



## ARPA-E GO COMPETITION CHALLENGE 1: TIMELINE

### A. Challenge 1: November 1<sup>st</sup>, 2018 – mid December 2019

Challenge 1 will focus on the SCOPF problem and utilize multiple unique datasets. Each dataset will consist of a collection of power system network models of different sizes with associated operating scenarios (for more details on the distinction between power system network models and operating scenarios, see details on scoring:

<https://gocompetition.energy.gov/challenges/challenge-1/scoring>).

Challenge 1 will focus on solely transmission networks while future challenges may involve optimizing settings for power flow over both transmission and distribution systems or more complicated grid software variants (see below). It is expected that many datasets will be open source and include models generated by the ARPA-E GRID DATA program. Datasets will be released on the GO Competition website throughout the twelve month period of Challenge 1. System models and datasets made publicly available in the GO Competition will not contain or constitute Critical Energy Infrastructure Information (CEII).<sup>1</sup> Any datasets or system models used in the GO Competition that do contain CEII will be maintained according to all applicable requirements and established industry best practices.

The datasets used for the Final Event will not be released in advance of the judging process but all open access datasets will be released after all judging is completed and the winners are determined. Note that the Final Event may include datasets that are not from the ARPA-E GRID DATA program and that will not publicly released after the judging is finalized for Challenge 1; these datasets may be proprietary industry cases that cannot be released. Proprietary datasets will be stored at a secure location by the GO Competition Administrator;<sup>2</sup> algorithm performance against actual datasets will contextualize and validate the GO Competition Challenge 1 results for the research and industry communities.

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<sup>1</sup> See 18 C.F.R. § 388.113(c)(1). The term “CEII” means “specific engineering, vulnerability, or detailed design information about proposed or existing critical infrastructure that: (i) relates details about the production, generation, transportation, transmission, or distribution of energy; (ii) could be useful to a person in planning an attack on critical infrastructure; (iii) is exempt from mandatory disclosure under the Freedom of Information Act, 5 U.S.C. Part 552; and (iv) Does not simply give the general location of the critical infrastructure.”

<sup>2</sup> The Pacific Northwest National Laboratory (PNNL) is acting as the GO Competition Administrator, the host team of the competition. Additionally, there are sub-contractors that are supporting PNNL and ARPA-E in regards to the GO Competition Challenge 1 (Arizona State University, National Renewable Energy Laboratory, Texas A&M University, the University of Wisconsin-Madison).

The “Challenge 1 Original Dataset (C1OD)” will be released at the start of Challenge 1 in order to allow Entrants to start developing solution methods and test their approach on the GO Competition platform. Entrants will be able to download the datasets in order to test algorithms within their own development environment. Entrants can also submit software to be scored against the C1OD dataset using the official competition platform at any time. Scores will be generated after each algorithm submission and will be displayed on a set of competition leaderboards, accessible via the competition website. Entrants may choose to remain anonymous on the leaderboards or may choose to display their Entrant name associated with their scores. However, Entrants that choose to remain anonymous are ineligible for awards under this competition. For more information on scoring, see <https://gocompetition.energy.gov/challenges/challenge-1/scoring>.

### **B. Trials (Spring 2019, Summer 2019, and Fall 2019)**

Three trial events will be conducted before the Final Event to allow the Entrants to view their performance on datasets that have not been publicly released. Approximately six and nine months into Challenge 1, the two dry-run “trial” rounds for the SCOPF competition will be held utilizing new power system datasets, Challenge 1 Trial Dataset 1 (C1TD1) and Challenge 1 Trial Dataset 2 (C1TD2). A third optional mini-trial event (C1TD3) will be held before the Final Event. The GO Competition platform will lock-down directly preceding the third trial and will remain fixed through the Final Event. Competitors may not request further changes to the software environment after that date. The models in these datasets will be similar in scope to those in C1OD, but they will not be publicly released until after the conclusion of each trial event. Entrants are expected to update their submitted approach throughout Challenge 1 and, in particular, before each trial event. The datasets used throughout the GO Competition Challenge 1 are likely to increase in size and complexity. Larger network models combined with a significant selection of contingencies are to be expected for the three trial runs.

There will be deadlines to register for the GO Competition Challenge 1 for Entrants wishing to participate in the trial events; Entrants may not participate in the trial events unless they have registered for the GO Competition Challenge 1 ahead of these deadlines. Once Entrants have successfully registered for the GO Competition Challenge 1, they do not need to re-register before subsequent Trial and Final Events. During each trial event, there will be a window in which Entrants must submit their SCOPF software approach before the judging is conducted; associated dates are listed below.<sup>3</sup> Immediately following the end of the submission window, the software from all Entrants will be run and scored against C1TD1, C1TD2, and C1TD3 respectively. After each trial event, scores for each Entrant submission will be displayed on a set of competition leaderboards. The objective of the trial events is to give Entrants experience in using the portal for the competition and to troubleshoot any potential algorithm submission and evaluation problems in the context of a specified deadline, as will be required in the Challenge 1 Final Event.

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<sup>3</sup> Entrants are only allowed one submission to each of Trial Events 1, 2, and 3 as well as the Final Event. Outside of these events, Entrants may make multiple submissions to the platform for scoring in the Sandbox environment.

**Trial Event 1: April 2019**

- **Prior to April 1<sup>st</sup>, 2019:** Entrants wishing to participate in Trial Event 1 must submit their registration and be approved for the GO Competition Challenge 1. We encourage you to submit your registration as early as possible.
- **April 1<sup>st</sup>, 2019 – April 15<sup>th</sup>, 2019:** Submission window for Trial Event 1. Entrants participating in Trial Event 1 must submit their algorithmic approach to the GO Competition platform. Entrants may only submit one algorithmic approach to be scored in Trial Event 1.
- **April 30<sup>th</sup>, 2019:** Trial Event 1 results will be released and leaderboards will be updated to reflect Trial Event 1 performance. Trial Event 1 datasets will be released and may be used for further algorithm development as well as scoring in the GO Competition Challenge 1 sandbox.

**Trial Event 2: July 2019**

- **Prior to July 17<sup>th</sup>, 2019:** Entrants wishing to participate in Trial Event 2 must submit their registration and be approved for the GO Competition Challenge 1. We encourage you to submit your registration as early as possible.
- **July 17<sup>th</sup>, 2019 – July 19<sup>th</sup>, 2019:** Submission window for Trial Event 2. Entrants participating in Trial Event 2 must submit their algorithmic approach to the GO Competition platform. Entrants may only submit one algorithmic approach to be scored in Trial Event 2.
- **August 5<sup>th</sup>, 2019:** Trial Event 2 results will be released and leaderboards will be updated to reflect Trial Event 2 performance. Trial Event 2 datasets will be released and may be used for further algorithm development as well as scoring in the GO Competition Challenge 2 sandbox.

**Trial Event 3: September 2019**

- **September 2<sup>nd</sup>, 2019:** Entrants must submit their final requested platform modifications to the GO Competition Administrator (PNNL).
- **Prior to September 11<sup>th</sup>, 2019:** Entrants wishing to participate in Trial Event 3 must submit their registration and be approved for the GO Competition Challenge 1. We encourage you to submit your registration as early as possible.
- **September 11<sup>th</sup>, 2019 – September 13<sup>th</sup>, 2019:** Submission window for Trial Event 3. Entrants participating in Trial Event 3 must submit their algorithmic approach to the GO Competition platform. Entrants may only submit one algorithmic approach to be scored in Trial Event 3.
- **September 30<sup>th</sup>, 2019:** Trial Event 3 results are expected to be released and leaderboards will be updated to reflect Trial Event 3 performance. Trial Event 3 datasets will be released and may be used for further algorithm development as well as scoring in the GO Competition Challenge 2 sandbox.

The datasets used for scoring for each trial event (C1TD1, C1TD2, and C1TD3) will be released to the public as soon as scoring and evaluation of all algorithms has been completed. The trial

event datasets will remain available for scoring runs using the GO Competition Challenge 1 sandbox throughout the remainder of the competition. Entrants will have the ability to submit new software/algorithms (to be tested against C1TD1, C1TD2, or C1TD3) at any time, and a continuously updated leaderboard will be maintained in the sandbox environment.<sup>4</sup>

#### A. Challenge 1 Final Event (late October – mid December 2019)

At the conclusion of Challenge 1, the Final Event will occur, which will include the official scoring that will determine the final placement of the Entrants for purposes of making awards. GO Competition formulations, scoring, and rules will be similar to those in each trial event, with a new Challenge 1 Final Dataset (C1FD) used for evaluation and scoring. Like the three trial events, there will be a deadline by which Entrants must register for the GO Competition Challenge 1 and Entrants will have a window during which they must submit their approach. Immediately following the deadline, the software from all Entrants will be run and scored against C1FD. Scores for each Entrant submission will be displayed on a series of competition leaderboards.

##### Final Event

- **Prior to October 28<sup>th</sup>, 2019:** Entrants must submit their registration and be approved for the GO Competition Challenge 1. We encourage you to submit your registration as early as possible.
- **October 28<sup>th</sup>, 2019 – October 30<sup>th</sup>, 2019:** Submission window for the Final Event. Entrants must submit their algorithmic approach to the GO Competition platform. Entrants may only submit one algorithmic approach to be scored in the Final Event.
- **Mid-December:** GO Competition Challenge 1 results will be released and leaderboards will be updated to reflect performance in the Final Event. The top 10 performers in each scoring division will be announced. Final Event datasets will be released.

Competition winners will be determined based on their Final Event scores subject to the winning criteria specified in the GO Competition Rules Document (see <https://gocompetition.energy.gov/competition-rules>). Datasets that are used for the Final Event, C1FD, will be made publicly available only after the scoring is finalized and the winners are announced.

#### B. Challenge 2 and Beyond (Details TBD): Spring 2020-Spring 2021

Future competitions, beginning with Challenge 2, are expected to build on the models used in Challenge 1 and may include complicating factors such as solving larger network models, optimizing power flows over both transmission and distribution systems, stochastic optimization, leveraging power flow control devices, increased model detail (node/breaker, substation/protection models, etc.) and/or including unit commitment. Challenge 2 will likely also focus on OPF, with some of the above complicating factors, and will likely disburse fewer

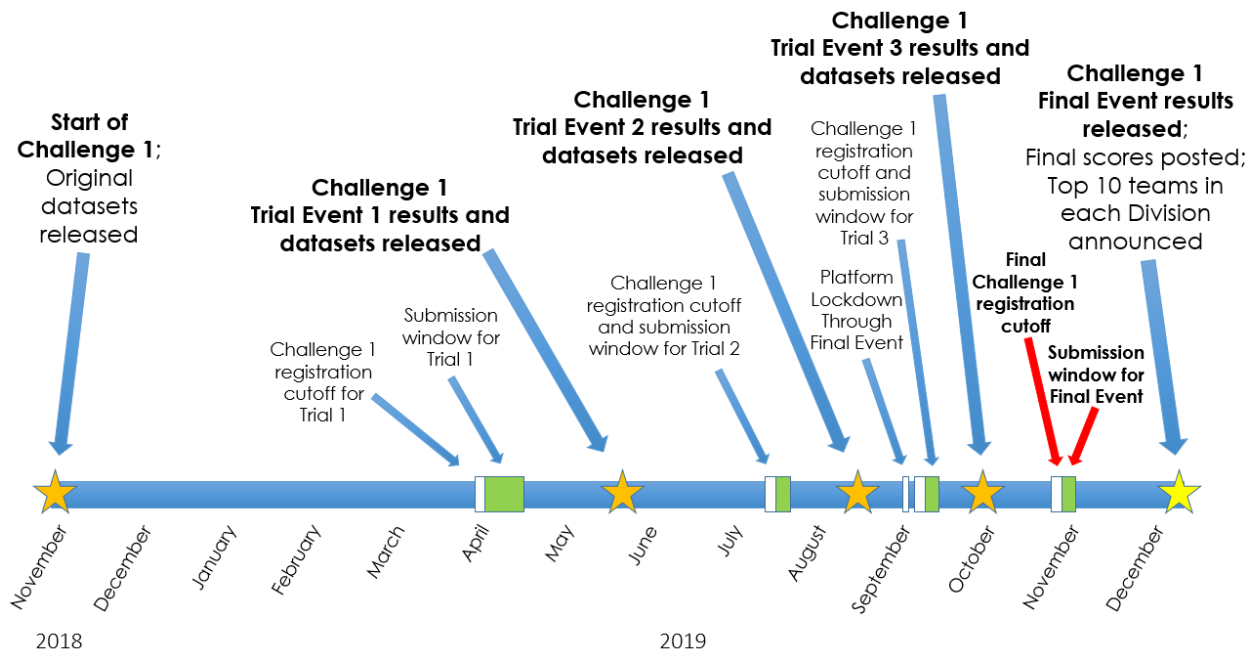
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<sup>4</sup> The sandbox leaderboards will not contain performance profile scoring.

awards in increased amounts for the winning Entrants. ARPA-E reserves the right to revise plans for Challenge 2 or future challenges to follow. ARPA-E may also release additional FOAs to provide additional Proposal Entrants funding for future challenges.

**C. Competition Timeline: Challenge 1**

The proposed Challenge 1 competition timeline is illustrated below.



**Figure 2. Challenge 1 Competition Timeline.**

ARPA-E intends for the competition platform to be capable of hosting a wide range of power system algorithm research competitions. Once the processes are established and the award competition model has been validated, private sector entities or other government agencies will have the option of commissioning and sponsoring additional award competitions, contributing to a new era of innovation in electric power systems research.