Electricity Load Forecasting Technology Contest

■ Application Guidelines

The TEPCO Group forecasts electricity load for electric power so that power may be supplied efficiently. The current forecasting system leverages know-how accumulated over many years and has been successfully predicting electricity load with high accuracy. However, in light of the progress being made in data science and forecasting technology, we should not be content with our current techniques, and we believe that opportunities are needed for actively incorporating new knowledge and applications.

Accordingly, the TEPCO Group has decided to hold the First Electricity Load Forecasting Technology Contest to discover innovative methods and new approaches. Anticipating actual operations, the task for participants is to propose a method for "the following day forecast", that is predicting load in one hour increments for the coming 24 hours of the following day based on data such as electricity load, weather and other factors available up until the day prior to the day for which electricity load will be forecast.

The proposed method must have a high degree of forecasting accuracy in addition to versatility and usability throughout the year. Therefore, during the contest, participants must submit a forecast for the entire year (Annual Forecast) and daily forecasts in line with Actual Forecasting operations (Actual Forecasts). Submitted forecasts will be evaluated according to their accuracy.

The aim of this contest is to take outstanding methods proposed in the contest and incorporate them into actual operations, thereby making it possible to forecast load with even greater accuracy and generate power in an even more reliable and environmentally friendly manner.

■Contest Overview

【Task Overview】

Theme : "Following Day Electricity Load Forecast"

" The following day forecast" is defined as the electricity load prediction for the following day in one hour intervals over an entire day by using data on electricity load, weather and other relevant factors available through the preceding day. Participants are to propose load forecasting methods and to perform the tasks below using the proposed methods.　A detailed reports on the methods and task results are to be submitted.

【Tasks】

Forecasting

[1]Annual Forecast : To forecast the hourly load over a period of 365 days comprising one year.

[2]Actual Forecasts : To forecast the hourly load for the following day based on real-time data provided by CUUSOO.

Reporting

Report on the method

*For the Actual Forecasts, participants must use CUUSOO provided real-time data. The forecast must be prepared and submitted no later than 8:00 JST of day previous to the forecast date. 8:00 JST is the time used in actual operation to determine the power plants' operating rate for the coming days. During the contest, participants may use an API for data receipt and submission to alleviate the burden involved in preparing the forecasts. For more specific details, please see the section 【Task Details】 on the lower part of the page.

【Notice】

・Electricity load is the total value of electricity load in the service area of TEPCO Power Grid, Incorporated.(Photovoltaic power generation self-consumption and consumption for hydroelectric pumped-up are not included.)

・All times are displayed in Japan Standard Time (JST, GMT+9).

・Given that "n" is a whole number between 0 and 24, the time between n:00 and (n+1):00 is defined as n:00 on this application guideline. For example, when n=7, 7:00 and 8:00(7+1) is defined as 7:00.

【What to submit】

・ Annual Forecast data

・ Actual Forecast data

・ Report explaining the method

年間予測結果	本番予測結果	手法説明レポート
Annual Forecast data	Actual Forecast data	Report explaining the method

【Task Details】

●Annual Forecast

The aim of this task is to examine the method's applicability throughout the year.

Participants are to predict an hourly forecast of load for electric power over a period of 365 days from Jan 1, 2015 to December 31, 2015 by only using data up to 7:00 of the previous day to derive the hourly forecast of the following day. (※1)

Forecasting Time Period:　January 1, 2015 0:00 until December 31, 2015 23:00 (in one hour intervals)

Submission deadline:　September 9, 2017 8:00 JST

How to submit:　Email to the specified address

Format:　Hourly data over a period of 365 days in CSV file

　　　　　The format will be announced separately at the time data is provided.

※1 Please note that electricity load data of 8:00 and after on the previous day of the forecast date may not be used in Annual Forecast. If it is verified that a forecast has used data from outside the designated scope, such use shall be regarded as a violation of the contest rules.

●Actual Forecast

The aim of this task is to examine the applicability of the method to actual operation.

Forecasting Time Period:　September 2, 2017 0:00 until September 10, 2017 23:00 (in one hour

intervals)

Submission deadline: by 8:00 JST each previous day(※2)　(September 1, 2017 to September 9, 2017, 9 times in total)

(ex. Forecast for September 2 must be submitted by September 1 8:00)

How to submit:　Over the contest website (※3)

Format:　Actual Forecast data for the following day extending <u>from the period of 0:00 until 23:00</u>

※2 As long as it is before the deadline, results can be submitted anytime and modified results can be submitted multiple times. However, only the latest submitted result at the time of deadline will be the result that would be evaluated. Refining and resubmitting the results until the deadline is recommended.

※3 Real-time electricity load data will be distributed through CUUSOO website. Forecast data are to be submitted through CUUSOO website before deadline.

Participants are recommended to use API in obtaining electricity load data and submitting forecast data. Prior to actual forecasting, "API Set Up Period" will be provided for preparation and training. Instructions will be given by CUUSOO. API use is most desired, but if connection is not possible, CSV files through e-mail are also acceptable.

●Report explaining the method

Report explaining the proposed method

Submission deadline:　September 9, 2017 8:00(JST)

How to submit:　by email

Format:　The report format will be announced separately at the time data is provided.

【What Data may be Used】

"Electricity Load Data," provided by CUUSOO

Publicly available data such as "meteorological and calendar data"

See 【Contest Rule】 for details.

<Data Sets to be Provided>

[A] Data on electricity load from January 1, 2009 0:00 until December 31, 2015 23:00

[B] Data on electricity load from January 1, 2016 0:00 until August 17, 2017 23:00

[C] Data on electricity load from August 18, 2017 0:00 until September 9, 2017　(to be provided hourly)

<Other Data>

Data generally available to the public such as meteorological data, calendar data, etc. may also be used.

Weather data: http://www.data.jma.go.jp/obd/stats/etrn/index.php   (Japan Meteorological Agency website)

Calendar data: https://www.timeanddate.com/calendar/?country=26   (timeanddate.com)

* Areas covered within the scope of the contest are the Tokyo Metropolis and eight prefectures (for Shizuoka prefecture, only the area east of Fujikawa) that are located in the TEPCO Group's service area.

* The data used for Annual Forecast is the actual recorded data. In contract, the data that will be used for Actual Forecasts is predicted data. Participants should employ their own ingenuity and creativeness in collecting information such as weather forecast data.

[Task Schedule]

Step 1 : Receive data set [A] and begin analysis.

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Step 2 : Receive data sets [B] and [C] and improve the method.

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Step 3 : Set up API and trial forecasting.

By submitting trial forecasts to CUUSOO, participants can check their scores and rankings. Scores and rankings are updated hourly.

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Step 4 : Submit Actual Forecasts

Each day, participants will submit their following day forecast by the designated time. Points will be deducted if a participant does not meet the deadline or does not submit a forecast.

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Step 5 : Submit Annual Forecast and Report explaining the method

Participants are to email their submissions to the specified address.

■Contest Rules

<Rules about method>

・ All forecast data and report must be based on the same method.

・ As the goal is to create a fully automated system, methods requiring human hands or other human components in the structure or operation are to be avoided.

<Rules about Annual Forecast>

・ Participants are asked to be consistent in their forecasting so as not to use any future electricity load data unknown at the time the forecast is made (the data of 8 o'clock and after on previous day of each prediction day). If any misconduct or data errors during forecasting are found, the participant shall be excluded from the judging regardless of his or her ranking. In addition, please note that, if any mistakes or other errors are suspected, the participant may be asked to submit results from experiments using other data or other additional materials.

・ <Rules about Actual Forecast>

· Please make sure to submit in time for the deadline. If there is a date that has not been submitted during the period, score will be deducted. Submitting the results in advance is recommended.

■ Evaluation

Forecasting accuracy is the primary metric in this evaluation.

[Metric for Evaluating Forecasts]

Evaluations will be calculated based on errors found between the forecast results(fi) and actual load for electric power for the days and times forecasted(ai). Methods having fewer outright failures in the electricity load forecast are considered ideal. RMSE (Root Mean Square Error), which squares errors over the entire period to find the mean, has been adopted as the evaluation metric.

Root Mean Square Error

$$RMSE = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (f_i - a_i)^2}$$

N = Number of Forecast results / Actual demand
f = Forecast results
a = Actual demand

Predictability will be evaluated based on RMSE formula.

(A participant can check his/her rank of Actual Forecast among all participants during Actual Forecast Period.)

In addition, the evaluation will assume actual use of the method in operation and assess the method's versatility and its coherence based on the submitted materials and presentation (made by finalists).

【Judging Schedule】

1. Screening

Members of the External Judging Committee and TEPCO experts will evaluate participants based on their aforementioned submissions.

2. Final judging

Participants who submitted the top ranking sets will be asked to come to Tokyo to give a 15 minute presentation at the final judging at the end of September.

※The final judging results are scheduled to be posted on this website in early October.

【Judging Committee】

1. External Judges (researchers in affiliated institutes)

Head Judge

Yutaka Matsuo, Project Associate Professor, Department of Technology Management for Innovation, Graduate　School of Engineering, The university of Tokyo

Judges

Kazuhiko Ogimoto, Project Professor, Collaborative Research Center for Energy Engineering Institute of Industrial Science, The University of Tokyo.

2. Internal Judges (TEPCO Group's load forecasting experts)

Practitioners with ten or more years of expertise in the field

【Prizes】

Maximum total of ¥3,000,000 will be awarded in prizes.

Participants with top scores will be awarded. Participants who did not make the top rank but achieve high points and those assessed with high potential may also get special awards.

※If overall forecasts do not attain a certain level, then the participant may not be eligible for a prize.

※Regardless of the contest results, if a proposed method contributes to improving TEPCO Group's forecasting accuracy, the participant who submitted the proposal may be contacted at a later date to discuss possibilities for future developments.

■ Important Dates
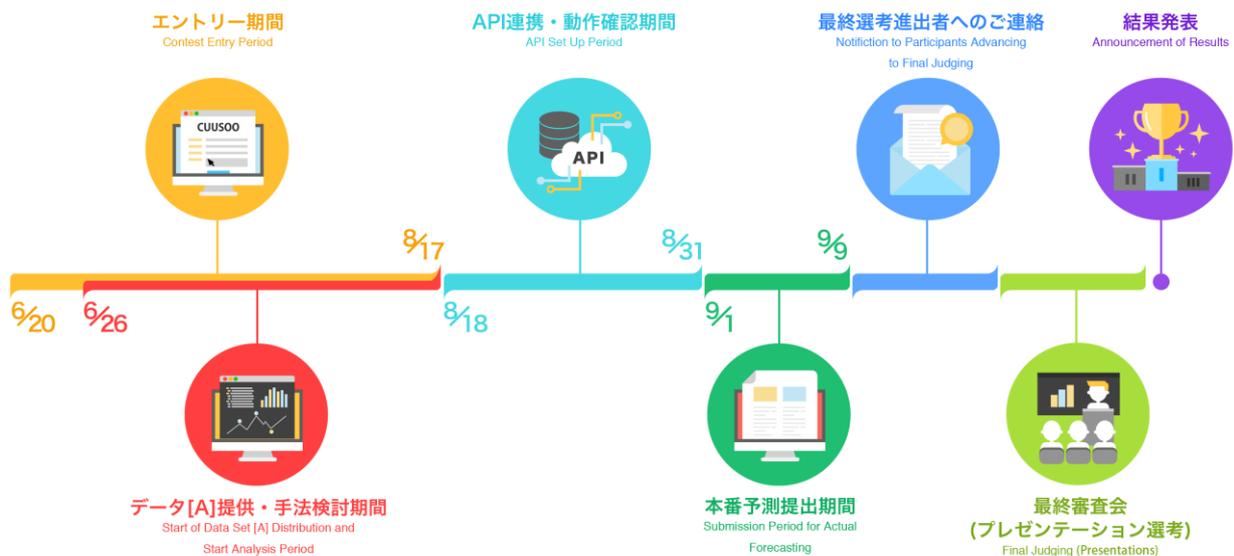
June 20 to August 17, 2017   Contest Entry Period

Persons wishing to participate in the contest may apply to do so over this website.

Applicants will be notified around 7 days after their application is submitted of the entry screening result.

If an applicant is not eligible for participation in the contest, that person's application will be rejected. (Please see the items pertaining to "Contest Eligibility" below.)

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June 26, 2017   Start of Data Set [A] Distribution and Start Analysis Period

Starting June 26, data set [A] will be distributed to those who passed the entry screening.

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August 18 to August 31, 2017   API Set Up Period

Data set [B] will be furnished and distribution of data set [C] will begin. In preparation for Actual Forecasting, participants are to use the API to verify operation of their methods.

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September 1 to September 9, 2017   Submission Period for Actual Forecasting

Each day, participants are to submit Actual Forecasts.

(Please note that the deadline for September 2 forecast is September 1, 8:00 JST. Likewise, the deadline for September 10 forecast is September 9, 8:00 JST) By the end of this submission period, participants are to submit their Annual Forecast and material explaining their methods.

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Late September 2017 Notification to Participants Advancing to Final Judging

Participants selected for advancement to final judging will be notified individually.

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End September-Early October 2017 Final Judging (Presentations) and Announcement of Results

Participants selected for advancement to final judging will give presentations in Tokyo.

(If a participant is unable to attend the final round in Tokyo, consideration will also be given to allowing presentations using Skype or other such tools.)

■Contest Eligibility

・People affiliated or associated with a company, university or research institute

Applications for participation may also be made by a group of people. In such a case, one representative of the group applies for entry.

■How to Enter the Contest

Click the Submit button at the bottom of the page to proceed to the entry form.

A CUUSOO account is required for all applications.

※Applications will be checked to verify that the aforementioned eligibility qualifications are met. If an application does not meet these qualifications, the application may be removed from consideration.

■Special Instructions (When submitting an application for entry, all applicants will be asked on the application form to consent to stipulations listed as special instructions.)

※Use of any furnished training data shall be limited to contest applications. Training data shall not be provided to non-applicants and its use is strictly prohibited for unauthorized activities. In addition, once the contest period ends, all furnished data shall be deleted.

※Participants are asked to consult the Contest Secretariat if they are considering using the method constructed for this contest or any results for a university graduation thesis, master's thesis, doctoral dissertation or submission of a paper to an academic society or other such organization. Preparation of a manuscript without such permission is prohibited. Also, inclusion of any furnished data as-is in a manuscript is not allowed. Applicants and participants are asked to consent to these stipulations.

※The TEPCO Group, people that the TEPCO Group deems necessary for judging, and the secretariat delegated by the TEPCO Group (TEPCO Town Planning Co., Ltd.・LiB Co. LTD) shall view and judge the submissions.

※Copyrights or other rights relating to submissions shall be retained by the contest participants.
※Top ranking participants understand that their names and other details about them may be published on this website or related websites.
※The TEPCO Group shall assume no liability whatsoever for any problems that arise between a participant and a third-party arising in regard to submitted content with respect to copyrights, image rights, privacy rights or any other legal rights, as well as any other problems whatsoever.

Please forward any inquiries about the contest by email to the Contest Secretariat.
Please note that, depending on the inquiry, the Secretariat may contact the inquirer directly with a reply.
The Secretariat shall not reply to inquiries related to judging.

Direct inquiries to: load.forecast.2017@cuusoo.com
(Contest Secretariat: TEPCO Town Planning Co., Ltd. ・ LiB Co. LTD)