

BATF Modeling and Data Management Strategy

Base Case Coordination System Alternatives Task Force
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Introduction

The purpose of this Modeling and Data Management Strategy document is to identify and prioritize improvements to the base-case building process from both the WECC staff and WECC Member perspectives. This strategy will document the present state of modeling and data management used by WECC. A list of existing modeling deficiencies is provided. Due to an unsuccessful attempt to implement a new modeling and data management strategy through the Base Case Coordination System (BCCS) Project, the Base Case Coordination System Alternatives Task Force (BATF) has outlined a review of the objectives from the original scope of the project. Lessons learned from the BCCS project are included. With an understanding of the present needs and historical lessons learned, the BATF is proposing a vision to the desired end-state for modeling and data management. Finally, this document presents a path that starts incrementally improving the base case and data management processes at WECC to achieve the vision.

Current State

The current WECC-System Review Work Group (SRWG) process aims to create 11 cases a year. The cases are broken up to accommodate a range of studies needed by both Operations and Long-Term Transmission Planning. Typical cases consist of five operating cases that cover conditions from Heavy Winter, Light Spring to Heavy Summer. Along with these cases, two 5-year cases and two 10-year cases are evaluated for Heavy Summer and Heavy Winter. The need for more cases has been discussed to evaluate alternating years based on the new TPL standards, special studies (path ratings, sensitivities for projects) as well as the demand for additional studies in the Operating Horizon. Creating cases month by month may not always meet the deadlines companies have for creating particular cases from five- or 10-year cases.

The following is a list of deficiencies and issues observed by the SRWG in the existing case building process at WECC. The issues are categorized as either a case development process issue or data issue.

Case Development Process

- Not enough WECC-approved cases are built to represent all of the situations that are needed by members of WECC to comply with all study needs. Annual survey responses include more requests than can fit in existing schedule.
- Transparency is needed in the assumptions that are used for developing cases. Study engineers need to know exactly what the foundation assumptions are to make assessments for studies.
- Lack of vendor responsiveness due to lack of consistent requesting process to add data fields that are required by or beneficial to the SRWG or the Modeling and Validation Work Group (MVWG). SRWG generally creates spreadsheets to “make do” until (or if) the vendor adds the desired fields.
- Developing and sending EPCL to WECC for case reviews. Process is a black box and doesn’t provide the transparency that is wanted by members. Makes it hard to check that data is consistent and accurate.
- Processes lack sufficient accountability for data submissions making it difficult to identify who is responsible for a particular piece of data.
- Data is often submitted late to WECC staff, resulting in delayed case development schedule

- Cumbersome, slow, voluntary case conversions between Positive Sequence Load Flow (PSLF) and Power System Simulator for Engineering (PSSE).
- Case build schedule can be difficult to meet based on inconsistency in data submittals. Schedule can be delayed due to data submittals coming from software other than PSLF.
- Path target flows on case description sheet are typically not met.
- Correcting data after a case has been approved is challenging.
- Case development by area at WECC does not allow responsible entities to submit data for an area outside of the one in which they reside.

Data Issues

Issue	Need	Priority	Smart Objective
Inconsistent assumptions and data formats between power flow modeling tools.	Database that contains all of the fields needed to populate all power flow platforms used in WECC. Creation of a case directly from the database in the preferred format of the user will not result in the loss of data that could occur when converting a case from one software platform to another. Getting the three vendors (GE, Siemens, and PowerWorld) to agree on the same assumptions in their power flow solutions is unlikely. Instead some reasonable margin of error can be developed for solving the power flow in the three different programs.	High ¹	Software solution should be able to create power flow cases in PSLF, PSSE and PowerWorld. Successful case creation would consist of the power flow solutions between the three resulting cases to be within some predefined margin of error. This is a high-priority step and should be functioning early in the development process.
Data requests are getting omitted, ignored, or forgot. RAS, GIC, Contingency files, Relay data, Long-load IDs do not get maintained as case data changes making “one time” submissions unusable. These independent datasets are always broken because data is changed or updated in the WECC cases.	Database that contains all of the fields needed to populate all power flow platforms used in WECC. Creation of a case from the database will not result in the loss or degradation of data that would occur when converting a case from one software platform to another. The case could include the designation of active fields (those required to be populated by WECC) and include the ability to notify a data owner that required data is missing.	High	Data fields will need to have designations to distinguish required data (per the Data Processing Manual (DPM)?) from optional data and established data from new data. Log-in page could include a 'Notifications' dialog of any updates or additional capability. Error warnings when submitting data will highlight whether there are required fields that are missing data. Auto-notifications are created when required data is due and when the due date has passed and data has not been provided.
Corrected data errors reoccurring after update has been made i.e., when that same error persists throughout multiple models.	Master database with current system representation to be used in the creation of each case. Updates to the master database would then automatically be included in any subsequent case builds.	High	Each case created would start with a base topology stored within a database. This would ensure that every case begins from the same starting point. Periodically applying project files with completion dates that have passed will ensure that the database is as up to date as possible.

¹ High priority requirements should be functional with the initial software solution.

Issue	Need	Priority	Smart Objective
Project files are constantly changing and have multiple versions. Keeping track of them and their applicability is very difficult.	Version control is needed to identify active project files (vs. inactive or superseded files). Need the ability to sort files by status or by owner.	High	Vendor needs to clearly define the approval process for posting a valid project file. Documentation should include flow charts defining the process. Version control should be automatically used to allow updates to a posted project file (i.e., an update to an existing file should change version by 0.1). Likewise there will need to be a vigorous process for deleting and reposting significant changes, such as a dialog asking whether the project file is replacing an existing file.
Transparency in errors. Where do they come from in the process?	Tracking of all changes made to the database, including who made the change, the date and time of the change and what change was made (maybe include previous data).	High	All changes made to the database, including the uploading of project files and profiles and updates to the base topology by applying project files, need to be documented to identify the person making the change, and when the change was made. Each piece of information in the database should also have an "owner" or Data Submitter field. The program should not allow Data Submitters to change data that they are not assigned to. Future features would include identifying the entity making changes to dynamics data, short circuit data, etc.
Projects in the cases are not well documented. Out year cases may or may not have projects in them but you can't tell without digging through the cases.	Maintain a record of what information went into a case, including when the case was created and what profiles and projects were loaded, similar to the 'About' menu options in some programs.	High/ Medium	Alternative 1 - Software solution will output a report for each base case that is created, similar to the Associated Material currently posted with each case. This report would include information pertinent to each case, such as which projects and profiles were used to create the case, area interchange schedules, supplemental line flows, loads and resources, etc. Alternative 2 - Software vendors implement a summary page in the software that will document which project and profile files were used to create the case. This page would be auto-populated during case creation.

Issue	Need	Priority	Smart Objective
Dynamics model management needs to be improved well beyond a static flat file for all time frames. Additionally, there are errors that are constantly making it into cases despite any review and alignment process.	Database structure where the dynamics data is associated with a specific element in the system (generator, switch/breaker, shunt, etc.) that could potentially also include a seasonal designation. If one element of the equipment is changed, the program would then be able to update associated elements of the dynamic record (i.e., update to equipment ID or MVA rating would also change the dynamic record).	Medium ²	Database structure where the dynamics data is associated with a specific element in the system (generator, switch/breaker, shunt, etc.) that could potentially also include a seasonal designation. If characteristics of the equipment change, the program would then be able to update associated elements of the dynamic record (i.e., update to equipment ID or MVA rating would also change the dynamic record). This is medium priority and would be implemented after the power flow portion is functioning. Low priority could include adding data checking capability to the tool to flag suspect data.
Inconsistent modeling practices between data submitters.	Data submitters are not modeling their systems to the same level of detail, which can impact interties and phase shifters where the level of detail is significantly different between the two interfaces. Is this something that can be solved with a base-case development software solution? Possibilities include creating data checks consistent with data requirements in the DPM.	Medium	A software solution can identify and flag data that falls outside of the data requirements included in the DPM. Does not have the ability to identify data that is not modeled to the appropriate level of detail (i.e., not enough data is provided). If deficiencies are identified, a database structure would allow for the submittal of a single file to correct the problem. West-wide System Model (WSM) example of users using transformer MVA base vs. 100-MVA base.
GIC, relay, RAS, node-breaker, requests are here or coming.	Capability to expand the data fields in the database based on future data requirements. Notification to users as new fields become available (through email alerts, highlighted data fields) and notifications that data is missing once some defined due date has passed. Ability to house 'How-To' documentation for completing the new data fields.	Medium	Data fields will need to have designations to distinguish required data (per the DPM?) from optional data. Log-in page can include a 'Notifications' dialog of any new updates or additional capability. Error warnings when submitting data will highlight if there are required fields that are missing data. Alternatively, create auto-notifications when required data is due and when the due date has past and data has not been provided.

² Medium priority requirements should be implemented once the initial software solution is made available. This would be second generation upgrades.

Issue	Need	Priority	Smart Objective
Inconsistent representations of the system between WECC and Peak Reliability (Peak) models	WECC and Peak models are created from two different data sets and currently consist of two different representations of the system (bus-branch and node-breaker). There is a significant amount of work going on through MVWG and at Peak to align these two data sets. Is this something that will be fixed with a base-case development software solution? A common database for both WECC and Peak models will need to include both representations until the WECC base cases are converted to node-breaker. This process is highly dependent on communication between Planning and Operations. Peak requested that we align the DPM with the data requirements of the Peak model.	Low	A centralized database can act as the 'master' database for building both WECC and Peak models. This database may need to include additional information beyond the DPM to facilitate building the Peak model. This could include data such as transformer configuration and additional fields, such as values on the transformer base as well as transformers on 100-MVA base. This step was classified as low priority given the ongoing work currently occurring between Peak and WECC entities and the different system representations of the two data sets. Populate our database with the ID/labels of the WSM.

Previous Strategy Change Project

WECC has previously reviewed its modeling and data management strategy. The result was the undertaking of the Base Case Coordination System project. The project was not fully implemented due to various reasons. The following section aims to review the past project in an effort to inform WECC on how to improve its future strategy.

BCCS RFP Objectives:

This section is intended to capture the original requirements and objective of the BCCS effort that ended in 2015. The purpose of adding this section is to have the previous information called out and co-located with the objectives that pertain to the future database management project.

The BCCS project consisted primarily of a solicitation to software providers to develop a database for managing data. The following was taken from the original request for proposals to the software vendors.

RFP Requirements – Section 1

Main Objectives

- To provide WECC with a software solution for improved management of transmission base-case data at a central location and improved coordination of the transmission study base cases.
- For a Vendor to develop and implement a centralized database that would contain power flow and dynamic data.
- To improve the existing business process by automating base-case reviews and assembly steps that are now done manually.

Expectations of the Selected Vendor by WECC

- Provide effective and carefully structured approach to implementing the “system”
- Provide a complete and functioning system
- Prepare WECC staff and WECC utility member-volunteers to use the system effectively by
 - Planning technology and implementation
 - Structuring detailed design
 - Integrating software used by WECC users
 - Designing and implementing software modifications
 - Interfacing to external and internal applications
 - Testing
 - Training
 - Developing end-user and technical documentation
 - Managing the project
 - Monitoring Post Implementation
 - Providing warranty and annual maintenance support

Addressing Functional Requirement

- Each Vendor should address each requirement. If a Vendor has an alternative method of achieving functionality, it must be explained.
- If a Vendor believes a requirement is not necessary, the vendor should explain reasons as to why is not be addressed.
- Each area of the BCCS functionality should have a price for each step.

System Requirements – Section 2.1 Business Background for BCCS

Purpose of the BCCS

- Develop Transmission Study Base Cases
- Support WECC Annual Study Program
- Establish or validate transmission path ratings
- Respond to generation interconnection requests by performing interconnection studies
- Respond to transmission service requests by performing transmission studies
- Perform transient stability or voltage stability studies
- Examine the effect of local and regional transmission changes
- Establish temporary operating procedures
- Evaluate the effect of additions, modifications, or deletions of transmission system devices
- Support each company's own Integrated Resource Planning (IRP) process
- Support requests from regional transmission planning entities

SRWG Needs for BCCS

****This section is listed in order of importance to WECC Transmission Planners****

1. Improve the base-case development process
2. Improve base-case data management (validation, tracking, notification)
3. Increase base-case production capability (produce more cases annually)
4. Interface with the WSM
5. Expanded planning timeframes beyond 10 years

WECC Needs for BCCS

****This section is listed in order of importance to WECC Transmission Planners****

1. Must conform to electrical utility and data management industry-standard formats
2. Multiple simulation-model platform capability
3. Centralized, auditable database system with query functionality

Other Needs for BCCS

****This section is listed in order of importance to WECC Transmission Planners****

1. Shall be exportable to interface with software used for WECC analyses, such as economic models used by TEPPC

Technical Platform Requirements

- Ability for multiple users to access at once while allowing other users to view, test and edit data
- Secure data storage for steady-state and dynamic power flow cases
- Track Changes
- Application to Validate and Edit Data
- Ability to accommodate Node Breaker detail (WSM or planning case)

BCCS Lessons Learned:

This Lessons Learned section is a collaboration between WECC Membership and WECC staff in an attempt to document both perspectives.

Issue 1: Deliverables

- Milestones and large all-encompassing specifications did not produce working deliverables
- Stipulated timeline for deliverables not followed by vendor
- Lack of vendor and stakeholder engagement

Lesson Learned:

- Vendor took an independent approach to creating the program, with little to no input from WECC and stakeholders before the final product was shared. Waterfall model may not apply well with this type of project. WECC needs more engagement from the vendor from the beginning and from stakeholders as well.
- Vendor should be made responsible for sharing the development plan for each functionality and get approval before coding begins.
- Vendor should resolve design challenges before coding occurs – with input from WECC and stakeholders.
- Stakeholders and WECC should help vendor solve problems, rather than having vendor decide on its own how to solve problems.
- Stakeholders are not willing to use a semi-functioning program.

Issue 2: Wholesale development of the software tool

- Equal treatment of all requirements of the RFP without defining high, medium and low priority items

Lesson Learned:

- Wholesale implementation approach put high-priority functionality/issues at same level as low-priority functionality/issues.
- A step-by-step approach to the software tool's creation may increase likelihood of success.
- Build in "off ramps" – this allows checks to be performed. Identify problems and solve them before they cascade into bigger issues.

Issue 3: Scope of the tool and RFP specifications

- Excessive Scope creates issues

- The RFP covered everything (Web access, Data submission, power flow, dynamics, short circuit data, WSM model, unlimited case creation)

Lesson Learned:

- Make more informed decisions on what is needed/wanted and how each functionality adds value.
- Limit individual stakeholder's expectations of the tool for their internal purpose.
- Avoid making the wish list the RFP. Need a vetting process that takes the wish list/requirements list and thins it down to what WECC and the stakeholders need or want.
- Limit the scope to current needs and then expand on things that would be "nice to have" features.
- Limit the number of cases to 11 cases initially. This ensures only WECC staff is able to build cases initially and limits users from expanding the scope so that cases for their internal planning studies can be created.

Issue 4: Software controlling the base case creation process

- Software was not able to accommodate all functionalities required for case creation, so users were forced to work around the deficiencies by manual intervention (interchange, limited filtering options for MOD file builder, etc.).

Lesson Learned:

- Do not allow the software to redefine the data submitters' needs and processes, the program should accommodate the submitters' requirements.
- Specify the steps and methods of a particular process users perform outside of the system approval. Make sure software input for that step is consistent with user output.
- Decide when we are willing to adjust our process to match the program, or if the program has to represent the process we have defined.
- Define how the program will be used before it is created, rather than building a tool and defining our use of it based on what was created. Vendor should demonstrate this capability.

Issue 5: Acceptable Performance of the Software tool

- Partial implementation capability is not the goal of the BCCS

Lesson Learned:

- Define what is acceptable performance for every function of the software tool.
- Define the standards for deciding whether a given product accurately performs that process.
- Culture seems to be oriented on "everyone must agree," instead of a culture that allows the majority to make a choice and move forward, which would be more effective. Need an approval process.

Issue 6: User experience

- Broken communications for delivery of notifications
- Slower internet speed requiring a lot of time from each user
- Files outside of the program (interchange) need to be maintained.

Lesson Learned:

- User experience should not depend on a software tool they use in-house.
- The software tool should be user friendly – requiring minimum effort, training and manual intervention.
- Better database management allowing query functionality and version-controlled file management.
- Make better documentation available so future users can learn the program on their own.

Issue 7: Vendor liability

- Missed deadlines for deliverables
- Produced product that is not fully functional
- Took too many iterations for each deliverable

Lesson Learned:

- If the vendor misses deliverables or deadlines, or if the deliverables are not performing satisfactorily, take action against the vendor.
- Hold the vendor responsible for delivering a fully functional program. Liabilities? Add language to RFP?

Issue 8: Existing base-case creation issues

- Existing issues in the manual process carried over escalating the issues seen in program implementation

Lesson Learned:

- Fix known issues in the current base-case building process or data modeling before any software implementation.

Issue 9: Software conversion/compatibility

- Converting (PSSE→PSLF) and solving the case inside the centralized database proved to be very challenging

Lesson Learned:

- Conversion experience suggests that a fixed reference is required; something to shoot for. The current manual process creates a PSLF case (fixed reference), then a PSSE case that requires iterations until it matches.
- Establish data checks to ensure conversion is one-to-one.
- Manage expectations for case conversions.
- Solve existing data conversion issues per WECC staff experience before developing the tool.
- Limit conversion where possible.
- The program should output cases in the latest versions of PSSE and PSLF used by WECC.

Issue 10: Bad input data/user responsibility

- Problems in initial data sets amplify during case creation process

Lesson Learned:

- Fix data issues in the existing base cases before a tool is built to create future cases.
- Develop a process for making the data submitter accountable for modeling bad data.

Issue 11: Data checks

- Adequate data checks were not performed on uploaded CIM file
- Need specifics on data checks

Lesson Learned:

- Specifications needed to include definitions of what “data checks” meant and how to handle the bad data after it was checked – correct? Reject? Modify? Replace?
- Need to create documentation allowing users to understand warnings without requiring WECC staff intervention to decipher.
- Need to know what other data checks need to be performed for CIM data, project files, and final output case (L&R balance, DC tie dispatch, etc.).

Issue 12: CIM file (MOD file builder)

- Not easy to understand
- Cannot be easily modified
- Too much extraneous information
- Limited filtering options do not support current case-creation process

Lesson Learned:

- Vendor diagnostic CIM format would be more effective and functional.
- CIM files should be easy to understand and easy to modify once created.
- What checks can be performed on the cases before creating CIM file? For example, if data is considerably different from the benchmark case, then print out a warning in the progress window.

Issue 13: Testing

- Vendor-only designed testing was inadequate

Lesson Learned:

- Test requirements should be better coordinated between WECC, stakeholders and the vendor.
- Tests should clearly cover requirements of the RFP and the specifications.
- Full scope functionality was not covered with the vendor designing the test, setting the required outcome, and then having WECC run the vendor’s tests.
- Test each function instead of waiting for the full product.
- Need stakeholder involvement in testing.

Issue 14: Case creation by the program

- Topology, load, generation changes if run at once may create issues with case creation

Lesson Learned:

- Provide a flow chart of how cases should be built rather than applying all the changes at once. Run transmission projects first and DC ties last, or make the process consistent with how WECC creates cases now (separate each area and use tie-line file to create a WECC case).

Future State Vision

The vision of a Data Management System (DMS) is to develop a software tool to automate the creation of the Interconnection-wide models. The software tool will provide the following capabilities:

- Create Interconnection-wide models (power flow and dynamic data) representing different loads levels, seasons, path ratings etc. for the current and future 10 years.
- Improve the Interconnection-wide case creation process and reduce staff power requirement of data submitters and WECC staff.
- Improve data coordination and conform to NERC data submission requirements.
- Achieve consistent representation between cases.
- Conform to WECC modeling guidelines.
- Create Interconnection-wide cases that are compatible with the power flow software platforms used by the members.
- Potential to implement node-breaker model implementation in the future when the modeling requirement becomes effective.
- Capability to expand data fields or new data categories based on future data requirements.

The objectives of the tool are as follows:

1. Data input format – Identify user input methods for an automated process that are compatible with the power flow software platforms used by members.
2. Enable a review process for submitted data that allows for individual submissions to be rejected by a reviewing user (Area Coordinator or WECC).
3. Data Coordination – Develop an Interconnection-wide model creation method that fits with individual data submitter requirements and WECC staff processes, and includes MOD-032 data requirements.
4. Ensure data security.
5. Allow different levels of access and control for members.
6. Database Management, Manual data entry and Retrieval – Develop centralized, auditable database with query functionality, capability for data editing, validation, tracking, notification, etc.
7. Data should be stored in a robust, vendor agnostic data format that fully supports GE PSLF, Siemens PSSE and PowerWorld Simulator.
8. Power flow data Entry and perform data checks to ensure quality:
 - Topology (buses, transmission elements, Generator, DC tie, etc.)
 - Tie-line changes – consistent reporting of interconnecting areas
 - Rating updates
 - Load data, 10 years of seasonal data

- Interchange and Generation data per case creation criteria
 - DC tie dispatch per case creation criteria
 - Variable device settings (phase shifter, transformer, switched shunts, etc.)
9. Dynamic data Entry and perform data checks to ensure quality:
 - Generator model data
 - System protection data
 - Load data
 10. Creation of a power flow case by the software tool.
 11. Convert power flow case to PSLF.
 12. Convert power flow case to PSSE.
 13. Create compatible dynamic data for the corresponding PSLF case.
 14. Create compatible dynamic data for the corresponding PSSE case.
 15. Produce WECC reports such as significant project additions and Loads & Resources balance etc.
 16. Accommodate review process for the power flow and dynamic data models.
 17. Allow user written queries of all DMS data.

Future objectives -

1. Improve base case production capability (more than 10 cases annually).
2. Interface with WSM.
3. Compatible with GIS software products. It shall be capable of extension to spatial analysis, data management and mapping, which are capabilities under development by present power system modeling vendors.

Roadmap

The roadmap is intended to serve as a recommendation to WECC as a preferred path that could be taken to increase the quality and functionality of the WECC cases. This roadmap identifies both long-term and short-term goals as well as a series of suggested projects that will assist in accomplishing the goal of a centralized and consistent modeling repository that is capable of delivering cases to the WECC staff and community. To mitigate risk, the roadmap is designed to provide distinct deliverables after each project that offer some level of benefit without continuing the roadmap. It is also recommended that an Agile approach be used when implementing this roadmap. Prior to beginning each phase, the circumstances should be scrutinized to ensure that, at the time of execution, the deliverables that provide the most benefit are being worked on; which may result in an alteration to the roadmap.

Suggested Projects:

All of the suggested projects are described at a high level and will need to be further defined by SRWG and/or TSS prior to being implemented to ensure their success.

- Combine like cases in case compilation schedule: Work on developing like models at the same time in the case compilation schedule by combining the first reviews of all the Heavy/Light case combinations. This will result in more space on the case compilation schedule to add more cases per year while also ensuring better data quality. Currently, SRWG struggles to maintain the same topology between two cases that are supposed to represent the same point in time. By building the topology once and only applying load, gen, reactive, and voltage profiles for the light case, the system topology should be consistent between the two models.
- Setup SRWG Training Sessions: The SRWG is comprised of predominantly young or new engineers, many of which have just started representing their companies at WECC in the last couple years. It is recommended that the SRWG focus on providing semi-annual training for SRWG members that focuses on using power flow programs, modeling the transmission system in steady state and dynamics, complying with the DPM, as well as other relevant topics that pertain to efforts at WECC such as relay modeling or the phase 2 wind models implementation.
- Post cases in PowerWorld Simulator: Support PowerWorld users in WECC to limit the conversions done at individual WECC utilities.
- Data submission format: Adopt a data submission process that is more representative of how data will be submitted in a database environment. Including project, profile, and modification files. Using these formats will help ensure that WECC members are familiar with and ready for a database solution to help maintain models. Additionally, this type of data submittal will reduce the ability for data submitted to send WECC large data files that potentially mask errors.
- WSM Alignment: Work with Peak and WECC members to align and correct differences between the WSM and the planning models. As the two models serve differing purposes and have different modeling boundaries, differences will always remain. However, the planning models should strive to align with the WSM to capture the scrutiny and validation of online measurements. This effort will benefit both models as errors are discovered in each and are corrected.

- Revise WECC case validation process: Update the processes that WECC uses to validate cases. Some existing steps do not yet provide the intended benefit. For example, it is suggested that WECC either stop inserting n-1 contingencies or wait until contingency definitions and RAS have been accounted for in the models.
- Process for WECC to reject data: Currently WECC would have to reject an entire data submittal if some of the data is wrong. The WECC process should be updated to incorporate the ability for WECC to reject submitted data at a more granular level. WECC staff may use rejected data and document the issue with the posted case if no response is received. This project will likely be able to leverage parts of the Data Submission format project.
- Data Correction Project: Undergo an effort to identify the data errors that exist in the current model submissions and define which data can be automatically fixed, which can be ignored, and which must be corrected before the case can be approved. This will serve us better if we do proceed to a database and a vendor by establishing a process that will be simpler to the one that is envisioned to be implemented.
- Case Compilation Schedule deadlines: Use or acquire more WECC resources to ensure that deadlines in the case compilation schedule are met. A fluctuating time table with short turnaround times does not allow WECC members to plan workload accordingly; resulting in poor reviews. Enforcing the deadlines in the case compilation schedule will allow WECC member utilities the opportunity to spend the proper amount of time reviewing data. If this time is utilized, the quality of the model should improve.
- Implement a database structure to managing data that will compile and solve more than 11 cases per year.
 - Gather stakeholders, define scope and validate requirements.
 - Define deliverables in a phased approach where each deliverable has discrete defined benefit to WECC. Allowing WECC to gain out of any work done.
 - Ex: Design a vendor agnostic data format that includes the minimum data to support the steady-state and dynamics model in PSSE, PSLF, and PowerWorld with a conversion tool. Stopping after this proposed phase 1 would give WECC a data format that could be implemented for manual data submittals similar to the existing process. However, all utilities will be able to submit data to WECC in a common format.
 - Ex: Create Database architecture to implement phase 1 data format. Stopping after this phase will leave WECC staff with a repository that will store the data submitted to it in the vendor agnostic format. Having a single repository of data facilitates data consistency and over time accuracy if maintained well.
 - Ex: Begin developing User Interface on top of database. Initial functionality should be focused on a web interface and data change management in the database. Including the ability to modify existing data (this would be similar to making edits to existing equipment) and managing time-dependent changes (such as projects). Stopping the project at this phase will result in a web-accessible database that can be used to submit and manage data by the WECC membership. This provides WECC the ability to develop processes where members submit data to WECC, which potentially uses the database to manually build models with profile submissions from WECC members.

- Ex: Implement a mechanism in the user interface to accept, store and modify data profiles that vary over time such as; voltage profiles, reactive support, loads, generation dispatch, interchanges, etc. Stopping the project at this phase will result in a web accessible database that can be used to submit and manage data by the WECC membership. This provides WECC the ability to develop processes where members submit data and profiles to WECC which potentially uses the database to manually build models.
- Ex: Develop case building and solving functionality. Using data from previous phases of a project to incorporate into a single solvable model to be used for review as a WECC planning case. Stopping after this phase would capture the full intended scope for the project at this point in time. Additional phases may be needed depending on scope and requirements defined by the stakeholders above.
- Contract with a vendor(s)
- There are other efforts in the United States to consolidate modeling data into a single source of data that is capable of developing models at some regular interval. It is recommended that WECC stay apprised of these efforts to learn from their issues and adopt their approach, if successful (AEP, ColumbiaGrid). Additionally, WECC should coordinate any data formatting and exchange efforts with similar tasks in the region (Western Network Model Task Force).



Risks:

ID	Severity	Risk Event	Effect
R01	High	Restructuring of WECC data development groups	A restructuring of the data development groups at WECC could result in the need to restructure the modeling software to include additional data needs not currently being met.
R02	Medium	Additional data needs requested by entities outside WECC such as FERC and NERC	The inclusion of additional requirements in the current process has been escalating. These requirements could require continuous alternations to the project requirements in all stages of development and use. This could also create data security access issues depending on the sensitivity of the information.
R03	Medium	WECC's support of three frequently changing software platforms	Three software platforms are primarily used in WECC that have been going through massive updates. Currently there are compatibility issues with software platforms. The increased frequency and magnitude of the changes could magnify this issue and create hurdles in development. It can also create issues with version control if the updates to the programs occur too frequently.
R04	Low	Changes in RTO and EIM footprints	Several changes have and are likely to occur that alter the data representatives for models in the WECC base cases. This could alter the data modeling and data tracking needs of the project.
R05	High	Non-compatible data formats	Implementing some changes, such as Data Submission Format, will struggle as long as there is an attempt to support multiple formats at WECC.

Conclusion

It is recommended that WECC evaluate the proposed alternatives and use smaller incremental projects to improve the quality and quantity of the WECC base cases as there is room for enhancement. As outlined above there are many common sense efforts that, despite some details that needs solving, will increase the accuracy of the models if the member utilities participate fully. These smaller efforts should be undertaken as individual steps to improve the existing processes of case building at WECC. While these projects are undertaken it is also recommended that WECC engage in the appropriate forums to assist in pushing along the developments surrounding software compatibility, as one of the biggest issues in a data management, to ensure that the vendor community is constantly reminded and incentivized to work in this area.

While some of the objectives sought can be implemented through process changes, it is recognized that a software solution will be required to reach the ultimate goals of a centralized repository of information that is used to develop cases many cases per year. Some of the objectives above, such as security, automated data validation, query-able data, and reporting, provide large hurdles that may only be surmounted with a software solution. If a software solution is sought, it is recommended to design the project using the Agile method so that each deliverable is phased and provides the maximum amount of benefit for each step. Each phase should also be designed to be independently useful and provide benefit to WECC in case the overall project is canceled.

Lastly, it is suggested that WECC identify and keep apprised of the other similar or complementary efforts that are currently being worked on in order to leverage any lessons learned or successful solutions.