

„Research on Technologies for Decommissioning and Dismantling of Nuclear Facilities in Germany”

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19. March 2014**

Project Management Agency (PTKA-WTE)

Project Management Agency Karlsruhe/ Federal Ministry of Education and Research

**Project Management Agency
Karlsruhe
Water Technology and Waste
Management Division**

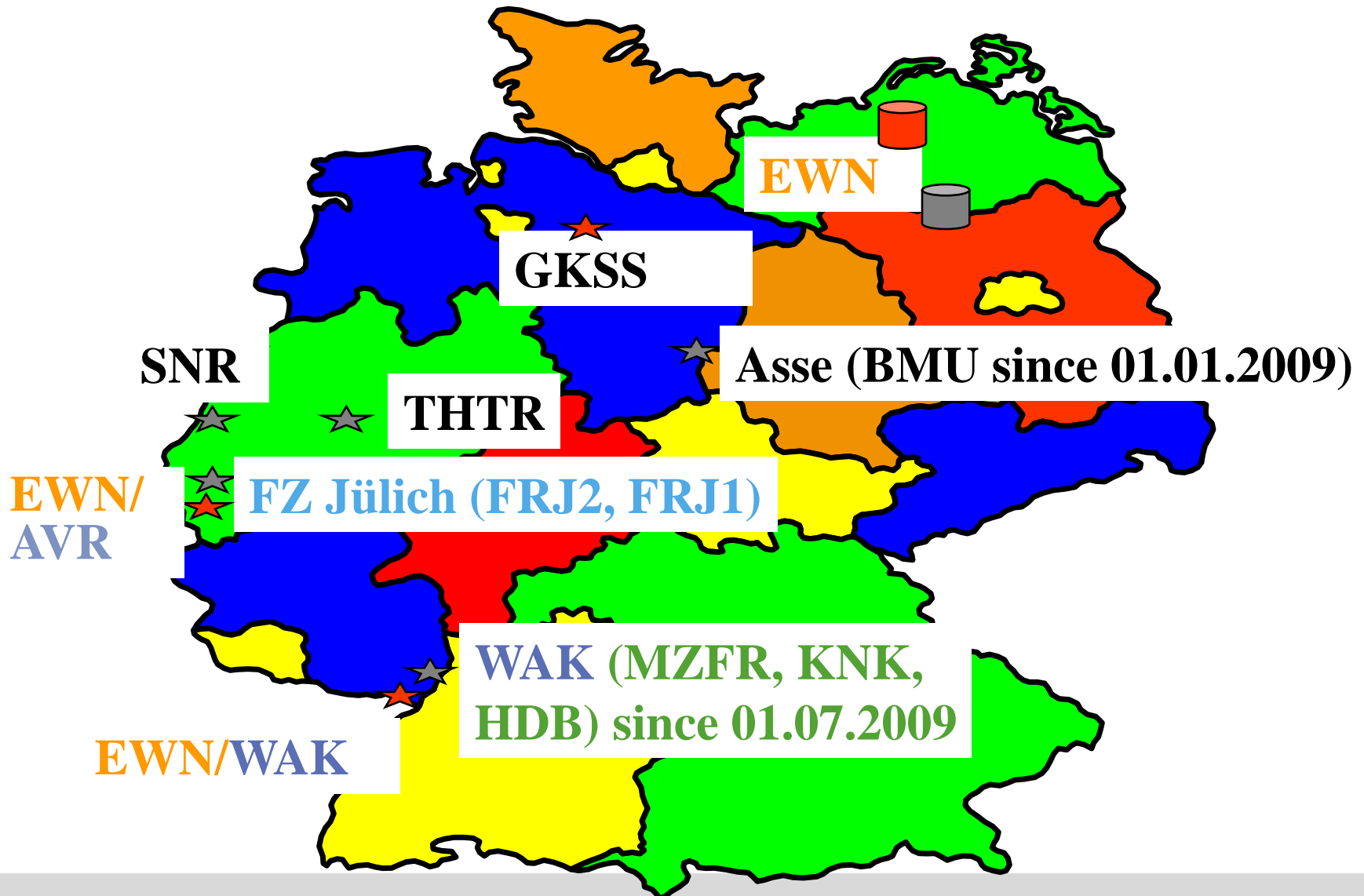
**Federal Ministry of Education and Research
Division 715:
Decommissioning of Experimental Nuclear
Installations and Waste Management
Head of Division: Sabine Diehr/
Dr. Hermann-Josef Meiswinkel**



Outline

- Decommissioning of Experimental Nuclear Installations in Germany – Past, Present and Future
- R & D Projects funded by the Federal Ministry of Education and Research (BMBF)
- Outlook

Decommissioning Projects of the Federal Ministry of Education and Research



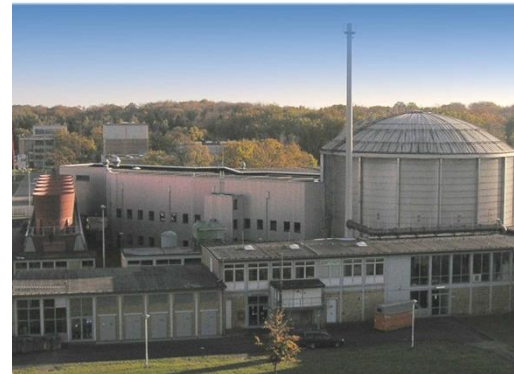
German Research Reactors

Karlsruhe
FR2
Safe storage
since 1996



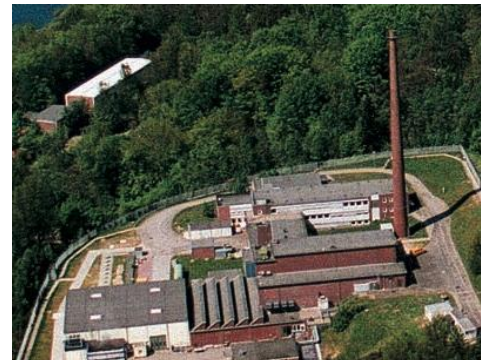
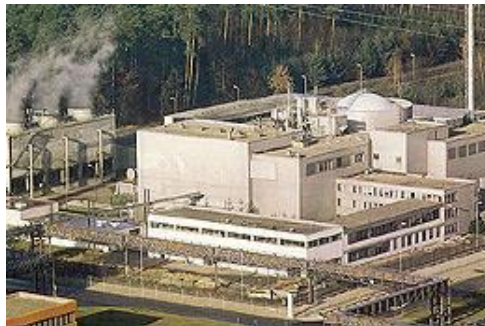
Jülich
Merlin (FRJ1)
Green field
reached 2008

Karlsruhe
MZFR
Aim:
Green field
2015



Jülich
DIDO (FRJ2)
D&D
started 2012

Karlsruhe
KNK
Aim:
Green field
2021



Geesthacht
FRG2:
Safe storage
FRG1:
Shut down in
2010

D&D Projects at the Karlsruhe site beside reactors

All Nuclear facilities belonging to WAK GmbH since 1. July 2009

Reprocessing Plant/
WAK GmbH

MZFR

KNK

Central
Decontamination
Department (HDB)

FR2

Project Management Agency

Tasks already finished

- Niederaichbach Nuclear Power Plant (KKN)



Green field 1996

- Karlstein Superheated Steam Reactor (HDR)



Green field 1998

Tasks already finished

- Thorium High temperature reactor THTR (Safe storage)
- TRIGA II Heidelberg (decommissioning completed)
- MERLIN (FRJ-1) Jülich, Green field reached 2008



Merlin was operated
1962 to 1985



D&D 1995 to 2007



Green field ceremony 2008

Overview: BMBF D&D Projects

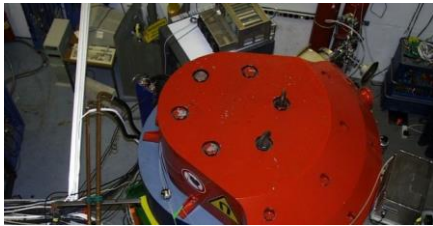
Location	Facility	Decommissioning operation time and goal	Total cost	BMBF Funding
			Million €	% of Total
Niederaichbach	KKN reactor	Completed in 1996, green field	130	100
Karlstein	HDR reactor	Completed in 1998, green field	40	100
Heidelberg, DKFZ	TRIGA II	2002-2006, total removal completed	2	90 ¹
Hamm-Uentrop	THTR-300 reactor	safe enclosure in 1997, safe storage from 1997-2017	~ 95 (cost for safe storage)	33 ²
Karlsruhe WAK	KNK reactor	1992-2021, green field	383	90 ¹
Karlsruhe WAK	MZFR reactor	1985-2015, green field	362	100
Juelich research center	Merlin (FRJ-1)	1995-2007, green field in 2008	30	90 ¹
Juelich, AVR GmbH	AVR reactor	1987-2017, safe enclosure of reactor vessel, total removal of the building	482	70 ¹
Geesthacht research center	FRG I+II	2002-2025, green field	167	90 ¹

¹co-financed by Federal State, ²co-financed by federal state and industry

Present and Future Tasks

- D&D of FRJ2 “DIDO” (Research Center Jülich); start 2012
- D&D projects at the Research Center Geesthacht (FRG2 safe storage, FRG1 shut down in 2010)
- FR2 (Karlsruhe) safe storage;
Decision about dismantling in near future
- Start of Operation of the Konrad Repository (LAW,MAW) not before 2019

Portfolio of BMBF funded R & D Projects



New Analytic Methods



Dump recultivation by bioremediation



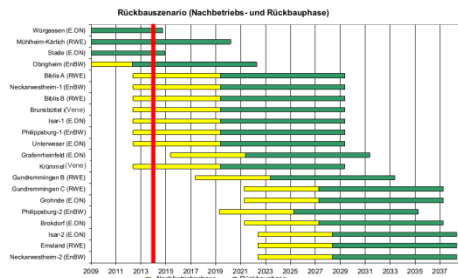
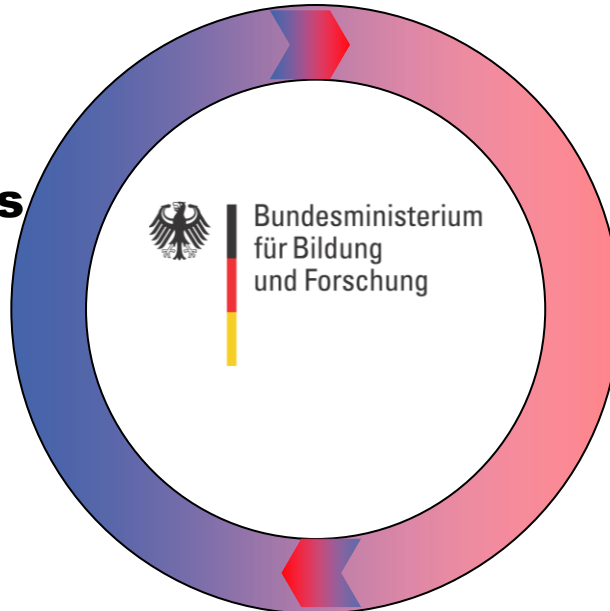
Cutting technologies



Decontamination



Remotly controlled techniques



Management of D&D



Economical and social consequences of D&D

R & D projects are performed by industry, universities and federal research centers

Running projects: 38 (7 single projects,
12 joint projects with 2 - 4
partners)

Universities: 20 projects

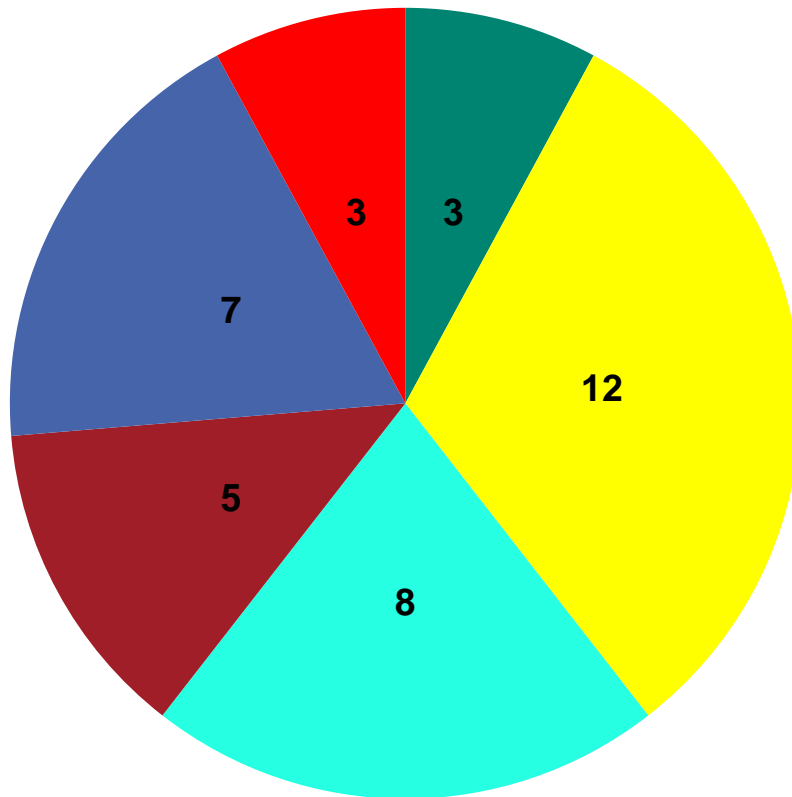
Industry: 12 projects

Research centers: 5 projects

Other: 1 project

Total funding: 19,3 Mio. EURO (approx. 6 Mio p.a.)

R & D projects by topics



- Cutting technologies
- Decontamination technologies
- Waste Management
- New analytic methods
- Management of D&D projects
- Remotely-controlled techniques

Overall goals of the research

- Increase efficiency and reliability of the techniques
- Minimizing of waste
- Reducing of the radiation exposure of the staff
- Shortening the durations of the D&D projects
- Cost reduction

1. Decontamination and Remotely-Controlled Technologies

Manola – An example for a successful joint project

Partners:

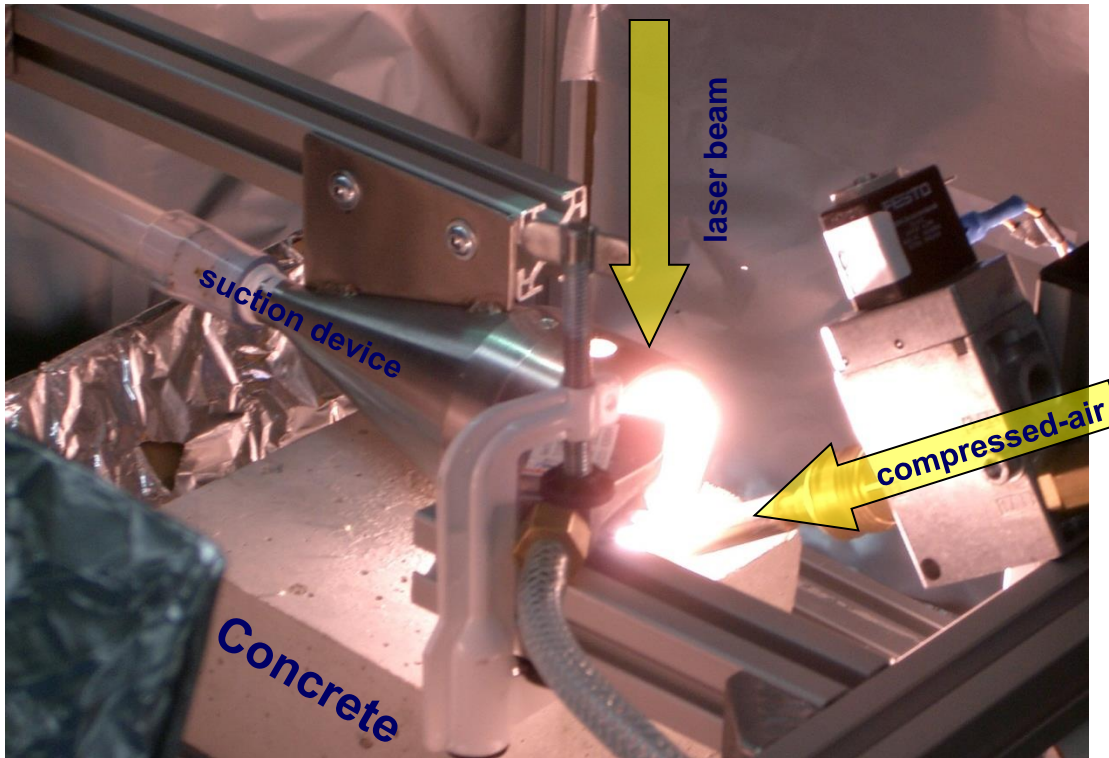




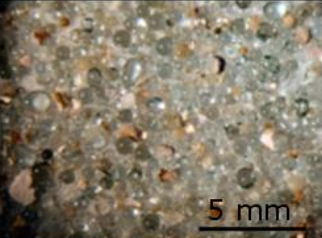
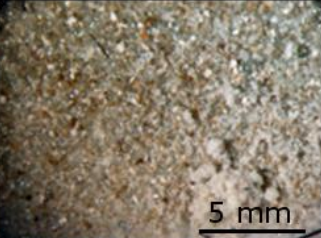
Previous projects:

Lasaba

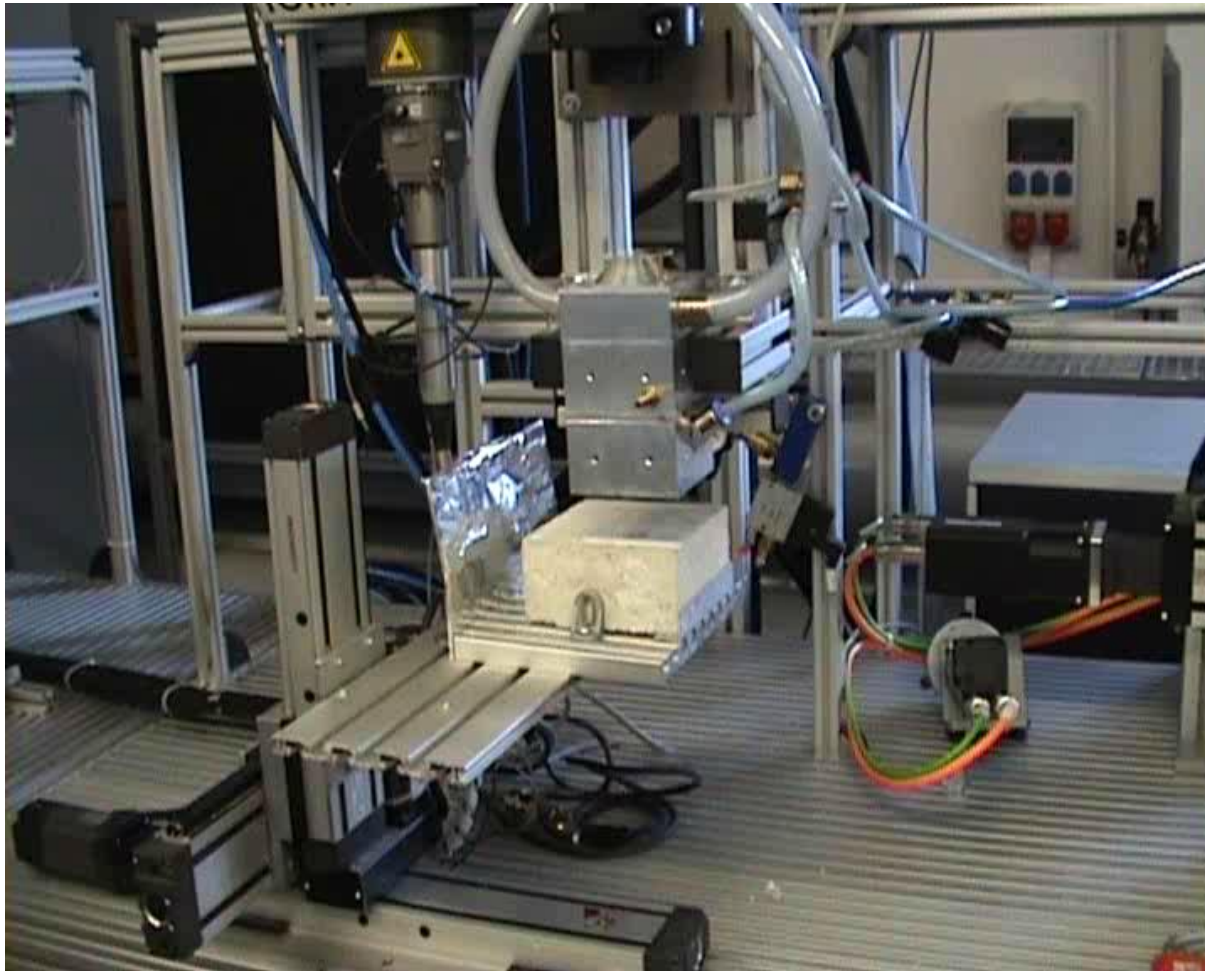
Amanda

Laser Ablation (Lasaba)



screenings				
Nr.	1 (1,6mm)	2 (1mm)	3 (0,3mm)	4 (0,125mm)
5a				
	5 mm	5 mm	5 mm	5 mm

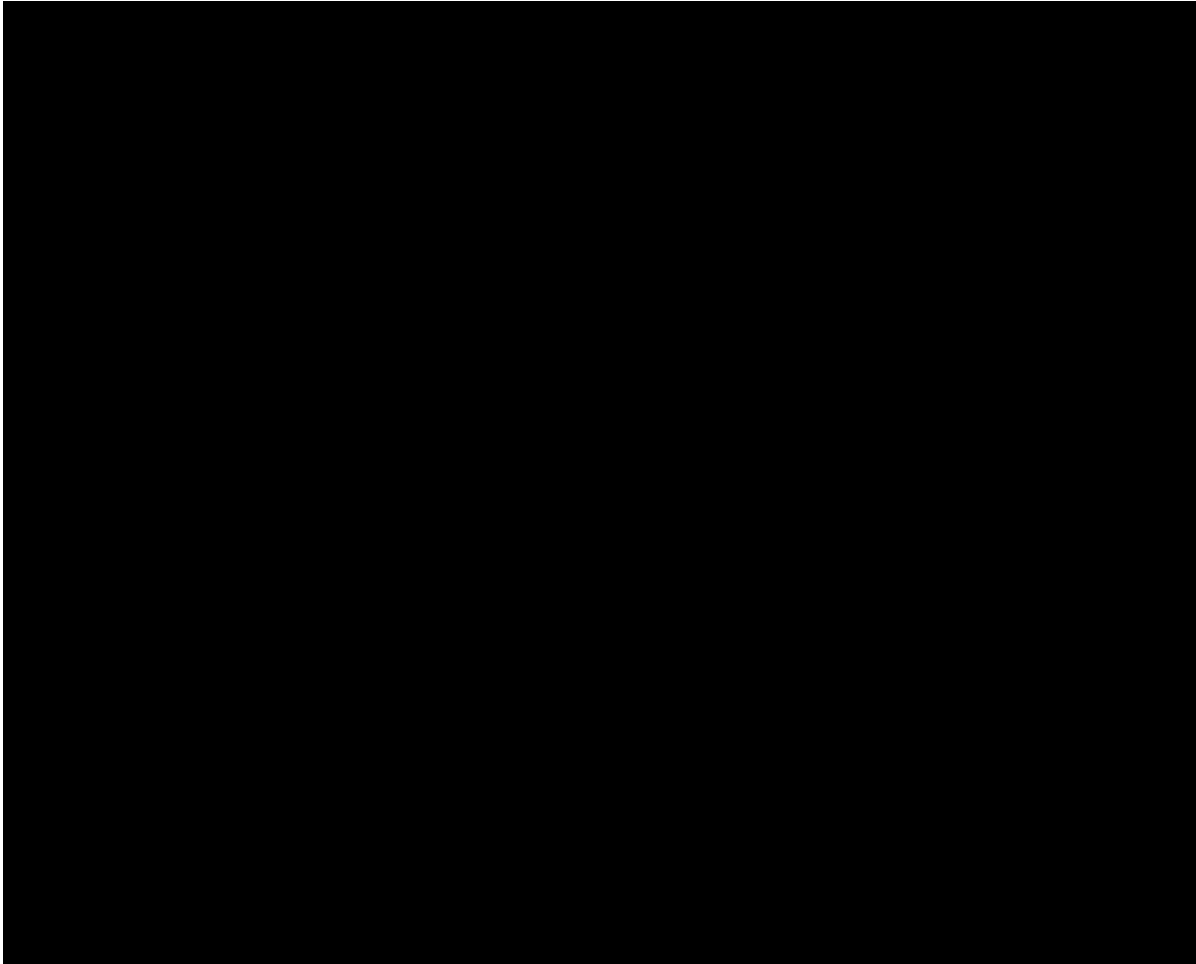
Laser Ablation of concrete surface (Lasaba)



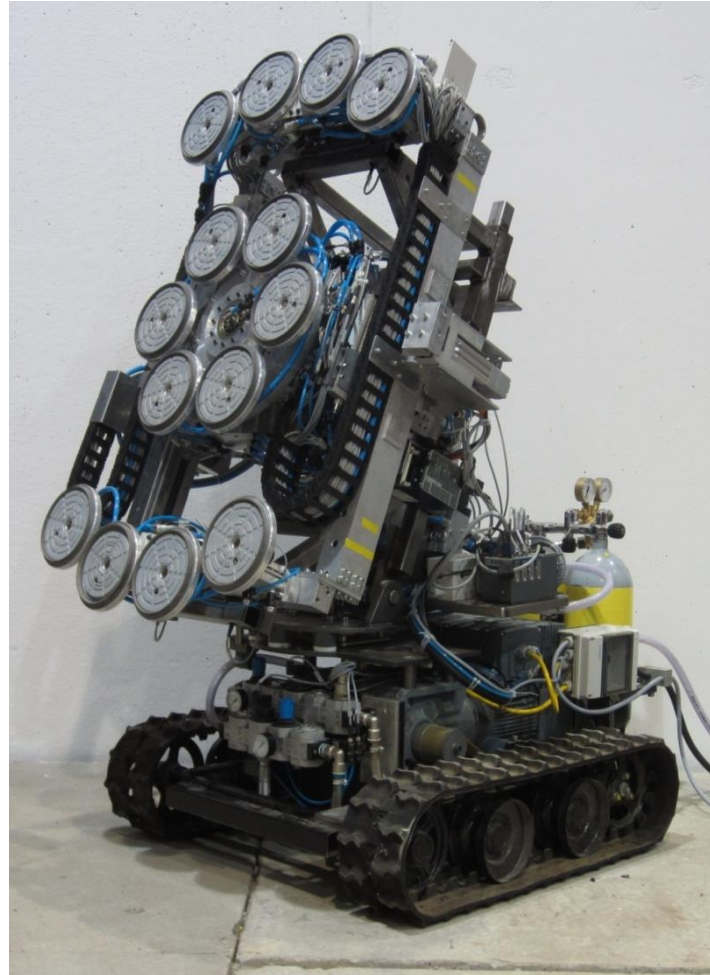
Laser Ablation of concrete surface (Lasaba)



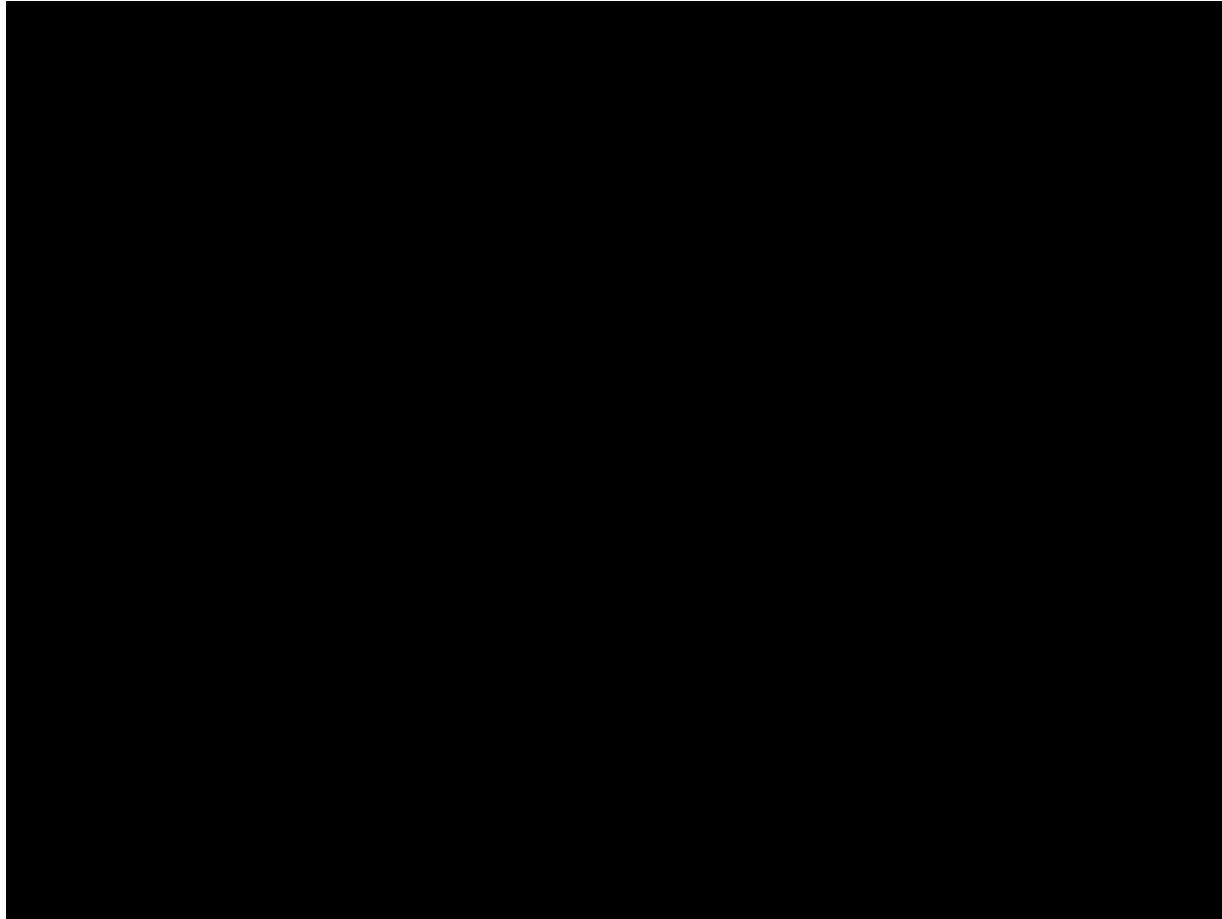
Amanda – Concrete surface decontamination



Manola- New climbing manipulator



Manola- Demonstration



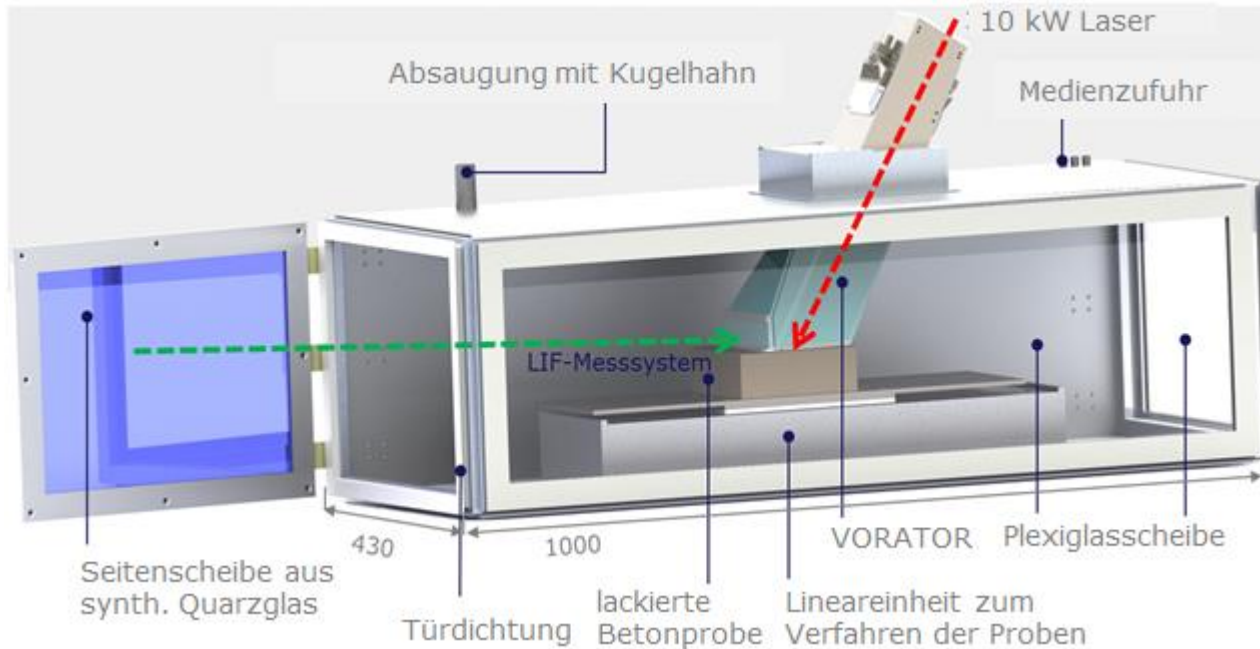
2. Waste Management



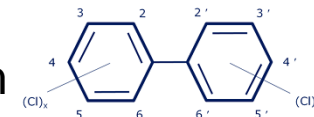
Low Emission Laser ablation of PCB surface coatings



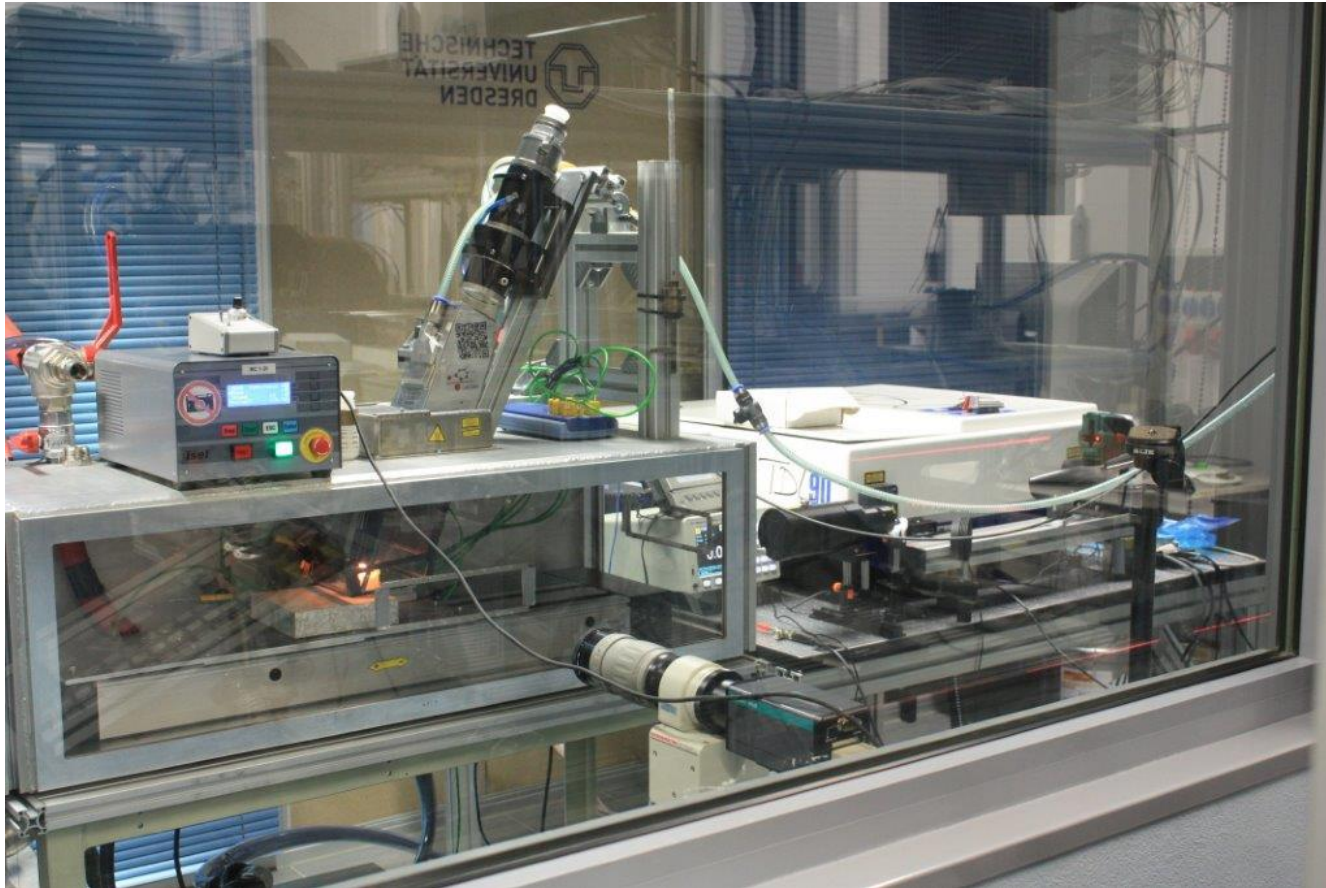
Low Emission Laser ablation of PCB surface coatings (LaColor)



LIF: Laser-induced fluorescence for detection of CCL-radical from

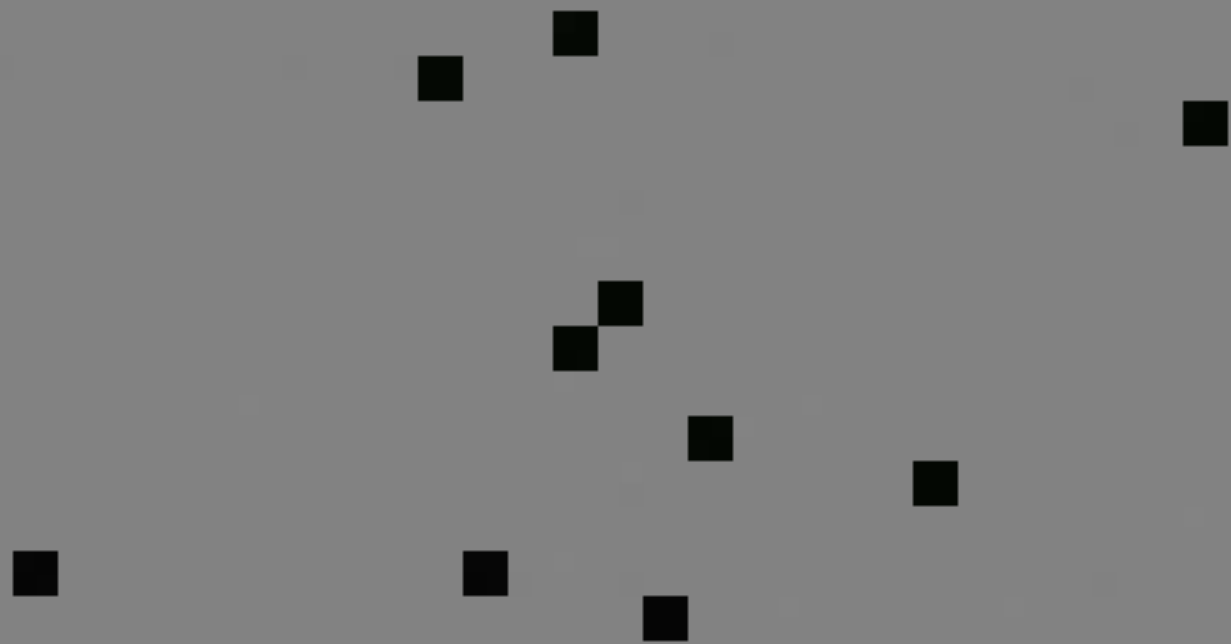


Demonstration of LaColor

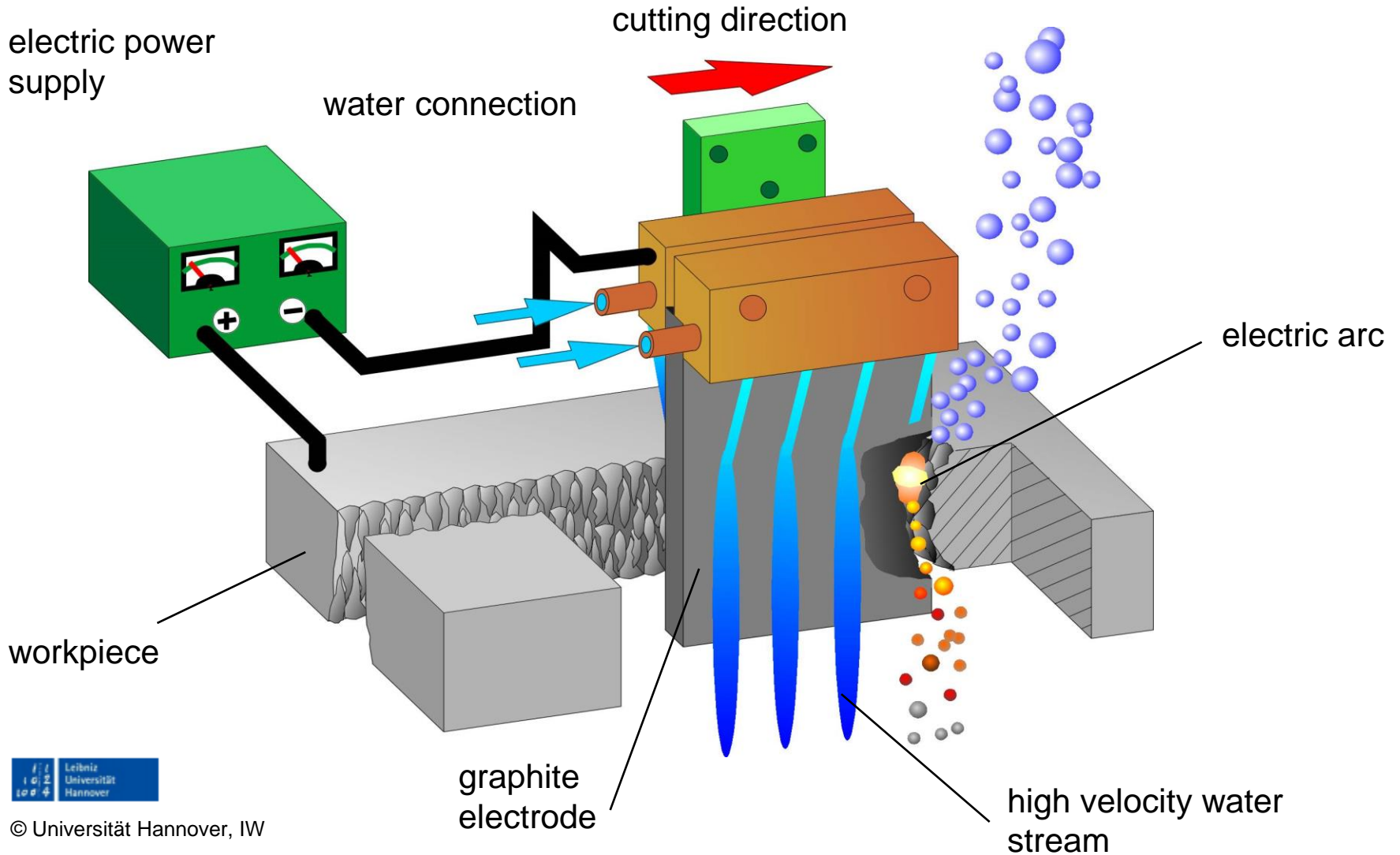




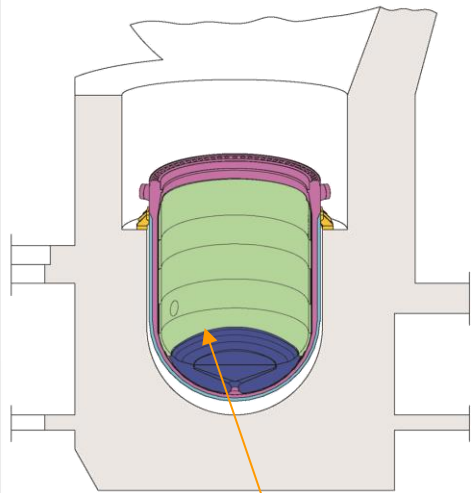
7/3/2014 14:38 96:10:30



3. Cutting Technologies



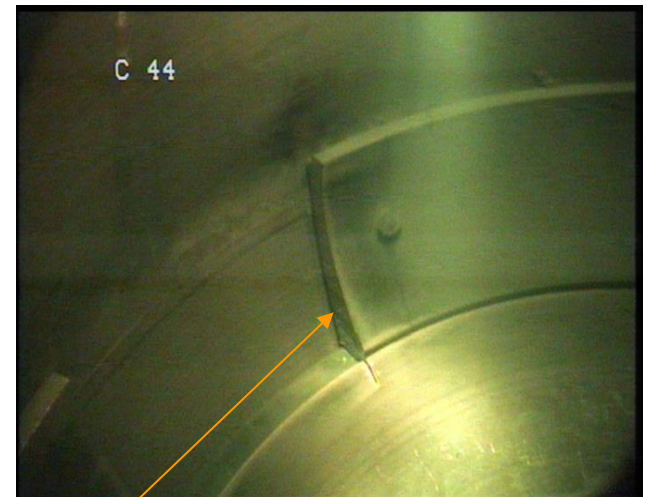
Remotely controlled underwater CAMC Cutting of a thick iron working piece inside a research reactor



installation position



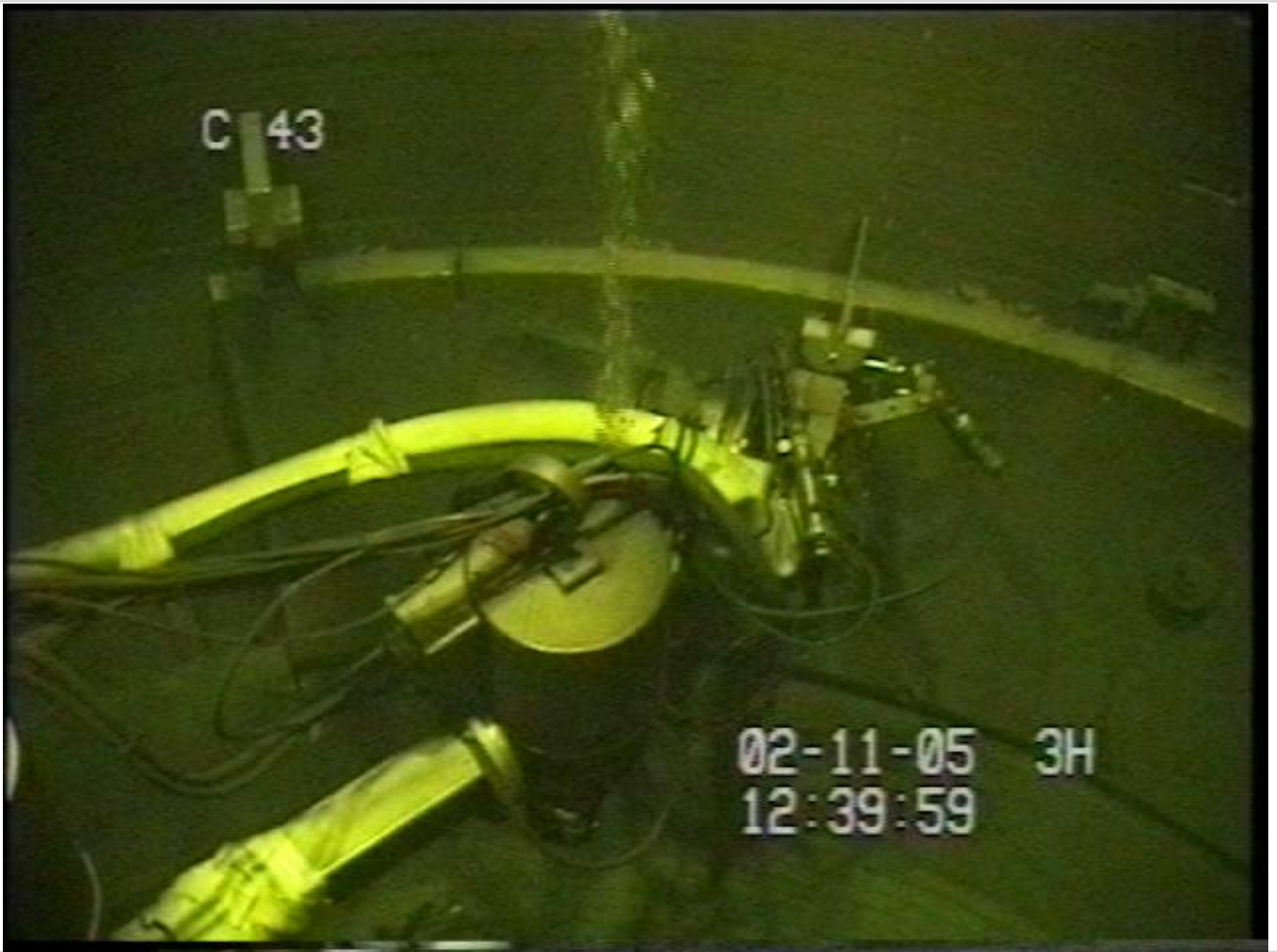
start of the cutting



afterwards

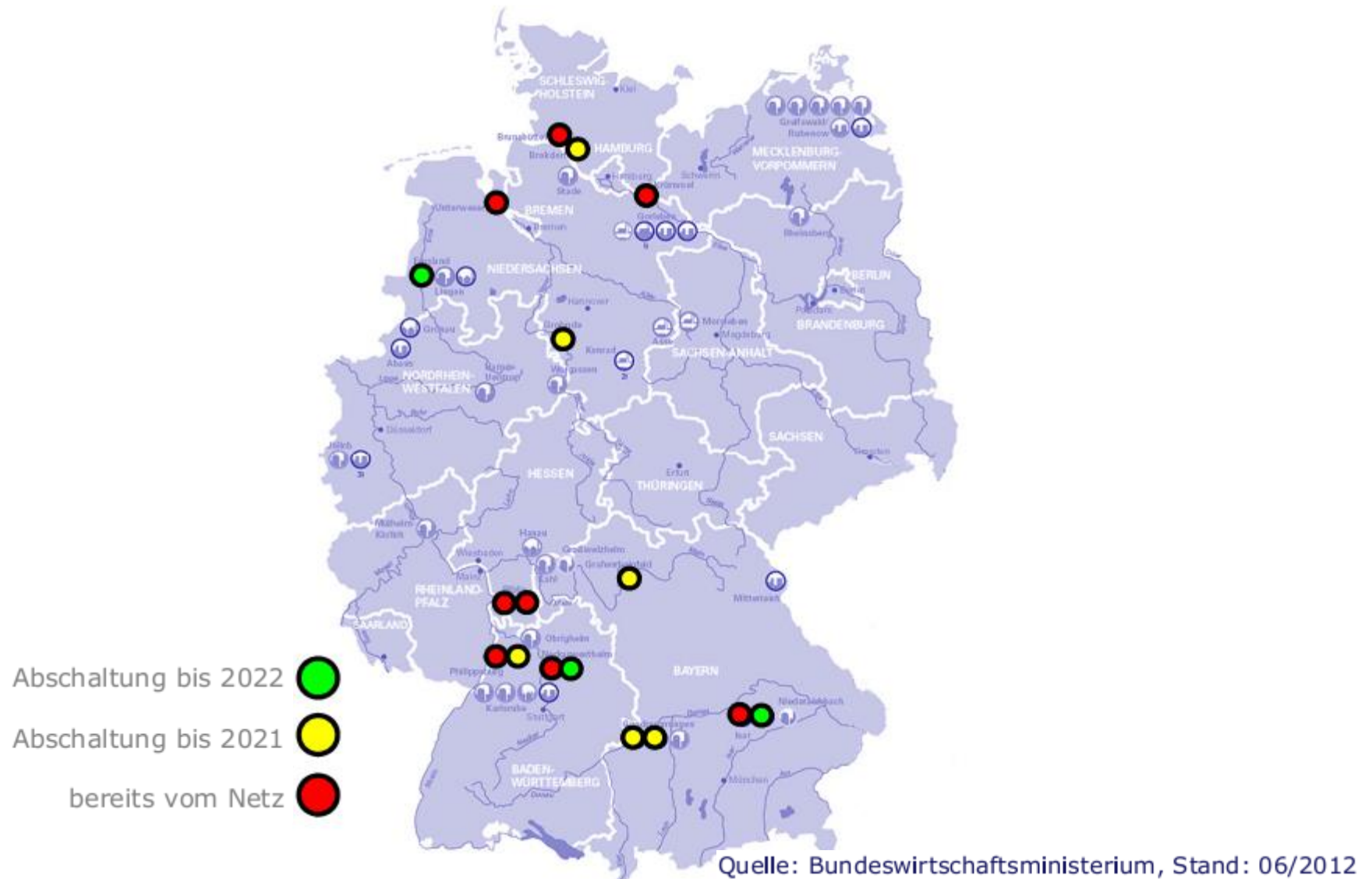
cutting depth 130 mm

E. Prechtl, B. Eisenmann
Hauptabteilung Projekte, Rückbauprojekt MZFR
Forschungszentrum Karlsruhe GmbH
W. Süßdorf, Fa. Studsvik, A. Loeb, Fa. Nukem
(2006)

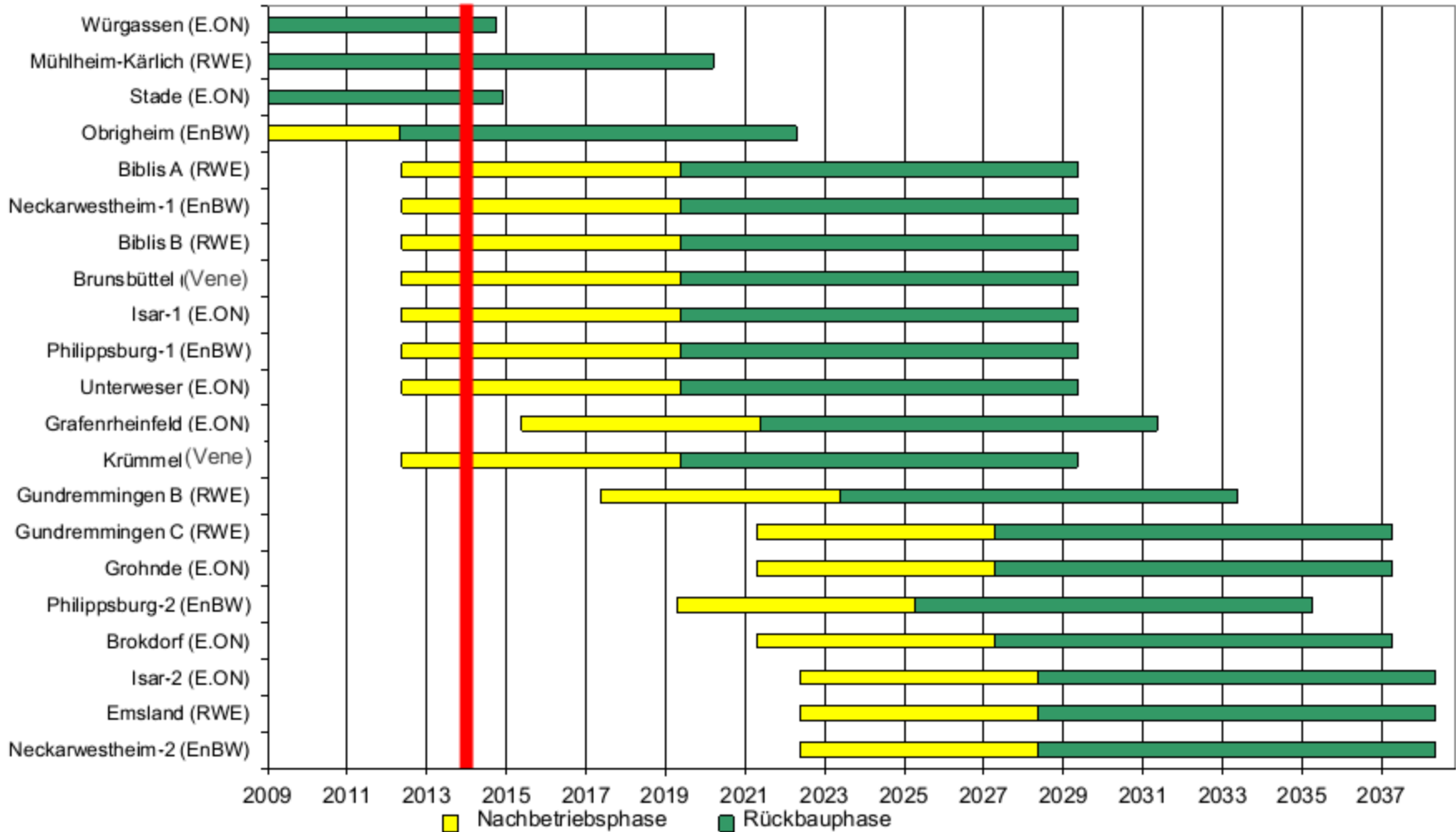


- Techniques for decommissioning and dismantling nuclear facilities are already available
- Improvement of common techniques and use of innovative techniques for special problems could reduce costs and improve safety of both the workers and the public
- Management of radioactive waste from decommissioning is a key consideration, therefore the availability of a final waste disposal is an increasing demand
- In future design of nuclear facilities considerations about decommissioning and dismantling have to be implemented

**Thank You for
Your Attention !**



Rückbauszenario (Nachbetriebs- und Rückbauphase)



Quelle: GNS