

Progress and Plans: Target

John Haines
Head of Target Division

www.europeanspallationsource.se

Nov 5, 2014

Outline

- Target organization and staffing
- Highlights
- Progress on in-kind partnering
- Plans
- Issues and risks
- Concluding remarks

Target Org

TARGET DIVISION

John Haines
Head of Division

Eric Pitcher
Deputy Head of Division

Carina Blixt
Team Assistant

12.1 Management and Administration

Target Controls Group

Linda Coney (GL)
Atefeh Adeghzadeh
Mikael Olsson (C)

Target Physics Group

Günter Muhrer (GL)
Riccardo Bevilacqua
Daniela Ene
Johannes Kazantzidis (C)

Materials Group

Yongjoong Lee (GL)
Monika Hartl
Jemilia Habainy (S)
Sofie Borre (S)
Johan Wendel (S)

Neutronics Group

Luca Zanini (GL)
Konstantin Batkov
Alan Takibayev
Esben Klinkby (C)
Troels Schoenfeldt (C)
Zsofia Kokai (S)

Fluid Systems Group

Håkan Carlsson (GL)
Per Nilsson
Andrea Polato
Leif Emås (C)
Robin Jansson (C)
Allan Lundgren (C)
Ingvar Olsson (C)
Olof Persson (C)
Carl Wilhelmsson (C)
Mateusz Pucilowski (S)

Monolith & Handling Group

Rikard Linander (GL)
Magnus Göhran
Daniel Lyngh
Ulf Odén
Naja de la Cour
Marc Kickulies
Kristoffer Sjögren
Markus Andersson (C)
Lennart Åström (C)
Reinhard Blum (C)
Paul Erterius (C)
Jens Harborn (C)
Bengt Jönsson (C)
Johan Kalmteg (C)
Cyril Kharoua (C)
Jarich Koning (C)
Emil Lundh (C)
Mikael Möller (C)
Anders Olsson (C)
Björn Persson (C)
Jesper Ringnér (C)
Pascal Sabbagh (C)
Mats Schmidt (C)
Srdjan Vareskic (C)

12.7 Controls
Linda Coney (WPM)

12.8 Physics
Günter Muhrer (WPM)

12.5 Fluid Systems
Håkan Carlsson (WPM)

12.2 Target System
Ulf Odén (WPM)

12.3 Moderator & Reflector Systems
Daniel Lyngh (WPM)

12.4 Monolith Systems
Rikard Linander (WPM)

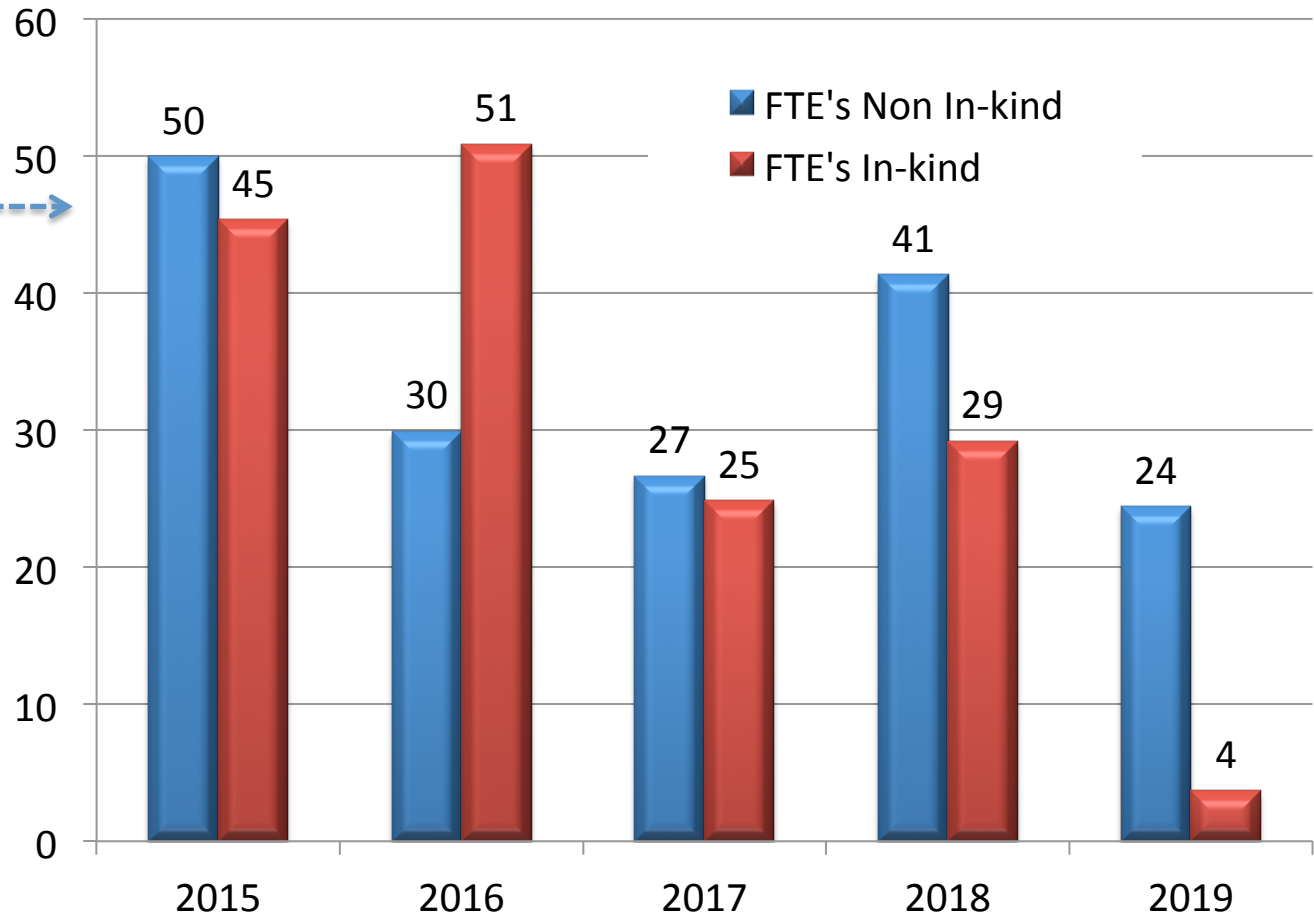
12.6 Remote Handling Systems
Magnus Göhran (WPM)

All Group Leaders and Work Package Managers in place

(C) Contractor or Consultant
(S) Student

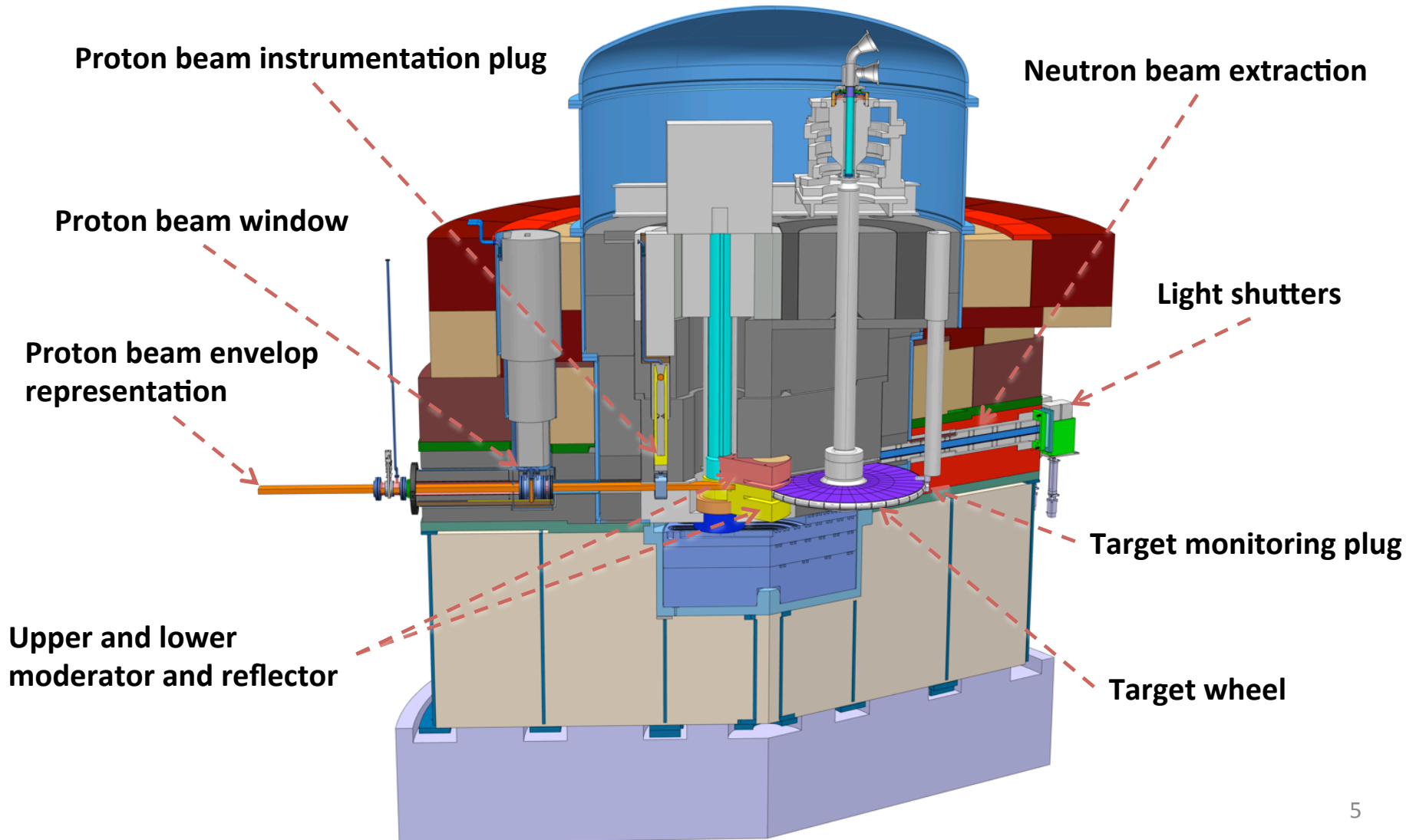
Staffing Increase Relies on In-Kind Partnering

Current FTE Level including employees, consultants, contractors, post-docs, etc. (no In-Kind Partners)



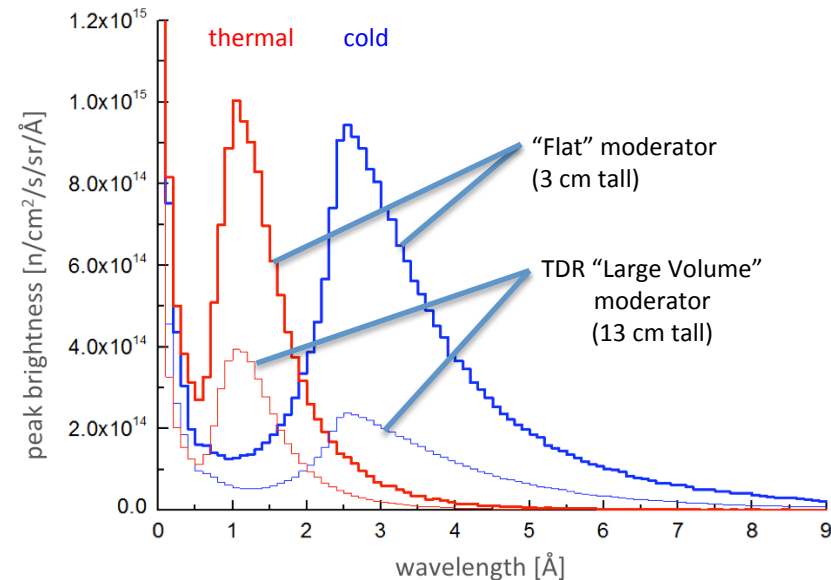
- ESS Target Division staffing level remains stable throughout project
 - Supplemented by In-Kind Partners, contractors, etc.

Target Station Design Continues to Evolve as We Approach Preliminary Design Completion



Progress on High Performance Moderators

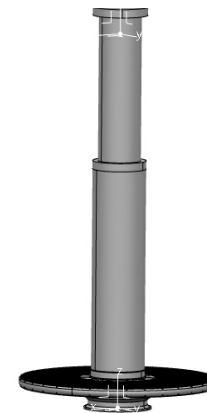
- May 2014 decision on overall approach
 - Top moderator: 3 cm tall viewable by all beam lines (120° on each side)
 - Bottom moderator: Taller moderator for instruments not able to take advantage of brightness gain with view of > 15° on each side
 - Final selection of detailed moderator configuration in Dec 2014
- Meanwhile, many options identified, including optimized thermal moderator
 - Promise of even higher brightness!
 - Will be discussed in breakout (L. Zanini)
- Worked with Science Directorate to separate the selection of moderator details from the overall configuration and handling
 - Allowed us to make needed engineering design progress to minimize impact on overall schedule



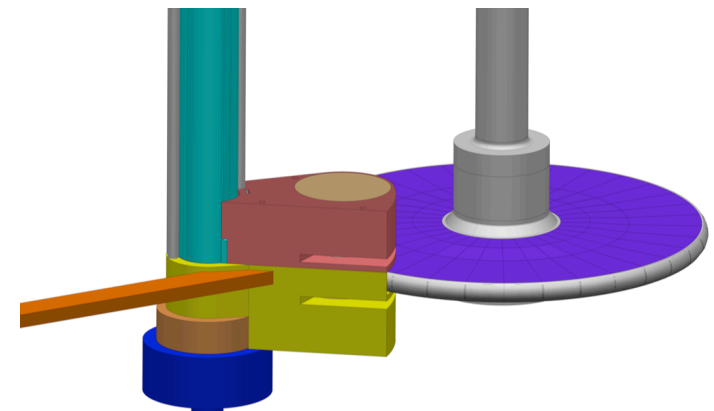
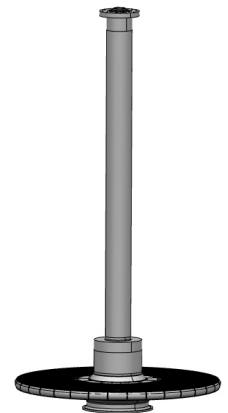
Progress Since Previous TAC Meeting

- Target Systems
 - Held Preliminary Design Review for Target He Cooling System
 - He pressure increased from 3.5 bar to 10 bar
 - More effective shroud cooling arrangement
 - Small He loop (ETHEL) operational at Lund University
- Moderator and Reflector Systems
 - New configuration that incorporates moderator flexibility and simpler handling compared to TDR concept

TDR design
17 ton

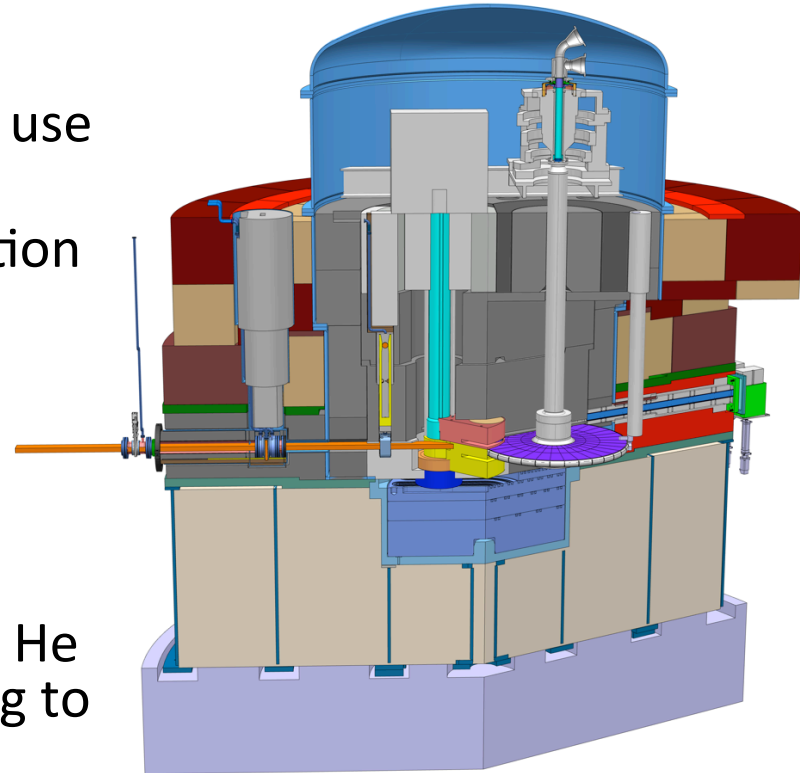


PDR design
11 ton



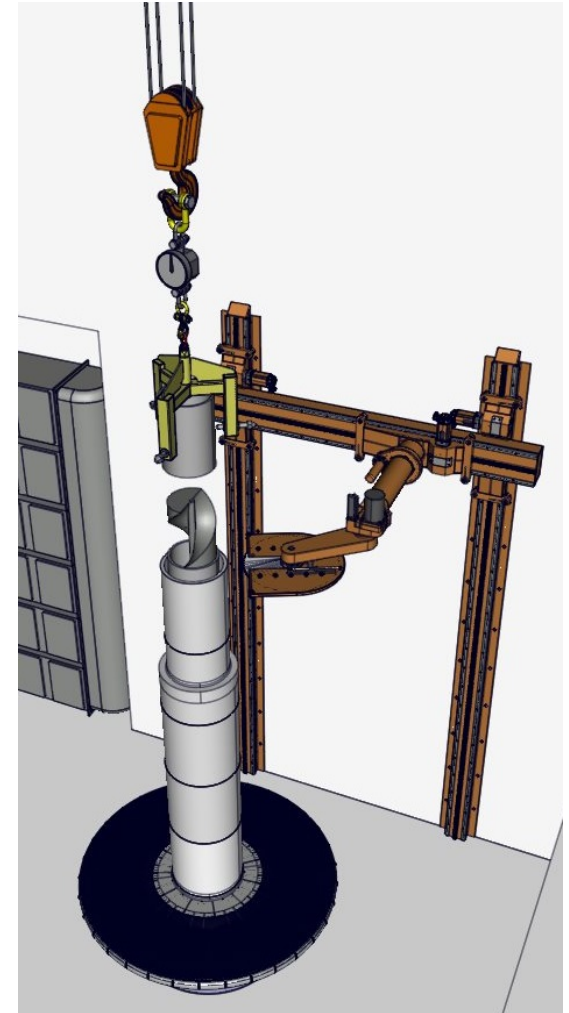
Progress Since Last Review - Monolith Systems

- **Monolith Systems**
 - Diameter reduced from 12 m to 11 m
 - Support rings facilitate alignment and use of cheap shielding materials
 - Smaller He vessel minimizes construction interface with CF
- **Fluid Systems**
 - Secondary loop for Target He Cooling System changed from nitrogen gas to water
 - Significant progress on understanding He purification needs – potentially leading to simplifications
 - Optimized cooling loop for energy recovery, while meeting system needs --- use of multiple heat exchangers in some cases



Progress Since Last Review

- Remote Handling Systems
 - New Active Cell approach with minimal number of Pb windows
 - Developed spent target handling logistics
- Target Controls
 - Worked with Integrated Control System (ICS) Division to develop Target-ICS Interface Control Document
 - Continued Hazards Analysis
- Target Physics
 - Continued moderator optimization efforts
 - Significant progress on shielding support for Target and CF design
 - Materials – Developed criteria for design lifetimes



Target In-Kind Contributions Identified and Need Dates for Partner Selection Established

Work Package	In-Kind ID	In-Kind Contribution	Planned Partner Selection Date	Cost Book Value (M€)
2 Target Systems	TIK.2.1	Target Wheel	15-Oct-14	8.4
	TIK.2.2	Target He Cooling system	15-Oct-14	5.6
3 Moderator and Reflector Systems	TIK.3.1	Moderator & Reflector Plugs	27-Nov-14	4.8
	TIK.3.2	Cryogenic Moderator System (LH2)	10-Nov-14	3.7
	TIK.3.3	Cryoplant	24-Nov-14	11.1
4 Monolith Systems	TIK.4.1	Target Monitoring Plug	2-Jun-15	0.5
	TIK.4.2	Proton Beam Instrumentation Plug	8-Oct-14	0.5
	TIK.4.3	Irradiation Module	4-May-15	0.2
	TIK.4.4	Proton Beam Window	15-Oct-14	0.9
	TIK.4.5	Monolith Vessel	7-Jan-15	4.6
	TIK.4.6	Neutron Beam Windows	11-May-15	0.5
	TIK.4.7	He Atmosphere System	23-Feb-15	1.2
	TIK.4.8	Monolith Shielding Systems	15-Jun-15	15.1
	TIK.4.9	Tuning Beam Dump	15-Dec-14	2.5
5 Fluid systems	TIK.5.1	Primary Water Cooling Systems	29-May-15	2.5
	TIK.5.2	Intermediate Cooling Systems	16-Sep-15	2.0
	TIK.5.3	Ventilation & Confinement	3-Jun-16	7.6
	TIK.5.4	Proton Beam Window Primary Cooling System	4-Dec-15	0.6
	TIK.5.5	Target He Purification	10-Apr-15	3.7
	TIK.5.6	Monolith He Purification	4-May-15	2.1
6 Remote Handling Systems	TIK.6.1	Active Cells	1-Dec-14	21.5
	TIK.6.2	Internal Casks and Handling Devices	4-Jul-16	3.4
	TIK.6.3	Workshop contaminated parts	22-Jan-18	0.1
	TIK.6.4	Mock-up and test stands for new components	12-Jan-16	0.9
	TIK.6.5	EDD: Test of Handling Procedures	16-Dec-14	0.4
	TIK.6.6	Shielding above Connection Cell	13-Nov-15	0.3
8 Target Physics	TIK.8.1	Tungsten Release Factors	1-Dec-14	0.2

- Target Project In-Kind efforts broken into 27 work elements
- Partner selection dates set based on schedule need and readiness to release work to an in-kind partner
- Dates tracked in project baseline schedule

Progress on Target In-Kind Partnering

- First Target Collaboration Meetings held in July and Oct
 - Purpose was to:
 - Affirm interest of parties
 - Help potential partners participate in the in-kind process
 - Provide opportunity to form collaborations
 - Kick-off the process of forming partnerships for first Target work elements
- Interest expressed in 16 of 27 work elements representing 43% of the value of the Target Project scope, compared to the 68% goal
- Draft Target Collaboration Agreement issued for comment

Progress on Partnering

- Submittals for first four work elements were due Oct 6 with key responses covering:
 - Agreement with cost book value and project schedule
 - Indication that funding agency will support work
- More than one potential partner institute responded to two of the four work elements, one element had one responder, and one element had no responder (Target He Cooling system)
 - Worked with In-Kind Office to develop partner selection process consistent with approved In-Kind processes
- ESS Bilbao selected as partner for three work elements
 - Target Wheel and Drive & Shaft
 - Proton Beam Window
 - Proton Beam Instrumentation Plug
- Six more work elements released with responses due Dec 19
 - Tuning Beam Dump
 - Primary Water Cooling Systems
 - Active Cells
 - Tungsten Release Factors
 - Monolith Vessel
 - Irradiation Module

- Near term plan (2015) focuses on:
 - Selecting In-Kind Partners
 - Holding design reviews – PDRs and CDRs

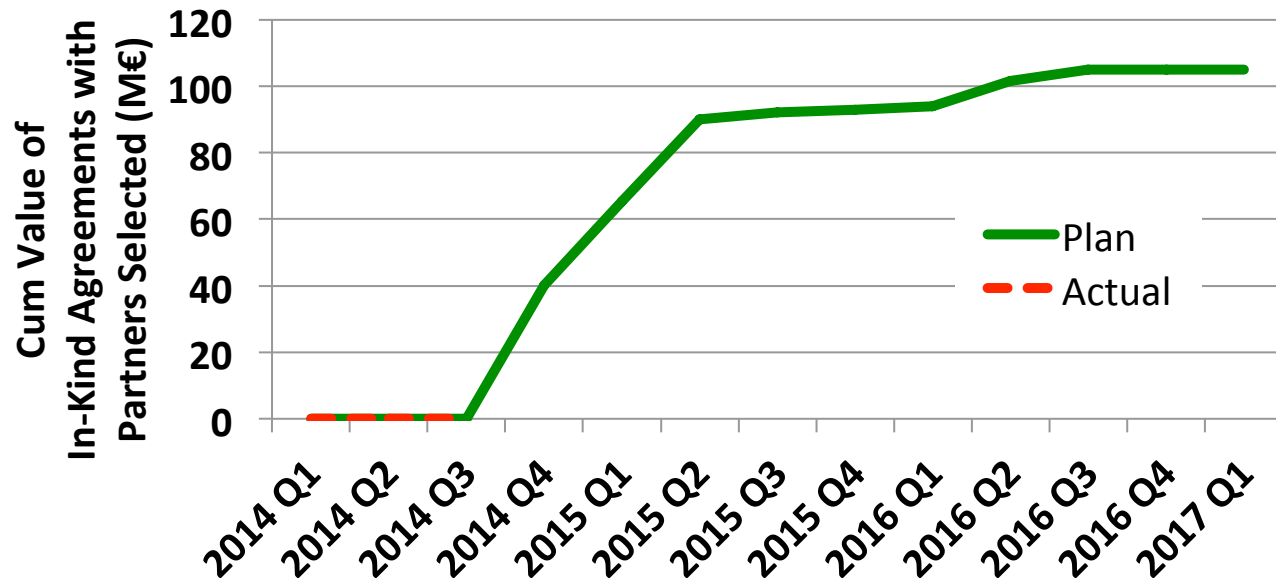
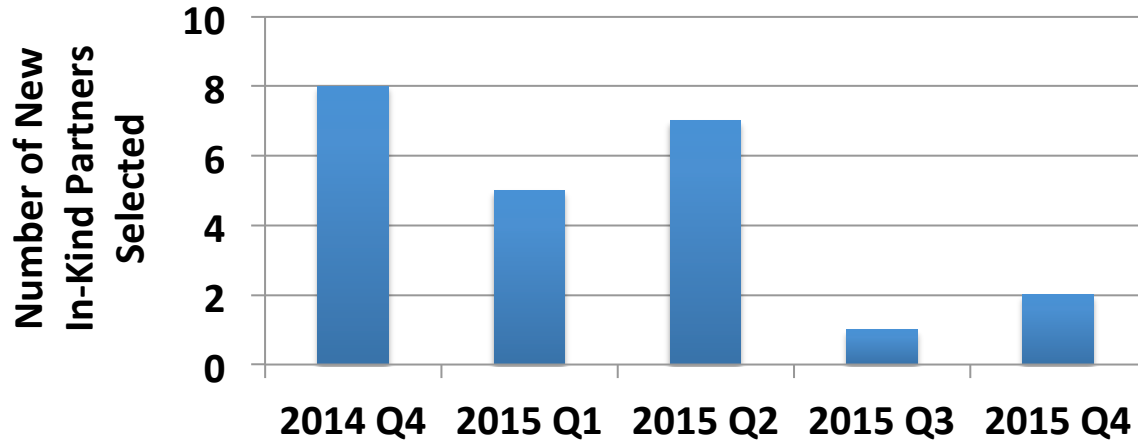
PDR = Preliminary Design Review

- Functional and performance requirements set
- Interface agreements in place
- Design approach that meets functional, performance and interface requirements established

CDR = Critical Design Review

- Design complete/ready to procure and build

Target Project In-Kind Partnering Plan



Design Reviews Are the Key Indicator of Progress for 2015

PDR	Milestone Date
Target Helium Cooling System	Sep-14 A
Active Cells Confinement	Dec-14
Proton Beam Instr. Plug	Dec-14
Target Wheel	Jan-15
Primary Water Cooling Systems	Feb-15
Beam Extraction	Feb-15
Monolith Vessel	Feb-15
Moderator and Reflector Plugs	Mar-15
Intermediate Cooling Systems	Mar-15
He Purification	Apr-15
Ventilation and Confinement	May-15
H2O Purification	May-15
Monolith Shielding Systems	Jun-15
Cryogenic Moderator System (LH2)	Jun-15
Active Cells Handling	Jun-15
Monolith He Purification	Jun-15
Helium Atmosphere System	Jun-15
Irradiation Module	Sep-15
Active Cells Equipment	Oct-15
Proton Beam Window	Oct-15
Tuning Beam Dump System	Nov-15
Target Monitoring Plug	Nov-15

- Design Reviews:
 - Three PDRs planned in 2014; nineteen in 2015
 - Three CDRs planned in 2015

CDR	Milestone Date
MR Handling System	Nov-15
MR Shielding	Nov-15
Active Cells Confinement	Dec-15

Key Issues and Risks (1 of 2)

- Issue: In-kind process could delay 2015 plans
 - Causes:
 - Difficulty identifying appropriate in-kind partner institutes for some systems
 - Early in the process for establishing in-kind partnerships
 - Treatments:
 - “Marketing” efforts
 - Participate in ESS Partner Days
 - Visit potential partners
 - Hold Target Collaboration Meetings to seek new partners, communicate schedule criticalities, and establish open and transparent partnering process
 - Establish partner selection need dates, and track progress in high visibility fashion
 - Add contract staff to self perform work until partners are in place

Key Issues and Risks (2 of 2)

- Issue: Licensing uncertainties could lead to cost overruns and schedule delays
 - Causes:
 - Lack of regulatory framework for ESS type project in Sweden
 - Tendency for regulator to fall back to nuclear reactor regulations
 - Treatments:
 - Support ESS ES&H Division in engagement with regulator - participation in Safety Advisory Group
 - Working with ES&H and Systems Engineering Divisions to develop safety classification and requirements process and analysis framework
 - Hire safety expert to facilitate final Hazards Analysis

Concluding Remarks

- Moderator and Reflector Plug concept selected; moderator details for initial plug will be selected soon
 - Working with Science Directorate to incorporate significant performance gains
- Major Target Division hiring effort completed – all Group Leaders and Work Package Managers in place
- Staffing build-up (employees plus contractors) has allowed us to significantly advance designs since the last meeting
 - Preliminary designs nearing completion for most work elements
 - Process exercised with first PDR held in Sep 2014
- Holding steady on cost and schedule
 - Re-plan recently completed to provide detailed work breakdown for 2015 maintains budget and schedule for project completion
- Plan relies on securing in-kind partners in near term
 - Dates for each work element identified and being tracked
 - Partner for first three work elements has been selected and they are beginning work