

Review of the Continued Analysis
of Supplemental Treatment
Approaches of Low-Activity Waste
at the Hanford Nuclear Reservation

Review #2

Background on this National Academies Study

- Requested by Congress in Section 3125 of the FY2021 National Defense Authorization Act (P.L. 116-283)
- Sponsored by the Department of Energy, Office of Environmental Management (DOE-EM)
- An analytic Team, led by a Federally Funded Research and Development Center (FFRDC) [SRNL], is analyzing supplemental low-activity waste (SLAW) treatment options
- The NAS Committee is concurrently evaluating the technical quality and completeness of draft Team reports to improve their quality
- Carried out in three reviews:
 - Review 1: Released publicly on January 6, 2022—brief interim report
 - **Review 2: Copy edited publication date December 30, 2022**
 - Review 3: Planned to be completed by March 2023

This briefing focuses on Review #2

Outline

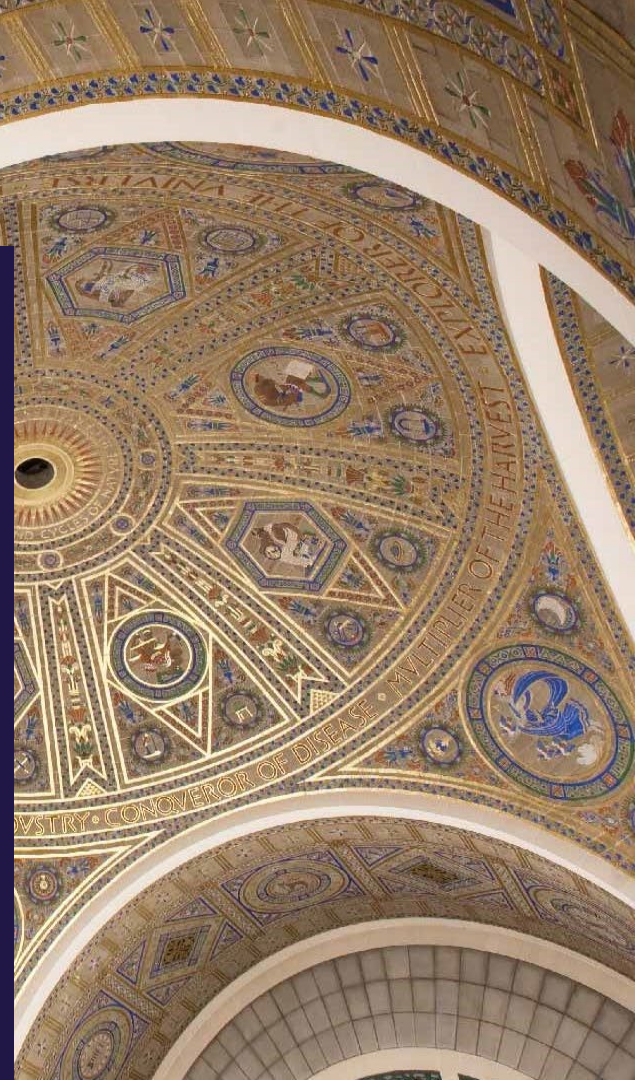
- **Overview of the National Academy of Sciences, Engineering, and Medicine**
- **National Academies Consensus Study Process**
 - Federal Advisory Committee Act Section 15
 - Flowchart for Studies
 - Committee Selection
 - Report Writing and Review
- **Update on National Academies Review of FFRDC Report**
- **Overview of Recommendations to the FFRDC**

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Overview of Consensus Studies: Practices of the National Academies

*Charles D. Ferguson, Ph.D., Senior Director, Nuclear and Radiation
Studies Board and Board on Chemical Sciences and Technology*



The Origin of NAS and Why This Matters



President Lincoln signed a congressional charter forming the National Academy of Sciences and Art in 1863

Left to Right:
Benjamin Pierce; Alexander Bache; Joseph Henry;
Henry Wilson; Abraham Lincoln; Louis Agassiz;
Charles Henry Davis; Benjamin Gould

“...the Academy shall, whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art...”

The National Academies Today (NASEM)

We marshal the energy and intellect of the nation's critical thinkers to respond to policy challenges with science, engineering, and medicine at their core.

3 Honorary Societies



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7 Program Units

- ❖ Division on Behavioral and Social Sciences and Education
- ❖ Division on Engineering and Physical Sciences
- ❖ Division on Earth and Life Studies
- ❖ Division on Policy and Global Affairs
- ❖ Gulf Research Program
- ❖ Health and Medicine Division
- ❖ Transportation Research Board

Strengths of the National Academies work

- **Stature and breadth** of Academies' memberships and ability to access the nation's (*as well as other nations'*) top experts
 - Honorific organizations and program units span all areas of science (natural and social), technology, engineering, and medicine.
- **“Pro bono” nature** of committee service
 - More than 7,000 volunteer experts from a range of sectors and disciplines serve pro-bono on the committees each year.
- **Independence, scientific objectivity, balance**
 - Private, nongovernment, nonprofit organization.
- **Quality control procedures**
 - FACA Section 15 provides requirements specifically for the National Academies to provide advice directly to the federal government.
 - Public transparency.
 - Rigorous peer review.

Federal Advisory Committee Act Section 15

- (a) In general.—An agency may not use any advice or recommendation provided by the National Academy of Sciences or National Academy of Public Administration that was developed by use of a committee created by that academy under an agreement with an agency, unless— (1) the committee was not subject to the provisions of this section after the date of the agreement; (2) the committee was appointed in accordance with the provisions of this section; or (3) the committee complied with the provisions of this section.
- (A) subsection (b)(2) and (5).
- (b) Requirements.— (1) The committee shall determine the names and biographies of its members and shall determine the procedures that it will use to ensure that its members are qualified to perform the function for which such conflict of interest information is required. (2) The committee shall determine the procedures that it will use to ensure that its members are balanced as a result of the selection process. (3) The committee shall determine the procedures that it will use to ensure that its members are not officials, agents, or employees of the Academy. (4) The Academy shall make available to the public, at reasonable charge if appropriate, a data gathering meeting, unless the Academy determines that the summary would disclose matters described in section 552(b) of title 5, United States Code. The summary shall identify the committee members present, the topics discussed, materials made available to the committee, and such other matters that the Academy determines should be included. (5) The Academy shall make available to the public its final report, at reasonable charge if appropriate, unless the Academy determines that the report would disclose matters described in section 552(b) of title 5, United States Code. If the Academy determines that the report would disclose matters described in that section, the Academy shall make public an abbreviated version of the report that does not disclose those matters. (6) After publication of the final report, the Academy shall make publicly available the names of the principal reviewers who reviewed the report in draft form and who are not officials, agents, or employees of the Academy.

- 20-day public comment period
- No individual appointed to serve on the committee has a conflict of interest that is relevant to the function to be performed
- When the committee meets in closed session, members of the public are provided brief summaries that include the list of committee members present
- All information-gathering meetings of the committee are open to the public unless the information is classified or official-use-only
- Any unclassified written materials provided to the committee by individuals who are not officials, agents, or employees of the Academies are maintained in a public access file that is available for examination.

The Consensus Study Process



FIGURE The National Academies Consensus Study Report Process

Study Defined: Summary of FFRDC Team's Scope from Sec. 3125

- Build on scope and analysis done for the Sec. 3134 (NDAA FY2017) congressionally mandated study
- FFRDC analysis of approaches for treating Supplemental Low Activity Waste (SLAW)
 - Treatment: vitrification, steam reforming, and grouting
 - Pre-treatment: further processing to remove long-lived constituents, esp. Tc-99 and I-129
 - Grout: provide additional analysis building on work done for Sec. 3134
- Top Level criteria the FFRDC approach analyzed
 1. Long-term effectiveness: environmental health and safety after disposal
 2. Implementation schedule and risk: environmental health and safety prior to completion, including risks posed by waste tank integrity
 3. Likelihood of successful mission completion: affordability, and robustness of technologies
 4. Lifecycle costs: capital, operations
 5. Regulatory approval
 6. Community and public acceptance

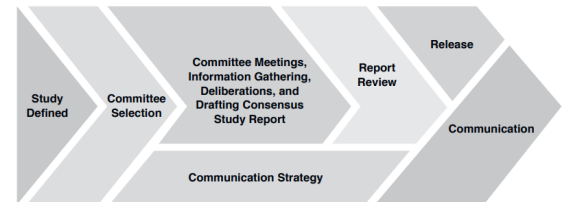


FIGURE The National Academies Consensus Study Report Process

National Academy Committee's Abbreviated Statement of Task during the Peer Review Process

A National Academies committee's review will evaluate the technical quality and completeness of the following:

- Does the FFRDC's report clearly lay out a framework of decisions to be made among the treatment technologies, waste forms, and disposal locations?
- Does the FFRDC's report consider in its analysis all the elements, criteria, and factors specified in Section 3125 of the National Defense Authorization Act of 2021?
- Does the FFRDC's report provide additional analysis for the grout treatment approach as identified in the FFRDC report for Section 3134 of the National Defense Authorization Act of 2017?

Review #1: first two questions as applied to FFRDC's draft analytic framework

Review #2: all questions as applied to FFRDC's complete draft report; plus have 60-day public comment period on the draft report

Review #3: review complete final FFRDC report

The Consensus Study Process



- Call for nominations & conduct interviews
- Provisional committee slate is internally approved, then announced **publicly**
- 20 day public comment period
- COI/Balance discussion
- Address any gaps
- Internal memo and final approval



John S. Applegate, Chair
Indiana University



Allen G. Croff, Vice Chair
Vanderbilt University



C.E. "Gene" Carpenter
Booz Allen Hamilton



David E. Daniel (NAE)
The University of Texas
at Dallas



Tori Z. Forbes
University of Iowa



Robyn E. Hannigan
Clarkson University



Carol M. Jantzen
Savannah River National
Laboratory (Retired)



George F. List
North Carolina
State University



Linda K. Nozick
Cornell University



John L. Provis
University of Sheffield (UK)



Geoffrey S. Rothwell
Longenecker
& Associates



Anne E. Smith
National Economic
Research Associates, Inc.



Kevin W. Smith
Falcon Cougar Management
Consultants, LLC



Chris G. Whipple (NAE)
ENVIRON (retired)



Robert "Bob" Manseill
Technical Advisor
Studsvik Inc.

Committee and Consultant

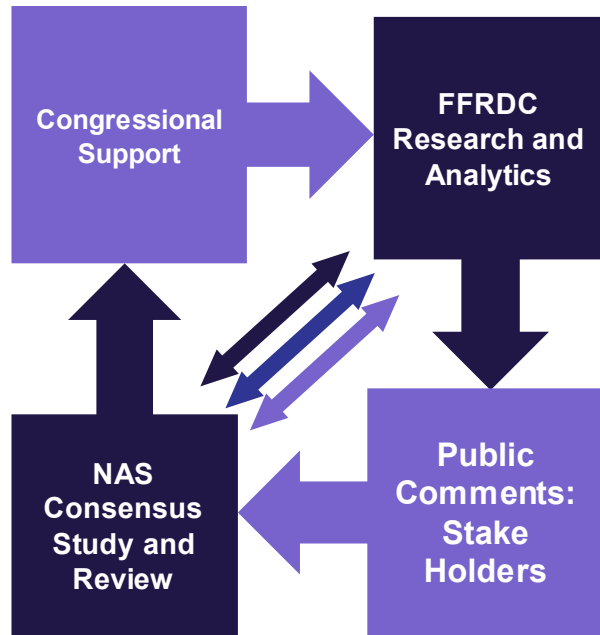
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The Consensus Study Process



FIGURE The National Academies Consensus Study Report Process

Process to Reach Review #2



- 2 Reports from the FFRDC team lead by SRNL Deputy Associate Laboratory Director Bill Bates
- 2 Reviews from the National Academies Committee
- Public Meeting in Richland Washington (April 2022)
- 60 day public comment period including input from the regional Tribal Nations, Oregon State, and Washington State

The process is on the second pass with the publication of the second review. The third iteration will complete the study with a final report and review for DOE Decision Makers and Congress (Spring 2023)

Report Review

What it is: As a final check on the quality and objectivity of the study, all Academies reports undergo a rigorous, independent external review by experts whose comments are provided anonymously to the committee members.

What is done:

- Informal review of final draft from relevant board directors and division staff
- Formal review coordinated by the Report Review Committee (RRC)
 - Independent set of outside experts
 - RRC oversees the review process
 - Required to consider all reviewer points
 - Reviewers assess whether the report addressed the Statement of Task
 - *Reviewers' comments are kept confidential*



Report Review

This Consensus Study Report was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the National Academies of Sciences, Engineering, and Medicine in making each published report as sound as possible and to ensure that it meets the institutional standards for quality, objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

We thank the following individuals for their review of this report:

CRAIG H. BENSON, University of Virginia
PETER C. BURNS, University of Notre Dame
WILLIAM L. EBERT, Argonne National Laboratory
ROBERT B. GILBERT, University of Texas at Austin
NEIL HYATT, Radioactive Waste Services
MARK LEPOFSKY, FACTOR, Inc.
SHEILA M. OLMSTEAD, University of Texas at Austin

Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations of this report nor did they see the final draft before its release. The review of this report was overseen by **MARK T. PETERS (NAE)**, Battelle Memorial Institute, and **THURE E. CERLING (NAS)**, University of Utah. They were responsible for making certain that an independent examination of this report was carried out in accordance with the standards of the National Academies and that all review comments were carefully considered. Responsibility for the final content rests entirely with the authoring committee and the National Academies.

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Summary of FFRDC Team's Scope from Sec. 3125

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National Academies of Sciences, Engineering, and Medicine: Summary

- FFRDC submitted their report April 12, 2022 titled “Follow-on Report of Analysis of Approaches to Supplemental Treatment of Low-Activity Waste at the Hanford Nuclear Reservation” (191 pages, referenced in this review as Volume I). Accompanying this report was 579 pages of supporting information (referred to as Volume II).
- Presentations supporting the material were provided by the FFRDC during a public meeting to discuss the reports in Richland, Washington, April 26-28, 2022. Public Comments were also included in this meeting.
- In the review, the NASEM consensus study committee established 17 Findings and 13 Recommendations. **Many of the Findings compliment the FFRDC team on the quality of their analysis and others focus on how the report could be improved for stake holders and decision makers.**
- The 13 Recommendations that highlight the Findings will be discussed during this briefing.

NASEM Committee Recommendations

I. FFRDC Recommendation

Recommendation M: If the FFRDC is to offer a recommendation, it needs to be fully transparent concerning the methods used to reach the recommendation and the analysis that supports the recommendation. In particular:

- i. The report should explain the process that led to the recommendation, who participated, and explicitly acknowledge the value judgments made in implementing the process;
- ii. The report should describe how the key criteria of regulatory and public acceptance were considered. If regulatory and public acceptance factors were not considered, except as significant uncertainties, by the FFRDC in developing its recommendation this should be made explicit.

II. Detailing Consequences

A. Tank Integrity

The FFRDC report states (Volume 1, pp 12) “Failures of selected DSTs may have little to no impact on the overall immobilization program if the tank failure does not prevent continued operations with the other DSTs.”

Recommendation A: The committee recommends that the FFRDC include in its report a discussion of the tank integrity program with annotated references to describe the strategy that is adopted and the status of the program to provide perspective for decision makers.

B. Non-Approval at IDF, Off-Site location, or with Off-Site Transportation

Recommendation D: The FFRDC should include a discussion of issues associated with obtaining regulatory approval for the various options. Specifically, it would be helpful to focus on the significant adverse consequences of grouted SLAW not being acceptable for disposal at IDF or other out-of-state disposal sites.

Recommendation E: The FFRDC should expand its consideration of the consequences of potential impediments impacting the safe and expeditious SLAW management, such as grouted SLAW not being accepted for transportation, disposal at IDF, or other out-of-state disposal sites. The FFRDC should incorporate insights from public comments obtained to date in the final report, as well as the experiences of other sites that have transported radioactive waste to distant treatment or disposal locations.

C. Delayed Start for SLAW Vitrification

Recommendation G: The FFRDC should give more discussion of the consequences for cost, time to completion, and likelihood of completion of the delayed start date of the vitrification treatment in their final report.

D. Unavailability of Off-Site Disposal (“Orphan Waste”)

Recommendation J: The FFRDC report should elaborate the potential negative consequences of the unavailability of off-site disposal by (1) discussing the possibility that permission to dispose of grouted SLAW at WCS and/or Clive might never occur or someday be withdrawn; (2) discussing what is known about public acceptance regarding potential grouted SLAW disposal in Texas and Utah; and (3) providing more information surrounding the orphaned waste issue including specifics on how the issue might develop and what the consequences/coping measures might be.

III. Specific Issues for Off-Site Treatment and/or Disposal

A. Differences Between On- and Off-Site

Recommendation K: The differences between on-site and off-site grouting treatment should be separately analyzed in the same level of detail as on- and off-site disposal. The grout alternatives, should identify potential variations on the on-site and off-site alternatives, such as tank-side treatment or pre-treatment, to provide DOE with the ability to make a financial “business case” with a range of budgetary possibilities for on and offsite alternatives, including additional upfront DOE funding. This is also captured by a public comment from Hastings (Appendix C) regarding possible technologies to increase the speed with which tank waste is retrieved.

B. Transportation

- **Recommendation H:** The FFRDC report should address the implications of using monthly averages of pre-treated liquid SLAW compositions when dose limits are on a tanker-by-tanker basis.
- **Recommendation I:** The FFRDC needs to resolve this possible inconsistency. The FFRDC should
 - i. describe how tanker dose rates were calculated and provide some summary results, especially for the dose rate at 3 meters and
 - ii. reconcile the inconsistency between using shielding to meet the dose rate limit at 3 meters with the statement that such an approach is prohibited to underpin the conclusion that liquid SLAW will be LSA waste ([U.S. Nuclear Regulatory Commission 2021](#)).

C. Consequences of Non-Approval at IDF, Off-Site location, or with Off-Site Transportation

Recommendation D: The FFRDC should include a discussion of issues associated with obtaining regulatory approval for the various options. Specifically, it would be helpful to focus on the significant adverse consequences of grouted SLAW not being acceptable for disposal at IDF or other out-of-state disposal sites.

Recommendation E: The FFRDC should expand its consideration of the consequences of potential impediments impacting the safe and expeditious SLAW management, such as grouted SLAW not being accepted for transportation, disposal at IDF, or other out-of-state disposal sites. The FFRDC should incorporate insights from public comments obtained to date in the final report, as well as the experiences of other sites that have transported radioactive waste to distant treatment or disposal locations.

IV. Cost Issues

A. Separation of Cost from Implementability

Recommendation B: The “failure to complete due to funding shortfalls” sub-criterion (section 2.1.2) should be removed from key criterion #3, the FFRDC should remove the affordability concept from the likelihood of successful mission completion criterion, and not assume any funding limit for this purpose. Instead, cost considerations should be addressed by estimating a lifecycle cost profile for constructing and operating each alternative that is designed to treat SLAW at the rate consistent with the nominal mission duration assumed in the report (operation from 2034 through 2075) while accounting for the variation in construction time. The FFRDC should then compare and contrast the lifecycle cost profiles accompanied by explicitly quantified sensitivity analyses about what funding levels would be required (note comment 3.2.4c).

B. Cost Profile Over Time

Recommendation C:

- i. Make defensible assumptions related to cost (e.g. capital cost, interest rates, escalation, operating cost, time to construct), calculate the cost profile for the duration of the mission, and then perform sensitivity studies on this analysis.
- ii. Provide graphs depicting the amount of SLAW processed and the amount remaining each year in terms of waste volume and radioactivity, and the annual projected budget requirements for each alternative to achieve a comparable rate of SLAW processing

V. Particular Issues

Recommendation F: The FFRDC should acknowledge as a sub-criterion under key criterion #6 (community/public acceptance), consideration of the location and amount of land to which tribal members are likely to have access among the four alternatives that were evaluated and include this in the discussion of community/public acceptance (see section 2.1.2.6).

Recommendation L: Comparisons should be quantified, and as such, charts and graphs that lack a quantified basis should be eliminated [Finding 4]. This recommendation is particularly directed at the presentations in Section 4.0 Comparative Analyses.



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Technical Advisor
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Committee and Consultant

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Save the date

Review of the Continued Analysis of Supplemental Treatment of Low-Activity Waste at the Hanford Nuclear Reservation

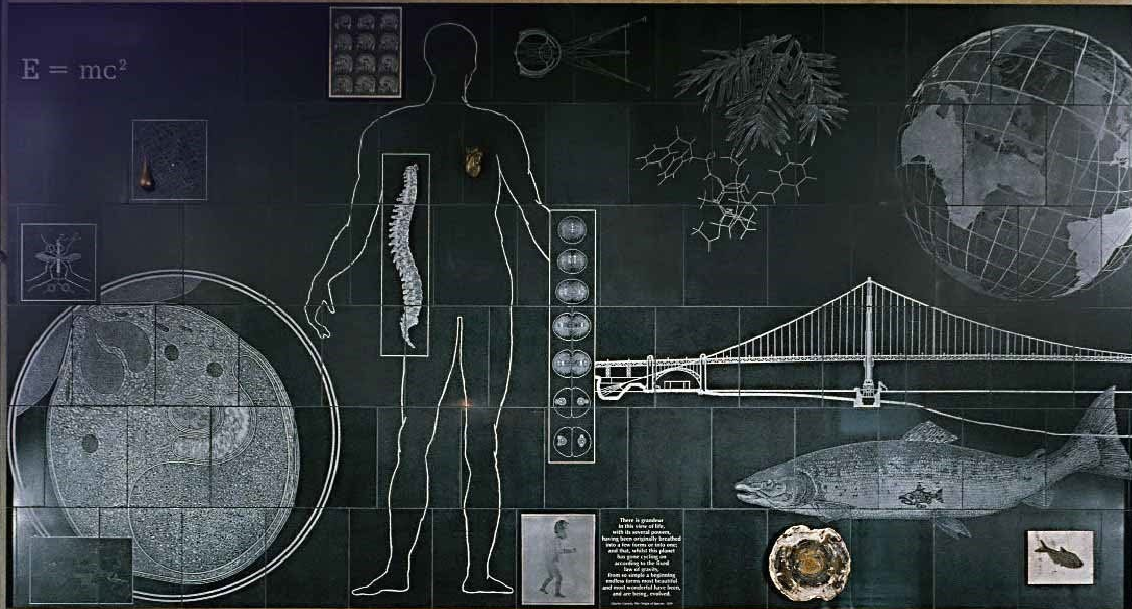
Hybrid Meeting | January 31 – February 1, 2023

As a reminder, there will be a meeting on **January 31, 2023 from 10:00am to 6:00pm PT** and **February 1, 2023 from 10:00am to 12:30pm PT** regarding the [Review of the Continued Analysis of Supplemental Treatment of Low-Activity Waste at the Hanford Nuclear Reservation](#). These open sessions will be held both virtually and in-person in Richland, WA.

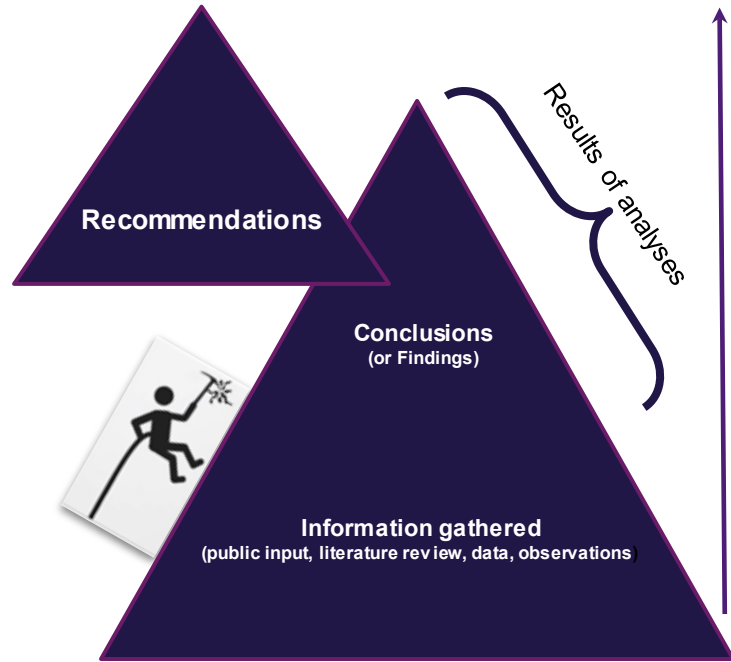
During these information-gathering sessions, the FFRDC team will present their response to the committee's second review and discuss the third and final report they have provided to the committee. This report is available to download under "meeting materials" on the [event webpage](#). Additionally, there will be presentations from The Washington State Department of Ecology and the Oregon Department of Energy.

Registration is required. For more information on this event and to view the agenda, please visit the [event webpage](#).

$$E = mc^2$$



Forms of Advice in Consensus Studies



1. Begin with gathering information/evidentiary support.
2. Build conclusions (or “findings”) from the committee’s analyses of the gathered information/evidence.
3. Recommendations, if any, are based on conclusions/findings and outline action steps for a specified actor.