Submission in response to the Assessing DER Integration Expenditure Consultation Paper

Battery Storage and Grid Integration Program
Research School of Electrical, Energy and Materials Engineering, ANU College of Engineering and Computer Science
Research School of Chemistry, ANU College of Science

Bjorn Sturmberg (bjorn.sturmberg@anu.edu.au)

The Australian National University
Canberra ACT 2601 Australia
www.anu.edu.au

Introduction

We thank the Australian Energy Regulator (AER) for the opportunity to respond to the Assessing DER Integration Expenditure Consultation Paper (henceforth the Paper). The issues of integrating Distributed Energy Resources (DER) into our electricity system are of great significance to the reliability, security, sustainability, and affordability of the whole electricity system.

We strongly support the inclusive consultation process being undertaken by the AER, and are confident that it will contribute to improved outcomes.

Framing

Before turning to the specific questions raised in the Paper we wish to refocus the framing of the challenges of integrating DER into the electricity system.

The power system is a complex mix of topologies, technologies, and users, that is constantly evolving. Nowhere is this more the case than in distribution networks. We therefore caution against focusing too narrowly on any one technology (in this case solar photovoltaics) and rushing to conclusions about any single technology being responsible for network issues.

We also wish to emphasise that when it comes to managing power systems electricity generation and consumption are two sides of the same coin, and should be valued equally. The characteristics that we find more appropriate for analysing the integration of devices into the power system are the degree to which they are controlled - by an autonomous system or a market participant such as Distribution Network Service Providers (DNSPs) or retailers - and the degree to which they operate in a correlated manner with other devices.

Figure 1 illustrates the variation in control and correlation characteristics of common devices. Photovoltaic generation within a local area is, for example, highly correlated and (currently) uncontrolled. Devices such as electric hot water heaters are less correlated but provide some degree of control, while underlying demand - such as in typical households - is even less correlated but is also uncontrolled.

Recent history demonstrates how rapidly the composition of devices in the electricity system and the level of control offered by devices can change rapidly, as has occurred with solar inverter standards and battery control systems. It also highlights that the level of control is often dictated by commercial or regulatory conditions rather than fundamental technical limits.

Viewed from this perspective, the management of the power system and distribution network is seen as a matter of using the available pool of controlled devices to balance the net actions of the uncontrolled and variously correlated devices. This has been the case throughout history and remains true in the presence of DERs.

We believe that the long term interests of consumers are best served by a continual focus on such holistic, systems level thinking.

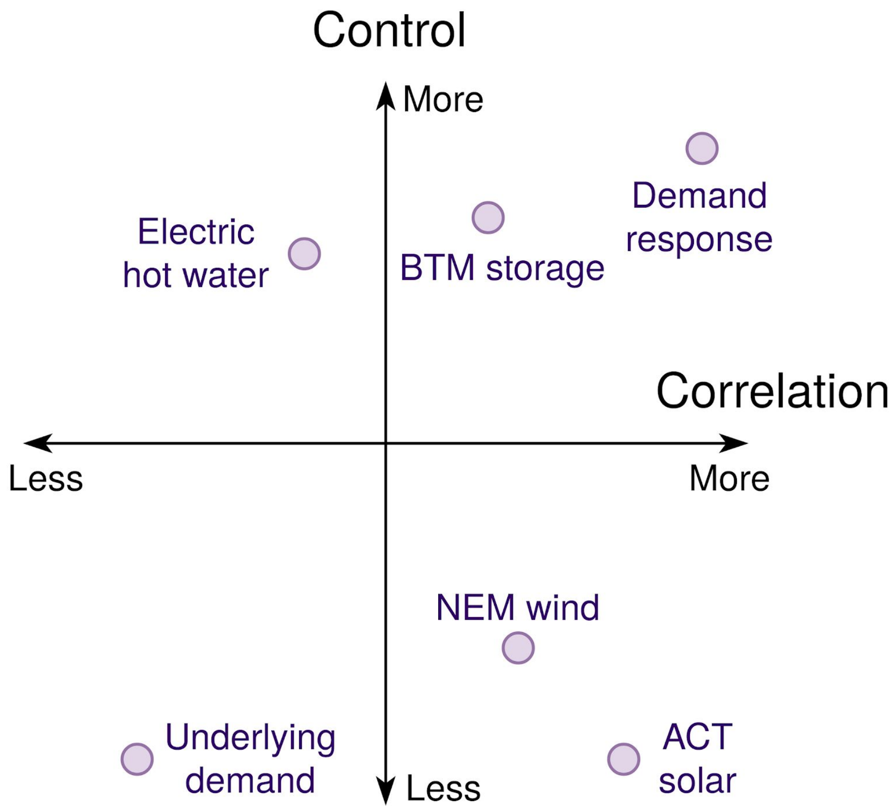

Fig. 1 Control and correlation of various types of demand and generation.

Consultation Questions

To us, the Paper raises four key challenges. We group our responses based on these themes.

Theme 1 - Are the Expenditure Forecast Assessment Guidelines and/or the Regulatory Investment Test – Distribution approaches appropriate and sufficient *(Q's i, ii, 2)?*

We believe that the combination of the Expenditure Forecast Assessment (EFA) and the Regulatory Investment Test – Distribution (RIT-D) provides an appropriate framework for DNSP investments into DER integration. They may be considered sufficient in scope however we believe they could be improved, particularly to ensure ongoing benefits for consumers.

Theme 2 - *How* should options be assessed? This includes the selection of data to be collected, what options should be considered, how should they be modelled, and on what metrics they should be assessed *(Q's 1, 3, 4, 6, 7, 9).*

These are difficult, interrelated challenges. We commend the AER on engaging with them and calling on the industry to contribute. As Australia continues to lead the world in many aspects of DER deployment and integration, we urge the AER and all stakeholders to aspire beyond good practice in pursuit of precedent setting **best practice**. We strongly believe that the long term benefits of doing so are worth the effort.

We do not purport to have easy answers to these challenges, but wish to put forward two principles to guide this work, and to illustrate these with a potential approach.

Principles

We believe that the two defining principles of best practice assessments are that they are **holistic**, covering the whole system and social as well as techno-economic aspects, and that they are performed and published **transparently**. These principles provide the best chance of building widespread trust and of handling the rapid inflection points that are likely to occur in technology costs, capabilities, and uptake.

Illustrative Approach

To illustrate how these principles may shape assessment methods we outline one potential approach. The approach centers on each DNSP maintaining a public catalog of scenarios that are relevant to their network. The motivation behind this is to minimise the duplication of effort from DNSPs and the AER in assessing equivalent situations across and within networks and to provide the public with visibility on the investments being made.

It is hoped that such a system would empower DNSPs and the AER with greater flexibility to adapt dynamically to evolving circumstances (rather than being bound by historic precedents or forecasts) while ensuring stakeholders have the information on which to assess the public benefit of decisions. Such collaboration from stakeholders would enrich the options available DNSPs and the AER at no extra cost.

Below we present a high level sketch of such an approach:

1. DNSPs taxonomise their network into segment types.
2. DNSPs develop representative models of each type class.
3. DNSPs deploy monitoring in a small number of network segments representative of each class.
4. The representative models and suitably anonymised data are shared publicly.
5. DNSPs and the AER assess investments based on modelling each class of network segment, potentially establishing precedents for how certain issues are best addressed for common situations. These precedents can then be applied in other locations and at other times, including in other DNSP networks. Stakeholders are empowered to carry out independent assessments of scenarios using their own assumptions and applying their chosen metrics for stakeholder costs and benefits.

Theme 3 - Standards *(Q's 5, 10).*

We strongly support the nationwide adoption of standards for communication protocols and interfaces. These are absolutely essential for realising the potential of DERs at scale. As noted in the Paper, there has been extensive work done overseas, particularly in the US (California continues to show leadership) and the EU. We are working with numerous DNSPs to deploy Distributed System Operator (DSO) functionalities using the IEEE 2030.5 standard and would be pleased if this were adopted nationally.

Theme 4 - How to reconcile the rapid evolution of DERs with the long lifetimes of network assets *(Q 8).*

As outlined in the Paper, it is extremely difficult to judge the cost-benefit balance of investments in assets with 65 year lifetimes when conditions are going to change dramatically within this timeframe. The Paper raises the potential of favoring smaller investments in shorter lived assets by explicitly valuing the flexibility that they provide to reassess options at a nearer point in time (for example 10-15 years in the case of batteries).

We suggest that another aspect to consider when assessing the "option value" is the range of future scenarios that are compatible with an investment. Continuing with the example of a battery, this asset may provide value in the short term by managing high reverse power, as well as providing value in future scenarios featuring large numbers of electric vehicles and large power imports.

We believe that such option values are very significant during times of rapid transitions and should be given considerable weighting in decision making. The best methodology for doing so are likely to be built around scenario modelling.