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31 October 2019

Dear Ms Falcon,

Interim Reliability Forecast Guidelines Ver 1.0

ENGIE Australia & New Zealand (ENGIE) has actively and consistently participated in AEMOs planning and forecasting forums and welcomes the opportunity to contribute to the development of the interim reliability forecast guidelines.

ENGIE is a global energy operator in the businesses of electricity, natural gas and energy services. In Australia, ENGIE has interests in generation, renewable energy development, and energy services. ENGIE also owns Simply Energy which provides electricity and gas to more than 720,000 retail customer accounts across Victoria, South Australia, New South Wales, Queensland, and Western Australia.

It is important to note that the forecasting process will, at times, result in obligations on the market participants which will increase cost to consumers (i.e. by a shadow price of the constraint imposed on the market). For consumers to "get value for money" it is imperative that the forecasting process isn't overly conservative as this is likely to result in customers paying more without receiving commensurate benefits.

The reliability forecasting assumptions, including demand forecasts, will be used by TNSP (transmission network service providers) to assess network augmentations when applying the RIT-T process. Should these assumptions prove to be over conservative, unnecessary transmission augmentations will be built, or will be delivered earlier than required. Such outcomes will result in economic inefficiencies and will increase costs to consumers in excess of potential benefits.

Therefore, the reliability forecasting process must be fit for purpose, must be robust, transparent and most importantly facilitate learning by following the principle of continuous improvement.

ENGIE considers the planning forums facilitated by AEMO to be useful and suggests several changes to make them truly effective.

Issues documentation and resolution

Many issues were raised by participants in the various forums facilitated by AEMO. These issues were usually noted in the minutes but not necessarily addressed. On occasions issues were only partially addressed before being closed out by AEMO. The result is that issues are revisited, missed altogether, or on occasions, deferred to the next cycle of forecasts due to time constraints without the necessary follow-up.

To illustrate the problem, some of the unresolved issues are as follows:

- **Plant retirements** (economic vs timetabled) – It is inappropriate to use a notional timetable for plant closures in a "base case" and then also use it in more extreme/different scenarios (such as much higher level of renewables impacting plant financial sustainability). The impacts of these assumptions are pivotal to carbon emission reductions, new entrant mix and costs.
- **Demand growth** over time exhibits various lumps and significant widening of the "needle peak". This directly impacts unserved energy in reliability modelling and is highly likely to lead to overestimations of unserved energy. These issues were initially raised by ENGIE but subsequently raised by other participants and stakeholders.
- **Reliability assessment** - In relation to reliability forecasting, only illustrative examples of the loss of load assessment (by day, by time) were provided. Even though participants requested samples of actual modelling data, the current interim guideline document only provides the illustrative charts which are considered inadequate.

It is imperative to improve the issues management process by implementing an effective issues register. Several essential elements of such a register/process, are as follows:

- All issues/suggestions would be captured in the register
- The register would include responsibilities for actions and contact details
- Issues would be closed out according to an agreed process which would must involve the party/parties who have originated the issue
- Explanations for actions taken (or no-action) would be documented in the register
- Issues deferred to the next planning cycle would be automatically raised at the start of that cycle.

The overriding motto should be "fix the process, not the product". In this way collective intellect and expertise can be more effectively leveraged.

Recommendation: ENGIE suggests that AEMO implements an effective issues register process to manage a complete set of issues/suggestions related to its forecasting and modelling functions.

Need for complete documentation

ENGIE has raised the issue of incomplete documentation in several submissions to AEMO and the AER. The modelling process documentation and the methodologies for input data preparation and output data interpretation must be complete and must include reference documents from consultants/experts. These need to be available in a timely manner, ahead of the eSOO release and not weeks after its release.

One example of incomplete documentation is in the demand forecasting methodology. Participants need to have sufficient documentation to assist in duplicating or extending the AEMO modelling. At present, AEMO have provided a high-level methodology document but it is lacking detail and participants cannot use it to develop their own demand forecast. AEMO needs to demonstrate accuracy of the demand modelling using current demand and back casting. Full disclosure of the detailed analysis is essential for participants to gain confidence in the forecasts.

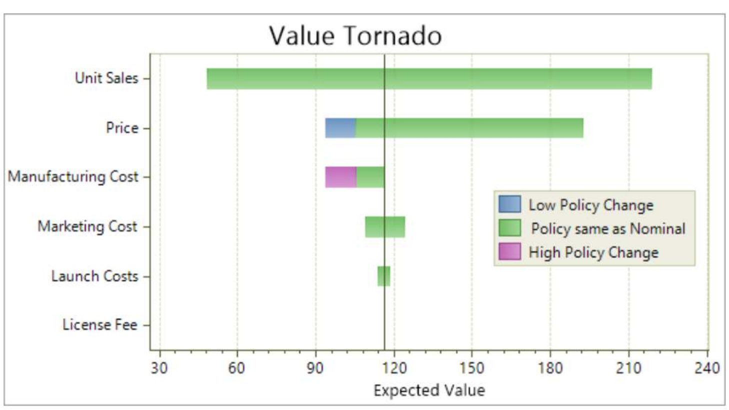
As a matter of principle, participants need to be able to quantify reliability impacts when they develop new scenarios or test sensitivities.

Engie notes that some elements are included in the draft document, in section "3.5 Quality assurance"; namely paragraphs 3.5.1 (c) and 3.5.2. Engie encourages this information to be made available as soon as practically possible to enable review by participants to ensure that information and methodology meet the agreed principles of transparency.

Recommendation: ENGIE encourages AEMO to provide full detailed documentation and also include any relevant reports and material from consultants in the earliest possible timeframe.

Working on the most important areas of the reliability forecast

The reliability modelling process involves a large number of inputs and configuration parameters. To work on the most important/most influential areas of the process is challenging. Tornado diagrams present an elegant way of determining what's most important. For a given change of input variables, the change in model output is arranged from the most to least sensitive. A simple illustration of this concept is presented below:



Recommendation: ENGIE encourages AEMO to examine the feasibility of using tornado diagrams when examining the output of the reliability modelling.

Statistical process control – don't move the funnel

Recently there was a move for AEMO to reinterpret forced outage data supplied by generators in response to a perceived increase in forced outage rates (FOR) in some regions in recent years. Unit outages are relatively infrequent and a number of major plant faults in Victoria alarmed AEMO. Reducing the data set to four years of history risks increasing modelled outage volatility and biasing data with recent outages by projecting "rare events" as more normal events.

It is imperative that statistical analysis ensures that:

1) The difference in observed outage frequency changes is statistically significant
2) Recent rare outages don't negatively over-influence plant reliability in future years. (ie When a piece of failed plant is repaired/replaced and this action is also applied to other units, then the reliability should in fact increase rather than decrease.)

Here is a quote by Dr Deming, the father of statistical process control that helped Japan improve product reliability post second world war.

> *Dr. Deming has said "If anyone adjusts a stable process for a result that is undesirable, or for a result that is extra good, the output that follows will be worse than if he had left the process alone."*

This concept is effectively illustrated by the funnel experiment, where it is left in one position or constantly adjusted for errors in hitting a target.

The distribution of outcomes changes and the spread of outcomes becomes more variable. A full description of the funnel experiment is provided in Appendix A.

The implication of this approach (moving the funnel/adjusting the historical FOR) are profound and most likely result in overestimation of the unreliability and hence the unserved energy.

Recommendation: ENGIE seeks for AEMO to re-examine the statistical methods when analysing FOR. The results of the analysis and full documentation of the methodology must be published as a matter of urgency. This analysis must inform AEMOs periodic reliability updates.

Continuous improvement, focus on what matters most

The draft document includes a section on forecast improvements which covers the production of a forecast accuracy report and production of a forecast improvement plan. Engie fully supports the principle of continuous process improvement which includes a "team effort" between AEMO and participants.

Recommendation: ENGIE suggest that the continuous forecast accuracy improvement be documented in more detail and participants engage early to facilitate meaningful and timely resolution of potential issues.

Summary

ENGIE seeks for AEMO to address short comings in the following categories:

- Issues documentation and resolution
- Need for complete documentation
- Working on the most important areas
- Statistical process control methods applied to FOR
- Continuous improvement

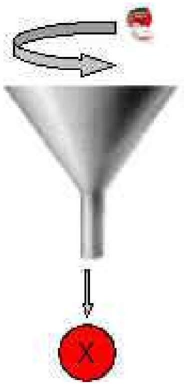
ENGIE looks forward to continuing to work with AEMO to advance the planning and forecasting processes and methodologies to ensure that value to customers is delivered and isn't compromised.

Should you have any queries in relation to this matter, please do not hesitate to contact me on, telephone, (03) 51 35 5040.

Yours sincerely,

David Hoch
Regulatory Strategy and Planning Manage

Appendix 1 - The Funnel Experiment

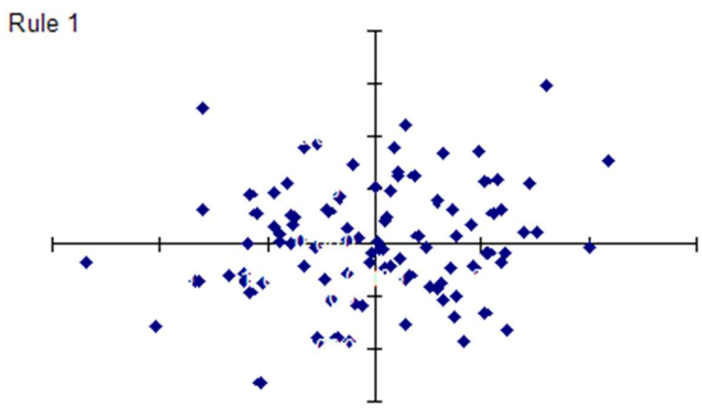


Dr. Deming has said "If anyone adjusts a stable process for a result that is undesirable, or for a result that is extra good, the output that follows will be worse than if he had left the process alone." This is often called tampering with the process. It is something that is done often by front line personnel and very often by management. This increases variation as well as losses in a process. Doing your best is no longer sufficient. You must know what to do.

An excellent example of over-controlling is the funnel experiment described by Dr. Deming. The objective of the funnel experiment is to drop a marble through a funnel and hit a target.A point on a level surface is designated as the target. A funnel is held a certain distance above the surface. A marble is dropped through the funnel. The spot the marble comes to rest on the surface is marked. This is repeated for at least 50 drops for each of four different rules.Each of the four rules is discussed below.

- Rule 1: Leave the funnel fixed over the target.
- Rule 2: For every drop, the marble will come to rest a distance "z" from the target. Rule 2 is to move the funnel a distance -z from its last position.
- Rule 3: Move the funnel a distance -z from the target after each drop of the marble that ends up a distance z from the target. Note that Rule 2 moves the funnel based on the funnel's last position. Rule 3 moves the funnel a distance from the target.
- Rule 4: Rule 4 is simply to set the funnel over where the last drop came to rest.

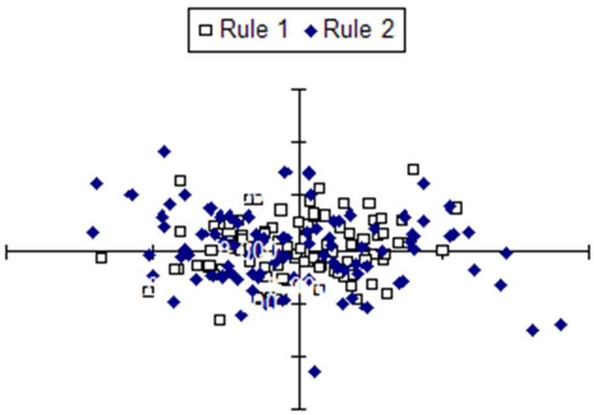
Rule 1



Rule 1 is to leave the funnel fixed over the target. The marble is dropped at least 50 times and the spot where the marble comes to rest is marked each time. The resulting pattern is shown in the adjoining figure. This is a computer simulation of 100 marble drops. The target is where the solid lines cross.

As can be seen in the figure, the variation is a rough circle and is stable. Surely we can do better than this! This circle is too big. Why don't we simply adjust the funnel after each drop so the next drop will be closer to the target?

Rule 2

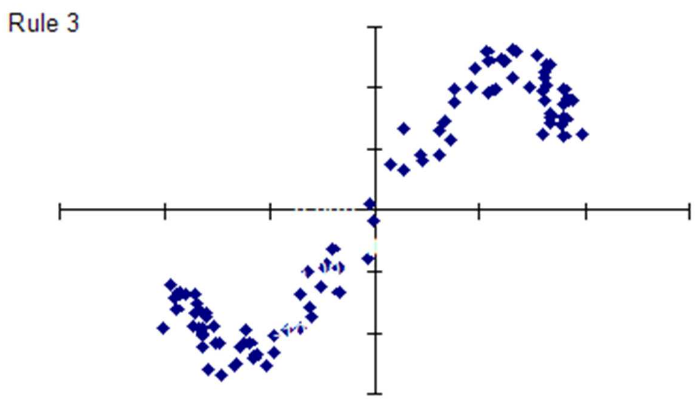


For every drop, the marble will come to rest a distance "z" from the target. Rule 2 is to move the funnel a distance -z from its last position. The resulting pattern based on the computer simulation is shown in the figure to the left where Rule 2 is compared with Rule 1.

As can be seen in this figure, the pattern for Rule 2 is also circular and stable. However, the circle is larger than for Rule 1. It is about 41% larger. Using Rule 2 actually increases the variance of the process by a factor of 2 over Rule 1.

Rule 2 is often used in business by people just trying to do their best. This is why it is important to understand the information in variation. By responding to variation that is common cause as if it were special cause, you are increasing the variation in your process.

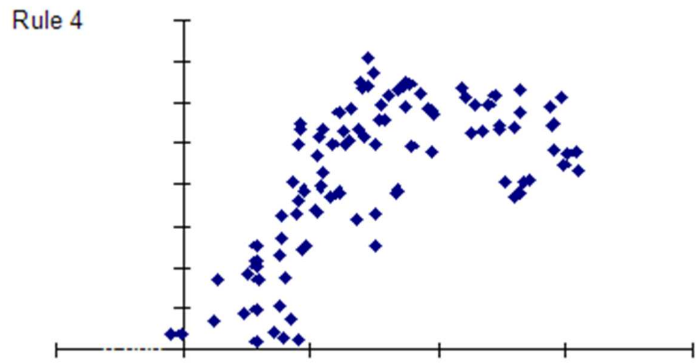
Rule 3



Rule 3 is to move the funnel a distance -z from the target after each drop of the marble that ends up a distance z from the target. Note that Rule 2 moves the funnel based on the funnel's last position. Rule 3 moves the funnel a distance from the target. The results obtained from the computer simulation for this rule are shown in the figure to the left.

Under Rule 3, the marble drop swings back and forth. The pattern looks similar to a bow tie. This is not a stable process. The amplitude of the swings will continue to increase.

Rule 4



Rule 4 is simply to set the funnel over where the last drop came to rest. The pattern for this variation is shown in the adjoining figure. Under this rule, the marble eventually goes off in one direction. It will not return. This is not a stable process.

Examples of the Rules

Dr. Deming lists examples of Rules 2 - 4 (see *Out of the Crisis* by W. Edward Deming, 1968).

Examples of Rule 2 include:

- Feedback mechanisms that respond to a single data point
- Adjusting a process when a part is out of specifications
- Operator adjustments without the aid of control charts
- Changing company policy based on the latest attitude survey
- Recalibrating instruments to a standard
- Adjusting the quota to reflect current output
- Using variances to set budgets
- Stock market reaction to last month's deficit

Examples of Rule 3 include:

- Illicit drugs. Enforcement improves so drugs become scarcer. The price goes up which stimulates the import of more drugs. The cycle repeats.
- Gambler increases his bet to cover losses

Examples of Rule 4 include:

- History passed down from generation to generation.
- Worker training replacements in succession.
- Adjustment of time of meeting based on last actual starting time.
- Use of last board cut as a pattern for the next board.
- Sitting in a circle with a number of people. One person whispers a secret to the next person who in turns whispers it to the next person and so on.

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