Task 4: Integral Effects Tests

VHTR Cooperative Agreement

Program Review Meeting

February 25, 2009

Cooperative Agreement

- **Task 1.**
  - **Quantifying the State-of-the-Art in Gas Reactor Data.**
- Task 2.
  - Coupled Reactor Physics and Thermal Hydraulics Modeling.
- Task 3.
  - Initial Separate Effects Tests for Gas Reactor Thermal Hydraulic Phenomena.
- **Task 4.**
  - **Integral Effects Tests and Code Validation for Gas Reactor Thermal Hydraulic Phenomena.**

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Task 1

- **Task 1.**
  - **Quantifying the State-of-the-Art in Gas Reactor Data.**
  - Literature Review.
    - Conducted to determine the state-of-the-art in gas reactor experiments and analysis tools.
  - Phenomena identification and evaluation.
    - No intention to duplicate.
    - Develop and examine a list of key thermal hydraulic and reactor physics phenomena.
    - Determine which phenomena require additional investigation via analysis and/or experiment.

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Task 4

- **4.A. Scaling and Design of OSU High Temperature Test Facility.**
  - Complete scaling analyses for an HTTF.
    - Prismatic core.
    - Pebble bed core.
  - Design HTTF and all of its supporting systems.
- **4.B. Instrumentation Plan Development.**
  - Develop an instrumentation plan for the test facility.
    - Placement of instrumentation will be coordinated with the system models for the test facility so that the data needed for code validation are obtained.
    - Computer simulations will be performed to guide the process of determining what variables should be measured and at what physical locations.

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Task 4

- **4.C. Test Plan Development.**
  - Develop test plan for the program.
    - MELCOR based model and CFD analyses will be used to assist with design of the test matrix.
- **4.D. Procurement, Construction and Shakedown of Test Facility.**
  - Procure all test facility hardware, components and instrumentation as specified in the design requirements.
    - Fabrication of components.
    - Installation of hardware, instrumentation and supporting systems.
  - Perform shakedown tests to assess instrument performance, assure safe operation and to characterize facility heat loss.

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Task 4

- **4.E. Testing.**
  - Conduct specified tests in accordance with the test plan.
    - Provides for all preparatory work needed for test conduct as well as all necessary facility maintenance activities.
- **4.F. Data Analysis.**
  - Analyze individual tests from each test series with the purpose of identifying and describing governing thermal hydraulic phenomena.
    - This analysis may include results from numerical modeling and separate effect test (Task #3) efforts.
- **4.G. Code Validation and Benchmarks.**
  - Test results will be used to validate a system transient analysis code such as MELCOR.

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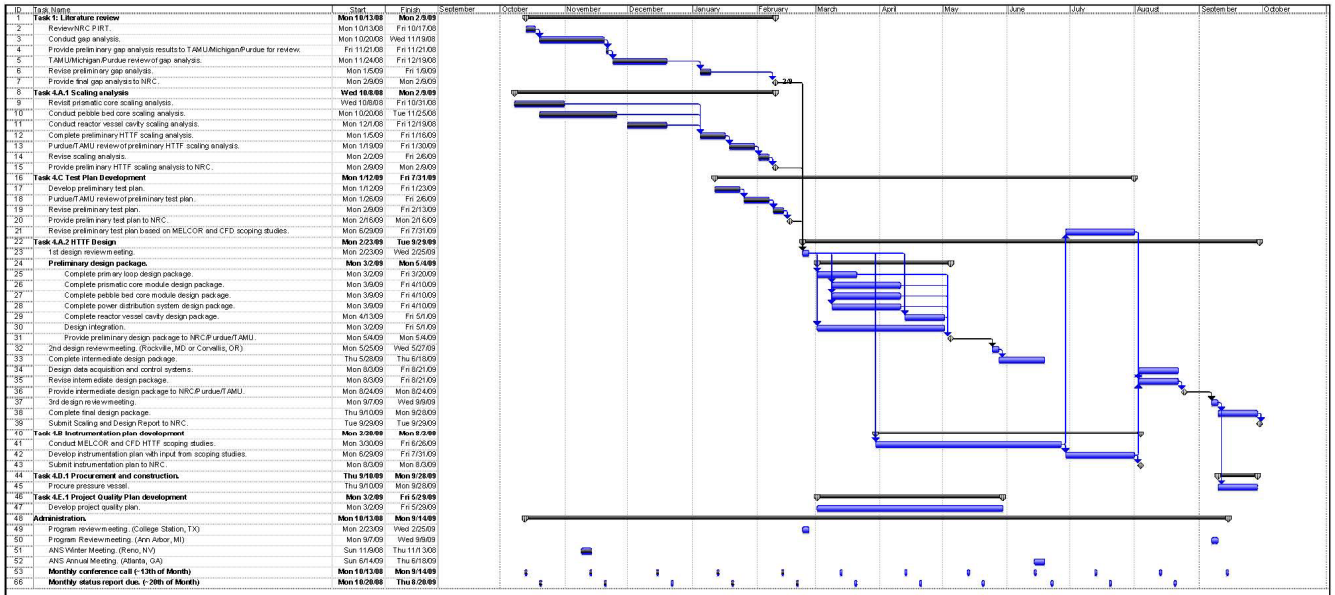
Task 4 Project Plan

ID	Task Name	Start	Finish
1	**Task 1: Literature review**	**Mon 10/13/08**	**Mon 2/9/09**
2	ReviewNRC PIRT.	Mon 10/13/08	Fri 10/17/08
3	Conduct gap analysis.	Mon 10/20/08	Wed 11/19/08
4	Provide preliminary gap analysis results to TAMU/Michigan/Purdue for review.	Fri 11/21/08	Fri 11/21/08
5	TAMU/Michigan/Purdue review of gap analysis.	Mon 11/24/08	Fri 12/19/08
6	Revise preliminary gap analysis.	Mon 1/5/09	Fri 1/9/09
7	Provide final gap analysis to NRC.	Mon 2/9/09	Mon 2/9/09
8	**Task 4A.1 Scaling analysis**	**Wed 10/8/08**	**Mon 2/9/09**
9	Revisit prismatic core scaling analysis.	Wed 10/8/08	Fri 10/31/08
10	Conduct pebble bed core scaling analysis.	Mon 10/20/08	Tue 11/25/08
11	Conduct reactor vessel cavity scaling analysis.	Mon 12/1/08	Fri 12/19/08
12	Complete preliminary HTTF scaling analysis.	Mon 1/5/09	Fri 1/16/09
13	Purdue/TAMU review of preliminary HTTF scaling analysis.	Mon 1/19/09	Fri 1/30/09
14	Revise scaling analysis.	Mon 2/2/09	Fri 2/6/09
15	Provide preliminary HTTF scaling analysis to NRC.	Mon 2/9/09	Mon 2/9/09
16	**Task 4.C Test Plan Development**	**Mon 1/12/09**	**Fri 7/31/09**
17	Develop preliminary test plan.	Mon 1/12/09	Fri 1/23/09
18	Purdue/TAMU review of preliminary test plan.	Mon 1/26/09	Fri 2/6/09
19	Revise preliminary test plan.	Mon 2/9/09	Fri 2/13/09
20	Provide preliminary test plan to NRC.	Mon 2/16/09	Mon 2/16/09
21	Revise preliminary test plan based on MELCOR and CFD scoping studies.	Mon 6/29/09	Fri 7/31/09
22	**Task 4.A.2 HTTF Design**	**Mon 2/23/09**	**Tue 9/29/09**
23	1st design reviewm eeting.	Mon 2/23/09	Wed 2/25/09
24	**Preliminary design package.**	**Mon 3/2/09**	**Mon 5/4/09**
25	Complete primary loop design package.	Mon 3/2/09	Fri 3/20/09
26	Complete prismatic core module design package.	Mon 3/9/09	Fri 4/10/09
27	Complete pebble bed core module design package.	Mon 3/9/09	Fri 4/10/09
28	Complete power distribution system design package.	Mon 3/9/09	Fri 4/10/09
29	Complete reactor vessel cavity design package.	Mon 4/13/09	Fri 5/1/09
30	Design integration.	Mon 3/2/09	Fri 5/1/09
31	Provide preliminary design package to NRC/Purdue/TAMU.	Mon 5/4/09	Mon 5/4/09
32	2nd design reviewmeeting. (Rockville, MD or Corvallis, OR)	Mon 5/25/09	Wed 5/27/09
33	Complete intermediate design package.	Thu 5/28/09	Thu 6/18/09
34	Design data acquisition and control systems.	Mon 8/3/09	Fri 8/21/09
35	Revise intermediate design package.	Mon 8/3/09	Fri 8/21/09
36	Provide intermediate design package to NRC/Purdue/TAMU.	Mon 8/24/09	Mon 8/24/09
37	3rd design reviewmeeting.	Mon 9/7/09	Wed 9/9/09
38	Complete final design package.	Thu 9/10/09	Mon 9/28/09
39	Submit Scaling and Design Report to NRC.	Tue 9/29/09	Tue 9/29/09
40	**Task 4.B Instrumentation plan development**	**Mon 3/30/09**	**Mon 8/3/09**
41	Conduct MELCOR and CFD HTTF scoping studies.	Mon 3/30/09	Fri 6/26/09
42	Develop instrumentation plan with input from scoping studies.	Mon 6/29/09	Fri 7/31/09
43	Submit instrumentation plan to NRC.	Mon 8/3/09	Mon 8/3/09
44	**Task 4.D.1 Procurement and construction.**	**Thu 9/10/09**	**Mon 9/28/09**
45	Procure pressure vessel.	Thu 9/10/09	Mon 9/28/09
46	**Task 4.E.1 Project Quality Plan development**	**Mon 3/2/09**	**Fri 5/29/09**
47	Develop project quality plan.	Mon 3/2/09	Fri 5/29/09
48	**Administration.**	**Mon 10/13/08**	**Mon 9/14/09**
49	Program reviewm eeting. (College Station, TX)	Mon 2/23/09	Wed 2/25/09
50	Program Reviewmeeting. (Ann Arbor, MI)	Mon 9/7/09	Wed 9/9/09
51	ANS Winter Meeting. (Reno, NV)	Sun 11/9/08	Thu 11/13/08
52	ANS Annual Meeting. (Atlanta, GA)	Sun 6/14/09	Thu 6/18/09
53	**Monthly conference call (~13th of Month)**	**Mon 10/13/08**	**Mon 9/14/09**
66	**Monthly status report due. (~20th of Month)**	**Mon 10/20/08**	**Thu 8/20/09**



Project: VHTR Integral Test Facility
Date: Mon 2/23/09

Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Deadline

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2008-2009 Task 4 Goals

- First year of agreement.
  - Ending September 30, 2009.
- Task 1: Quantifying the State-of-the-Art in Gas Reactor Data.
  - Conduct literature review.
    - **Complete.**
    - Online database up and running.
  - Develop and examine a list of key thermal hydraulic and reactor physics phenomena.
    - **Complete.**
    - Chapter 4 of scaling report.
  - Determine which phenomena require additional investigation via analysis and/or experiment.
    - **Complete.**
    - Chapter 4 of scaling report.

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2008-2009 Task 4 Goals

- Task 4.A: Scaling and Design of OSU High Temperature Test Facility.
  - 4.A.1: Complete scaling analyses for an HTTF.
    - **Preliminary scaling analysis complete.**
  - 4.A.2: Design HTTF and all of its supporting systems.
    - Preliminary design package.
      - Loop.
      - Vessel.
      - Core.
      - Power distribution.
      - **May 2009.**
    - Intermediate design package.
      - Revisions.
      - DAS.
      - **June 2009.**
    - Final design package.
      - Revisions.
      - **September 2009.**
    - Final Scaling and Design Report.
      - **September 29, 2009.**

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2008-2009 Task 4 Goals

- Task 4.C: Test Plan Development.
  - Draft preliminary test plan.
    - **Complete.**
  - MELCOR and CFD scoping studies.
    - Test plan.
    - Instrumentation plan.
    - TAMU.
    - **June 2009.**
  - Final preliminary test plan.
    - **July 2009.**
- Task 4.B: Instrumentation Plan Development.
  - MELCOR and CFD scoping studies.
    - **June 2009.**
  - Instrumentation plan.
    - **August 2009.**

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2008-2009 Task 4 Goals

- Task 4.D: Procurement, Construction and Shakedown of Test Facility.
  - 4.D.1: Procure pressure vessel.
    - **September 2009.**
- Task 4.E: Testing.
  - 4.E.1: Develop Quality Assurance Program.
    - **May 2009.**

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2008-2009 Task 4 Goals

- Program Review Meetings.
  - College Station, Texas.
    - February, 2009.
  - Rockville, MD or Corvallis, OR.
    - If needed.
    - May 2009.
  - Ann Arbor, MI.
    - September, 2009.
- Other meetings.
  - Monthly conference calls.
  - ANS meetings.

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Questions?

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