Department of Energy, Mines, Industry Regulation and Safety
Energy Policy WA
GOVERNMENT OF WESTERN AUSTRALIA

Meeting Agenda

Meeting Title:	Power System Security and Reliability Standards Working Group
Date:	18 April 2024
Time:	1.00pm – 3.00pm
Location:	Online, via TEAMS.

Item	Item	Responsibility	Type	Duration
1	Welcome and Agenda	Chair	Noting	2 min
2	Meeting Apologies and Attendance	Chair	Noting	2 min
3	Competition Law Statement	Chair	Noting	2 min
4	Minutes of previous meetings	Chair	Noting	2 min
5	Updates on Technical Working Group	Chair	Noting	2 min
6	**Stage 2 – Issues Analysis** (a) Overview of previously discussed issues (b) Discussion on remaining identified issues (c) Agreement on Stage 2 package	Mott MacDonald /Merz	Discussion	20 min 60 min 20 min
7	General Business	Chair	Discussion	5 min
8	Next steps Stage 3 – develop design proposals	Chair	Noting	5 min
	Next meeting: TBD			

Please note, this meeting will be recorded.

Competition and Consumer Law Obligations

Members of the MAC's Power System Security and Reliability Standards Working Group (**Members**) note their obligations under the *Competition and Consumer Act 2010* (**CCA**).

If a Member has a concern regarding the competition law implications of any issue being discussed at any meeting, please bring the matter to the immediate attention of the Chairperson.

Part IV of the CCA (titled "Restrictive Trade Practices") contains several prohibitions (rules) targeting anti-competitive conduct. These include:

(a) **cartel conduct**: cartel conduct is an arrangement or understanding between competitors to fix prices; restrict the supply or acquisition of goods or services by parties to the arrangement; allocate customers or territories; and or rig bids.

(b) **concerted practices**: a concerted practice can be conceived of as involving cooperation between competitors which has the purpose, effect or likely effect of substantially lessening competition, in particular, sharing Competitively Sensitive Information with competitors such as future pricing intentions and this end:

- a concerted practice, according to the ACCC, involves a lower threshold between parties than a contract arrangement or understanding; and accordingly; and
- a forum like the MAC is capable being a place where such cooperation could occur.

(c) **anti-competitive contracts, arrangements understandings**: any contract, arrangement or understanding which has the purpose, effect or likely effect of substantially lessening competition.

(d) **anti-competitive conduct (market power)**: any conduct by a company with market power which has the purpose, effect or likely effect of substantially lessening competition.

(e) **collective boycotts**: where a group of competitors agree not to acquire goods or services from, or not to supply goods or services to, a business with whom the group is negotiating, unless the business accepts the terms and conditions offered by the group.

A contravention of the CCA could result in a significant fine (up to $500,000 for individuals and more than $10 million for companies). Cartel conduct may also result in criminal sanctions, including gaol terms for individuals.

Sensitive Information means and includes:

(a) commercially sensitive information belonging to a Member's organisation or business (in this document such bodies are referred to as an Industry Stakeholder); and

(b) information which, if disclosed, would breach an Industry Stakeholder's obligations of confidence to third parties, be against laws or regulations (including competition laws), would waive legal professional privilege, or cause unreasonable prejudice to the Coordinator of Energy or the State of Western Australia).

Guiding Principle – what not to discuss

In any circumstance in which Industry Stakeholders are or are likely to be in competition with one another a Member must not discuss or exchange with any of the other Members information that is not otherwise in the public domain about commercially sensitive matters, including without limitation the following:

(a) the rates or prices (including any discounts or rebates) for the goods produced or the services produced by the Industry Stakeholders that are paid by or offered to third parties;

(b) the confidential details regarding a customer or supplier of an Industry Stakeholder;

(c) any strategies employed by an Industry Stakeholder to further any business that is or is likely to be in competition with a business of another Industry Stakeholder, (including, without limitation, any strategy related to an Industry Stakeholder's approach to bilateral contracting or bidding in the energy or ancillary/essential system services markets);

(d) the prices paid or offered to be paid (including any aspects of a transaction) by an Industry Stakeholder to acquire goods or services from third parties; and

(e) the confidential particulars of a third party supplier of goods or services to an Industry Stakeholder, including any circumstances in which an Industry Stakeholder has refused to or would refuse to acquire goods or services from a third party supplier or class of third party supplier.

Compliance Procedures for Meetings

If any of the matters listed above is raised for discussion, or information is sought to be exchanged in relation to the matter, the relevant Member must object to the matter being discussed. If, despite the objection, discussion of the relevant matter continues, then the relevant Member should advise the Chairperson and cease participation in the meeting/discussion and the relevant events must be recorded in the minutes for the meeting, including the time at which the relevant Member ceased to participate.

Department of **Energy, Mines, Industry Regulation and Safety**
Energy Policy WA

GOVERNMENT OF WESTERN AUSTRALIA

PSSR Standard for SWIS

PSSR Standards Working Group

Meeting 4 - 18 April 2024

Working together for a **brighter** energy future.

Purpose

1. To continue the discussion on the issues identified within the Stage 2 works.
2. To review and agree the completion of the Stage 2 (Issues Analysis) PSSR Standards Review.

Agenda

1.00pm	Item 1: Overview of final consolidated issues list
1.20pm	Item 2: Discussion on remaining issues
2.45pm	Item 3: Agreement on Stage 2 package
2.55pm	Item 4: Closing

Consolidated Issues List

The Consolidated Issues List – Previously Discussed

Issue ID	Consolidated Issue Description	Previously Discussed with PSSRWG?
I1	It is not clear how each Standard should be applied, and customer value is not considered in all cases.	Yes (1.1)
I3	Network elements are not required to operate continuously through credible system disturbances.	Yes (2.1)
I5	No considered approach to compliance across classes of Users that can have a similar impact on PSSR.	Yes (3)
I6	The requirements on Energy Storage facilities are spread across multiple mechanisms in the Technical Rules and the WEM Rules and additional clarity is required.	Yes (A.2)
I9	More clarity is required for when the Technical Rules should be applied as a guide to GEIP and when it the overrides economic optimisation required by the ENAC and specifically requires investment (capital or operating) in PSSR by the NSP at an efficient cost.	Yes (B.1)

Please note that the naming convention has changed in the consolidated list.
The intent of stage 2 analysis is to identify any overlaps, inconsistencies or gaps in the existing mechanisms (collectively termed Findings). These Findings have been consolidated into a set of Issues.

The Consolidated Issues List – Todays Discussion

Issue ID	Consolidated Issue Description
I2	There is not a coordinated approach to the methodology and inputs used in forecasts required to apply the various PSSR standards.
I4	There is an opportunity to consider the effectiveness and efficiency of the current GPS framework in how it applies the standards to different classes of generators and at different locations on the network
I7	The existing security standards may not adequately consider future limitations in fuel supply, renewable location diversity and storage duration in the SWIS.
I8	There is no obligation or guidance on establishing long term fault level forecasts required to confirm system facilities remain in secure operation. There is no requirement to confirm that the forecasts are being met operationally.
I10	There are different processes in the ENAC and WEM Rules for Western Power to procure and operate non-network solutions to provide locational services. Clarity should be provided by having one process to procure such services
I11	There is duplication and inconsistency in financial penalties for distribution outages.
I12	Additional clarity is required for how all PSSR mechanisms respond to customers that request different reliability standards.
I13	The existing GPS / Technical Rules governance mechanisms may not be defined in a way that is consistent or flexible enough to meet the pace of technology change or get best use from the flexibility in new technologies.
I14	There is not a consistent approach to the definition of Limit and Operating Margins. The Limit Margins (delivered by Western Power) are defined, the Operating Margins (delivered by AEMO) are not.
I15	Additional issues identified in the Western Power July 2023 Submission to the ERA that haven't otherwise been covered by another Consolidated Issue.

Discussion on remaining Identified Issues

Issue 2 – Lack of coordinated approach to forecasting.

Forecasts are required to support the application of many PSSR standards.

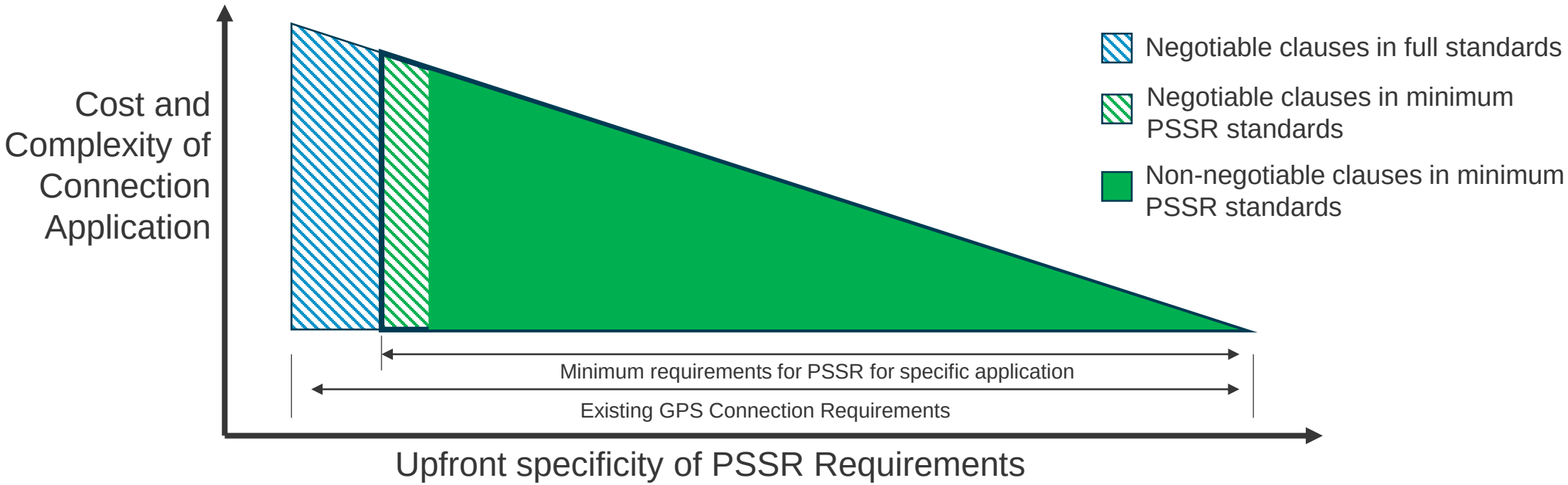
- The methodology and assumptions used in the forecasting process can have a material impact on PSSR and consumer cost outcomes.
- Multiple forecasts used for PSSR purposes with different inputs can cause confusion in the application of PSSR standards.
- Forecasting is used differently in the analysis of different PSSR standards.
- There is currently no coordinated approach to the application of forecasting methodologies or consistency in forecasting inputs (such as ambient conditions) as applied across the various PSSR standards.

Issue 2 – There is not a coordinated approach to the methodology and inputs used in forecasts required to apply the various PSSR standards.

Issue 4 – Application of GPS requirements

- There are differences between the Technical Rules and the WEMR A12
  - Some of these are clarifications of Technical Rules requirements
  - Others are new requirements, and it is not clear how they are applicable to many applications in the SWIS (i.e. Multiple fault ride through for transmission connected generators where it is unclear how such disturbances would be generated on the SWIS).
- The Technical Rules currently apply different standards to different technologies and sizes.
- The current WEM Rules approach is to require all applicants to confirm compliance with all requirements, even if the requirements are not necessary for PSSR for their connection location / application (for example the disturbance to be modelled is not credible in their location). If applicants do the studies and identify they do not meet the ideal requirement there is an option to negotiate. Negotiated outcomes are only accepted after WP/AEMO determine PSSR is not impacted, however all applicants must meet the minimum.
- Needing to do studies on every standard can result in result in generators having to do studies for standards that are not relevant to them, adding cost, complexity and time to the connection process.
- Consideration will need to be given to the way the GPS are applied as more classes of generators are bought under the WEM Rules, as not all standards will be relevant to all facilities.

Issue 4 – Application of GPS requirements



- Guidance will be required for situations when specified standards are not required for PSSR due to the specific nature of the connection e.g. network configuration at the connection location or generator size.

Issue 4 – There is an opportunity to consider the effectiveness and efficiency of the current GPS framework in how it applies the standards to different classes of generators and at different locations on the network

Issue 7 – Addressing Limitations on fuel, storage and renewable location diversity on supply security

- The retirement of coal will reduce diversity of traditional fuel sources to liquids and gas.
- There is limited diversity in the SWIS for:
  - Liquid Supply (Limited import (3 terminals) and transport capabilities).
  - Gas Supply (supply dominated by DBP).
- The introduction of more diverse renewable generation sites will in part mitigate the impact of fuel supply constraints. However, the geographic diversity of renewable energy generation will be limited by access to sufficient network capacity and suitable land.
- No clarity in the rules as to how the 0.0002% EUE requirement is to consider future fuel / storage duration / diversity of renewables limitations and impacts?

Issue 7 – The existing security standards may not adequately consider future limitations in fuel supply, renewable location diversity and storage duration in the SWIS.

Issue 8 – System Strength

The existing guidance for System Strength is in the Power System Security Procedure and Guidelines

> *Minimum plant short-circuit ratio where available from a vendor / Short Circuit Ratio of 3 / Voltage phase angle change of between 30/60% Voltage oscillations up to 0.5%peak-peak RMS voltage*

These requirements will retain a secure system and apply in different situations.

Short Circuit ratio is defined by System Strength.

$$\text{Short Circuit Ratio (SCR)} = \frac{\text{Fault Level (MVA)}}{\text{Max Active Power Output/Input}}$$

The unknown in this formulae is minimum **Fault Level.**

Fault Level is also required to calculate the other System Strength metrics above (in conjunction with Electro Magnetic Transient (EMT) models).

Western Power currently calculates and provides minimum fault levels for the design of all customer applications and for network element designs.

Issue 8 – What is system strength and how is it changing?

- **System strength** Is a measure of how resilient the voltage waveform is to disturbances such as those caused by a sudden change in Load or an Energy Producing System, the switching of a Network element, tapping of transformers and other types of faults (WEM Rules).
- **Synchronous units** provide strength naturally by virtue of their large spinning mass which produces a ‘heavy’ continuous sine wave, which remains available even during external disturbances to the system.
- **Non-synchronous units** (inverter-based resources) typically use electronics to match the system’s sine wave; however, without a ‘heavy’ signal to follow nearby – these units can be subject to oscillation, or interaction with each other.
- **Newer technologies** (like grid forming inverters), are less reliant on the system’s sine wave, These units can supply a ‘heavy signal’ but need to be specified to do so at a higher cost.
- **As existing synchronous units withdraw,** providing enough new sources of system strength is increasingly important for system security and allowing future renewables to connect.

Issue 8 – System Strength

All large customers design for ride through requirements at the minimum fault level provided by Western Power including:

- Large generators confirm SCR requirements with OEMs (some of these are now as low as 1).
- Western Power currently requires EMT Models for all large generators.
- Large load customers currently consider minimum fault levels (provided by Western Power) for design implementation of large variable speed drives.
- Western Power considers forecast minimum fault levels in the design of network elements.

However,

Western Power does not provide forecast minimum fault level in the context of reducing synchronous generation. There is no guidance in any rules on how such a forecasting may be done.

Issue 8 – System Strength

Treatment of FL Considerations under existing PSSR framework

Out of Scope

	Impact on generator / load ride through (security)	Impact on protection system operation	Impact on waveform	**Result**
Generators	Install technologies that can ride through prescribed events at the minimum forecast fault level provided	Design protection on their system to meet forecast Fault Levels (high and low)	Design and install technologies to maintain waveform within limits set by Western Power for Fault Level forecasts provided by Western Power.	Generator is designed and installed to ride through and provided required Power Quality at forecast Fault Levels.
Loads	Design to meet the requirements of the Fault Levels provided by Western Power (both high and low)	Design protection on their system to meet forecast Fault Levels (high and low)	WEM Rules for DSM and AEMO Load Shedding	Load operates correctly with the fault level available. Only a consideration for large loads a long way from generation sources
Western Power	**Forecast fault levels** Review / undertake studies to confirm generators ride through as required (purpose of EMT / PLS CADD studies)	Design protection to meet forecast Fault Levels (high and low)	WEM Rules	Fault Level Forecasts are accurate, and Protection operates to protect Western Power Equipment and people as practicable
AEMO	Review Western Power analysis for GPS	Review Western Power analysis for GPS	Review Western Power analysis for GPS	
Result	Generators ride through system disturbances as per TR Section 3 / GPS	All protection system operate in a coordinated manner to protect equipment and people as practicable	Harmonics are within the prescribed standards at all points of connection	

- The forecasting of fault levels is critical to the effective energy transition.

Issue 8 – System Strength

Long term forecasts of fault levels should include consideration that:

- The PowerFactory study will require assumptions on SWIS wide forecast generation dispatch. All assumptions should meet the requirements of the RoCoF standard, ESS requirements and Constraint Equations. It is likely the RoCoF standard will limit forecast dispatch options in a way that will create a floor to the minimum forecast fault levels.
- The operation of some network and customer elements require a minimum fault level that, under the existing regulatory framework, will require Western Power investment, or to procurement of NCESS, to resolve.
- The Whole of System Plan informs the likely generation mix, this coupled with GPS minimum requirements can be used to calculate fault level across the system.

There is no requirement to operationally monitor Fault Level and change dispatch should minimum forecasts not be met (although this may not be necessary if the floor is defined by the RoCoF or other ESS standard).

Issue 8 – There is no obligation or guidance on establishing long term fault level forecasts required to confirm system facilities remain in secure operation. There is no requirement to confirm that the forecasts are being met operationally.

Issue 10 - Unclear when Western Power should implement alternate options and when it can rely on constraint equations.

- Specific changes to the NQRS have been required to clarify when an NCS should be implemented for locational network services (Clause 13A-13C - 25 September 2018).
- Security constrained economic dispatch (SCED) provides a mechanism to modify dispatch of generation to meet locational requirements (network limits). Notwithstanding the SCED, generators continue to be dispatched out of the market solution for locational requirements on a short-term basis that deliver inefficient outcomes.
- In 2020, part 6A was added to the ENAC 2004 to clarify the process by which Western Power should procure “Alternate Options” when in competition to regulated network expenditure. In 2022, the NCESS drafting was incorporated into the WEMR. The 2020 drafting in the 6A of the ENAC does not contemplate the NCESS drafting in the WEMR.

Issue 10 – There are different processes in the ENAC and WEM Rules for Western Power to procure and operate non-network solutions to provide locational services. Clarity should be provided by having one process to procure such services

Issue 11 - There is no coordinated approach to financial penalties for distribution outages.

- The NQRS includes SAIDI, SAIFI and CAIDI and has financial penalties for outage duration and system notification. The AA5 separately has financial penalties for SAIDI, SAIFI and CAIDI. There is no coordinated approach to these penalty mechanisms across the separate instruments.

Issue 11 – There is duplication and inconsistency in financial penalties for distribution outages.

Issue 12 - Customers to negotiate or change their reliability standard.

- Customers can request non-reference service under the ENAC 2004 and Western Power has implemented this for larger customers where the cost of the required control systems can be warranted. Customers can participate in demand side management services with increasing participation by smaller customers through aggregators.
- The process of requesting different reliability service standard from network services and supply services is necessarily different under the current industry structure.
- When customers select different reliability standards, the connection to associated technical parameters is in some cases unclear. For example:
  - The Technical Rules do not fully reflect this customer option and the items that may be negotiable.
  - How will non-reference network services be reflected in the development of constraint equations if they are being used to improve market efficiency (deliver a net benefit) in place of direct network investment.
  - How do the UFLS settings change for customers getting a financial benefit from demand side management services?

Issue 12 – Additional clarity is required for how all PSSR mechanisms respond to customers that request different reliability standards.

Issue 13 - Governance of PSSR Standards including ability to respond flexibly to emerging technologies.

- The GPS and the Technical Rules are governed (process of implementing changes) under different mechanisms.
- Technology is evolving more quickly than the SWIS has previously experienced:
  - Example1 : System strength was a major issue for inverter connected generators 3 years ago but new “grid forming” inverters may not have the same restrictions.
  - Example 2: The largest quantity of generation under a single control response is now small inverters meeting AS 4777.
- The Technical Rules have struggled to keep up with the pace of change.
- Currently, the GPS Rules limit what they ask of generators because of what they have been able to provide in the past. However, newer generators may be able to provide additional services at no additional cost. Keeping these requirements up to date could negate the need to procure these services through the market.
  - For example, inverters are required to be programmed to respond with a behaviour similar to that of a synchronous generator, but that may not necessarily be a good thing for system security as the system changes.

Issue 13 – The existing GPS / Technical Rules governance mechanisms may not be defined in a way that is consistent or flexible enough to meet the pace of technology change or get best use from the flexibility in new technologies.

Issue 14 - Approach to Operating and Limit Margins.

- An inconsistency was identified in the industry transparency of the Limit and Operating Margins used in the SWIS.

Issue 14 – There is not a consistent approach to the definition of Limit and Operating Margins. The Limit Margins (delivered by Western Power) are defined, the Operating Margins (delivered by AEMO) are not.

Issue 15 - Capturing previous efforts.

- The following Issue seeks to capture any additional Issues previously identified by Western Power in their efforts to evolve the Technical Rules to better suite the current and future state of the SWIS.

Issue 15 – Additional Issues identified in the Western Power July 2023 Submission to the ERA that haven't otherwise been covered by another Consolidated Issue:

- Clarification of transmission voltage limits
- Distribution voltage limits can be clearer and align with wider limits adopted in other jurisdictions and AS 61000.3.100
- Standard for transient stability is technology specific (rotor angle) and need to be more clearly applicable to inverter technologies Standard for oscillations does not consider all forms of oscillation.
- Lack of clarity on assessing voltage stability (definition of Adequately Damped in the WEMR is broken).
- RRST may no longer be able to be designed to meet the NCR criteria.
- Definition of plant ratings to adopt cyclic or short term ratings.
- Duration of protection equipment being taken out of service.
- Definition of equipment for which CFCTs apply.
- Weak infeed assessments under islanding conditions.
- Distinction between transmission and distribution protection operation for CFCT.
- Presentation of protection and disturbance ride through requirements.
- Section 5 of Technical Rules needs to align with WEM Rules operational governance requirements.
- Wording of voltage control can be improved.

Agreement on Stage 2 package

The PSSR Analysis workbook

- The *PSSR Analysis workbook* details the existing standards from Stage 1 of the review, the findings from the Stage 2 analysis and mapping of these findings to a set of consolidated Issues for resolution in the Stage 3 Options Assessment.

The Consolidated Issues List

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