2014 Regional Transmission Plan Study Scope and Process

1. Regional Transmission Plan Goals
   - 1.1. Identify transmission projects to meet ERCOT System needs per ERCOT Planning Guide Sections 3 and 4 and NERC TPL-001 and TPL-002 reliability standards for years 2015, 2017, 2019 and 2020
   - 1.2. Identify transmission N-1-1 reliability constraints under minimum load conditions for year 2017
   - 1.3. Identify transmission projects that meet the ERCOT economic planning criteria per Protocol Section 3.11.2 for years 2017 and 2020
   - 1.4. Projects identified will be based on a consensus between ERCOT Planning and the Transmission Planners (TP) with input from other market participants
   - 1.5. Projects identified in the Regional Transmission Plan will normally be included in the 2015 SSWG Data Set B cases
   - 1.6. Improve communication and understanding of transmission project additions among market participants

2. Assumptions
   - 2.1. Transmission Topology
     - 2.1.1. The SSWG 2014 Data Set B 2015-2020 summer peak base cases will serve as the starting point for the study
     - 2.1.2. All projects that require RPG review (Tier 1, 2 and 3 projects) but have not received it will be removed from the cases
     - 2.1.3. Model corrections and updates provided by TPs during the course of the analysis will be documented and included in the study cases. Projects receiving RPG acceptance will be included if determined by ERCOT to have a material impact on the analysis
     - 2.1.4. Dynamic ratings will be used for the economic portion of the analysis, but will not be used for the reliability portion since the reliability portion uses summer peak base cases
     - 2.1.5. Transmission outages scheduled for June through September in the years 2015 through 2020 will be included in the analysis
     - 2.1.6. The following transmission interface limits will be modeled based on the established interface limits used by ERCOT System Operations:
       - 2.1.6.1. The appropriate Panhandle export interface limit (based on the latest planning studies) will be modeled in the economic cases if the total capacity of generation meeting the requirements to be included in the cases exceeds the interface limit
       - 2.1.6.2. Any other stability SOLs or GTLs identified for the planning horizon at the beginning of the analysis will be appropriately modeled
     - 2.1.7. FACTS devices which are not available for voltage support will be turned off for the RTP analysis since they are not expected to contribute during steady-state system conditions
   - 2.2. Generation
     - 2.2.1. All existing generation plants and new generation (as defined in Planning Guide Section 6.9) will be used in the study with the below exceptions:

2.2.1.1. If needed to meet the load and reserve requirements, mothballed units will be placed in-service in the reliability analysis per the SSWG Procedure Manual Section 4.3.4.

2.2.1.2. Hydro units will be dispatched as follows:

- Reliability analysis: Hydro units will be modeled as offline in reliability analysis
- Economic analysis: Hydro units will be dispatched using generation profile information using historical data for a representative weather year.

2.2.1.3. Wind plants will be dispatched as follows:

- Reliability analysis: Wind plants will be dispatched using the information from the following table.

Region	Output
Coast	12%
South	7%
Panhandle	3%
North	1%
West	2%

This information is based on the AWS Truepower profile 15th percentile output captured when ERCOT system load is higher than its 95th percentile load on an annual basis.

- Economic analysis: Wind plants will be dispatched according to AWS Truepower profiles selected for each plant

2.2.1.4. Solar plants will be dispatched as follows:

- Reliability analysis: Solar plants will be modeled at 70% output
- Economic analysis: Solar plants will be dispatched according to URS profiles selected for each plant

2.2.2. ERCOT will check the output of DFW area units that do not have SCRs in the final cases to ensure that they do not exceed their NOx emission restrictions

2.2.3. Generation that is switchable between ERCOT and another grid will be modeled consistent with the information provided to ERCOT under Protocol Section 16.5.4(2)

2.2.4. Horse Hollow 1 (HH1) will be connected to Bluff Creek (West) instead of Kendall (south). The rest of the Horse Hollow plants will be connected to Kendall (south)

2.2.5. The following fuel price related assumptions will be used:

- Wind production cost = $0/ MWh
- No carbon tax
- The natural gas price will be reevaluated prior to beginning the economic analysis

2.2.6. In the Economic analysis, generation dispatch will include 1400 MW of responsive reserve requirements along with regulation requirements

2.3. Load

2.3.1. The load will be evaluated by weather zone. The higher of 1. the aggregated weather zone load in the SSWG base cases or 2. the ERCOT 90th percentile weather zone load forecast will be used for the reliability portion of the analysis. In addition, if there is not sufficient generation to meet the load and reserve requirements, the base cases may be split into multiple study regions, defined by combinations of weather zones. For each region studied, the corresponding weather zone demand will be set to the higher of the either the SSWG or ERCOT 90th percentile weather zone load forecast. If there is not sufficient generation to meet the load and reserve requirements the following methods may be used:

1. Increase the wind generation output level to a higher value outside the study area. The average wind generation utilized should not exceed the AWS Truepower profile 25th percentile wind output when ERCOT load is more than 95th percentile.
2. Turn on mothballed units that are outside of the study area
3. Loads outside of the study area may be reduced until the load and reserve requirements are met.

2.3.2. For the economic analysis section, the 8760-hour weather zone load forecast will be utilized for the years 2017 and 2020 based on the 2006 weather year. ERCOT performed a weather year analysis using 12 different sets of load forecasts each representing a weather year from 2002-2013. Based on this analysis it was determined that year 2006 can be used as representative weather year for the 8760-profiles in the economic analysis.

2.3.3. ERCOT will utilize the "Scalable load" information from the SSWG cases to identify non-conforming loads to be used in the RTP cases. Non-conforming loads will be extracted from the weather zone load and will not vary on an hourly basis in the economic portion of the analysis.

2.3.4. Demand response will not be explicitly modeled in the analysis

2.3.5. When loads are scaled in a weather zone, all loads within the weather zone will be scaled by the same percentage and the power factor at each load will be kept constant. Non-conforming loads identified in 2.3.3 will not be scaled in this step.

2.3.6. Load modeling changes (including shifting loads between substations) and corrections provided by TPs during the course of the analysis will be documented and included in the study cases

2.4. The latest SSWG ERCOT contingency list will be used

2.4.1. Pre-contingency conditions will be studied

2.4.2. The following post-contingency conditions will be studied for all summer peak cases:

2.4.2.1. Single transmission line or transformer (60 kV and above) – including breaker to breaker contingencies

2.4.2.2. Two circuits sharing towers for 0.5 miles or more

2.4.2.3. Single generation unit

2.4.2.4. Single generation unit, followed by manual system adjustment plus any contingency listed in 2.4.2.1 and 2.4.2.2

2.4.2.5. Single 345/138 kV transformer unavailable, followed by Manual System Adjustments, followed by the contingency loss of one of the following: 1) common tower outage, 2) generating unit, 3) transmission circuit, 4) transformer, 5) shunt device, or 6) FACTS device

2.4.3. The following post-contingency conditions will be studied for the 2017 minimum loading condition:

2.4.3.1. Loss of a single transmission element (voltage 100 kV or above) with system re-dispatch/adjustments plus loss of a single transmission element (voltage 100 kV or above)

2.4.4. Limits shall be enforced per the latest ERCOT System Operating Limit (SOL) Methodology

2.4.5. It will be noted in the report that Transmission Planner organizations may have different rating or voltage limit criteria than specified above. ERCOT will use the above limits in the Regional Transmission Plan; however, Transmission Planners may apply different limits during their studies.

2.5. DC ties

2.5.1. All of the existing DC ties (including CFE) will be dispatched based on historic information

3. Method of Study

3.1. Condition the SSWG base case topology

3.1.1. Identify all the RPG projects submitted by the TPs in the Model on Demand (MOD) Project Model Change Request (PMCR) in creating the SSWG base cases and remove all projects that require RPG review but have not yet received it and create the conditioned case using MOD

3.2. Reliability Analysis

3.2.1. Perform Powerworld SCOPF or TARA redispatch to identify unresolvable constraints in the 2020 conditioned case. Work with TPs to find projects to solve the constraints. If a TP does not agree with the need for a project, the TP will provide an operational corrective action plan, such as a Constraint Management Plan (CMP), to solve the constraint

3.2.2. Run generation outage analysis on the 2020 case to screen for generator unit outages that may cause unresolvable constraints. Create Powerworld or TARA case for each generator identified in the screening with that generator placed out of service. Work with TPs to find projects to solve the constraints

3.2.2.1. A scenario will be run with all DFW area units that do not have SCRs removed from service

3.2.3. Run 345/138 kV transformer outage analysis on the 2020 case to screen for transformer outages that may cause unresolvable constraints. Create Powerworld or TARA case for each 345/138 kV transformer identified in the screening with that transformer placed out of service. Work with TPs to find projects or operational solutions to solve the constraints

3.2.4. Once all reliability projects have been identified (no more unresolvable constraints) perform one by one back out of projects to determine if each project is needed

3.2.5. Repeat the above process for 2015, 2017 and 2019

3.3. Economic Analysis

3.3.1. Import the final reliability cases for 2017 and 2020 into UPLAN as the starting economic cases. Start the analysis with the 2020 case. Update the load to the ERCOT 50th percentile forecast plus self-serve load. Add dynamic ratings to transmission lines (for existing transmission lines that have dynamic ratings)

3.3.2. Organize congestion in each case by rank and shadow price. Work with TPs to develop projects to solve the highest congested elements

3.3.3. Once economic projects to solve highest congested elements have been identified perform one by one back out of projects to determine if each project is still economically justified. Repeat the above process for each previous year

3.3.4. Create an AC case for the peak load hour of the year with all identified reliability and economic projects. Perform contingency analysis to verify the case is secure

3.4. NERC Requirements

3.4.1. Compile data to adequately document the Regional Transmission Plan for NERC Reliability Standards

3.5. LTSA Alignment

3.5.1. "Large" projects will be further evaluated using 2014 Long-Term System Assessment (LTSA) cases if available to ensure project robustness

3.5.2. Areas identified in the 2014 LTSA as requiring a significant number of system upgrades will be evaluated on a long-term basis if upgrade needs are identified in the area during the 2014 RTP analysis

4. Deliverables

4.1. A final report with documentation of reliability and economic projects is targeted to be completed by 11/14/2014

4.1.1. The report will include an explanation of congestion causes and congestion solutions that were tested but determined to be not economic

4.1.2. A draft report for review is targeted to be issued by 10/17/2014

4.2. Post intermediate cases and binding constraints and proposed reliability and economic projects as they become available. AC cases modeling the problems will be provided to TPs upon request.

4.3. Steady-State AC base cases at yearly peak that include all reliability projects for each case (SCED) will be posted

4.4. Steady-State AC base cases at yearly peak that include all reliability and economic projects for each case (SCED) will be posted

4.5. A final congestion table will be posted for each study year in the Economic analysis

4.6. The results of the analysis of any constraints identified for 2015 will be forwarded to ERCOT Operations and the TPs for possible CMP or Special Protection System (SPS) development