IAEA
International Atomic Energy Agency
*Atoms for Peace and Development*

Technical Meeting on Compatibility Between Coolants and Materials for Fusion Facilities and Advanced Fission Reactors

IAEA, Vienna

*30 October -03 November 2023*

# Meeting Objectives and Expected Outcomes

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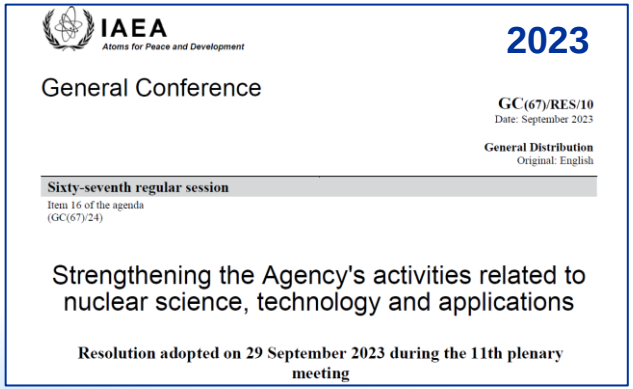
# Fusion Power in the High-Level IAEA Documents

**Recommendation of SAGNE-VII on Fusion** **2020**

Noticing the important achievements in the construction of ITER and other nuclear fusion facilities around the World and the advancement toward the deployment of fusion technology for energy production, SAGNE supports the initiative of the Agency to implement new activities, including cross-cutting ones, focused on engineering, technology and science, ***including addressing synergies in technology development between nuclear fission and nuclear fusion as well as fission-fusion hybrid systems for power production and radwaste transmutation***.

Noting that Nuclear Fusion is approaching the crossing point from a science and technology programme to energy implementation SAGNE recommends the Agency to strengthen its efforts to support the implementation of a strong safety culture in the fusion world community.



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**2023**

General Conference

GC(67)/RES/10
Date: September 2023

General Distribution
Original: English

**Sixty-seventh regular session**
Item 16 of the agenda
(GC(67)/24)

Strengthening the Agency's activities related to nuclear science, technology and applications

**Resolution adopted on 29 September 2023 during the 11th plenary meeting**

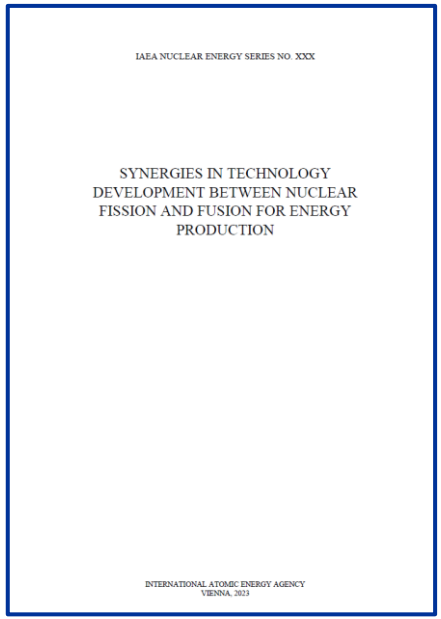
**Agency activities in the development of innovative nuclear power technology**

(l) Recognizing that a number of Member States are planning to license, construct and operate prototypes or demonstrations of fast neutron systems, high temperature reactors, ***fusion power plants***, and other innovative reactors and integrated systems, noting the latest technology developments in these areas and encouraging the Secretariat to foster these developments through the provision of international fora for the exchange of information, thus supporting interested Member States to develop innovative technology and improve safety, proliferation resistance and economic performance,

(m) Welcoming the increased effort of the Secretariat in exploring ***synergies between fusion and fission technologies***, and in implementing new activities in the sphere of fusion technology development and deployment in response to the increasing interest of Member States in such technology,

# History of Activities
## in the Department of Nuclear Energy (IAEA-NE)

# General Structure of the IAEA Document on Synergy


IAEA NUCLEAR ENERGY SERIES NO. XXX

SYNERGIES IN TECHNOLOGY DEVELOPMENT BETWEEN NUCLEAR FISSION AND FUSION FOR ENERGY PRODUCTION

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2023

Chapter 1: Introduction

Chapter 2: Status of fusion technology: needs and challenges

Chapter 3: Scenario studies: nuclear fusion reactors as an element of future energy systems

Chapter 4: Structural materials and circulating fuels

Chapter 5: Technology for synergies and know-how transfer

Chapter 6: Design safety, safety analysis and regulations

Chapter 7: Economic and market considerations

Chapter 8: Human resources and knowledge management

Chapter 9: Fission-Fusion Hybrid system

Chapter 10: General considerations on needed infrastructure

Chapter 11: Stakeholder involvement

Chapter 12: Conclusion and suggestions for future work

# From “Synergy” to “Compatibility”

## Chapter 12: Conclusion and suggestions for future work

“The most remarkable synergies can be found in the materials development to withstand harsh service conditions (temperature, heat flux, neutron irradiation and interactions with coolants) and efforts “

“The long-term development of fusion should also be kept compatible with developing Generation IV systems for fission energy to bring their best contribution to a sustainable energy development worldwide”

**Deadline for applications**
**31 May 2023**

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**Technical Meeting on Compatibility Between Coolants and Materials for Fusion Facilities and Advanced Fission Reactors**

**IAEA Headquarters, Vienna, Austria**
and virtual participation via Cisco Webex

**30 October–3 November 2023**

**Ref. No.: EVT2205016**

# Positioning of the TM

**TM on Compatibility**
**30 Oct -03 Nov, 2023**

**TECDOC Publication**

**CM-1**
**07-09.02.2023**

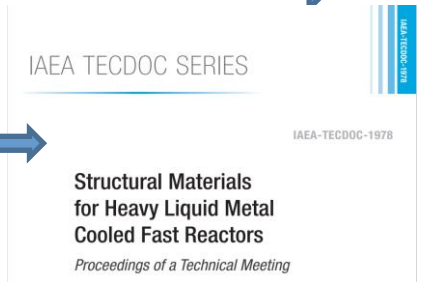
**CM-2**
**19-20.09.2023**

**CM-3**

**International Symposium on Fusion Nuclear Technology, Spain**
**10-15.09**

**Fusion Energy Conference, UK**
**16-21.10**

Example of publication



# On ISFNT-15: Distribution by topics

Blanket technology – 103,

Plasma facing components – 82,

Experiments & models – 69,

Fuel cycle and tritium processing – 64,

Nuclear system design – 57,

Material engineering – 55,

Safety issues and waste management – 53,

Vacuum vessel and ex-vessel systems – 47,

Repair and maintenance – 36,

Inertial confinement fusion – 26,

Burning plasma control – 23,

***Fission-Fusion synergy 12***.

Total number of attendees – about 700

Total number contributions - 627.

2 – from the IAEA
D.Ridikas (IAEA activities in support of nuclear fusion research and technology development) IAEA-NA
V.Artisiuk (Synergies in technology development between nuclear fission and fusion for energy production) IAEA-NE

4 relate to fusion-fission hybrids (from China, Sweden, Japan, Italy),
3 – to application of fusion based neutron sources and measurement techniques,
1 – to application of fusion to industrial heat production (similar to SMR),
1 – to TRISO fuel performance in fusion facilities

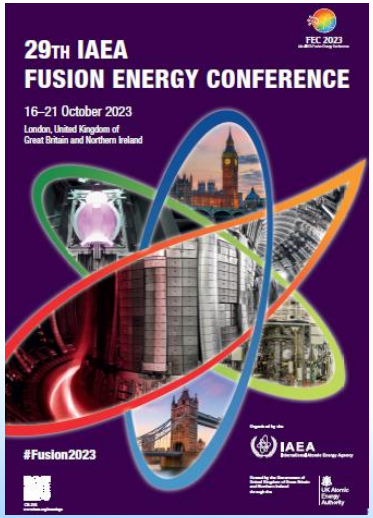
# Recent Trends in Fusion:
# From Plasma Science to Power Applications


FEC-23
16- 21 October 2023

1961: IAEA Conference on Plasma Physics and Controlled Nuclear Fusion research

1996: IAEA Fusion Energy Conference (FEC)

FEC-23: 20% of contributions – on technology




**1000 (1300 initially)** participants in-person and **1600 (1000)** – on-line participants:

1 Keynote presentations
19 Overview talks
**100 Regular talks**
2 Rapporteur and Rapporteured talks
36 Overview posters
774 Regular posters
2 Post deadline talks
15 Post deadline poster

- ✓ Magnetic Fusion **Theory** and Simulation
- ✓ Magnetic Fusion **Experiments** including Validation
- ✓ Fusion Energy **Technology (23 oral presentations)**

# Technical Meeting on Compatibility Between Coolants and Materials for Fusion Facilities and Advanced Fission Reactors

Session 1 Advances in the Areas of Fusion& Fission Technologies

Session 2 IAEA activities in support of advanced technologies

| | | |
|---|---|---|
| Session 3 Experimenting: Corrosion and mass transfer | 14 | (11 + 3 virtual) |
| Session 4 Modelling: Corrosion and mass transfer | 5 | (4+1) |
| Session 5 Specifics of coolant-material compatibility in fusion environment | 4 | (3+1) |
| Session 6 Compatibility of materials and coolants in nuclear reactors' environments | 9 | (5+4) |

Session 7 Conclusions

Total: 32 (23+9) Contributions
65 nominations

# Objectives of the TM:

**The purpose** of the event is to present, review and discuss the state of the art of research on compatibility between coolants and structural materials used or proposed for use in fusion experimental facilities and future thermonuclear reactors for energy production; and to determine the applicability of the technology and materials used in advanced fission reactors to future fusion systems.

**Specific objectives** of the event are:

- Promote and facilitate the exchange of information on compatibility between coolants and materials for both fusion and fission;
- Summarize the current status of research into the topic of coolants and materials;
- Identify needs and challenges on the topic;
- Document the discussions and major findings among subject matter experts to support Member States in better understanding and benefiting from research into coolant-material compatibility.

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# Thank you