match with the RDF IDs of same instances in ERCOT NMMS database, NMMS (Name Service) replaces the RDF IDs with corresponding ERCOT RDF IDs</p> <p>For NOMCRS that are generated from conversion of an existing PMCR, the information of the corresponding PMCR is automatically filled up in NOMCR form</p>	<p>(from) MP (to) MC and vice versa</p>	<p>The NOMCR and the CIM/XML incremental file as described above. Notification of Receipt contains the "Received at ERCOT" status, the NOMCR identification and other header information about the NOMCR.</p>
Step 3	<p>MC posts the NOMCR and corresponding CIM/XML incremental file to the MIS Web-site for access by all Market Participants within 5 Business Days.</p>	<p>(from) MC (to) MIS Web-site</p>	<p>The CIM/XML file contains the model change being requested and is an exact duplicate of what was sent by the MP.</p>
Step 4	<p>MC completes level 2 validation (i.e., visual inspection and identification of issues or dependencies) on the CIM/XML file received with the NOMCR and the level 3 validation (runs Power Flow).</p>	<p>MC</p>	<p>NOMCR, XML file and validation tools</p>
Step 5	<p>MC sends the MP an incomplete or Complete as soon as possible based on the level 2 / level 3 validation on the CIM/XML file received with the NOMCR</p> <p>A Complete notice indicates that the requested change will be processed and entered into the model database. The change will be scheduled into the network operations model based on the energize date provided in the NOMCR. No matter what the disposition is, the NOMCR and the status are</p>	<p>(from) MC (to) MC at MP and MIS Web-site</p>	<p>Complete or Incomplete status notice contains the NOMCR identification and other header information about the NOMCR. The Validation report contains the results of the validation</p>

	<p>posted immediately on the MIS web-site</p> <p>If an incomplete notification is sent, the MP has up to 15 days from the date of scheduled date (here the scheduled date implies the date 90 days before it is supposed to be energized, e.g. for April Model, Jan 1 is the scheduled date and the MP has up to Jan 15 to correct the NOMCR) as per the Nodal Protocols defined in Section 3.10.1</p> <p>If all corrections are not received within the 15-day period, the NOMCR is rejected by the MC.</p> <p>If a NOMCR is rejected, no further additions to the NOMCR are allowed and a new NOMCR must be submitted to process the associated change. MC should update the status of NOMCR in Project Tracker and Coordinator (PTC) as rejected</p> <p>If MP submits corrections using incremental CIM/XML files, these will replace the prior files submitted. The NOMCR will be re-submitted and noted as corrected in the status box on the NOMCR form. MC posts the corrected NOMCR to MIS web site within 3 days of receipt</p> <p>The validation report is logged within the NMMS</p>		tools and other information concerning the validation results obtained by the MC. Each posting to the MIS web-site contains a NOMCR status.
Step 6	MC sends notification to the ERCOT Model Tester that the NOMCR is approved for testing	(from) MC (to) ERCOT Model Tester	NOMCR, CIM/XML file
Step 7	<p>ERCOT Model Tester selects all the NOMCR(s) for the current day.</p> <p>The CIM/XML file corresponding to each NOMCR is imported into the NMMS and merged into a test model by the ERCOT Network Model Tester. The model is tested for 60 days- Level 4 Validation using validation tools and network modeling tools such as State Estimators, Power Flows, Contingency Analysis, LMP processing, etc. During the 60-day modeling test, the model is analyzed by the Network Modeling Team.</p> <p>This step is repeated until the model passes the 60-day Level 4 Model Test.</p>	ERCOT Model Tester	Complete model file with incorporated changes
Step 8	<p>If the model passes the one (1) month modeling test (first 30 days out of total 60) ERCOT Model Tester sends notification to MC who changes the NOMCR status to Scheduled and archives change until needed for Time line Model Build.</p> <p>At the scheduled time the MC sends a notification to ERCOT Model Tester.</p> <p>ERCOT Model Tester builds the “Timeline Model”</p>	(from) ERCOT Model Tester (to) MIS Web-Site	<p>Complete model file with incorporated changes and the CIM/XML incremental files.</p> <p>Rejected Notice</p>

	<p>and MC posts the Model to the MIS Web-site for testing to be done by the Market (REP or Wholesale).</p> <p>If any problems are found in the first 30-day of level 4 testing, the ERCOT Model Tester sends a failure status to MC. MC sends a revision request to MP if it is within the 15-day period of scheduled date. (This may happen because MP can submit the NOMCR much earlier than scheduled date, e.g. MP may submit a change in October for April model, the 30 day testing may start and if problem is found MP has till 15<sup>th</sup> Jan to correct NOMCR)</p> <p>MP must send a correction within this 15-day period after submission deadline.</p> <p>MC posts the corrected NOMCR to MIS web site within 3 days of receipt</p> <p>If the 15-day period is passed, the NOMCR is rejected by MC and the NOMCR status is updated to rejected. NMMS sends an automatic email to MP (NOMCR submitter) for rejection of NOMCR. ERCOT MC updates the status in MIS for that NOMCR to rejected</p>		contains the NOMCR identification and other header information about the NOMCR. The Test report contains the results of the tests conducted by the ERCOT Model Tester. Each posting to the MIS web-site contains a NOMCR status.
Step 9	<p>The Network Model Testers continue to test the model for an additional month to validate that all the changes are correct (Level 4 Validation for next 30 days) and Market continues validation for 30 days This step is repeated until the model passes the 1-month Market (REP, Wholesale) test and next 30 day level 4 Test of ERCOT Model Tester is completed</p>	(from) Network Model Testers and Market Participants	Complete model file with incorporated changes and the CIM/XML incremental files.
Step 10	<p>NOMCR passes the one (1) month Market (REP, wholesale) test and Level 4 validation – next 30 days, ERCOT Model Tester runs another 15 day Test on EMS system.</p> <p>In case of failure in level 4 next 30 day test or market test the information is sent to MC. MC sends revision request to MP or rejects the NOMCR as appropriate</p> <p>Market sends a corrected NOMCR in the form of interim update or correction NOMCR if they receive a revision request.</p> <p>If the NOMCR is corrected, then the new corrected NOMCR or interim update is reported to PUCT and WEMM and posted to MIS</p>	<p>(from) Market (REP/Wholesale) (to) ERCOT Model Tester</p> <p>(from) ERCOT Model Tester (to) EMS system (for 15 day test)</p> <p>(from) MC (to) MP and back as correction or</p>	<p>Complete model file with incorporated changes. Update notification, timestamp, time of activation, reference to specific update file</p> <p>Problem notification contains the NOMCR identification and other header</p>



		interim update	information about the NOMCR. The Test report contains the results of the tests conducted by the ERCOT Model Tester. Revision request contains NOMCR and XML files
Step 11	<p>NOMCR is finalized and a scheduled model is generated by ERCOT Model Tester to be used by EMS after successful completion of level 5 validation</p> <p>The differences between the new and old Model is posted by MC</p> <p>If the test results are not satisfactory ERCOT Model Tester sends a notification to ERCOT Model Tester who then decides the disposition of correction</p>	<p>EMS test system for 15 day test</p> <p>(from) ERCOT Model Tester (to) MC for NOMCR disposition of correction</p>	
Step 12	The MC generates an EMS model with scheduled NOMCR for offline Testing	EMS Off-line Test Bed System	Complete model file with incorporated changes.
Step 13	<p>EMS completes the offline Model test and on successful completion loads model to online production system.</p> <p>In case the EMS tester finds a problem it is reported to the MC to disposition the problem(s) appropriately.</p>	<p>EMS Off-line Test Bed System</p> <p>(from) EMS (to) MC</p>	Complete EMS model
Step 14	MC archives and generates a report.		History report of NOMCR changes that includes the initial and final values of parameters changed

#### Exceptions / Alternate Sequences:

Since updates are supplied in advance of commissioning, several may be outstanding at one time. Furthermore, updates could be issued in one order and notified in another, i.e., for two updates X and Y, the steps could be: issue X; issue Y; notify Y in service; notify X in service.

#### Post-conditions:

Complete and error-free transfer. All changes must be tested before the model will be used.

## References:

Use Cases referenced by this use case, or other documentation that clarifies the requirements or activities described.

- COPS.P01.ModelManageData\_UC\_CreateNOMCR

The following Standards and documents are referenced by this case:

- IEC 61970-552-4, CIM/XML Model Exchange Format Rev6 20050505 Standard
- IEC 61970-501, CIM RDF Schema
- ERCOT Protocol documents
- ERCOT NMMS Requirements document

## Issues:

ID	Description	Status
1.	There are a several software tools that can generate and accept a CIM/XML Incremental file. However, some MPs may need to manually generate the CIM/XML incremental input files. Some examples of these files are located on the CIM/XML e-group ( <a href="http://groups.yahoo.com/group/cimxml/">http://groups.yahoo.com/group/cimxml/</a> ). The IEC 61970-552-4 standard provides the requirements should an MP wish to create their own tool.	
2.	When the data changes associated with a NOMCR are submitted in CIM/XML format but the RDF IDs of instances do not match with the RDF IDs of same instances in ERCOT NMMS database, NMMS (Name Service) replaces the RDF IDs with corresponding ERCOT RDF IDs	
3	If the level 5, 15-day test fails or the EMS offline test fails, MC is sent the failure notice. At this point MC must decide the disposition to correct the Model	

## Revision History:

No	Date	Author	Description
0	6/1/2006	M. Goodrich	Initial version
1	6/2/06	M. Goodrich	Inserted NOMCR timeline
2	6/05/06	M. Goodrich	Inserted change to step 1 of Normal Sequence per Ken Dye comment.
3	7/10/06	M. Goodrich	Inserted comments from Curtis Crews
4	7/17/06	M. Goodrich	Inserted final comments from NMMS team
5	7/26/06	M. Sengupta	Modified use case based on latest information
6	8/9/06	M. Goodrich & L. Caylor	Added definition for additional Actors, corrected name of Standard and provided edits/corrections
7	8/9/2006	M. Sengupta	Updated version name
8	8/22/2006	M. Goodrich & L. Caylor	Completed Updates and Accepted prior changes.
9	8/23/2006	M. Sengupta	Completed Updates, Accepted prior changes, added changes as needed
10	8/25/06	M. Goodrich	Final Revision Changes
11	8/25/06	M. Sengupta	Added further changes based on conversation with Margaret, issue of non-matching RDF ID in CIM/XML

			file
12	9/6/06	M. Sengupta	Made changes based on change of business processes as conveyed in meeting with ERCOT (Aug 27 – 31)
13	9/10/06	M. Goodrich	Input Consistency changes and accepted all edits for ERCOT internal review
14	9/11/06	M. Goodrich	Added final edits from NMG