Outcome from the Mid-Term Review of TSVV tasks

Meeting # 14 of the SC on the EUROfusion-IO development of IMAS| 10 October 2023

D. Kalupin, F. Jenko, V. Naulin

thanks to contributions by the E-TASC SB

This work has been carried out within the framework of the EUROfusion Consortium, funded by the European Union via the Euratom Research and Training Programme (Grant Agreement No 101052200 — EUROfusion). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.

E-TASC ECO SYSTEM

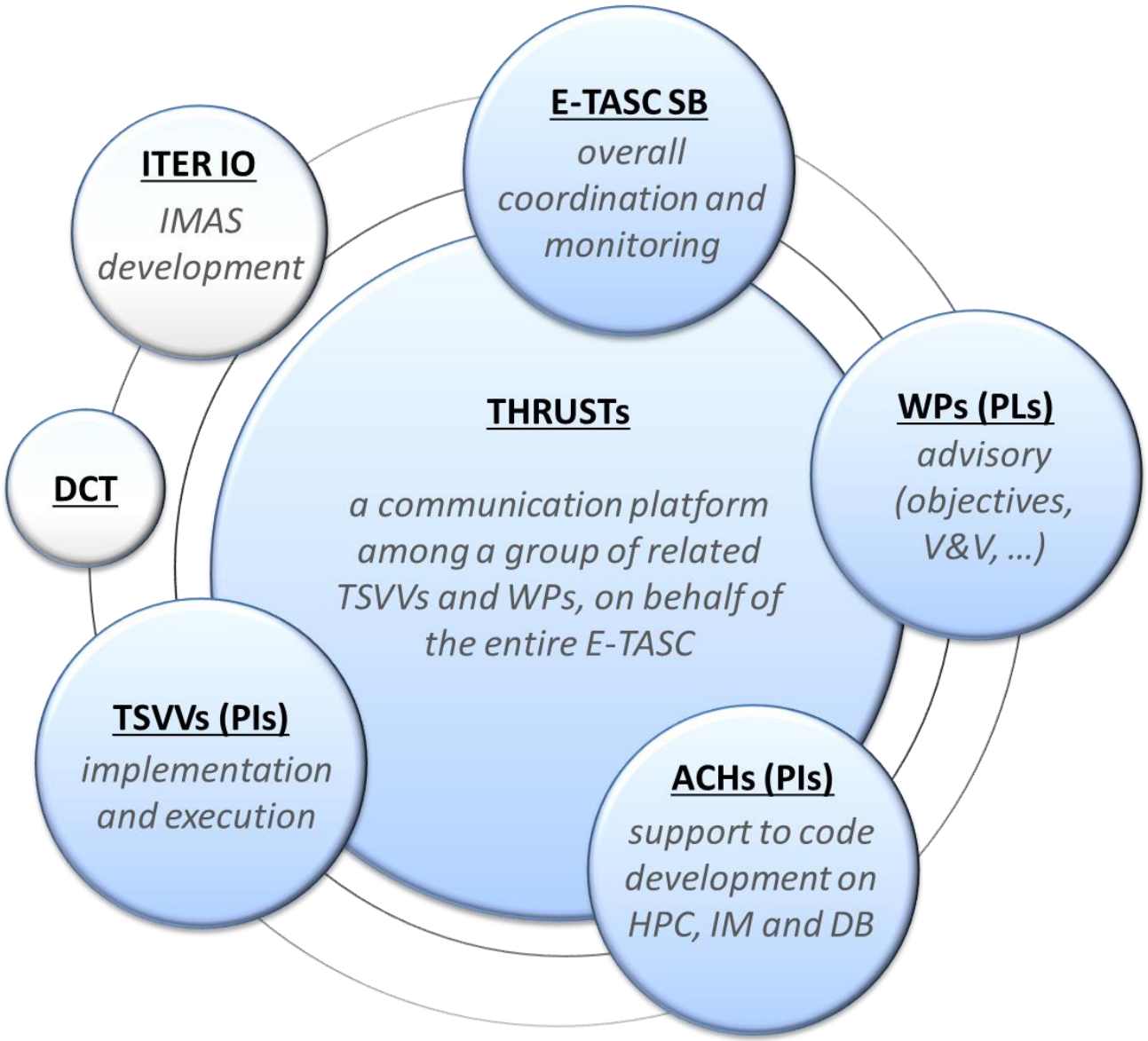
*Different players **working together** exchanging through the E-TASC Eco System*

Roles are clear and distinct.

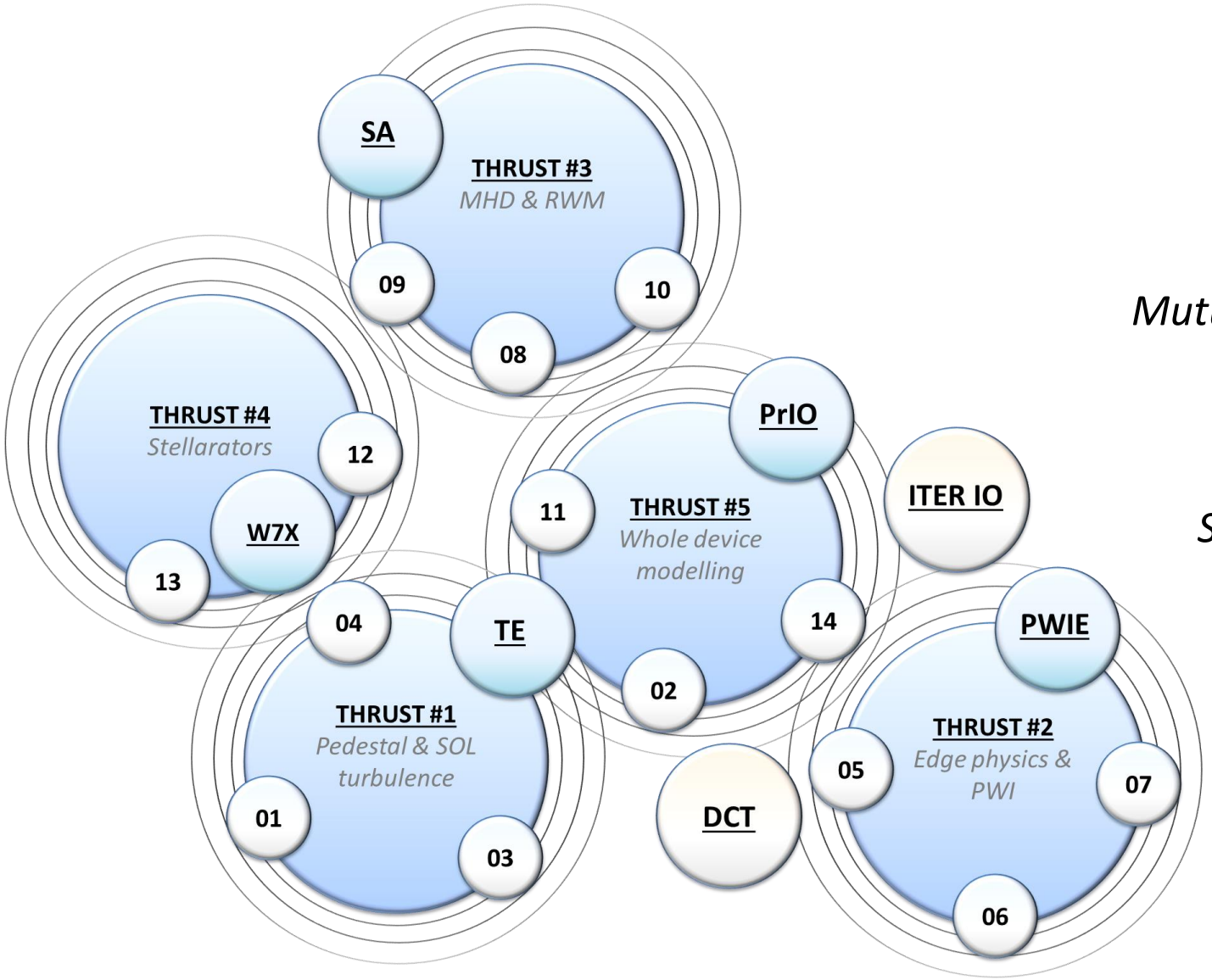
*A Thrust serves as a **communication platform** among a group of related TSVVs and WPs, on behalf of the entire E-TASC.*

Thrust facilitator provides feedback on the Thrust activities and proposes corrective actions for the TSVV work programmes to the E-TASC SB if and when needed.

Additional interactions with ITER IO on IMAS platform development through IMEG and EF-IO IMAS SC



“Team of Teams” approach



Groups working together in close interactions between them

TSVVs are sharing “orbits” of different Thrusts

Mutual interest between Thrusts on specific topics, emerging interactions between Tokamak and Stellarator groups (turbulence, 3D, AI)

Several services provided (mostly through ACH) to benefits of entire community

Close interactions with ITER IO on the platform and code development (shared)

Interactions with DCT

TSVVs

- Continue with TSVV project execution following work plans originally agreed by the E-TASC SB and corrections/recommendations from the Mid-Term Review

- Mid-Term Review

  The review was carried out in a three-step process:

  - Presentation of each TSVV project's achievements to date to a broad audience of EUROfusion scientists: focusing on the main scientific and technical highlights, briefly mentioning specific impacts (achieved or anticipated) on the WPs, and plans. All materials are available at https://indico.euro-fusion.org/event/2429/;

  - Inputs by the Thrust Facilitators regarding possible changes of the project objectives to reflect the current state and updated needs of Work Packages (in coordination with WP leaders); Materials are available at https://indico.euro-fusion.org/event/2611/.

  - Meeting of the E-TASC SB, drafting of recommendation reports to individual TSVVs and the overview regarding the findings, recommendations, and general lessons learned addressed to the Programme Manager (in progress).

TSVV Mid-term review (preliminary outcome)

Key conclusions

- **Successful start of the 14 TSVV projects**. The SB was very impressed by the major progress that was achieved during the first phase of the 14 TSVV projects, as demonstrated during the EUROfusion Science Meeting on September 11-12, 2023. Despite a delayed start in 2021, Covid-induced communication restrictions during the first two years, and the need to overcome several losses of key personnel, the milestones and deliverables have almost always been met and the projects are on track. The SB congratulates the TSVVs to this achievement, which reflects the teams' dedication and capability.

- **World-class research, theory, and code development.** The 14 TSVV projects address key open questions in fusion science, developing and using state-of-the-art simulation tools. This is reflected, among other things, in many papers in top-notch journal and invited talks at major international conferences (including, e.g., the IAEA-FEC). The basis for this success is a healthy mix of setting ambitious scientific goals and fostering a collaborative spirit, both of which are part of E-TASC's DNA.

- **Fruitful interactions with all relevant WPs.** The Thrust leaders confirmed this very positive impression in their reports during the SB meeting at Prague. The establishment of Thrusts which are coordinated by WP leaders has proven to be a useful step towards strengthening the links between TSVV projects and all relevant WPs, serving as a communication platform in both directions.

TSVV Mid-term review (preliminary outcome)

General recommendations

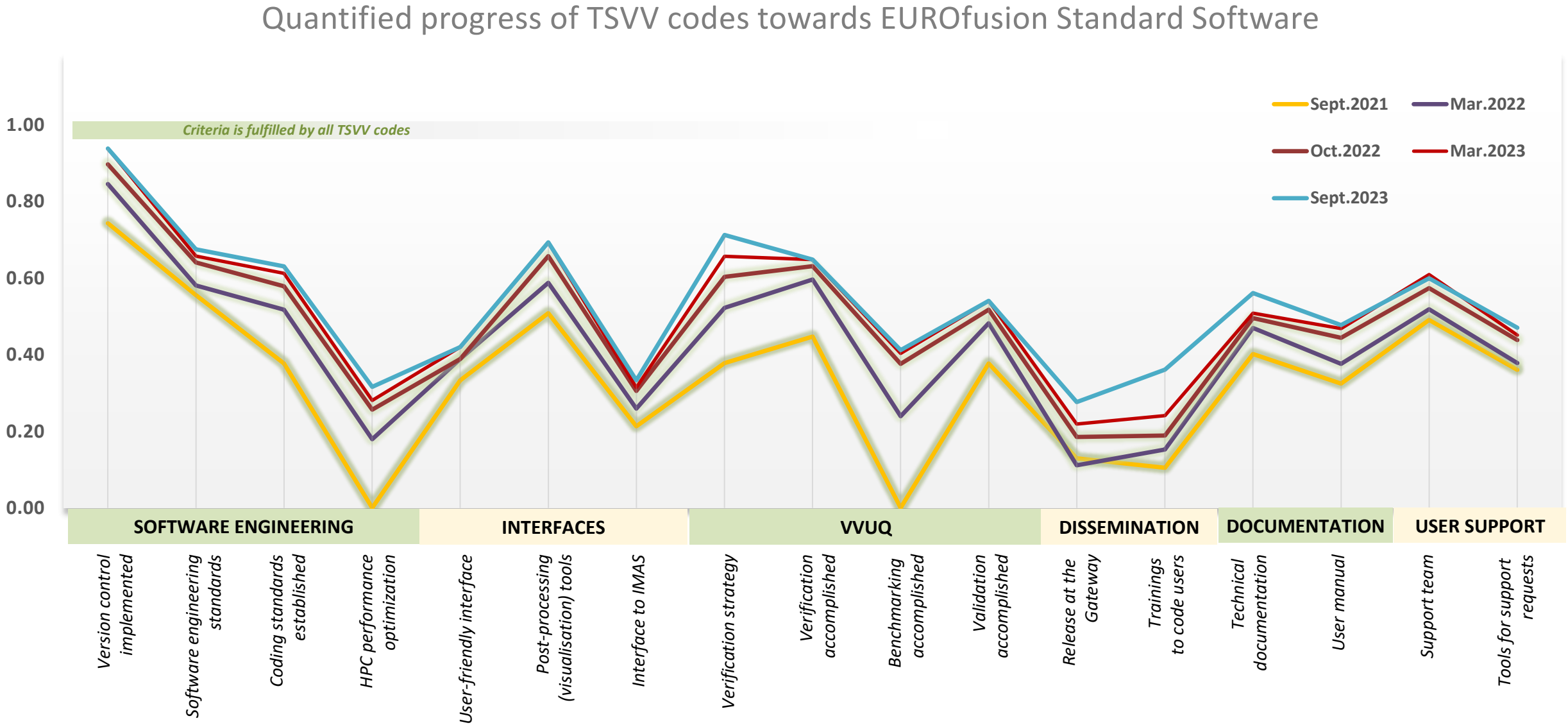
- **Further strengthening collaborations within the E-TASC ecosystem.** During the review process, it became apparent that there often exist synergies between various TSVVs beyond the established Thrusts. Similarly, the communication with/between ACHs should be further strengthened. Actions should be taken to foster this kind of communication and collaboration. (Occasional in-person meetings of suitable subsets of all TSVV leaders, selected WP leaders, all ACH leaders, and the E-TASC SB members)

- **Increased focus on the development of EUROfusion Standard Software.** Up to now, most projects have focused on the (further) development and important applications of various codes, with remarkable results in many cases. The SB greatly welcomes and fully acknowledges these advances. From now on, however, the focus will shift to cross-code fertilization, the completion of the IMASification, and the dissemination of the developed tools.

- Providing resources for **in-person meetings and trainings**. This is considered an extremely important aspect regarding the exploitation of the full potential of E-TASC.

- **Enabling modern data-driven plasma science.** Fusion research follows the general trend to explore the exciting possibilities of modern data science, machine learning, and artificial intelligence, which involves various aspects of data access and data exploration.

Progress towards EUROfusion standard software



The standard for the EUROfusion software is defined in https://idm.euro-fusion.org/?uid=2Q72WQ

TSVV Mid-term review (preliminary outcome)

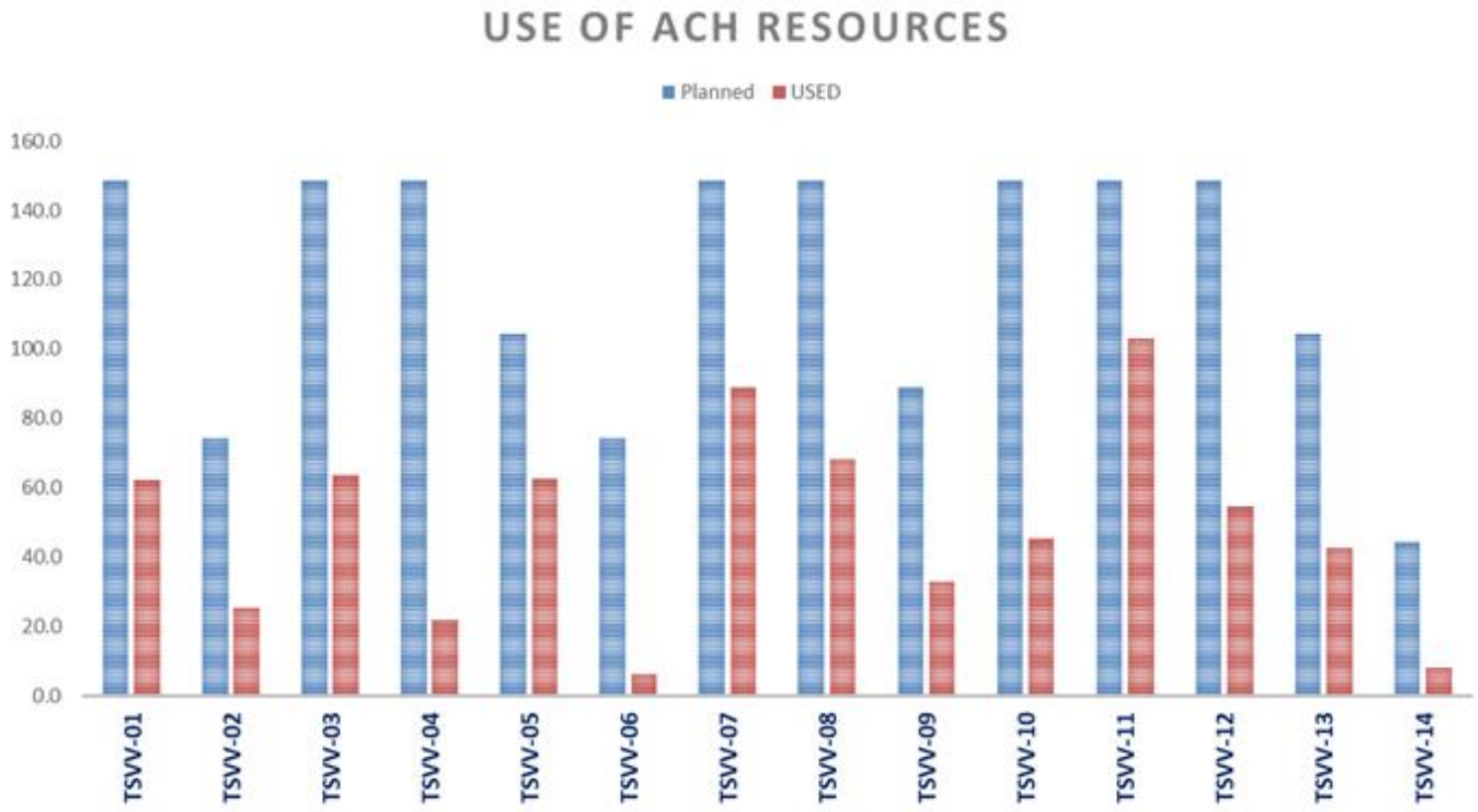
Key open questions

- **Role of UKAEA.** UKAEAs role in the EUROfusion programme should be clarified, particularly for cases where they are having a project lead or other important responsibilities.

- **Software licensing.** Considering the push towards providing EUROfusion Standard Software, the topic of developing suitable software licenses must be addressed. This task is complicated by the fact that codes are often developed by multiple institutions/organizations, which may have their own unique perspective on this topic. With the advent of many fusion startups, many of are interested in using codes developed within E-TASC, there exists a new layer of considerations to be considered. A clear recommendation on exact licenses (or license options) to be used should be provided on a EUROfusion-wide basis in a timely fashion.

- **Development of a Pulse Design Tool (PDT).** Recently, a small activity coordinated by members of TSVV-11 has been launched by the PMU to identify possible paths forward regarding the development of a PDT. The exact definition of such a tool and how to best exploit the links to existing or planned activities both within and beyond EUROfusion remain a subject for discussion. The SB and the TSVV leaders will play an active role in this context.

ACH



Majority of TSVVs are spending ACH resources according to the plan [35-55%]

Several other tasks (total up to 220 PMs over 2021-2023) **are carried by ACHs in addition to TSVV code support** (small projects in other WPs and whole community services)

With agreement from TSVVs underusing the ACH resources, their **quota might be re-distributed to other projects**

Summary

The WPAC is progressing well in accordance with the agreed research plan (*all planned deliverables and milestones are accomplished within the deadline*).

Mid-Term review has confirmed and acknowledged the progress made by TSVVs in theory and code development. From now on, the focus will shift to cross-code fertilization, the completion of the IMASification, and the dissemination of the developed tools.

ACH provide crucial support to code developers mainly from TSVVs, but also to several small projects from other WPs and to the services like HPC or Data Bases important to the entire community. (staff issues must be addressed)

New hardware for the EUROfusion **HPC&GW** services is expected at the mid of 2024, the mitigation of the transition is arranged by making LEONARDO resources available for the EUROfusion users.

The team of computer and data experts have been set up to work on the technical implementation of the **DMP towards F.A.I.R. data** from EUROfusion machines

Two support actions: 1) PDT development; 2) faster transition to SCENARIO B