STAKEHOLDER RESPONSES – INTERIM MODELLING PROCEDURE V1.0

Item	Section	Submission	Stakeholder Comment	ISO Response
1.	General	Woodside	Power System model development, assessment, and maintenance are essential for the network connection process, often involving significant time and cost, especially for Access Seekers or Participants who are required to cover the Network Service Provider (NSP) and Pilbara Independent System Operator (ISO) Power System modelling expenses. Woodside has concerns about the time, cost, and efficiency of the assessment criteria and process. Accordingly, feedback is provided in this submission to assist in refining the Interim Power System Modelling Procedure (Procedure) for all stakeholders involved in the Pilbara electricity market. Woodside's comments focus on clarifying and Improving processes related to model validation, exemptions, provision of Electromagnetic Transients (EMI) models, and other Issues that Access Seekers or Participants in the NWIS may encounter. Woodside appreciates the opportunity to provide feedback on the Interim Power System Modelling Procedure (Procedure) which came into effect on 2 October 2023. As a potential new entrant into the Pilbara electricity market, Woodside supports the development of this Procedure and the further clarity it provides regarding power system modelling requirements. Woodside is of the view that the Procedure requires some amendment to clarify aspects of the modelling requirements and the overall process for providing and updating Power System models. It is therefore submitted that the procedure would benefit by providing further clarity for an Access Seeker on the development and updating of models, especially for Power System strength impact assessments. Additionally, the Power System model validation Process and Exemption Process could be enhanced further for the Access seeker and participant without compromising on Power System safety, security, and reliability requirements.	Noted

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2.	General	Horizon Power	Compliance monitoring program not included in this document, will it be included here or in future documents?	The Compliance Procedure has been published.
3.	3.2.1	Woodside	Update of model Clause 3.2.1(I) of the Procedure requires the NSP to update their network wide model prior to sharing with the ISO each year. Clause 118(2) of the Rules requires the controller to notify the NSP of any material change to a generation facility or consumer facility. Issue The Procedure does not address situation whether generators must submit the model for annual review if there are no changes. Additionally, the definition of material changes and the Process to communicate upgrades or replacements are not discussed in this procedure. It is to note that Rule 118.5 states that the power system modelling procedure may specify thresholds, requirements, and procedures for reporting to the ISO. Section 4.4.43(g) of the Procedure notes that the DIgSILENT Power Factory model must match the version currently used by ISO. It is possible that the version used by ISO, NSP and the Access Seeker might be different, resulting in additional cost and time to the Access Seeker to ensure their model Integrate with the NWIS model. A possible approach The Procedure should be updated to specify thresholds, requirements, and procedures for reporting to ISO as noted In clause 118.5 of the Rule. Additionally, the Procedure should provide examples of the 'material' changes for several types of generation to make it clearer when models need to be updated. ISO should provide guidance on what DIgSILENT Power Factory version the models are to be submitted, how frequently DIgSILENT Power Factory Versions are expected to change and how participants are expected to update their models.	New paragraph 4.3.2 Most material changes are captured by the Access and Connection Procedure, the regular updates of the model will capture all smaller load growth and changes.
4.	3.3.1 (c)	Horizon Power	Does this clause require protection systems to be modelled on NSPs circuits? (i.e. VTs, CTs, relays, CBs)	Note added below paragraph 3.3.1 (e)
5.	4.2	Woodside	Simplified Process Issue	New paragraph 4.1.2

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			There are several processes that is required to be followed by the Access Seeker, ISO and NSP. A possible approach To address the complexity, a unified and-to-end flowchart should be developed and included In the procedure. This flowchart should combine the standard Power System Modelling stages with CPC Modelling requirements, and clearly outline the process for new proponents to connect to the NWIS (Northwest Interconnected System). Time constraints and expectations across the Access Seeker, NSP & ISO should also be Included In the flowchart. Currently, a flowchart exists for CPC Application under the Interim Access and Connection Procedure, but one does not exist for Power System Modelling stages. By providing a clear and unified flowchart, Access Seeker will have a better understanding of the scope of the project, leading to better resource planning and cost certainty.	
6.	4.2.1 Stage 1	Horizon Power	NSP's may requests for a model from access seekers to perform studies. Can this be changed to 'the provision of a power...'	Paragraph 4.2.1 covers responsibilities of access seekers as well as NSPs, further detail is provided in the Access and Connection Procedure as referenced in paragraph 4.2.2.
7.	4.2.1 Stage 1	Pacific Energy	**4.2.1 Stage 1** – Regarding the Interim Access and Connection Process, PE seeks further clarification as to the purpose and process of Stage 1. Having stepped through the connection process recently, it is our expectation that only Stage 2, and Stage 3 have a specific alignment with Horizon Power's (HP) Power System Modelling Guideline phases (through the R0 and R1/2 phases). It is our understanding therefore, that only from Stage 2 and beyond could we formally engage with HP. We would like to request clarification from Pilbara ISOco regarding the method of interaction with both Pilbara ISOco and HP connection teams and further clarification regarding the purpose of Stage 1.	Stage 1 provides the Host NSP with the model at no cost from ISO for feasibility study purposes. The Host NSP may also request due diligence from the ISO including stakeholder engagement recommendations. This is covered in section 3.1 of the Access and Connection Procedure. Sentence added to paragraph 4.2.1 for clarity.
8.	4.2.1 Stage 3	APA	Section 4.2 of the Procedure sets out a phased approach for the modelling requirements associated with power system modelling in the NWIS. At Stage 3 of the phased approach are the connection stage models (R1 and R2 models). R1 models (as built models), include as built design data and are followed by the site validated model (R2 model). The Procedure states that the R2 model is a pre-requisite of project energisation enabling normal dispatch to the grid.	Refer to Access and Connection Procedure for the process.

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			The current drafting of stage 3 in section 4.2.1 of the Procedure is not clear. APA propose that the drafting in the final sentence of section 4.2.1: "The validated model is a pre-requisite of project energisation enabling normal dispatch to the grid" be replaced with: "The R1 model is a pre-requisite of project energisation and the R2 model is a prerequisite of commercial operations after being connected and energised." APA recommends this update is also reflected in the Access and Connection Procedure for consistency.	
9.	4.2.1 Stage 3	Pacific Energy	**4.2.1 Stage 3** – We believe the term normal dispatch is ambiguous in nature especially as partial commercial operations can be achieved at different power levels (albeit below the registered nameplate) throughout incremental hold point testing. As a result, we would like to request clarification in the wording about how the term "normal dispatch" relates to the plant capacity defined during the connection study. Moreover, we would request the use of terms such as "full nameplate operations" or "full operation control within the agreed project nameplate" etc as we believe this will reduce ambiguity.	Refer to Access and Connection Procedure for the process.
10.	4.3.2 EMT Requirements	Pacific Energy	**4.3.2 EMT Requirements** – The current wording regarding thresholds for EMT model triggering is vague and leads to risk and uncertainty for proponents considering renewable plant applications. We request that greater clarification around the specific numerical thresholds for SCR or grid impact are provided so that proponents will understand up front when an EMT study is and isn't required. Furthermore, using the NEM case as a reference preliminary impact assessments (PIA) are typically provided conducted at connection enquiry stage to address this uncertainty. The PIAs typically stipulate the requirements for EMT studies as well as provide transparency upfront to new proponents on the system strength. It is recommended from a connection process that the use of PIA's should also be considered within the Pilbara ISOco network zone.	Updated paragraph 4.3.2 (now 4.3.3)
11.	4.3.2	Woodside	**Provision of EMT models** Clause 4.3.2 of the Procedure discusses the EMT model requirements for generation projects and load facilities. <u>Issue</u> According to Procedure 4.3.2, the ISO can request EMT models on a project-by-project basis. However, it would be helpful If the	Updated paragraph 4.3.2 (now 4.3.3)

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			ISO could further clarify the circumstances under which an EMT model Is required. EMT modelling includes significantly higher levels of details generally resulting in a higher computational burden. There are some specific concerns regarding clause 4.3.2 that should be addressed as follows: • Generators during the connection application stage It is important to know the precise requirements for the models that are needed for system strength assessment as it can affect both the design and vendor selection process. While clause 4.3.2 of the Procedure suggest EMT models may be required depending on the SCR(Short Circuit Ratio) at the point of connection, the Procedure is unclear regarding the SCR that would require provision of these models. • Existing Network participants When there are system strength issues, guidance is needed on how to manage generators, load facilities and other plant equipment such as Variable Speed Drives (VSD) that have previously provided adequate Root Mean Square (RMS) models and other relevant information during the connection process. Is there a provision for them to be exempt from EMT model submission if the system had adequate system strength at the time of the connection application? • Future connections on the NWIS If a new connection impacts system strength issues, it is important to clarify how those new connections will be managed relative to existing facilities. • System strength impact assessment and response time It is vital to have a clear timeframe for an Access Seeker or a participant to respond to situations when there are system strength issues. We suggest the Procedure specify indicative timelines for the completion of any system strength assessment by the NSP and the ISO. • Clarity in the extent of modelling required when a change is made to a generation facility. It is unclear on the extent of modifications that can necessitate updating the modelling requirements. The Procedure needs to specify the extent of modelling required in these circumstances. A possible approach The Procedure should provide a clear indication of what qualifies as a low SCR at the point of connection and the technologies that might trigger the need for an EMT model. The Procedure should clearly define an exemption process for existing generators that are already connected to the system and have a high SCR at the point of connection. Updating the impact assessment process	

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			with indicative time frame would assist all stakeholders to work efficiently and effectively.	
12.	4.4.3d	Horizon Power	"…When these preconfigured system conditions are beyond plant operational limits or otherwise not consistent with valid operating conditions for the plant, the model must warn the user by way of a message to the progress output device.". Is this referring to sending a warning to the PowerFactory output window's Warning messages? Would like to understand how this warning is intended to be signalled for steady-state studies.	Removed paragraph 4.4.3d
13.	4.4.3f	Horizon Power	There are multiple IEC standards i.e. IEC 60909, 61363, for avoidance of doubt we can clarify here that the intention is to be able to use the IEC 60909 method.	Updated paragraph 4.4.3e (now 4.4.4e)
14.	4.4.4	Woodside	**Hierarchy of various documents** ISO to advise the hierarchy of this Procedure over the Horizon Power's power system modelling guidelines. Issue • Timeframes for simulation Clause 4.4.4 (a) of the procedure states that 'The model must Include all functional controllers and ancillary equipment that materially affect the performance of the equipment over the typical timeframes of a dynamic simulation (up to several minutes), and accurately represent the performance for all possible conditions where the equipment would be in operation.' The Horizon Power Guidelines 3.3.2 (IBR-10) states models to include controllers and other equipment which affects the response over 30 seconds of simulation time. It Is not clear whether models should be developed to meet the 30 second requirement or the up to several minutes requirement. • Unbalanced system conditions Clause 4.4.4 (g) of the Procedure states that 'The dynamic model must be suitable for RMS studies at the project specific short circuit levels at the point of connection and should accurately represent the equipment response during and after a system event. This includes active and reactive current injection during a system fault or system frequency excursion. This performance must be achieved under a balanced and unbalanced system condition.' This is Identical to Horizon Power Guidelines A-8 and A-9 except for the requirement to accurately represent the equipment response for active and reactive current Injections under unbalanced system conditions - Horizon Power Guideline A-	ISO Procedures have authority.

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			9 says it is 'highly desirable' (but not a strict requirement) for the model to achieve this level of accuracy. The response of Inverter-based loads (LCI drives) and future battery energy storage systems (BESS) and solar farms to unbalanced faults can be a cause for concern. This is because some OEM Power Factory models may not be configured to provide an accurate RMS response during unbalanced faults, which Is covered In the Power System Computer Aided Design (PSCAD) EMT model. A possible approach The ISO to provide hierarchy of this Procedure over other documents and consider updating this procedure to avoid any ambiguity. The ISO shall also consider the cost and schedule implications of these requirements on the Access Seeker and balance it in achieving Power system safety and security.	
15.	4.4.4 (g) Active/reactive Current Injection Requirements	Pacific Energy	**4.4.4 (g) Active/reactive Current Injection Requirements** – Regarding the performance of Voltage/Frequency fault ride through, there is a need for a definition of the point at which current injection begins and additional details regarding the expectation of current injection methodology. Additionally, further guidelines are necessary for positive/negative sequence current injection requirements during both balanced and unbalanced conditions. Finally, it is necessary to provide a clearer definition of the term "absorption" in the case of HVRT for the removal of doubt.	Paragraph 4.4.4g (now 4.4.5f) details requirement for development of the model. Further guidance can be received from HTR 3.3.3.1 - 3.3.3.3
16.	4.4.4 (k) DSL Model Compilation to C Code	Pacific Energy	**4.4.4 (k) DSL Model Compilation to C Code** – Given the nature of DSL code, automatic or direct compilation to C code is not always feasible for several reasons. In certain circumstances, HP have indicated that an exemption or alternative source code options can be made possible. We recommend using a similar approach here and would request such wording to be added to the modelling procedure document. This would result in greater consistency of the process and also provides greater flexibility when dealing with OEM source code providers.	Removed paragraph 4.4.4k
17.	4.4.5g	Horizon Power	Typo?	Updated paragraph 4.4.7g
18.	4.5.1	Horizon Power	How does ISO intend to capture the modelling of generators which have motoring capability (i.e. to support low-load conditions)? Is it preferred to have an explicitly modelled representation of	NSP's may opt to model a generator as out of service and instead as a load in the low load scenario with a text box and description in the network user guide.

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			the generator in motoring mode, separate to the representation of the generator?	
19.	4.5.2b	Horizon Power	How does ISO intend to capture the operational limitations of STGs based on the number / output of coupled CCGTs online?	Updated paragraph 3.2.1l
20.	4.5.2d	Horizon Power	Can more clarity be provided for the "site maximum"? Eg. the site maximum as specified by the NSP (or a default max value where not provided)? Additionally, temperature dependency may be any piece of equipment imposing a technical limit on the generating unit, not just the generator itself.	Updated paragraph 4.5.2d
21.	4.5.2d	Horizon Power	Just want to clarify the 35°C specification for synchronous generators while IBR are to be modelled at site maximum ambient (typically ~50°C in the Pilbara).	Updated paragraph 4.5.2d
22.	5.1.2 (c) Model Accuracy	Pacific Energy	**5.1.2 (c) Model Accuracy** – From our point of view, the currently used wording regarding model accuracy presents some ambiguity. Firstly, the current wording does not specify what constitutes an acceptable deviation to model accuracy. Furthermore, we recommend the document also includes details on to measure the total change in quantity. Finally, it needs to clarify the extent to which deviations are compliant with both normal steady-state and transient response.	Paragraph 5.1.2(c) details the accuracy required to be 10%
23.	5.2.3	Woodside	**Model validation process** Section 5.2.3 discusses the development of Schedule of tests for performance verification and model validation process. <u>Issue</u> Though this Procedure identifies the key stakeholders and the need for performance verification and model validation, it does not provide clarity on the time frames and sequence of stakeholder involvement in the development of the schedule of tests. The Technical Rules have two sets of test requirements: Compulsory tests and Special Tests. The Special Tests are requested at the discretion of the NSP and the ISO. There is no guidance on how these Special Tests are requested and the objectives of the Special Tests. Section 5.3.1.b discusses the risk caused by the Schedule of Tests on the power system security and stability to other network users. This section does not make consideration for the risks imposed on the facility under test. It is unclear:	New paragraph 5.2.3

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			• The process and timeframe to be followed to define Schedule of Tests to be undertaken, • What is the role of the NSP, the ISO and the Access Seeker during these tests, and • Number of iterations, possible tests and schedule. A possible approach It is recommended that consideration be given to: • Defining the scope of the Schedule of Tests on a balanced risk-based approach to the network, its users and the Access Seeker's facility. • Defining a streamlined process with indicative timeframes, roles, and responsibilities for developing, reviewing, and approving the test plan. • Clarifying the intent and qualifying requirements for special tests. • The risks imposed on the facility under test. The performance verification and model validation process should consider the Access Seekers risk during development of the Schedule of Tests and in conducting the tests, with the aim of ensuring benefit gained are proportionate to the risk incurred In undertaking the proposed tests.	
24.	5.3.1 NSP Witness Requirements	Pacific Energy	**5.3.1 NSP Witness Requirements** – We request that this wording is changed to the following: "registered NSP should be invited to witness performance testing", To allow for greater flexibility when witnessing is not feasible or practical due to possible timing and logistical constraints within a specific project.	Updated paragraph 5.3.1
25.	5.3	Horizon Power	If NSP witness testing is mandatory, I'd suggest changing this to "the NSP must" or "the NSP shall".	Updated paragraph 5.3.1
26.	8.1	Woodside	**Exemption Process** The Procedure is structured to include a Chapter on "8: Special Circumstances", but It does not provide detailed information. It is assumed that Special Circumstances considers Exemptions noted In the Rules. Issue Subchapter 3.1 and 3.4 of the Rules note that the ISO Is responsible for administrating the exemption regime and maintaining an exemption register. The Procedure does not address the handling of any exemptions related to non-compliance of the Rules. It also does not allow for any negotiations on modelling complex equipment especially in cases where a model can only be developed by the equipment's original	The ISO's exemption function is outlined in Chapter 3 of the Rules. There is no head of power for the ISO to make a Procedure which deals with Chapter 3 exemptions, rather the ISO must prescriptively follow the process set out in the Rules. The ISO notes that some flexibility is required under this Procedure and has included Paragraph 5.5.3

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			equipment manufacturer (OEM). <u>A possible approach</u> The Procedure should cascade from the Rules and discuss: (a) Grounds on which an exemption can be granted. (b) How negotiations to modelling requirements will be handled. (c) How to apply for exemption. (d) ISO and NSPs steps following receiving an exemption application. (e) Indicative timeframes associated with the above steps. (f) The Procedure should also extend to discuss its applicability regarding the Connection Point Compliance (CPC) applications and how Compliance Monitoring Plans can be used to replace or supersede requirements imposed in the Power System Modelling Procedure.	
27.	Appendix B Generators including IBRs & BESS <10 MW Steady State Data & Dynamic Models	Horizon Power	Clarity required. System models load/gen is aggregated at the substation level. There is 22kV and 33kV for the NWIS. what is the expectation here?	Updated paragraph
28.	Appendix B Generators including IBRs & BESS <10 MW Steady State Data & Dynamic Models	Horizon Power	clarity required - the next column shows reduced order ? and in this is full and unencrypted?	Headings of table in Appendix B updated
29.	Appendix B Generators including IBRs & BESS <10 MW Dynamic Models	Horizon Power	clarity required on the minimum and the connection type of generators. For example 60s bumpless? backup (not interconnected), parallel.	Footnotes added to Appendix B
30.	General	Woodside	In summary, Woodside has provided feedback on the Interim Power System Modelling Procedure, highlighting the need for clarification on various aspects of the Procedure. These Include providing clearer guidance on the requirement for EMT models, how to manage generators and load facilities in cases of system strength issues, and the model validation process. Woodside also	Noted

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			recommends the need for a defined exemption process and a unified and end-to-end flow chart for better understanding of the project scope. Overall, Woodside supports the development of the Procedure but suggests amendments to further clarify requirements and processes.	

ISO INITIATED CHANGES – MODELLING PROCEDURE V1.0

Item	Section	Initiated by	Comment	Change
1	N/A	ISO	Standardisation across all of ISO's Procedures.	Updated wording, structure and formatting to standardise across all of ISO's Procedures.
2	1.2	ISO	Define the reduced order model and full model.	Table 1 updated with additional definitions.
3	General	ISO	Clarify the definitions of network model and power system model.	Procedure updated to reflect the definitions in PNR.
4	3.2.1 (g)	ISO	Clarify if the issues register will be published.	Updated paragraph 3.2.1 (h)
5	3.3.1	ISO	ISO may provide unvalidated other version on the model / a subset of the model on request which cannot be relied upon for access and connection purposes	New paragraphs 3.3.1 b and 3.3.1 c
6	4.2.1 Stage 2	ISO	Clarify that the last sentence should end with "Connection Assessment stage".	Connection application updated to connection assessment.
7	4.4.2	ISO	Clarify which assessment this is referred to.	Updated paragraph 4.4.3
8	4.4.3	ISO	Note that when applicants return a model it is to be using a variation.	New paragraph 4.4.3
9	3.2.1k	ISO	All NSPs are responsible of providing a model representing the normal operation of their system – including switching.	New paragraph 3.2.1l
10	4.4.3	ISO	Naming conventions i.e. no use of line1 line 2 etc	Updated paragraph 4.4.5a
11	4.4.3 a	ISO	Replace "schematics" with "project data". Schematics refer to detailed design drawings used for construction but not modelling.	Updated paragraph 4.4.4a
12	4.4.3 g	ISO	Change "match" to "compatible with"	Updated paragraph 4.3.2
13	4.4.4 b	ISO	Change min step size to 2ms	Updated paragraph 4.4.5b
14	4.4.4 f	ISO	Suggest to clearly split out model performance requirements from model functional requirements, for improved navigation and readability.	Removed paragraph 4.4.4f

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15	4.5	ISO	Add minimum requirements for lines and transformers.	New paragraphs 4.5.6 & 4.5.7
16	5.2	ISO	NSP confirmation of model validation.	New paragraph 5.2.3