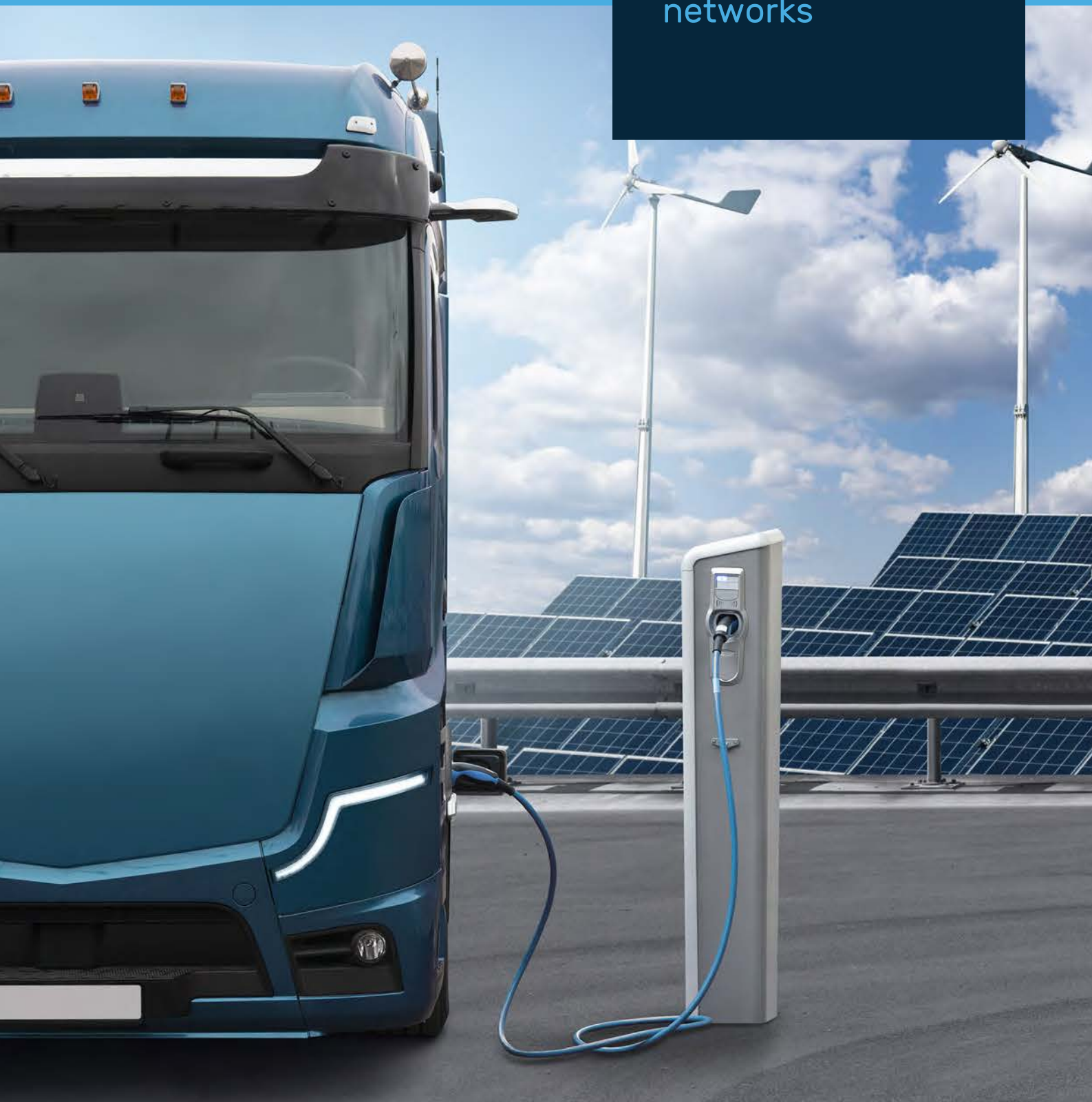
EVENERGI

GRIDFLEET™

Granular modelling tool for predicting the impact of electric vehicles on distribution networks



Background

GridFleet™ is a granular modelling tool for predicting the impact of electric vehicles on distribution networks. It has been successfully utilised by many major Distribution Network Service Providers (DNSPs) in Australia since 2018. The Australian Energy Regulator is familiar with the GridFleet™ outputs and trusts the accuracy in Evenergi's modelling of entire DNSP networks.

The GridFleet™ platform comes with pre-configured integrations to thousands of data points from sources such as the Australian Energy Market Operator (AEMO), Australian Bureau of Statistics (ABS), Open Street Maps (OSM), Google and others. It has also already been set up with data specific to many DNSP distribution areas. Completing this work internally is possible but unlikely to reach the same level of detail without a significant investment in resources. The average cost to utilise GridFleet™ is typically less than half of one full time analyst headcount in any DNSP. The average time taken to produce the model in house is 12-18 months. GridFleet™ goes further, deeper in analysis, and takes around 1-2 months to complete, including thorough quality assurance checks and collaboration with the DNSPs forecasting, asset planning and other stakeholders.

The model is driven by real-world inputs such as quantities of buses, demographic data influencing EV uptake in a postcode area, and population growth for specific geographical areas (including development or growth areas). Multiple sources, some difficult or impossible to access by DNSPs themselves, are used for the area being modelled.

GridFleet™ enables DNSP forecasting teams to spatially allocate power demand to specific geographical areas. It uses real, catalogued and emulated data to create load curves for summer, winter, weekdays and weekends and worst case peak scenarios. Every postcode will have a different makeup by typology of bus, fleet, public DC fast charging, car park and residential charging. Recent modelling for an Australian DNSP has shown that due to influxes of tourist traffic during holiday periods the EV charging demands could reach as high as 4.2MW by 2030, adding to other peak holiday loads. An insight that was not achievable using existing modelling processes or tools.

The model has been designed to be entirely configurable for forecasters to enable them to manage and modify escalators for all assumptions. It also has a powerful scenario analysis tool that enables the user to modify high-impact assumptions such as time of use tariff impacts.

What is the problem we are addressing for forecasters?

The GridFleet™ tool has been significantly updated after detailed analysis and lessons learnt by engaging in infrastructure planning projects with the NSW, SA and Federal Governments. Deep insights have been gained on the way in which public charging infrastructure is rolled out, impacts of grant funding programs, site selection, charger ratings and types. This experience has given Evenergi real first-hand experience in how charging infrastructure is planned and developed. The latest version of GridFleet™ offers several new features, including enhanced reporting capabilities, a more user-friendly interface, enhanced data visualisation capabilities and additional features that make it easier to identify and diagnose network issues. GridFleet™ has been developed through years of experience working with DNSPs and complements the projects and insights developed within their individual environments.

Improvements in the quality of data and its extraction process

The latest version of GridFleet™ has improved algorithms for extracting data from open source databases, which results in more accurate, reliable and consistent data. This would be difficult to replicate.

The software has been successfully integrated with a global point-of-interest POI dataset referred to as the OpenStreetMap, to make it region agnostic and faster to collate data. This means that the software can now be used in any part of the world without having to worry about different regional datasets. Additionally, the speed at which the data is collated has been significantly improved, making it faster for users to get results. In our prior modelling the data collation process might take over a month, now it is a matter of 1-2 weeks.

The development of more accurate algorithms has allowed for the precise modelling of charging operations by EVs at specific geospatial locations. This improved precision is due to the ability of these new algorithms to accurately allocate the nature of points-of-interests (POIs). The algorithm initially identifies the locations of all the parking lots in a postcode before classifying them according to the closest POI. With the help of this functionality, charging requirements for each category of POIs can be precisely predicted. As a result, DNSPs can better plan and manage the charging infrastructure needs arising from increased EV adoption.

The charging profile inputs for the residential typology have been updated based on the practical arrival patterns of vehicle drivers at home. This change has been made using vehicle travel survey data in Australia. The new inputs will better reflect how people charge their electric vehicles and should result in a more accurate simulation of EV charging behaviour.

Addition of functionalities

The latest version of GridFleet™ includes new functionalities that allow users to better analyse and visualise their data. These new functions include tools for comparing technical parameters, identifying outliers, and creating insightful graphs that can be used in regulatory submissions.

- Estimation of number of registered EVs by postcode where actual databases are not available. Demographic data is used to estimate an adjusted EV uptake in a
- postcode. DC fast charging model has been refactored based on learnings from real-world public charging infrastructure deployments.
- DC fast charging model has been refined in the way station utilisation is modelled In addition, the algorithm also accounts for differences in charger type (slow and fast) and location (urban vs suburban), both of which can have a significant impact on utilisation
- Peak demand day simulation has been added as a new feature. This allows DNSPs to model the impact of increased EV charging demand on the distribution network by identifying locations with abnormally high peaks due to holiday traffic and ambient conditions. The tool can help identify hotspots where upgrades or reinforcements are needed, especially in areas where existing grid infrastructure may be weak.
- The GridFleet™ tool is now enhanced to understand the amount of flexible load available from EV charging that could potentially be used to mitigate minimum demand days where solar generation is high and load on the network is typically low.
- The development of an energy model which is interrelated and complementary to the peak power model was one of the major improvements made to the forecasting tool. This allows forecasting teams to analyse the impact of additional energy volumes on the network due to EVs and how this could impact classification of customers across different tariff classes. Increases in energy volume consumed impact the tariff that electricity customers are assigned, meaning the addition of EVs will cause customers to shift to different tariff classes with different cost structures. This information is critical for DNSPs in tariff-setting activities.

Improvements in processing the model

The processing time for running simulations on a large number of geographical regions has been significantly reduced with the latest release of GridFleet™. This has been done through optimisation of core algorithms and allows users to run more complex simulations in a shorter amount of time.

By using complex algorithms and current data wrangling tools, the processing time of models to produce the outputs has been significantly improved. It used to take 5 mins per postcode to process all five typologies. This processing time is now reduced to 0.06 mins per postcode, approximately improving the efficiency of the model by 100%.

Improvements in data visualisation

Data visualisation is an important tool for understanding and analysing data. By creating visual representations of data, we can see patterns and trends that would be difficult to spot in a table or spreadsheet. Data visualisation can help us understand complex concepts, identify relationships between variables, and discover new insights. It can also be used to communicate information clearly and effectively.

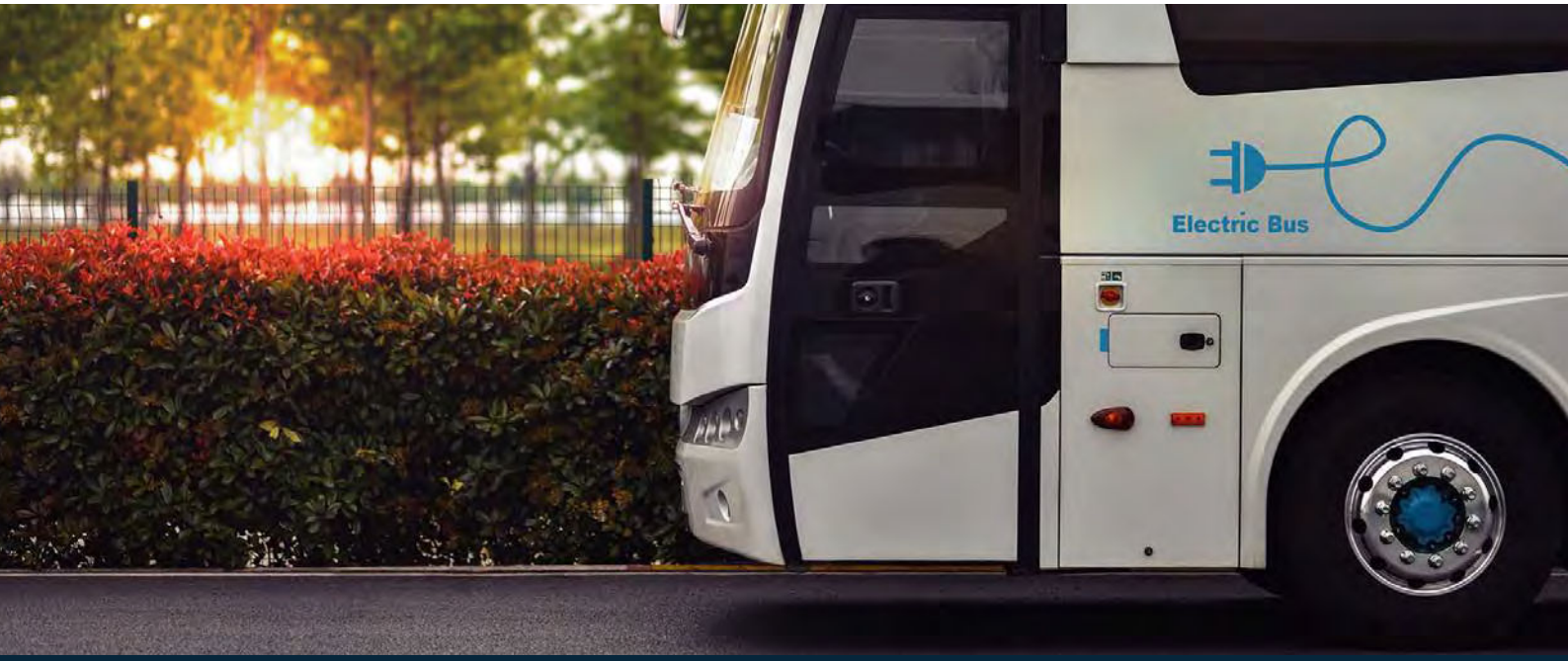
GridFleet's™ graphical user interface has been completely redesigned with the latest release. This provides users with a more intuitive way to explore their data, find trends and identify outliers. This includes geospatial mapping of datasets to help identify network hotspots and streamline the output quality assurance process.

The updated version of the GridFleet™ tool is equipped with several data visualisations for in-depth analysis of huge sets of data. The key parameters that can be visualised are:

1. *Load profiles by time of day, by year, by typology, by profile*
2. *Vehicle uptake by typology, by year*
3. *Load profiles plotted on a geographical map, to identify hotspots*
4. *Plugs per 1000 EVs ratio by year, by typology for public charging*
5. *Comparison of EV uptake by typology forecasted by GridFleet™ tool against the EV uptake forecasted by AEMO*
6. *Geographical maps of EV charging hotspots*

Improvements in validation checks

With each new release, GridFleet's™ validation checks are becoming increasingly sophisticated. This ensures that all results generated by the tool are accurate and reliable. These results are validated against scientific literature, international studies and local surveys in similar areas of study.



GridFleet™ and your next regulatory submission

Contact Evenergi to discuss how we can help with your regulatory planning submissions and post-model adjustment needs. There is no other tool that can provide the level of deep insight in EV charging behaviour, extremely quickly and that has already been used by other DNSPs for their AER submissions.

FURTHER INFORMATION

Contact: Max Zaporoshenko
Email: maxz@evenergi.com
LinkedIn: linkedin.com/in/max-zaporoshenko-a014647
Mob: +61 407 479 639

Evenergi.com