

Target Project Progress and Plans

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TAC-10

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Outline



- Progress on in-kind partnering
- Collaboration and Technical Boards
- Configuration management
- Summary of the first Preliminary Design Review
- Progress on Engineering Development and Demonstration (EDD) activities
- Progress on shielding
- Plans for the Target Safety System
- Responses to TAC-9 recommendations

Several In-Kind packages have been released for partner participation



Work Package	In-Kind ID	In-Kind Contribution	Cost Book Value (M€)	Selected Organizations
2 Target Systems	TIK.2.1	Target Wheel	8.4	ESS-Bilbao - Spain
	TIK.2.2	Target He Cooling System	5.6	
3 Moderator and Reflector Systems	TIK.3.1	Moderator & Reflector Plugs	4.8	
	TIK.3.2	Cryogenic Moderator System (LH2)	3.7	
	TIK.3.3	Cryoplant (He)	11.1	
4 Monolith Systems	TIK.4.1	Target Monitoring Plug	0.5	
	TIK.4.2	Proton Beam Instrumentation Plug	0.5	ESS-Bilbao - Spain
	TIK.4.3	Irradiation Module	0.2	
	TIK.4.4	Proton Beam Window	0.9	ESS-Bilbao - Spain
	TIK.4.5	Monolith Vessel	4.6	
	TIK.4.6	Neutron Beam Windows	0.5	
	TIK.4.7	He Atmosphere System	1.2	
	TIK.4.8	Monolith Shielding Systems	15.1	
	TIK.4.9	Tuning Beam Dump	2.5	
5 Fluid systems	TIK.5.1	Primary Water Cooling Systems	2.5	
	TIK.5.2	Intermediate Cooling Systems	2.0	
	TIK.5.3	Ventilation & Confinement	7.6	
	TIK.5.4	PBW Primary Cooling System (He)	0.6	
	TIK.5.5	Target He Purification	3.7	
	TIK.5.6	Monolith He Purification	2.1	
6 Remote Handling Systems	TIK.6.1	Active Cells	21.5	
	TIK.6.2	Internal Casks and Handling Devices	3.4	
	TIK.6.3	Workshop contaminated parts	0.1	
	TIK.6.4	Mock-up and test stands	0.9	
	TIK.6.5	EDD: Test of Handling Procedures	0.4	
	TIK.6.6	Shielding above Connection Cell	0.3	
8 Target Physics	TIK.8.1	Tungsten Release Factors	0.2	

COLOR KEY:

Not yet released
Released for in-kind partnership
In-kind Partner selected

- 2/3 of scope in-kind
- 27 IK packages in all
- 3 IK selected
- 7 released for partner interest
- Expect ~5 more to be released next month

Total

104.9

Developed and exercised an In-Kind Collaboration (IKC) response decision matrix



IKC Partner assessment		EUROPEAN SPALLATION SOURCE <small>SCIENCE FOR SOCIETY</small>
TIK ID: ...	Partner organization: ...	
TIK name: ...	Contact person: ...	

	Criteria	Alternatives	Response	Comments / Additional information
			Select from drop-down list	Please fill-in comments/additional information below or indicate if attached separately
GENERAL	Funding available	YES NO		
	Ready to sign IKC agreement (vs HoA)	IKC Agreement HoA <i>Work can not start STM</i>		
	Supply chain management/Procurement capabilities	Organization in place Managed ad hoc No experience		
	Sustainable material selection process	Formal process in place Can be applied Rejected		
	Quality Management System in place	Formal process in place Managed ad hoc No experience		
	Risk management in place	Formal process in place Managed ad hoc No experience		
	ESS IKC Agreement terms and conditions accepted	YES NO		
TECHNICAL	Technical baseline accepted	YES NO		
	Cost Book value accepted	YES NO		
	ESS Programme Schedule accepted	YES NO		
	Resources available	YES NO		
	Past experience, references	Sufficient Limited		
	Ready to take complete TIK	YES NO		
	Involvement in ESS pre-construction/ experience with ESS	YES NO		

Four most important criteria:

- Funding available?
- Ready to sign IKC agreement?
- Cost Book value accepted?
- ESS Programme Schedule accepted?

Drafted and circulated for comments a Target Collaboration Agreement



- Establishes a Technical Board
 - Ensure the global coherence of the Project through:
 - continuous monitoring of the work and planning of all tasks
 - coordination of interfaces between Collaborators
 - monitor the progress of each work package
- Establishes a Collaboration Board
 - Arbitrates conflicts dealing with activity planning, deliverables, and allocation of resources for all matters brought to it by the management team
- Feedback solicited from potential collaborators, and establishment of the boards expected early next year

Target Configuration Management Plan establishes the change control process



- Defines the Target baseline configuration
- Establishes the Target Change Control Board
 - Reviews and approves changes to the Target baseline (cost, schedule, and technical)
- Change levels and approval authority
 - Level A: ESS Board
 - Level B: ESS Programme Group
 - Level C: Programme Change Control Board
 - Level D: Target Station Project Manager ← **Target CCB**
 - Level E: Work Package Manager

Changes approved to date by Target CCB



Number	Proposed Change	Status	Further Action	Outcome
TC-1	Monolith diameter and position of light shutters	Approved	Take to Programme CCB	Approved
TC-2	Lower monolith bulk shielding and support structures	Approved	None	
TC-3	Monolith helium vessel diameter and upper dome	Rework	Rework	
TC-4	Cooling medium for intermediate target cooling	Approved	None	
TC-5	Active Cells layout and waste package logistics inside the target station	Approved	Take to Programme CCB	

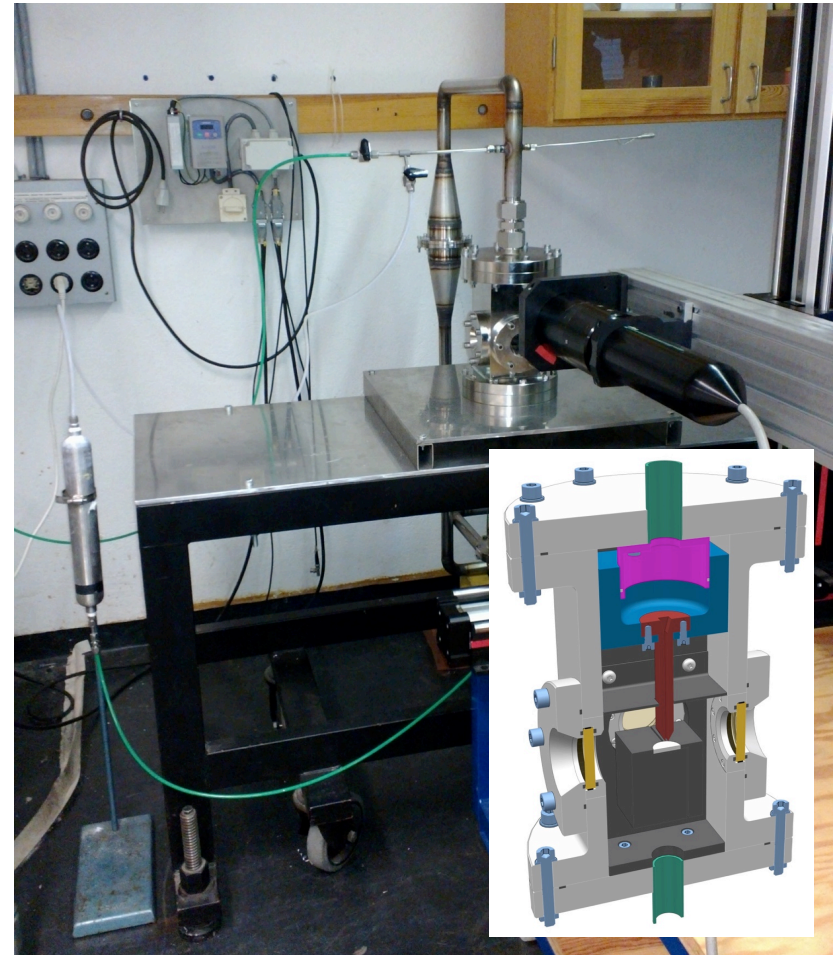
First Preliminary Design Review for a Target system held 3-4 September



- Systems reviewed:
 - Target primary helium cooling loop
 - Helium cooling loop pressure control system
- Process
 - 1½ day review by six stakeholders and two external experts
- Recommendations to be addressed prior to completion of Preliminary Design:
 - Assign a safety class to each of the sub-systems or components, following a methodology applicable for ESS
 - Develop a plan to perform detailed impact analysis all along the detail design, to confirm the safety classification
 - Availability and reliability objectives should be allocated to these systems, by and derived from the Target Station requirement
 - Acceptable ranges of impurities in the He (O₂ and H₂O specifically) shall be specified
 - Make an exhaustive list of the interface requirements

Progress on Engineering Development and Demonstration (EDD) activities

- Tungsten erosion and corrosion (ETHEL loop)
 - Helium temp to 450°C
 - Control system under development
 - Velocity measurements to be restarted next week
 - Samples for erosion in preparation
- Tungsten release factors measurement was circulated for in-kind collaboration



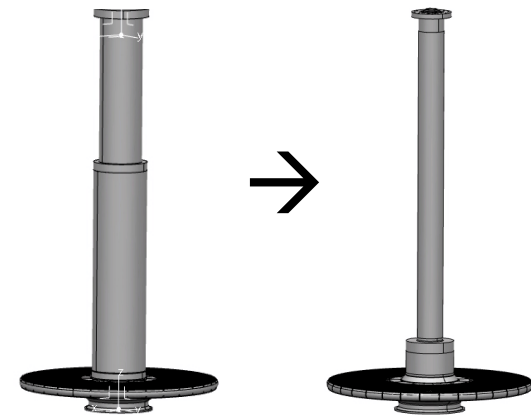
Progress on the Target Safety System



- The process for selecting the instrumentation needed for the TSS is ongoing
- Safety credited controls will be identified following detailed safety hazards analyses
 - Safety Analyst currently being recruited to lead the hazards analyses
- Detailed safety hazards analyses is planned for 2016, consistent with the timing at other facilities (e.g. SNS)
- The number of active safety-credited controls is expected to be quite small, likely only beam shutdown due to loss of wheel rotation and perhaps loss of coolant

Radiation shield design continues to make significant progress

- Shield Design Process has been formulated and has been approved by the ESS Safety Advisory Group
- Shielding estimates made for:
 - A2T
 - Active cells
 - Streaming around the target shaft
 - Tuning beam dump
 - Monolith (upwards, downwards, and radially)
- Target Division staff supported shield design work of the Accelerator Front End Building



Responses to TAC 9 Recommendations (1 of 5)



- Are the measures to resolve the issues and implement the recommendations of the 1st ESS Annual Review adequate and sufficient?
 - Committee Recommendation: Continue to manage these efforts and make decisions as necessary to meet schedule
 - *Response:*
 - *Moderator and Reflector Systems remain on the critical path for the Target Project*
 - *Delaying this work was judged to be worthwhile because of the substantial performance gain*
 - *We are nearing a final configuration*
 - Staffing remains an important issue. Continue to manage it, integrating in kind contributions when possible to try to meet the in kind contribution goal
 - *Response:*
 - *Target division staff increased significantly in 2014*
 - *All Group Leaders and Work Package Managers are now in place*
 - *Delays in securing in-kind partners were partially offset by hiring additional contractors*
 - *Success in the 2015 plan relies on bringing in-kind partner resources onboard soon*

Responses to TAC 9 Recommendations (2 of 5)



- Are the technical risks of the construction plans for Accelerator, Target and Controls low enough for safely achieving start of initial operation in 2019 on time, budget and performance?
 - Committee Recommendation: Complete formal in-kind negotiations as quickly as possible
 - *Response:*
 - *Engagement with potential in-kind partners has progressed*
 - *First partners are now being brought onboard*
 - Committee Recommendation: A more complete answer to the budget & schedule question can be provided at the next meeting, or by the annual review committee, whichever is more appropriate
 - *Response:*
 - *This information may be more appropriate for the annual review*

Responses to TAC 9 Recommendations (3 of 5)



- What intermediate early key milestones are required to be met on the way?
 - Committee Recommendation: The current process for deciding the geometry and number of moderators seems sensible; follow the plan
 - *Response:*
 - *A decision was made as planned on April 30, and has been endorsed by a special advisory committee and the ESS SAC*
 - *We are nearing a final configuration*
 - Committee Recommendation: Define the appropriate target instrumentation for the target safety system monitoring
 - *Response:*
 - *The process for selecting the instrumentation needed for the TSS is ongoing*
 - *Safety credited controls will be identified following detailed safety hazards analyses*
 - *Detailed safety hazards analyses is planned for 2016, consistent with the timing at other facilities*
 - *The number of active safety-credited controls is expected to be quite small, likely only beam shutdown due to loss of wheel rotation and perhaps loss of coolant*
 - Committee Recommendation: Consider the lead reflector decision carefully
 - *Response: There are no plans to use a lead reflector*

Responses to TAC 9 Recommendations (4 of 5)



- Is there a need to study other back-up options for securing timely start of initial operations?
 - Committee Recommendation: It would be good to see details of both the helium and the water-cooled target analyses at the next meeting
 - *Response:*
 - *The Target Helium Cooling System held its PDR in Sept*
 - *All required Preliminary Design documents are nearly complete*
 - *The water-cooled backup study was successfully completed and this work is being closed out*

- The moderator decision
 - Committee Recommendation: Make the decision consistent with your schedule to pursue the flat moderator or not
 - *Response:*
 - *A decision was made as planned on April 30*
 - *Decision was endorsed by a special advisory committee and the ESS SAC*
 - *We are nearing a finalized configuration*

 - Committee Recommendation: For the flat moderator, ED&D funding would be better spent on engineering versus neutronic performance
 - *Response:*
 - *We are exploring the idea of measuring the brightness distribution of hydrogen moderators at currently operating facilities to verify code predictions for the ESS flat moderator*
 - *Fabrication of engineering prototypes and tests of the flat moderator are planned*

Responses to TAC 9 Recommendations (5 of 5)



- Materials issues
 - Committee Recommendation: Calculate the helium production in beryllium
 - *Response: Results will be presented in TAC-10*
 - Committee Recommendation: Evaluate waste storage and decommissioning cost for the different materials of the target system. Are there disposal paths for the beryllium and proposed lead concept?
 - *Response:*
 - *Discussions with the Swedish waste repository operator, SKB, are ongoing*
 - *Most wastes from Target Station operations (e.g., tungsten, steel, aluminum) are considered to be straightforward*
 - *The disposal path for beryllium is not yet identified*
 - *The mitigation strategy is to separate beryllium (along with its aluminum housing) from other wastes and store it until a disposal path is decided*
 - *There are no plans to use lead in the spallation target or reflector areas (lead could be used as a shield material in other parts of the facility)*

Concluding Remarks



- Significant progress on in-kind partnering but much work still remains to be done in 2015
- Following the process developed by the Accelerator Division, we are establishing Collaboration and Technical Boards to engage our in-kind partners
- We have stood up and exercised a Target CCB to implement formal baseline change control
- We have held our first PDR and are incorporating lessons learned into future PDRs