PREDEC 2016

International Symposium on PREparation for DECommissioning

Feedback from D&D projects - Improvement through preparation

D&D = **D**ecommissioning and **D**ismantling

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AREVA
forward-looking energy

Feedback from D&D projects - Improvement through preparation

Summary

This presentation

- gives feedback from AREVA's experience in decommissioning projects,
- summarizes the main lessons learned,
- focuses on the recommendations for initial actions to be taken early in the D&D project and in the preparation phase,
- gives examples with an emphasis on decommissioning support systems and
- shows, that the strategy needs to be direct and streamlined.

Decommissioning Phase is very different from Operating Phase

Move from Operation Structure to Project Structure

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Selected References

Millstone, Rancho Seco, Yankee Rowe, USA

- D&D of RPV-internals and RPV (152 t; 33 container)

Würgassen, Germany

- D&D of RPV-internals (320 t; 29 container) and RPV (113 t)

Stade, Germany

- D&D of RPV-internals (85 t; 167 casks/container)

Isar 1, Germany

- D&D of control rods

Krümmel, Germany

- D&D of control rods

SVAFO, Sweden

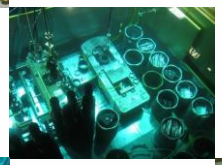
- D&D of research reactors R2-0 and R2

Biblis, Germany

- Sorting, cutting and packing of core waste with underwater robotics AZURo

Superphenix Reactor, France

- Planning, licensing, decontamination, Sodium + Fuel handling, D&D of internals





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Lessons Learned

- Build a “Decommissioning Team”
- Prepare a thorough “Radiological Characterization”
- Develop a specific “Decommissioning Manual”
- Replace the legacy operation support systems with new “Decommissioning Support Systems”

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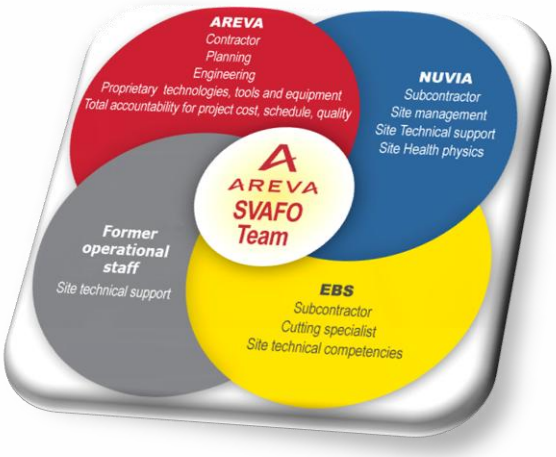
Decommissioning Team

	Former operational staff	D&D contractor
Knowledge	Plant history; transition-management	Decommissioning and Dismantling
Motivation	Provide perspective for personnel; Setup incentive plan and HR transition plan	High performance; Economical success
Collaboration	Involved in all project phases	Involves all sub suppliers

Team building
Common creation of documents
Common test of equipment
Common training



Strong alliance of customer, contractor and (local) sub contractors from the very beginning

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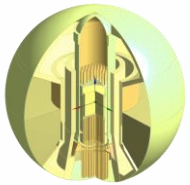
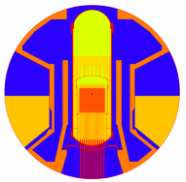
Radiological Characterization

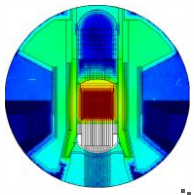
	Former operational staff	D&D contractor
Characterization	Plant operation history	Sampling experience, modelling, equipment and laboratory

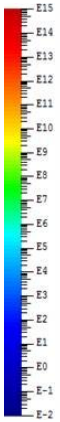
Plant in operation → **Post operation phase** → **D&D license** → **D&D execution** → time

Radiological modelling

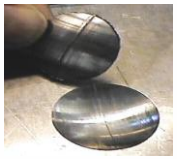






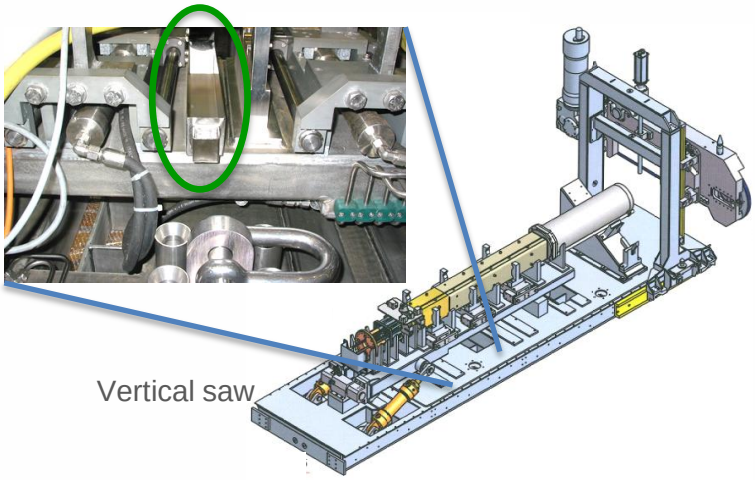


Pre-sampling

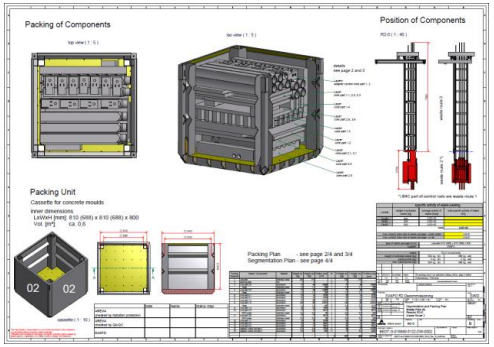


"Real time" sampling

Swarf sampling device



(Preliminary) packing plan



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Decommissioning Manual

	Former operational staff	D&D contractor
Decommissioning Manual	**Used to follow the Plant Operation Manual**	**D&D knowledge to create Decommissioning Manual**

Operation Manual

~~condense~~
replace!

Decommissioning Manual

Main topics of Decommissioning Manual:

- New transport routes incl. entrance/exit controlled area
- New auxiliary cranes
- New lifts

➔ address simplifications

➔ write open and flexible (incl. technologies)

- New buffer areas inside and outside the building
- New decontamination and conditioning facilities

➔ be prepared for the unexpected (Plan B and C)

➔ standardize as far as practical (same degree of details, high level)

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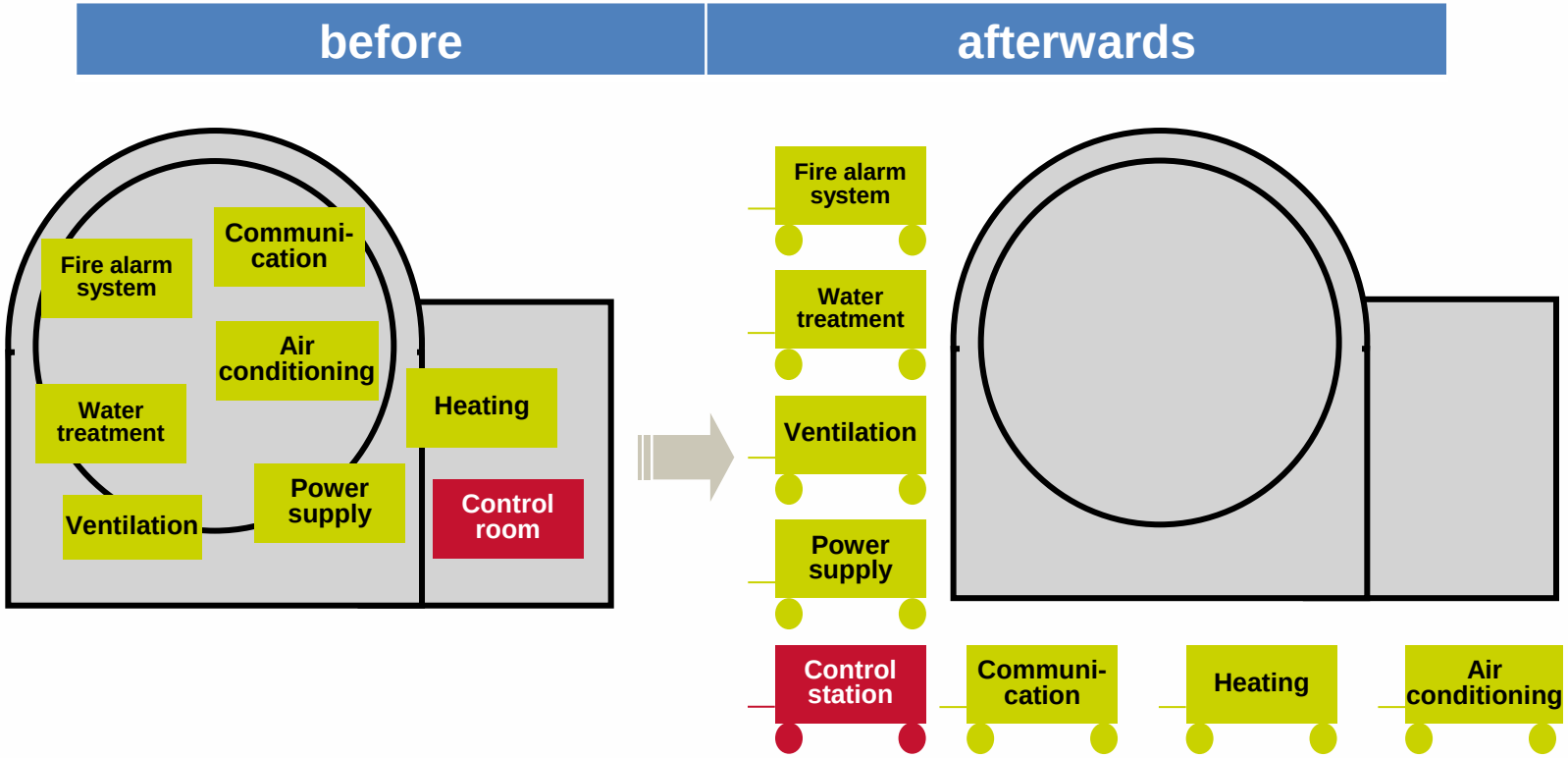
Decommissioning Support Systems (1/7)



- Reduction of interfaces
- Step by step replacement of expensive to maintain and operate legacy systems
- Clear dismantling strategy: „room-by-room“ instead of „system-by-system“

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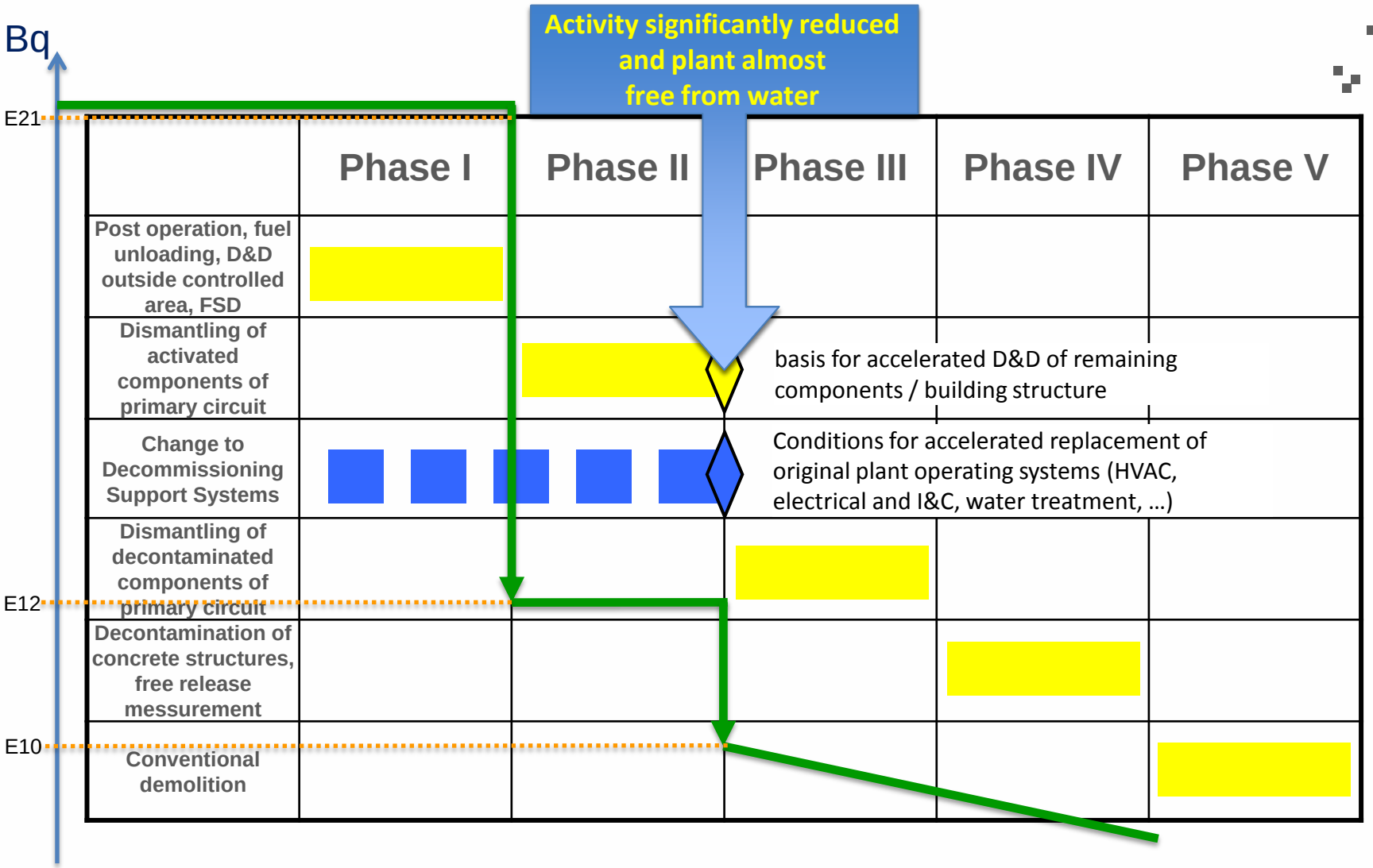
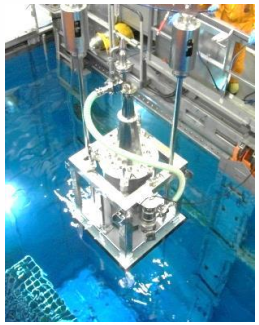
Decommissioning Support Systems (2/7)



Decommissioning Support Systems (3/7)

	Former operational staff	D&D contractor
Water Treatment	Planning for new mobile system installation and Operation	Optimization D&D operations, Planning (concept, design) for and Installation of new mobile system



before	afterwards
Flow rate: several m^3/h	Flow rate: 200 l/h
whole plant: several thousand m^3	laundry-, shower- and hand wash water
Ions, Boric Acid	Organics, Detergents
Fixed installation	Small, mobile water treatment equipment

BIBRA ® Biological Treatment of Radioactive Waste Water using bacteria for decomposing the typical pollutants found in the washing water.

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Decommissioning Support Systems (4/7)

	Former operational staff	D&D contractor
Ventilation	Planning for new mobile system installation and Operation	Optimization D&D operations, Planning (concept, design) for and Installation of new mobile system

Source: EWN GmbH

before	afterwards
Flow rate: several 100.000 m³/h	Flow rate: 10x 3000 m³/h
Typical NPP conditions	Dust and aerosols from D&D activities
Fixed installation	Small, mobile ventilation system inside and outside the controlled area

Source: WAK GmbH

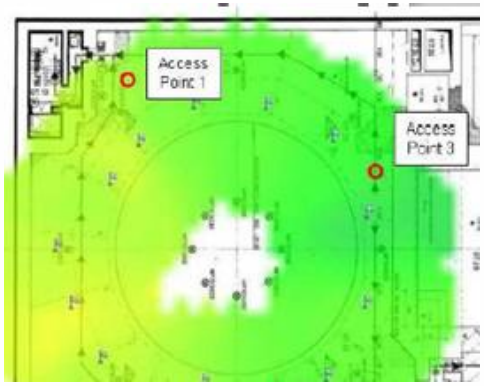
Required for accelerated dismantling strategy

Decommissioning Support Systems (5/7)

	Former operational staff	D&D contractor
Electrical and I&C	Planning for new mobile system installation and Operation	Optimization D&D operations, Planning (concept, design) for and Installation of new mobile system

before	afterwards
Fixed cable trays	Flexible, “free” cabling (magnet holder)
Fixed lighting	Flexible work place lighting, combined with heating
Fixed wired telephones	Flexible, wireless telephones, WLAN

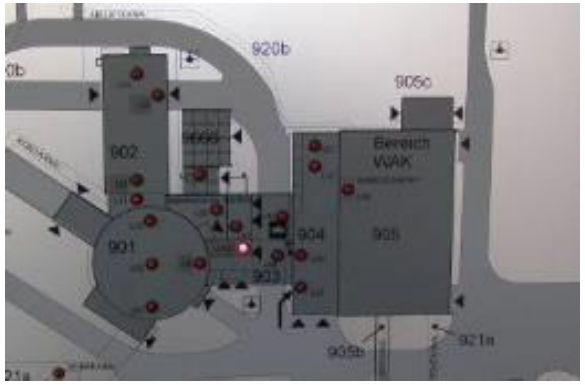
Sufficient wireless coverage for flexible communication



Decommissioning Support Systems (6/7)

	Former operational staff	D&D contractor
Fire alarm system	Planning for new mobile system installation and Operation	Optimization D&D operations, Planning (concept, design) for and Installation of new mobile system

before	afterwards
Fixed fire protection sensors	Flexible sensors on working areas, no signals to the former control room



Source: WAK GmbH

Replace the Fire Protection Tableau of the Control Room by an open Fire protection system with display outside the controlled area

Decommissioning Support Systems (7/7)

	Former operational staff	D&D contractor
Control room	Planning for new mobile system installation and Operation	Optimization D&D operations, Planning (concept, design) for and Installation of new mobile system

before	afterwards
Fixed wired signals	Flexible, wireless data transfer, WLAN, stand-alone solutions

Early replacement of Control Rooms: avoids interferences; simplified dismantling strategy

Source: WAK GmbH

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Conclusion

- "Decommissioning Team"
  - establish a new "paradigm" and a project focused mind-set
  - build a common team of operators, contractors and sub contractors
- "Radiological Characterization"
  - the sooner the better
  - saves time and costs
  - confirmation by real time sampling
- "Decommissioning Manual"
  - replace the Plant Operation Manual by a Decommissioning Manual
  - take advantage of source term and risk reduction
- "Decommissioning Support Systems"
  - Independent of the "old" plant operation systems
  - easier contracting, due to less interfaces
  - D&D room by room, complete pull out (all cables and pipes can be axed)

Thank you for your kind attention !

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