



Presentation to NUSAC

Chemistry Nuclear Safety Research

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Contents of presentation

Research Areas Covered

- Key Projects
 - Wythenshawe Boiler Rig
 - AMEC-NNC Autoclaves
 - PWR Water Chemistry
- Achievements
- Essential Research Capability
- Collaboration

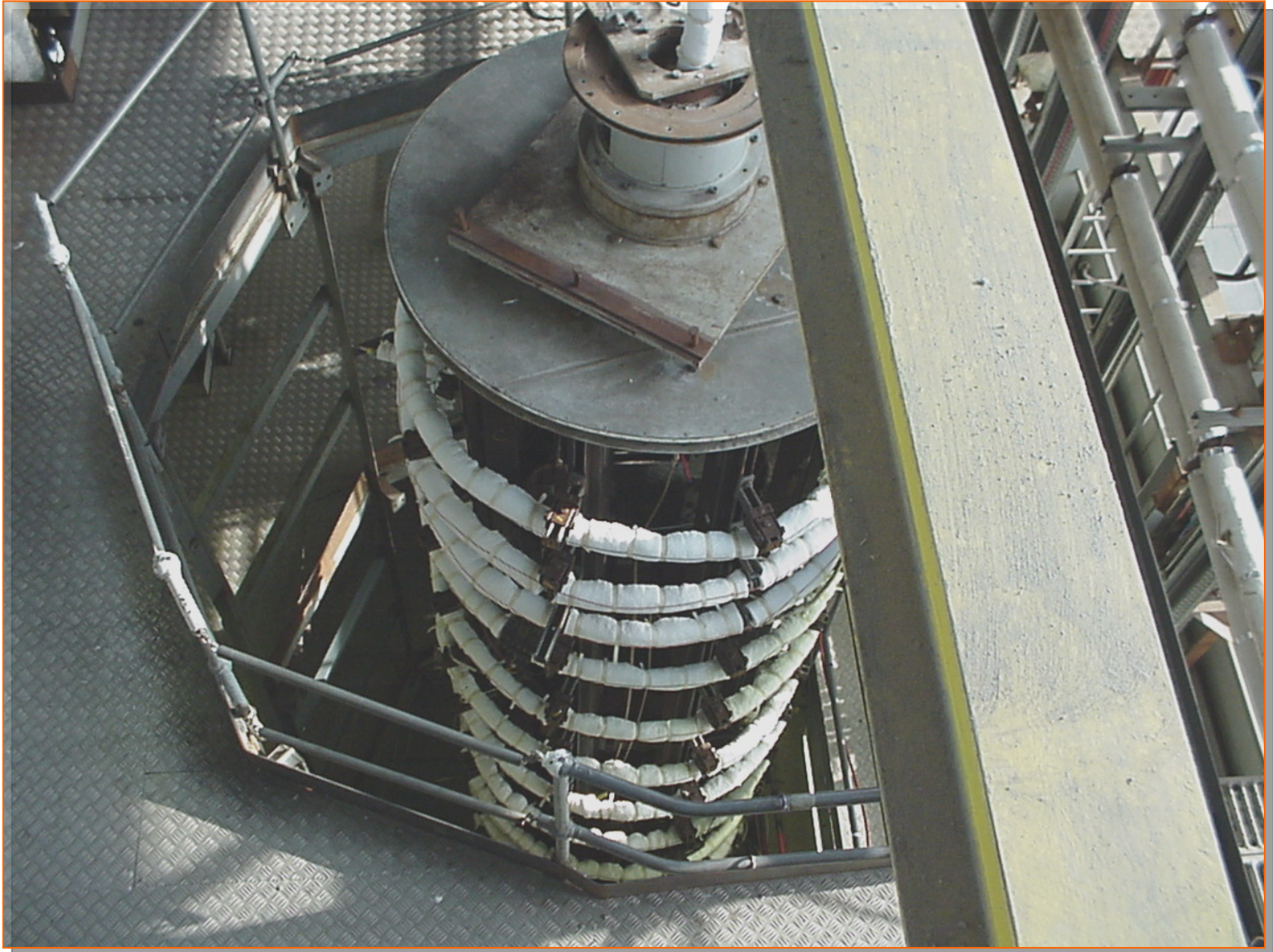
Balanced Chemistry Research Programme

Covering Corrosion and Degradation
Occupational Radiation Exposure (ORE)
Awareness of Operational Best Practice

Plant Areas	AGR Gas Chemistry	AGR Boilers
	PWR Primary Chemistry	PWR Secondary Chemistry

AGR Boiler Rig Facility at Wythenshawe

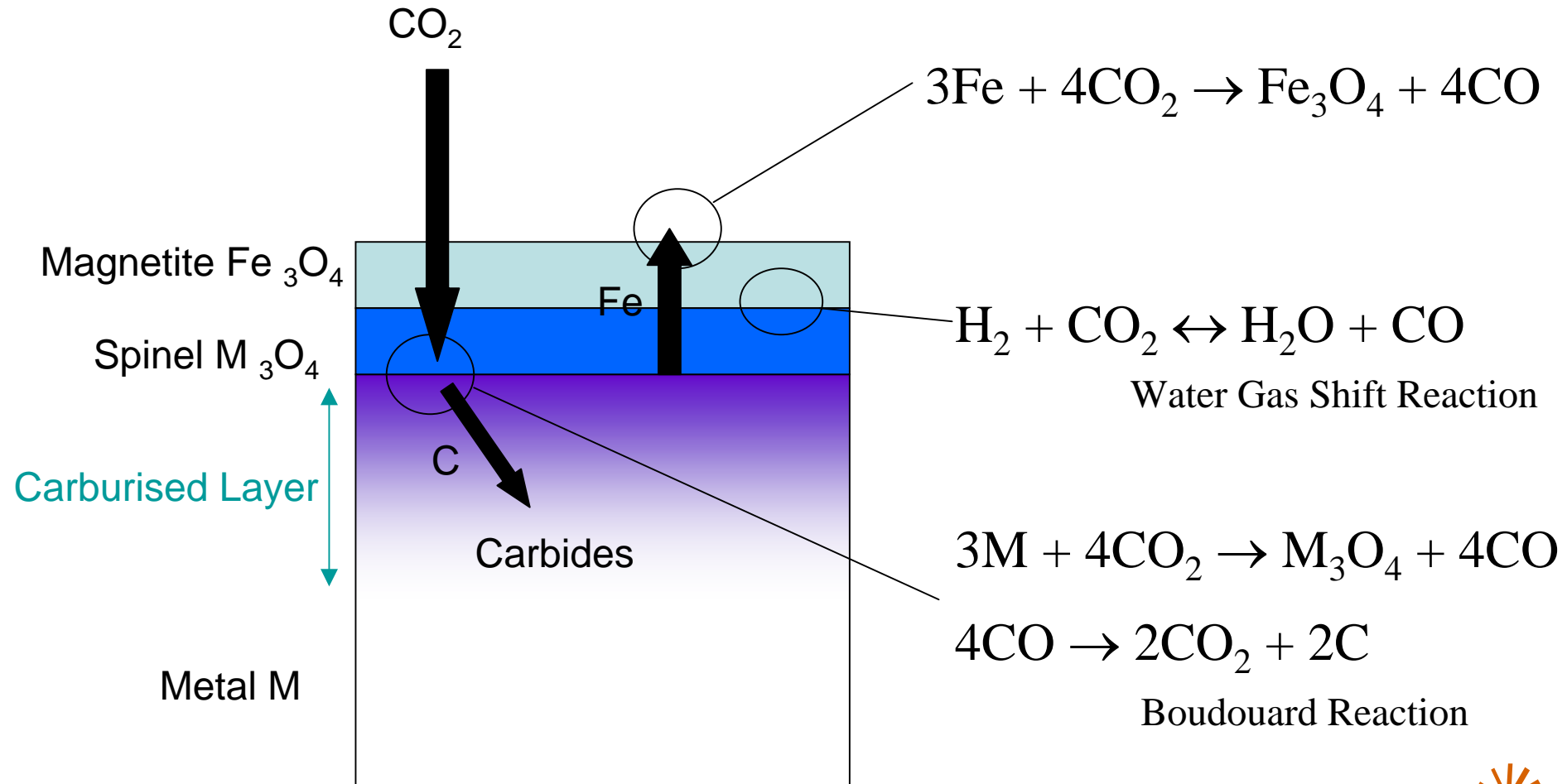
- Operating since 1980
- Owned by BE – Currently operated by SERCO
- Agreed 5 year support – reviewed after 3 years
- £450k budget for 2006-7
- Full scale single boiler tubes – plant conditions
- Underwrites Nuclear Safety Case
- Current programme to validate DMA dosing to control pressure loss
- Collaborative work for BNFL Wylfa



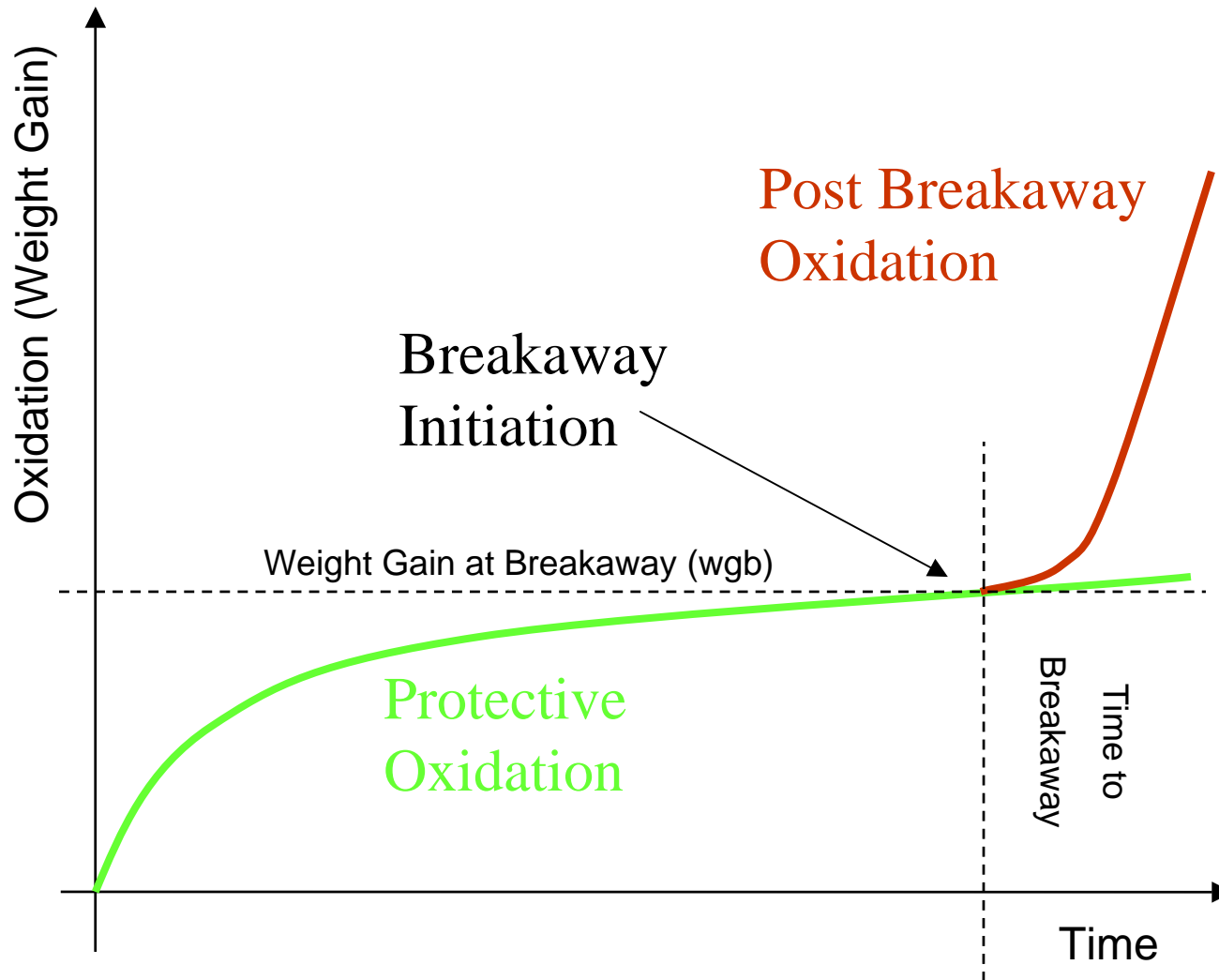
Large Autoclave Facilities

- Fund NNC autoclaves for a further five years
- £200k budget for 2006/7
- Long term tests on 9Cr CO₂ oxidation
- Investigating parameters affecting breakaway oxidation
- Keep plant away from breakaway oxidation initiation
- Underwrites Nuclear Safety Case

CO₂ Oxidation - Chemistry



CO₂ Oxidation - Kinetics



CO₂ Oxidation - Effect of Variables

Variable	Protective Oxidation	Breakaway Initiation	Post Breakaway Oxidation
Steel Si Content	Good	None	Good
Temperature	Bad	Bad	Bad
Gas Moisture [H ₂ O + H ₂]	None	Bad	Bad
Other	None	Thin sections, corners and edges	None

PWR primary chemistry (ORE issues)

- Monitoring during shutdowns
- International collaboration
- Radiation chemistry team at Harwell -£120k in 2006/7

Harwell team

- Development of iodine manual
 - Computerised knowledge database
- Modelling of PWR primary water chemistry
 - collaboration with EPRI

SUCCESS

Sizewell B primary chemistry

- Novel commissioning procedure
- Monitoring of primary coolant
- Very small crud burst → shortened shutdown → low ORE
- Taken up for EPR
- Collaboration with EdF / Framatome

SUCCESS

Wythenshawe Rig

- Underwrites AGR feedwater chemistry
- Understanding of the fundamental processes applied on plant
 - Stress corrosion risk analysis
 - Validated chemical cleaning
 - Examined AGR fault conditions
 - Flow assisted corrosion control
 - Oxygen dosing
 - DMA dosing
- Paper accepted for Korean water chemistry conference in October

Essential Research Capability

- Changing contractor capability
- Maintaining capability

Collaboration

NEXIA Harwell radiation chemistry team

EPRI Contribution to EPRI guidelines documents
Collaboration on modelling of PWR water chemistry
Attendance at workshops

EdF Joint meetings on PWR chemistry issues

Framatome EPR considering using SZB commissioning procedures