

ARENA



ARENA INSIGHTS SPOTLIGHT: INTERNATIONAL REVIEW OF VEHICLE TO GRID TECHNOLOGY: AN INTERVIEW WITH ANU

FEBRUARY 2021

INTRODUCTION

The Realising Electric Vehicle-to-Grid Services (REVS) project seeks to unlock the full economic and grid benefits of vehicle-to-grid (V2G) services in Australia.

The REVS project will install 51 bi-directional chargers and deploy a fleet of 51 V2G capable vehicles in the ACT. A system will monitor charger and vehicle availability, as well as a range of electrical parameters, which will enable the delivery of market contingency Frequency Control Ancillary Services (FCAS) at a fleet scale.

The project aims to demonstrate V2G technology providing contingency FCAS to the NEM, complemented with a holistic roadmap for the mass deployment of the full value stack of V2G services. This will lead to new V2G enabled service offerings for fleets and residential customers.

As part of the project, knowledge sharing partner ANU are delivering studies and reports to assist all the various actors from the transport and electricity sectors to understand the roles and opportunities V2G technology brings for them.

In this interview, Bjorn Sturmborg discusses 'The A to Z of V2G' report, which provides a comprehensive review of international V2G projects, exploring the benefits and challenges of V2G technology.

INTERVIEW WITH:

BJORN STURMBERG

RESEARCH LEADER, BATTERY STORAGE AND GRID INTEGRATION PROGRAM,
THE AUSTRALIAN NATIONAL UNIVERSITY

ARENA: THE STUDY NOTES THAT EVEN IN COUNTRIES WITH HIGH EV ADOPTION, V2G LEVELS ARE LOW - WHY IS THAT?

BJORN: I think the main reason is novelty. V2G represents a radical departure from the capabilities of internal combustion engine (ICE) vehicles. It thereby represents a fantastic opportunity, but also poses a daunting challenge for car companies to engage their customers in whole new conversations about a subject - electricity - that's far outside of their traditional wheelhouse. For electricity providers it is likewise unfamiliar grounds to talk to customers about their vehicles. So what we've seen is car companies choosing to focus on assuring customers that EVs can fulfill the functions of ICE vehicles, rather than venturing into conversations about V2G or other ways in which EVs transcend our traditional conceptions of vehicles, which may risk confusing or unnerving customers. This has created a critical gap in our understanding of what customers may value about V2G services - are they interested in V2G as a financial proposition, or for backup power for homes (V2H), or meeting net zero objectives of businesses or buildings (V2B)?

I think Tesla have shown the power of creating new narratives about EVs and that it's unhelpful to narrowly frame EVs in relation to ICE vehicles (though Tesla have not gone as far as V2G). I get the sense that the industry as a whole is maturing in confidence - having proven the basic functions of EVs - freeing them to embrace in the more novel upsides of EVs, including the varied uses of V2G that we discuss in the report.

ARENA: WHAT IS THE MOST SURPRISING THING YOU LEARNT DEVELOPING THIS STUDY?

BJORN: I think a point that's stood out to me is just how much value batteries can bring by simply having stored energy available (that can be delivered extremely rapidly), rather than the quantum of energy that passes through them. This may seem self-evident, but it's surprised me to see how many applications draw upon battery energy rarely, but place a very high value on the insurance of having stored energy available. These include grid frequency management, uninterrupted power supply for buildings, backup power for homes, the delivery of power to disaster areas.

This aspect of batteries is important to highlight because it radically reduces concerns about battery degradation due to extra battery cycling. Another clear finding of our report, which may also surprise some readers, is that the number of cycles is not as important to battery longevity as the conditions under which cycles occur. Of primary importance are the temperature and the rate at which power is drawn from, or injected into, the battery, both of which are typically more intense during driving than during V2G use.

ARENA: WHAT DO WE KNOW ABOUT EV OWNER ATTITUDES TO V2G? WHAT FACTORS DO THEY CONSIDER IMPORTANT?

BJORN: Our review found that little is known about EV owner attitudes to V2G. What studies there have been suggest that owners (and citizens more broadly) don't really have much of a conception of what V2G is or means to them. We see this as an exciting opportunity. It's rare to have a blank slate on which to create meaning and shape the utilisation of a new technology. For this process (and technology) to be successful, it will need to be inclusive of both transport and electricity sector voices as well as citizens and policy makers. Some of the early factors that will need to be addressed are assurance around having sufficient charge in vehicles when they're needed for driving, trust in the service providers that are being given partial control of vehicle charging (this holds for managed uni-directional charging also), and the owner's ability to feel in control of setting the level of access granted to service providers.

ARENA: HOW CAN MARKETS ADAPT TO ENABLE MORE V2G?

BJORN: V2G will benefit from market updates that more fully value the increasingly critical roles of energy storage to provide fast, flexible, and on demand power supply (and demand). Markets for these services include system services such as frequency control and demand response, network services such as voltage and congestion management, and financial services such as generation firming and hedging. The move to 5 minute settlement is one local example of a positive step in this direction. Australia can also learn from overseas markets, particularly those where network services are used much more. The Piclo Flex platform in the UK is a great example of this, with over 10GW of capacity available to be procured for distribution services through a transparent market.

WHAT DO YOU THINK IS THE MOST IMPORTANT FACTOR TO ADVANCE V2G TECHNOLOGY?

BJORN: The crux for V2G technology, and where I see the greatest opportunities for ongoing improvements, is bi-directional chargers. These are still in an earlier phase of the technology development curve than many of the other power electronic converters used to connect generation and storage to the power system and as such lag behind in their functionalities and cost. In particular, there is more work to be done to enable a greater range of grid support functionalities, such as reactive power support, and building backup power functionalities, such as grid forming and UPS. There are also exciting proposals to use EVs' onboard converters to provide these functionalities, which would enable them wherever a vehicle is, and would do away with a major cost. In addition to V2G technology, our report stresses the crucial work that needs to continue to develop customer value propositions and business models.

ARENA: WHAT KNOWLEDGE CAN READERS EXPECT TO LEARN FROM THE REVS PROJECT THIS YEAR?

BJORN: Our first report - "The A to Z of V2G" - provides a comprehensive review of the technical, economic, and social dimensions of V2G, anchoring the discussion on the values V2G can deliver to users and what the electricity and transport sectors need to do to service these values. It concludes with a shortlist of 16 recommended actions for accelerating the V2G journey. In the remainder of the year, we'll be publishing updates on our social inquiry into stakeholders' visions for V2G and the testing of our V2G chargers' frequency response in the DER Lab at the ANU. In early 2022 we'll have more results on our business model innovation work and real world of the V2G chargers.

Further information is available at
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