



Time-Based Management of Large Scale Network Models

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- **The Electric Reliability Council of Texas (ERCOT) manages the flow of electric power to 21 million Texas customers – representing 85 percent of the state’s electric load and 75 percent of the Texas land area.**
- **Approximately 3 years ago, ERCOT began a project to migrate from a Zonal market to a Nodal market.**
 - Load prices were calculated in 5 zones → Price will be calculated at roughly 5000 nodes

- **Roughly four years ago Network Modeling identified deficiencies in their current modeling tool.**
 - Issues such a change tracking, etc.
- **Work began on a RFP. As this process was wrapping up, the ERCOT Nodal Project was approved. RFP was adjusted for protocol inclusion and project placed under Nodal banner.**
 - Nodal protocol requirements included enhanced market transparency, modeling accuracy, agreement between planning and operations, and use of the **CIM standard**
- **Standard was a good base line but lacked many items including those necessary to support Nodal Implementation.**

- **Goals of NMMS:**
 - Single Model Data Base
 - Use Common Interface Language
 - Incorporated Data Entry User Interface
 - Unified Change Tracking System
 - **Time-based Model on Demand**

CIM Model Approach

- One common database to generate models for all processes
 - Energy Management System
 - Market Management System
 - Long Range System Planning
 - Outage Scheduling
 - Outage Evaluation
 - Congestion Revenue Rights Auction

CIM Related Problems confronting ERCOT in 2006

- **The CIM standard was mature enough for a power flow application, but not much else.**
 - SCADA/ICCP support
 - Planning Model Support
 - Market Support
- **CIM (by itself) is not temporal**

Common point of information entry

- Provide a interface robust enough to allow all model information to flow through.
- Decrease the amount manually transcribed data.
- Perform some pre-validation in the data submittal process.
- Allow Data Owners to either submit or create a CIM compliant file.

Tracking

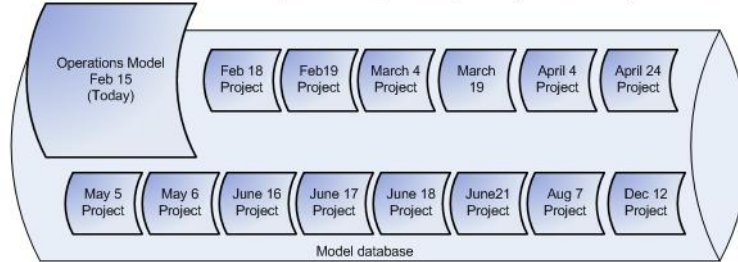
- Since the model feeds all major systems, multiple overlapping data ownership will occur. Changes will be protested, questioned and denied. For resolution to occur, every data entry into the database will be tracked.
- The entry log will be readily accessible, and provide the who, what, when, and where of how any piece of data found its way into the data base.

Time based Model on Demand

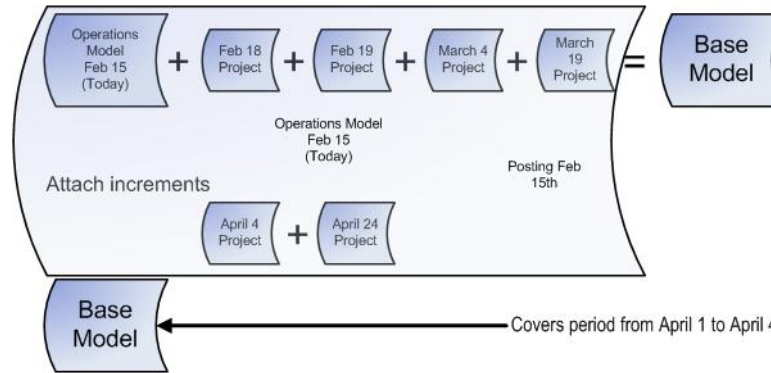
- Produce, package, and track incremental time based model changes.
- Provide an interface that allows users to produce a model with the incremental changes applied.
- Realize both effects and dependencies of incremental model changes.

Timeline Database Build

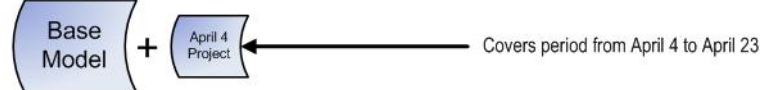
Desired model: April 1 to April 30 (Today is Feb 15)



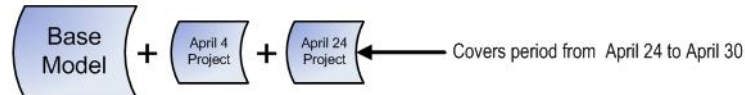
Build Base model



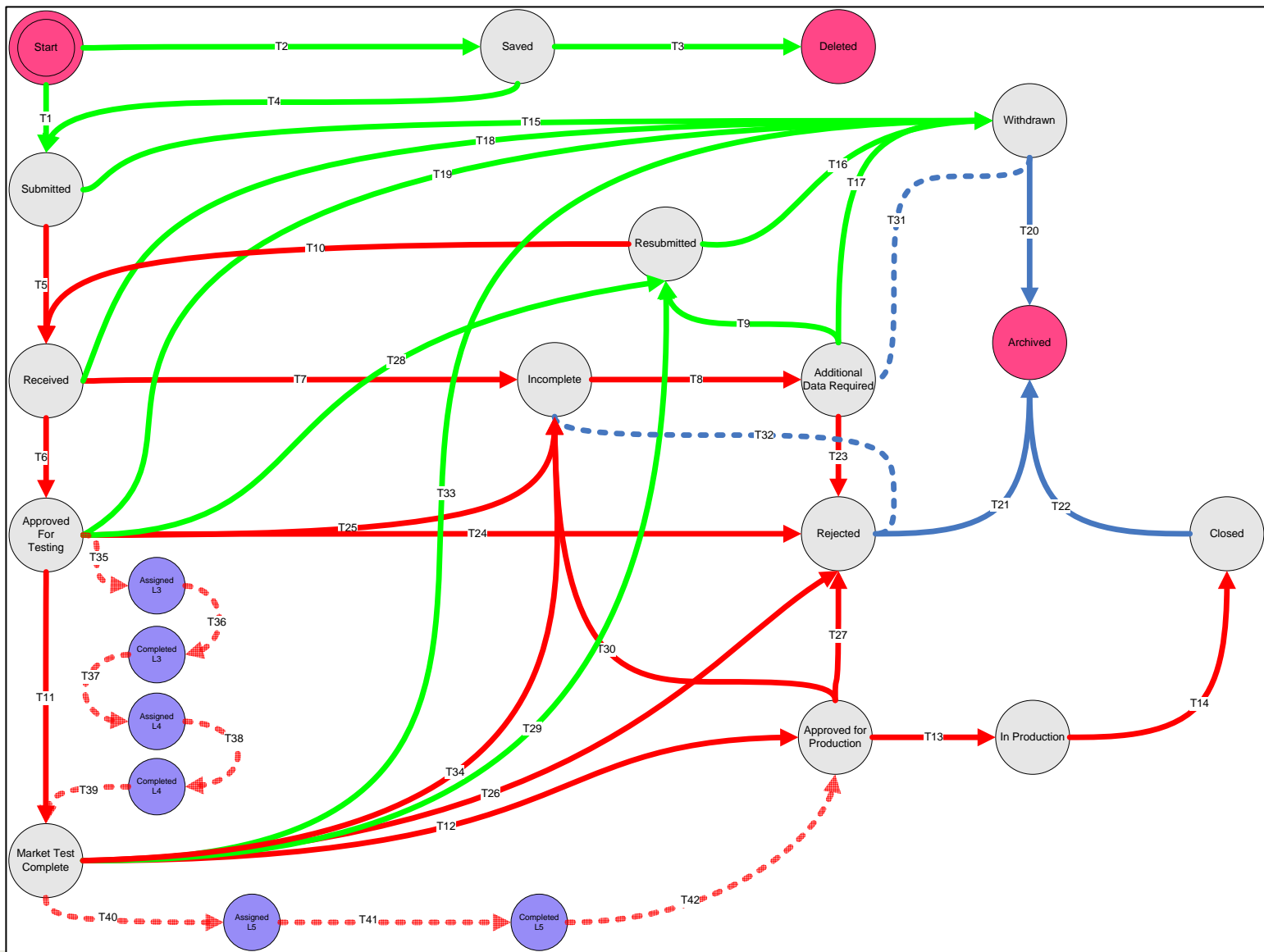
Add increment



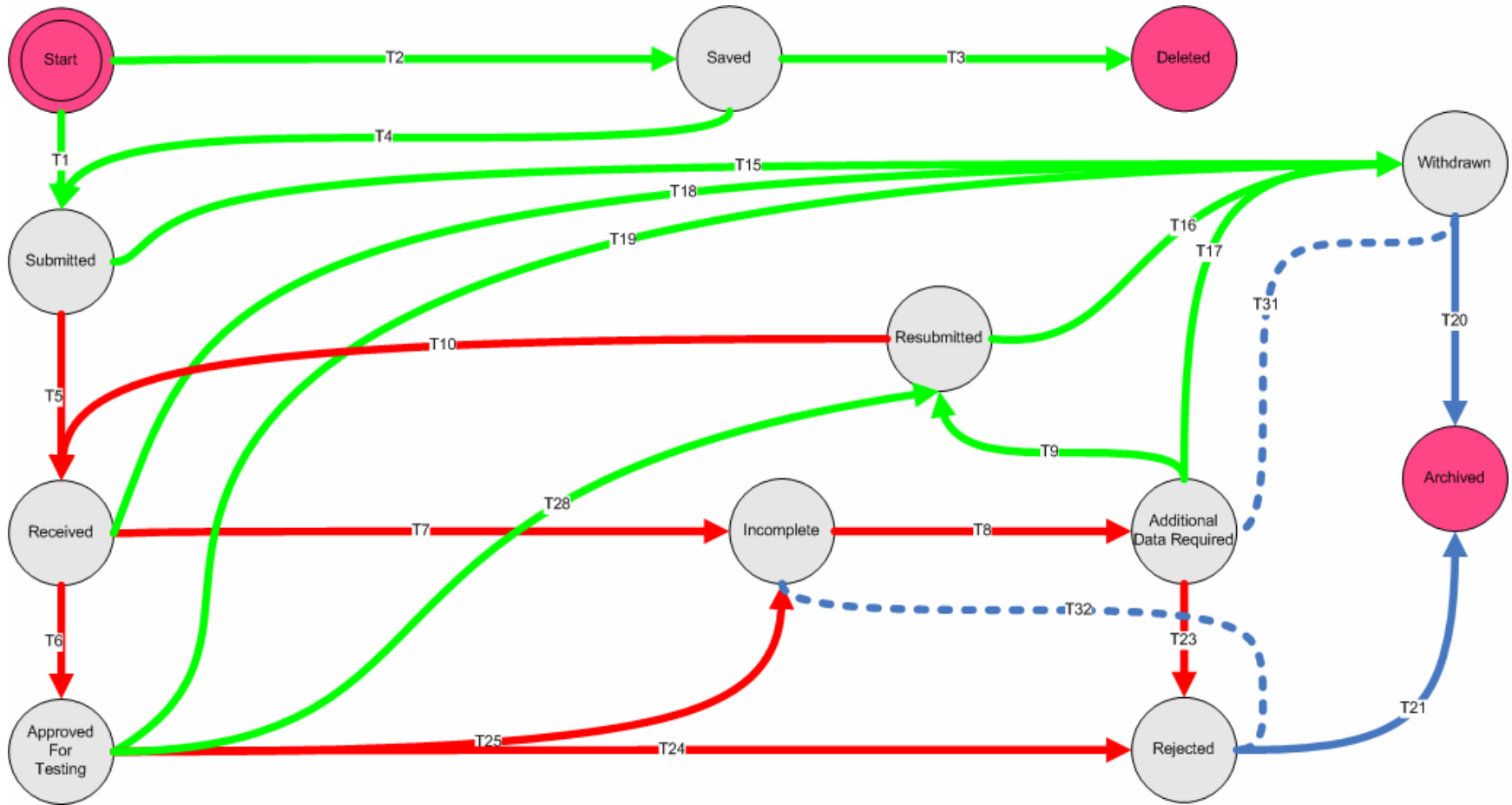
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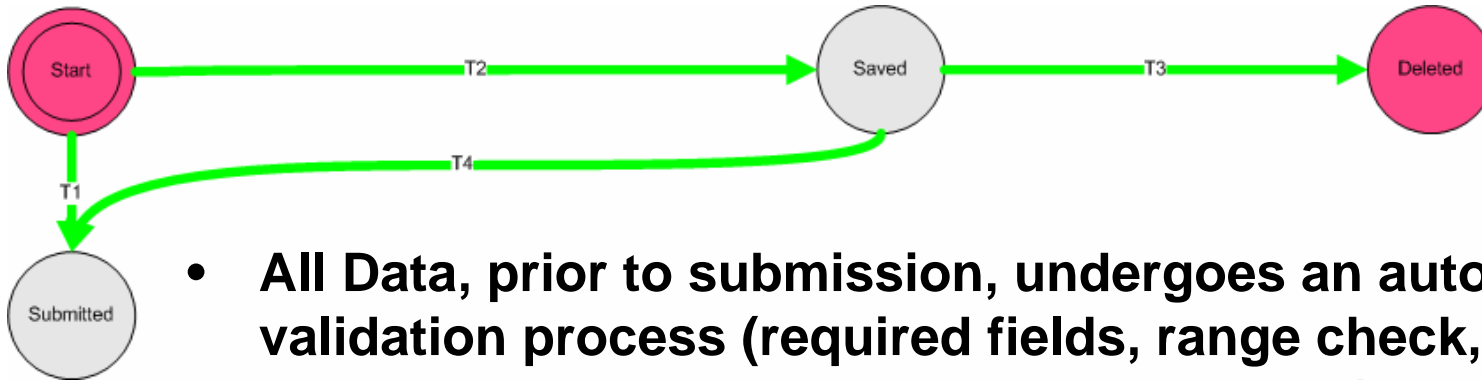
Network Operations Model Change Request (NOMCR) Process



Level 1 and 2 of NOMCR process (Data Validation)



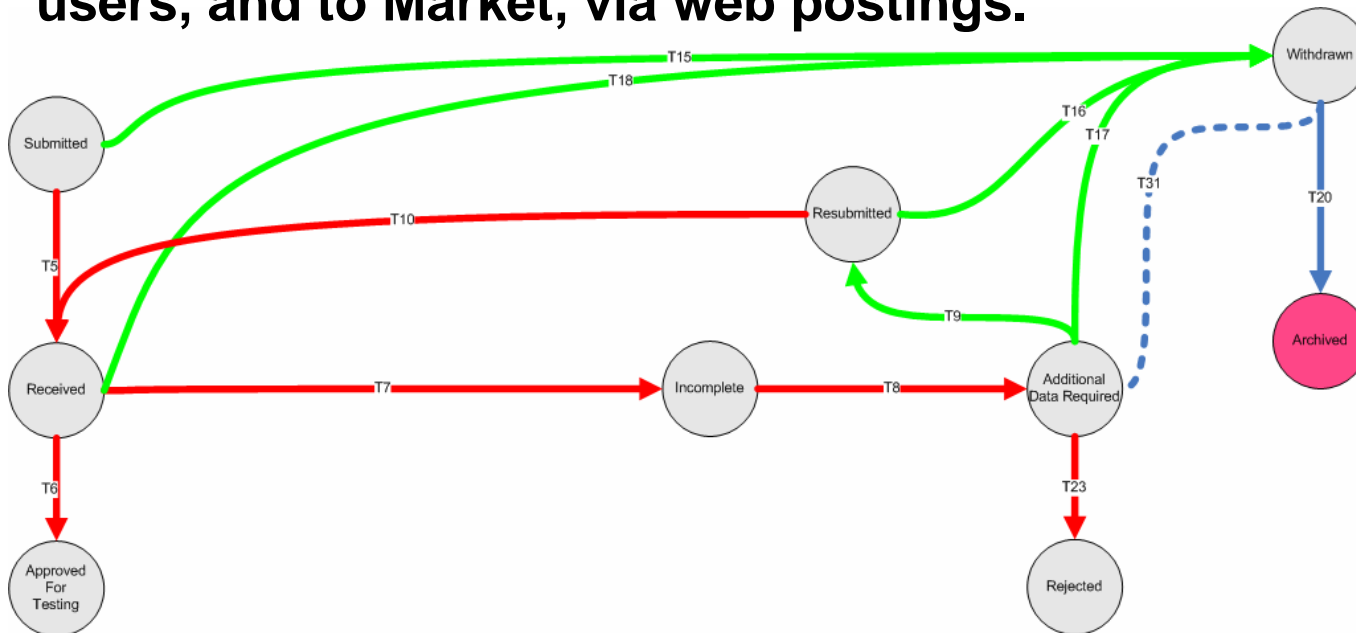
Level 1: Range Check and Schema Validation



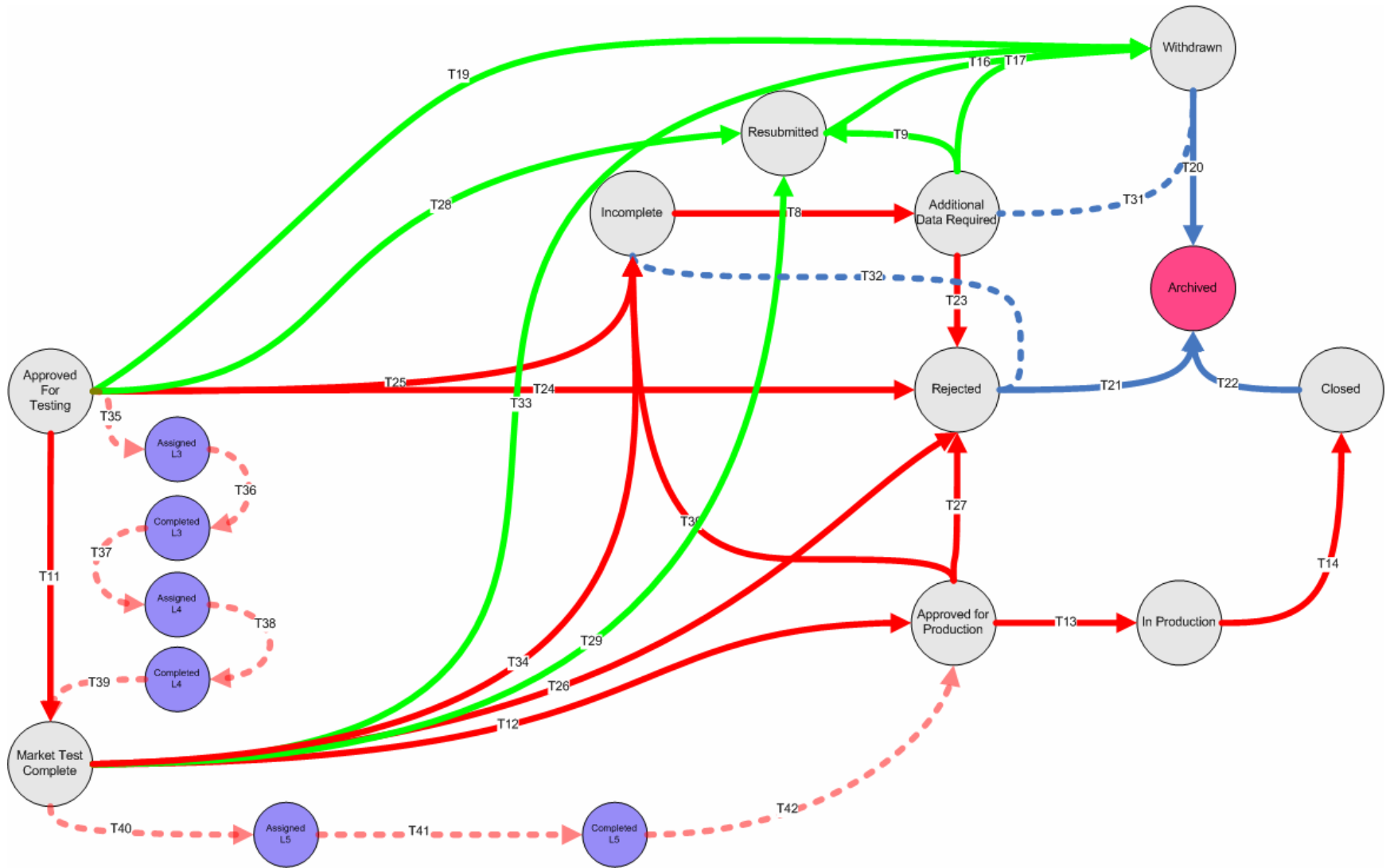
- **All Data, prior to submission, undergoes an automatic validation process (required fields, range check, schema integrity, name service registration)**
 - Protocols dictate a time line for notifications, and testing once data has been successfully submitted. While a pre-submission validation is no guarantee of error free data, it provides at least basic assurances.
 - Change requests that don't pass validation, may be saved, edited, etc. At this state, only the change request owner can view the data.

Level 2: Visual validation and Sanity Check

- All data once successfully submitted, undergoes a visual inspection by the Model Coordinators.
 - Insures that the submitted changes, match the description provided.
 - Upon opening the submitted change, the status of the NOMCR is changed from “Submitted” to “Received”. This is when the NOMCR is made public, both in the NMMS system to other users, and to Market, via web postings.

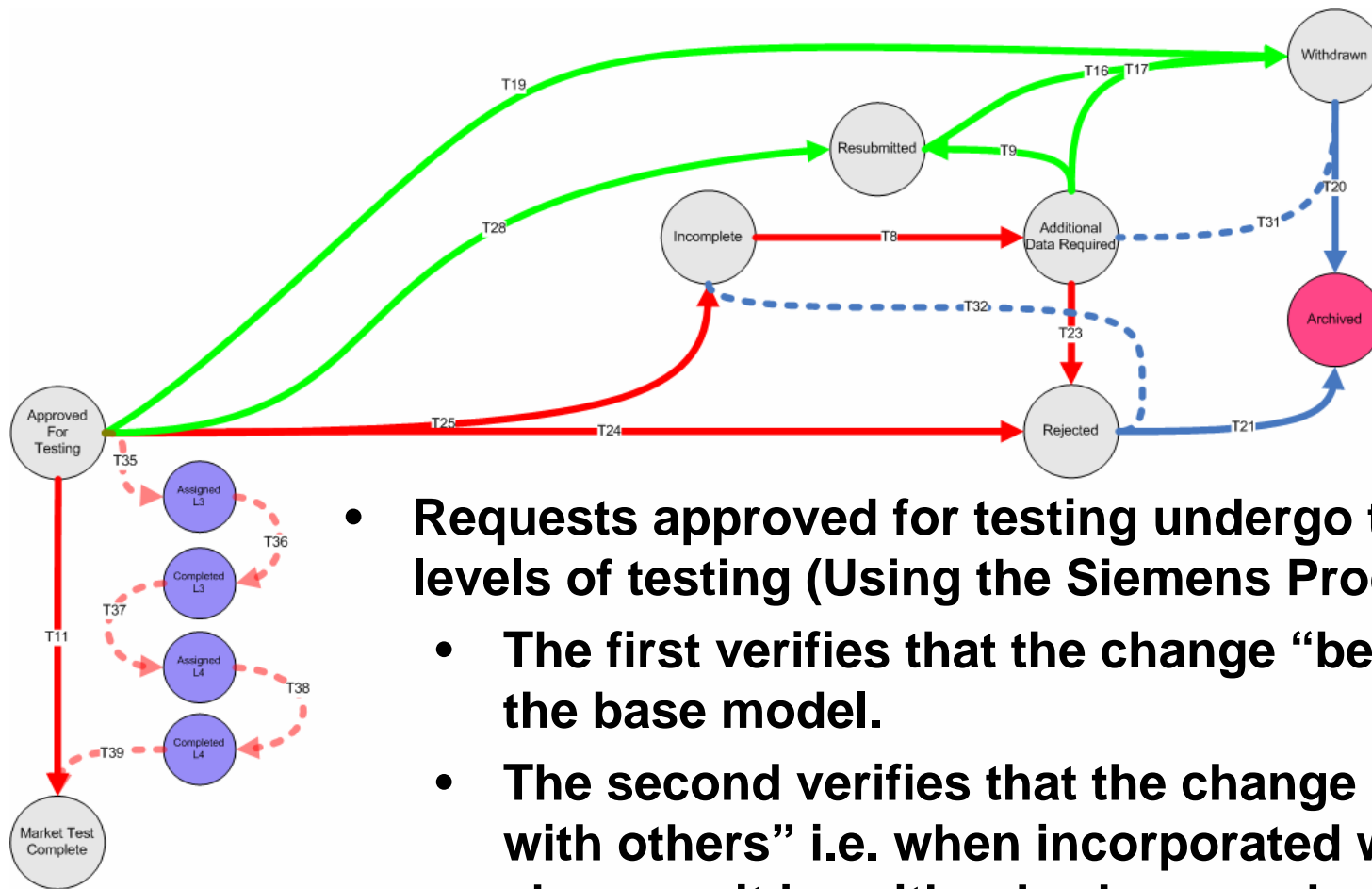


Level 3, 4, and 5 of NOMCR process (Model Testing)



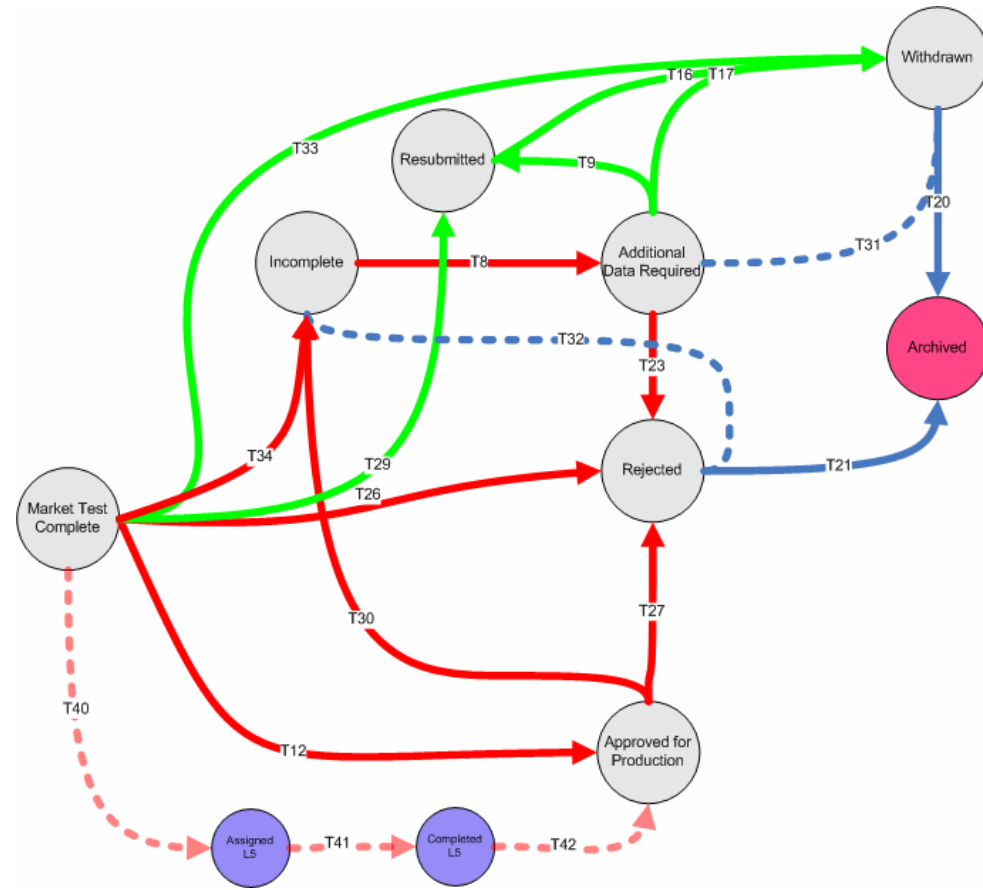
Level 3 – Testing the Model Request Change

Level 4 – Testing the Model Request Change with other changes

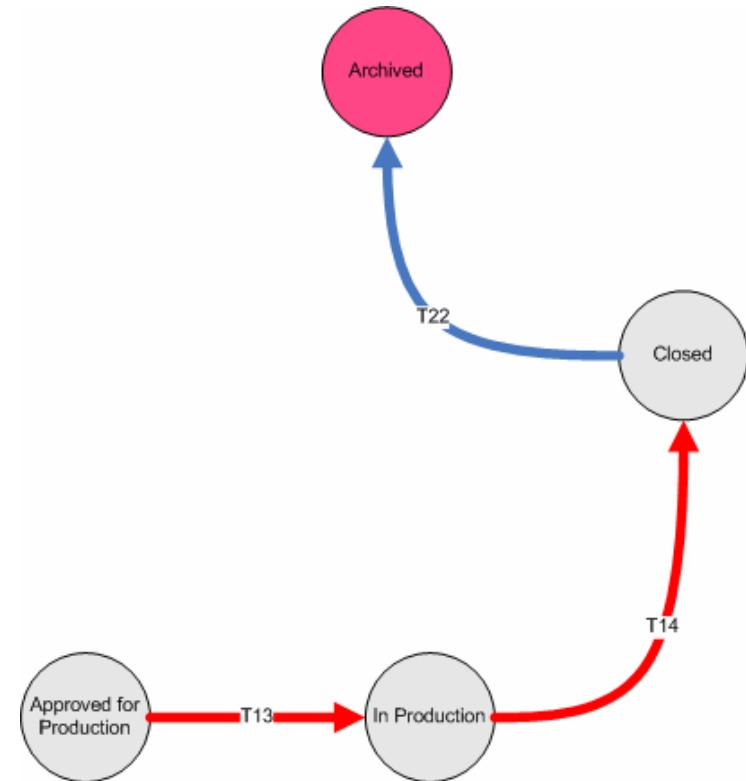


- **Requests approved for testing undergo two basic levels of testing (Using the Siemens Product).**
 - **The first verifies that the change “behaves” in the base model.**
 - **The second verifies that the change “plays well with others” i.e. when incorporated with other changes, it is neither broken, nor breaks others.**
- **Testing is done in accordance with protocol posting requirements.**

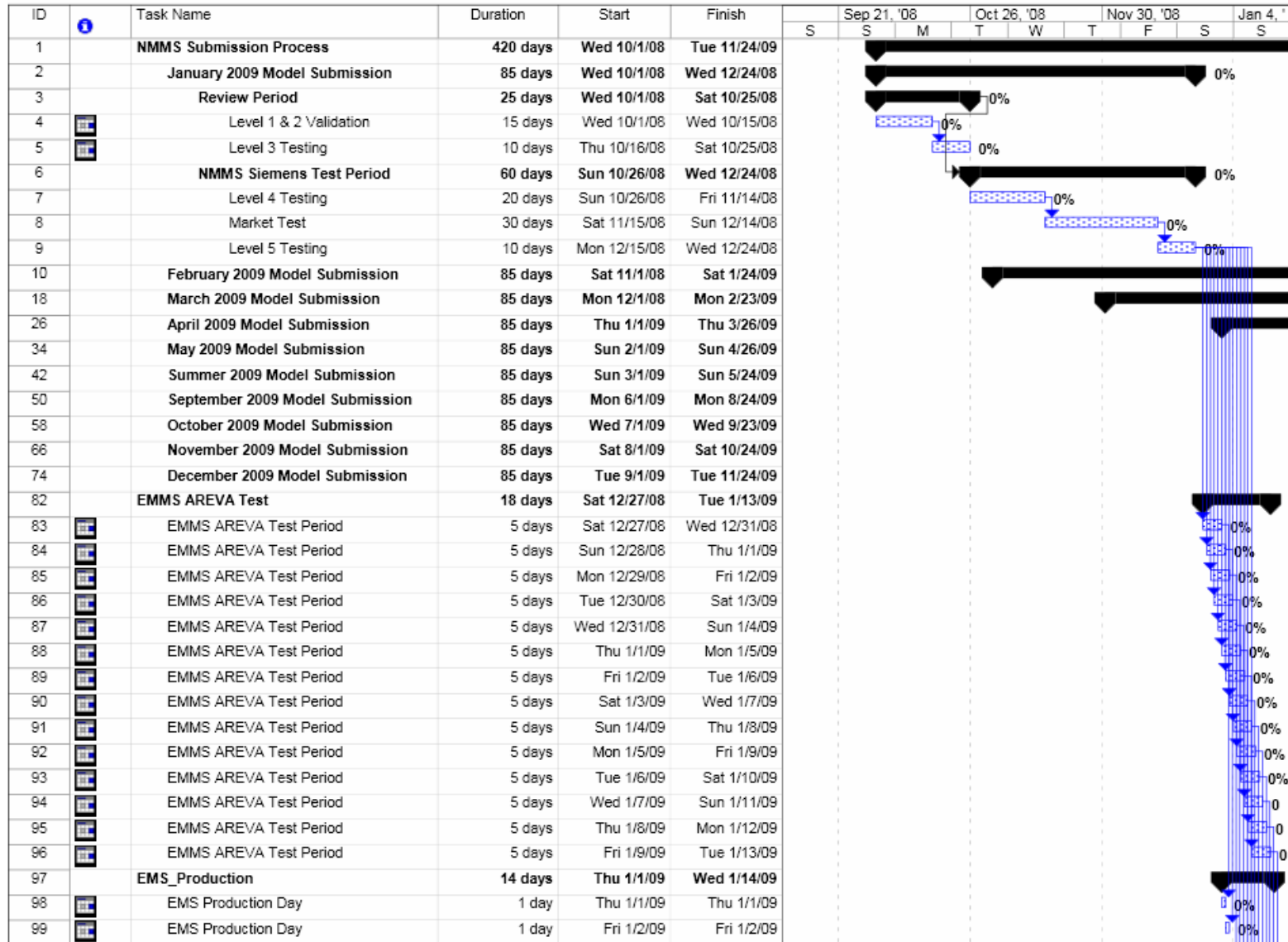
- This test moves a full production model from the Siemens platform to the AREVA platform via a CIM XML flat file.
- AREVA EMS validation is run, and basic applications functions are tested (Power Flow, Contingency Analysis, etc).
- Once the NOMCRs are in the “Approved for Production” state, they can no longer be withdrawn.



- **NOMCRs that are “Approved for Production” are incorporated into model for an operation day, and passed to the EMMS ITEST group. This occurs at a minimum of five days prior to the operations period. (OD – 5), depending on holiday/weekend**
- **After ITEST is complete, the model is loaded onto a production server, and a switch over occurs from the current EMS sever to the server where the new model resides.**
- **Both EMMS and Operations provide feedback on any issues encountered.**



Gant Chart of Business Process



Lessons Learned:

- 1. In moving to this concept, its important to have leadership. Or not to tell the leadership until your already done moving.**
- 2. Vendors will (this part removed by ERCOT legal department)**
- 3. If they are not a power engineer, or part of your department, don't talk to them.**

Questions?