Thrust #1: Pedestal and SOL Turbulence

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Thrust 1 Involved TSVVs

- TSVV1 : Physics of the L-H Transition and Pedestals

- Validated local & global GK simulations of ion-/elect.-scale, & multi-scale turbulent transport in the H-, QH-, I-, and L-mode edge with extensions to relevant macroscopic (MHD-like) instabilities and radial electric field development
- Consistent application of new TSVV 4 edge GK code
- An interpretative and predictive capability of L-H transitions from fluid codes to GK
- Reduced transport models for the pedestal on the basis of GK simulations, involving electron-/ion scale, and MHD-like instabilities

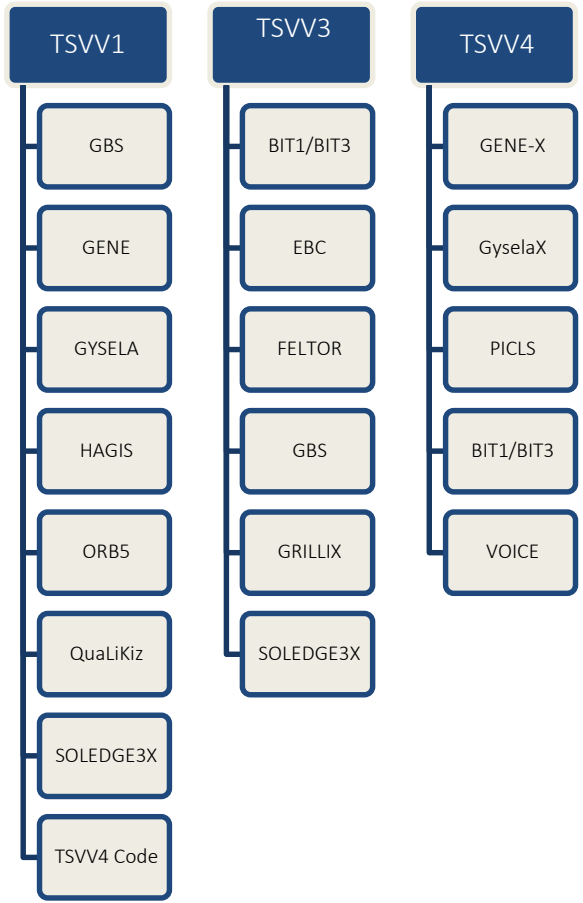
- TSVV3: European boundary plasma modelling towards reactor relevant simulations

- Develop a comprehensive modelling capability (incl. anomalous transport) for the plasma edge based on fluid/gyrofluid equations, ideally including important kinetic effects and a realistic description of plasma-wall interactions.
- Ensure that the respective tools exhibit good scalability on high-performance computers, such that reliable and accurate results can be obtained for the preparation and interpretation of experiments and the design of fusion power plants.
- Validate these tools and apply to address key physics questions.

- TSVV4: Plasma Particle/Heat Exhaust: Gyrokinetic/Kinetic Edge Codes

- Highly scalable gyrokinetic and fully kinetic codes for the plasma edge. These are to be provided to TSVV Task 1 for applications as soon as possible.
- New approaches for dealing with open field lines, based on fully kinetic models potentially involving code coupling
- Investigations of the limitations of gyrokinetics, including comparisons between gyrokinetic and fully kinetic predictions possibly extended orderings for GK.
- Code coupling techniques for neutral physics and impurities, and for coupling to fluid or gyrofluid codes. New developments in computer science and applied math should be exploited for this

Thrust 1 - TSVVs Overview



- Synergies already existing between the TSVVs considering that some of the codes are developed on different TSVVs
- AIM: Tackling the Pedestal/edge/SOL dynamics by exploiting fluid/gyrofluid/gyrokinetic approach exploring respective boundaries
- Thrust as a space for facilitating TSVVs interactions as well as interactions with WPTE Research Topics

WPTE-TSVVs relation in a nutshell

From RTs: open physical problems, unresolved experimental observations, detailed experimental dataset

From TSVVs: needs for validation. Ad-Hoc experimental proposals for validation

WPTE – Thrust 1 TSVVs interaction

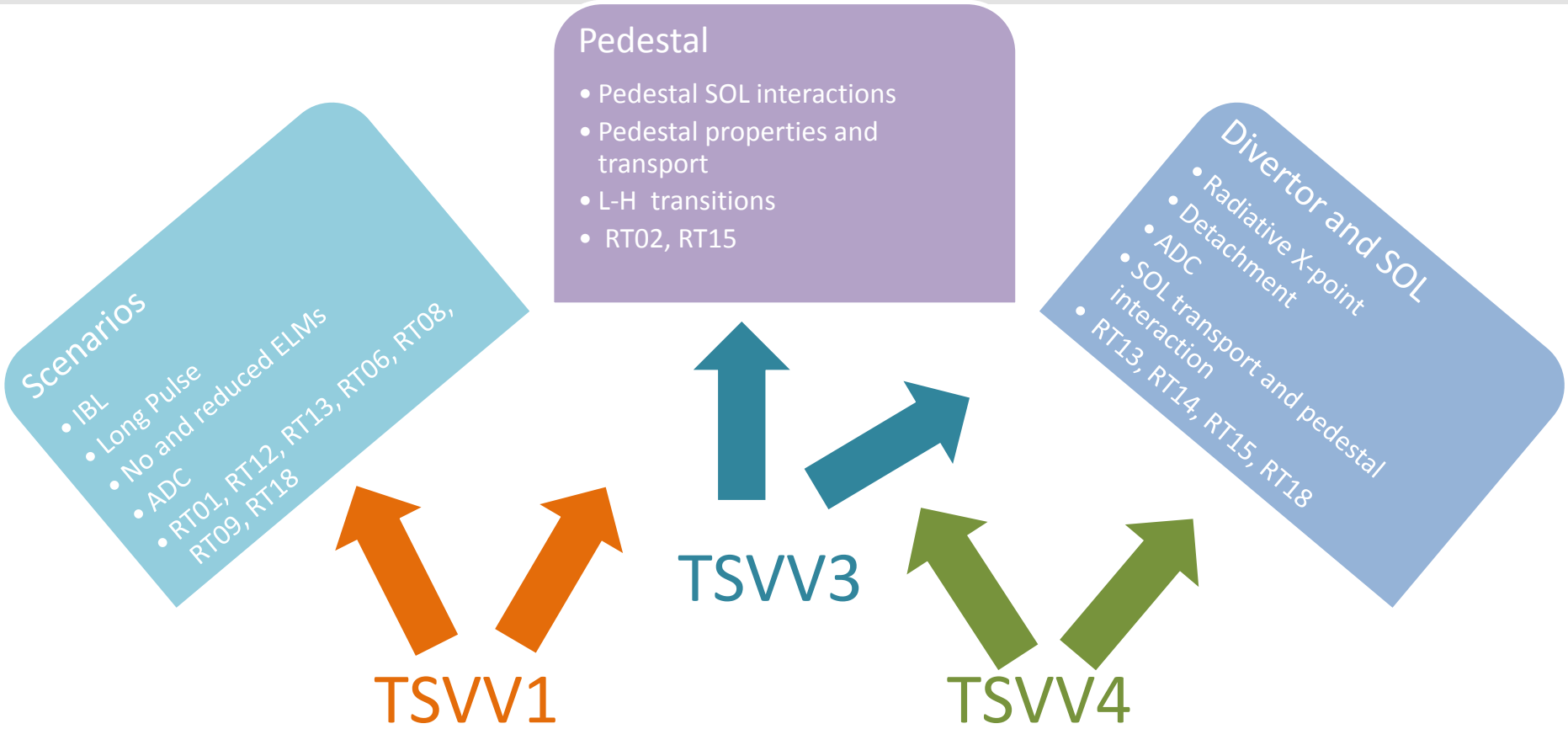
All WPTE research topics have a direct and relevant relation with at least one TSVV and most of the time with several of them (see WPTE wiki). Research topics have to execute a set of objectives that are often connected with code/model deliverables of TSVVs.

WPTE TFLs have informed the Scientific Coordinators about the relations of their Research Topics with the relevant TSVVs. WPTE TFLs will foster the interaction between SCs and TSVV PI promoting focused meetings.

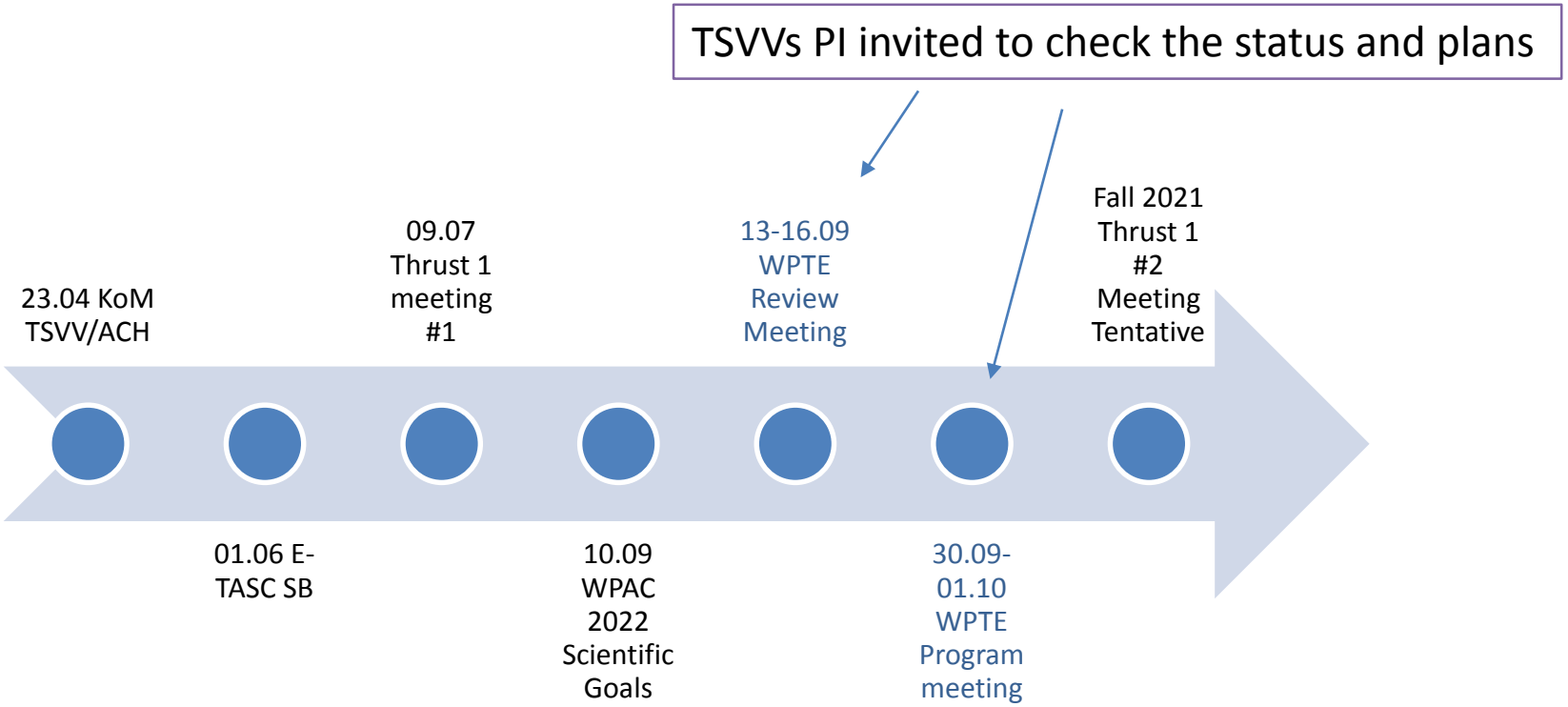
WPTE TFLs expect working meeting to take place between the SCs and PIs to define / identify:

- Specific model/code requests that the Research Topics have towards the TSVVs.
- People involved in this work on both sides
- The validation actions required for the models/codes developed such as database, data mining, targeted experiments & their analyses, etc.

WPTE TSVVs relation



Thrust work in 2021



Thrust 1 Meeting #1

- Slides and minutes available on INDICO
- Provided Research Topic modelling issues/gaps to TSVVs PI
  - Outcome of WPTE TFLs interactions with RT SCs. Direct link to relevant TSVV provided
  - → Inputs further elaborated and discussed within TSVV (see e.g. TSVV1 research questions & discussion)
- Identified actions :
  - Priorities of the modelling/interpretative requests (WPTE → TSVVs). **This will happen after WPTE Review and Program meetings**
  - Feedback on possible stepladder approach: which issue can be firstly addressed (TSVVs → WPTE).
  - Theory-driven experimental proposals for validation → Thrust will foster synergies with present SCs to put forward these proposals in future WPTE calls

Experimental validation exercises

- Validation exercises of TSVV1 and TSVV3 already started as legacy of the corresponding pilot projects: papers submitted or on the pinboard
- Data validation requests from TSVV3:
  - Low-recycling L-mode AUG plasmas with full set of edge SOL diagnostics (similar to TCVX21 turbulent-cyclone case) → RT15
  - Neutral modules will be available to 3D turbulent codes by end of 2021 -- > validation exercises through ad-hoc density scan in TCV → RT14, RT15
- Further requests to be elaborated in synergies with relevant RTs.
  - To be considered time constraints (AUG will not operate from 06/2022-12/2023) and foreseen campaigns (e.g. He campaigns)

Future steps

- 2nd General Thrust meeting: fall/2021
- Ad hoc focused meetings on specific topics: direct involvement of the experts/SCs.
- Call for proposals for WPTE: fostering theory/numerical-driven experiments to be performed on WPTE devices