



E-TASC General Meeting: Summary

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On behalf of all participants



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US

- DOE-FES Annual Budget for Theory & Simulation: ~\$50M

UK

- Impressive progress towards Digital Twins, including plasma physics, materials science, and fusion technology/engineering
- They are committed to open science and open source software
- Many possibilities for establishing/extending fruitful collaborations
- Next step is to identify specific tasks and agree on required resources



Main tasks:

- **Code development** (in collaboration with ACHs)
- **Code validation & applications** (with WPs)
- **Code deployment** (including user training and support)

Prerequisites for code support:

- **Appropriate data environment (including IMAS interfaces)**
- **Open access for the EUROfusion community**

Implications:

- Existing TSVVs are expected to evolve and possibly merge
- New pilot TSVVs in fusion engineering and technology
- Potential adjustments in ACH responsibilities



Criteria (from May 2020) include:

- **Free availability (within EF) of an up-to-date release version of the source code for production runs**
- **Specific plans for code verification and validation, including aspects of UQ**
- **Specific plans for code dissemination and user training within EF**

ACH proposal: **3 priority levels**

- Some criteria need to be clarified
- Traffic light system needs to be refined
- E-TASC SB is invited to review and endorse the proposed priority levels
- Code developers are invited to assess their code and define next steps to maximize progress in 2025
- ACHs are available to support these efforts in close collaboration with code developers (incl. Poznan tools)

Open source software: Key considerations



Countless benefits and assures high-quality science (incl. transparency & reproducibility)

Right of use for research purposes within EUROfusion; repository in Poznan

Access to a recent release version of the source code; needs to be as easy and fast as possible; with or without registration

Dependencies on 3rd-party software (like NAG) should be avoided

We need a set of recommended licences (also addressing re-distribution etc.); some codes use: MIT, Apache, GPL, AGPL, LGPL, EURL etc.

The IO is about to release the IMAS software as open source.



The PSD proposal for additional funding aimed at targeted applications of TSVV codes to address WP needs was met with great enthusiasm. The implementation will follow a fast-track approach with light management to enable project setup by 2025:

1. WP TFLs/PLs will define their modeling needs and specify objectives (Sara created a SharePoint document).
2. They will reach out to PIs with ready-to-apply codes for clarifications and adjustments based on WP requirements.
3. Once a suitable code is identified, projects and training opportunities will be advertised via WPTE and TSVV community channels.
4. WP PLs and PIs will jointly select candidates from interested trainees and define a work plan.
5. Training will be scheduled flexibly, based on the availability of trainees and trainers.
6. WPs will provide support throughout the training via RTCs or sub-project leaders.
7. Funding will be allocated through the new PSD scheme.



Additional PSD comments:

- **Publication clearance for data:** Improvements are needed in the publication clearance process for data used in TSVV code validation and verification. Structures that encourage a culture of individual data ownership should be reconsidered and discouraged.
- **WPTE support for V&V:** WPTE will allocate experimental time and support for TSVV participation in validation and verification through their 2025 call for participation. TSVVs are encouraged to apply, clearly specifying the related work plans.

DCT proposal to enhance TSVV interaction:

- Regular meetings with experimental colleagues (e.g., 'FSD-FTD meetings'), currently involving occasional input from theoreticians.
- **A forum specifically for theory engagement should be established.** It could be either combined with existing meetings or set up separately based on the situation. Deciding factors include specific topics and the stakeholders involved.
- Note: The goal is a two-way process — learning from the broader community while also shaping research directions.



- Increased focus on the physics of future machines (ITER, DEMO, optimized stellarators)
 - Core transport: high beta, energetic particles, impurities
 - Disruptions and REs
 - Edge physics: L-H transition, no/small ELM regimes (incl. RMPs)
 - Exhaust: divertor solutions, PWI, radiation
- Development of predictive capabilities (incl. VVUQ)
- Development of reduced models (for flight simulators)
- Extension to fusion engineering (see TSVV-14)
- Interface to computational research on fusion materials within EUROfusion

ACH developments: Key topics



- There is growing concern about losing ACH expertise if ACH continuity beyond 2025 cannot be confirmed soon. Faced with the uncertainty of contract continuation beyond 2025, ACH team members are likely to start looking for other jobs and will not have difficulties finding jobs in industry. It has taken a lot of effort to build the current teams and it would not be wise to let them disintegrate.
- ACHs will tighten their contacts and collaborations. ACHs in Poznan and Helsinki will start to meet regularly to discuss data and AI/ML issues and will participate remotely to HPC ACHs annual meeting later this month.
- To start preparing ACH work beyond 2025, more details on codes' status and needs e.g. in terms of HPC compatibility and portability to different architectures would be helpful. Dedicated HPC resources for ACH projects would be helpful.
- Beyond the annual face-to-face meetings among HPC ACHs, we discussed holding a remote, one-day meeting with all five ACHs to focus on specific common tasks or issues.
- TSVV request allocation and interaction with code developers should be further improved.



- Thrusts: Monthly meetings (JourFixe, including recent news)
- Adequate resources for travel support; information on available funds is not (easily) accessible
- Communication platform: Mattermost
- Explore pathways to supporting an HPC/AI Summer School (see MIT, W&M), possibly in collaboration with European HPC centers, CERN, UKAEA, or FuseNet
- Next E-TASC General Meeting in 2025 (breakout sessions!)
- Significant progress on the DMP



- Data (DMP!) & AI (assessment of ongoing projects)
- Code Development
- Predictive Modelling (see TSVV-11/15)
- ENR projects and dedicated theory efforts
- Infrastructure (incl. Long-Term Data Storage Facility)