

Coalition for Advanced Reactor Licensing (CARL) Industry Connections Activity Initiation Document (ICAID)

Version: 1.0, 13 September 2022

IC22-014-01 Approved by the CAG 12 October 2022

Instructions

- Instructions on how to fill out this form are shown in red. Please leave the instructions in the final document and simply add the requested information where indicated.
- Spell out each acronym the first time it is used. For example, "United Nations (UN)."
- Shaded Text indicates a placeholder that should be replaced with information specific to this ICAID, and the shading removed.
- Completed forms, in Word format, or any questions should be sent to the IEEE Standards Association (IEEE SA) Industry Connections Committee (ICCom) Administrator at the following address: industryconnections@ieee.org.
- The version number above, along with the date, may be used by the submitter to distinguish successive updates of this document. A separate, unique Industry Connections (IC) Activity Number will be assigned when the document is submitted to the ICCom Administrator.

1. Contact

Provide the name and contact information of the primary contact person for this IC activity. Affiliation is any entity that provides the person financial or other substantive support, for which the person may feel an obligation. If necessary, a second/alternate contact person's information may also be provided.

Name: Larry Cunningham PhD

Email Address: cunninghamlp@ornl.gov

Employer: Oak Ridge National Laboratory

Affiliation: IEEE, ASME, ANSEntity Name(s)

IEEE collects personal data on this form, which is made publicly available, to allow communication by materially interested parties and with Activity Oversight Committee and Activity officers who are responsible for IEEE work items.

2. Participation and Voting Model

Specify whether this activity will be entity-based (participants are entities, which may have multiple representatives, one-entity-one-vote), or individual-based (participants represent themselves, one-person-one-vote).

Individual-based

3. Purpose

3.1 Motivation and Goal

Briefly explain the context and motivation for starting this IC activity, and the overall purpose or goal to be accomplished.

There are many new Advanced Reactors being designed that are safer than the current Light Water Reactors. Some of the new designs are Light Water Reactors but many are not. There are gaps in codes, standards, and regulations for these First of Kind reactors being developed. It takes up to 8 years to create a standard or regulatory guide, once identified. The NRC is a model in innovation and efficiency but could not meet the demands of reviewing these new license applications in a timely manner. Conversely, Applicants might be faced with ambiguity in what to include in their application. The goal of CARL is to identify priority topics of *Uncertainty* that would be of concern to the regulator and develop targeted position papers, case studies and other output that would directly support the license applicant in their Advanced Reactor license application. Such output will include regulator review which in turn would provide input for subsequent Standards and Regulatory Guides.

3.2 Related Work

Provide a brief comparison of this activity to existing, related efforts or standards of which you are aware (industry associations, consortia, standardization activities, etc.).

There are groups that are identifying gaps and pathways. The NRC is developing a new licensing code, 10 CFR 53 for advanced reactors. It is not expected to be completed for several years and design firms are already saying they won't even use that method.

3.3 Previously Published Material

Provide a list of any known previously published material intended for inclusion in the proposed deliverables of this activity.

None at the moment. As work products are developed, the listing of previously published materials will be updated with approvals obtained by the primary contact person for this activity.

3.4 Potential Markets Served

Indicate the main beneficiaries of this work, and what the potential impact might be.

The advanced reactor technical community is rapidly growing and evolving space with a diverse set of technical and programmatic stakeholders. Activities and work products from CARL would provide the basis for guidance documentation as it relates to existing and new standards that would facilitate the timely and safety review of licensing submission documentation from device and technology developers as well as the support organizations from SDOs to the US NRC as applicable.

3.5 How will the activity benefit the IEEE, society, or humanity?

Describe how this activity will benefit the IEEE, society, or humanity.

This activity will provide needed guidance documentation and the coordination of technical resources across multiple stakeholders, including manufacturers, regulators, SDOs, and other organizations to facilitate the construction of advanced nuclear reactors in the US and internationally. While approaches vary in complexity and similarity to reactors currently in service, there is a level of uncertainty that has to be resolved to maximize the potential impact of their implementation on the electric grid. Advanced reactor designs that are modular in nature, easy to assemble on-site, and with safer functionality provide the potential for clean energy solutions that reduce carbon in the environment, improve air quality, generate hydrogen for energy, desalinate seawater and meet the increasing power demands worldwide.

4. Estimated Timeframe

Indicate approximately how long you expect this activity to operate to achieve its proposed results (e.g., time to completion of all deliverables).

Expected Completion Date: 09/2024

5. Proposed Deliverables

Outline the anticipated deliverables and output from this IC activity, such as documents (e.g., white papers, reports), proposals for standards, conferences and workshops, databases, computer code, etc., and indicate the expected timeframe for each.

Position papers that address technical issues such as implementation of digital twins and regulatory guidance such as requests for additional information (RAIs) for specific advanced reactor designs that would be used in the development of Codes, Standards, Regulatory Guides (RGs).

5.1 Open Source Software Development

Indicate whether this IC Activity will develop or incorporate open source software in the deliverables. All contributions of open source software for use in Industry Connections activities shall be accompanied by an approved IEEE Contributor License Agreement (CLA) appropriate for the open source license under which the Work Product will be made available. CLAs, once accepted, are irrevocable. Industry Connections Activities shall comply with the IEEE SA open source policies and procedures and use the IEEE SA open source platform for development of open source software. Information on IEEE SA Open can be found at <https://saopen.ieee.org/>.

Will the activity develop or incorporate open source software (either normatively or informatively) in the deliverables?

No. To be determined. Some might be subject to export restrictions per 10 CFR 810. There also might have a design-specific code which may then be proprietary

6. Funding Requirements

Outline any contracted services or other expenses that are currently anticipated, beyond the basic support services provided to all IC activities. Indicate how those funds are expected to be obtained (e.g., through participant fees, sponsorships, government, or other grants, etc.). Activities needing substantial funding may require additional reviews and approvals beyond ICCOM.

At this time, we do not anticipate funding needs beyond the resources typically provided by IEEE SA IC staff. Should any meeting costs be necessary we will seek sponsors. We are currently working on DOE and/or NRC funding. We can also look at the possibility of Alliance formation and management and would consult with IEEE ISTO for that area, membership fees from design firms, and other organizations. Specify funding requirements and sources, if any.

7. Management and Procedures

7.1 Activity Oversight Committee

Indicate whether an IEEE Standards Committee or Standards Development Working Group has agreed to oversee this activity and its procedures.

Has an IEEE Standards Committee or Standards Development Working Group agreed to oversee this activity? **No**

No. Though we will be pursuing NPEC for oversight. If yes, indicate the IEEE committee's name and its chair's contact information.

IEEE Committee Name: Committee Name

Chair's Name: Full Name

Chair's Email Address: who@where

Additional IEEE committee information, if any. Please indicate if you are including a letter of support from the IEEE Committee that will oversee this activity.

IEEE collects personal data on this form, which is made publicly available, to allow communication by materially interested parties and with Activity Oversight Committee and Activity officers who are responsible for IEEE work items.

7.2 Activity Management

If no Activity Oversight Committee has been identified in 7.1 above, indicate how this activity will manage itself on a day-to-day basis (e.g., executive committee, officers, etc.).

Briefly outline activity management structure.

Current plan is to have an Executive Committee with top level (including Subcommittee Chairs and Vice Chairs) would have the function of prioritizing candidate projects and allocating funding. Current draft on possible subcommittees would include:

SC1: Regulatory Pathways;

SC2: Licensing Strategy;

SC3: NRC Request for Additional Information (RAI) / Application Lessons Learned Case Studies;

SC4: High Temp Reactors;

SC5: Molten Salt Reactors;

SC6: Fast Reactors;

SC7: Modular Reactors;

SC8: Risk Informed Methods / PRA;

SC9: Depth in Defense approaches;

SC10: Digital Twins;

SC11: Knowledge Management;

SC12: Case Review, Acceptance and Publication Committee

7.3 Procedures

Indicate what documented procedures will be used to guide the operations of this activity; either (a) modified baseline *Industry Connections Activity Policies and Procedures* ([entity](#), [individual](#)), (b) *Abridged Industry Connections Activity Policies and Procedures* ([entity](#), [individual](#)), (c) Standards Committee policies and procedures accepted by the IEEE SA Standards Board, or (d) Working Group policies and procedures accepted by the Working Group's Standards Committee. If option (a) is chosen, then ICCom review and approval of the P&P is required. If option (c) or (d) is chosen, then ICCom approval of the use of the P&P is required.

Baseline Industry Connections Activity Policies and Procedures - individual Specify the policies and procedures document to be used. Attach a copy of chosen policies and procedures.

8. Participants

8.1 Stakeholder Communities

Indicate the stakeholder communities (the types of companies or other entities, or the different groups of individuals) that are expected to be interested in this IC activity and will be invited to participate.

Regulator(s), National Labs,

IEEE NPEC, ANS, ASME, IEC, ASCE, ACI, ASTM, ISA, NFPA, NEI, EPRI,

License Applicants, Prospective Applicants, Suppliers (A&E Firms, Equipment and Technical Service Suppliers)

8.2 Expected Number of Participants

Indicate the approximate number of entities (if entity-based) or individuals (if individual-based) expected to be actively involved in this activity.

Hopefully in the scale of 50 – 100 individuals. Number of entities or number of individuals.

8.3 Initial Participants

Provide a few of the entities or individuals that will be participating from the outset. It is recommended there be at least three initial participants for an entity-based activity, or five initial participants (each with a different affiliation) for an individual-based activity.

Use the following table for an individual-based activity:

Individual Name	Employer	Affiliation
George Flanagan, PhD	ORNL	ANS
Larry Cunningham PhD	ORNL	ANS; ASME NED; IEEE NPEC
Michael Muhlheim, PhD	ORNL	IEEE
Robert Duckworth PhD	ORNL	ANS
Wesley Williams PhD	ORNL	IEEE
Mark Bowman	TVA	IEEE NPEC
Frank Schaaf PE	Sterling Refrigeration	ASME
Robert Stakenborghs	Advclean energy	ASME
Ronald Wise, P.E.	CONTECH	IEEE
Ryan Crane	ASME	ASME
Kent Sutton	iNgrid Consulting Services LLC	

8.4 Activity Supporter/Partner

Indicate whether an IEEE committee (including IEEE Societies and Technical Councils), other than the Oversight Committee, has agreed to participate or support this activity. Support may include, but is not limited to, financial support, marketing support and other ways to help the Activity complete its deliverables.

Has an IEEE Committee, other than the Oversight Committee, agreed to support this activity? **No**

If yes, indicate the IEEE committee’s name and its chair’s contact information.

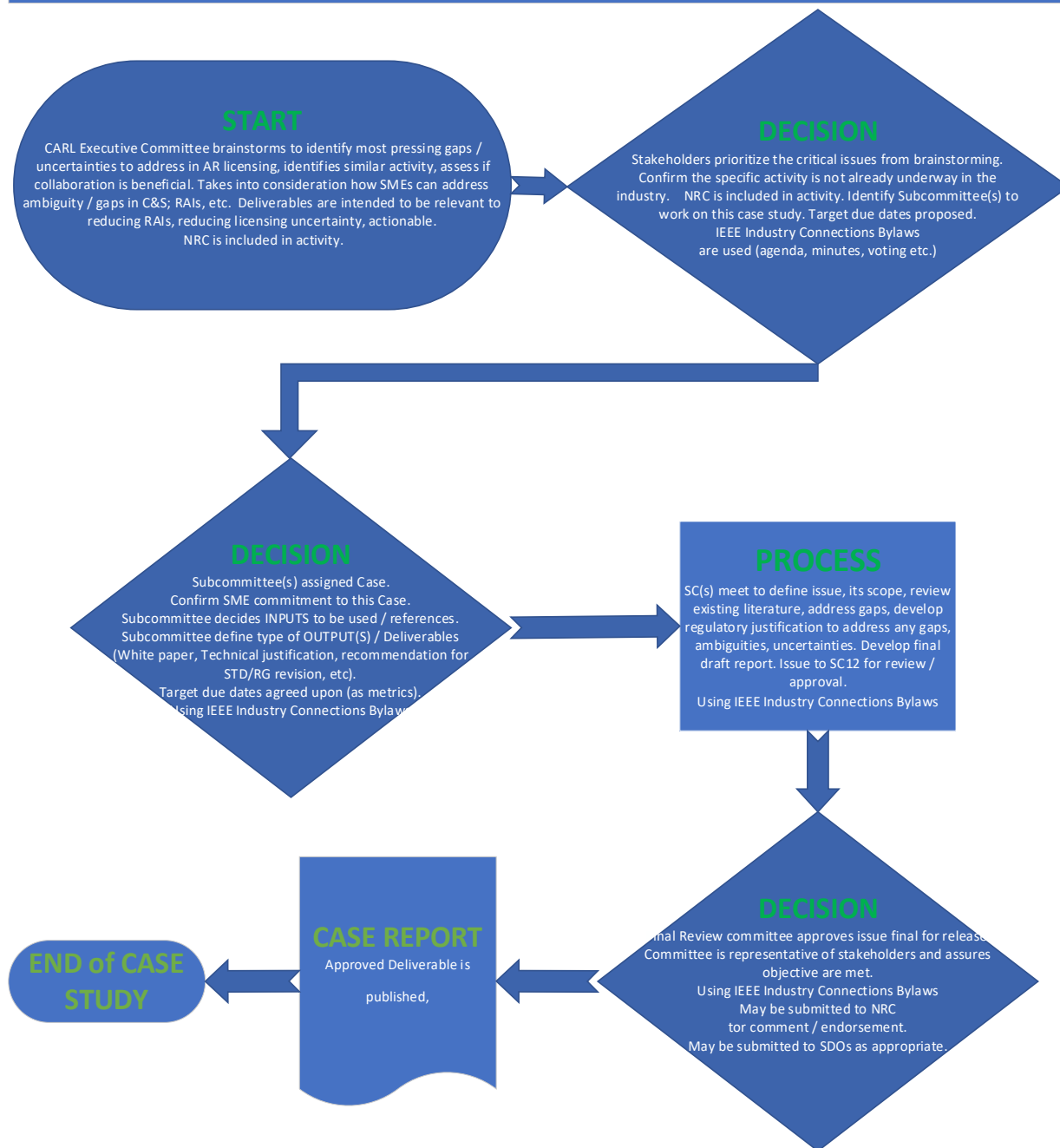
IEEE Committee Name: Committee Name

Chair’s Name: Full Name

Chair’s Email Address: who@where

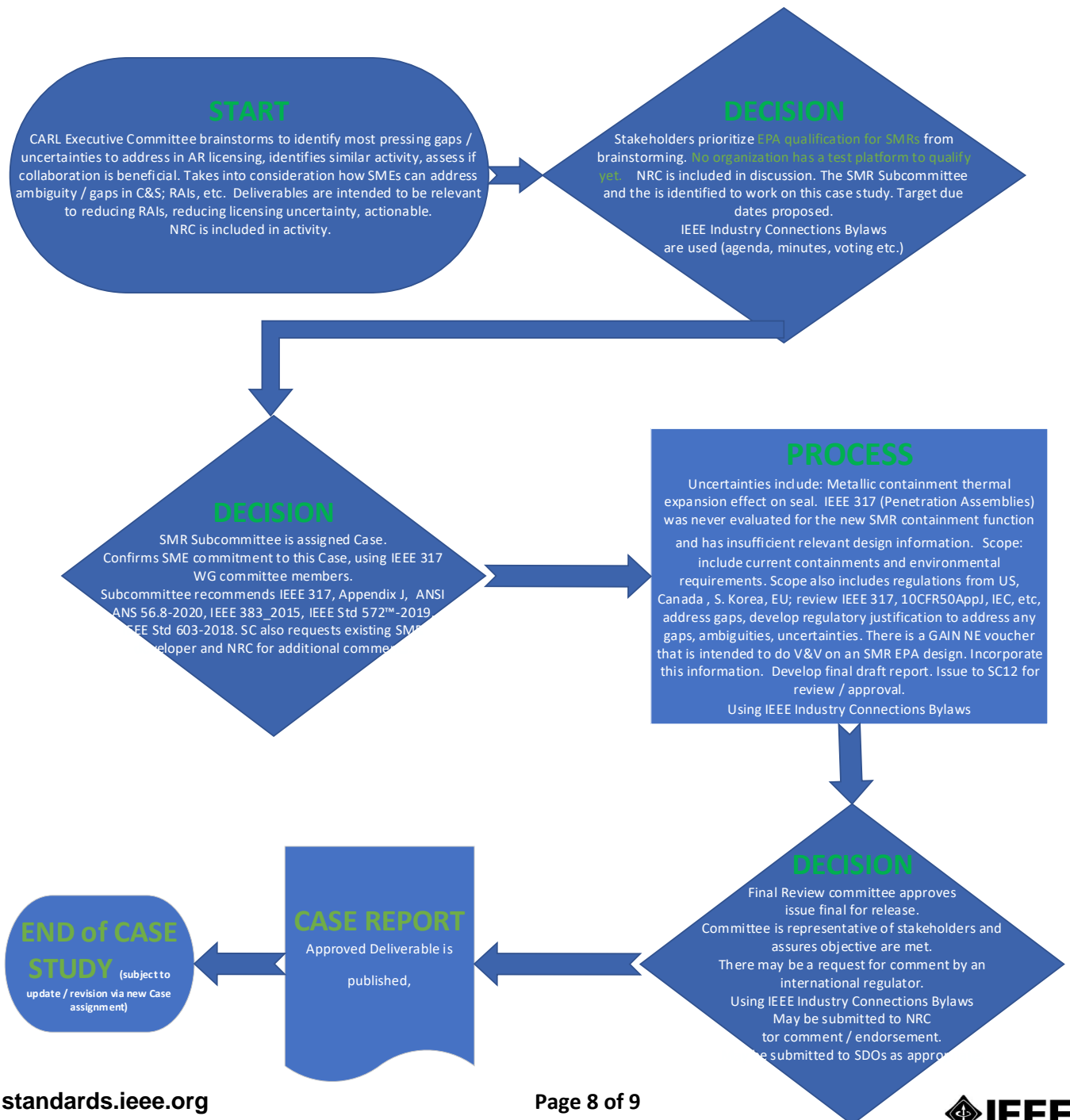
Please indicate if you are including a letter of support from the IEEE Committee.

Coalition for Advanced Reactor Licensing (CARL) is a Case-based process optimization to provide reasonable assurance in areas of uncertainty. CARL includes informed stakeholders and follows by laws similar to an SDO, but it does not develop standards (Using IEEE Industry Connections). It is not meant to compete with pathways, codes and standards development but rather use them as strategical inputs, where available, in a manner to mitigate uncertainty where there may be gaps (in OpEx, Data, Codes and Standards, Knowledge, etc.). CARL Case reports could, for example, be used to make recommendations for future SDO activity. The main purpose is to reduce time in Advanced Reactor licensure owing to ambiguities and gaps.



CARL Example 1: Addressing Uncertainty in the qualification of EPAs for SMRs FOR ILLUSTRATION ONLY

- ➔ SC1: Regulatory Pathways;
- SC2: Licensing Strategy;
- SC3: RAI / Application Lessons Learned Case Studies;
- SC4: High Temp Reactors;
- SC5: Molten Salt Reactors;
- SC6: Fast Reactors;
- ➔ SC7: Modular Reactors;
- SC8: Risk Informed Methods / PRA;
- SC9: Depth in Defense approaches;
- SC10: Digital Twins;
- SC11: Knowledge Management;
- SC12: Case Review, Acceptance and Publication



CARL Example 2: Addressing Uncertainty in the use of Digital Twins for Advanced Reactors FOR ILLUSTRATION ONLY

- ➡ SC1: Regulatory Pathways;
- ➡ SC2: Licensing Strategy;
- SC3: RAI / Application Lessons Learned Case Studies;
- SC4: High Temp Reactors;
- SC5: Molten Salt Reactors;
- SC6: Fast Reactors;
- SC7: Modular Reactors;
- SC8: Risk Informed Methods / PRA;
- SC9: Depth in Defense approaches;
- ➡ SC10: Digital Twins;
- SC11: Knowledge Management;
- SC12: Case Review, Acceptance and Publication

