TYPE ONE ENERGY

Early & Essential Engagement to Optimize the Licensing Process for Fusion Systems in Tennessee (Joint Presentation with the Division of Radiological Health, TN)

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BACKGROUND

RECENT MILESTONES & ACTIONS

- Nuclear Energy Innovation and Modernization Act (2018): NRC to develop new processes for licensing of Advanced Nuclear Reactors (ANRs) including fusion systems
- October 2020: first of a series of 18 NRC public meetings on fusion regulatory approaches for licensing fusion energy (last was held on March 2024)
- January-April 2023: SECY to Commissioners for options to regulating & licensing and unanimous decision for adopting 10 CFR Part 30
- February 21, 2024: State of TN, TVA, ORNL and Type One Energy announced Infinity One project
- February 22, 2024: Kick-off meeting between TN Regulator and T1E in Nashville
- March 2024: NRC released first complete draft of NUREG-1556 vol. 22 (Fusion License Application Guide)
- April 2024: Presentation at TN Regulator All Staff with State Commissioner in attendance
- May 2024: 2-day Workshop with TN Regulator in Oak Ridge on NUREG-1556 vol. 22

REGULATORY ENGAGEMENT

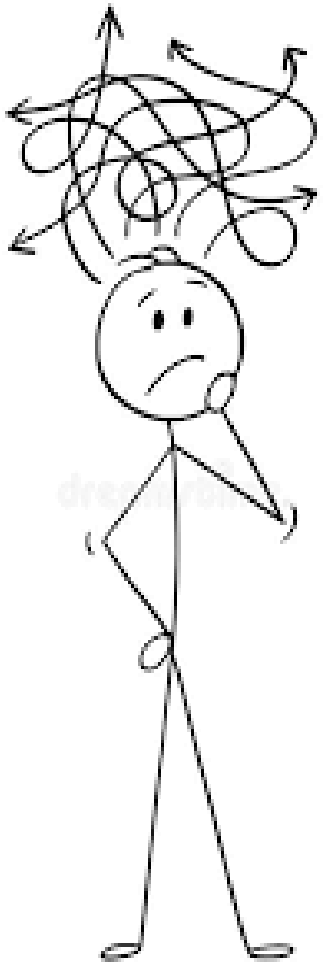
KEY CONSIDERATIONS FOR EARLY ENGAGEMENT WITH TN REGULATOR

- ✓ The ***low radiological risks*** of fusion systems are well understood and have been regulated in relation to other applications for decades (e.g., particle accelerators, neutron sources, etc.)
- ✓ The level of efficiency of the State Regulator to review fusion safety cases will ramp-up rapidly through ***efficient interfaces and early engagement*** (pre-application).
- ✓ This will facilitate inherent design safety (***radiation safety "built in"***), rather than safety through the addition of engineering systems (***radiation safety "added-on")***
- ✓ Integrating safety at all levels, from pre-conceptual design to final design, eliminates risks rather than simply mitigating them, thus guaranteeing a safer design.
- ✓ The pre-application engagement phase assist Agreement States and the NRC in ***generic regulatory improvements*** (i.e., development of NUREG-1556 vol. 22)
- ✓ Market development interests are also at stake. A ***business model combining design and objective-based, risk-appropriate regulations*** is attractive and sells well. A unique context and opportunities since the 60s/70s/80s (e.g., Westinghouse PWRs following U.S. Regulations in Belgium and Spain)

TENNESSEE'S EXPERIENCE

Communication in the early stages with Type One Energy has allowed our Division several advance opportunities.

- Meetings, Workshops, Emails, Phone Calls…….
  - Developing a more detailed understanding of Type One's specific fusion system, allowing the Division a clearer picture of associated radiation hazards and the training that we will need.
  - Forecasting the challenges of implementing fusion into our existing regulations (materials, x-ray, new section??).
  - Addressing budgetary concerns for the uptick in the number of licensing actions and inspections (ensuring we will be adequately staffed and trained).



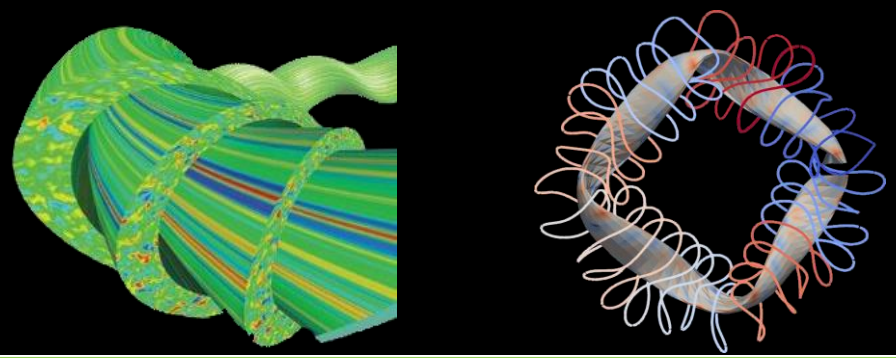
KEY INTERFACES WITH TN REGULATOR

GUIDING PRINCIPLES FOR ESTABLISHING OPTIMAL CONDITIONS FOR EFFICIENT LICENSING

- The fundamental principles of radiation protection (justification, optimization and dose limitation) are integrated in decisions and documented in the earliest stages of design and definition of operating programs
- For the pre-conceptual and conceptual phases, information exchange and engagement activities focus on validating methodological approaches and logical steps for radiation safety case to inform the development of USNRC regulatory guidance and build capacity within the State regulatory body on T1E fusion technology.
- The interface between the engineering systems team and regulatory affairs is the anchor for the integration of considerations related to the design and operating program requirements for licensing.
- Options and considerations brought to the TN regulator on a regular basis for validation and situational awareness.

Simplified Illustration of Engagement Approach

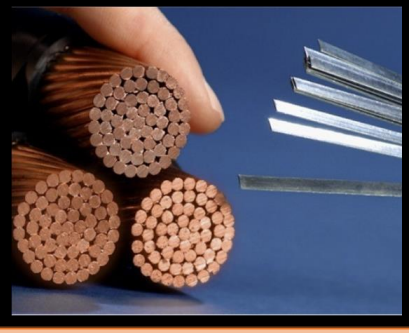
TOP & UPPER-LEVEL SAFETY GOALS

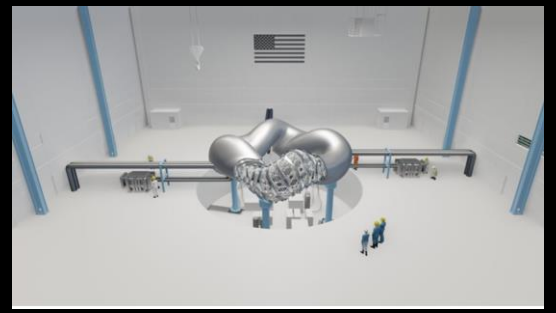


Our Radiation Protection Program and overall Safety Culture are key ingredients with our low radiation risk technology and operations. The results of neutronics modeling enable us to optimize the design and material options for compliance with the ALARA principle upstream.

Demonstration of our radiological inventories, where they are located (SSCs), what are the loads/hazard at risk of negatively impacting their sizes and potential for mobilization, and what means “normal operation” for a T1E fusion technology.

INTERMEDIATE & LOW-LEVEL SAFETY GOALS





What are the potential/hypothetical transients, SSCs failures and how they translate into initiating events (IEs) then informing the safety architecture and performance/reliability framework of our final design through comprehensive safety & investment protection assessment

Demonstration of the SSCs and operating programs capacity to prevent abnormal operation and failures; detect and control transients and failures. Demonstrating the compliance with preventive maintenance, safety limits and operating margins to drive the choices for the selection of the reference design

Addressing these goals iteratively through a series of key communications with TN Agreement State Authority

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Question period/ Thank you

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