

**Generation IV Roadmap NERAC Subcommittee (GRNS) Meeting
October 2-3, 2001
Meeting Report**

The GRNS met at the Nuclear Energy Institute in Washington, DC with Department of Energy officials, the Roadmap Integration Team, and Co-chairs of the Near Term Deployment, Evaluation Methodology, Fuel Cycle Crosscut Working Group, and Technical Working Groups. The agenda and attendance list are attached. Agreements and commitments reached at the meeting are also attached.

The next meeting of the GRNS is tentatively scheduled for the week of January 21, 2002.

Key Items Discussed:

- 1) **DOE Perspective (W. Magwood, IV).** Mr. Magwood provided guidance to the Near Term Deployment Group (NTDG) and Evaluations Methodology Group (EMG): The NTDG report should document why any concepts submitted in response to the earlier solicitation for expressions of interest were excluded from consideration; the report should reflect the consensus of the entire group, at least in its conclusions; it should explain what needs to be done to make any reactor deployable in the next decade; and it should provide specific recommendations for DOE and reasons why Federal funds are needed. It is better to delay the report schedule perhaps by up to a few months in order to “get it right”. The EMG is the most important activity that GRNS can advise and guide; balancing the many factors is key; don’t discard concepts that appear too exotic now but could be very promising after 20 years of R&D; doing it right is more important than meeting the schedule.

- 2) **GRNS Observations from Joint TWG Meeting in Seattle August 23, 2001.** S. Levy attended the meeting on behalf of GRNS and provided his observations/ recommendations:
 - a) The Nuclear Regulatory Commission (NRC) liaison (J. Flack) should be provided copies of all Generation IV Roadmap draft reports and provided the opportunity to review and provide informal comments.
 - b) The House draft legislation (HR 4) on energy policy implementation appears more restrictive than the Roadmap plan for concept down-select. DOE officials should be sensitive to the legislation and adjust the Generation IV objectives as necessary based on final legislation. W. Magwood recognized this and stated DOE would have the final say in which technologies R&D funds were to be invested. S. Johnson pointed out that the Roadmap is an international effort and each participating country would decide on which technologies it would invest R&D funds.
 - c) The EMG, Fuel Cycle Crosscut Group (FCCG) and technical working groups (TWG) were not all together in the direction of their activities. Levy recommended that the chairs get together and agree on a common course. It was decided later in this GRNS meeting that the RIT and TWG Co-chairs would meet in Salt Lake City on October

18-19 to do this.

- d) The TWG membership contains some very strong proponents of selected technologies. The TWG Co-chairs, backed up by the Roadmap Integration Team (RIT), need to work hard to remove any biases that may crop up. W. Magwood stated that he recognized this but that each TWG also had representatives from other competing technologies that would help ensure the reports were balanced. N. Todreas reminded the TWG Co-chairs that they were to evaluate entire systems, not just the reactors.

3) Near Term Deployment Working Group (NTDG) activities. T. McConnell (Co-chair) presented the recent and future activities of the NTDG. The September 14 draft report was sent to GRNS for review and some GRNS members had provided written comments. The NTDG's recommendations included:

- a) Government leadership: Issue national policy on new nuclear plants.
- b) Near term actions for 2010 deployment: Establish financial incentives to build new plants.
- c) Economic competitiveness: Clarify/refine the 10CFR52 process; establish mechanisms for reducing investors first costs for new plants.
- d) Deregulated marketplace: Establish vehicles for business risk reduction.
- e) Demonstration project: Evaluate feasibility/desirability of gas-cooled reactor demonstration project.
- f) Provide DOE funding to match private sector investment through the end of this decade to support near term deployment.

These recommendations were discussed. The role of the NRC and the Advisory Committee on Reactor Safety (ACRS) in the regulatory process and their ability to support early site permits, design certification, and combined construction/operating license reviews was seen as a challenge. The GRNS suggested that the NTDG provide more specific recommendations for government leadership, since DOE felt that the National Energy Policy is already quite specific. Chapter 4 of the report contains some strong arguments for nuclear that should be summarized in the Volume I summary report. The GRNS noted that the recommendation for a gas-cooled reactor demonstration evaluation appears like an endorsement of that technology – the NTDG did not agree and noted that potential near-term water-cooled reactor technologies may not need demonstrations; the next revision to the report will make that clear. GRNS suggested the report address the following additional items: NEI's perspective on what utilities will do to address the 10CFR52 processes for the first time; what the Canadians and British are pursuing in near-term deployment of modified CANDU reactors; addressing the terrorist threat to nuclear power plants; the NRC's desire to review new designs on a risk-informed basis. While the NTDG believes some concepts are not deployable by 2010, DOE suggested ranking concepts rather than dropping any from further consideration. Those concepts that won't be ready before 2010 need to be bridged from the near-term to the long-term roadmap.

4) Evaluation Methodologies Working Group (EMG). W. Rasin presented the current

status of EMG activities. The draft Final Screening and R&D prioritization Methodology report was provided to the GRNS, RIT and TWG Co-chairs for review before the meeting. Much of the meeting agenda centered around this topic, as the six questions for discussion during the first day signify:

- What are the planned steps in the evaluation?
- How will each evaluation be made? How is consistency among TWGs to be achieved?
- What are characteristics of the desired portfolio of concepts?
- How is discrimination against less mature technologies to be avoided?
- How are fuel cycles defined and integrated with the concepts?
- What groups and methods will be used for R&D crosscuts?

W. Rasin and the RIT stated the following key points: The draft report did not provide economic weights and that these would be provided after the meeting. While weighting factors are to be applied to criteria, the Gen IV goals themselves are not to be weighted. A figure of merit representing concept potential and uncertainty will be developed by TWGs for each goal area (Sustainability, Safety and Reliability, and Economics) for each concept. Concept selection will be performed by RIT based on evaluating potential vs. uncertainty or potential vs. R&D risk.

Based on the ensuing discussion, the following points were agreed to by the RIT:

- (1) Regarding options for concept selection, the TWGs will continue to evaluate concepts/concept sets, interface with EMG and feed information to the RIT. The RIT will evaluate the inputs, but defer a decision until January 2002 on the final path forward, based on their initial analysis.
- (2) In order to improve the selection process, it may become necessary to consider scenarios, specific applications and selection of a portfolio or system of concepts.
- (3) The EMG, FCCG, RIT and TWG Co-chairs should meet soon to address the topic of consistency among TWGs and finalize their approach.
- (4) The EMG will remove sections of the EMG final screening report on R&D prioritization and integrate them back in later as the top level process and analysis develops.

In preparing this report GRNS has adopted the additional suggestion that a gate based on minimum satisfaction of the three goal areas be made explicit in the selection process through which any concept must pass to be retained for future consideration.

Agreement was reached for the GRNS, RIT and TWG Co-chairs to comment on the draft Final Screening Report by October 5, so that EMG can get its next version out for review by all Gen IV participants by October 15.

Regarding discrimination against less mature concepts, the Nonclassical TWG Co-chair wants more time to adequately evaluate the less mature technologies and conduct comparative screening for potential. It was agreed that he would draft an approach for discussion with the

RIT and subsequently GRNS Co-chairs. The EMG should provide direction to the Nonclassical TWG regarding ameliorating steps, e.g., R&D along technology lines, bipolar distribution of scores. And, the RIT must interact more with Non-classical TWG, to achieve results on building consensus in 4-6 weeks.

- 5) **Nuclear Regulatory Commission Interface.** The NRC representative stated that the commission is receptive to ways to improve its license review process. The NRC, ACRS, and potential applicants need to be preparing for how they will process applications for near-term deployment reactors. Issues that must be addressed include the licensing process and interactions, confirmatory research, and extent of NRC acceptance of foreign testing data for licensing purposes. The NTDG and EMG Co-Chairs need to interface through the RIT with NRC to ensure NRC receives reports to review and provide comments. NRC will need to identify the nature of confirmatory research they would want to perform on selected concepts. A need also exists to establish an interface between RIT and NRC, particularly regarding R&D as it is being identified.

- 6) **Fuel Cycle Crosscut Group (FCCG).** D. Wade (Argonne National Laboratory) presented the current status of the FCCG activities. GRNS provided the following recommendations for the FCCG to consider:
 - a) Use the known gas and oil reserves in 2001 versus 1973 to establish a potential for future uranium reserves considering their known values in 1973 and 2001.
 - b) Temper the report with respect to projections to keep from giving the impression you want to go to a breeder reactor economy.
 - c) Mention fusion as an option for the far future.
 - d) Recognize that nuclear energy is not the only option for generating hydrogen or solving the world's energy needs of the future.
 - e) Establish base case scenarios and mention the others in an appendix or elsewhere in the report.
 - f) Report needs a disclaimer regarding future energy projections and the potential role for nuclear.
 - g) Mass is not the right metric for waste attributes. Decay heat is controlling.
 - h) The National Energy Policy continues to discourage the accumulation of separated plutonium. Take this into account in the report.
 - i) Resolve with RIT how the Fuel Cycle Crosscut report is to be integrated with the TWG concept reports and R&D scoping reports.

In addition, the RIT was requested to look at symbiotic alternatives that involve more than one TWG. The RIT, with the TWG co-chairs, agreed to identify these before their meeting on October 18-19 and take an action item to make writing assignments at the meeting. The NTDG should be included in these discussions since near-term deployable reactors could be part of the symbiotic systems.

- 7) **Crosscut Groups/R&D.**

Four crosscut groups in addition to Fuel Cycle have been identified and agreed to by the GRNS and RIT. These are Fuels and Materials, Risk and Safety, Economics, and Energy Production. A draft charter for the crosscut groups was distributed to GRNS for review and comment. The GRNS endorsed crosscut group membership subject to charter review. The GRNS Co-Chairs assigned the following GRNS liaisons to the crosscut groups - FCCG- Garrick; F&M –Naughton; RSCG-Chapin; ECG – Marston; EPCG- Kammen. The question of how the R&D program will be established was next discussed. GRNS recommended that the RIT develop the scope and guidance for the R&D program including demonstration plants, lay out its desired budgets (including industry and international cost-shares) for R&D, and provide to the TWG Co-Chairs.

The GRNS understands and agrees that the Generation IV research plan will be based on the selection of a few system concepts which will become the foci of the long-term program. In implementing this approach, the GRNS provides the following guidelines:

- (1) It is not clear that at this time we have the ability to select systems which will, in fact, be the most desirable 20 to 30 years in the future. Hence, care must be taken not to support "only" those concepts initially chosen and to banish all others to the darkness of no support.
- (2) A significant fraction of the long-term research effort (10-20%) should be set aside for relatively unstructured exploratory basic research in the topics of interest, including support of significant efforts, e.g., needed test facilities, on promising but "far-out" concepts to better assess their feasibility.
- (3) The reference designs should be used to determine research paths forward toward major goals rather than develop detailed designs, particularly at the outset. This allows focusing the research on problems of particular significance and avoiding getting bogged down in research and development on details of specific designs.
- (4) The research paths and major goals should be selected to include research and development in "cross-cut", or "generic", technical areas supportive of several of the promising systems, but keyed to the reference concepts.
- (5) The research paths and reference concepts should be prioritized and have intermediate milestones at reasonable intervals, say three-to-five years, to allow assessing progress, reviewing and revising priorities, and provide decision points for reallocating research support to promising new developments, back-out of dead-ends, etc.

8) Public Information.

The roadmap communications plan, current activities and plans to improve public information and inputs were discussed. Suggestions were made for the Gen IV roadmap leadership to participate in upcoming public meetings including the NRC regulatory conference, INPO conference, NEI annual nuclear energy assembly meeting; and in newspaper editorial responses that project a positive future for nuclear energy, especially in the near-term. GRNS suggested RIT lay out a plan for reaching different audiences, and tailor the message to each audience, while keeping the message consistent.

9) Risk-Based Regulatory Process R&D.

This issue was discussed, with consensus being reached that a risk-informed regulatory approach should be used, rather than risk-based. The Gen IV roadmap should seek to identify and perform research on issues expected to be surfaced by a risk-informed regulatory regime. In practice this will have the effect of targeting research to address phenomena that have both severe consequences and significant probability of occurrence. While the NRC Representative would like to focus on performance-based regulations to build confidence, Gen IV systems have no performance data to evaluate. GRNS suggested modifying the recommendations from the RIT for areas to be considered to include reliability modeling in addition to PRA modeling, adding scope to PRA comprehensiveness, and evidence-based modeling and data rather than reliability modeling.

AGENDA
Generation IV Roadmap NERAC Subcommittee (GRNS) Meeting
October 2-3, 2001
Nuclear Energy Institute
Washington, DC

Tuesday, October 2

8:00 – 8:05	Approval of Agenda	Todreas
8:05 – 8:20	DOE Perspective	Magwood
8:20 – 8:35	RIT Update	Bennett
8:35 – 8:45	GRNS Observations on Roadmap Activities including Seattle Meeting and TWG Reports	Levy/Todreas
8:45 – 10:15	Near Term Deployment Group Update	McConnell
10:15 – 10:45	Break	
10:45 – 12:15	Review and Discussion of Proposed Evaluation Methodologies <i>Specific Questions for Discussion:</i>	
	1. What are the planned steps in the evaluation ? [0:30]	RIT
	2. How will each evaluation be made ? How is consistency among TWGs to be achieved ? [1:00]	EMG
12:15 – 1:15	Lunch	
1:15 – 3:15	Continue Discussion of Proposed Evaluation Methodologies	
	3. What are characteristics of the desired portfolio of concepts ? [1:00]	RIT
	4. How to avoid discrimination against less mature technologies ? [1:00]	EMG
3:15 – 3:30	Break	
3:30 – 5:30	Continue Discussion of Proposed Evaluation Methodologies	
	5. How are fuel cycles defined and integrated with the concepts ? [1:00]	RIT
	6. What groups and methods will be used for R&D crosscuts? [1:00]	RIT
5:30	Adjourn	

Wednesday, October 3

8:00 – 9:30	Fuel Cycle Crosscut Group Update	Wade/Forsberg
9:30 – 10:30	Complete Discussion of Proposed Evaluation Methodologies	
	7. Summary/Conclusions [1:00]	GRNS
10:30 – 10:45	Break	
10:45 – 11:30	Other Roadmap Products <i>Public Information Plan</i> <i>Risk-Based Regulatory Process R&D</i>	GRNS/RIT
11:30 – 12:15	Review of Recommendations	GRNS/Magwood
12:15 – 12:45	Lunch	
12:45 – 1:30	Path Forward	Todreas/Levy

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Attendance List

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Agreements and Commitments**

<u>DOE:</u>	<u>Due Date:</u>
C Provide comments on Oct. 9 draft of NTDG report to CO-chairs	Oct. 17
C Develop schedule for finalizing NTDG report (Miller)	Nov. 2
<u>GRNS SUBCOMMITTEE:</u>	
C Co-chairs make assignments of GRNS liaisons to crosscut groups	Oct. 3 (complete)
C Provide comments on Sep. 14 draft of NTDG report to co-chairs	Oct. 4
• Provide feedback to EMG on draft final screening report	Oct. 5
• Prepare recommendation on R&D Plan (Chapin)	Oct. 12
• Provide comments on Oct. 9 draft of NTDG report to CO-chairs	Oct. 17
• Provide comments on crosscut group charters	Oct. 19
• Provide comments on EMG Oct. 15 draft of the final screening methodology report	Nov. 5
<u>ROADMAP INTEGRATION TEAM:</u>	
C Provide draft crosscut group charter to GRNS for review/comment	Oct. 3
C Provide feedback to EMG on draft final screening report	Oct. 5
C Meet with TWG co-chairs to discuss integration of FCCG report into TWG reports, and symbiotic alternatives	Oct. 18-19
C Interact with Nonclassical TWG to achieve results on building consensus	Nov. 16
C Develop scope and budgets for R&D Program and provide to TWGs	Oct. 26
<u>TWG Co-Chairs:</u>	
C EMG co-chairs provide economic criteria weighting factors	Oct. 4
C Provide feedback to EMG on draft final screening report	Oct. 5
C NTDG co-chairs issue second draft of report	Oct. 9
C EMG co-chairs distribute draft final screening report to all Gen IV participants for	Oct. 15

	review.	
C	NTDG co-chairs disposition comments, prepare final draft of report for submittal to NERAC	Oct. 22
C	Nonclassical TWG co-chair draft approach for evaluating less mature concepts and conducting comparative screening. Provide to RIT for discussion.	Oct. 22
C	EMG provide direction to nonclassical TWG regarding ameliorating steps.	Oct. 22
C	NTEG and EMG co-chairs coordinate through RIT to provide reports to NRC for review and comment.	As issued