ACTION SHEET 32

between

The Power Reactor and Nuclear Fuel Development Corporation of Japan (PNC)
and
The United States Department of Energy (DOE)
for

Automated Controlled-Potential Coulometer

1. Introduction

Under Article II (Area of Cooperation) of the Agreement between PNC and DOE for Cooperation in Research and Development Concerning Nuclear Material Control and Accounting Measures for Safeguards and Nonproliferation (herein called the "Agreement"), dated September 15, 1993, DOE and PNC undertake to carry out a cooperative effort on the building, calibrating and delivering of an automated controlled-potential coulometer, including interconnect cabling.

2. Scope of Work

This Action Sheet provides for the building, calibrating and delivering of an automated controlled-potential coulometer, including interconnect cabling. Included in this Action Sheet is the re-assembly of the hardware, performance of start up testing, calibration, and operation and maintenance training at PNC.

The work performed under this Action Sheet shall be performed at the Savannah River Technology Center (SRTC), Westinghouse Savannah River Company and PNC facilities in accordance with the terms and conditions of the Agreement.

3. Program Management

SRTC is responsible for building, calibrating and delivering the coulometer. Work to be done is identified in Appendix I and is limited to this technique for plutonium measurement. PNC is responsible for providing operating data and other information required for completion of this Action Sheet. Appendix IT identifies key personnel working on this project.

DOE and SRTC shall work directly with PNC in planning tasks and resolving programmatic and technical questions. SRTC shall start by developing and circulating separate work plans

with projected milestones for each task and update the work plans with PNC concurrence as work progresses.

SRTC shall prepare brief quarterly letter progress reports on each task and circulate them to PNC, DOE, and to other pertinent organizations as requested by PNC.

- - SRTC and PNC shall prepare and present written and oral reports at meetings of the Permanent Coordinating Group (PCG).

4. Fiscal Management

PNC shall make a cash contribution of $178,785 in United States dollars to conduct the activities related to the development of hardware for PNC facilities as defined in Appendix I of this Action Sheet in the following manner:

a.) A contribution of $178,785 in United States dollars shall be due and payable within thirty days of receipt by PNC of an invoice to be issued in JFY 1997 (Japanese Fiscal Year) after the date of signature of the Action Sheet. This payment is subject to availability of appropriated funds to PNC.

DOE shall be responsible for the budget planning and financial management and shall make best efforts to complete the PNC-funded activities in the Appendix I satisfactorily and within the cash contribution by PNC. DOE costs are determined in accordance with DOE's policy for costing work it performs for others as set forth in 10 CFR Part 1009. The total cost to PNC for DOE's performance of work under this Action Sheet shall not, without PNC's prior consent, exceed the contributions set forth above.

DOE shall not begin or carry out work prior to entry into force of the Agreement and Action Sheet and receipt of the required payment in advance. Work shall not be continued after funds from PNC have been depleted.

Throughout the duration of work under this Action Sheet, PNC shall provide sufficient funds in advance to reimburse DOE for causing SRTC to perform the work described in this Action Sheet, and DOE shall have no obligation to perform in the absence of adequate advance funds. Payment in advance from PNC shall be sufficient to cover the expected obligation and cash requirements of the work until a subsequent request for payment in advance can be made, collected, and recorded. In this regard, sufficient advance funds shall be provided to maintain, at a minimum, a continuous 90-days advance of funds for expected DOE fund requirements during the life of this Action Sheet. Advances shall be sufficient to cover expected termination costs that DOE would incur on behalf of PNC.

5. Duration and Termination

This Action Sheet shall enter into force upon the later date of signature and shall continue in force for a two year period. In case all the activities under this Action Sheet are not completed in the designated period above, the Action Sheet can be extended by consent of both parties.

For the United States Department of Energy		For the Power Reactor and Nuclear Fuel Development Corporation of Japan	
Signature:	Kenneth E. Sanders	Signature:	姫野嘉昭
Printed Name:	Kenneth E. Sanders	Printed Name:	oshiaki Himeno
Title:	Director, International Safeguards Division	Title:	Director, International Division
Date:	13 Nov. 1997	Date:	December 8, 1997

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APPENDIX I

Automated Controlled-Potential Coulometer

1. Study Outline

This program involves the building, calibrating, delivery, and installation of an automated controlled-potential coulometer, including interconnect cabling in a PNC facility. In this effort SRTC will provide:

Automated Controlled-Potential Coulometer

Svstem Description

The proposed controlled-potential coulometer will be composed of two complete coulometers. Each coulometer will include two potentiostat modules, an integrator module, a counter module and an automation module. Both coulometers will be controlled by an IBM computer with a Pentium processor, 32 MByte RAM, 1 GByte hard drive, minimum of 4 ISA slots and 2 PCI slots. The ISA slots are for the digital output board, analog output board, GPIB board, and four channel RS232 board. Three of the RS232 channels will be for robot control, and one for the printer. One PCI slot will be for the video card and one for the SCSI hard drive controller card if necessary. The keyboard does not require a card. PNC may obtain a Japanese keyboard and load their own operating system on the machine. SRTC will supply the computer and interface cards so that it can write the software drivers, except for robot control, ensuring that the integrated system will work.

The two potentiostat modules, one for oxidation and one for reduction, are identical. They provide extremely stable control potential and can supply over 200 mA of current. The SRS cell however operates in the 50 mA to low uA range for plutonium samples in the 10 mg range. In both potentiostats, all of the electrolysis current passes through a 50-ohm load resistor in series with the measurement cell. The voltage drop across the load resistor is thus proportional to the electrolysis current. When the voltage signal across the load resistor is integrated, the quantity of material electrolyzed may be determined from Faraday's Law. Only potentiostat #1, used for sample oxidation, is connected to the integrator module.

The four channel analog output card will connect to each potentiostat module. The signal from the analog voltage is routed to the non-inverting input of the driver amplifier. Connection of the signal to this reference point of the driver amplifier allows programmable incrementing of the control potential supplied to the measurement cell.

The integrator module is composed of two voltage-to-frequency converters (VFC's), precision op amp circuits and a quartz crystal oscillator. The signal from the potentiostat to be integrated and a small offset signal are supplied to VFC #1. Only the offset signal is

supplied to VFC#2. The frequency signal from the two VFC's and the crystal oscillator are supplied to the counters for accumulation. The signal to be integrated would be exponentially decaying DC were it not for AC noise. The offset signal is supplied to ensure that the polarity of the net signal to be integrated is always positive. Supplying only the offset signal to VFC#2 allows accurate correction for the contribution of the offset signal to the total integrated counts from VFC#1.

The automation module allows automatic interconnection/interfacing of the cell assembly and the coulometer modules via the digital output card.

The routine electrical calibration precision (2-sigma) is less than 0.001% at the current levels of major importance. The overall accuracy of the system for plutonium samples in the 5 to 10 mg range is +/- 0.1%.

Phase I (at SRTC)

1. Building of the automated controlled-potential coulometer.
2. Calibration of coulometer.
3. Delivery of coulometer to PNC.

Phase II (at PNC)

1. Re-assembly and installation of the coulometer hardware.
2. Performance of start up testing.
3. Calibration of the system.
4. Operation and maintenance training.

2. Sites

This work will be conducted at:

Savannah River Technology Center Westinghouse Savannah River Company Aiken, South Carolina, USA	and	Power Reactor and Nuclear Fuel Development Corporation Tokai-mura, Japan

3. Programmatic Responsibilities

A. SRTC will be responsible for providing best efforts within the funding and schedule for the fundamental design work. Any tests or technical assistance shall be provided on a non-interference basis with existing SRTC programs.

B. PNC will be responsible for facility specific program direction and the equipment installation interface.

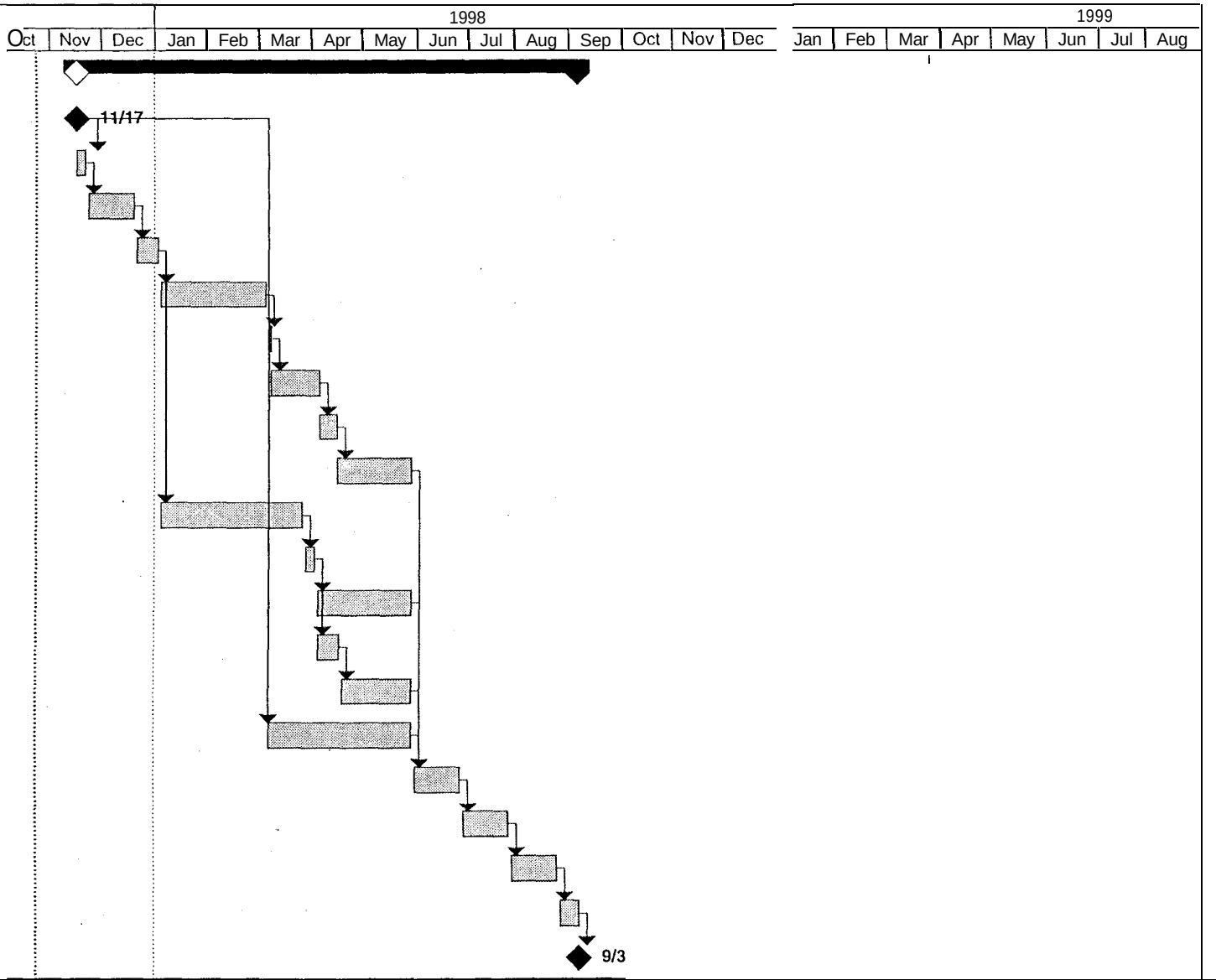
As more detailed program plans are developed, specific responsibilities will be better defined and delineated.

4. Schedule

The projected schedule is shown on the attached project summary page. This schedule will be followed on a best-effort basis commencing on receipt of funding and availability of parts.

DOE/PNC Action Sheet 32

ID	Task Name
1	PNC Task 32- Automated Controlled-Potential Coulometer
2	Receive Authorization
3	Determine Component Availability
4	Write Purchase Requisitions
5	Purchase Orders Placed
6	Vendor Fabrication
7	Receive blank NIM Modules
8	Machine Front and Back NIM Panels
9	Engrave NIM Panels
10	Wire Modules and NIM Bin
11	Vendor Fabrication
12	Receive Hewlett Packard Hardware and Computer Hardware
13	Revise Existing Software
14	Mount Hardware in 19 Inch Rack
15	Fabricate Interconnect Cables
16	Stuff PC Boards For All Modules
17	Integrate System, Perform Electrical Calibrations
18	Ship System to 772-l F for Testing with PU Samples
19	Ship System to PNC
20	Installation and Training at PNC
21	Project Completion



Project: DOE/PNC Task 32
Date: Fri 10/24/97

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

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APPENDIX II
Automated Controlled-Potential Coulometer

Power Reactor and Nuclear Fuel Development Corporation

1. PNC Headquarters

Jinichi Masui, General Manager
Safeguards Office
Nuclear Material Control Division
Power Reactor and Nuclear Fuel Development Corporation
Sankaidoh Building
9-13,1-Chome, Akasaka
Mainatoku, Tokyo, 107, JAPAN

Yoshiaki Himeno, General Manager
International Division
International Cooperation Office
Power Reactor and Nuclear Fuel Development Corporation
Sankaidoh Building
9-13, 1-Chome, Akasaka
Minato-ku, Tokyo, 107, JAPAN

2. Tokai Works

Yusuke Kuno, General Manager
Analytical Section
Technical Service Division

Department of Energy

1. DOE Headquarters

John Cappis
International Safeguards Division
Office of Arms Control and Nonproliferation (NN-44, GA017)
Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

2. DOE-Savannah River Operations Office

Terry Montgomery
Office of Science, Technology and Business Development
DOE/Savannah River Operations Office
P.O. Box A
Aiken, SC 29802

3. Savannah River Technology Center

Frank R. Utsch
Technology Business Development
Westinghouse Savannah River Company
Building 773-4 1 A
Aiken, SC 29808

Joseph V. Cordaro
Engineered Equipment & Systems Department
Westinghouse Savannah River Company
Building 723-A
Aiken, SC 29808