U.S. DEPARTMENT OF ENERGY | Office of Science

NSTX-U

Perspective on High-Z Tile Upgrade

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High-Z Tile Upgrade Discussion
NSTX-U Control Room Annex
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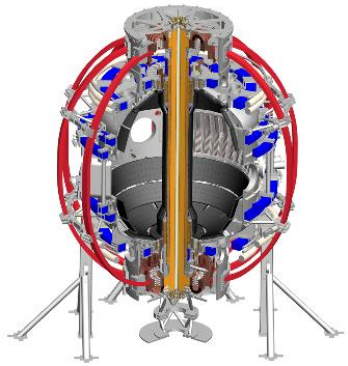
OAK RIDGE National Laboratory

PPPL



Relevant Answers to Questions

- do present scenarios avoid power on high-Z tiles?
  - probably not, but high-Z mitigation was built in via BZN, Li coatings,etc and you can always run USN (w/ Rev. B)
    - upper divertor install limits ability to coat high-Z tiles with lithium
- what is the status of diagnostics for high-Z tiles
  - necessary tools in lower divertor can be made ready, but this needs to be reviewed for schedule/personnel gaps
  - nearly all boundary tools biased towards lower divertor
    - no wide-angle IR for 3D heat flux (tile misalignments), no bolometry in upper divertor, limited impurity source measurements
- tile alignment is absolutely critical and install problems is where high-impact failures would originate
  - if we don't have time + spare to do it right, don't do it
- partial row doesn't make sense to me; nearly all of the burden with reduced scientific impact

Importance to Program Goals

- a single year delay to the high-Z install is reasonable given FY16 ops and FY17 outage schedule pressures
  - if delaying high-Z for FY17 means delaying until after the cryopump, then it means a significant impact to 5-year goals
  - if we're not doing high-Z now, then when/where
    - it should be scheduled and resources reallocated, not left up in the air
- moving NSTX-U to high-Z has separable facets
  - testing the ability for an ST to operate with high-Z walls
  - improving the ability to implement Li via high-Z substrate
  - **contributing to world-wide efforts on PFC design and high-Z materials is a *benefit* but NOT a primary goal**
    - NSTX-U would uniquely answer the question: "Can an ST survive using high-Z PFCs?" not the question "Can high-Z PFCs survive NSTX-U?"

Can An ST Survive Using High-Z PFCs?

- there is still much that can be done to prepare for NSTX-U for life at high-Z without the high-Z tiles
- utilize multiple means of injecting high-Z material
  - high-Z, recycling gas puffs simulate source (Kr, Xe), laser blow-off to study transport, granules to look at larger injec.
- demonstrating a diagnostic workflow for core high-Z
  - VUV/SXR spectroscopy, P_{RAD}, Z_{eff}, dilution/neutrons
- understanding core transport: neo/turb + MHD effects
- examine disruption event chains from high-Z injec.
- testing actuators to limit edge source: 3D fields, LGI
- testing actuators for core transport: is HHFW and effective tool for mitigating on-axis accumulation?