Research and Development Technical Working Group (R&D-TWG)

Discussion of Materials and Components / Testing and Validation

Wednesday, May 26, 2026; 2:00 p.m. to 4:00 p.m. EDT

Discussion Summary

Welcome and Questions

- The facilitator from Eastern Research Group (ERG), a New York State Energy Research and Development Authority (NYSERDA) contractor, welcomed TWG members and reviewed the meeting agenda.

Materials and Components Study Topic

- Solestiss, a NYSERDA contractor responsible for researching and drafting the R&D Study, provided a brief overview of the materials and components study topic.
    - The existing nuclear materials database is built on 50 years of light water reactor experience. Advanced reactors introduce new operational regimes from Gen III+. Data gaps exist regarding material lifetimes, corrosion behavior, irradiation effects, and manufacturing readiness. R&D will help demonstrate that materials and components can withstand harsher operating environments.
- TWG members responded to the following electronic polling questions:
    - *Which materials and components R&D needs have high potential for New York State to support? (select all that apply)*
        - Of 11 TWG members who selected all options they agreed with, 73% selected qualification of advanced high-temperature alloys and coatings, 64% selected securing supply chains for critical reactor materials, 55% selected coolant compatibility and corrosion performance, 45% selected qualification and scaling of powder metallurgy hot isostatic pressing (PM-HIP) and additive manufacturing, 36% selected radiation-hardened sensors and high-temperature instrumentation, 36% selected irradiation testing and lifetime data, and 18% selected qualification of high-temperature passive safety systems.
    - *Are we missing any categories related to materials and components?*
        - The study should address both material R&D efforts that might find a home in New York State as well as manufacturability and industrialization.
        - The study should include extensive temperature-dependent mechanical and thermal material properties associated with fabrication specification.

- Solestiss then reviewed three of the subtopics in further detail including: (1) securing supply chains for critical reactor materials, (2) qualification and scaling of PM-HIP, and (3) qualification of high-temperature passive safety systems and specialized components.
- TWG member feedback:
    - Although it would be expensive, New York State should consider an approach to develop technology for recycling graphite because it is important in terms of supply chain and energy security. That said, because some fuel is designed to be indestructible (i.e., it doesn't readily melt and has few failure modes), dissolving graphite out of the fuel could prove challenging.
    - Massive processing vessels are necessary for manufacturing large-reactor pressure vessels. The U.S. Department of Energy has ongoing research initiatives to scale up such capabilities.
    - Although the qualification of advanced high-temperature alloys must take place in a reactor or high-flux environment, other research may be conducted without using reactor assets or neutron flux sources. For example, ion beam facilities may be useful for some testing, such as corrosion testing.
    - While irradiation testing is not required to qualify a material, a lack of irradiation testing can create a safety risk.
    - There are no current PM-HIP pressure vessels. All large-reactor pressure vessels are constructed of forged materials. If the United States could qualify advanced alloys, including the necessary welding, then forging could be done domestically and with more advanced materials.
    - Some New York State institutions have facilities that can perform materials categorization, depending on the sample size. One university in New York also has one of the only departments dedicated to material discovery, including characterization systems.
    - New York State should consider investing in high-temperature materials qualification and research outside of irradiation to strengthen the fabrication process and make it commercially available at a low cost.
    - Many passive safety systems are integrated into the reactor design and not a separate system that would be independently developed. For safety, instrumentation and controls outside the reactor itself could be addressed independently.

Testing and Validation Study Topic

- Solestiss provided an overview of the testing and validation study topic, including existing testing and validation facilities in New York State.
- Solestiss also described three key subtopics the R&D Study may address: (1) creating shared test infrastructure for multi-unit control demonstrations; (2) expanding access to high-temperature, coolant-specific test loops; and (3) increasing irradiation testing capacity for fuels and materials.

- TWG members responded to the following electronic polling question: *Which testing and validation resources are most needed in New York State?*
    - Of the nine TWG members who selected multiple options, 78% selected post-irradiation examination capacity; 67% selected high-temperature, coolant-specific test loops for Gen IV reactors; 56% selected test standards and validated methods for advancing manufacturing; 44% said irradiation testing capacity for fuels and materials, and 0% selected shared test infrastructure for multi-unit control room demonstrations.
- TWG member feedback:
    - Regarding shared infrastructure, testing for interim storage of used fuel and disposal of advanced fuels could be potentially relevant.
    - Access to the limited number of large-scale test reactors nationally that are better suited for certain materials is currently very competitive and expensive.
    - Testing facilities need state-of-the-art simulation tools and computing facilities to run codes.
    - Cost sharing could be of significant benefit to laboratories seeking federal grants to work on further developing testing infrastructure.

Action Items and Next Steps

- R&D TWG meetings will take place on Friday, June 12, from 9:00 a.m. to 11:00 a.m. and on Thursday, July 9, from 12:00 p.m. to 1:30 p.m. (final meeting).

Task	Assigned to	Target date
Provide the agenda and read-ahead for the next meeting.	ERG	June 3, 2026
Publish meeting three summary notes and slide deck.	ERG	June 9, 2026

Participants

Member Organizations

Brookhaven National Laboratory
City College of New York
Columbia University
Cornell University
GE Vernova
Oak Ridge National Laboratory
Rensselaer Polytechnic Institute
State University of New York
Stony Brook University
University at Buffalo

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