



2013 High Priority Incremental Load Study

June 26, 2013

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ESWG Approval: June 27, 2013



Revision History

Date or Version Number	Author	Change Description	Comments
06/14/2013	SPP staff	Initial draft	
6/20/2013	HPILS TF	Final draft	Approved 6/19 for TWG
6/26/2013	TWG	Approved with revisions to RCAR model details and their review and removal of 10/90 case	
6/27/2013	ESWG	Approved the scope	

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Overview

This document presents the scope for High Priority Incremental Load Study (HPILS) that is being driven by member concerns regarding the need for projects to address recent oil and gas developments. In the April 2013 Board of Directors (BOD) meeting, Jim Eckelberger directed the Southwest Power Pool (SPP) Staff to perform a high priority study to address load growth. In May 2013 the Transmission Working Group (TWG) created the High Priority Incremental Load Study Task Force (HPILS TF). The HPILS TF is to develop and recommend a scope to guide the performance of the study. HPILS TF will report to the TWG and will also provide updates and reports to affected SPP organizational groups including Economic Studies (ESWG), Model Development Working Group (MDWG) and Market and Operations Policy Committee (MOPC).

The HPILS is conducted in accordance with the High Priority Study provisions outlined in the SPP Open Access Transmission Tariff (OATT) Attachment O. This assessment is designed to address reliability needs and economic benefits/costs, with scenarios and sensitivities to provide a framework for recommendations associated with needed transmission expansion projects.

The assessment will be conducted on the years 2015, 2018, and 2023. The assessment begins in June 2013, with interim reliability results in September 2013 and final results mid-January 2014, for MOPC approval mid-April 2014. The HPILS results will be incorporated into the next 10 Year Integrated Transmission Plan (ITP10).

Objective

The objective of the High Priority Incremental Load Study is to develop a transmission plan to address the needs associated with projected oil and gas development loads in SPP, along with any other warranted incremental load impacts. The assessment will identify a robust and flexible transmission plan that is capable of reliably and economically providing deliverability of energy to the SPP market. The HPILS will also reevaluate the three suspended NTC-Cs:

- Tuco – Amoco - Hobbs 345 kV
- Tuco - New Deal 345 kV
- Grassland – Wolfforth 230 kV

The results of the HPILS will be utilized in the 2015 ITP10, as well as the 2015 ITPNT.

The HPILS will create an effective near-future plan for the SPP footprint which identifies solutions to potential issues for system intact and (N-1) conditions using the following principles:

- Identifying potential reliability-based problems (NERC Reliability Standards TPL-001 and TPL-002, SPP and local criteria)
- Developing additional mitigation plans including transmission upgrades to meet the region's needs and maintain SPP and local reliability/planning standards

Stakeholder Process

Working Group Involvement

Economic Studies Working Group (ESWG)

The ESWG will be responsible for review of the data and results for the following items:

1. Scope
2. Cases
3. Benefit metrics
4. Model review and assumptions
5. Resource plan review
6. Economic analysis
7. Report

Transmission Working Group (TWG), Model Development Working Group (MDWG)

The TWG and/or the MDWG will be responsible for review of the data and results for the following items:

1. Scope
2. Transmission topology inputs to the models
3. Load forecasts
4. Constraint assessment
5. Stability assessment
6. Final reliability impact assessment
7. Report

Markets and Operations Policy Committee (MOPC)

The MOPC will make a recommendation to the Board of Directors regarding approval decisions of the following items:

1. Interim Results
2. High Priority Incremental Load Study (HPILS) Report which will include the Expansion Plan

Board of Directors (BOD)

The BOD will make approval decisions for the following items:

1. Interim Results
2. High Priority Incremental Load Study (HPILS) Report which will include the Expansion Plan

Regional State Committee (RSC)

The RSC will review the following items:

1. Interim Results
2. High Priority Incremental Load Study (HPILS) Report which will include the Expansion Plan

Stakeholder Reviews

The following is a list of reviews provided by stakeholders during the HPILS:

Load Forecast Review

Projected peak load per area for the year 2015, 2018, and 2023 will be submitted by the modeling contacts for the development of needed models. Identification of incremental load projections relative to base models, as well as the projected profiles for loads over time will be key inputs into this study. While new forecasts of the entire SPP footprint may not be necessary, there will be a review of load forecasts including the incremental loads. These incremental HPILS loads specified in the load forecasts should not be based on typical temperature dependent load projections; however exceptions could be made for irrigation loads which are dependent on climate conditions (i.e. drought). Associated incremental energy sales for 2018 and 2023 will be provided along with demand projections and sources/values will be reviewed and updated by Stakeholders. Stakeholders will have the option to review projected peak load and energy per area. Coordination and cooperation from load serving entities which are not necessarily SPP members will be a critical success factor for this HPILS.

Policy Survey

The HPILS will use the most current available Stakeholder survey results conducted by the ESGW on current and planned renewable generation plants, renewable targets, EPA regulation impacts including unit retirements, de-ratings, and fuel switching, and other policy level drivers that will impact the study.

Generation Resource Plan Review

ESWG and TWG will review the data for all generators added to the model. This will include conventional and renewable generation. The review will focus on the siting and capacity of new units. For conventional generation, the zonal demand and capacity figures will be provided, as well as expected capacity margins for 2018 and 2023. For wind and solar generation, the siting, capacity, and average capacity factor of each new renewable resource will be provided, and the calculations for renewable targets, mandates, and new renewable generation required will be provided as required by the HPILS. The local Load Serving Entity (LSE) will need to plan for resources to serve the projected load and will be responsible for resource expansion assumptions.

Economic Model Review

ESWG will be provided with model data indicating generators and the parameters used in the economic model. Non-confidential parameters such as maximum capacity, ramp rates, O&M

costs, etc. will be provided for review. Information from a third party vendor will be used for confidential parameters.

Power Flow Model Review

TWG and MDWG will review the power flow models and provide feedback. The review will focus on any topology updates.

Constraint Assessment Review

The most current list of TWG-vetted constraints will be used in analysis to perform the security constrained unit commitment (SCUC) and security constrained economic dispatch (SCED).

Project Development Request

Stakeholders will be asked to provide suggestions on expansion planning solutions to be considered in the study. All stakeholder-submitted project requests will be analyzed to assess the project's potential to meet needs. This includes reliability and economic needs as detailed in the Analysis section of this document.

Study Process

1. The current input assumptions refined through the various stakeholder groups (ESWG, TWG) will be used in the HPILS.
2. The steady-state powerflow analysis will include full AC solution to test projects adequacy to meet reliability need in base case and contingency conditions.
3. Constraints will be developed through the identification of congested facilities. All constraints will be 100 kV and above facilities for 100 kV and above facility outages within SPP. Initial constraints will come from the 2018 and 2023 Regional Cost Allocation Review (RCAR) models. The TWG and ESWG will review the constraint list.
4. Staff will perform an AC analysis using applicable NERC Reliability Standards on power flow models that represent the applicable load profiles and generation dispatch associated with each case. All facilities 60 kV and above in the models will be monitored within SPP for this analysis as a means to determine 100 kV and above solutions for SPP to the problems identified. The TWG will review the results.
5. 100 kV and above solutions to potential criteria violations, policy requirements, and/or congested facilities will be identified with input from stakeholders. Staff will request suggestions for solutions from stakeholders and perform a preliminary assessment of benefits for these projects.
6. The reliability models will include current topology and Projects with approved NTC's.
7. The steady state models will be:
 - a. 2015 Summer Peak (50/50)
 - b. 2015 Summer Peak (90/10)
 - c. 2018 Summer Peak (50/50)
 - d. 2018 Summer Peak (90/10)
 - e. 2023 Summer Peak (50/50)
 - f. 2023 Summer Peak (90/10)
8. The ESWG will oversee any changes to the 2018 and 2023 RCAR economic assumptions.
9. An economic assessment will be performed, using the economic model and constraints to identify congested facilities on the transmission system. This will be done using security constrained unit commitment (SCUC) and security constrained economic dispatch (SCED) tools over 8,760 consecutive hours.
 - a. Reliability and economic needs will be identified.
10. Transmission solutions will be developed and tested to assess their ability to meet the needs of the different cases.
 - a. A portfolio will be developed for HPILS based on reliability and economic needs in a cost effective way.

11. A single recommended portfolio will be identified.
 - a. Benefit metrics will be calculated.
 - b. A 40-year financial analysis will be conducted.
12. The steady state assessment will include N-1 contingency analysis will be conducted for the steady state reliability models for facilities 60 kV and above in SPP. All facilities 60 kV and above in SPP will be monitored for this analysis in consideration of 60 kV and above solutions to the problems identified. The final project solution(s) will be analyzed using full AC solution methods to test voltage criteria.
13. The portfolio of solutions will come from SPP transmission service studies, generation interconnection studies, previous ITP studies, local reliability planning studies by TOs, Attachment AQ studies, stakeholder input and staff evaluation.

Data Inputs – Economic

The HPILS economic analysis will use the assumption and data from the most current 2018 and 2023 RCAR analysis. The model will perform a security constrained unit commitment (SCUC) and security constrained economic dispatch (SCED).

Cases

The study will be conducted on a set of cases. All cases will assume that Entergy is a member of MISO. The 2014 ITPNT 2015 summer peak scenario 0 model will be used for Case 1 of this assessment. The RCAR power flow and economic models will be used for Case 2 and Case 3.

The power flow models were created through 2013 ITPNT model development process and include the 2013 ITPNT 2018 and 2023 summer peak scenario 0 models with all additional NTCs issued through March 2013. The economic models will be based on the 2013 ITP20 PROMOD Power Base model and updated to match the RCAR power flow data as needed.

Case 1

This Case is reliability only (powerflow), therefore, economic analysis will not occur.

- 2014 ITPNT 2015 summer peak scenario 0 model
- Two Load Forecasts – 50/50 & 90/10 load probability

Case 2

The HPILS economic model Case 2 assumptions are:

- 2018 RCAR Model
- Two Load Forecasts – 50/50 & 90/10 load probability
- Current operating network with the addition of approved NTC's
- No Tres Amigas SuperStation DC project
- No Clean Line Energy Partner's projects

Case 3

The HPILS economic model Case 3 assumptions are:

- 2023 RCAR Model
- Two Load Forecasts –50/50, & 90/10
- Current operating network with the addition of approved NTC's
- No Tres Amigas SuperStation DC project
- No Clean Line Energy Partner's projects

Resource Plan

The HPILS will use the RCAR 2018 and 2023 generation resource plan, supplemented by LSE input.

Policy Survey

HPILS will leverage the 2014 ITP10 policy survey in process.

System Topology

Power flow models will be required for the assessment. The models will include all approved NTC and NTC-C projects. These power flow models will serve as a topology input into the modeling program to develop a market based economic dispatch for the system.

Modeling of External Regions

The 2018 and 2023 RCAR economic model assumption for the external region will be used in the HPILS.

Generation Parameters

The 2018 and 2023 RCAR parameters for each generator in the economic model (startup cost, ramp rates, O&M costs, etc.) will be used in the HPILS.

Fuel Prices

The fuel forecasts utilized in the resource planning, production cost modeling, and benefit metric calculations will be the same as the RCAR models, and reflect the “best guess” for fuel prices.

Hurdle Rates

The hurdle rates utilized in the economic model will be the same as the RCAR models.

Load Forecasts

The RCAR models will be adjusted to include the HPILS incremental load.

Modeling of Renewable Generation

The renewable generation will be the same as the RCAR models.

Market structure

SPP will implement an Integrated Marketplace and Consolidated Balancing Authority (CBA) March 2014. The baseline assumptions for the analysis will be consistent with those in the RCAR models.

DC Ties

DC ties connect SPP to the WECC and ERCOT systems. Confirmed firm transmission service will be used as a basis for modeling the flow levels of existing DC ties. The DC ties are modeled consistent with 2018 and 2023 RCAR models.

Benchmarking

The RCAR models are the baseline for the HPILS models.

Data inputs - Reliability

SPP in its development of the initial basecase reliability models in this study assumed individual Balancing Authorities (BA). SPP will use 2015, 2018, and 2023 models in the HPILS. The initial basecase modeling assumptions are detailed in sections below.

Load

HPILS loads will be provided by the MDWG contacts.

Generation Resources

Existing generation resources will be those in the 2015 Summer Scenario 0, 2018 Summer RCAR, and 2023 Summer RCAR models. Additional resources will be supplied by the MDWG Contacts and 2013 ITP20 Resource Plan. The HPILS will use the RCAR 2018 and 2023 generation resource plan, supplemented by LSE input.

Analysis - Economic

Define Constraints

To determine which constraints are needed to constrain SPP's security-constrained economic dispatch, Staff will review the existing NERC Book of Flowgates (BoF) to determine what (if any) constraints need to be added or deleted from the list of constraints (event file) for the economic model runs. Staff will perform analysis using PROMOD Analysis Tool to identify the top constraints by congestion costs (average shadow price times the number of constrained hours) on the system for 8,760 hours. These additional constraints will be reviewed and approved by TWG. The following items will be considered in the analysis:

- The initial constraint list will be the then-current BoF
- Constraints studies will be run over 8,760 hours (1 year)
- This analysis will use the 2018 and 2023 RCAR economic model(s) for each case
- Contingencies 100 kV and above in SPP
- Monitored elements 100 kV and above in SPP
- Unless other information is available, each constraint's rating will be selected based upon the applicable Rating A (normal rating) or Rating B (emergency rating) in the power flow model.

SCUC & SCED Analysis

The reliability, policy, and economic, needs of the system will be identified in each HPILS study scenario in order to develop a portfolio for each scenario. All of the system needs will be identified through the use of a SCUC & SCED simulation that accounts for 8,760 hours representing each hour of the years 2018 and 2023. Line loading will be determined using direct current (DC) models.

Reliability Needs

The 2018 and 2013 RCAR models will be used to determine initial reliability needs and redispatched to meet HPILS requirements.

Economic Needs

The 2018 and 2013 RCAR models will be used to determine initial economic needs and redispatched to meet HPILS requirements.

Policy Needs

The 2018 and 2013 RCAR models will be used to determine initial policy needs and redispatched to meet HPILS requirements.

Develop Transmission Solutions

Projects will be proffered by staff and stakeholders based on the needs of all cases and will be tested to determine the most cost-effective set of projects. The solution set will not be limited to 345 kV and higher voltage facilities. Needs that warrant lower voltage solutions will be addressed.

Reliability Assessment

A reliability assessment will be conducted on the recommended portfolio for Case(s) to examine any potential overloads that are caused by the recommended portfolio. An AC contingency scan (N-1) will be conducted for each of the Summer Peak hour, for the base case as well as the change case with the recommended portfolio. The list of constraints (development described earlier) will be utilized in this scan. Overloads in the base and change cases will be compared, and any overloads that occur in only the change case will be documented in order to show potential reliability concerns that the recommended portfolio may be causing.

Cost Estimates

The cost estimates used for projects that are tested in the initial project development phase will be Conceptual Estimates as defined by the SPP Business Practice 7060. The Conceptual Estimates will be developed by Staff, and Staff will use standardized estimates and multipliers that are based on historical data. Projects that pass the initial screening phase will be designated for Study Estimates as defined by Business Practice 7060.

A Study Estimate will be prepared by the designated TO(s) by completing a Standardized Cost Estimate Reporting Template (SCERT) for all upgrades that are required to complete that project. The Study Estimate will provide a more refined cost estimate for potential project approval. For all Study Estimates, staff will work with TO's to provide a reasonable turnaround time from the date of request before the estimate is due.

Final Expansion Plan

Benefit metrics will be calculated for the final portfolios for all cases. After a final recommended portfolio has been identified, a 40-year financial analysis will be conducted.

Forty-Year Financial Analysis

The HPILS shall assess the cost effectiveness of the recommended portfolio over a forty-year time horizon in accordance with Section III.3.c of Attachment O of the SPP OATT. To calculate the benefits over 40 years, two years will be utilized: 2018 and 2023. The slope between the selected points will be used to extrapolate the benefits beyond 2023 over a 40 year timeframe. The costs will be calculated using the formula for Annual Transmission Revenue Requirement (ATRR). The total benefits and costs will be reported in net present value (NPV) dollars.

Benefit and impact calculations will be made on a Regional, Zonal, and State basis. State values will be extrapolated from the zonal costs and benefits. Many zones are only in one state. For those zones that are only in one state, their full portion of both costs and benefits will be

allocated to the state. For zones crossing state borders, their portion of both costs and benefits will be allocated to each state based on their percentage of load that is in each state.

Net benefits and B/C ratios will be calculated based on NPV benefit and NPV cost, and will be reported based on present dollars (2014).

Metric Development and Usage

The metrics used to measure the value of the final portfolio are identified below. These metrics will be used to measure the value of the final portfolio.

Metric Description
APC Savings
Value of Replacing Previously Approved Projects
Reduced Losses
Reduced Capacity Costs
Assumed Benefit of Mandated Reliability Projects
Mitigation of Transmission Outage Costs

Table 1: Monetized Cost Benefit Metrics for HPILS

Sensitivities

No sensitivities will be conducted.

Staging

Staging of projects based on lead times for key facilities like autotransformers will be a critical output of this HPILS. Recommendations to address flexibility and optionality needs will depend upon alternatives available to TOs regarding system expansion and inventory strategies which may need to be addressed as part of this HPILS.

Analysis - Reliability

Steady State Assessment

The steady state assessment will use the following models:

1. 2015 Summer Peak (50/50)
2. 2015 Summer Peak (90/10)
3. 2018 Summer Peak (50/50)
4. 2018 Summer Peak (90/10)
5. 2023 Summer Peak (50/50)
6. 2023 Summer Peak (90/10)

An N-1 contingency analysis will be conducted for the peak and off-peak cases for facilities 60 kV and above in SPP. All facilities 60 kV and above in SPP will be monitored for this analysis in consideration of 60 kV and above solutions to the problems identified.

Solution Development

SPP will use a pool of possible solutions to evaluate upgrades used to create the HPILS plan. This pool of solutions will come from SPP transmission service studies, generation interconnection studies, previous ITP studies, local reliability planning studies by TOs, Attachment AQ studies, stakeholder input and staff evaluation.

Timeline

The study will begin in June 2013 with interim results in September 2013. A rough timeline with approximate milestones is as follows:

Tasks	Group to review/endorse	Start Date	Completion Date
Cases & Scope	TWG/ESWG	May 2013	June 2013
Data Collection	TWG/ESWG	June 27, 2013	Aug 2013
Load Forecast Review	TWG/ESWG	May 2013	July 2013
Model Development & Review	TWG/ESWG	July 2013	Sept 4, 2013
Reliability Assessment	TWG	July 2013	Sept 2013
Analysis	TWG/ESWG	Sept 2013	
AC Voltage Study	TWG	Aug 2013	Sept 2013
Reliability Needs Recommendations	TWG	Oct 2013	
Economic Assessment Begins		Early Oct 2013	
Project Development Request	TWG/ESWG	Oct 2013	Oct 2013
Final Reliability Assessment	TWG	Dec 2013	Jan 2014
Final Benefit Metrics Calculations	ESWG	Jan 2014	Feb 2014
Final report with recommended solutions	TWG/ESWG	Mar 2014	Mar 2014
	MOPC	Apr 2014	
	BOD		

Deliverables

HPILS Interim Reliability Results and Recommendations

HPILS NTC's

HPILS Final Report

HPILS Support documentation for TWG, ESWG, MOPC, and BOD

Changes in Process and Assumptions

In order to protect against changes in process and assumptions that could present a significant risk to the completion of the HPILS, any such changes must be vetted through the HPILS TF, TWG, and ESWG.