



Commissioning and operation of current enhancement projects

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WPSA Operations Subproject Leader



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2009-2012 EFDA Goal Oriented Training in Tokamak Operations - IPP Garching

- Session Leader of ASDEX Upgrade, MAST and JET (4 MA)

2012-2019 Responsible Officer in Operations in the Operation Group of the EFDA CSU, later JET Exploitation Unit (JEU) - UKAEA, Culham

- Responsible for the management of the JET (scarce) resources, tritium rehearsals
- Responsible for the JET session leaders

2019-2021 Deputy EU Coordinator of the EUROfusion Naka-site team

- Responsible for Wall Conditioning, EDICAM, camera tomography and scenario development

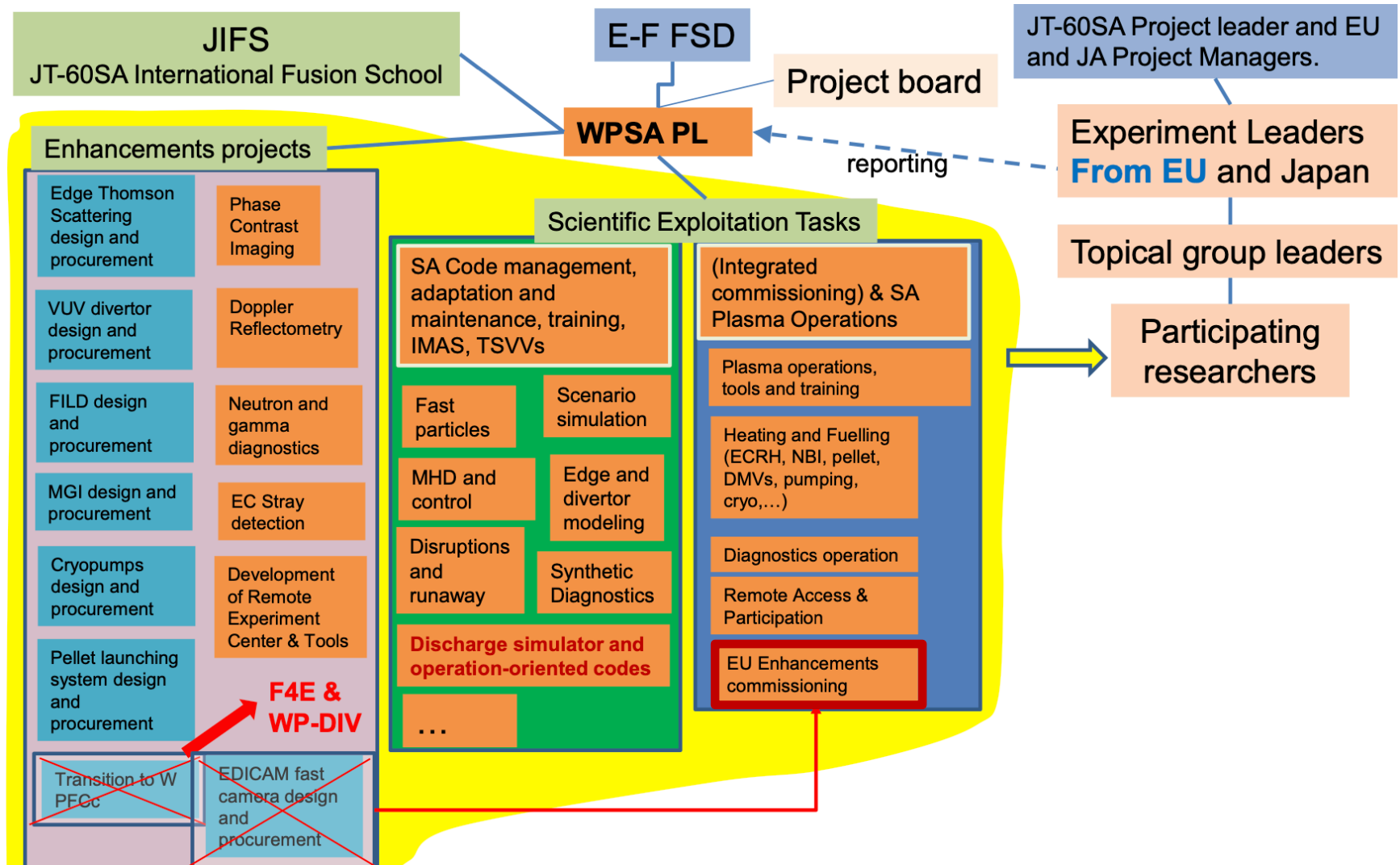
2021-2025 WPSA Operations Subproject Leader

Member of the ITER Operations Network

Special Editor of the [Special Issue on the the Physics and Engineering of Toroidal Fusion Plasma Operations](#)



WPSA in FP9



WPSA Operations Activities in FP9



Activity	2021	2022	2023	2024	2025
Cryo and Magnets	Review coil energisation in the integrated commissioning, analyse lessons learned and support EEG on magnets.	Review coil energisation in the integrated commissioning, analyse lessons learned and support EEG on magnets.			
EDICAM operation	Review operational experience from the integrated commissioning	update where needed	diagnostics operation	diagnostics operation	diagnostics operation
Plasma Operations	Review the operational experience of the integrated commissioning in 2021	Train and contribute to plasma operation preparations	Train and contribute to plasma operations	Train and contribute to plasma operations	Train and contribute to plasma operations
Real-time Networks	Consider tools for JT-60SA based on integrated commissioning experience	Learn about the RT networks at JT-60SA. Develop / integrate suite of tools for JT-60SA	Develop RT networks and support operation	Develop RT networks and support operation	Develop RT networks and support operation
Wall conditioning	Review vacuum conditioning and the ECWC in 2021 from the operational aspect	Contribute to preparation of vacuum conditioning for the 2023 campaign	Monitor wall condition and contribute to operation of ECWC	Monitor wall condition and contribute to operation of ECWC	Monitor wall condition and contribute to operation of ECWC
Divertor Cryo operation		Installation and test	Commissioning and operation, training of resident staff	Commissioning and operation, training of resident staff	Commissioning and operation, training of resident staff
ECH		prepare for operation	Support operation	Support operation	Support operation
NBI			Support operation	Support operation	Support operation
Edge Thomson Scattering		Installation	Installation / commissioning	diagnostics operation	diagnostics operation
VUV operation		Installation	Installation / commissioning	diagnostics operation	diagnostics operation
FILD operation				Installation / commissioning	diagnostics operation
Massive Gas Injection			Installation / commissioning	operation	operation
Pellet Launching System			Installation / commissioning	operation	operation

2021: no operations budget, no task or deliverable



Research plan: www.jt60sa.org/pdfs/JT-60SA_Res_Plan.pdf

Plant Integration Document (PID): <https://users.jt60sa.org/?uid=222UJY>

Common Quality Management System (CQMS)

Definition of management procedures and processes.

- CQMS-01000 Common Quality Management
(https://users.jt60sa.org/?uid=223AVV&action=get_document)
- CQMS-13000 Integrated Commissioning
(https://users.jt60sa.org/?uid=29YUZV&action=get_document)
- CQMS-13100 Control Room Organisation
(https://users.jt60sa.org/?uid=2A7288&action=get_document)

What we have learned



Experience from the installation and commissioning of EDICAM, however we are still learning about daily/weekly/... operational practices

- E.g. **weekly vacuum window inspections** on Monday mornings require movement of the EDICAM camera

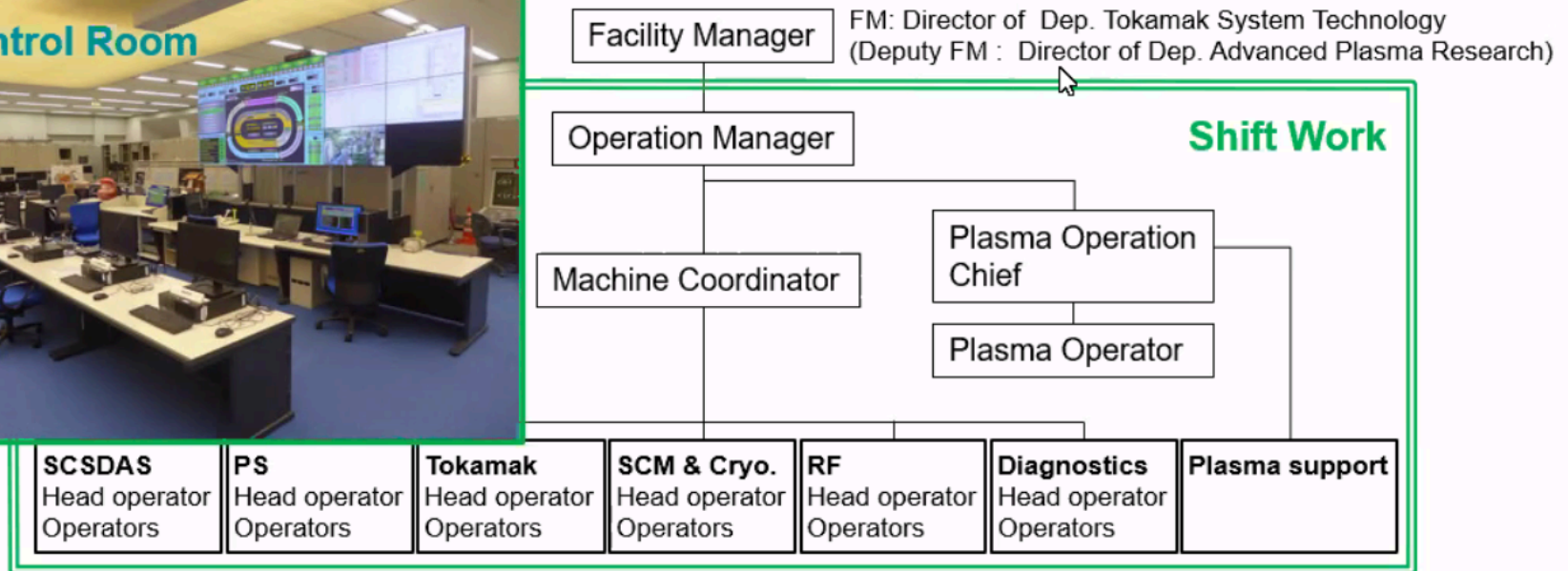
Control room work in Japanese (integrated commissioning is QST's responsibility, concern about adequate communication when it comes to machine and personnel safety).

- QST contacts and plasma operation chiefs (JT-60SA session leader) speak good English
- Pulse logs and daily logs can be written in English
- Diagnostics are managed by three seconded personnel per shift who only speak Japanese

Communication on Microsoft Teams with remote EU team worked well.

Daily QST-EU meeting (10-20 min) with the Plasma Operation Chief for GDC worked well.

Control Room



Plasma Operation Chief: Execute plasma operation and ECWC requested by **Topic Leaders**. Optimize discharge conditions and shot plan in the day considering subsystem status.

Plasma Operator: Program discharge conditions in Human Machine Interface (HMI) according to Plasma Operation Chief.

Plasma Support: Support commissioning by monitoring data and analysing data mainly according to request by Topic Leader or Plasma Operation Chief.

*Sometime "Topic leader" holds "Plasma Operation Chief" or "Plasma Operator".
Some of Plasma Team members join in the shift work as "Plasma Support".*

What we have learned



2-shift operation 5 days a week

- Early shift: 8.00-15.00 JST / 12.00-07.00 CET (winter time)
- Late shift: 15.00-22.00 JST/ 7.00-14.00 CET (winter time)

Pulse start, handover and end meeting in Japanese. Plan of the next day added to the log.

Possibility of a hardware link to enable remote operation (unique approval)

Work in torus hall require official Japanese license to work (unlikely)

Current software: python. We need to know of any paid software (MATLAB, IDL, etc) needs for post-processing and/or data analysis on the Naka server.

Reporting structure in CQMS

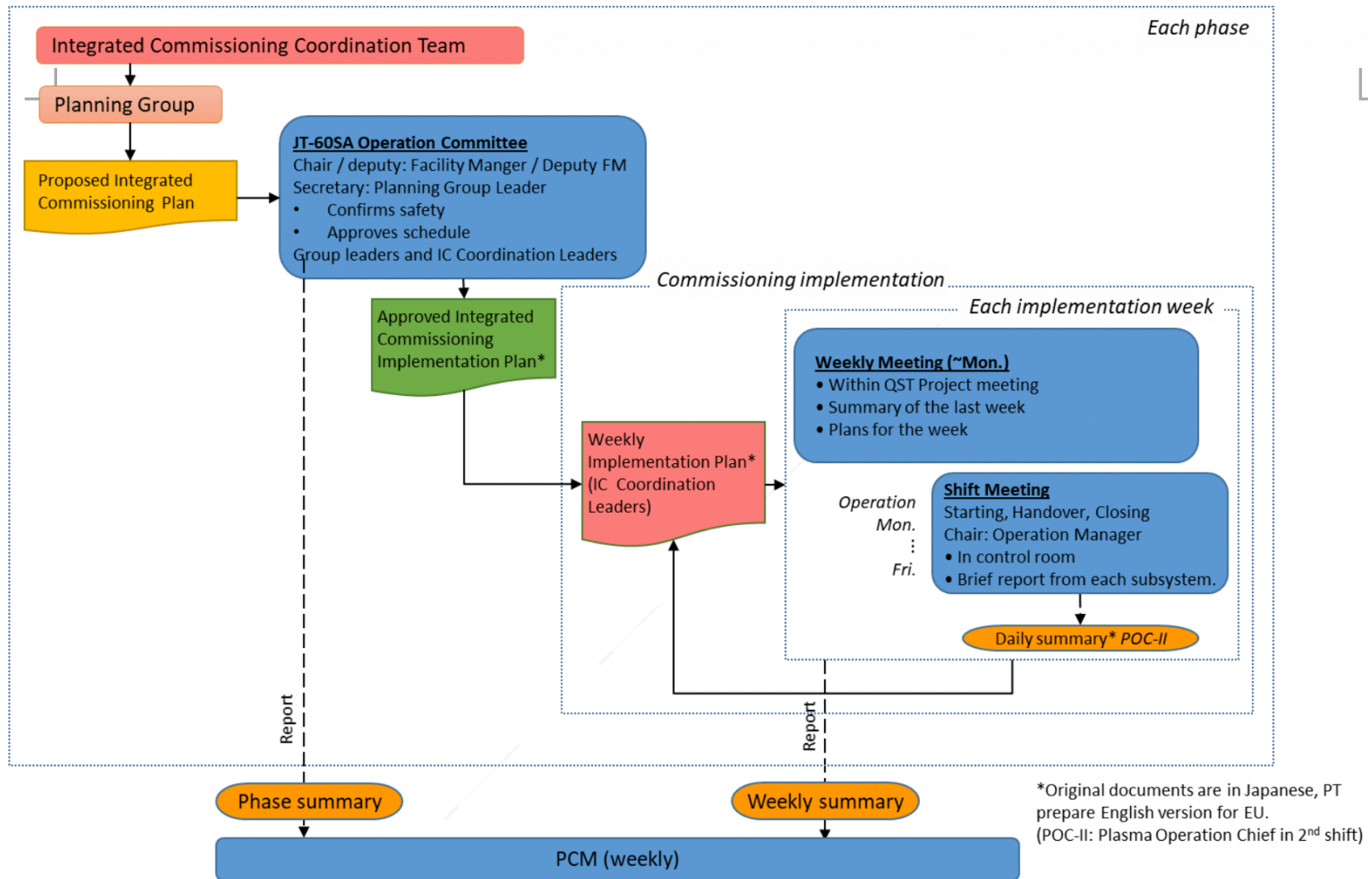


Figure 3: IC work planning, approval & reporting

Commissioning of enhancements



Plan to start discussion with Fusion for Energy and QST on the installation support, commissioning and operations in 2023-25 in mid-2021 or after the completion of the integrated commissioning phase.

Questions to start a conversation:

- **Onsite support.** Installation, work in the torus hall and labs are expected to be conducted by Japanese personnel (QST or seconded).
 - Any significant need for EU personnel to work in labs or the torus hall? This requires Japanese licence to conduct the work.
 - EU expert support in Japan (control room work etc.)?
- **Software needs** beyond the ones listed in the Procurement Arrangement (e.g. for post-processing, calibration or analysis). Licenced or free software.
- **Knowledge management and transfer** (reports, publication, training). **Training** of EU and Japanese personnel in English/Japanese.
- **Remote operation/maintenance/commissioning or Remote support**
- Safety, protection systems, real-time systems

Dedicated meeting later this/next year to discuss more in depth



Backup slide: QST structure 2021

