AI Qualification Protocol Development

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AI Qualification Protocol Driver

- Objective
  - Develop a protocol under the ASME Section XI, Appendix VIII qualification program at EPRI to perform future qualifications of AI or AI assisted procedures / techniques for:
    - Detection of flaws
    - Characterization of flaws (e.g. orientation, surface connected / embedded, volumetric / planar)
    - Sizing of flaws (length sizing or thru-wall sizing)

Current use cases focus on detection but progression to characterization and sizing seems possible
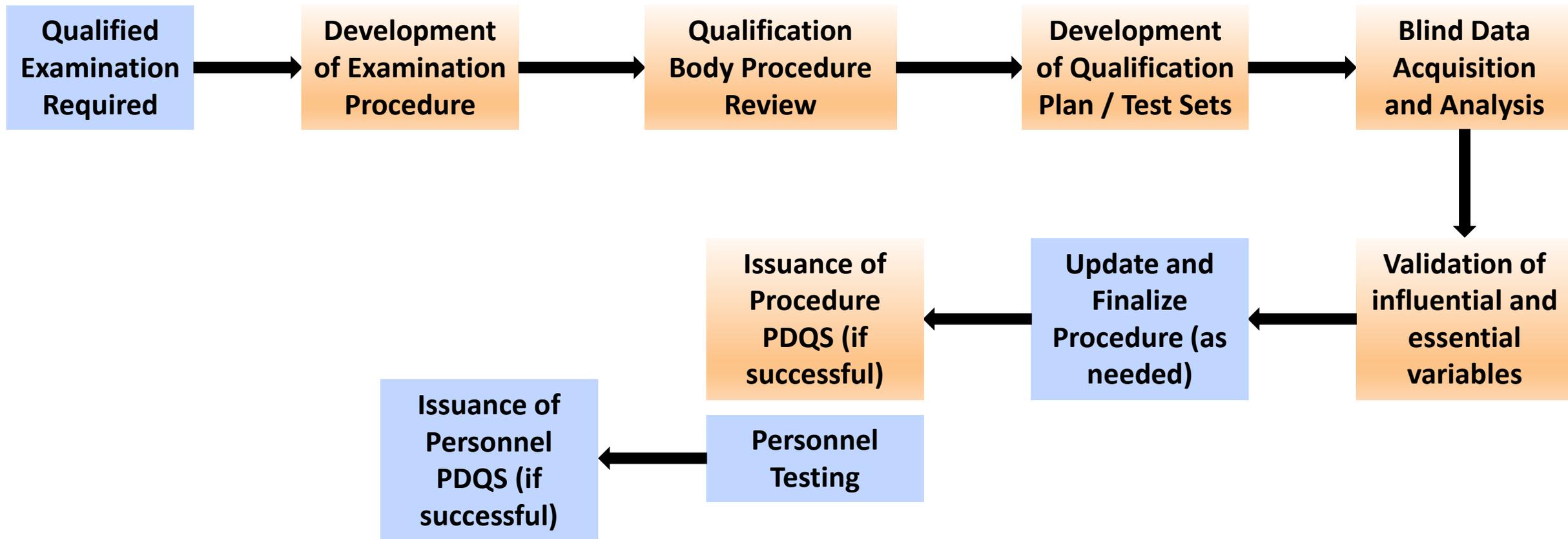
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AI Qualification Use Cases Considered

- **AI as Secondary Analysis**
  - Primary analysis still carried out under the standard human based process
  - AI used as confirmatory or contradictory result in a qualified manner as part of the qualified examination
    - RVUHP Supplement 15 examinations
- **AI as an Assisted Primary Analysis**
  - Primary initial analysis (data screening) is performed by AI
  - Humans only review areas flagged by AI for further investigation
  - All non-flagged data "cleared" and no human analysis performed

Not Considered – Fully Autonomous Analysis with AI – Code Changes Required
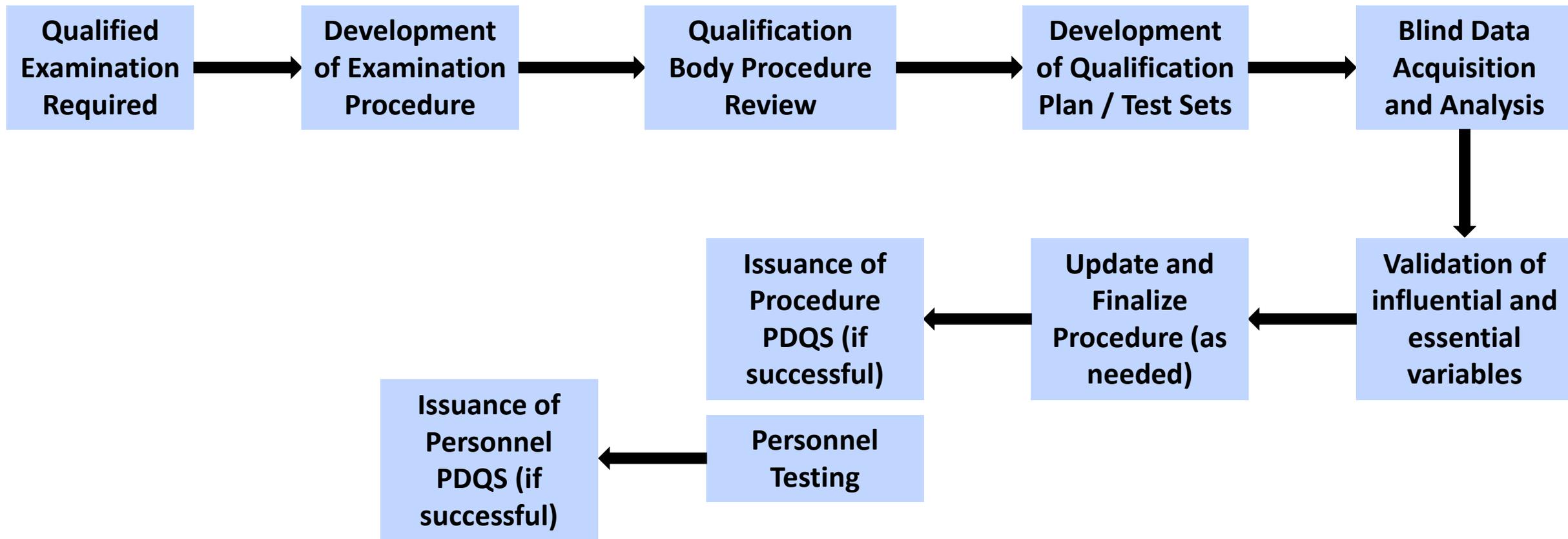
Simplified "standard" ASME Section XI, Appendix VIII qualification process

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Qualified            Development of       Qualification        Development of        Blind Data
Examination    →     Examination     →    Body Procedure  →    Qualification    →    Acquisition
Required             Procedure            Review               Plan / Test Sets      and Analysis
                                                                                          ↓
Issuance of          Update and                                                     Validation of
Procedure       ←    Finalize        ←───────────────────────────────────────────  influential and
PDQS (if             Procedure (as                                                  essential
successful)          needed)                                                        variables
    ↑
Issuance of          Personnel
Personnel       ←    Testing
PDQS (if
successful)
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AI/ML Affected Areas

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Key Take-Aways

- AI/ML will require qualification changes depending on the use case defined the applicable procedure
  - ASME Section XI, Appendix VIII rules will not change
  - How a procedure is required to demonstrate meeting those rules may change based on the selected use case
- The majority of the change will be up front with the examination procedure preparation
  - Ensuring the AI/ML process is well defined and includes all essential steps and processes
  - The development of the qualification plan by the qualification body will be vital to ensure the qualification can meet all of the requirements with the appropriate level of objective evidence
- Model validation and lock down at the completion of a successful qualification will be a key factor in issuing a qualification for a given procedure / technique (e.g. version control)
- One major change that requires additional investigation is the ability to create a benchmark set of flaws / specimens that future revisions of the model can be applied to for validation and qualification of model revisions that are efficient and effective for industry implementation

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Summary

- EPRI's current ASME Section XI, Appendix VIII process is suitable for qualification of AI/ML models that can be trained and locked down (non-continuous learning models).

- Additional guidance through an instruction (QPI) for the PDA will be completed to provide guidance on qualification planning to ensure all aspects are properly considered.

  - QPI planned for Q2 2026

- Re-qualification of updated models requires additional investigation to determine if a benchmark (re)qualification set is possible. The requirements for this are under consideration and will be included in the protocol / instruction.

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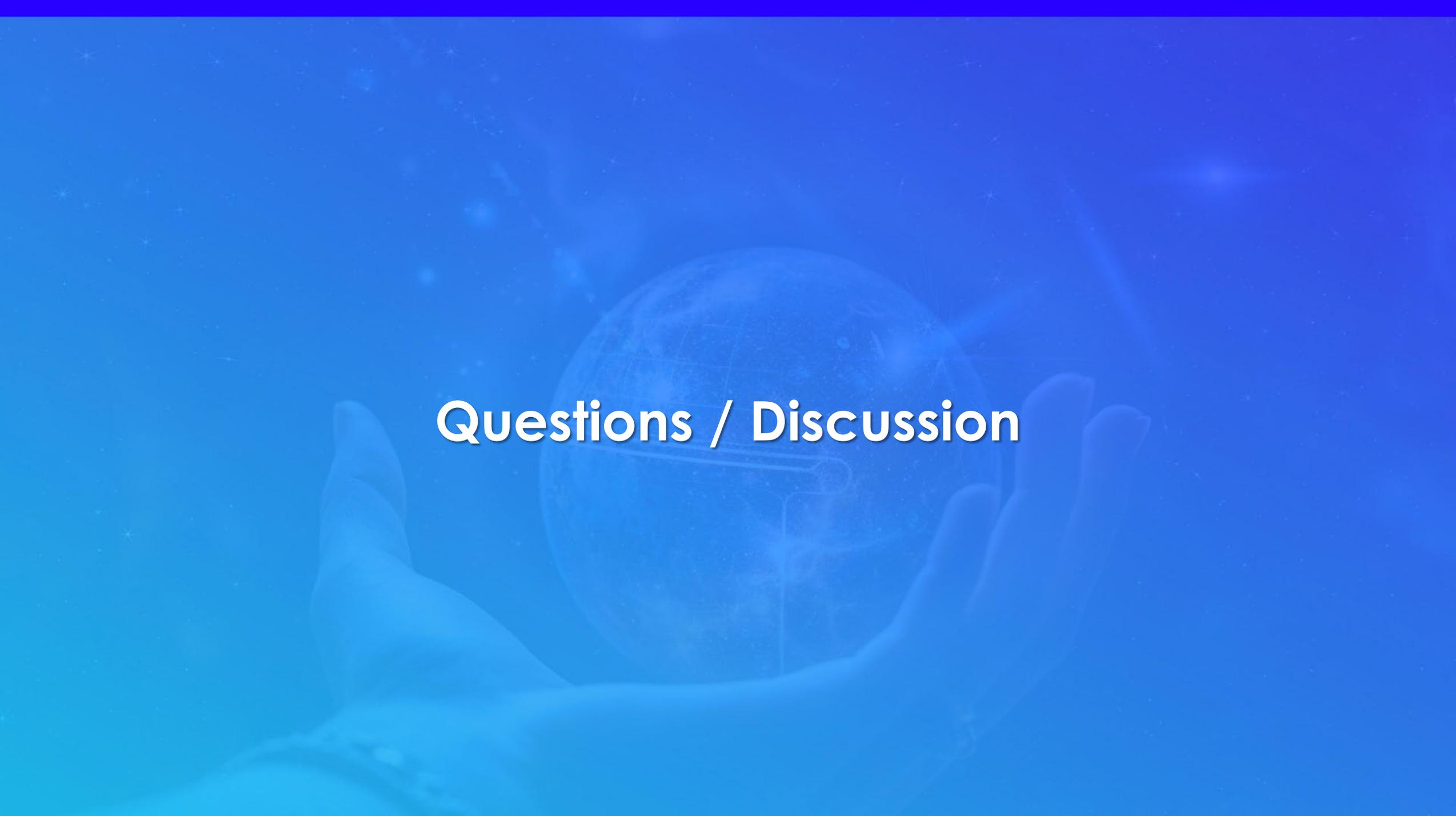
Questions / Discussion

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