E.ON Technologies GmbH
Challenges in Nuclear Decommissioning for E.ON

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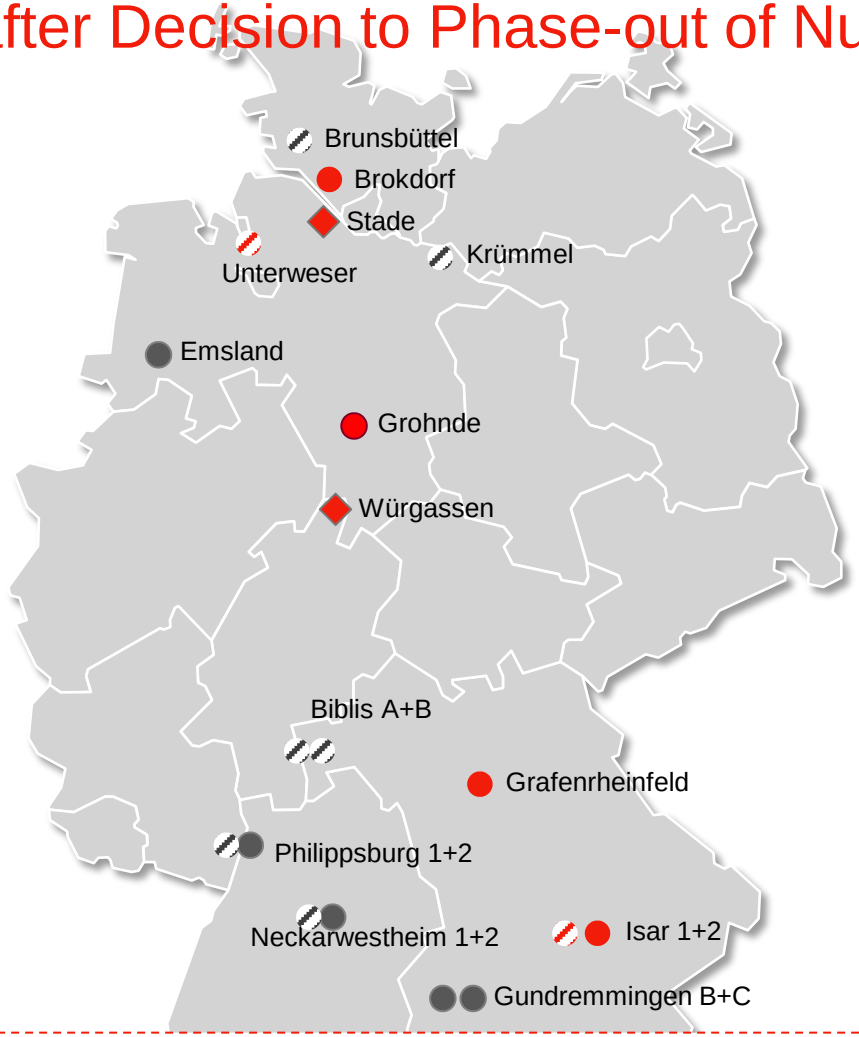
Kerntechnisches Kolloquium in Dresden
15. Oktober 2014

Outline

- Introduction of Phase-Out Situation in Germany
- Status and Challenges in Decommissioning for E.ON
- Case Study - Portfolio Planning as a fleet-wide Approach
- E.ON Nuclear Service Business Model

Situation of Nuclear Power Plants in Germany and E.ON Fleet after Decision to Phase-out of Nuclear in 2011



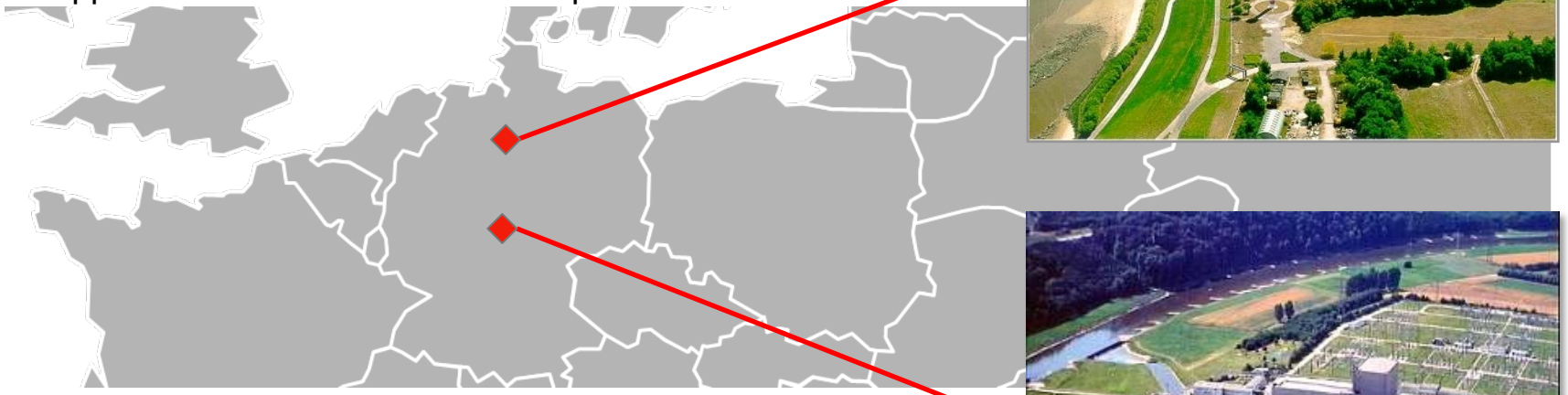
- E.ON sites in operation
- E.ON sites shut-down in 2011
- E.ON dismantling sites
- Other utilities in operation
- Other utilities shut down in 2011

In accordance with the amendment of the Atomic Energy Act, E.ON has to shut down the last NPP no later than 2022

E.ON Decommissioning Projects: Stade & Würgassen NPP

Stade NPP, PWR, 630MW$_{el}$

- Start of construction: 1968
- Commissioned: 1972
- Shut down: 2003
- Phase I of dismantlement approved: 8 Sep 2005

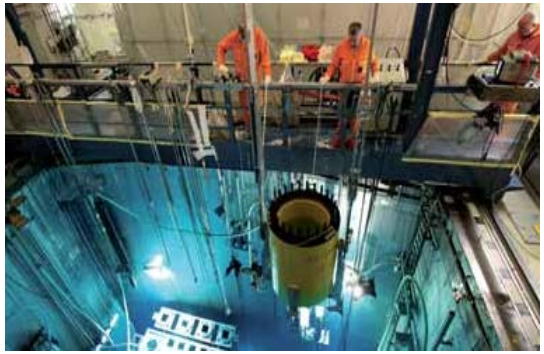


Würgassen NPP, BWR, 640MW$_{el}$

- Start of construction: 1968
- Commissioned: 1971
- Shut down: 1995
- Phase I of dismantlement approved: 14 Apr 1997

As of today, significant Experience in Decommissioning of Nuclear Power Plants is available

- In Germany, extensive experience from the decommissioning and dismantling of commercially operated power reactors and research reactors exist
- Utilities, OEMs, supplier and service organizations have significant competences across the D&D value chain
- Technologies are available and have been proven and used successfully several times
- However, challenges remain on
  - Logistics, disposal route and repository,
  - Technology optimization,
  - Regulatory and technical requirements,
  - Organization, standardization, procurement, resources and steering



Simplification and standardization is highly desirable

Waste Disposal Route and Final Repository have tremendous impact on the initial Planning and Planning Assumptions

High Level Waste

- In general, the „Repository Site Selection Act“ has re-started the process to find and select a final repository site

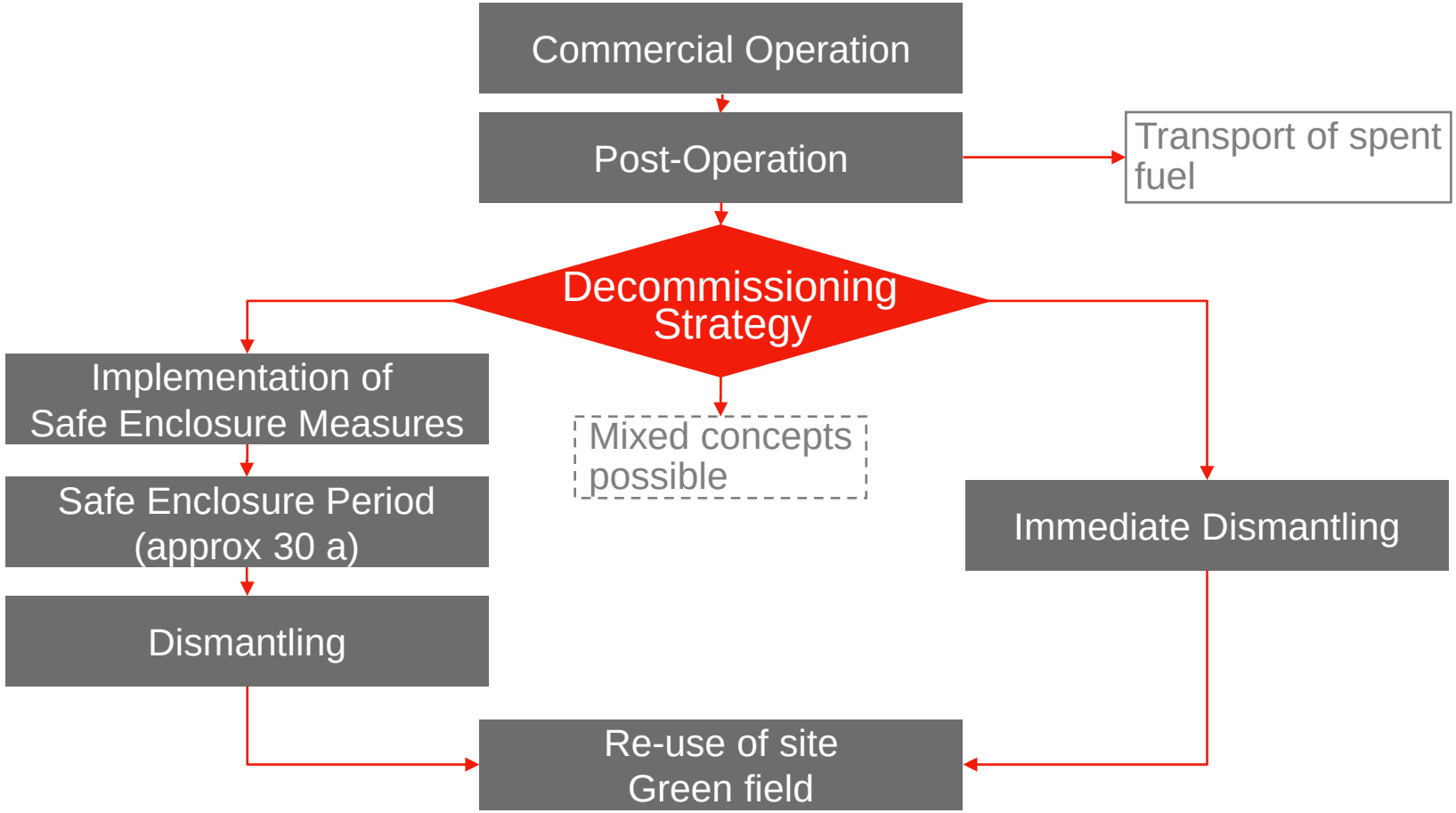
Final Disposal of Low and Medium radioactive Waste

- Situation open for utilities on concrete availability of final waste disposal „Konrad“ as input to decommissioning planning
- Also the required qualified permission under water law for the final storage of radioactive waste in the “Konrad” repository has not been concluded
- Hence, applications for additional buffer or intermediate storages are observed at different nuclear sites as one remedy measure

Containers and Casks

- Acceptance criteria in principle defined for final disposal
- However, deployment is not yet secured e.g. as design certificates are pending

In principle, two main concepts are applicable to completely remove a nuclear facility in Germany



Immediate dismantling route is the preferred option for E.ON.

Key Issues to be addressed very early in the Decision Making and Planning Process

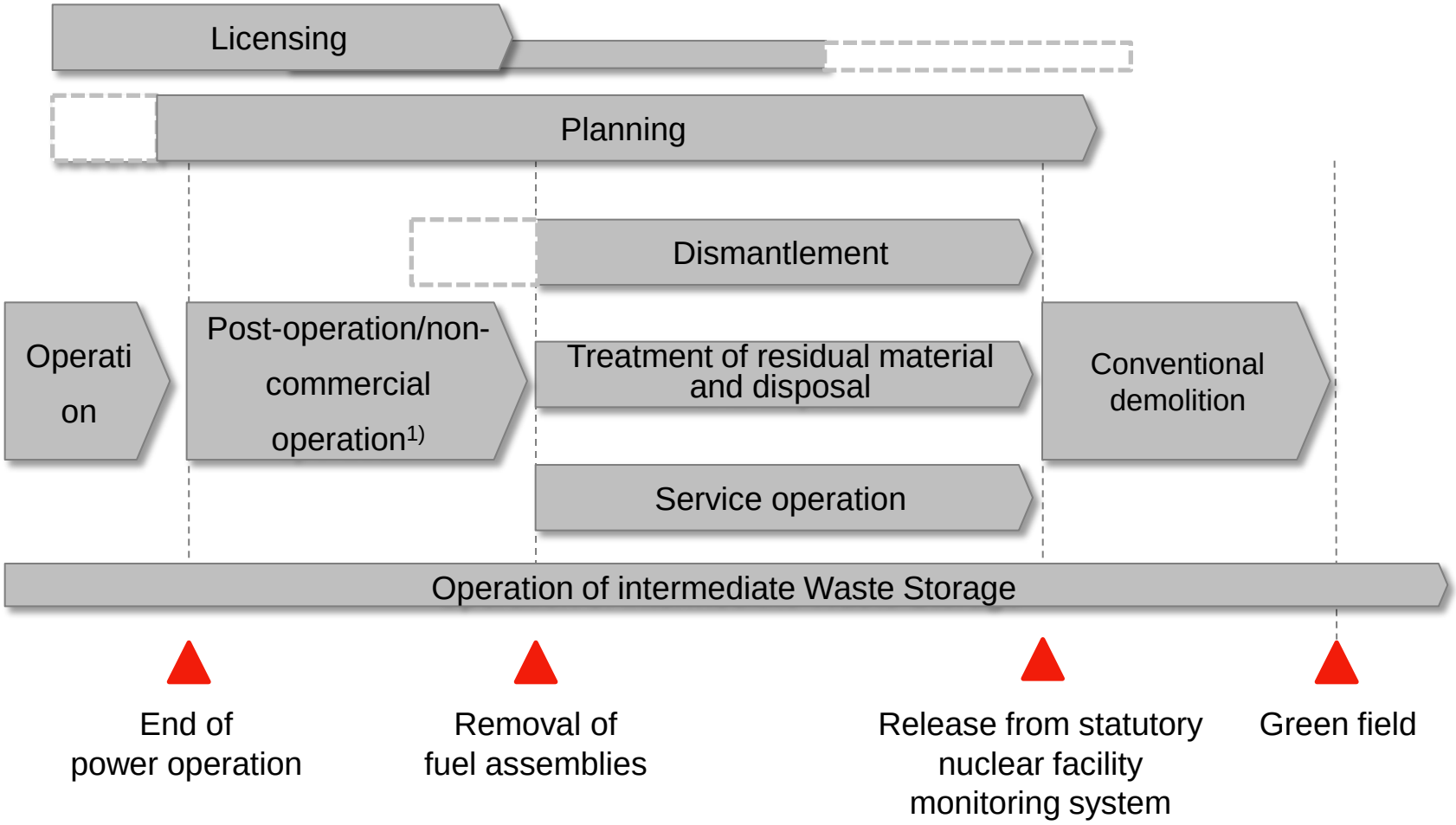
- **Strategy** - Direct dismantling vs safe enclosure, waste management concept
- **Licensing** - Licensing strategy and preparation of application for decommissioning approval
- **Safety** - Reduction of radioactive and conventional hazard inventory within the plant
- **Fuel -** Planning and realization of fuel and debris removal from spent fuel pool
- **Characterization** - Radiological characterization of the whole NPP
- **Plant optimization** - Shut down of installations only necessary for operation
- **Organization** - Different or modified responsibilities, processes and work flows
- **Documentation** - Modification of specifications for safety relevant installations and operational documentation (organizational manual)
- **Change** - …

All of this takes time and needs to be addressed right from the beginning as various interfaces exist and must be reflected against individual requirements (legislation, organization, provisions, …)

New Situation needs significant Change on all levels within a Nuclear Utility Organization

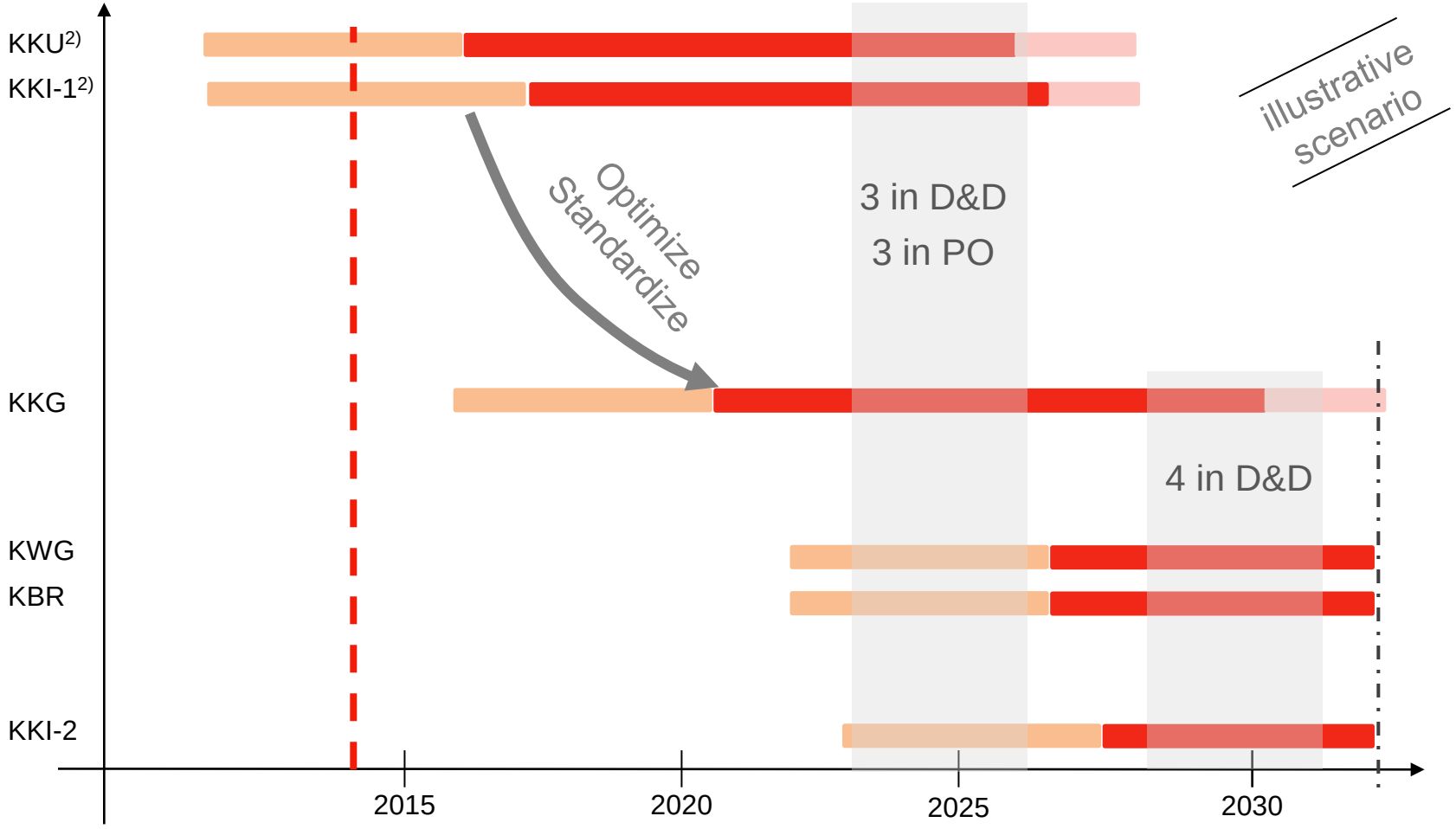
Operation	Decommissioning
• Highest focus on safety and quality on operation and maintenance (e.g. preventive) • Fundamental safety functions (protection goals) are control reactivity, fuel cooling and to confine radioactive material • Continuous and extensive training of staff • Profitability and availability • High radiological inventory • Commitment of staff towards long-term operation	• Highest focus on safety and quality for non-commercial/post/residual operation • No more generation contribution, permanent checking and testing of requirement and measures • After removal of spent fuel very low activity inventory; protection goal is to confine radioactive material • Adjusted requirements on quality in maintenance (e.g. condition oriented) • Changed focus of organization • „Dismantling of organization“
Preserve – Maintain – Invest	Shut-down – Reduction – Change

Main Processes to drive from “Operation” to “Green Field”



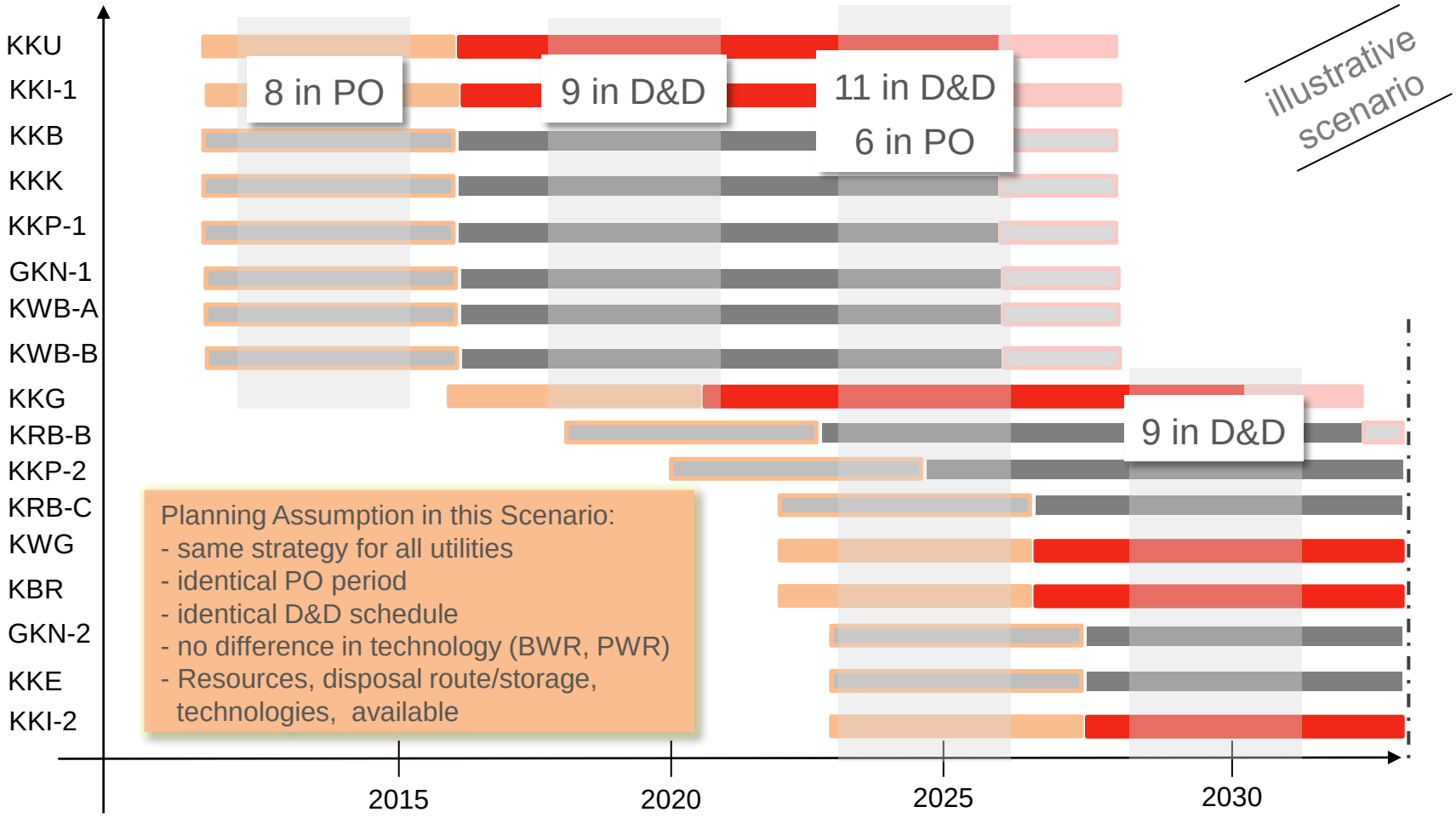
1) Nomenclature subject to pending legal cases

Case Study: Portfolio Planning is a key Element to reveal Bottlenecks within the Organization, e.g. regarding resources and competencies[1)]



1) simplified assumptions: 4 years of post operation; 10 years of dismantling, 2 years of conventional dismantling
2) NB: in contrast to scenario, plants are presently in non-commercial operation

Case Study: Theoretical Project Mountain from a cross Utility Perspective in Decommissioning[1)]

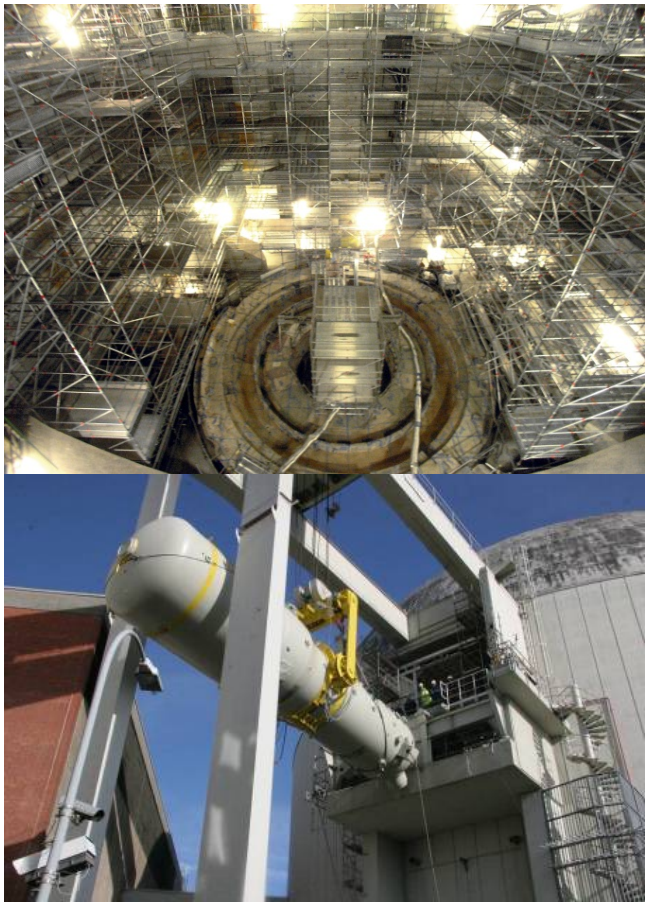


1) Simplified picture of overall situation, legal cases pending

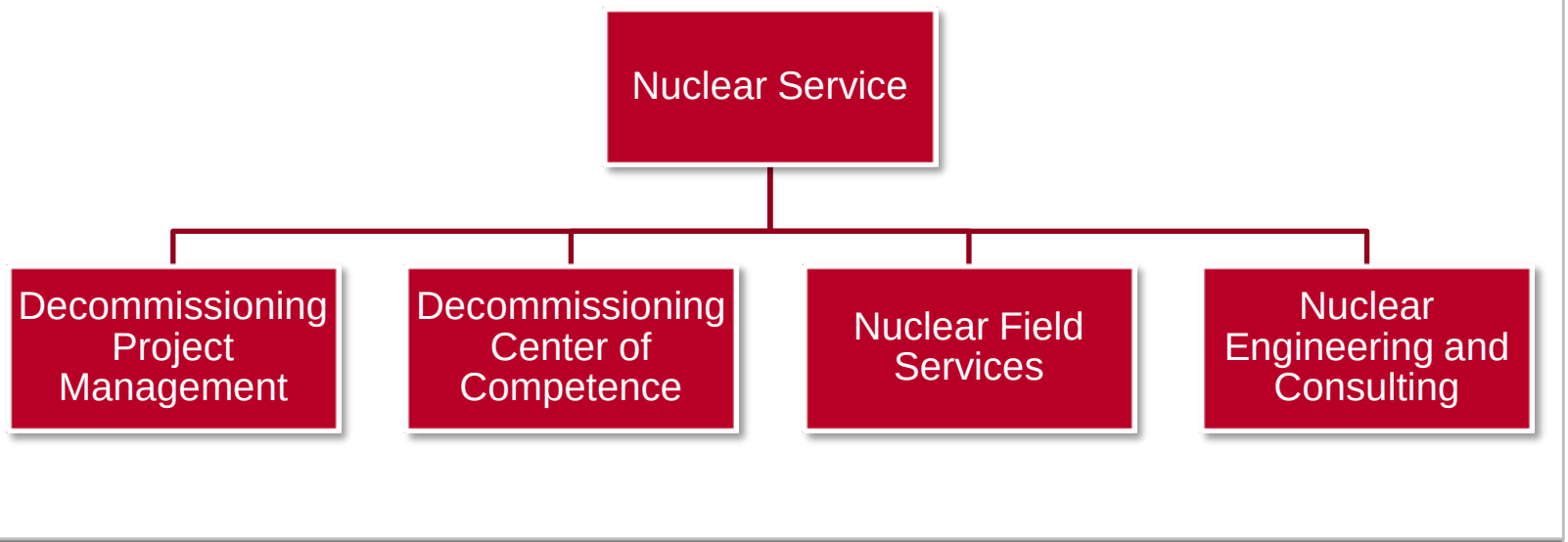
E.ON has successfully demonstrated the D&D of large NPPs - fully in our own Responsibility

The way forward is now …

- to decommission our plants in a fleet-wide approach
- to bundle, secure and use the dismantling competencies from decommissioned NPPs and all E.ON entities
- to enable fleet-steering of the planning and execution of the dismantling projects
- to create long-term work perspectives
- to achieve maximum synergy effects for E.ON



A new “Nuclear Services” Organization and Business Model has been established at E.ON Technologies GmbH



- Development of a new D&D business model at E.ON
- Delivery of value-adding solutions to the client based on our unique expertise and experience
- Future support also to the third market with services from planning to execution

Thank you very much for your Attention!

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