



GENERATOR INTERCONNECTION PROCESS OVERVIEW

ESIG MARCH 23, 2022

*Helping our members work together to keep
the lights on... today and in the future.*



SouthwestPowerPool



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GENERATION INTERCONNECTION OVERVIEW

GENERATION INTERCONNECTION (GI) OVERVIEW

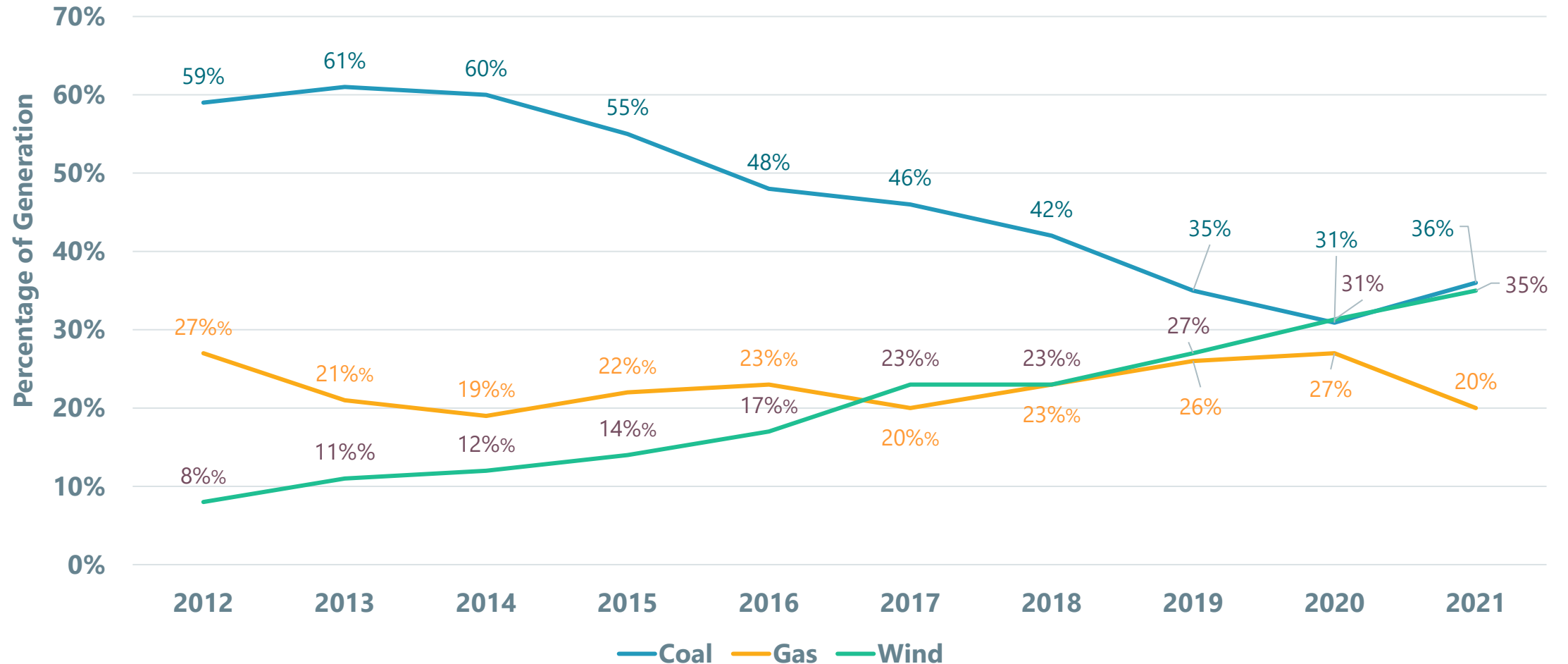
- SPP's GI queue process provides a means for:
 - Planners and developers to submit requests to connect new generation to SPP's transmission network
 - SPP to validate, study and analyze these requests
 - Joint execution of a Generator Interconnection Agreement
 - Staging of requests, studies and connection in the queue

GENERATION INTERCONNECTION (GI) OVERVIEW

- What we'll discuss today:
 - RTO perspective – renewable penetration
 - GI backlog mitigation plan – current environment
 - GI SCRIPT recommendations – future environment

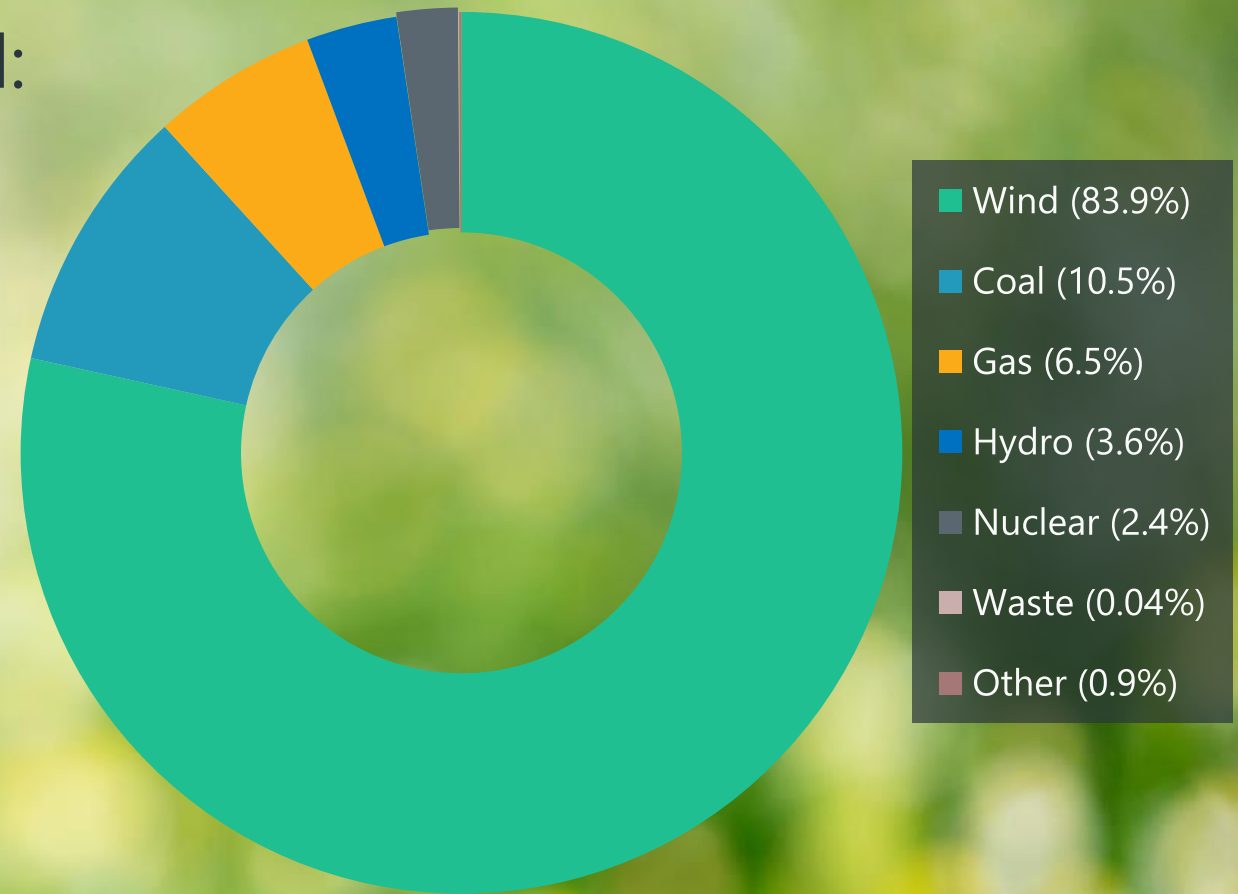
OUR EVOLVING ENERGY MIX

Trend By Year



RENEWABLE PENETRATION

- Renewable penetration record: 87.5% of load
 - 5:08 a.m. on 5/8/21
 - 19,663 MW of 22,469 MW of load served by renewables
 - **81.8% of total generation** at that time was renewables

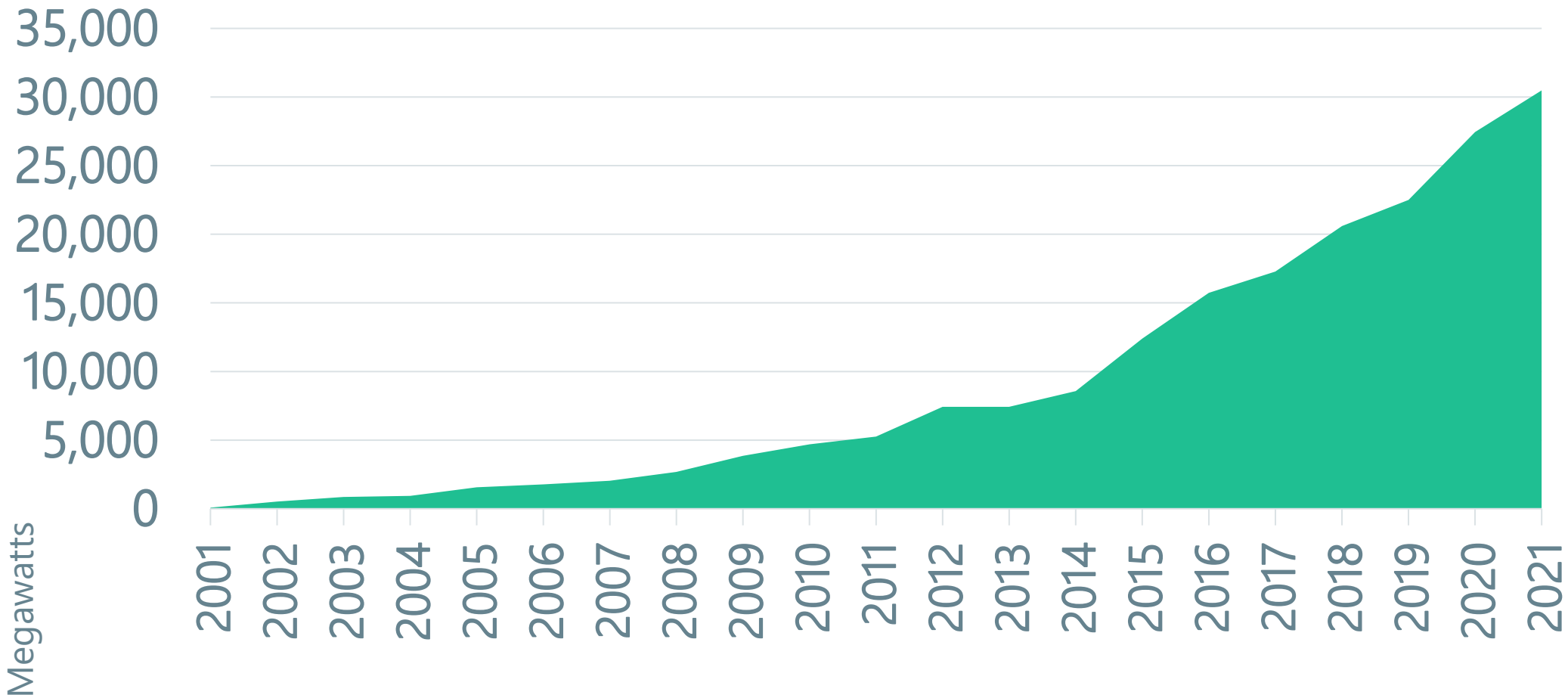


Penetration of Load by Fuel Type

WIND PENETRATION IN THE SPP SYSTEM

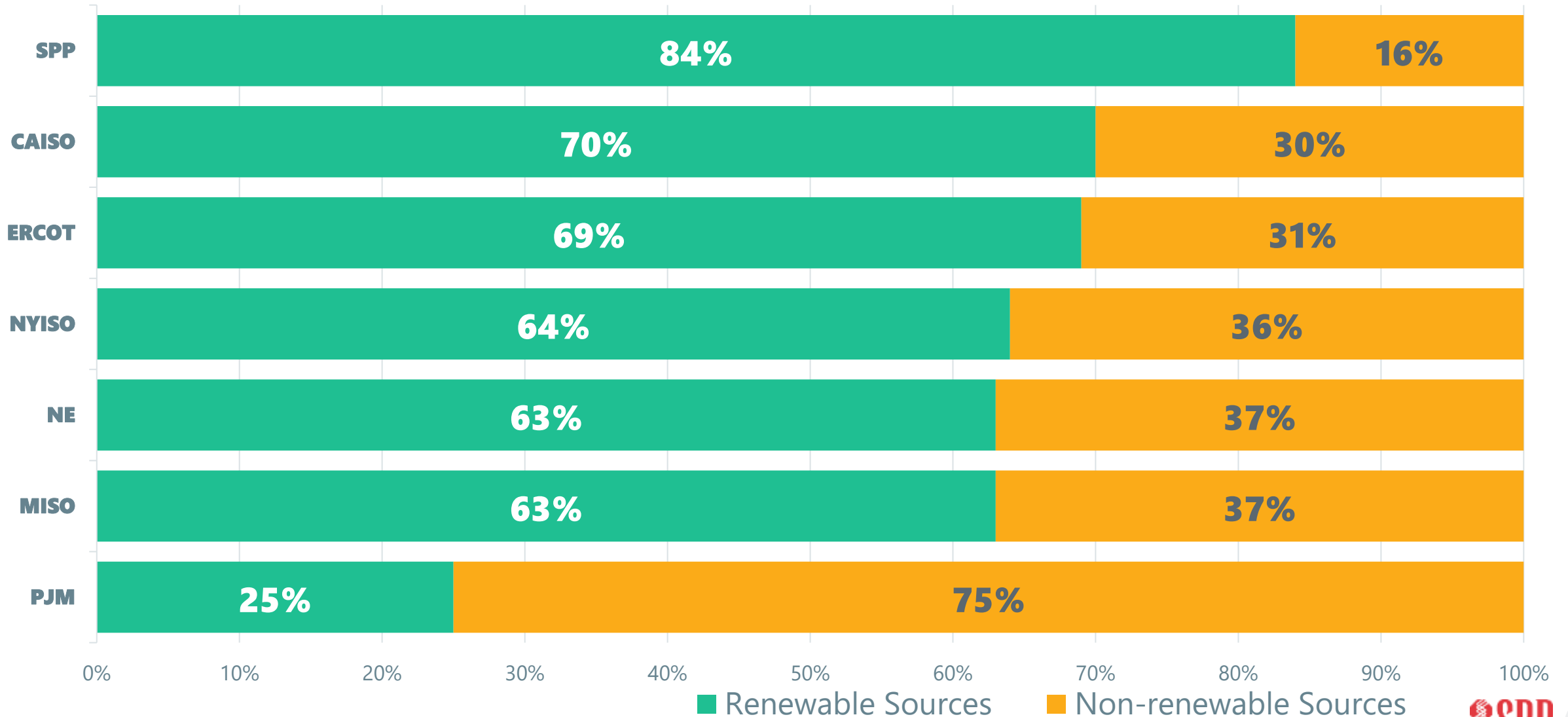
- Maximum wind output: 21,322 MW (2/11/22)
- Minimum wind output (last 12 mos.): 378.8 MW (6/2/21 @ 2:27 p.m.)
- Maximum wind penetration: 84% (5/8/21)
- Average wind penetration (2020): 36.5%
- Max wind swing in one day: > 16 GW on Dec. 11-12, 2019 (17.9 GW to 1.7 GW in 21 hours)
- Max 1-hour ramp: 3,700 MW

INSTALLED WIND CAPACITY BY YEAR



% OF NEW ELECTRICITY GENERATION IN U.S. RTOS

New generation built in each RTO since 2012 including what will be built through 2022

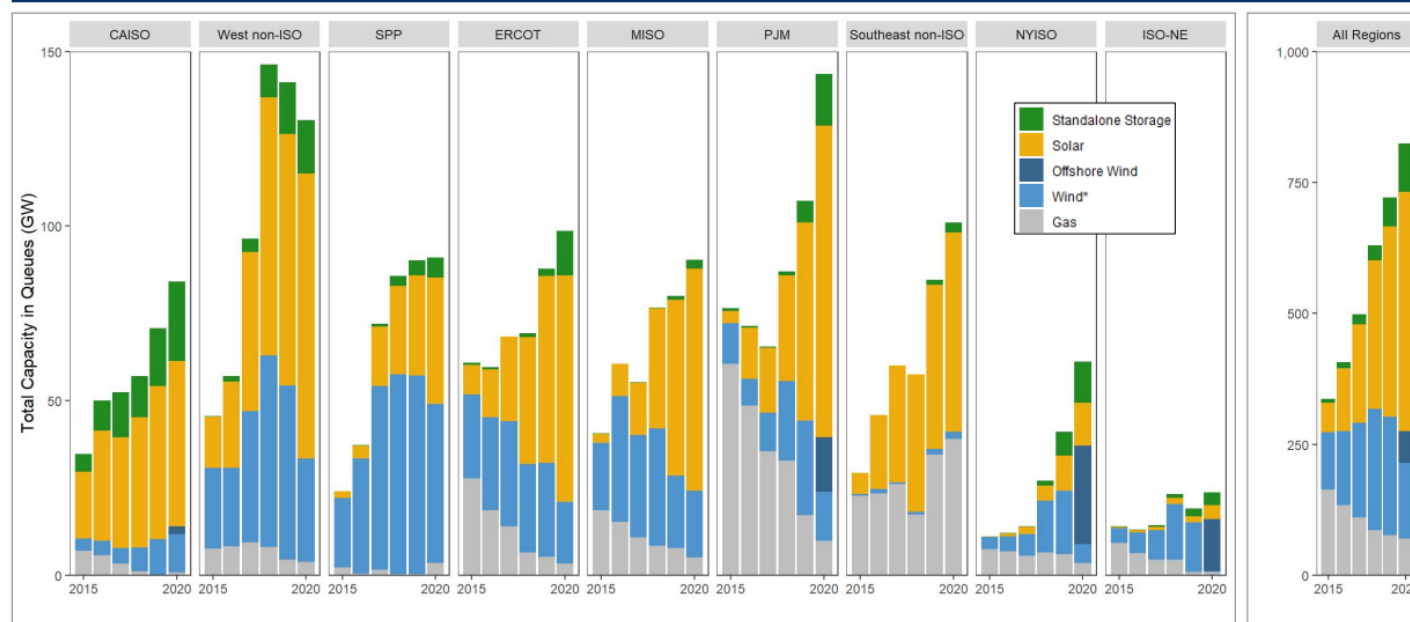


Source: NRDC analysis of S&P Global Market Intelligence data

GI BACKLOG MITIGATION PLAN

GRID CHALLENGES

Trends over time vary somewhat by region: Wind capacity has contracted in some regions, solar and storage see consistent growth, gas largely declines



*Wind capacity includes onshore and offshore for all years, but offshore is only broken out starting in 2020.
 Notes: (1) Storage capacity only includes standalone storage – storage in hybrid configuration is not included here.
 (2) Hybrid generation capacity is included in all generator categories. (3) Not all of this capacity will be built.

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As of the end of 2020, there were over 5,600 projects seeking grid interconnection across the U.S., representing over 755 GW of generation and an estimated ~204 GW of storage.

GI Interconnection Queues

Source: Lawrence Berkeley National Laboratory, "Queued Up, Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2020"

BACKLOG CAUSES

- Speculative Requests
- Restudies due to request modification and withdraws (i.e. waterfall effect)
- Transmission Capacity Scarcity
 - The cost assigned to customers is the main factor for a request to withdraw
 - Cost uncertainty for customers
- Number of models, model, analysis, and software version updates
- Number of special study requests
- Seams Impacts and Coordination



BACKLOG MITIGATION STRATEGIES



1. Reduce restudies through development milestones



2. Increase financial commitments



3. Simplify and reduce study timelines

GI DISIS BACKLOG MITIGATION PLAN OVERALL HIGH-LEVEL TIMELINE

MS: DP2 Final Backlog Cluster Study Complete
12/31/24

MS: GI Backlog Mitigation Program Complete
6/17/25

Update

FERC Approval of SPP Filing in ER22-253 (RR458)

MS: 1702 P1 Complete and 1801 Models Updated

MS: Transition to 2022ITP power flow and 2021MDAG dynamics models



Today

Aug 2 - Sep 9 1702 DP 2

80 days

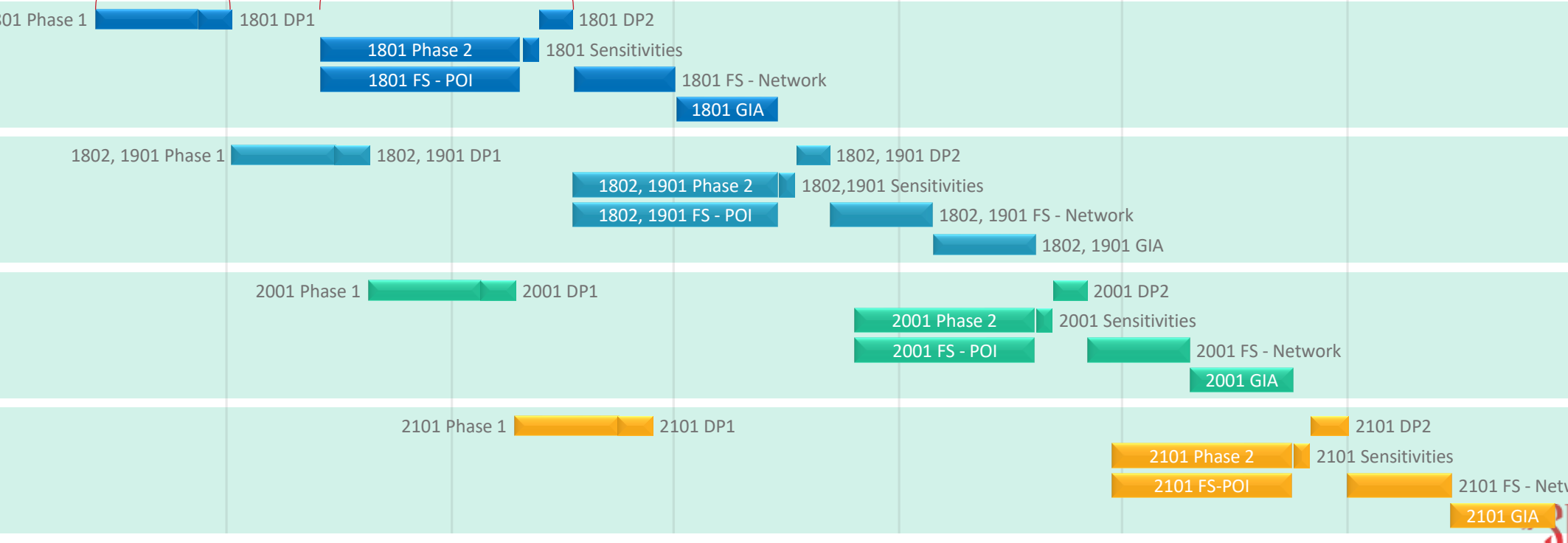
136 days

1801 Cluster (SPP & Consultants)

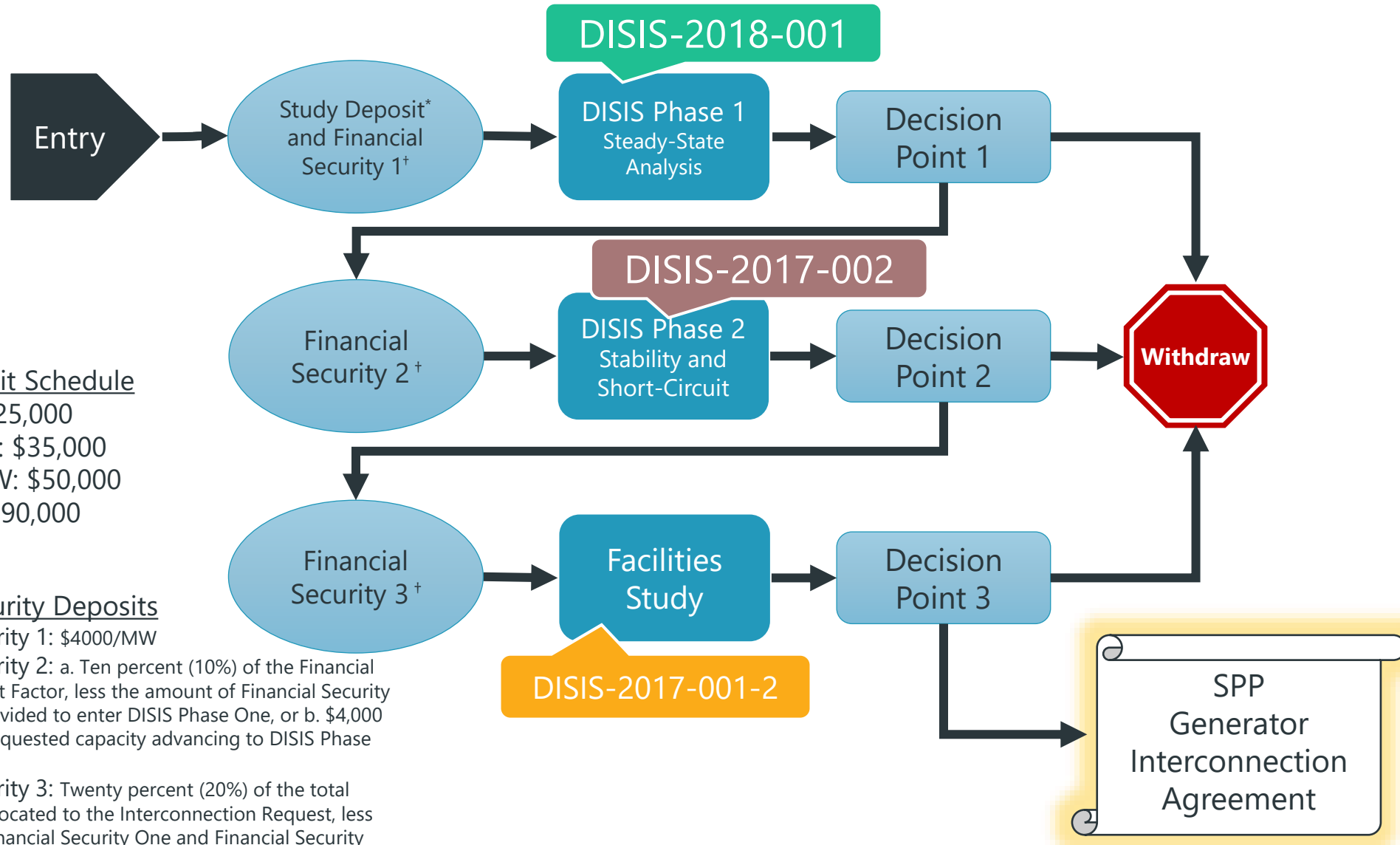
1802, 1901 Cluster (SPP & Consultants)

2001 Cluster (SPP & Consultants)

2101 Cluster (SPP & Consultants)



DEFINITIVE INTERCONNECTION SYSTEM IMPACT STUDIES (DISIS) THREE-PHASE PROCESS OVERVIEW (APPROVED)



***Study Deposit Schedule**

- 0-2 MW: \$25,000
- >2-20 MW: \$35,000
- >20-74 MW: \$50,000
- 75 MW+: \$90,000

† Financial Security Deposits

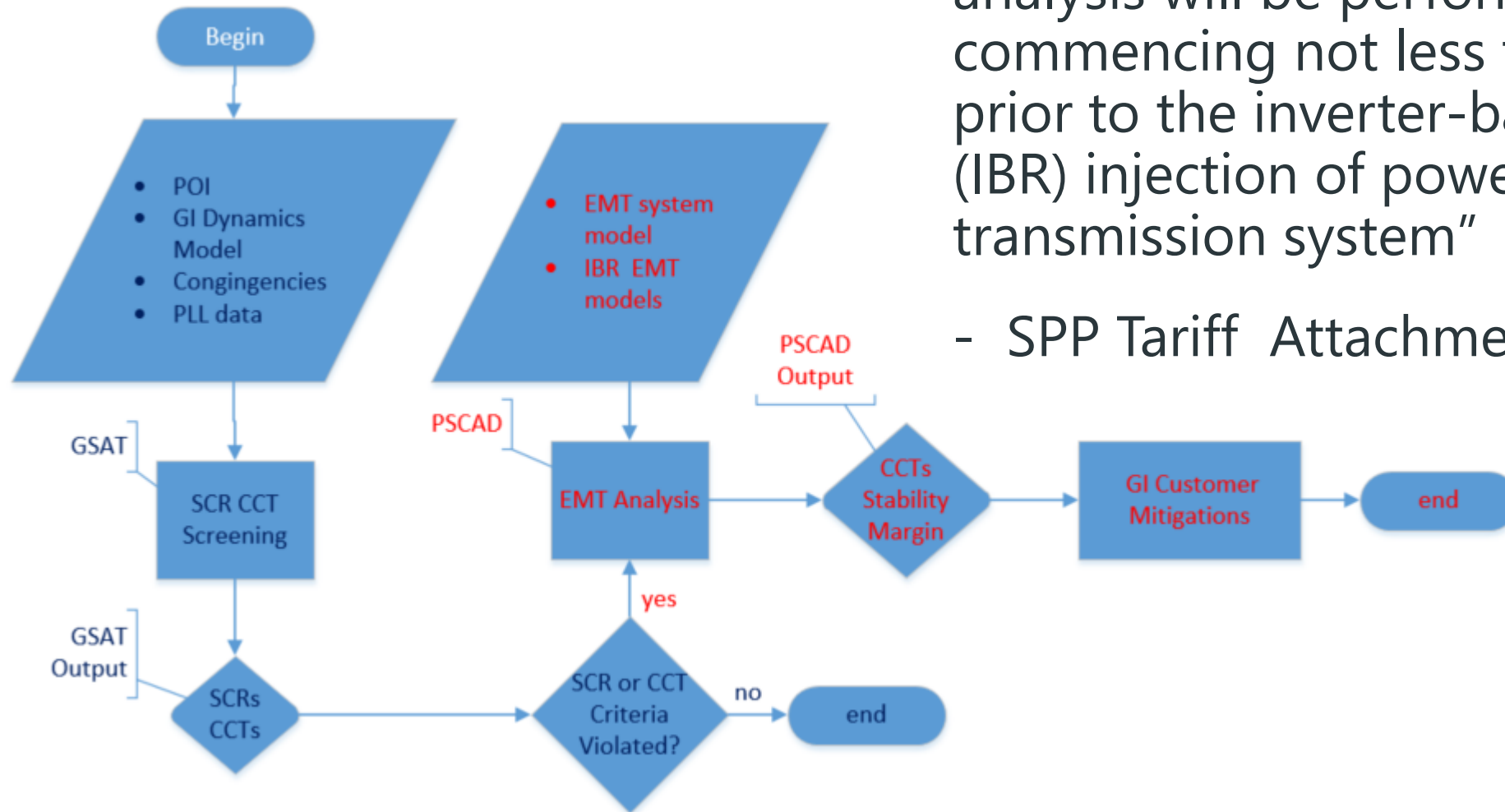
- Financial Security 1: \$4000/MW
- Financial Security 2: a. Ten percent (10%) of the Financial Security Two Cost Factor, less the amount of Financial Security One that was provided to enter DISIS Phase One, or b. \$4,000 per MW of the requested capacity advancing to DISIS Phase Two
- Financial Security 3: Twenty percent (20%) of the total upgrade costs allocated to the Interconnection Request, less the amount of Financial Security One and Financial Security Two that was previously provided to enter DISIS Phase One and DISIS Phase Two

BACKLOG AUTOMATION, TECHNICAL IMPROVEMENTS

- Model and Group Reduction
- SUGAR®
 - Model solving
 - Assist with non-contingency analysis
- MUST or TARA®
 - ACCC and TDF
- Fuel Based Dispatch
 - More realistic dispatch of renewables across models, seasons

Update

EMT/PSCAD™ ANALYSIS



“When the SCRCCT Screening indicates a possible inverter instability due to a customer’s interconnection, an EMT analysis will be performed commencing not less than 15 months prior to the inverter-based resource (IBR) injection of power into the transmission system”

- SPP Tariff Attachment V, Section 8

GI FUTURE PROCESS ADJUSTMENTS

WHAT IS THE SCRIPT?

- **Strategic and Creative Re-engineering of Integrated Planning Team**
- 16 stakeholder representatives from board, Members Committee, SPC, MOPC and RSC
- Reports to the Board and Members Committee
- Responsible for strategically developing broad changes to SPP's transmission planning processes
 - Better meet customer needs
 - Resolve growing stakeholder concerns about the amount, nature and funding of continued transmission investment amid rapid industry changes.



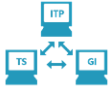
SPP'S PLANNING CHALLENGES

- Unwieldy GI queue volumes
- Excess energy and lack of transfer capability or incentives
- Divisiveness about planning assumptions, results and funding
- Lack of certainty about future transmission investment decisions
- Parallel studies that use different cost allocation
- Concerns about inequitable cost allocation

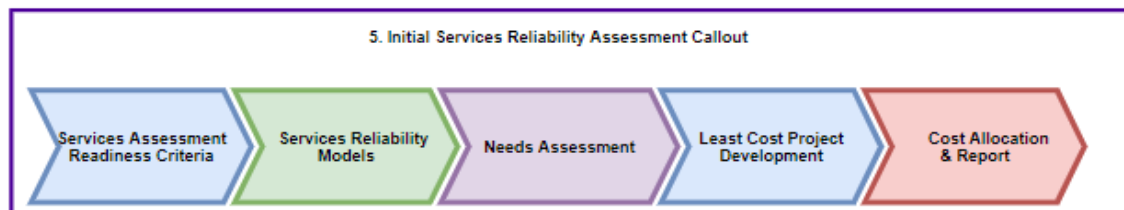
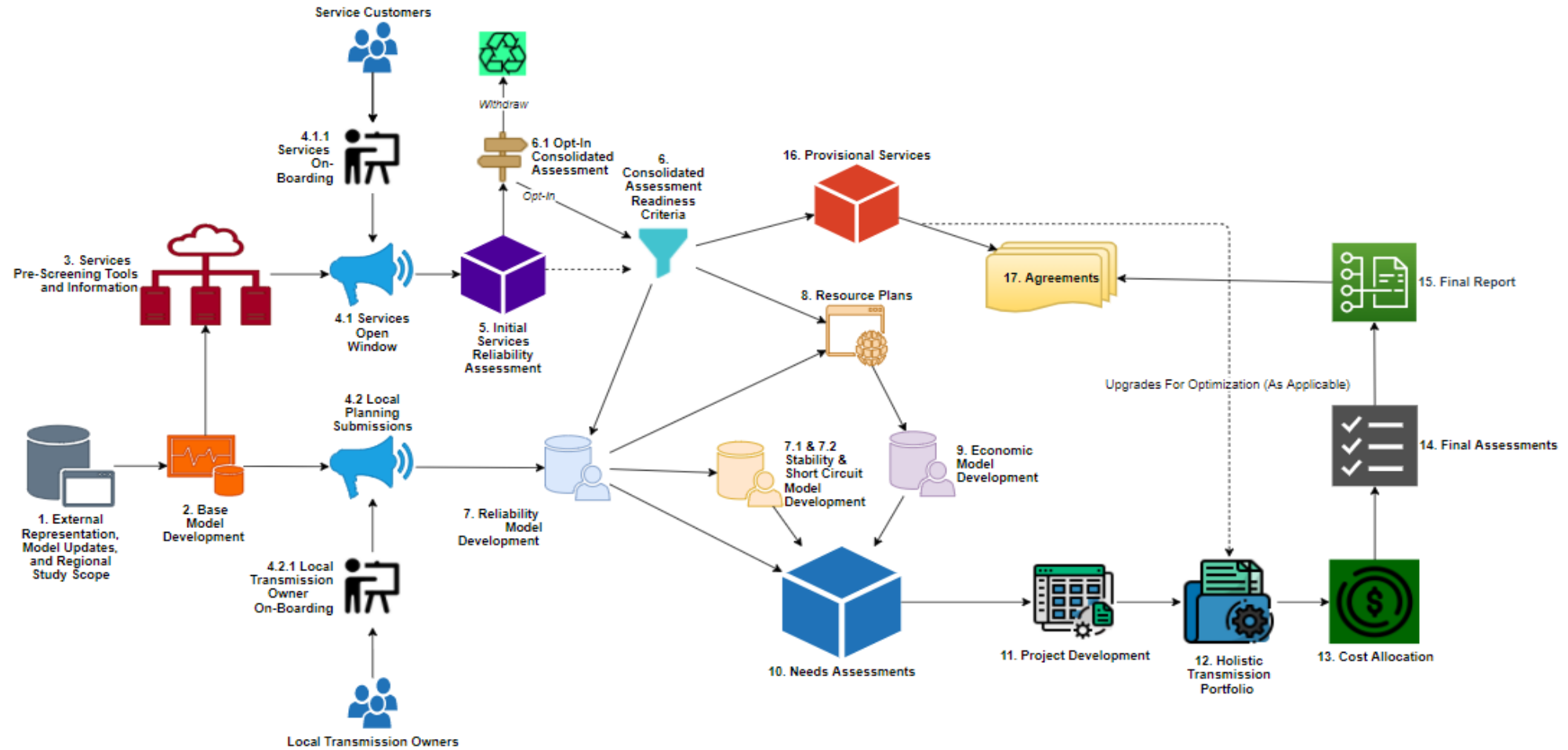
SCRIPT TASKED WITH PROPOSING POLICIES TO:

- **Consolidate** planning processes
- Improve **services** processes
 - Responsiveness and certainty
 - Reduce dependence on queue-driven analyses
- **Optimize** our transmission network
- Improve **decision quality**
- Facilitate beneficial interregional energy **transfers**
- Improve **cost-sharing**





CONSOLIDATED PROCESS: "CUSTOMER OPT-IN"



SCRIPT AUTOMATION, TECHNICAL IMPROVEMENTS

- Services Pre-Screening Tools and Information
 - Historical POI Data
 - Transmission Capacity Tool
- Cost Allocation
 - Cost sharing

QUESTIONS & DISCUSSION



THANK YOU!

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