Next Generation Nuclear Plant
Project Briefing for
Nuclear Energy Advisory Committee

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Outline

• NGNP Organization

• Timelines and Key Decisions
  – Programmatic
  – Research and Development
  – Licensing
  – Engineering & Design
  – Industrial Consortium
NGNP Organization

NGNP

- Engineering/Design
- QA, Records
- Project Integration
- R&D

DOE

Industrial Alliance

INL, Other Labs, Universities
NGNP Timeline: Programmatic

2001
Gen IV International Forum Formation

2004
ITRG Report

2004
NGNP CD-0 Issued

2006
NERAC Issues “A Review of the NGNP Project”

2006
NGNP Project Established at the INL

2008
Joint DOE/NRC Licensing Strategy to Congress

2008
EPACT 2005 Authorized NGNP Project

2009
DOE-ID Issues FOA

2009
EOI for NGNP Project Issued

2010
April 2009 Design Work Suspended

2010
May 2010 DOE-ID Establishes FOA Contract with General Atomics

2010
Sept 2010 Commence NEAC Review

2010
Mar 2010 Selections for Conceptual Design Award Announced

1999
Gen IV Program Initiation

2003
Sept US Gen IV Implementation Strategy with VHTR for NGNP as Priority 1

ITRG – Independent Technical Review Group
EOI – Expression of Interest
FOA – Funding Opportunity Announcement
NGNP Technology Development and Qualification Needs

High Temperature Materials Characterization, Testing and Codification

Graphite Characterization, Irradiation Testing, Modeling and Codification

Fuel Fabrication, Irradiation, and Safety Testing

Design and Safety Methods Development and Validation
Example of Qualification Programs: Fuels and Graphite

**Fuels Qualification Program**

- AGR-1
- AGR-2
- AGR-3
- AGR-4
- AGR-5
- AGR-6
- AGR-7
- AGR-8

- Shakedown capsule
- Production fuel
- Accident conditions
- Qualification data
- Methods V&V
- Design/fab … Irradiation … PIE

Current status (↓)

**Graphite Qualification Program**

- AGC-1
- AGC-2
- AGC-3
- AGC-4
- AGC-5
- AGC-6

- T1 & D1
- T2 & D2
- T3 & D3

- Shakedown capsule
- Current status (↓)
NGNP Timeline: Research & Development, Technology Development Office

Apr 2008
Complete HTM & RPV Technology Development Plan

Dec 06
AGR-1 Experiment Inserted into ATR for Irradiation

2006

Jul 08
Complete AGR-1 PIE Plan

Feb 09
Issued Report on Experimental Data from the Operation of the HTE ILS Experiment

2009

Mar 09
Installed HTM Characterization Equipment at INL

Jul 08
Complete AGR-1 PIE Plan

Sep 09
Initiated Reactor Physics Benchmarks and Thermal Hydraulic Standard Problems

Nov 09
Complete AGR-1 Experiment Irradiation in ATR

Sep 09
Initiated PIE of AGR-1

Mar 10
Initiated Refurbishment Of ANL Natural Circulation Shutdown Test Facility for Integral RCCS Studies

Oct 09
Issued Results Reports for the H₂ 2500-Hr Long-Duration Stack Test

Apr 10
Commenced Air Ingress Experiments

Jun 10
AGR-2 Experiment Inserted into ATR for Irradiation

Sep 10
Developed Quantitative Creep-fatigue Interaction Diagrams for IHX Alloys

Sep 10
Initiated Construction of Bypass Flow Experimental Hardware

Sep 10
Developed Models for Atypical Strain-rate Sensitivity and Creep in IHX Alloys

2010

Jul 10
Initiated Refurbishment Of ANL Natural Circulation Shutdown Test Facility for Integral RCCS Studies

NGNP Timeline: Research & Development, Technology Development Office

NGNP Next Generation Nuclear Plant
NGNP Timeline: Licensing

- **Aug 08**: Joint DOE/NRC Licensing Strategy to Congress
- **Sep 07**: Initial Meetings with Commissioners
- **Jun 09**: NGNP Licensing Implementation Plan Issued
- **Feb 09**: Initial Work Scope & Methodology Agreed by DOE/INL/NRC
- **Dec 09**: Commenced White Paper Submittals to NRC
- **Dec 08**: First NGNP Public Meeting with NRC
- **May 10**: HTGR Training for NRC Staff
- **Apr 08**: NRC Establishes NGNP as Priority for Advanced Reactors
- **Sep 08**: NRC Establishes Advanced Reactor Office

**ARO** – Advanced Reactor Office
**ACRS** – Advisory Committee on Reactor Safeguards
**RIC** – Regulatory Information Conference
Developed Licensing Strategy in Conjunction with NRC

- Initiated regular interactions with NRC, leading to
  - Development of Licensing Plan, including identification of high-priority items
  - Agreement on Content-Guide approach for COLA development
  - Development of White papers, first in 2009, four more in 2010
  - Development of training course on HTGRs
NGNP Timeline: Engineering & Design

2006 - 2007
Pre-Conceptual Design Studies

Jun 06
Competitive Selection of Pre-Conceptual Design Teams

Nov 07
NGNP Pre-Conceptual Design Report Issued

Jul 07
INL issues EOI for Conceptual design

Sept & Oct 08
SAG meetings Initial Configuration & Conditions

Mar 09
Conceptual Design Work Scopes Established

Apr 09
INL Conceptual Design Work Suspended

Aug 09
SAG Meeting

Jul 09
H₂ Technology Down-selection (HTSE)

Jul 10
SAG Meeting
Configuration & Operating Conditions revised

Sep 06 - Dec 09
Design Data Needs Identified including CTC Integrated Testing Requirements

2007 - 2010
Technology Selection Design Development Studies

Jan 09
Technology Development Roadmaps for 950°C (ROT) issued

Aug 09
Technology Development Roadmaps for 750-800°C (ROT) issued

NGNP – Next Generation Nuclear Plant

SAG – Senior Advisory Group
NEAC – Nuclear Energy Advisory Committee
Engineering Studies Provided Framework for Conceptual Design

- Generic, technology-neutral studies yielded insights in:
  - Overall System Requirements
  - Source Term, Fuel Performance
  - Contamination Control
  - Facility Configuration, Embedment
  - Reactor Core Structures, Pressure Vessels, Cooling Systems
  - Power Conversion System, Duty Cycle
  - Heat Transfer and Transport System, Components, Hot Piping and Connectors, Valves, Number of Loops
  - Gas (Heat Exchanger) and Steam (Generators) Cycle Configurations
  - Hydrogen Production
  - Technology Development Road Maps for each Critical System

The result of these efforts have culminated in design, functional and technical requirements, which will be reviewed later today
Industrial Consortium

Aug 05  
Energy Policy Act of 2005  
Requires collaboration between Government and industry for NGNP Project

Jun 06  
Initial formation of consortium and users  
Group that became the NGNP Industry Alliance Limited

Jun 08  
Responses to DOE’s Request for Information and Expressions of Interest – NGNP

Jul 09  
Letter of Intent to DOE to submit unsolicited proposal

Nov 09  
Submittal to DOE of proposed Project Implementation Strategy for NGNP Project

Nov 09  
Response by members of NGNP Industry Alliance to DOE’s FOA

Jul 10  
SAG Meeting  
Configuration & Operating Conditions revised

Sep & Oct 08  
Initial SAG Meetings

Jul 10  
Incorporation of NGNP Industry Alliance Limited*

2005

2010

*Includes member-companies that represent end-users, owner/operator, nuclear system suppliers, and fuel and equipment suppliers.