

# Work Plan for Heat Transport Small Scale Testing for Prismatic Block

September 29, 2009

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BEA Contract No. 000 75310, Release 7



## Work Plan Approval

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**Joe Stringer, AREVA Project Manager**



**Record of Revisions**

<b>Revision</b>	<b>Date</b>	<b>Page/Sections Changed</b>	<b>Brief Description</b>
000	September 2009	N/A	Initial Release



## Table of Contents

<b>Record of Revisions .....</b>	<b>3</b>
<b>Table of Contents .....</b>	<b>4</b>
<b>List of Tables .....</b>	<b>5</b>
<b>List of Figures .....</b>	<b>5</b>
<b>1 Project Overview .....</b>	<b>6</b>
<b>2 Work Plan .....</b>	<b>6</b>
<b>3 Project Controls Plan.....</b>	<b>8</b>
3.1 Schedule .....	8
3.2 Budget .....	11
<b>4 Project Quality Plan .....</b>	<b>11</b>
<b>5 Resource Plan .....</b>	<b>11</b>
5.1 Project Organization .....	11
5.2 Training Plan.....	12
<b>6 Communications Plan .....</b>	<b>13</b>
6.1 Status Reviews .....	14
6.2 Monthly Reporting.....	14
6.3 Design Reviews .....	15
<b>7 References.....</b>	<b>15</b>



**List of Tables**

Table 1. Milestone List for SOW-7744, Rev. 0 ..... 10  
Table 2. Task Budgets for SOW-7744, Rev. 0 ..... 11  
Table 3. Monthly Report Schedule ..... 15

**List of Figures**

Figure 1. Activity-based Schedule for SOW-7744, Rev. 0 ..... 9  
Figure 2. Project Structure ..... 12

## 1 Project Overview

This work plan is formulated to provide for development of a listing of all systems, structures, and components (SSCs) that will require static or small scale tests prior to use in the NGNP. This will include evaluation of the Technology Development Roadmaps (TDRMs) and test plans (TPs) generated under previous tasks for the NGNP reactor outlet temperature of 750 to 800 °C to identify small scale test requirements at elevated temperature and pressures. The results of this evaluation will be used to identify Technical and Functional Requirements of a small-scale, high-temperature, high pressure helium test loop.

AREVA has the overall project responsibility. The specific project organization for the work scope addressed in this work plan is outlined in Section 5.1, Project Organization.

## 2 Work Plan

The work covered under this work plan includes the following tasks.

- Task 1 Review and assess TDRMs and TPs for a core operating temperature of 750 to 800 °C, assuming a conventional steam cycle (Reference 3)
- Task 2 Identify small-scale test conditions by SSC at elevated temperature and pressure
- Task 3 Define test facility technical and functional requirements
- Task 4 Prepare and issue deliverables (i.e. 90% Review, listing of test conditions by SSC, listing of test loop Technical and Functional Requirements)
- Task 5 Project management & reporting

The purpose of this work is to identify:

- Testing that can be performed in static tests or small-scale, ( $\leq 2$  MW heat input) low flowing test loops
- Functional requirements for a set of test systems that could accomplish the required testing.

For the purposes of this work scope, static tests are defined as tests at elevated temperatures, pressures and/or chemical environments but at no flow or very low flow rates.

AREVA will review the applicable TDRMs and their associated test plans to identify the SSCs that will require static or small scale tests. This will consider only the 750 to 800 °C and will assume a conventional steam cycle. (**Note: SOW-7744, Rev. 0**)

**specified that the 950 °C should be considered, but BEA requested that AREVA reduce the scope to allow for the smaller, assigned budget for this task. Therefore, the 950 °C cases are not included in this scope.)** For these identified SSCs, AREVA will define the appropriate test facility technical and functional requirements and document these results of this work in a letter report to BEA.

The letter report shall include the following information for each SSC and its associated tests:

- Identification of the SSC (e.g. circulator, steam generator, hot duct)
- Brief description of the test
- Reference to a test number or applicable test plan
- TRL rating
- Test type
- Environment (e.g. He, He with impurities, air)
- Temperature,
- Pressure
- Mass flow (if applicable)
- Approximate physical size of the test
- Approximate thermal size of the test loop need (if completed under flowing conditions)

Based on the list of testing required, AREVA will also provide a report defining the functional requirements for the flowing test loop that would be capable of performing the needed testing. Initial BEA estimates anticipate that this will likely be capable of:

- 1 to 2 MW thermal
- Temperatures of 950 °C (although temperatures this high are not being considered in this work scope)
- Pressures up to 9 MPa
- Mass flow rates of 0.8 to 1.4 kg He/s
- Chemistry control for CO, CO<sub>2</sub>, CH<sub>4</sub>, H<sub>2</sub> and moisture in the ppm range.

The following lists the milestones and deliverables associated with this task.

*Milestones:*

- |                                      |                  |
|--------------------------------------|------------------|
| • Kickoff Meeting with BEA           | October 5, 2009  |
| • Draft Work Plan to BEA             | October 5, 2009  |
| • Final Work Plan to BEA             | October 22, 2009 |
| • Draft Letter Report for BEA Review | December 7, 2009 |



- Draft Functional Requirement for BEA Review December 7, 2009
- 90% Review December 14, 2009
- Final Letter Report to BEA December 18, 2009
- Final Functional Requirement to BEA December 18, 2009

*Deliverables:* Letter report to BEA and Functional requirements for a small-scale test loop

Project management activities are included in each individual task, but are not explicitly discussed in the following sub-sections. AREVA will provide sufficient project management to ensure that the activities described below are accomplished on schedule and within budget.

Any additional tasks authorized under Release 4 will result in revisions to this work plan.

### 3 Project Controls Plan

AREVA is committed to implementing sound project management practices to ensure that they meet deliverable dates within budget. This includes tracking schedule and budget against established milestones. The following subsections address the schedule and budget for this work plan.

#### 3.1 Schedule

The following figure shows the activity-based schedule for this work plan. This schedule provides the basis for monthly reporting of earned value calculations. Also included is a table of milestones for this work plan.

The activities shown in the schedule are listed below:

- Review and assess TDRMs and TPs
- Identify test conditions by SSC
- Define test facility technical and functional requirements
- Prepare and issue deliverables
- Project Management

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 Document No. PD-3002052-000

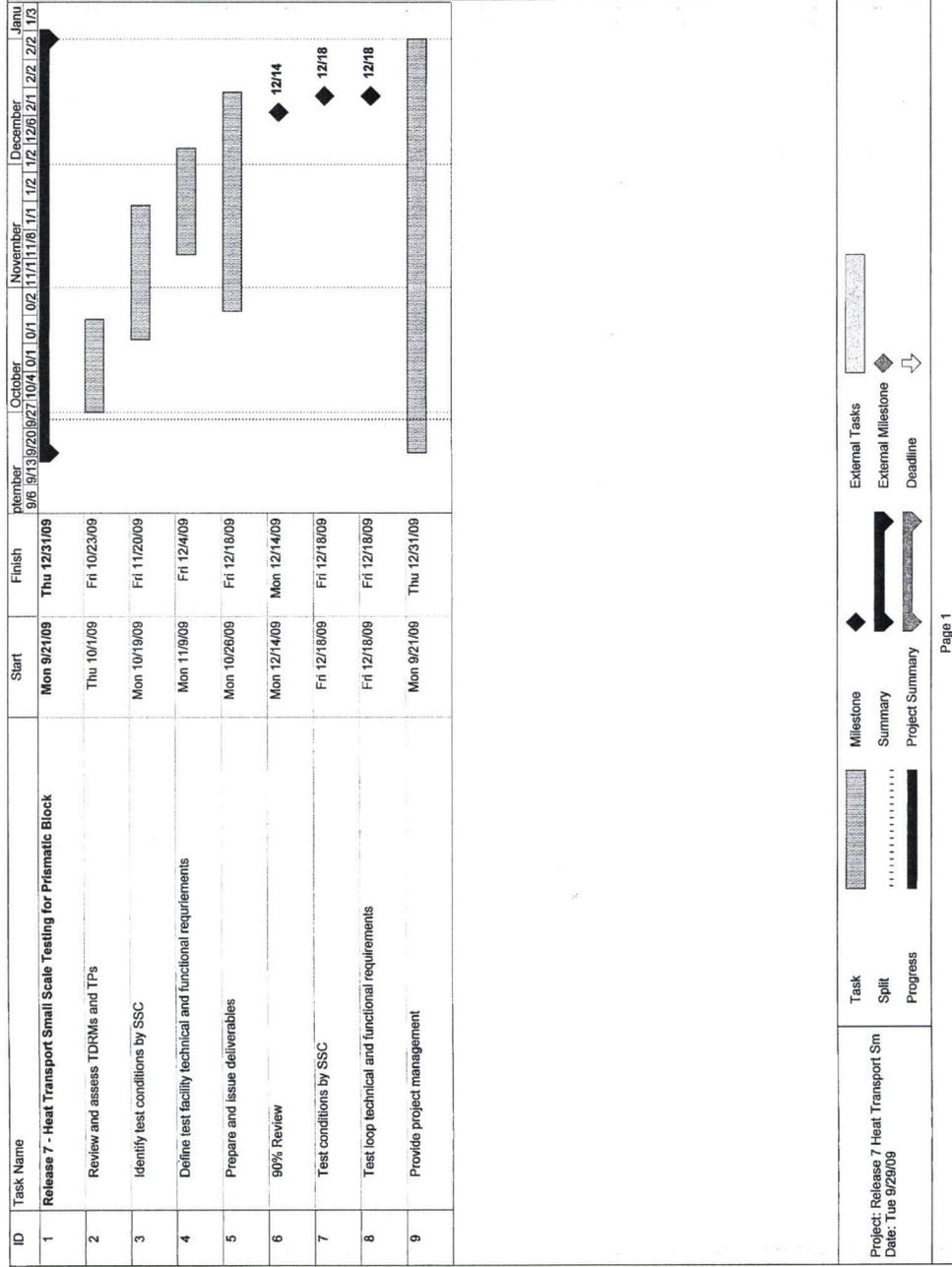


Figure 1. Activity-based Schedule for SOW-7744, Rev. 0



**Table 1. Milestone List for SOW-7744, Rev. 0**

<b>Milestone</b>	<b>Due Date</b>
Kickoff Meeting with BEA	October 5, 2009
Draft Work Plan to BEA	October 5, 2009
Final Work Plan to BEA <sup>#</sup>	October 22, 2009
90% Review	December 14, 2009
Draft Letter Report for BEA Review	December 7, 2009
Final Letter Report to BEA <sup>#</sup>	December 18, 2009
Draft Functional Requirements for BEA Review	December 7, 2009
Final Functional Requirements to BEA <sup>#</sup>	December 18, 2009

<sup>#</sup> Deliverable – actual completion date depends on timely comments from BEA – with a day-for-day slippage of due dates.



### 3.2 Budget

The following table shows project setup along with budgets by task for this work plan. This table provides the basis for monthly reporting of earned value calculations.

**Table 2. Task Budgets for SOW-7744, Rev. 0**

Task/Subtask Name	Budget
Review TDRMs and TPs, Identify Tests and Develop Deliverables	\$116,864
Travel	\$5,000
Provide Project Management	\$14,533
	Fee \$9,198
	Total \$145,595

## 4 Project Quality Plan

Under the existing contract (Blanket Master Contract No. 00075310) AREVA implements a quality system in accordance with ASME-NQA-1-2000 where required by specific SOWs. The requirements of this standard only apply when invoked via individual work task. Work tasks that are governed by NQA-1 requirements will contain the statement “NQA-1 applicable Work Task” at the beginning of the work task description. This release (Reference 1) and SOW (Reference 2) do not call-out NQA-1 requirements for the work to be performed under this work plan. Therefore, no quality plan is required for these tasks.

As a quality nuclear engineering services provider, AREVA and its subcontractors will perform work under the applicable quality management systems. This will included following the applicable procedures governing non-safety, non-quality-affecting work.

## 5 Resource Plan

### 5.1 Project Organization

AREVA intends to employ the following AREVA affiliates: AREVA Federal Services, LLC (AFS) and AREVA NP Inc. (ANP). Where beneficial, AREVA NP SAS

(SAS), may also be used to support some of these tasks. The following figure displays the overall project organization.

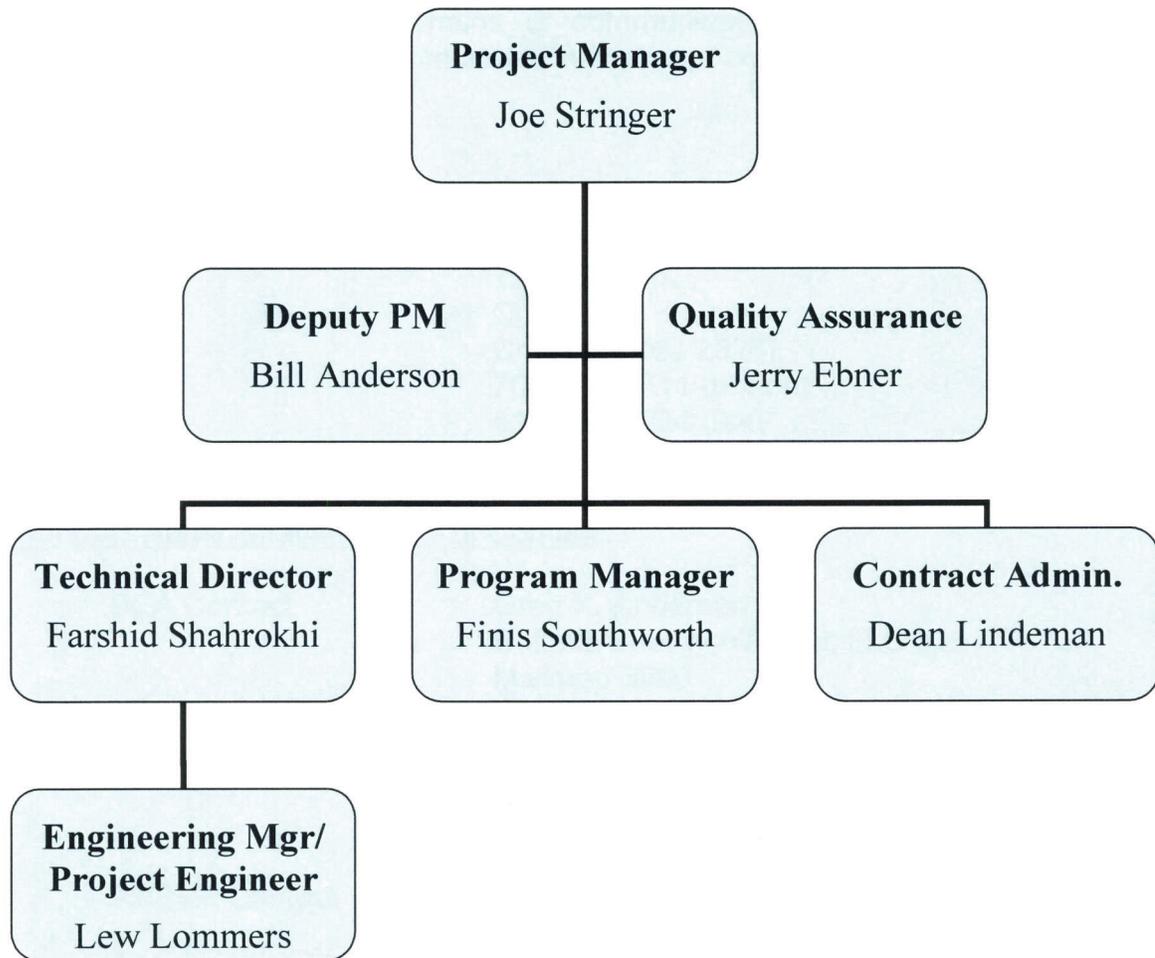


Figure 2. Project Structure

## 5.2 Training Plan

This work will be performed by AREVA and their affiliates. Personnel working on this project will be trained to their applicable procedures as governed by their quality management system. No project-specific training is necessary for this work scope.



## 6 Communications Plan

AREVA recognizes that proper communication is essential to successful projects. This involves establishing clear chains of communications. To this end, AREVA recognizes the following formal communication lines and contacts.

### Project Points of Contact:

AREVA Contact	Joe B. Stringer 7207 IBM Dr. CLT-1D Charlotte, NC 28262 704-805-2711 (phone) 434-382-5924 (fax) Joe.Stringer@areva.com
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### Contract Administration Points of Contact:

BEA Contact	Greg K. Anderson Battelle Energy Alliance, LLC Mailstop 3890 2525 Fremont Ave. P.O. Box 1625 Idaho Falls, ID 83415-3890 Gregory.Anderson@inl.gov
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AREVA Contact	L. Dean Lindeman 3315 Old Forest Rd. PO Box 10935 Lynchburg, VA 24506 434-832-3203 (phone) Dean.Lindeman@areva.com
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### Technical Points of Contact:

BEA Contact	Bill Landman 208-526-7170 Bill.Landman@inl.gov
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AREVA Contact	Farshid Shahrokhi 3315 Old Forest Rd.
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PO Box 10935  
Lynchburg, VA 24506  
434-832-2923 (phone)  
F.Shahrokhi@areva.com

For this work scope, AREVA will implement status reviews, formal monthly status reporting, and design reviews, as necessary. The following subsections discuss these various reporting mechanisms.

### **6.1 Status Reviews**

AREVA will host bi-weekly status teleconferences with BEA. For these meetings, AREVA attendees will include, at a minimum, the Project Manager, Technical Director, and Project Engineer. The purpose of these teleconferences is to review the status of the on-going tasks.

In general, the bi-weekly status meetings will include discussion of:

- Progress to date vs. schedule
- Schedule concerns and issues
- Recovery plan for activities behind schedule
- Status of staffing and job hour expenditures
- Highlight of activities in the upcoming month
- Support required from BEA
- To-date costs vs. budget, cost trends, earned value, etc.

AREVA proposes that the bi-weekly calls be held on the first and third Wednesday's of the month at 11AM eastern time. Additional teleconferences may be added later, at the discretion of the AREVA Project Manager.

### **6.2 Monthly Reporting**

In addition to bi-weekly teleconference, AREVA will submit monthly written status reports. These written reports will report earned value, estimated costs, and accomplishments achieved during the month. These reports will be issued for FY2009 according to the table following page.

These monthly report will include earned value monthly reporting, with this information at the activity level shown in the Figure 1 schedule. This will not include reporting status of specific milestones, but rather of the actual labor activities.

**Table 3. Monthly Report Schedule**

<b>Accounting Month</b>	<b>Accounting Period</b>	<b>Due Date*</b>
September	August 24 – September 30	September 22, 2009
October	October 1 – October 25	October 20, 2009
November	October 26 – November 22	November 18, 2009
December	November 23 – December 20	December 15, 2009

\* Actual due dates are dependent upon actual start dates. Monthly reporting will only commence following authorization to begin work.

### **6.3 Design Reviews**

A 90% Design Review is tentatively scheduled for December 14, 2009. This is subject to finalization based on AREVA and BEA schedules.

AREVA will provide presentations and drafts for the deliverables to BEA no less than 4 working days prior to the reviews, unless otherwise requested by BEA. All commented received during the review will be documented, resolved and incorporate in the report prior to final submission. Comments and resolutions will be documented and submitted for inclusion in the project files.

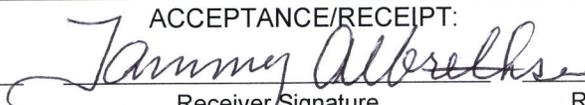
## **7 References**

1. Battelle Energy Alliance, LLC (BEA), *Release No. 7 Under Blanket Master Contract No. 00075310*, September 18, 2009.
2. Battelle Energy Alliance, LLC (BEA), *Statement of Work: Project No. 23843, Heat Transport Small Scale Testing for Prismatic Block, SOW-7744, Rev. 0, August 17, 2009.*
3. AREVA Federal Services, LLC (AFS), *NGNP Technology Development Road Mapping Report, TDR-30001031-003, September 2009.*

## NEXT GENERATION NUCLEAR PLANT PROJECT INFORMATION INPUT SHEET

1. Document Information			
Document ID:	PD-3002052-000	Revision ID:	Project Number: 23843
Document Title/Description:	Work Plan for Heat Transport Small Scale Testing for Prismatic Block, Prepared by AREVA	Sub-Project No.:	Date of Record: 09/29/09
Document Author/Creator:	AREVA	<b>OR</b>	
Document Owner:	Bill Landman	Date Range:	
Originating Organization:	INL	From:	To:

2. Records Management Requirements			
Category:	<input checked="" type="checkbox"/> General Record <input type="checkbox"/> Quality Assurance <input type="checkbox"/> Controlled Document		
If QA, Record, QA Classification:	<input type="checkbox"/> Lifetime <input type="checkbox"/> Non-Permanent		
Uniform Filing Code:	8201	Disposition Authority:	A17-31-a-1
Retention Period:	Until dismantlement or disposal of facility, equipment, system, or process; or when superseded or obsolete, whichever is earlier.		
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Total Number of Pages (including transmittal sheet):	16	File Index Code:	8201.1.2
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3. Signatures			
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Print/Type Sender Name	Sender Signature	Sender S Number	Date
QA RECORD VALIDATOR:			
Print/Type Authenticator Name	Authenticator Signature	Authenticator S Number	Date
ACCEPTANCE/RECEIPT:			
Tammy Albrethsen		105429	5/31/11
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