**Charging Ahead – Powering eBuses**

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| Electric buses (eBus) have seen gains in energy density and subsequently range. But just how many new generators do we need and how do we actually charge those 350km eBuses (and some eFerries)?  WSP has developed a ***Battery Optimisation Life Cycle Tool*** (BOLT) which incorporates data from heavy vehicle manufacturers (rolling resistance, wind resistance, drivetrain, chassis and battery information etc.) the physical environment (GIS, traffic, road data and topology, bus routes and passenger loading etc.) as well as system information (grid power supplies, transformer and charger efficiency, battery capacity and degradation) with the vehicle scheduling and driver behaviour to accurately predict the energy demand of the system.  Application of BOLT in the Zero Emission Electric Bus in Canada, USA and NZ has an accuracy of 4% which provides confidence to fleet owners and electrical infrastructure on the energy demands.  Further work has resulted in a BOLT Post-Processing tool (BOLT-PP) which enables fleet owners to examine the impact of vehicle, battery and charging equipment choices when coupled with charging strategies (such as after-hours, fast or on-route charging.) This impacts both capital and operational costs and is an effective tool in forward planning both for the fleet owner (number of eBuses and chargers) and the Electrical Utility Networks (upstream reinforcement, zone substation demand and 11 or 22kV local transformer requirements and their subsequent utilisation.)  Using this tool, WSP has been involved in a number of eBus depot charging and on-route (fast charging) systems for bus operators as well as an Auckland-wide study for AT and Vector to establish the future power.  WSP is further testing assumptions for eFerry applications and Hydrogen systems – all of which use substantial electrical power to replace fossil fuels and will further require grid infrastructure upgrades to meet the low carbon future. |