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# Development of Nuclear Fuel Cycle Terminology Standards in ISO

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# Experience Summary

- 37 years at Savannah River National Laboratory (U.S. Department of Energy)
- Member of ISO working group on terminology in the nuclear fuel cycle since 2016
- I am not representing or speaking for ISO
- I am sharing my experience as a subject matter expert (not a terminologist) in terminology development for the nuclear fuel cycle in the ISO working group
- Views expressed are based on my experience, and are not necessarily the views of SRNL or DOE

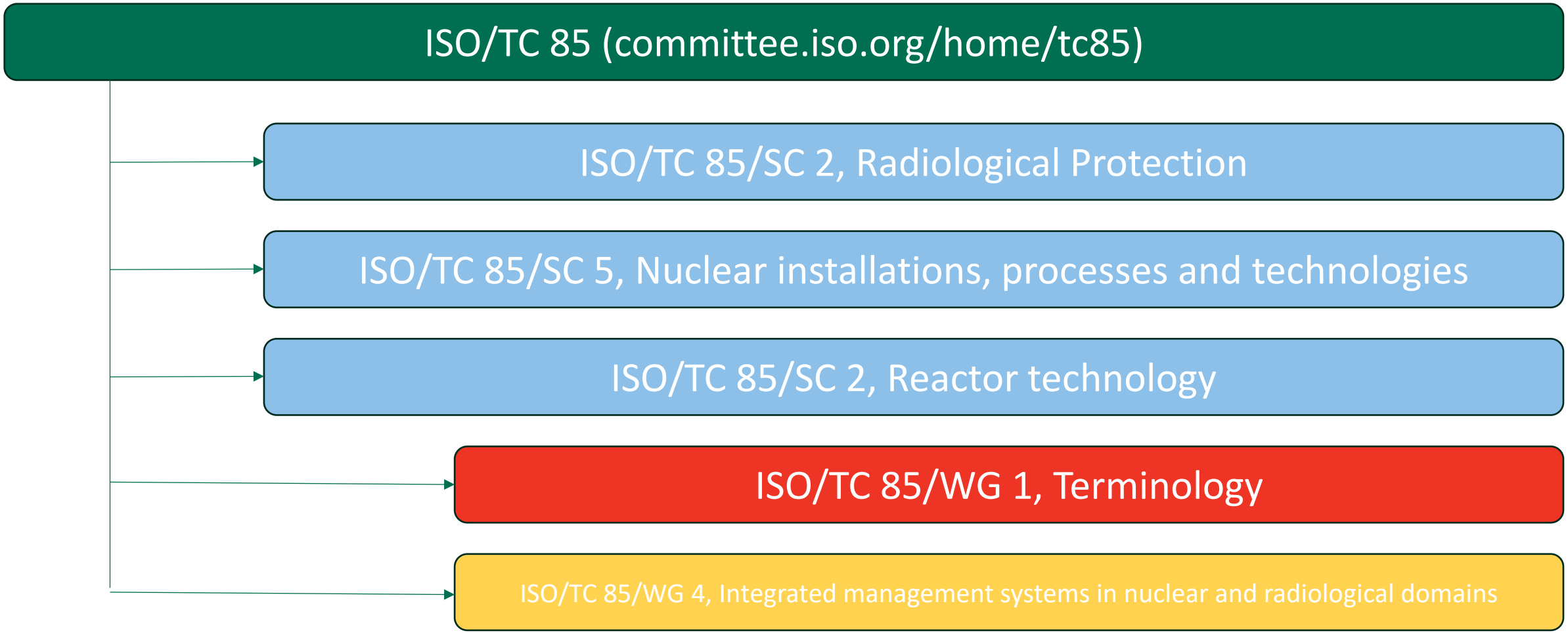
# Overview

- Introduction
- Selection and Organization (Taxonomy) of Terms
- Selection of Definitions
- Approval of ISO Standards

# About ISO and ISO Vocabulary Documents

- Over 270 technical committees
  - Wide variety of industry sectors
- Most ISO committees have one or more documents to define key terms
  - ISO prefers to refer to “vocabulary” rather than “terminology” or “glossary”(Directives, Part 2, 11.5.2)
- ISO vocabulary documents serve purposes similar to:
  - IAEA Glossaries
  - IAEA Nuclear Energy Series NR-T-1.19, Terms for Describing Advanced Nuclear Power Plants
- Those purposes are:
  - Harmonization (using the same vocabulary)
  - Achieve a common understanding of what terms mean

# ISO/TC 85, Nuclear energy, nuclear technologies, and radiological protection



# ISO 12749 Vocabulary Series

| Document No. | Subject Area | Corresponding Group | Edition | Year Published | Revision Status |
|---|---|---|---|---|---|
| 12749-1 | General terminology | TC 85 | 1 | 2020 | Revision in progress |
| 12749-2 | Radiological protection | SC 2 | 2 | 2022 | |
| 12749-3 | Nuclear installations, processes and technologies | SC 5 | 2 | 2024 | |
| 12749-4 | Dosimetry for radiation processing | TC 85/WG 4 (disbanded) | 1 | 2015 | |
| 12749-5 | Nuclear reactors | SC 6 | 1 | 2018 | Revision being balloted |
| 12749-6 | Nuclear medicine | N/A | 1 | 2020 | |

# Selection of Terms

- Term selection is based on usage in standards in the given subcommittee or group
  - Terms used in more than one standard
  - Terms/definitions that need to be defined/harmonized for general understanding
  - Terms that are commonly used and understood (i.e., based on dictionary definitions) are not included
    - Example: In ISO 12749-5, “reactor” is not defined, but “nuclear reactor” is
- During development of ISO 12749-3:
  - Terminology section of each standard was reviewed
  - Terms considered important for harmonization and understanding of key concepts were selected
  - In the recent revision of ISO 12749-3, emphasis was placed on standards that had been published, or recently revised, since the first edition of 12749-3 (2015)
- ISO/TC 85/WG 1 has benefitted by having a mix of subject matter experts and terminologists

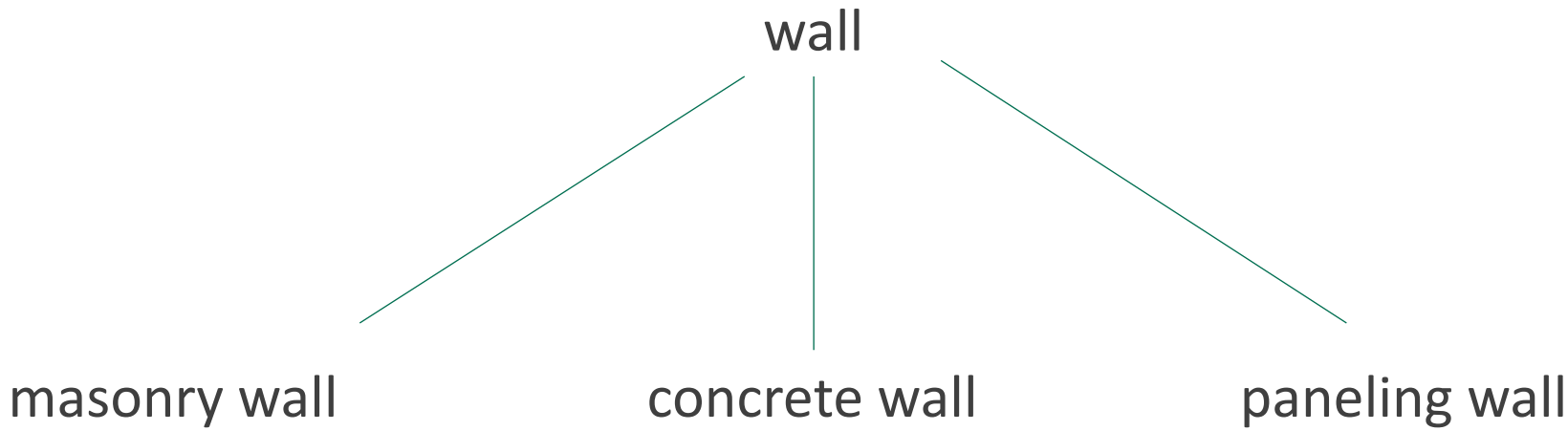
# Organization of Terms: ISO 10241-1

- Key principles (from ISO 10241-1:2011)
  - A concept is defined as a “unit of knowledge created by a unique combination of characteristics”
    - A concept is not necessarily bound to a particular language
  - Sets of concepts (called “concept systems” in ISO 10241-1) are structured based on how the concepts relate to one another
  - As much as possible, a single term should correspond to a single concept
- Arrangement of terms
  - Most preferred: systematic order (based on hierarchy of the concepts)
  - Least preferred: alphabetical order

# Concept Diagrams

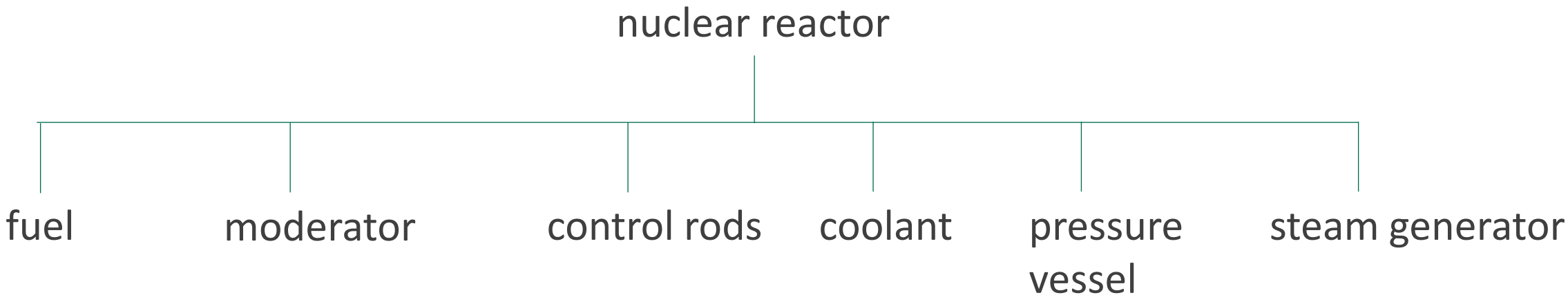
- Types of concept diagrams (from ISO 704:2022)
  - Generic
  - Partitive – one concept represents the whole of something and the other concepts are parts of the whole
  - Associative
- ISO 12749 series uses all three of these types

# Example Generic (Hierarchical) Concept Diagram




No arrows are used in this diagram.
(For illustration purposes only.)

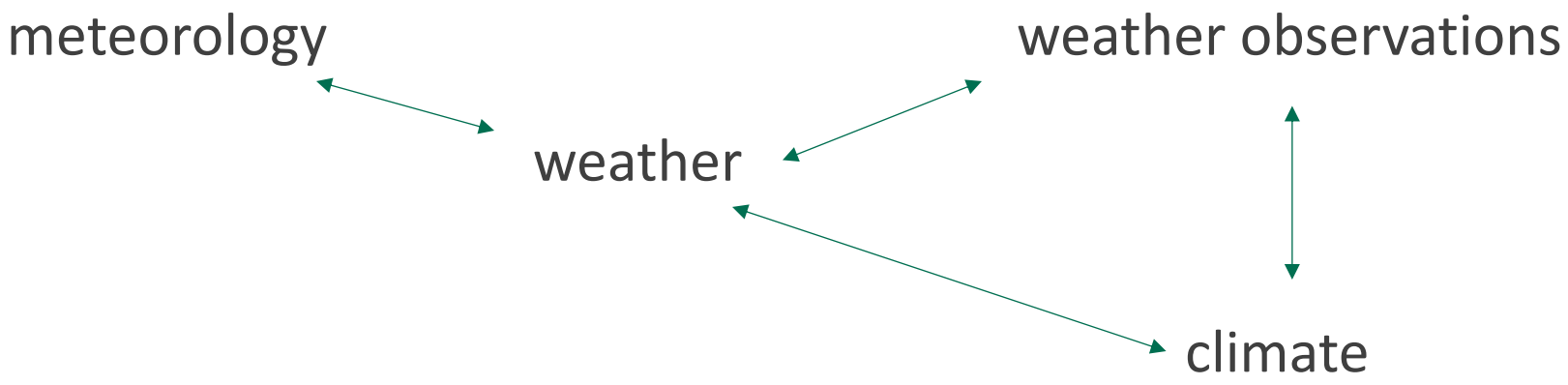
# Example of Partitive Concept Diagram




No arrows are used in this diagram.
(For illustration purposes only.)

# Example of Associative Relation Diagram

- Most commonly used concept diagram
- Illustrate the relationship of concepts to each other within a concept system
- Lines with arrowheads at each end



# Selection of Definitions

- In most cases, start with definition provided in the original standard where the term is used
  - If the same term is also defined in the IAEA Safety and Security Glossary, the definitions are compared with a goal of harmonization with IAEA definition when possible
    - ISO/TC 85/WG 1 has an IAEA liaison representative to help with this
- Modifications can be made for reasons such as:
  - For greater clarity
  - To conform to ISO style
    - Example: ISO definitions cannot start with an article (a, an, the)
  - Modifications must be clearly identified

# ISO 12749-3 History

- First edition published in 2015
- ISO 12749-3:2015 (nuclear fuel cycle vocabulary) preceded first edition of ISO 12749-1 (general nuclear vocabulary, published in 2020)
- Some terms in ISO 12749-3:2015 were adopted into ISO 12749-1:2020, but with modifications
- Second edition of ISO 12749-3 (2024) adopted definitions in ISO 12749-1:2020

# Approval of ISO Standards

- Prepared by cognizant working group (e.g., ISO/TC 85/WG 1)
- Reviewed and approved by participating members of ISO/TC 85
  - National standards bodies (such as ANSI in the USA or DIN in Germany)
  - Currently 26 participating members
  - An additional 22 observing members can review and comment, but do not approve or disapprove

# Molten Salt Reactor in ISO

- ISO 12749-5:2018 defines “molten salt reactor”:

  “nuclear reactor where the fuel is a molten salt mixed with a carrier molten salt that acts as primary coolant

  Note 1 to entry: Molten salt is typically uranium, plutonium and thorium fluorides. Carrier molten salt is typically lithium fluorides.”

- ISO/DIS 12749-5 (currently being balloted) would remove this term
  - It is not used in any ISO publication per the ISO Online Browsing Platform

# Questions?