

Charge for the 1st Beam Dump Facility (BDF) Targetry Systems Advisory Committee (TSAC)

4-6 March 2025

<https://indico.cern.ch/e/BDF-TSAC-2025>

Project summary and committee mandate

The High-Intensity ECN3 (HI-ECN3) Project has been set up to design and build a high-energy, high-intensity Beam Dump Facility (BDF) to carry out research into feebly interacting particles at the SPS in conjunction with the Search for Hidden Particles (SHiP) experiment. The Project was endorsed by CERN management in March 2024, and it is planned to deliver its Technical Design Report (TDR) in 2026, aiming for beam on target in 2031. The target facility includes a 350-kW high-Z production target, its target station and its supporting infrastructure

The mandate of the BDF-TSAC is available in EDMS 3166418.

Objectives of the 1st BDF-TSAC :

Primary objective

- The primary objective of the 1st BDF-TSAC is to make sure the members have a clear understanding of the design choices, specifications and history of the project. This includes the BDF/SHiP project scope, operational expectations and design of the various relevant subsystems, including the respective interfaces. This also includes aspects associated with radiation protection, remote handling and maintenance scenarios.

Additional objectives – the committee is asked to:

- Comment on the project's current design and on its state of maturity relative to the objective of delivering a Technical Design Report in early 2026.
- Evaluate the preliminary design of the target assembly, specifically for the two concepts being investigated in parallel

- Evaluate the preliminary design of the target complex and associated subsystems, including integration, maintenance plans and handling aspects.
- Address whether the proposal of a He-cooled full tungsten target is well justified.
- Identify possible limitations and critical items in the current design phase, among which production techniques, cooling system, thermal behaviour, prototyping activities and other technical challenges ahead.
- Comment on whether the addition of a service cell would be appropriate and useful for both the safe and reliable operation of the target systems and to appropriately manage radioactive waste.

Specific questions for the BDF-TSAC 1st meeting

- Do you see any feasibility issues in the proposed designs (target core, pressure vessel, vacuum vessel, shielding system etc.) in view of their future production and assembly?
- Do you see any potential showstopper in the FEA / thermo-mechanical calculations, for both nominal and for degraded scenarios? Are there specific topics which have been under evaluated?
- Are the most important operational considerations and accident scenarios being fully addressed? Shall other situations be considered?
- Do the target block R&D plans adequately support the design efforts? Do you see any potential missing aspects that would need to be considered at this stage?
- Are the present target block design options appropriate for long-term reliability – should options be included or eliminated?
- Are the plans for target prototype proton beam testing appropriate and useful to support the target development plans? Shall other complementary tests be explored?
- Do you identify any specific risks in the proposed target designs? Do you see areas for optimisation?
- Is the proposed target instrumentation package suitable for diagnosing operational and potential accident scenarios? Is there any other instrumentation you would suggest?
- Is the current target station design in line with best operational and maintenance practices from the international community? Are there any specific improvements or design options that should be considered at this stage?
- Is the design of the cooling and ventilation systems adequate for the needs of the target systems? Are the safety concerns associated with such a cooling system being addressed and mitigated in the current design? Including maintenance scenarios of the cooling system

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- Are radiation protection aspects adequately considered in the design of the complex, both in terms of operation as well as waste management?
- Is the concept for the service cell in the target service building appropriate to tackle the challenges of maintenance and waste packaging of the target systems?
- Did we have to consider additional failure scenarios?