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# **Network Operations Modeling Expectations for TSPs, REs, and QSEs.**

Version 1.11

DRAFT

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# Revision History

Revision	Comments	Date	Author
1.0	Initial Version	5/6/2010	D.W. Rickerson
1.1	Trefny, Thompson, Hoover comments included	5/10/2010	D.W. Rickerson
1.11	Incorporated additional Trefny comments	5/11/2010	D.W. Rickerson

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## **I. Overview**

ERCOT Protocols broadly delineate modeling requirements for different segments of the ERCOT market. The information in this document is intended more clearly define the expectations ERCOT has for market participants as they help to maintain the accuracy of the ERCOT Network Operations Model through the submission of model and outage data. In case of any inconsistency in these clarifications and the Nodal Protocols, the Nodal Protocols shall govern.

## **II. Data Submission Guidelines for Network Model Changes**

### **A. NOMCR submissions**

Changes to ERCOT's Network Model Management System (NMMS) database will be made using Network Operations Model Change Requests (NOMCRs). Transmission Service Providers (TSPs) will submit changes directly into the NMMS using NOMCRs. REs will make submit their model changes in the Resource Asset Registration Form (RARF). ERCOT will convert RARF submissions into NOMCRs. Qualified Service Entities (QSEs) will submit telemetry changes for the model using service requests (SRs) in Siebel. ERCOT will convert the SRs into NOMCRs. ERCOT expects all requests to modify the Network Model to meet the Protocol timelines for Network Model changes<sup>1</sup>. NOMCRs that are submitted outside of the normal timelines will not be included in the model unless the NOMCR is a correction to an existing NOMCR that was submitted on time. Model changes submitted outside the normal timeline must be posted publically and reported to the PUCT and IMM as a model change requiring an Interim Update to the Network Model.<sup>2</sup> In that event, a corresponding Emergency Model load will also be scheduled.

#### **1. Timeline for RARF submissions**

RARF submissions by REs are subject to the same Protocol mandated deadlines as directly submitted TSP NOMCRs.<sup>3</sup> RE RARF submissions may be considered Interim Updates if they fail to pass RARF validation prior to the normal timeline for data submission described in Protocols for NOMCRs. RARF submissions failing to pass RARF validation will be rejected as "Needing Additional Data" and sent back to the RE.

Successful RARF submissions will be converted by ERCOT into NOMCRs and processed as part of the model update process and schedule required in the protocols. REs will receive status updates for the NOMCRs representing their RARF data submissions. If the RARF-NOMCR has significant problems passing the validation rules within the NMMS system it can be rejected even though it passed the validation for submission in the RARF hub. In this event, the RE will be notified and required to submit a new RARF. It is likely that this RARF resubmittal will not be able to meet the normal Protocol timeline for data submission. REs wishing to avoid having data submissions potentially identified as Interim Updates should submit RARF information with enough notice to avoid this conflict.

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<sup>1</sup> ERCOT Nodal Protocols 3.10.1

<sup>2</sup> ERCOT Nodal Protocols 3.10.4 (5)

<sup>3</sup> ERCOT Nodal Protocols 3.10.1 (1)

## **2. Timeline for Siebel submissions**

SRs submitted into Siebel by QSEs to add or modify ICCP data names are subject to the same Protocol mandated deadlines as directly submitted TSP NOMCRs. NOMCRs resulting from QSE ICCP data name SRs will be considered Interim Updates if they fail to meet the normal timeline for NOMCR submission.

## **3. Data Submissions not Subject to the Interim Update rules include:**

### **a) ICCP data object names.**

Changes to an existing NOMCR that modify only Inter-Control Center Communication Protocol (ICCP) data object names may be submitted outside the normal timeline for NOMCRs.<sup>4</sup> NOMCR modifications containing only ICCP data object names can be made up to the 15<sup>th</sup> day of the month prior to the month in which the equipment associated with the ICCP name is energized in the field without incurring Interim Update status for the ICCP update.

### **b) Dynamic rating changes for new and existing lines**

TSPs and REs will be able to dynamically rate a statically rated line in production within 48 hours. Model changes that dynamically rate lines will not be subject to Interim Update status.<sup>5</sup>

### **c) QSE to RE associations**

RE to QSE association changes must be made in the production environment with six days notice provided the RE or QSE does not require any changes to the ICCP data stream.<sup>6</sup> If ICCP data needs to be revised, the change must be submitted according to the timeline for model updates in the protocols. Changes involving only QSE designations without ICCP changes do not have to correspond with a new model load and will not be considered an interim update request.

## **B. Ownership**

Ownership of equipment in the NMMS system refers to the physical owner of the equipment. Equipment may have multiple owners.

## **C. Operatorship**

Operatorship of equipment in the NMMS system refers to the entity that is responsible for the physical operation of that piece of equipment. Equipment may have multiple operators. REs and Private Use Networks (PUNs) owning transmission equipment must identify in the RARF the connecting TSP as an operator. The TSP designation will be used by ERCOT to enable TSPs to enter outages on behalf of the RE for RE-owned transmission equipment.

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<sup>4</sup> ERCOT Nodal Protocols 3.10.1 (6)

<sup>5</sup> ERCOT Nodal Protocols 3.10.8.4 (c),(d)

<sup>6</sup> ERCOT Nodal Protocols 16.5.3

### **III. Model loads**

#### **A. Frequency**

ERCOT will publish a schedule for model loads at least one year prior to the date for each load. The normal periodicity for a new load will be one week. There will also be a load on the first of every month (unless the first falls on a weekend). The normal weekly load schedule will be adjusted to accommodate this first-of-the-month load. If ERCOT needs to perform additional model loads, ERCOT will update the schedule so that the additional dates are included.

It is expected that TSPs and REs will, to the degree practical, coordinate the modeling of new and retiring equipment to with correspond with scheduled model load dates.

#### **B. Model load Types**

##### **1. Scheduled Loads**

Model loads are listed in the published model load schedule found on the MIS. These loads will normally correspond with the weekly load periodicity. First-of-the-month load will also be incorporated into the schedule.

##### **2. Supplemental Loads**

Supplement Loads are model loads that ERCOT deems necessary in order to represent Network Model changes that cannot be accurately modeled using a model load periodicity of one week. Model changes requiring Supplemental Loads will be at the sole discretion of ERCOT. It is expected that TSPs or REs submitting changes that may require a Supplemental load will coordinate this need with ERCOT at the time of the data submission. Supplemental Loads will not be scheduled for data submissions that are outside of the normal data submission deadlines. When a Supplement Load date is finalized ERCOT will include that load in the published list of scheduled loads.

##### **3. Emergency Loads**

Emergency Loads will be scheduled at the discretion of ERCOT. It is expected that some Emergency Loads will be necessary to correct unintentional inconsistencies or to model system restoration configurations after a storm or hurricane that cannot be replicated with outages. Emergency Loads will always be associated with Interim update NOMCRs that will be reported to the Public Utility Commission of Texas (PUCT) Staff and the Independent Market Monitor (IMM).

In extreme situations, if approved by ERCOT executive management, Emergency Loads may be scheduled to facilitate modeling requests from REs or TSPs that require additional loads of the network model. These Emergency Loads will be at the discretion of ERCOT.<sup>7</sup>

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<sup>7</sup> ERCOT Nodal Protocols 3.10.4 (5)



### **C. Model load Content**

In general, the model for each period will be “back-loaded”. This means that the last day of the database load period will be used for the snapshot of what is included in the model for the entire period.

For example, if model loads are scheduled for April 1<sup>st</sup> and April 8<sup>th</sup> then the model that is loaded on April 1<sup>st</sup> would normally include all model additions between April 1<sup>st</sup> and April 8<sup>th</sup> that have been scheduled in NMMS. A new piece of equipment that is scheduled to be energized on April 5<sup>th</sup> would be included in the April 1<sup>st</sup> model and be associated with an outage recorded in the Outage Scheduler that is scheduled to end on April 5<sup>th</sup>.

Changes to the model that are both introduced and retired within the life cycle of a single model will not be captured. In these circumstances data submitters should coordinate with ERCOT for a Supplemental Load or modeling of pseudo devices.

It is expected that TSPs and REs will coordinate their construction schedules with the published list of Scheduled Model loads. However, there will be some circumstances in which new equipment or configuration changes cannot be handled with planned outages. In these cases a Supplemental Model load may be scheduled. In no case will a Supplemental Model Load be allowed to input new or revised transmission system connectivity that was not provided to ERCOT according to the submittal schedule required in the protocols. Pseudo modeling techniques may also be used in these circumstances. It is expected that TSPs and REs will coordinate with ERCOT in order to find a feasible and efficient solution.

### **D. Scheduled Model Load Time-of-Day**

Scheduled Model loads will normally occur at 12:00 AM on Thursdays. The day of the week for first-of-the-month loads will vary.

### **E. ERCOT discretion for Emergency Loads**

ERCOT may implement an emergency model load into the production environment if significant errors are uncovered during validation of the model. It will be at ERCOT’s discretion to determine if an Emergency Load into the production environment is necessary.

#### **1. Emergency Loads due to Unintentional Modeling Errors**

Errors in the model may be found at any point in the model validation process. ERCOT will coordinate with TSPs and REs in order to correct errors through the submission of revised data in NOMCRs. A NOMCR update may be required even if an Emergency Load is not made in the production environment. Any NOMCR submission not meeting the normal submission timeline that results in an Emergency Load must be reported to the PUCT and IMM.

#### **2. Emergency Loads due to Safety or System Restoration Conditions**

Emergency Loads may be used to represent the system during emergency conditions. In most cases, outages can be used to represent these conditions using the existing model. However, ERCOT will coordinate with TSPs and REs in order to modify the model used in the production environment when necessary so that conditions in the field can be represented. Adherence to

the normal timelines for NOMCR submittal will still be required. Any NOMCR submission not meeting this timeline will be reported to the PUCT and IMM if that NOMCR results in an Emergency Load.

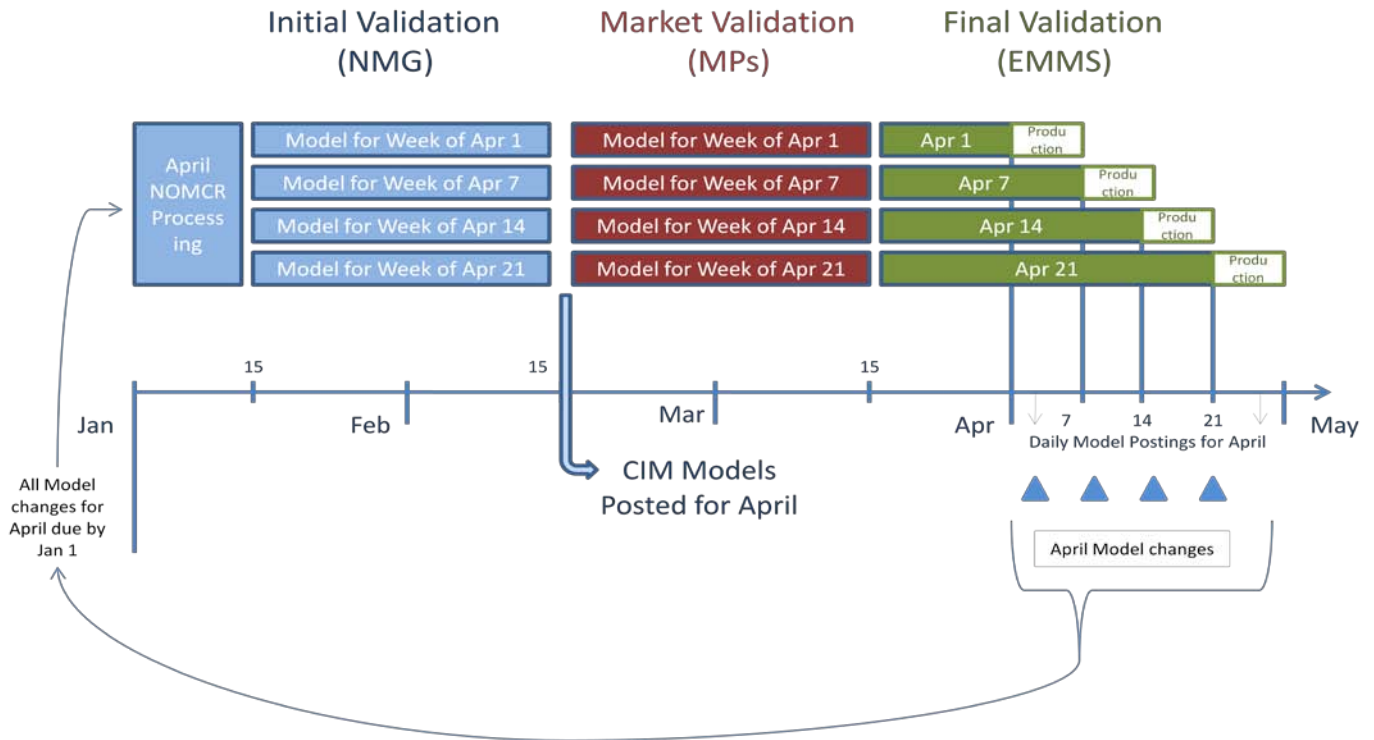
### 3. Emergency Loads by request

It is expected that situations requiring deviation from Scheduled Loads will be identified by data submitters prior to the deadline for NOMCR submissions and be resolved with Supplemental Loads, outages, or pseudo device modeling. In the event an Emergency Interim load is requested by a data submitter, ERCOT will evaluate the request and make a decision as soon as practical. It is anticipated that Emergency Load requests will be difficult to grant. Any NOMCR submission not meeting the NOMCR submission guidelines must be reported to the PUCT and the IMM.

## IV. NOMCR and Model Validation Process

### A. NOMCR Integration into Models

The modeling year is divided into ten periods in Protocols. Each non-summer month represents one period with the summer months (June, July, and August) representing another period<sup>8</sup>. Each period will be divided into weekly models. There are three stages of validation that each model completes. The overall model validation process is illustrated below for a hypothetical month of April.



<sup>8</sup> ERCOT Nodal Protocols 3.10.1

Individual NOMCRs are integrated into the appropriate model based on the model-ready date of each NOMCR. ERCOT has 15 days from the receipt of the NOMCR to either approve or reject the submission. It is during and prior to this NOMCR processing period that the first four levels of validation occur. ERCOT may request additional data be submitted during this 15-day period.

*Level 1 Validation-* The Level 1 Validation is performed automatically by the NMMS system whenever a NOMCR is submitted or resubmitted. The system will not accept submissions unless they pass the Level 1 Validation criteria. The Market Information System (MIS) Secure postings required by Nodal Protocols are achieved when the NOMCR is submitted.

*Level 2 Validation-*The Level 2 Validation is performed by the ERCOT Model Coordinator as a visual inspection to ensure that all data in a NOMCR has been provided in a coherent manner.

*Level 3 Validation-*The Level 3 Validation is performed by the ERCOT Model Tester, who will generate a test network model, transfer it to the Transmission Networks Application (TNA) test bed, and validate that the NOMCR under test will pass a Power Flow and will not corrupt any other portion of the model.

*Level 4 Validation-*The Level 4 Validation is performed by the ERCOT Model Tester, who will generate a test network model, transfer it to the TNA test bed, and validate that the NOMCR under test, when compiled with other NOMCRs that have the same Model-ready date will pass a Siemens® Power Flow and not corrupt any other portion of the model.

After the NOMCR processing period, models are exported from the NMMS system according to the schedule for Scheduled and Supplemental database loads published on the MIS. These models are then subjected to the Initial Validation that is performed by ERCOT's Network Modeling Group. Errors found during this validation period will require the submission of NOMCRs outside the normal timelines. Responses to these types of requests will be categorized as Interim updates if they result in the need to compile and export a new model. It is during this validation period that ERCOT will apply level 5 validation to the weekly models.

*Level 5 Validation-*The Level 5 Validation is performed by the ERCOT Model Tester in the same manner as the Level 4 Validation but using a copy of the Areva Energy Management System (EMS) software that will include State Estimator testing. Validation of new or changes to ICCP telemetry are re-verified with the requestor in a point-to-point data check. A price validation on the model will also be conducted using the Market Management System (MMS) software.

ERCOT has approximately forty-five days from the NOMCR submission deadline until it must post the validated models that will be used for the target month Network Operations Model. After posting, changes to the model cannot be allowed due to the fact that the CRR model has already been processed

and posted. A period of Market Validation follows the public posting and is scheduled for approximately thirty days. Upon completion of the Market Validation, the CRR Auction is conducted.

The final phase of Validation is facilitated by ERCOT's Energy and Market Management System (EMMS) group. This is a final check before the model is placed into the production environment. It will be necessary for this set of models to include all final ICCP object name changes<sup>9</sup>. Failure to provide final ICCP data will result in Emergency Model loads and notification to the PUCT and IMM.

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<sup>9</sup> Related to NPRR146

## V. Approval to Energize Process

In order to describe the Approval to Energize Process two concepts must be defined.

First is the **model-ready** date which is found in the NMMS database and corresponds with the energization date associated with a NOMCR. The model-ready date is the date that the new piece of equipment first appears in the ERCOT production environment. In almost all cases, ERCOT expects that the model-ready date will correspond with a Scheduled or Supplemental Model load date. The model-ready date will also correspond with the date that new piece of equipment can initially be outaged in the ERCOT Outage Scheduler.

The second term is the date that corresponds with the **field-energization** of a piece of new equipment. The field-energization date is the date the new equipment is energized in the field and is ready for normal service.

The energization of new equipment in the production environment will be preceded by two conditions. First, the equipment must be included in the production model in its normal state prior to energization. Secondly, a Planned outage whose end time corresponds with the energization of the new equipment must be entered in the Outage Scheduler.

### A. Modeling Equipment Prior to Field-Energize Date

ERCOT expects the model-ready date to precede the field-energization date in all circumstances. New equipment must be entered into the Network Operations Model in its normal operating state. For example, a normally-closed breaker will be initially modeled as normally closed.

#### 1. Use of the ERCOT Outage Scheduler

The ERCOT Outage Scheduler will be used to coordinate the energization of all new equipment in the Production Environment.<sup>10</sup>

##### a) Planned outages

TSPs and REs should remember that Planned Outages on new pieces of equipment will be possible only after the new piece of equipment is modeled in NMMS. Future equipment will be available in the Outage Scheduler two days after the NOMCR is submitted. The model-ready date for a piece of equipment is the earliest planned start date that can be entered for an outage on that same piece of equipment in the Outage Scheduler.

##### b) Forced outages

The ERCOT Forced Outage Detector will notify operator anytime the telemetered status of a piece of equipment differs from the modeled state for more than two hours.

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<sup>10</sup> ERCOT Nodal Protocols 3.3.2.1

**c) Coordinating Model and Outage Scheduler Entries**

Protocols require data submitters to use Planned Outages to coordinate model-ready and field-energization dates for new equipment<sup>11</sup>. The use of Planned Outages is essential in the evaluating security in all study cases preceding real-time. In addition, the lack of Planned Outages in association with new equipment energization will result the increased cancellation of previously approved outages.

**2) Modeling of Islanded Equipment**

Data submitters should not model future equipment in the NMMS model that is not connected to the rest of the ERCOT grid. For example, an islanded station that will eventually be connected to other equipment in the Network Model should not be modeled until the physical ties it has to the system are also modeled. It is acceptable to model future equipment as long as it is connected to the rest of the system and proper entries are made in the Outage Scheduler for the equipment.

**3) Modeling of Single Terminal Switching Device**

Switching devices that only have a single terminal connecting to the network Model such as ground disconnectors or hanging switches should not be included when submitting modeling changes to ERCOT. The Protocols only required that devices that can change the flow of power be included in the model.

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<sup>11</sup> ERCOT Nodal Protocols 3.3.2.1

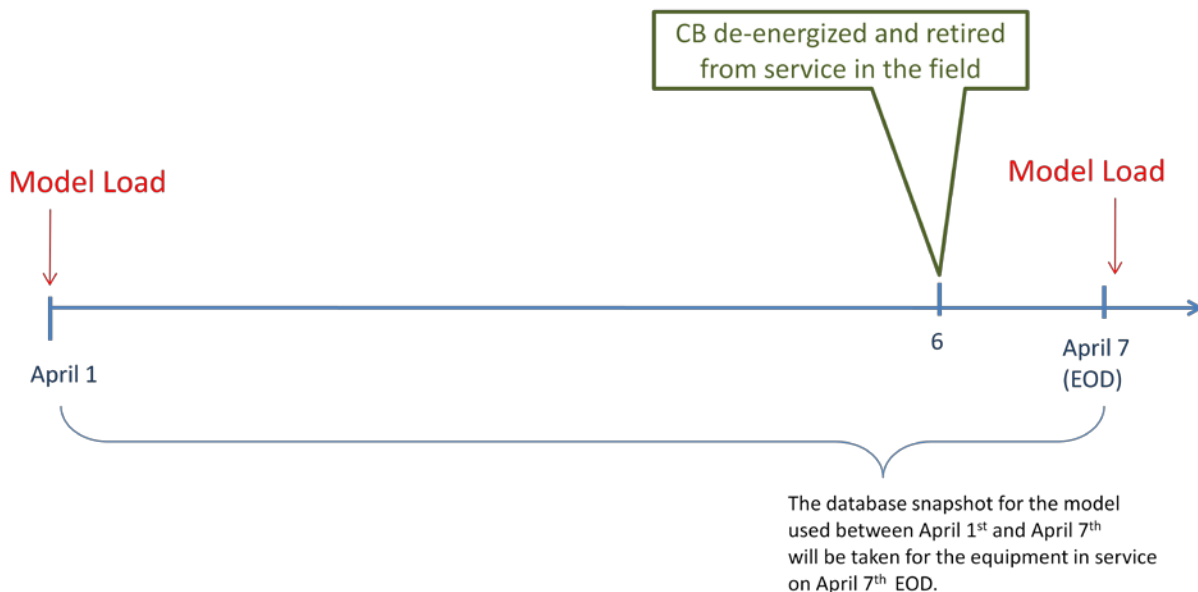
## VI. Retiring Equipment

Similar to the energization process, two terms need to be defined in order to describe the retirement process for existing equipment.

The first is the **model-retirement** date and the second is the **field-retirement** date. The model-retirement date is the date that an existing piece of equipment is retired or removed from the NMMS model. This date is governed by the submission of a NOMCR. The field-retirement date is the date that the equipment is de-energized in the field in order to be permanently removed from service and is controlled by entries in the Outage Scheduler. In general, NOMCRs that retire equipment from the model should be separate from those that make other changes.

The field-retirement date should precede the model-retirement date. In addition, the model-retirement date should be associated with a Scheduled or Supplemental model load date. If a TSP mistakenly enters a model-retirement date for a existing piece of equipment that does not match a model load date, that piece of equipment will not be included in that model (models are back-loaded with data).

For example, assume a model is to be loaded on April 1<sup>st</sup> and then a subsequent model will be loaded on April 8<sup>th</sup>. A breaker is to be field-retired on April 6<sup>th</sup>. If the TSP retires the equipment on April 6<sup>th</sup> from the model, that equipment will not be included in the April 1<sup>st</sup> model load. The April 1<sup>st</sup> model load only includes what is in service on April 8<sup>th</sup> (this is the backloading mentioned earlier). See illustration below.



In this example, ERCOT expects the model-retirement date will be scheduled for April 8<sup>th</sup>. A planned outage will be entered for April 6<sup>th</sup> until April 8<sup>th</sup> in order to represent the fact that the equipment has been retired from service. Similar to outages associated with model-energization dates the outages

associated with model-retirement dates need to be entered well in advance in order to facilitate any analysis done before real-time. If the CB that is field-retired on April 6<sup>th</sup> is also model-retired on that date it will not be included in the model used for April 1<sup>st</sup> to April 7<sup>th</sup> resulting in an energized breaker not being represented in the model for six days.



## **VII. General Modeling Principles for Submitters**

Scheduled Model load dates should be utilized for all topology changes, the energization of new equipment, the retirement of existing equipment, and changes to ICCP data telemetry. ERCOT will work with data submitters to schedule Supplemental Loads if possible to simplify the modeling demands for data submitters provided the protocol required data submittal timelines are met.

In cases where topology changes or additions cannot be coordinated with scheduled Model Loads, a series of outages and duplicate (pseudo) modeling can be used to accurately represent in the model changes that occur in the field.

Adherence to the following modeling principles will be useful in minimizing the use of pseudo equipment in the Network Model.

- Model-ready dates for new equipment should coincide with a scheduled model load.
- Model-ready dates for new equipment should precede field-energization dates for that same equipment.
- Model-retirement dates should coincide with a scheduled model load
- Field-retirement dates for equipment that is to be retired should precede the model-retirement date for that same equipment.
- The Outage Scheduler will be the primary tool to coordinate the difference between the model-ready dates and field-energization dates (as well as model-retirement dates and field-retirement dates). In general, unforeseen changes in construction schedules should be accounted for by modification of outages in the Outage Scheduler.
- ERCOT suggests that the model-ready date precede the field-energization date by approximately two weeks in order to give the NOMCR submitter flexibility to bring the new equipment into service earlier than anticipated.
- ERCOT suggests that the field-retirement date precede the model-retirement date by approximately two weeks in order to give the NOMCR submitter flexibility to keep a piece of equipment in service past the expected field-retirement date.

### **A. Pseudo Device Modeling**

ERCOT expects to be able to minimize the use of Pseudo Device Modeling by publishing well in advance a list of Scheduled Model Loads and working with data submitters to add Supplemental Model Loads when feasible. However, in some cases it may be necessary for the TSP to model pseudo transmission elements. The NMMS database structure for ownership and operatorship of Transmission Elements make it impractical for ERCOT to model pseudo devices. If pseudo device modeling is required the modeling and maintenance of that equipment will be completed by the data submitters.<sup>12</sup> These

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<sup>12</sup> ERCOT Nodal Protocols 3.10.1 (5)

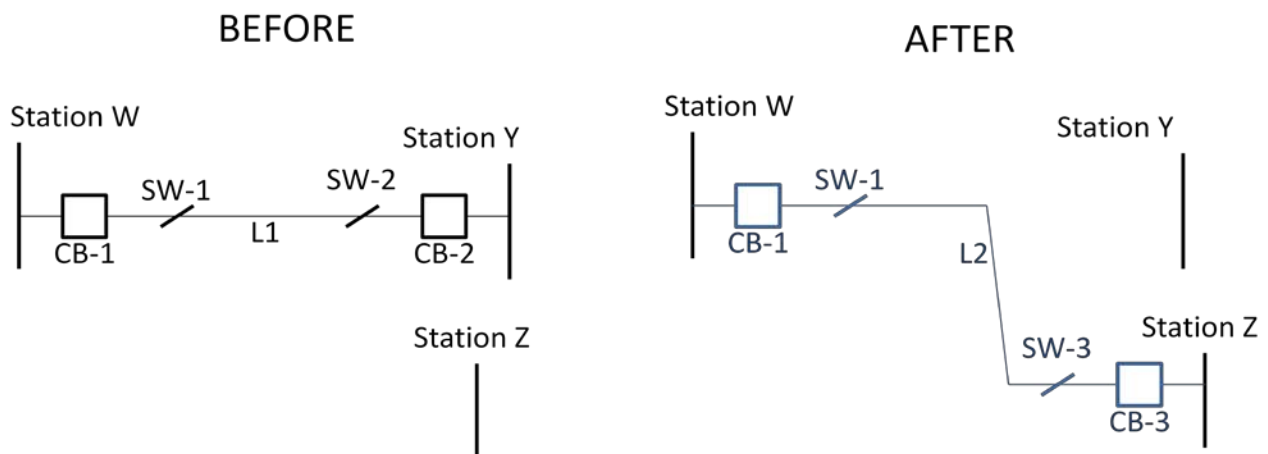
pseudo devices will need telemetry<sup>13</sup> and their use must be consistent in both the ERCOT production environment as well as in the native EMS systems of TSPs.<sup>14</sup>

## B. Modeling Examples

Included below are several examples of common additions and changes to the ERCOT Network Model. For each of these examples a model load schedule of April 1<sup>st</sup>, April 7<sup>th</sup>, April 14<sup>th</sup>, and April 21<sup>st</sup> will be used.

### a) New Line Termination

Line terminates in a different station on April 10<sup>th</sup> and requires a 5-day construction outage



The sequence of events would be as follows:

- Before January 1<sup>st</sup>, a NOMCR should be submitted with a model-ready date of April 7<sup>th</sup> for L2, SW-3, and CB-3.
- Before January 1<sup>st</sup>, a NOMCR should be submitted to retire L1, SW-2, CB-2 with a model-retirement date of April 7<sup>th</sup>
- Outages should be submitted on CB-1, SW-1, L1, SW-2, and CB-2 starting date on April 5<sup>th</sup>. These outages will de-energize the existing equipment from the model. The TSP has the flexibility to enter the outages earlier than expected. However the new line cannot be energized until after the model load on April 7<sup>th</sup>. Ideally these outages should be submitted

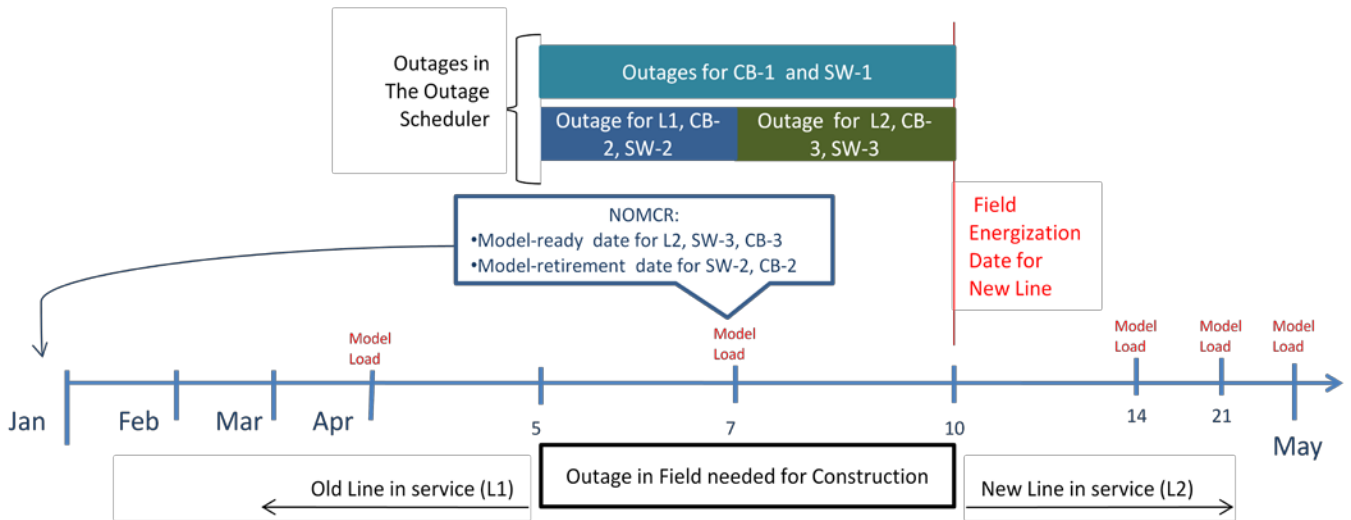
<sup>13</sup> ERCOT Nodal Protocols 3.10.5 (2), 3.10.7.5 (5), 6.5.7.1.13 (a) (iii)

<sup>14</sup> ERCOT Nodal Protocols 3.10.7.1 (1)

prior to January 15<sup>th</sup> to facilitate model validation. The outages on SW-2, CB-2, and L1 should end on April 7<sup>th</sup> (the model load in which this equipment is retired from the model).

- A second outage should be entered on L2, SW-3, and CB-3. These outages should begin on April 7<sup>st</sup> (model load date in which the new equipment first appears in production) and end on April 10<sup>th</sup> (field-energization date for the new equipment).
- On April 10<sup>th</sup>, the Approval to Energize process is followed to energize the new equipment.

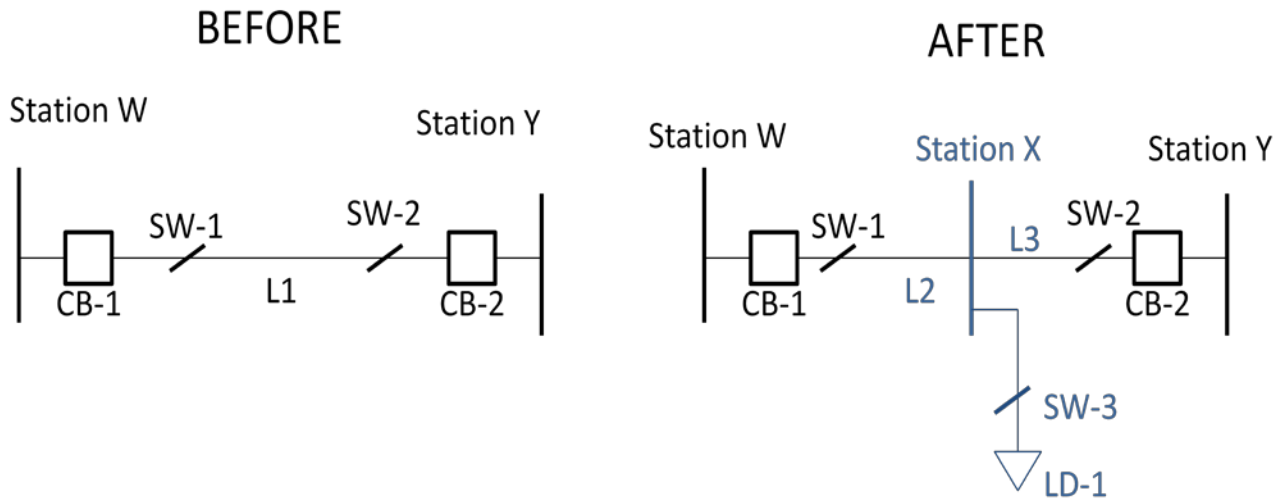
The following illustration shows the sequence of outages and modeling needed to represent this change in topology in the field.



**IMPORTANT NOTE:** The sequence of outages and NOMCRs illustrated above gives the TSP to ability move the beginning of the construction outages as early as needed. The TSP also has the flexibility to extend the outages to anytime past April 10<sup>th</sup> using entries in the Outage Scheduler. Restrictions include the fact that the Field-energization of the new line cannot occur before the model load on April 7<sup>th</sup>, and the entire process requires a model load to occur during the construction outage.

## b) New Tapped Station

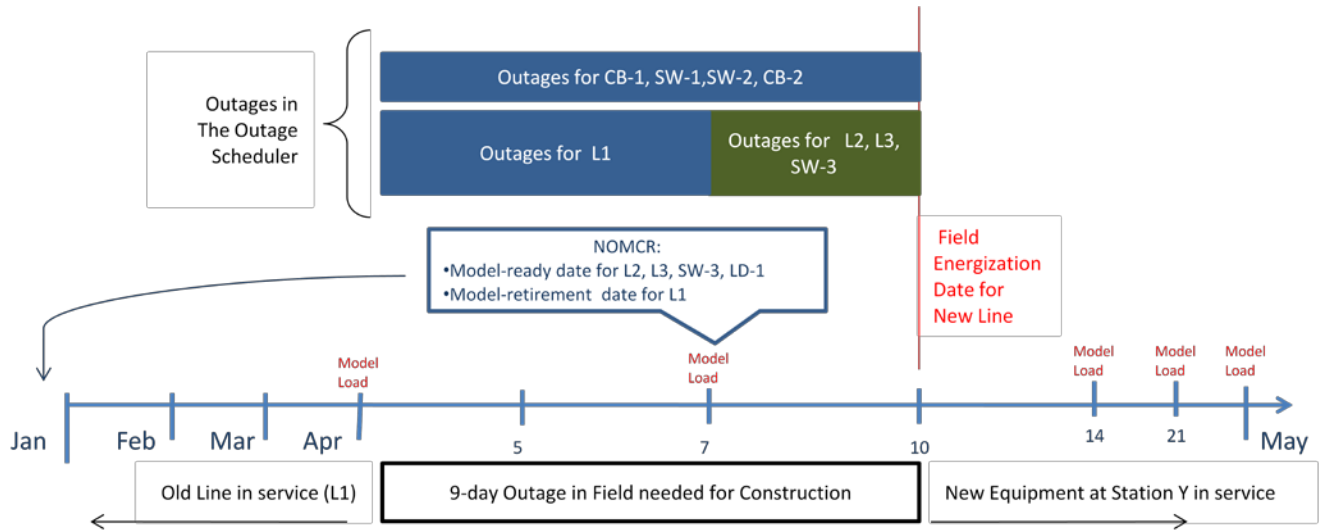
New Station built in the middle of existing line to be energized on April 10<sup>th</sup>. Construction requires a 9-day outage.



The sequence of events would be as follows:

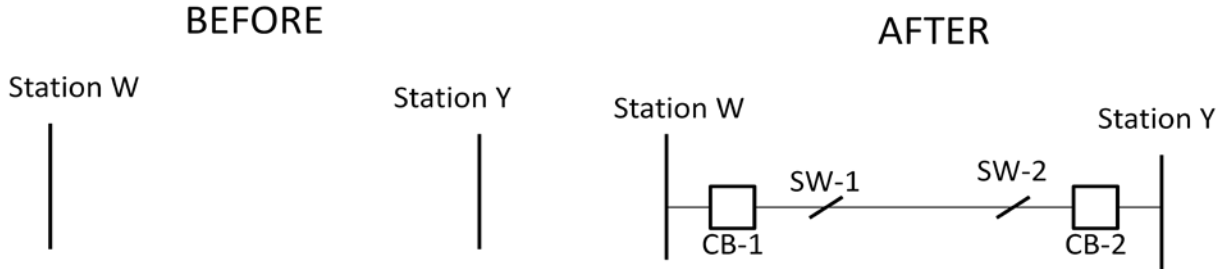
- Before January 1<sup>st</sup>, a NOMCR should be submitted with a model-ready date of April 7<sup>th</sup> for L2, L3, Station X, SW-3, and LD-1
- Before January 1<sup>st</sup>, a NOMCR should be submitted to retire L1, SW-2, CB-2 with a model-retirement date of April 7<sup>th</sup>
- Outages should be submitted on CB-1, SW-1, L1, SW-2, and CB-2 starting date on April 2<sup>nd</sup>. These outages will de-energize the existing equipment from the model. Ideally these outages should be submitted prior to January 15<sup>th</sup> to facilitate model validation. The outage on L1 should end on April 7<sup>th</sup> (the model load in which this equipment is retired from the model).
- A second group of outages should be submitted on L2, L3, SW-3, and LD-1. These outages should begin on April 7<sup>st</sup> (model load date in which new equipment first appears in production). The outages should end on April 10<sup>th</sup> (field-energization date for the new equipment).
- On April 10<sup>th</sup>, the Approval to Energize process is followed to energize the new equipment.

The following illustration shows the sequence of outages and modeling needed to represent this change in topology in the field.



**c) New Line**

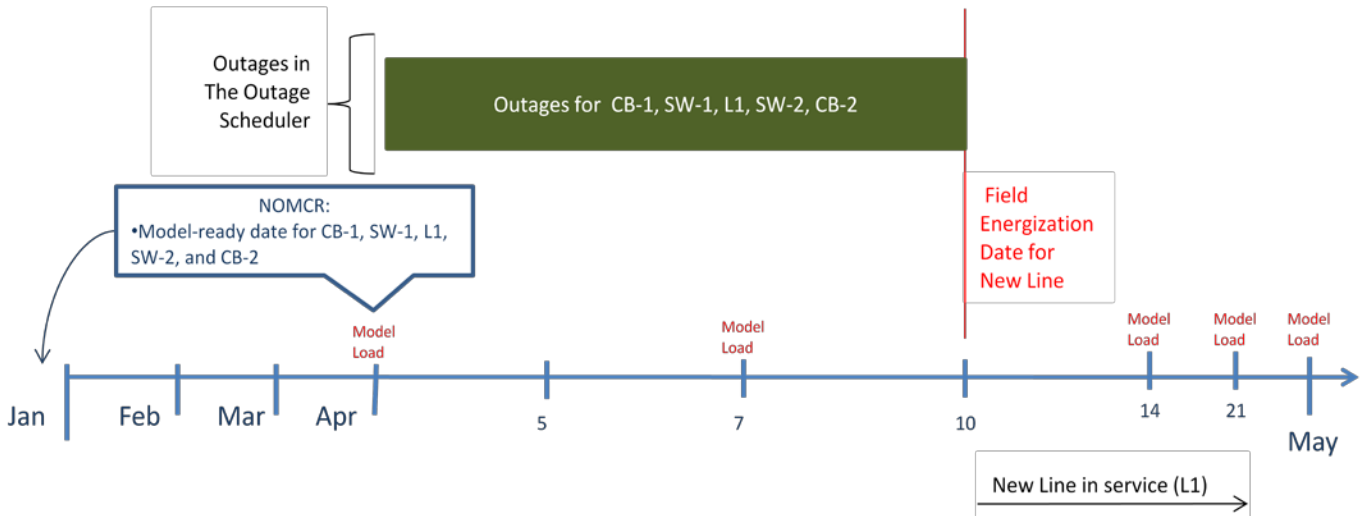
Line is constructed between existing stations with an field-energization date of April 10<sup>th</sup>.



In this example a new line, two breakers, and two disconnect switches are scheduled to be field-energized on April 10<sup>th</sup>.

- Before January 1<sup>st</sup>, a NOMCR should be submitted with a model-ready date of April 1<sup>st</sup> for each piece of new equipment.
- Outages should be submitted for each piece of new equipment<sup>15</sup> that span the time period between the model-ready date and the field-energize date.
- On April 10<sup>th</sup>, the Approval to Energize process is followed to energize the new equipment.

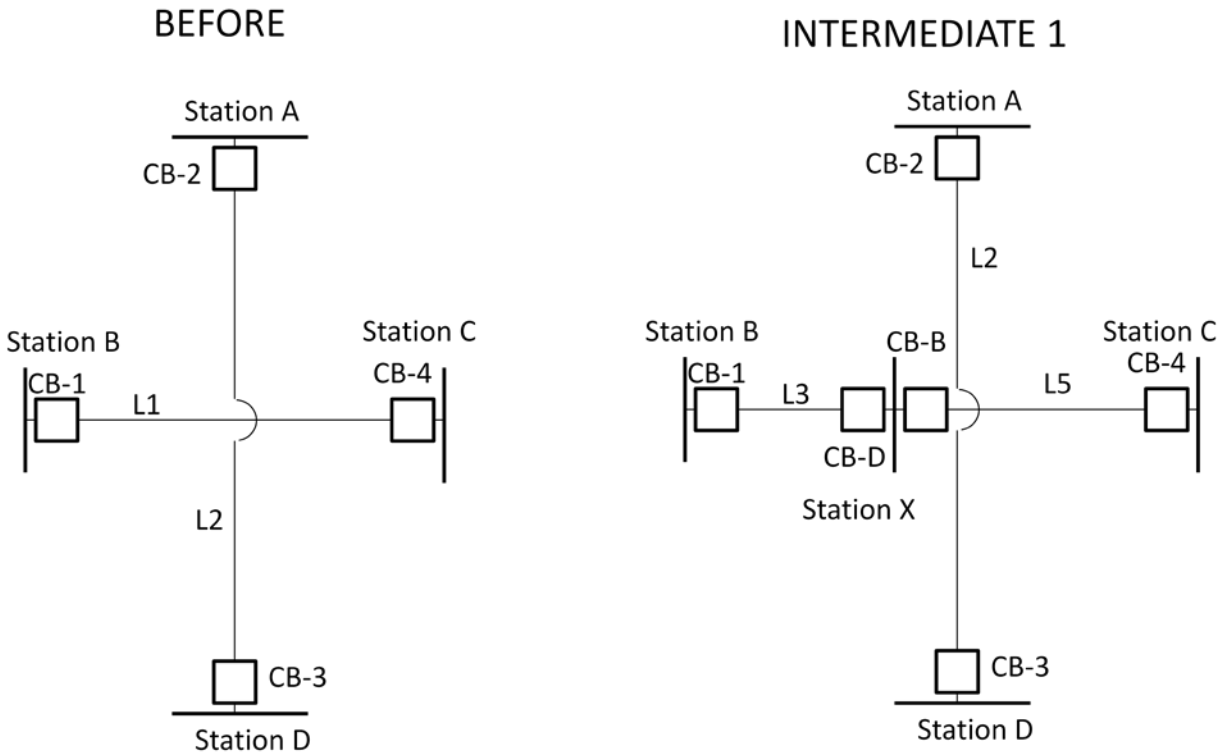
The following illustration shows the sequence of outages and modeling needed to represent this change in topology in the field.



<sup>15</sup> ERCOT Nodal Protocols 3.1.5.1 (1)

#### d) Switching Station

New Switching Station is constructed at the intersection of two existing lines. Station is to be fully energized on April 22<sup>nd</sup>. Construction requires a series of outages spanning a twenty-one day period with two intermediate configurations.

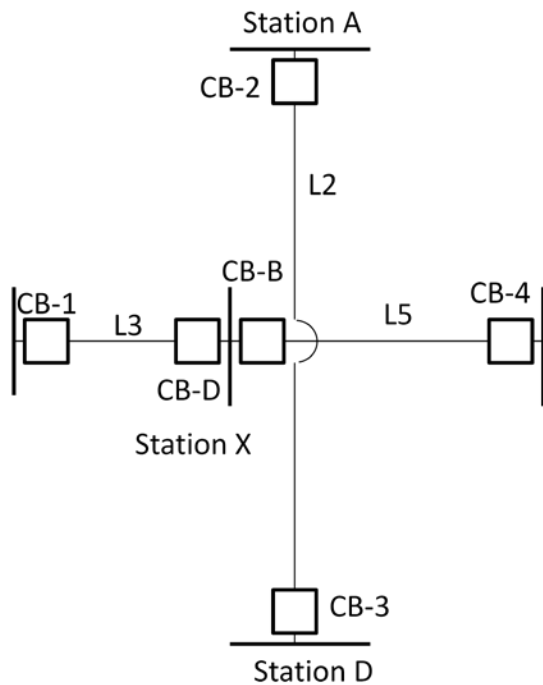


In this example, the first intermediate stage requires a new station to be cut into L1 on April 8<sup>th</sup>.

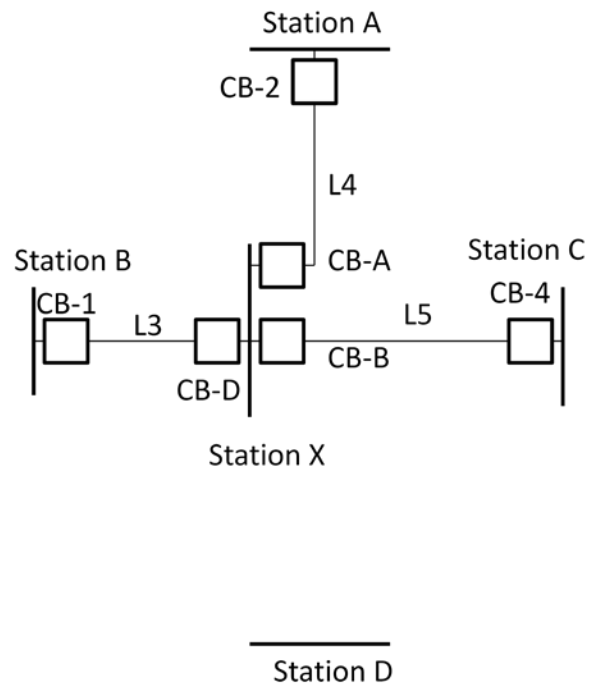
- Before January 1<sup>st</sup>, a NOMCR should be submitted with a model-ready date of April 1<sup>st</sup> for CB-D, CB-B, L3, and L5.
- Before January 1<sup>st</sup>, a NOMCR should be submitted with a model-retirement date of April 7<sup>th</sup> for L1.
- Outage should be submitted for L1 that begins on April 2<sup>nd</sup> and ends on April 7<sup>th</sup> (the model-retirement date for L1).
- Outage should be submitted for CB-1 and CB-4 that begins on April 2<sup>nd</sup> and ends on April 8<sup>th</sup> (the field-energization date for L3 and L5).
- Outages should be submitted On April 7<sup>th</sup>, for CB-D, CB-B, L3, and L5. These outages should end on April 8<sup>th</sup>.

This completes configuration Intermediate 1.

## INTERMEDIATE 1



## INTERMEDIATE 2



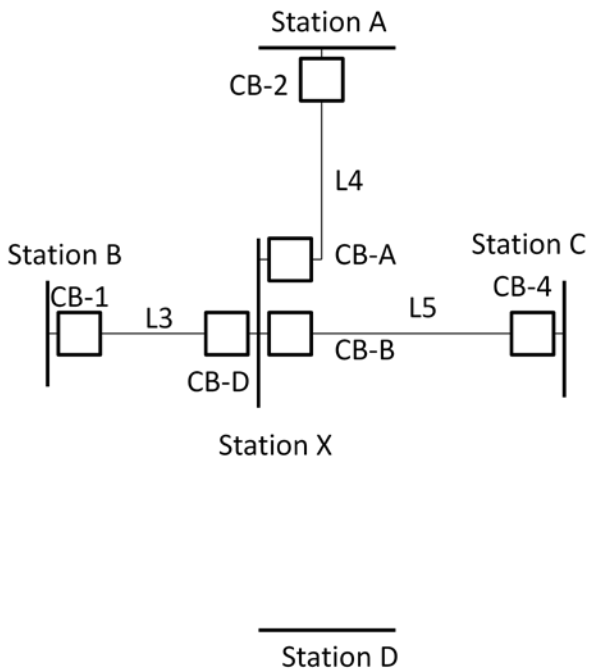
The following needs to take place in order to transition from Intermediate 1 to Intermediate 2. For this stage, L4 is to be field-energized on April 14<sup>th</sup> (the same day as the Scheduled Model Load).

- Before January 1<sup>st</sup>, a NOMCR should be submitted with a model-ready date of April 14<sup>st</sup> for CB-A and L4.
- Before January 1<sup>st</sup>, a NOMCR should be submitted with a model-retirement date of April 14<sup>th</sup> for L2.
- Outages should be submitted for L2 and CB-2 that begin on April 11<sup>th</sup> and end on April 14<sup>th</sup> (the model-retirement date for L2 and the field-energization date for CB-2).
- Outages should be submitted for CB-A and L4 that start and end on April 14<sup>th</sup> which is both the model-ready and field-energization date for this equipment. The outages would span the time from the database load (12:00 AM) until the field-energization.

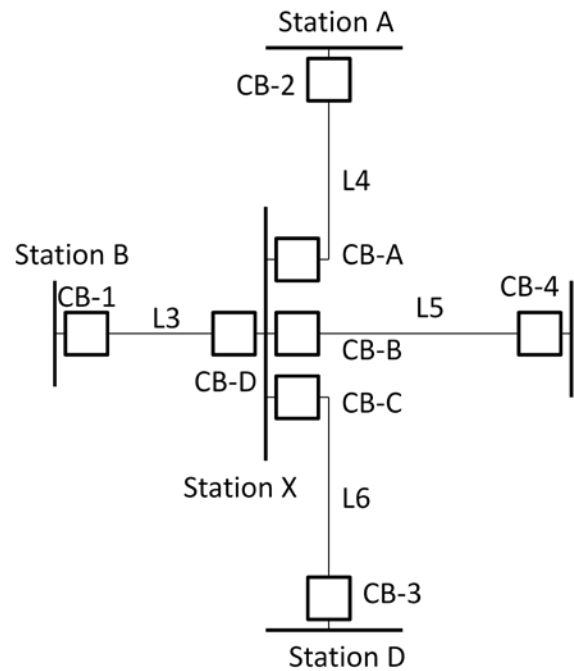
This completes configuration Intermediate 2.



## INTERMEDIATE 2



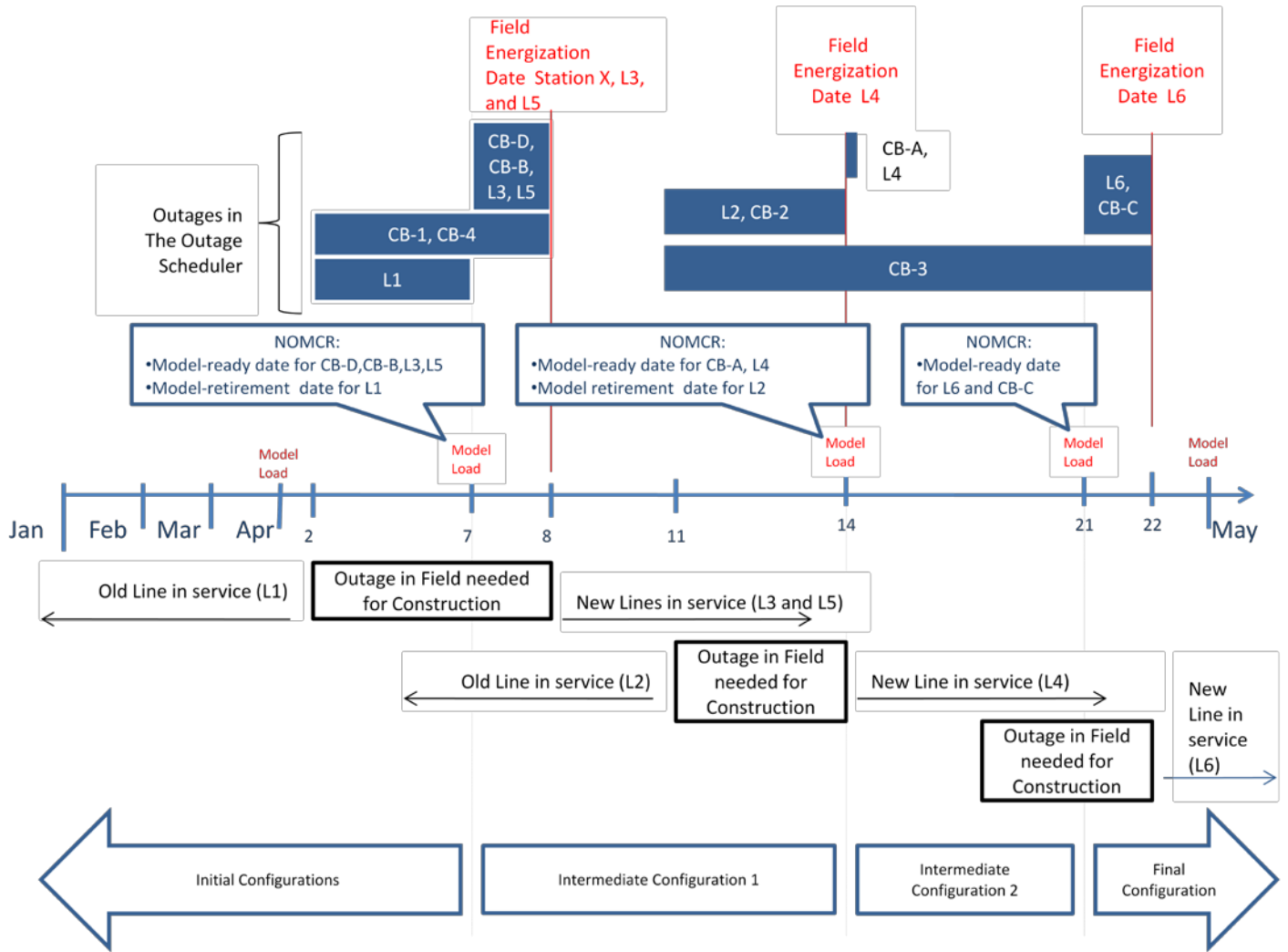
## FINAL



The following needs to take place in order to transition from Intermediate 2 to the final configuration for the new switching station. Line L5 is to be field-energized on April 22<sup>nd</sup>.

- Before January 1<sup>st</sup>, a NOMCR should be submitted with a model-ready date of April 22<sup>nd</sup> L6 and CB-3 (These elements could have been entered on an earlier database load and outaged).
- Outages should be submitted for L6 and CB-3 that begin on April 14<sup>th</sup> and end on April 22<sup>nd</sup> (the field-energization date for L2 and CB-B).

This completes the modeling and outage sequence for the new switching station. The overall series of modeling and outage submissions is illustrated in the below diagram.



## **VIII. Contingencies**

### **A. Double Element Contingencies**

ERCOT will submit NOMCRs and model double contingencies in NMMS after consulting with the owners of the equipment in the double contingencies. It is expected that equipment owners will proactively communicate to ERCOT which equipment should be included in double-circuit contingencies as identified in ERCOT Operating Guides. For example, any model change that results in the creation (or removal) of one or more new double contingencies should be submitted with the identification of which elements create each of the new double contingencies. That information will be used to update the contingency list in NMMS. An agenda item will be added to the Network Data Support Working Group (NDSWG) meetings to review the current list of double elements and verify that the list is complete. ERCOT will be identified in the model as the owner of the contingencies.

### **B. Single Element Contingencies**

Single element contingencies will be programmatically generated and appended to each CIM model. Each Network Operations Model could have a unique contingency file. It is expected that equipment owners will work with ERCOT to identify equipment that should not be included in a contingency (i.e. breakers without relaying). Conversely, it is expected that the equipment owners notify ERCOT when equipment that was previously excluded should be re-included in a contingency. ERCOT's programmatic contingency generator has the capability to exclude contingencies on previously identified equipment. The identification flag for equipment that is to be excluded from the programmatic contingency generation will have ERCOT ownership in the model.