Capacity Auction Reforms: Seasonal/Accreditation (CAR-SA)

Impact Analysis (IA)

Chris Geissler & Fei Zeng

DIRECTOR, ECONOMIC ANALYSIS & MANAGER, PLANNING SERVICES DEVELOPMENT AND SOLUTION

CAR-SA Project Overview

WMPP ID: 185

Proposed Effective Date: Q2-Q3 2027

- The ISO plans to provide an Impact Analysis (IA) that shows the potential quantitative and qualitative impacts of the CAR proposal
- This analysis will provide stakeholders with a better understanding of how CAR may impact how much capacity they can sell, and wholesale market revenues and costs under specific scenarios, as well as other key parameters
- This presentation provides more detail on the base cases that the ISO is planning to use in the Resource Accreditation and Modeling (RAM) IA and continues the discussion of potential outputs, analysis, and sensitivities that may be considered as part of this work

Key Topic Areas for Discussion

- Proposed Resource Accreditation and Modeling IA (RAM IA) structure
- ISO's current thinking on base cases
- Key outputs, analysis, and sensitivities
- The ISO plans to collect additional stakeholder feedback on what outputs, analyses, and sensitivities would be of greatest interest
- Today's discussion focuses on the RAM IA, though the ISO anticipates having additional discussions about the proposed approach to the Market Clearing (MC) IA later in Q1

PROPOSED RAM IA STRUCTURE

Proposed RAM IA Structure Overview

- Split the RAM IA to consider two distinct time periods

1. **Near-Term Base Case**: Focuses on potential outcomes given potential near-term system and market conditions
2. **Future Base Case**: Assesses how outcomes may change or evolve under a set of potential future conditions that look further into the future

- Will include analysis and sensitivities to each base case
- The base cases, as well as any model sensitivities, are not intended to predict future outcomes
  - Rather, they aim to provide information about potential outcomes under plausible future conditions

RAM IA Will Consider Outcomes With and Without CAR in Place

- Doing so will provide information about the impact of CAR on key outputs, as the change in outcomes will be more clearly demonstrated as attributable to CAR
  - For example, the capacity product being procured will change from Qualified Capacity (QC) to MRI Capacity, and the RAM IA will seek to unpack this change
  - For accreditation, the current rules results (i.e., those when CAR is not assumed to be in effect) will assume the continued use of QC

Near-Term Base Case

- Uses assumptions and inputs that are broadly consistent with potential system conditions that may be in place in the near-term (e.g., for CCP 19 in 2028/29)
- Provides key outputs and analysis related to this case, including demand curve parameters (seasonal Net ICR values, MRI values) and accreditation values by resource type, given these assumptions and inputs
- The Near-Term Base Case will serve as the starting point for any additional analysis that is focused on modeling assumptions, drivers of results, or changes to the design

Future Base Case

- Provides stakeholders with information about how possible, assumed changes in system conditions (resource mix, load level, and shape) could impact key parameters such as seasonal Net Installed Capacity Requirements (NICR) values and seasonal accreditation values by resource type
- The Future Base Case will serve as the starting point for evaluating how changes to system conditions, such as load levels or the resource mix, affect key outputs
  - Reflects the fact that uncertainty with respect to system conditions increases with time
  - Will help participants learn about how the assumptions and inputs impact key model outputs, and develop their own expectations about the potential evolution of these values based on their expectations of the future
- The ISO also plans to enhance its resource outlook study to provide additional information related to the capacity market to account for CAR, such as accreditation data

NEAR-TERM BASE CASE

Near-Term Base Case: Overview

- Seeks to use assumptions that are broadly in line with expected system conditions for CCP 19
- We share preliminary data reflecting the ISO's current thinking regarding the assumed system load and resource mix
- If any of these assumptions or values change as the ISO builds the base case, we will update stakeholders accordingly

Near-Term Base Case: Assumed Resource Mix Based on CCP 18's ARA 1

- The modeling will assume the same resource mix for the current rules and CAR cases
- As a starting point, the base case uses the resource mix that was modeled in the RAA case for the ICR and Related Values calculation for ARA 1 of CCP 18, which were filed and approved by FERC
- This is the most recent annual auction for the commitment period that precedes CCP 19
- The resource-specific parameters that inform accreditation values under CAR-SA (e.g., Maximum Capability (MCap), seasonal equivalent forced outage rates on demand (EFORd)) would be calculated based on current information

Adjustments to the Assumed Resource Mix

The near-term base case includes additional adjustments relative to the CCP 18 ARA 1 resource mix:

- Remove not-yet commercial resources that withdrew from CPS Monitoring after ARA 1
- Remove existing resources that have publicly announced their intent to deactivate ahead of CCP 19
  - Based on the ISO's retirement tracker and public reports
- Include additional qualified resources from the 2025 interim qualification process
  - More information available in the reconfiguration auction qualification summary

Summary: Near-Term Base Case Assumed Resource Mix

- Summary of non-intermittent resources by type

Non-IPR Resources		
Resource Type	Summer QC (MW)	Winter QC (MW)
Gas-only	7,873	8,607
Oil-only	2,561	2,826
Gas/Oil Dual Fuel	8,736	9,402
Nuclear	3,358	3,372
Daily/Weekly Hydro	1,168	1,192
Pumped Storage Hydro	1,858	1,856
Stand-alone Battery	2,107	2,107
Hybrid (Solar/Battery)	303	240
Non-IPR Others	564	636
Active Demand	761	764
Passive Demand	2,658	2,508
Import	5,641	3,956
Total	37,588	37,465

Notes:

1. Import resources will be reduced to respect the Capacity Transfer Limit (CTL) of the external interfaces
2. In presenting the IA results, some of these categories may need to be merged to conform with the ISO's information policy

Summary: Near-Term Base Case Assumed Resource Mix, cont.

- Summary of IPRs by type

IPRs			
Type	Summer QC (MW)	Winter QC (MW)	Nameplate (MW)
IPR-Solar	601	4	1,706
IPR-Wind	565	1,255	2,521
IPR-Hydro	368	476	689
IPR-Hybrid	45	28	79
IPR-Others	232	244	449
Total	1,811	2,007	5,445

Notes:

1. The nameplate value for IPR-Hybrid is the sum of the nameplate value of the solar component and the summer QC of the storage component
2. The nameplate value for a small number of resources is estimated

Near-Term Base Case: Load Assumptions

- Both the current rules (i.e., without CAR) and CAR cases will assume improved methods to forecast load, including:
  - Improvements to the modeling of load response during extreme summer conditions
  - The use of 70 years of climate-adjusted historical weather data to represent weather-driven uncertainty
- The CAR cases will also change the treatment of Passive Demand Resources (PDRs), so that it is no longer reconstituted as an adder to the load forecast, and introduce multiple load shapes to reflect variability based on historic weather data
  - These changes were discussed in the November RC committee

Near-Term Base Case: Load Assumptions (cont.)

- Assumed load values will be consistent with the 2025 CELT values for CCP 19
  - Presentation to the RC
  - 2025 Load Forecast
- Under this methodology, there are four components to the load forecast
  - Base load forecast
  - Electric Vehicle forecast
  - Heat Pump forecast
  - Behind-the-Meter Photovoltaic (BTM PV) forecast (reduces the load forecast)
- 50/50 peak forecast

	Base	EV	HP	BTM PV	Net
Summer	26,801	174	18	(1,869)	25,124
Winter	19,810	356	992	(58)	21,101

Near-Term Base Case: Other Assumptions

- The winter gas constraint for the CAR-SA scenario will be derived consistent with the availability model outlined at the December Markets Committee
- Tie Benefits assumptions align with the values outlined at the December 2025 Reliability Committee
- Do not plan to model deliverability constraints due to (i) minimal impact on anticipated directional IA results, and (ii) significant time and data work necessary to make this adjustment in the model

FUTURE BASE CASE

Future Base Case: Overview

- Current thinking is to start with the assumptions for an approximate timeframe of 2035
- Plan to develop resource mix assumptions by introducing a set of incremental updates to the Near-Term Base Case
  - Add additional renewable resources, as explained in the next slide
- Load forecast will be using the 2025 CELT forecast for 2035
- Propose to continue using the assumptions regarding the gas constraint and Tie Benefits that are consistent with those in the Near-Term Base Case

Future Base Case: Resource Mix

ISO's current thinking is to include the following set of additional renewable resources, which may be aligned with a conservative approximation on progress towards the states public policy by this timeframe

- 2,000 MW (nameplate) off-shore winds
- 200 MW (nameplate) of utility solar
- 200 MW (nameplate) of stand-alone 2-hour battery

The ISO welcomes feedback and is providing this future resource mix as a starting point for discussion so that we can begin the conversation with a tangible starting point to build from

Future Base Case: Resource Mix Summary

- Summary of non-intermittent resources by type.

Non-IPR Resources		
Resource Type	Summer QC (MW)	Winter QC (MW)
Gas-only	7,873	8,607
Oil-only	2,561	2,826
Gas/Oil Dual Fuel	8,736	9,402
Nuclear	3,358	3,372
Daily/Weekly Hydro	1,168	1,192
Pumped Storage Hydro	1,858	1,856
Stand-alone Battery	2,307	2,307
Hybrid (Solar/Battery)	303	240
Non-IPR Others	564	636
Active Demand	761	764
Passive Demand	2,658	2,508
Import	5,641	3,956
Total	37,588	37,465

Additions from near-term base case in red

Future Base Case: Resource Mix Summary, cont.

- Summary of IPRs by type

IPRs			
Type	Summer QC (MW)	Winter QC (MW)	Nameplate (MW)
IPR-Solar	671	4	1,906
IPR-Wind	1,145	2,525	4,521
IPR-Hydro	368	476	689
IPR-Hybrid	45	28	79
IPR-Others	232	244	449
Total	1,811	2,007	5,445

Additions from near-term base case in red

Notes: The QC values for the solar and wind additions are estimated using the fleet-average from the near-term case

Future Base Case: Load Assumptions

- Summary of 50/50 peak forecast for 2035 and comparison with CCP 19

	Case	Base	EV	HP	BTM PV	Net
Summer	Near-Term Case (CCP 19)	26,801	174	18	(1,869)	25,124
	Future Case (2035)	28,014	1,019	133	(1,835)	27,331
Winter	Near-Term Case (CCP 19)	19,810	356	992	(58)	21,101
	Future Case (2035)	19,919	2,104	5,769	(521)	27,272

- The timing of daily peak load is expected to shift for both summer and winter for the future case because of the increasing penetration assumed for BTM PV and heating electrification

KEY OUTPUTS, ANALYSIS, AND SENSITIVITIES

Stakeholder Interest in RAM IA Outputs

The ISO appreciates that there is considerable interest in the RAM IA results, including:

- How supply and demand parameters may change under CAR
- Analysis that helps explain these results
- Unpacking the key drivers behind these changes among the many proposed enhancements under CAR
- The impact of making changes to the modeling assumptions or proposed elements of the CAR design
- Sensitivity of the results to assumed system conditions (load and resource mix)

The ISO Seeks to be Responsive to this Interest

- The following slides provide further information on these areas of interest and broadly group them into two categories:
  - **Expected**: Outputs and analysis that the ISO plans to provide as part of the RAM IA
  - **Potential**: Additional analysis and sensitivities that could be included, as time allows
- Given the large number of cases and analyses that may be of interest and the considerable time required for such work, the ISO looks forward to working with stakeholders to determine how to prioritize among these additional items that could be considered
- While we welcome feedback on these items today (including items not discussed), we plan to request feedback via an input form that will be shared with stakeholders in the coming week

Key RAM IA Reliability Outputs Used in the Capacity Auction

Expected Outputs

	Demand Outputs	Supply Outputs
Current Rules	Annual Net ICR Annual System MRI demand curve	Qualified Capacity by resource type
CAR	Seasonal Net ICRs Seasonal System MRI demand curves Winter gas constraint	rMRI values and MRI Capacity by resource type and season

The ISO anticipates providing these outputs for both the Near-Term and Future Base Cases, as well as any sensitivities that are run

Additional Analysis Explaining These Results

Expected analysis for the Near-Term Base Case

- Heat map of EUE hours by month and hour
- How a representative storage resource's storage duration impacts its seasonal rMRI values
- Information on the distribution of durations of reliability events by season

Potential additional analysis

- Breakdown of MRI hours by type (e.g., load shed MRI hours, dispatch MRI hours, charging MRI hours)
- Similar analysis as outlined in the bullets above, but for the Future Base Case and/or sensitivity cases

Further Evaluation of the Drivers of Change

Expected analysis on drivers of change for the Near-Term Base Case

- Move from an annual to seasonal procurement
- Load forecast improvements
- Resource modeling changes, including:
  - Introduction of limited energy and energy storage modeling
  - Inclusion of profiles in resource modeling for certain resource types (e.g., Intermittent Power Resources)
- Shift from QC to Maximum Capability in modeling

Impact of Changing the Modeling Assumptions or Design Elements

Potential evaluation of alternate modeling assumptions or design elements:

- The charging and/or discharging logic for limited energy and energy storage resources
- The seasonal LOLE split
- The gas availability profile used to develop the winter gas constraint

Sensitivities and Alternate System Conditions

Potential sensitivities to the Future Base Case:

- Changes to the system load driven by factors such as higher or lower:
  - Winter heating electrification
  - EV adoption
  - Behind-the-meter solar generation
- Changes to the resource mix to consider higher/lower levels of generation from certain resource classes, such as:
  - Wind
  - Solar
  - Energy storage
  - Oil

Considerations for Sensitivity Scenarios and Additional Analysis

Selecting sensitivity scenarios for evaluation and additional analysis should account for both modeling complexity and data availability

- Scenarios that are comparatively more straightforward to implement
  - Linear scaling of selected base-case assumptions and aggregate system-level adjustments can effectively capture directional impacts, for example:
    - Apply a specified percentage increase or decrease to individual or combined load-forecast components to reflect alternative growth assumptions
    - Add an aggregate X MW of 4-hour battery storage with representative characteristics
    - Increase system-wide solar and/or wind penetration by X%

Considerations for Sensitivity Scenarios and Additional Analysis, cont.

Scenarios that may be challenging to implement or produce sensible outcomes

- Involve many resources individually modeled, such as:
  - A large number of hybrid or DECR resources with diverse configurations
- Rely on new or emerging technologies for which the ISO has:
  - Limited understanding of performance characteristics
  - Limited industry experience or modeling capability in MARS
    - e.g., small modular reactors (SMRs)
- Represent future system conditions without well-established evaluation frameworks, such as:
  - Large load impacts
  - Impacts of aggressive heating electrification on gas availability
- Require substantial effort to collect or develop input assumptions, for example:
  - Modeling renewable projects at specific locations
- Novel design and modeling changes and additional analysis that require the development of new outputs (e.g., the types of MRI hours)

NEXT STEPS

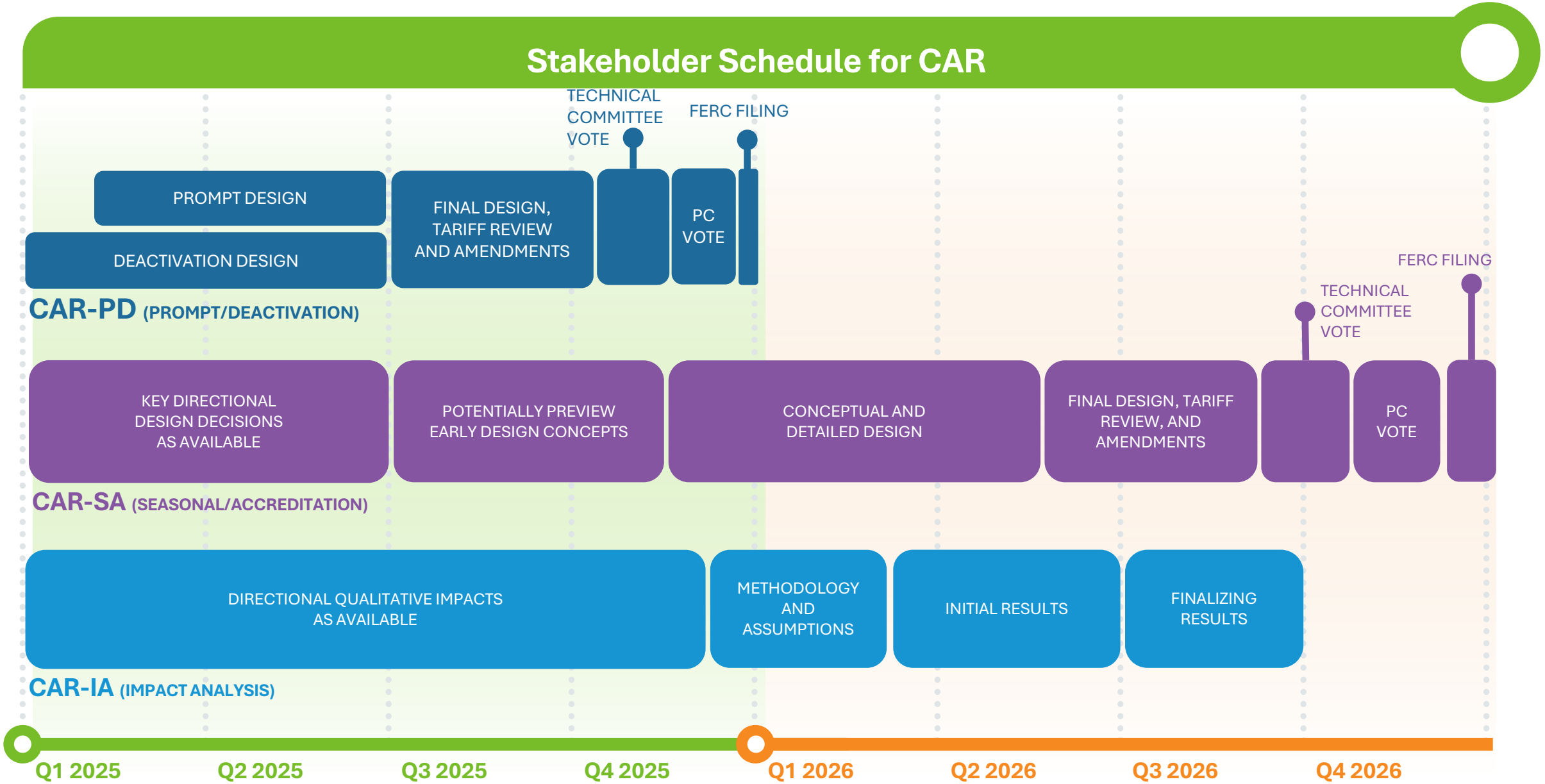
Soliciting Stakeholder Feedback

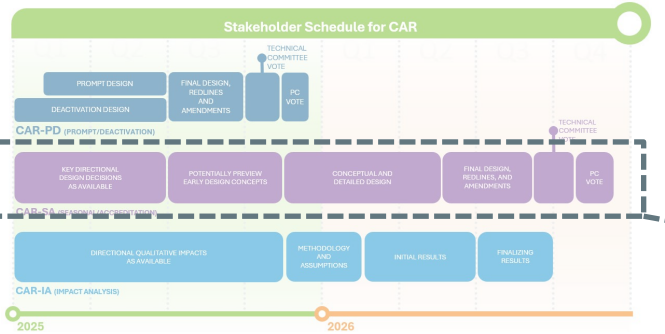
- In order to make the IA as informative as possible, the ISO welcomes stakeholder input on the proposed approach to the RAM IA
- The ISO plans to solicit such feedback via an input form that it will distribute to the MC and RC the week following the MC
- The questions in this input form will be informed by the capabilities of GE MARS as well as discussions with stakeholders to date
- The use of an input form to collect this information offers many benefits, including:
  - Supports broad participation from stakeholders in establishing what analysis and scenarios should be considered in the IA process
  - Provides structure to the feedback so that the ISO can set up its IA work to facilitate the inclusion of scenarios and analysis for which there is significant stakeholder interest
- The ISO has employed forms to obtain stakeholder input in other projects (e.g., REST) and found them to be an effective tool to gather feedback in an organized and timely manner
- In February, the ISO will aim to share a summary of the stakeholder input received

Questions

STAKEHOLDER SCHEDULE

Stakeholder Schedule for CAR





Stakeholder Schedule for CAR-SA

CORE MODELING AND ACCREDITATION CONCEPTS

SEASONAL/ACCREDITATION MODELING AND MARKET DESIGN

CONFORMING DESIGN DETAILS

FINAL DESIGN, TARIFF REVIEW AND AMENDMENTS

TECHNICAL COMMITTEE VOTE

PC VOTE

FERC FILING

CAR-SA (SEASONAL/ACCREDITATION)

PROVIDE QUESTIONS AND FEEDBACK ON DESIGN

Stakeholder Activity

CONCEPTUAL AMENDMENTS

PRESENT AMENDMENTS

PRESENT DESIGN & RESPOND TO FEEDBACK

ISO Activity

PROVIDE QUESTIONS AND FEEDBACK ON AMENDMENTS

Q4 2025 | **Q1 2026** | **Q2 2026** | **Q3 2026** | **Q4 2026**

CAR-SA Schedule Projection

- **January**
  - Gas Market Constraint Design Detail and Gas-Only Resource Modeling and Accreditation (MC timeframe)
  - Intermittent Power Resource Modeling and Accreditation Introduction (includes run-of-river hydro) (MC timeframe)
  - Impact Analysis: Discussion of Assumptions and Solicitation of Input from Stakeholders (MC timeframe)
  - Follow-Up Medley (MC timeframe)
  - Seasonal Tie Benefits (RC timeframe)
- **February**
  - Intermittent Power Resource Modeling and Accreditation, Continued Discussion (MC timeframe)
  - Gas Market Constraint Design Detail, Continued Discussion (MC timeframe)
  - Installed Capacity Requirements under CAR-SA (MC Timeframe)
  - Hybrid Resource Modeling and Accreditation Introduction (MC timeframe)
  - Impact Analysis, Continued Discussion
  - Import Resource Modeling and Accreditation (RC timeframe)
  - Modeling Deliverability: Summary of All Resource Types (RC timeframe)

All NEPOOL members are invited to attend meetings where CAR topics are discussed

CAR-SA Preliminary Topic Schedule: March and Beyond

- The list below provides a projection of when core accreditation committee discussions will begin:

Topics	Projected Committee Discussions
Impact Analysis Initial Results	March – June
Market Clearing IA Assumptions	February or March
Q1 Follow-Up Medley	April
Gas-Only Resource Contract Requirements	April – May