WESTINGHOUSE SAVANNAH RIVER COMPANY
SAVANNAH RIVER LABORATORY

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TRIP REPORT
EUROPEAN COMMUNITIES 1989 INTERNATIONAL CONFERENCE ON DECOMMISSIONING OF NUCLEAR INSTALLATIONS, BRUSSELS, BELGIUM, OCTOBER 24-27, 1989 (U)

INTRODUCTION

The European community is conducting research on the decommissioning of nuclear installations. The prime objective is to develop effective techniques to ensure the protection of man and his environment against the potential hazards of nuclear installations that have been shut down. The results of the

1979-1983 research program were presented in a conference held in Luxembourg (Proceedings: EUR 9474). This program was primarily concerned with decommissioning nuclear power plants.

The second, larger 1984-1988 program was extended to all types of nuclear installations. Fuel fabrication, enrichment and reprocessing plants, and research and development facilities having fulfilled their useful purposes are also awaiting decommissioning. This Program has produced numerous scientific and technical achievements. Great progress has in particular been achieved in the reduction of metal waste arising from decommissioning, due to advances in areas such as the development of aggressive decontamination procedures and of techniques for melting and recycling low-level radioactive waste metal. This meeting was attended by 390 participants who were from 20 different countries. Eighty-two papers were presented on information accumulated from joint research and development programs, coupled with practical experience, gained from actual dismantlement of prototype reactors and other plants.

HIGHLIGHTS

- There is more decontamination technology development in Europe than in the U.S. Europe has been under pressure from the beginning to minimize waste. They don't have anywhere to put it. What they have learned can be very beneficial to us in our efforts in waste minimization.

- Confidence was reinforced that the SRL Decontamination Program is indeed addressing state-of-the-art technology. We are investigating most of the technology being investigated, but at a much slower rate.

- Some research program elements elsewhere are much further developed than the SRL Decontamination Program. For instance, Harwell has developed electropolishing using a nitric-acid-based solution to the stage of a prototype operation. DF's of 10^4 have been achieved. Disposal of wastes has been addressed. We are only in the initial stages of investigation. A technology exchange is being investigated.

- Identify new technology, such as a chemical decontamination solution for lead from which the lead can be recovered.

- One of the key issues confronting decommissioning is that a common agreement is needed, on an international basis, under which decontaminated wastes from nuclear installations can be accepted for release. The resolution of this issue should be followed very carefully. When international release criteria are established, they could be used at Savannah River and other DOE installations to minimize wastes. The United States Government should participate in the establishment of these criteria. When Europe begins releasing decontaminated wastes from nuclear installations it will come into our country too!

- Waste minimization technique identified for contaminated concrete. Concrete is separated into its constituents. The contamination is in the cement, not the sand and aggregate. Wastes can be greatly reduced by removing the clean components.

- Modular containment structures have been developed that are assembled from panels. Before the structure is placed in radioactive service, the inside surfaces are coated with a strippable coating. When the job is completed, the structure is decontaminated by fixing the contamination and removing the strippable coating. The use of these devices would minimize waste generated by operations requiring construction of a tent. And they would be expected to provide better containment.

- An electrochemical cutting technique was identified. It cuts through a piece of metal using localized electropolishing. It is much slower than conventional cutting techniques. But time may not be the most important thing.

- Ultra high pressure water-jet has been successfully used with a robot. There was a big discussion about waste disposal problems. We would have less problems with disposal of wastes from an abrasive water-jet at Savannah River. For instance, we could use this technology in a size reduction operation with glass frit as the abrasive. All wastes could be sent to the DWPF and used in the production of waste glass.

- It has been demonstrated that prefiltration extends the lifetime of HEPA filters my orders of magnitude. This could be used at Savannah River to minimize the amount generated by reducing the number of HEPA filters needed. Radioactive aerosols are trapped in electrostatic devices. These devices can be cleaned to recover the material. This could be used at Savannah River to recover product that presently goes into HEPA filters. Bag filters made of polyester cloth could also be used for product recovery. They could be cleaned in nitric acid to recover the product.

- The prerequisite for decontamination is knowledge of the distribution of radioactivity in the material. Contaminated metal was characterized. More than 99% of the radioactivity was in the surface oxidation. Activity also penetrates 90 microns into the grain boundary. A two step decontamination process was developed. The surface oxides were removed using a Lomi-type solution. Removal of material from grain boundaries required a more aggressive etch. This work is documented in EUR 9352. SRL is presently beginning a similar investigation of the contamination on canyon vessels.

- A recirculation spray technique was used to minimize wastes generated from decontaminating a tank. SRL is presently beginning an investigation of using a recirculating spray system in decontaminating canyon vessels.

OVERVIEW OF TECHNICAL PAPERS

Session II - Aspects Relevant to Decommissioning Strategy

"Strategy of NPP Decommissioning in the IEA Member States"
Y. LARIN, et al, USSR Ministry of Nuclear Power; E. Hladky, et al, CSSR; S. Nozharova, et al, Bulgaria

- He said a few things about Chernobyl accident. For instance, they moved all people living within 30 miles of the Site.

"Deterioration Assessment of Nuclear Power Station Buildings and Long-Term Stability and the Leak-Tightness of Reactor Containments"
D. C. POCOCK, TWC; H. Van Exel, R. OBERPICHLER, SSP; D. Beukelman, R. Huth, B. Rose, TUV Bayern

- The time for decommissioning might be delayed ~100 years. The structures of some English facilities were examined to determine if their lifetime would be greater than 100 years. The answer was yes. But periodic monitoring was recommended.

"Consequences of Suppression of Negative Pressure in the KW-Lingen Containment"
W. HARBECKE, KWL

- The necessity of maintaining a negative pressure on a facility in Phase I (Safe Enclosure) was investigated in Germany. Results are that negative pressure is not necessary.

"The Potential Radiological Consequences of Deferring the Final Dismantling of a Magnox Nuclear Power Station"
P. B. WOOLLAM, CEGB (NPD)

- This paper describes a study of the consequences of loss of containment at various stages of shutdown when decommissioning is delayed for ~100 years to allow radioactive decay to reduce dose to dismantlement personnel. Results are radiological consequences are very small.

"The Decommissioning Data Bank Relating to Dose Rates and Costs"
P. PETRASCH, NIS; J. Roger, CEA

- CEC is developing a data bank for use in predicting decommissioning costs and personnel exposure in decommissioning operations.

"Radiological Criteria for Unrestricted Release of Materials from Nuclear Installations"
A. M. CHAPUIS, CEA; F. LUYKX, CEC

- CEC has investigated radiological criteria for unrestricted release of materials from nuclear installations.

Session III - Design Features Facilitating Decommissioning

"Testing of Cobalt-Free Alloys for Valve Applications Using a Special Test Loop"
C. BENHAMOU, S. Cohen, Framatome; F. Ruffet, CEA

- The use of cobalt alloys should be avoided. Alloys were identified. Values made of these alloys performed satisfactorily in a test loop.

"Analyses and Testing of Model Prestressed Concrete Reactor Vessels with Built-In Planes of Weakness"
P. Dawson, A. A. PATON, C. C. Fleischer, TWC

- Prestressed concrete reactor cavities with and without planes of weakness were designed, fabricated, and tested. The planes of weakness would make the structure easier to break up during decommissioning. Results are that planes of weakness would have no significant effect on integrity of cavity. And they would facilitate decommissioning.

"In Situ Treatment of Concrete Surfaces by Organic Impregnation and Polymerisation"
P. Ursella, G. Moretti, Italcementi; V. PELLECCHIA, Snia Techint

- Impregnation of concrete surfaces with resins to increase lifetime was investigated. Impregnation possible to 6 cm depth. Treatment effective in leaching tests.

"Influence of Design Features on Decommissioning of a Large Fast Breeder Reactor"
J.-L. FOURNIE, C. Alary, D. Maire, N. de Seroux, G. Peyrard, Novatome

- Design features in a large, fast breeder reactor to facilitate decommissioning include using stainless steels that do not contain cobalt, and providing a way to clean the sodium coolant channels.

"The Rack Removal System as a New Design Feature Adopted to Facilitate Decommissioning of the Reprocessing Plant. Decontamination and Remote Dismantling Tests in the ITREC Pilot Plant."
T. CANDELIERI, A. Gerardi, G. Soffietto, ENEA

- Remotely operated equipment was developed to decontaminate and dismantle centrifugal contactors mounted in modular units.

"Design Features Adopted to Facilitate Decommissioning"
M. DUBOURG, Framatome

- Activity and volume of radioactive wastes from light water reactors were made.

Session IV - Remote Operation for Dismantling and Decontamination

"Polyjointed Robot with Integrated Laser Beam"
P. GARREC, CEA

• Focused laser power beam cutting of metal produces less dross than other thermal cutting techniques. A tool was developed and tested in non-radioactive environment. It is manipulated with a polyjointed robot.

"Investigation of Laser Cutting Applications in Decommissioning"
B. MIGLIORATI, Fiat CIEI; G. Tarroni, M. Di Fino, P. Picini, ENEA; G. Manassero, Fiat

• Laser cutting was investigated. Aerosols produced were characterized. Abatement of aerosols is still a problem.

"Adaptation to Teleoperation of an Existing Airtight Modular Workshop for Remotely Controlled Operations"
B. Gasc, M. JEANJACQUES, Technicatome

• The French have developed an air-tight modular workshop. Its capabilities have been extended to use with alpha contaminated materials. Operations inside the facility previously requiring operators entering using plastic suits can now be replaced by using teleoperators (manipulators inserted through ports). This equipment has a bagless transfer system for waste minimization.

"Adaptation of a Robot and Tools for Dismantling of a Gas Cooled Reactor"
N. W. COLLINS, C. J. Lewis, Strachan & Henshaw

• A program was carried out to assess the practicality of using commercially available industrial robots and control systems in the nuclear industry for the application of reactor dismantlement.

"Development of Measuring and Control Systems for Underwater Cutting of Radioactive Components"
P. Drews, K. FUCHS, RWTH Aachen

"Development of a Prototype System for Remote Underwater Plasma Arc Cutting and Secondary Emission Measurements"
R. LEAUTIER, G. PILOT, CEA

• Underwater plasma arc cutting was investigated in non-radioactive and radioactive tests. The torch was controlled using a manipulator. Emissions generated were characterized.

"The Teleman Programme"
H. J. DE NORDWALL, CEC

• The CEC program to strengthen design basis for developers in the nuclear industry is described.

Session V - Dismantling Techniques

"Underwater Cutting Techniques Developments"
F.-W. BACH, U. Hannover

• An overview is given of different thermal cutting processes for cutting underwater. Handling techniques and process control systems required are discussed.

"Solid and Gaseous Secondary Emissions from Underwater Plasma Arc Cutting"
B. WALDIE, W.K. Harris, Heriot Watt U; G. Pilot, H. Loyer, CEA

• Solid and gaseous emissions from underwater plasma-arc cutting of non-radioactive stainless steel were studied. The effect of water depth on emissions was quantified.

"In-Situ Arc-Saw Cutting of Heat Exchanger Tubes and of Pipes from the Inside"
J. P. THOME, Field Automation

• Electric arc-saw cutting using robots were studied.

"Electrochemical Technique for the Segmenting of Activated Steel Components"
W. STANG, A. Fischer, KGB

• An electrochemical technique for segmenting activated steel components was studied. The feasibility of the technique in nuclear applications was demonstrated in non-radioactive tests. Operating parameters were investigated. Volume of waste generated was determined.

"Adaptation of High Pressure Water Jets and Abrasives to Dismantle Nuclear Installations"
C. LORIN, R. Rouviere, CEA

• Steel and concrete samples were successfully cut using high pressure abrasive water-jets. Cutting tool manipulated using robot. Emissions generated were characterized. (No reference to work done in U.S.)

"Submerged Cutting of Steel by Abrasive Water Jets"
H. Haferkamp, H. Louis, G. MEIER, U. Hannover

• A cutting head was designed and tested to increase the effectiveness of high pressure abrasive water-jets used underwater. Great thicknesses of material were cut using an oscillating head.

"Removal of Concrete Layers from Biological Shields by Microwaves"
P. F. WACE, A. H. Harker, UKAEA; D. L. Hills, BRE

• Spalling concrete surfaces by localized heating with microwaves

was investigated. Further investigation required.

"Explosive Techniques for the Dismantling of Radioactive Concrete Structures"
C. C. FLEISCHER, TWC; H. U. FREUND, Batelle

• Explosive techniques for dismantling radioactive concrete were investigated. Some variables characterized.

Session VI - Radioactivity Measurement Methods

"Systems for Contamination Measurements on Curved Surfaces"
B. HERMANNS, R&A

Summary in German.

"A New Method for the Analysis of Small Peaks in Gamma Ray Spectra, and a Detector System for Monitoring Gamma Activity in Land Areas"
A. D'Eer, P. Gray, C. KOUTSOYANNOPOULOS, T. D. MACMAHON, A. Naboulsi, Imp. College

• No interest to me. Maybe Burial Ground people will be interested.

"Optimisation of Measurement Techniques for Very Low-Level Radioactive Material"
R. HOFFMANN, B. Leidenberger, Siemens KWU

• This technology needed to prove material is below release limits.

"Development of Sampling and Assay Methods for Windscale Advanced Gas-Cooled Reactor Radwaste"
F. G. BRIGHTMAN, UKAEA

"Device for Decision Measurements of Waste from Dismantling of KKN"
I. AULER, F. Helk, E. Neukäter, and U. Zimmermann, NIS

"Measurement and Sorting Techniques for Unrestricted Recycling of Metal for the Nuclear Industry"
J. R. Costes, D. da Costa; G. IMBARD, CEA

• This report describes a low-level radioactive controller with a large detection surface area used at decommissioning sites to sort parts weighing up to 500 kg as they move past the detectors. The device calculates the specific activity and the mean activity per unit area, while logging the measurement parameters and the number of parts scanned.

"Measurement Techniques Applicable to Residual Radioactivity on a Decommissioned Reactor Site"
P. B. WOOLLAM, CEGB, (NPD)

Session VII - Estimation of Waste Quantities and Their Disposal

"Inventory of Glove Boxes Dismantling Operations in the Fuel Fabrication Complex of Cadarache from 1986 to 1988"
A. CAILLOL, CEA

• Dismantlement of glove boxes in a plutonium fuel fabrication facility. Different ways of dismantling, recovering plutonium, waste size reduction and decontamination were tried.

"Testing of New Techniques in Decommissioning of a Fuel (U, Th) Fabrication Plant, Especial Consideration to Free Release Measurement of Low Uranium Activities"
W. in der Schmitten, B. SOHNIUS, E. Wehner, Nukem

"Demonstration of a Methodology for Assessing Suitable Systems for Management of Reactor Decommissioning Wastes"
I. M. BARRACLOUGH, S. F. Mobbs, J. P. Davis, NRPB

"Anticipated Assessment of the Amount of Radioactive Wastes Arising from Pool LMFBR Dismantling"
C. Alary, D. Maire, G. PEYRARD, Novatome

"Decommissioning Wastes Arising in the European Community and Western Europe"
F. H. PASSANT, R. D. Ward, UNIPEDE

"Situation and Prospects of Radioactive Waste Disposal in the Member States of the European Community"
K. H. SCHALLER, S. Orlowski, CEC

Session VIII - Large Transport and/or Disposal Containers

"Development of a Large Waste Container Cast of Low-Level Radioactive Steel"
H. DEIPENAU, SGR; K. Pflugrad, CEC

• Research work successful. Containers fabricated and evaluated. Author believes this indicates recycling nuclear steel waste is a realistic route to reduce volume of radioactive waste and save resources. (Unsuccessful with DWPF canisters because of cost associated with QA of canisters.) (No reference in paper to U.S. work.)

"Large Waste Containers Made of Fibre Reinforced Concrete"
C. JAOUEN, SGN

• Canisters made of high-performance mortar with metal fiber reinforcement. Lab-scale tests indicate feasibility.

"Large Shielded Industrial Packages for the Transport of Intermediate Level Waste"
M. S. T. PRICE, UKAEA

Session IX - Steel Waste Melting with a View to Recycling or Conditioning

"Melting of Contaminated Steel Scrap from Decommissioning"
D. S. HARVEY, BSC

- The behavior of several radioactive isotopes was studied under a range of steelmaking conditions. Concluded that the use of steel scrap containing low levels of radioactivity would not be viable. Work will be discontinued by British Steel.

"Melting of Radioactive Metal Scrap from Nuclear Installations"
M. SAPPOK, SGR; G. Lukacs, NIS; A. Ettemeyer, W. Stang, KGB

- More than 2000 tons of low level contaminated scrap has been melted and recycled in Germany. A separate and modernized facility was erected.

"First Results of the Melting of Radioactive Waste in the EIRAM Plant"
A. THOMA, Noell

- German.

"Melting of Low-Level Contaminated Steels"
S. Menon, G. Hernborg, L. Andersson, Studsvik

- More than 400 tons of low active metallic scrap melted. Experience gained so far shows that melting is a safe, environmentally acceptable and commercially viable method of treating contaminated metallic low-active scrap.

"Separation by Transport in the Vapour Phase of Stainless Steel Constituents"
M. ALLIBERT, CNRS-ENSEEG; G. Gibon, G. Kurka, G. Tanis, CEA

- France is investigating a new technique for removing small amounts of radioactive isotopes from SS. Results of 2 g-scale tests indicate feasibility. But technique not cost effective.

"Behaviour of Difficult to Measure Radionuclides in the Melting of Steel"
E. SCHUSTER, E. W. Haas, Siemens KWU

- Melt experiments performed to study behavior of radioactive elements including activation products from SS. Technique was developed to measure alpha-radionuclides in steel. For ultimate use in unrestricted reuse of steel decontaminated by the melt process.

Session X - Decontamination for Decommissioning Purposes

"A Process for the Complete Decontamination of Entire Systems"
W. AHLFÅNGER, Kernkraftwerk Emsland

• Characterized surface of SS to be decontaminated. More than 99% of the activity in surface oxide. Remainder in grain boundaries up to 90 µm depth. Removed surface oxide using a LOMI reagent. Removed base metal containing contamination using mixture of nitric acid and hydrochloric acid.

"Aggressive Chemical and Ultrasound Decontamination Tests on Small Valves, and Tubes from a Feedwater Preheater, of Garigliano BWR"
F. BREGANI, A. Garofalo, ENEL

• Italian tests with small valves (1-2 inches) showed that some residual radioactivity remained in deep crevices after decontamination. Therefore, these types of complex components cannot be totally decontaminated. For decontaminating the tube-bundle of feedwater preheaters, a new decontamination process based on the simultaneous use of ultrasonics and aggressive chemicals was developed and tested. Results were that the technique is very effective. Alternative techniques being studied are electropolishing, abrasive water jet, freon jet, and direct melting.

"Decontamination Before Dismantling of a Fast Breeder Reactor Primary Cooling System"
J. R. COSTES, P. Antoine, J.-P. Gauchon, CEA

• Chemicals were circulated through cooling loop to remove residual sodium.

"Development of Techniques to Decontaminate the WAGR Heat Exchangers"
H. Crossley, J. R. WAKEFIELD, UKAEA

• Sections of tubes were removed and the contamination was characterized in laboratory. Contamination in 150 µm oxide film. Considered fill and drain, refluxing, and recirculating spray for applying decontamination solution. Approximately 70% of the activity was removed using dilute nitric acid applied using a recirculating spray. (This is applicable to our canyon vessels.)

"Decontamination using Chemical Gels, Electrolytical Swabs, Abrasives"
G. BRUNEL, CEA

• Laboratory tests were performed on spraying of gels containing decontaminating agents, electropolishing using a swab device, and abrasive blasting.

"Electrochemical Decontamination in Easily Processed Electrolytes"
A. D. TURNER, UKAEA; A. Steringer, KAH

• A number of different electrolyte systems were examined. System with nitric acid has been developed from laboratory to pilot-scale operation.

"Closed Electropolishing System for Decontamination of Underwater Surfaces/Development of Vibratory Decontamination with Abrasive Media"
E. BENAVIDES, M. Fajardo, Equipos Nucleares

• An underwater closed electropolishing system has been developed for use underwater. It will be useful in decontaminating large stainless steel areas such as pool liners. Vibratory finishing using abrasives was studied. Conclusions are electropolishing very effective. DF's over 1000 were achieved. Effectiveness of vibratory finishing increased by using a solvent that attacks the metal being decontaminated.

"Thermal Techniques for Surface Concrete Decontamination"
C. MORILLON, Bertin & Cie; J. F. Routier, STMI; G. Pilot, CEA

• Two techniques investigated. A rack-torch with a fast cooling system was relatively ineffective. A plasma augmented burner was more effective.

"Some Remarks about Decontamination"
A. BERTINI, ENEL

Not a technical report.

Session XI - Ventilation and Filtration Techniques for Decommissioning Purposes

"Ventilation and Filtration Techniques for Handling Aerosols Produced by Thermal Cutting Operations"
A. BISHOP, UKAEA

• Thermal cutting in air generates considerable aerosols that shorten life of filters in ventilation system. Aerosols generated from different thermal cutting operations were characterized. Suitable ventilation and filtration systems were developed.

"Prefiltering Devices for Gaseous Effluents from Dismantling Operations"
G. PILOT, M. Pourprix, CEA

• Aerosols produced by cutting tools were characterized. Effect of prefiltration and filtration systems was determined. Concluded many benefits of prefiltration. Lifetime of filters increased greatly by capturing particles in prefilter device (waste minimization).

"Spreading and Filtering of Radioactive By-Products from Underwater Segmenting"
H. STEINER, F.-W. Bach, H. Haferkamp, U. Hannover

• Tested filter systems for air and water. The aerosol generation by plasma arc cutting and grinding is strongly dependent on the cutting parameters used. No aerosol generation

could be measured with the grinding technique when cutting stainless steel or aluminum.

"Optimisation and Filtering Systems for Various Concrete Decontamination Techniques"
W. Ebeling, Salzgitter; K. W. ROSE, Noell

• Three cleanable filters were investigated. All tested were satisfactory.

"Measurement and Assessment of Cutting Secondary Emmissions by Plasma Torch and Laser Beam in Standard Cutting Tests"
G. PILOT, R. Leautier, M. Noel, CEA; H. Steiner, U. Hannover; G. Tarroni, ENEA; B. Waldie, Heriot Watt U.

• Tests performed in three different locations. Results are comparable. The importance of optimizing the cutting parameters is underlined. The better the cut, the lower the waste volume.

"Analysis of Results Obtained with Different Cutting Techniques and Associated Filtration Systems"
F.-W. Bach, H. Steiner, U Hannover; G. Pilot, CEA; E. SKUPINSKI, CEC

• Purpose of work was to analyze the results generated in a number of research contracts concerned with cutting tests in air and underwater. All useful information was introduced into a computerized user-friendly data bank.

Session XII - Treatment of Decommissioning Waste

"The Decommissioning of Large and Complex Glove Box Structures in a Mixed Oxide Fuel Fabrication Plant"
J. DRAULANS, BN

• Information is given concerning the different techniques applied during the decommissioning of glove boxes and equipment inside BELGONUCLEAIRE Mixed Oxide fuel fabrication plant.

"Immobilization of Contamination by the Coating of Polymers on Large-Size Waste Products"
C. de TASSIGNY, CEA

• Several polyurethane formulations have been identified which are suitable for the application of quick hardening thick coats. The diffusion of radioactive elements through these materials was characterized.

"Immobilization of Active Concrete Debris Using Soluble Sodium Silicates"
S. P. JULL, S. N. Field, TWC

• Laboratory-scale tests were conducted using sodium silicate solutions to solidify debris from scabbled Portland cement.

"Separation of Contaminated Concrete"
H. A. W. CORNELISSEN, KEMA

• The cement in concrete will become contaminated. The sand and gravel will not become contaminated. Separations techniques based on mechanical and thermal shock techniques were used. It was possible to separate the fine porous material from the coarse aggregate, resulting in a volume reduction of about 60-70%. Decontaminated components could be reused in road building, etc.

"Conditioning for Disposal of Radioactive Graphite Bricks from Reactor Decommissioning"
J. R. COSTES, C. de TASSIGNY, C. Koch, H. Vidal, A. Raymond, CEA

• Graphite waste was characterized. Impregnation processes to fix the contamination were investigated. Leach tests were performed.

Session XIII - Recycling of Material and Decommissioning Methodology

"Radiological Impact of Very Slightly Radioactive Copper and Aluminium Recovered from Dismantled Nuclear Facilities"
H. GARBAY, A. M. Chapuis, CEA

"Comparison of Decontamination and Melting with Direct Disposal"
K. G. JANBERG, D. Rittscher, GNS

• Scrap metal melting has a good public image and is now not only competitive with other methods but seems to have a decisive advantage; thus, we shall see an increasing variety of recycling applications in the future, at least as far as the FRG is concerned. (This position is directly opposite to the British Steel position.)

"Key Parameters for the Safe and Economical Recycling of Contaminated Stainless Steel"
P. HEBRANT, Westinghouse

• Westinghouse decontaminated 8 tons of piping removed from a nuclear power station in Belgium. The decontamination technique, the method used to measure the residual activity, and the amount of waste generated by decontamination and melting are discussed. The economical data extrapolated to large quantities are shown to justify the selection of recycling as opposed to long-term storage. Decontamination was affected by a four-step chemical process developed by Westinghouse.

"An Utility View of Decommissioning a Gas-Cooled Reactor"
P. McOWAT, SSEB, UK

• This paper is concerned with the non-technical aspects of decommissioning.

Plenary Session XIV - Large-Scale Decommissioning Operations

"Large Scale Application of Segmenting and Decontamination Techniques"
W. STANG, A. Fischer, KGB; P. Rubischung, Nusec

• In 1985 KRBA started investigations of decommissioning techniques in order to select effective segmenting and decontamination methods for large-scale applications. Several techniques have been applied to full-scale equipment with special regard to efficiency, costs, dose, and amount of secondary waste production. In the framework of this research program, a procedure was introduced for the regeneration of phosphoric acid.

"Decommissioning of a Mixed Oxide Fuel Fabrication Facility"
S. BUCK, A. Colquhoun, BNF

• Decommissioning of the coprecipitation plant, which made plutonium/uranium oxide fuel, is a lead project in the BNFL Sellafield decommissioning program. The objectives are to gain experience in a wide range of decommissioning operations. This plant is heavily contaminated with plutonium and other actinides. The operations have been used to test improvements in temporary containment, contamination control, decontamination methods, and to develop in-situ plutonium analysis, plutonium recovery, and size reduction methods. The project is also yielding data on manpower requirements, radiation uptake, and waste generation.

"Dismantling and Decontamination of the PIVER Prototype Vitrification Facility"
A. JOUAN, CEA

• The PIVER vitrification facility was decontaminated and decommissioned. Remote manipulation, handling, and cutting devices were used. A technique called "gamma teletopography" developed at Saday Nuclear Research Center was used to generate photographs with false colors to indicate the dose rates in different areas.

"Advances in the Decommissioning of the JPDR"
K. Tomii, M. YOKOTA, T. Hoshi, JAERI

• Dismantlement of the Japan Power Demonstration Reactor (JPDR) has been in progress since 1986. Techniques developed by the Japan Atomic Energy Research Institute (JAERI) are being used. Highly activated reactor internals have been dismantled since 1988 using underwater plasma arc cutting devices developed at JAERI. This paper describes the program and the experience so far.

"Completion of the Shippingport Reactor Decommissioning"
J. J. SCHREIBER, USDOE

• Planning began in 1979 and ended in 1983 with publication of

the Decommissioning Plan. The Decommissioning Operations Contractor began work in 1985. The physical work was completed in 1985, 6 months ahead of schedule. Total cost will be $92 M which is $6 M less than estimated. Personnel exposure was also less than estimated.

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