IBR Plant Model Development: Developer/OEM/ERCOT Interactions and Gaps

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ERCOT IBRWG

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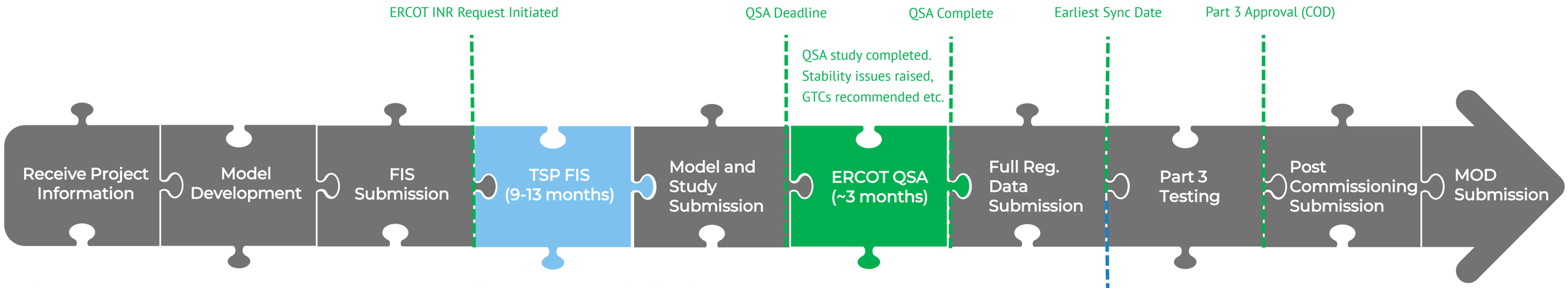
IBR Plant Development Process

Model development and submission is a long iterative process (up to 3 years). There are multiple stages throughout the process where the results of various studies, i.e. design, FIS, SSR, etc. and OEM selection can result in the need to update models.



BOP Design Data
OEM Model Data (IBR and PPC)

PSS/E Equivalent and Detailed Model

RIOO Submission
PSSE MQT

TSP completes FIS in 9-13 months
Within 3-4 months SS is completed and notification of SSR study is provided

TSAT MQT
PSCAD MQT
Model benchmarking (PSSE/TSAT/PSCAD)
Reactive Power Study

Project IFC Data

Part 3 testing Submissions
PGRR-109 submissions (if approved)

Within 30 days of COD
PVR
MQT

TSP completes SSR study

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IBR Plant Development Challenges

The request for information and review can be a time-consuming process. This is where critical assumptions are sometimes made that can have significant impacts on projects and could lead to need to restudy during the interconnection process or even further down the road during commissioning.

BOP Design Data
OEM Model Data (IBR and PPC)

OEM Challenges

- **Generator/PPC Models**
  - Depending on requirements within a region, dynamic and transient models may take extended time to provide due to availability of necessary controls

Developer Challenges

- **BOP Design**
  - Typically, very preliminary and subject to change leading to assumptions
  - Inverter selection is still being negotiated and finalized
  - PPC is most of the time not even in the discussion at this point

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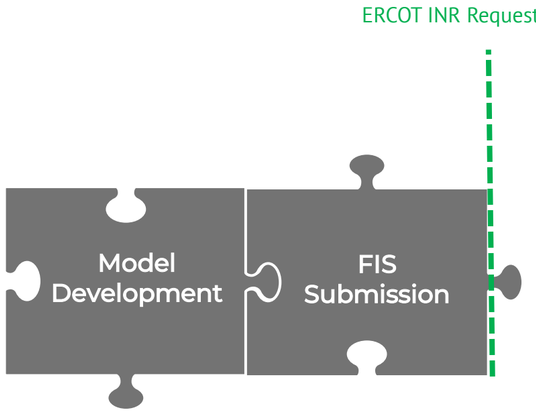
IBR Plant Development Challenges

The assumptions made during model development are critical and understanding equipment/controls are needed before moving to full model testing and benchmarking.



OEM Challenges

- **Dynamic/Transient Model (PSSE/TSAT/PSCAD) and MQT**
  - UDM vs GM
  - Default and hidden control parameters
  - Transient initialization (P and Q)
  - Minimal to no documentation related to MQT
  - VRT response concerns
  - Default protection settings
  - IBR OEMs provide PPC model even though it is not available or typically installed
  - No clarity on integrating external PPC
  - Use of Generic PPC
  - Hybrid PPCs

Developer Challenges

- **Steady State Model (PSSE)**
  - MPT sizing and OLTC control
  - Need for additional reactive devices
  - Quantity of IBRs and OEM selection

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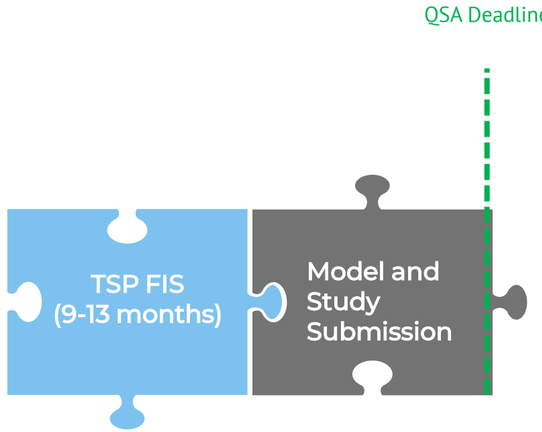
IBR Plant Development Challenges

At this stage, the TSP/ISO begins to get involved. Through discussions with them we begin to gain even more clarity surrounding the performance of the models.



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TSAT MQT
PSCAD MQT
Model benchmarking (PSSE/TSAT/PSCAD)
Reactive Power Study

OEM Challenges

- **MQT and Benchmarking**
  - IBR OEMs do not have TSAT UDM
  - PPC OEMs do not have PSSE/TSAT UDM
  - PSCAD model is not aligned with PSSE/TSAT model
  - Performance concerns meeting requirements

TSP Challenges

- **FIS Study**
  - Model doesn't pass VRT
  - Time to resolve model issue for VRT

Developer Challenges

- **FIS Study**
  - Visibility to any stability issues
- **MQT and Benchmarking**
  - Design changes from reactive power study
  - MQT results reviewed by ERCOT

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IBR Plant Development Challenges

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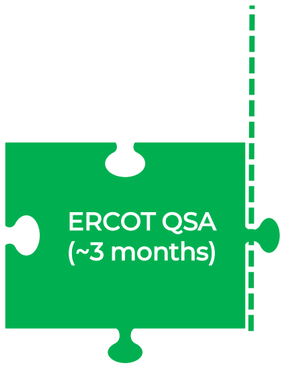
QSA Complete



QSA study completed. Stability issues raised, GTCs recommended etc.

ERCOT Challenges

- **QSA Study**
  - Accurate models
  - Many study scenarios
  - More detailed assessment (PSCAD) may be necessary

Developer Challenges

- **QSA Study**
  - Visibility to any stability issues or GTCs that result from the study
  - Results could drive changes to models

OEM Challenges

- **QSA Study**
  - Existing hardware may not be able to resolve any stability issues

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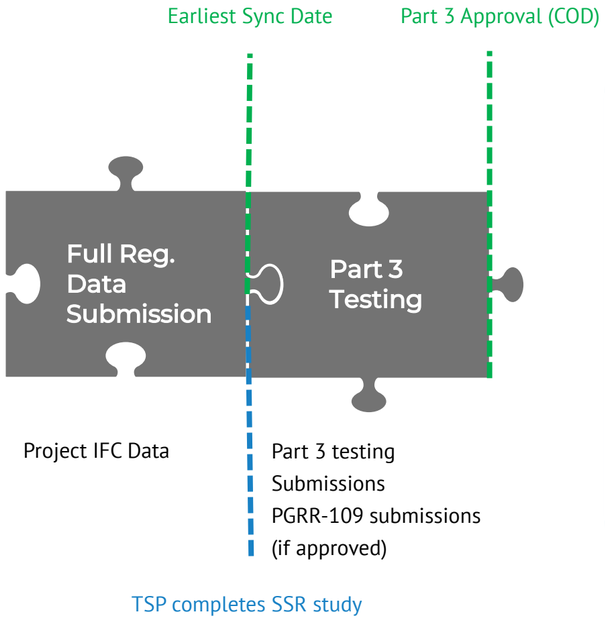
IBR Plant Development Challenges

At this stage, the project design is being finalized and the SSR study is being completed and Part 3 testing is being completed. This is where all final parameters are being set and tested and thus an important phase of the model development



TSP Challenges

- **SSR Study**
  - Accurate models (new and old)
  - Ability to provide representable system models to Developer/OEM for testing/tuning

OEM Challenges

- **SSR Study**
  - Ability to test and tune due to lack of PSCAD models provided
  - Performance sacrifices based on SSR control mitigation
- **Part 3 Testing**
  - IBR and PPC parameters may change
- **PGRR-109 (upon approval)**
  - Commissioned settings not matching QSA/FIS settings

Developer Challenges

- **Project IFC Data**
  - Completion of design impact models
- **SSR Study**
  - Results may impact model parameters
- **Part 3 Testing**
  - Results may impact model parameters

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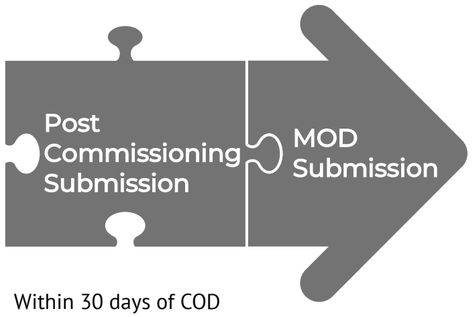
IBR Plant Development Challenges

Finally in post commissioning, all as-left settings for all controls and protections are being evaluated and reflected into the models for submission. Additionally MOD studies will be completed at some point within the next 12 months.



Within 30 days of COD
Parameter Verification Report
Model Quality Test

OEM Challenges

- **PVR**
  - Commissioned settings do not match FIS/QSA
  - PPC changed during commissioning and models not readily available

Developer Challenges

- **PVR**
  - OEM does not provide report
- **MQT and Benchmarking**
  - Due to parameter changes from SSR study, Commissioning and/or Part 3 Testing, model may not pass MQT

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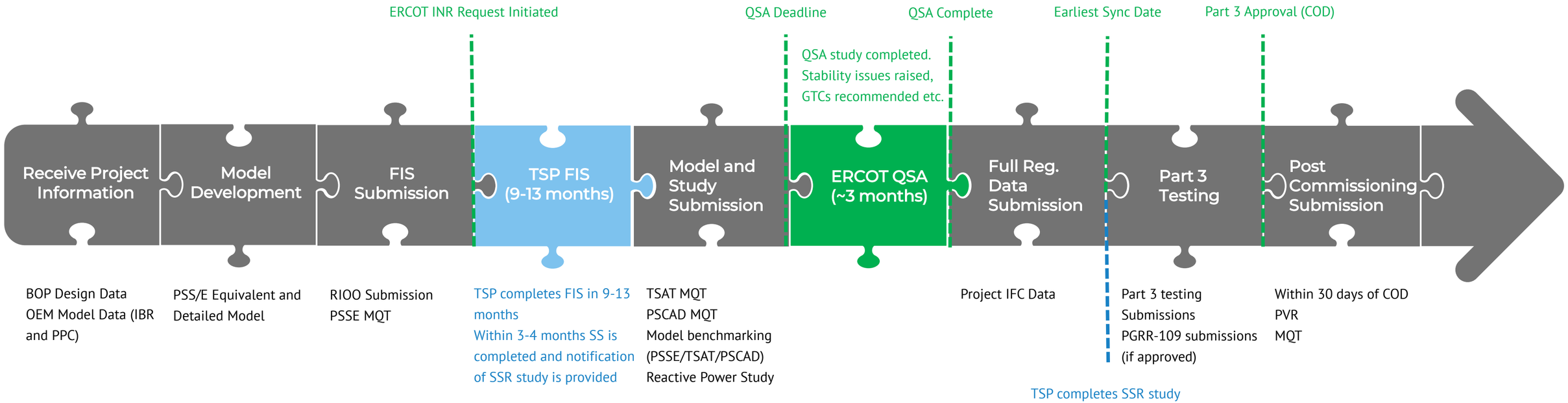
Final Thoughts

- **Get started early in the OEM selection phase (IBR and PPC)**
- **OEMs to continue to provide feedback and documentation on requirements**
- **Encourage to share more about stability related issues with OEMs/Developers**
- **Communicate**



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Thank You

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