

# Independent Third Party Review Process for HPHT Equipment

Material Characterization and Design Verification and Validation

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# Independent Third Party (I3P) Reviews

- Purpose: To assist in demonstrating that HPHT equipment is fit for purpose, which will help facilitate regulatory approval
  - Fit for purpose means that equipment and materials of construction will continue to function as intended, i.e., in the design environment(s) and in accordance with functional and other applicable engineering specifications, for the life of the equipment without presenting significant hazards to people and the environment
- The Conceptual Plan will provide an outline and specific expectations for the I3P review

# I3P Review “Requirements”

- Required by BSEE for Cat 1 and “suggested” for Cat 2 equipment
  - Should include both equipment and materials
- Requires highly experienced engineers with highly specialized skills and knowledge and only those who possess “good engineering judgment”
- Success requires:
  - Establishing and maintaining clear lines of communication and extensive cooperation among the operating company, manufacturer, and I3P
  - Avoiding conflicts of interest – “small community”
  - Protecting intellectual property of all parties

# It's About V&V

- **Verification** – The process of examining the result of design and development output (*i.e.*, a product) to determine conformity with specified requirements.
- **Validation**: The process of proving a design by testing (and possibly in combination with other means) to demonstrate conformity of the product to design requirements.
- This may require:
  - Confirming the accuracy and applicability of design results via independent review (*sans* designer/developer input)
  - Comparing new designs with similar proven designs
  - Prototype build/testing
  - QC, functional and/or operational tests of products and materials using approved methods
  - Reviews of field tests and performance

# Responsibilities of Operator

- Prepare functional specifications, and where necessary, supplemental specifications for materials, systems, sub-systems, and components
- Define scope of work (SOW) for I3P review (not for CVA)
- Define/agree to verification and validation strategies and methodologies
- Define project schedule
- Provide point of contact
- Provide support of internal Subject Matter Experts and/or Technical Authorities (SMEs and TAs) as needed
- Define priorities for reviews and track progress
- Submit final documentation to BSEE

# Responsibilities of Manufacturer

- Define equipment designs and provide equipment/ component/ materials lists along with applicable internal specifications and guidelines
- Define/provide internal verification and validation plans, strategies, and methodologies
- Provide timely, complete, and clear design documentation (calculations, FEA reports, drawings, material test results, etc.)
- Provide point of contact
- If documentation is considered proprietary, provide facilities, assistance, and necessary time for I3P to conduct reviews on-site
- Keep I3P reviewer abreast of schedule, documentation, and strategy or methodology changes

# Responsibilities of I3P Reviewer

- Provide qualified personnel to perform reviews
- Reviewer should familiarize him/herself with system and equipment requirements, specifications, and planned verification and validation strategies and methodologies
  - Verify that planned methods are appropriate and adequate, and if not, be prepared to offer an alternative plan
  - Provide practical, cost-effective, and timely comments/alternatives
- Be consistent, review only against specified requirements, and practice good engineering judgment
- Perform independent calculations or analyses, if the data presented are insufficient
- Protect the intellectual property of all stakeholders
- Be prepared to accommodate scope and schedule changes
- Assist operator with submittals to BSEE



# Specifics: Analysis Reports

- Reports should:
  - Be clear, legible, reproducible, and retrievable
  - State the objective(s) of the analysis along with the design requirements for the equipment
  - State applicable regulatory, industry, functional, and supplemental requirements for the equipment
  - Define/describe analysis methods and calculations used to verify conformance with design requirements
  - List all modeling assumptions, such as materials, loads and constraints, contact, analysis options
  - Include engineering drawings of the equipment that identify critical locations as well as drawings that illustrate loads and load paths; identify critical locations
  - Include plots of mesh, loads, and boundary conditions
  - Address validation of the analysis model / method



# Specifics: Materials

- The “HPHT world” requires designers and manufacturers, operators, and persons and organizations that provide I3P services to know more about materials properties and performance, especially environmental performance, than ever before
  - Remember that there are multiple environments to consider
    - Must qualify materials in all applicable environments
  - Prepare separate plans for materials qualification and materials selection
    - Don’t confuse these two activities
  - The results of environmental tests are, more often than not, dependent on selection of environment and test method
    - Remain “detached” when reviewing test results and apply appropriate levels of conservatism when selecting or approving material selections for HPHT equipment
  - Don’t interpret the materials and testing information in documents such as PER15K-1 and 17TR8 as “the final word”
    - There is no “magic” test or series of tests that will provide all the information required in all sets of circumstances

# Potential Pitfalls

- I3P reviewer is unaware of changes in requirements, scope, approach/strategy, or schedule
- Operator fails to approve /update methodology
- Work is incomplete or incorrect
- Documentation is lacking (non-existent, incomplete, out-of-date, untraceable) or inconsistent in content and format
- Multiple design iterations prolong review process
- Methodology is new / unfamiliar to one or more parties
- Analysis methods have not been validated
- Manufacturer does not follow own procedures and guidelines
- Sub-vendors do not follow established procedures and guidelines
- Personnel changes / lack of continuity
- Schedule conflicts / I3P reviewer falls behind schedule

# Recommendations: Keep Calm and Carry On

- Define responsibilities, accountability, and who must (or should) be consulted and/or informed (RACI) regarding all tasks in the I3P SOW
  - Among organizations and within organizations
- Develop and agree to V&V plans early (materials and equipment)
- Create a master equipment and materials list up-front, listing requirements for review and supporting documentation
  - Keep this list up-to-date
- Maintain independent nature of the review but include I3P reviewer in design rollouts, reviews, TRAPs, etc., whenever possible
  - This helps familiarize the reviewer with the equipment and keep up with design changes
- Submit only proven designs and complete work for the I3P to review
- Provide necessary administrative assistance to the I3P in terms of document retrieval, document control, etc.
- Provide adequate time for reviews to take place

# Thank You!

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