System Planning

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System Planning Overview for Sunset

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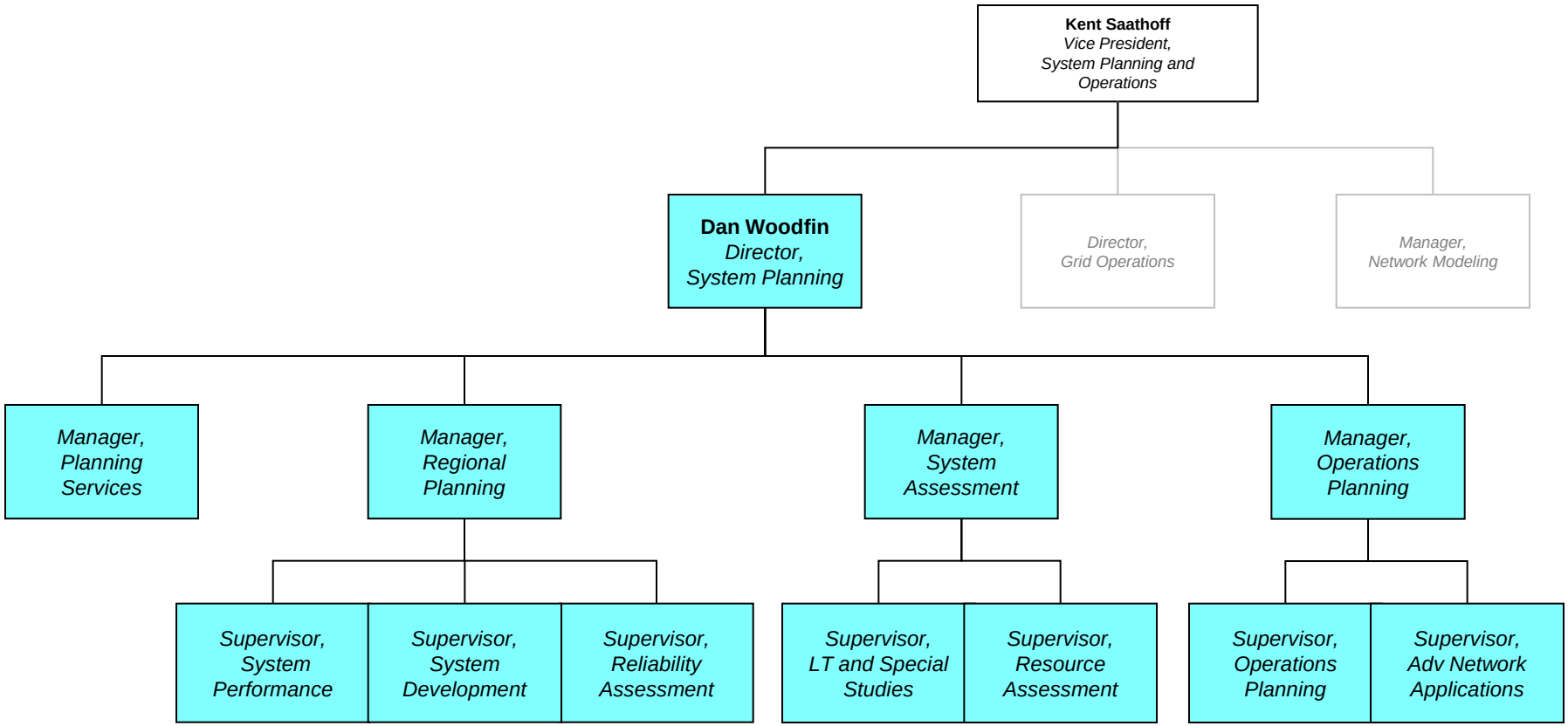
Major “Programs” in System Planning

1. Transmission Planning
2. Generation Interconnection
3. Congestion Analysis
4. Resource Adequacy
5. Operations Forecasting
6. Ancillary Services Planning
7. Advanced Network Applications
8. Renewables Integration

System Planning Organization



1. Transmission Planning

- **Transmission Planning is a core SB7 ERCOT responsibility; it is fundamental to maintaining system reliability and providing non-discriminatory access**
- **ERCOT is the sole Planning Authority registered with NERC for the Texas Interconnection**
- **Primary activities include:**
  - Transmission Planning Case Development
  - Regional Planning Group (RPG) Project Reviews
  - Annual Five-Year Transmission Plan Development
  - NERC Compliance Analyses
  - Long-Term System Assessment
  - Dynamic Simulation Studies

Core

New in 2007

Increased documentation requirements

SB 20

Increased ERCOT role

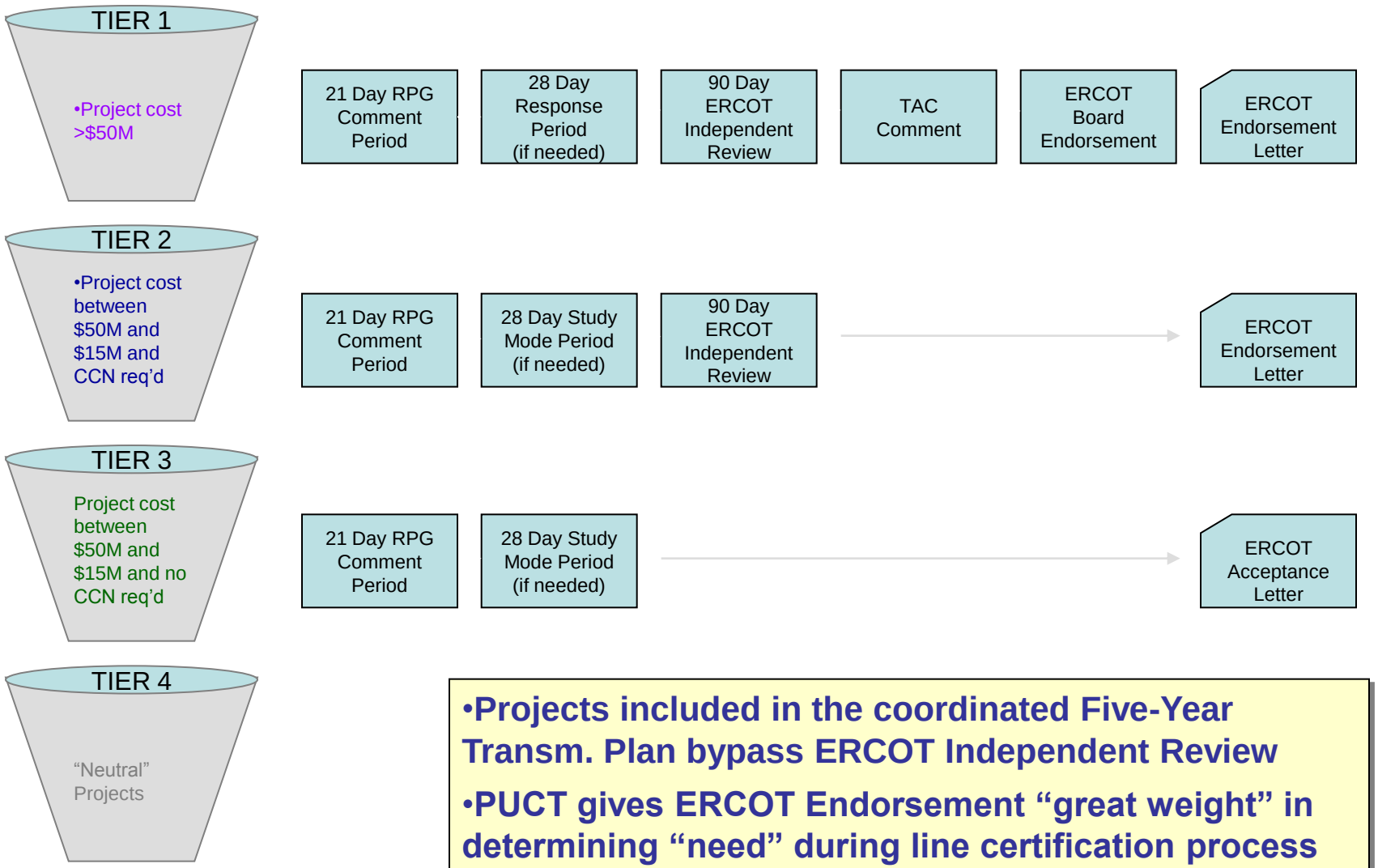
Regional Planning Framework

Coordinated 5-Yr. Transmission Plan	Long-Term System Assessment
•Annual study of transmission needs of ERCOT system over next five years •Projects identified by ERCOT in coordination with TOs with comment from stakeholders •Projects included to meet all identified reliability requirements and congestion reduction projects that meet economic criteria •Local and already-Reviewed projects are included without review	•Study of long-term transmission needs of ERCOT system •Includes scenario-based analysis of future resource investment by market participants and resulting transmission system needs •Produced in even years and re-evaluated annually •Provides directional vision to near-term decisions with goal of long-term efficiency in transmission plans
Transmission Owner Plans	**Individual Project Reviews**
• Projects developed by each transmission owner • Generally include projects that are “Local” (<$15M) or “Neutral” • Included in Steady-State Working Group (SSWG) powerflow cases	• Additional projects or studies can be proposed by any Market Participant, Transmission Owner or ERCOT Staff • Individual projects included in 5-Yr. Transm. Plan also reviewed at appropriate time • Reviews follow process illustrated on slide 7

Regional Planning Organization

- **Regional Planning Group (RPG) is fundamental**
  - The ERCOT RPG is a non-voting, consensus-based group open to all stakeholders
  - Information about planning activities is distributed to and among participants in this group
  - This group provides the means for stakeholders to participate
    - Provides structure for any stakeholder to propose specific projects or ask that studies be done
    - Allows communication among neighboring transmission companies
    - Allows broad group of stakeholders to brainstorm potential solutions
    - Provides opportunity for input on impacts of proposed projects from entities with different perspectives
    - Provides for informed independent assessment by ERCOT
  - ~Monthly meetings; active email distribution

Individual Project Reviews



- **Projects included in the coordinated Five-Year Transm. Plan bypass ERCOT Independent Review**
- **PUCT gives ERCOT Endorsement "great weight" in determining "need" during line certification process**

2. Generation Interconnection

- **Generator submits interconnection request with ERCOT**
- **ERCOT performs simple screening study**
  - Identifies magnitude of system upgrades needed
- **If generator wants to proceed, ERCOT assigns lead TSP to perform Full Interconnection Study (FIS)**
  - Scope of FIS is developed by TSP, generator and any other interested TSPs
- **TSP(s) perform various technical studies to determine how to interconnect Generator reliably**
  - Includes determining specific facilities
- **TSP and Generator sign Interconnection Agreement**

3. Congestion Analysis

Current

- **Annual zone definition analyses (CSCs, CREs)**
- **Annual and monthly zonal congestion rights quantity calculations for auction**
- **Reporting of congested elements and costs**
- Evaluation of need for Reliability Must Run units and exit strategy development
- Evaluation of proposed Special Protection Systems and exit strategy development
- Development of near-term congestion reduction plans
- Model vs. actual improvement

Nodal

- **Reporting of congested elements and costs**
- Evaluation of need for Reliability Must Run units and exit strategy development
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- **Model vs. actual improvement**

4. Resource Adequacy

- **Producing the Capacity, Demand and Reserves (CDR) report**
- **Performing studies to set minimum reserve margin target**

2009 Report on the Capacity, Demand, and Reserves in the ERCOT Region

Summer Summary

Load Forecast:	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Total Summer Peak Demand, MW	63,491	64,056	65,494	67,394	69,399	70,837
less LAARs Serving as Responsive Reserve, MW	1,115	1,115	1,115	1,115	1,115	1,115
less LAARs Serving as Non-Spinning Reserve, MW	0	0	0	0	0	0
less BULs, MW	0	0	0	0	0	0
less Energy Efficiency Programs (per HB3693)	110	242	242	242	242	242
Firm Load Forecast, MW	**62,266**	**62,699**	**64,137**	**66,037**	**68,042**	**69,480**

Resources:	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Installed Capacity, MW	63,492	61,800	61,800	61,800	61,800	61,800
Capacity from Private Networks, MW	5,313	5,318	5,318	5,318	5,318	5,318
Effective Load-Carrying Capability (ELCC) of Wind Generation, MW	708	708	708	708	708	708
RMR Units to be under Contract, MW	115	0	0	0	0	0
Operational Generation, MW	**69,628**	**67,826**	**67,826**	**67,826**	**67,826**	**67,826**
50% of Non-Synchronous Ties, MW	553	553	553	553	553	553
Switchable Units, MW	2,848	2,848	2,848	2,848	2,848	2,848
Available Mothballed Generation , MW	0	401	479	479	479	479
Planned Units (not wind) with Signed IA and Air Permit, MW	0	3,769	4,389	5,414	7,206	7,206
ELCC of Planned Wind Units with Signed IA, MW	0	76	121	168	211	211
Total Resources, MW	**73,029**	**75,472**	**76,215**	**77,287**	**79,122**	**79,122**
less Switchable Units Unavailable to ERCOT, MW	317	158	0	0	0	0
less Retiring Units, MW	0	0	0	0	0	0
Resources, MW	**72,712**	**75,314**	**76,215**	**77,287**	**79,122**	**79,122**
Reserve Margin	**16.8%**	**20.1%**	**18.8%**	**17.0%**	**16.3%**	**13.9%**
(Resources - Firm Load Forecast)/Firm Load Forecast						

5. Operations Forecasting

- **Forecasting in operational timeframe**
  - Near-term and mid-term load forecast
  - Wind and wind ramp forecasts ← New in 2008-2009
    - Load and Wind forecasts are used for day ahead and current day unit commitment
    - Wind ramp forecast is intended to predict the probability of a large increase or decrease in wind generation occurring in the next six hours.
- **Seasonal Studies**
  - Annual review of operational congestion management (RAPs, mitigation plans) plans based on existing and expected topology
  - Dynamic stability analysis to set system operating limits
  - Setting of voltage profiles

6. Ancillary Services Planning

- **Annual development of methods for determining quantities of each type of ancillary service (A/S)**
- **Monthly calculation of Regulation and Non-Spin A/S quantities**
- **Procurement of Black Start Resources and development of black start plan**
- **Development of new tools and techniques to optimize procurement of A/S (e.g. ERAT)** ← New in 2009

7. Advanced Network Applications

- **Engineering (as opposed to IT) development and support for the various reliability tools used in real time operations**
  - State estimator provides real-time status and flows every 5 minutes and is used by Real-time Contingency Analysis (RTCA)
  - RTCA runs every 5 minutes and provides NERC security analysis
  - Voltage Stability Analysis Tool
  - Other operator visualization and assessment tools

8. Renewables Integration

- **Specific implementation of Transmission Planning and Ancillary Services Planning activities**
  - Wind Resource Study, performed by AWS Truewind for ERCOT
  - CREZ Transmission Plan development
  - Study of future ancillary services requirements, performed by GE for ERCOT
  - CREZ Plan Implementation Studies – Ongoing
  - Participation in ERCOT and national groups related to wind integration
  - Evaluation of technical standards for renewables integration (e.g. voltage ride-through study)
  - Significant Protocol and Operating Guide activity

Other Concepts

- **Certain high-workload activities span all programs** — Significant new workload
  - NERC compliance studies, increased documentation requirements and audit preparation, participating on NERC committees
  - Stakeholder support – answering info requests, participating in Protocol and Operating Guide revision activities, presenting info in stakeholder meetings
  - Regulatory requests – Entergy integration study, greenhouse gas study, PUCT rulemaking participation
- **Senior staff retention has been significant issue in this area**
  - Market participants need staff with ERCOT planning experience
  - Replaced with recent college graduates ← Reduced capacity
- **Market participants call for increased "study horsepower"**
  - Reorganized to focus more resources on highest need activities (dynamics studies, congestion analysis, operations planning studies)
- **Increased system complexity requires enhanced analytical capabilities**
  - High renewable penetration
  - Demand response via advanced meters
  - Implementation of new resource technologies

A few enhancement areas

Base Activity	Need for Enhanced Effort
Month-ahead determination of A/S requirements	Provide estimates to market of A/S needs for upcoming years to aid in investment decisions
Established A/S characteristics	Restructure particular A/S products to allow provision by new technology resources
NERC standard minimum compliance	Performing studies specifically to demonstrate compliance
Limited input into NERC standards drafting activities	Participate in standards drafting groups
Long-term transmission planning limited in scope	Development of long-term framework for transmission expansion
Deterministic assessment of economic transmission needs	Assess economic transmission needs probabilistically to reduce potential for price disparities due to load variation and outages
Provide procedural oversight of full interconnection studies	Provide enhanced oversight and review of technical generation interconnection studies

Proposed DOE Study

- **DOE Funding Opportunity 68 under ARRA requested entities to perform planning study for each of three interconnections**
- **ERCOT submitted proposal; Response from DOE expected "mid-November"**

- **Enhanced Long-Term System Assessment**
  - Broader and more inclusive evaluation of potential future resource decisions by market, including storage, solar, demand response
  - Development of long-term transmission expansion framework
  - Evaluation of future operational requirements including A/S requirements and A/S structure to allow provision by new resources
  - Input from policymakers on inputs to, and information needed from, planning studies

Questions?