# Draft submission to InfraCom's Strategy Consultation Document

## 1 Scope

**Priority areas 1-3**

Our comments relate both to **Priority 1, Building a Better Future**, and to **Priority 3, Creating a Better System**, and specifically to **Priority 2 Getting the price right** and **Priority** 4 **Supporting a zero-carbon economy and preparing for climate change**, notably in electrification of transport and related infrastructure.

## 2 Specific questions

### 2.1 Discussion Question 4: Building better futures

The six areas you identify as requiring change seem well considered to us.

The first three (Prepare infrastructure for climate change; Transition energy infrastructure for a zero-carbon 2050; Adapt to technological and digital change) are interconnected, thanks to technology. Wireless charging technology for light EVs is almost upon us. It will drive further investment in renewable energy generation, but has implications for the location of new wind and solar farms, since it makes sense to position generation close to demand.

If static wireless charging is initially delivered to bus and taxi fleets through taxi ranks and bus stops, installing small-scale solar generation in the city (e.g. from available rooftops) will create a micro-market within the city. Systems suited to proprietary bus charging could start to be implemented from 2022. Taxi systems in dedicated parking areas (off road) could be deployed post 2022, while in-road charging at taxi ranks could begin within 5 years.

Parking buildings could offer stationary EV charging during the day from their own solar panels.

For example, a parking building at the airport could cover about 7500sqm with flat panels mounted on top. It can provide 10MWh a day in January and 3.3MWh a day in June. Batteries are needed to capture this energy and make it available as needed.

If each park is designed on average to provide level 2 charging (some may provide level 3 11kW some 3kW and some 8kW) and averaging this to 5MWh, then 625 cars could be continuously charged over the course of a day.

However, cars are typically parked from 7am -7pm so. If only charging half the day, then we can charge 1250 EVs continuously at the average Level 2 rate.

The rate-limiting step will be the installation of small-scale solar generation, not the installation of wireless charging, since solutions already exist that do not require the road to be excavated. But if investors are given sufficient confidence, we could expect to see these solutions deployed in our largest cities from 2023 onwards. This will drive down the cost of solar installations and hasten the decarbonisation of the transport fleet.

New windfarms located near cities will become economically viable once dynamic wireless charging becomes feasible, say from 2035.

Road use is lumpy: some 2-3% of roads carry 25% of traffic. This implies that transport planning should consider which existing roads, e.g. arterial routes in Auckland, would benefit from retrofitted installation of dynamic charging of EVs in one lane. The technology solution will drive faster uptake of EVs and better demand management of the most congested routes. Other demand-management tools such as congestion charging would further stimulate mode switching and allow Auckland city to make progress towards its carbon-zero goal. This approach will become feasible from 2035, and speed up the switch to EVs.

**Counterfactual.** The alternative is to rely on powering EVs overnight. Each New Zealand house is designed for 2 kW demand, but at that rate it would take 30 hours to charge an EV from depletion. Overnight charging requires 8-10 kW to charge a depleted EV. Not only will this ramp up domestic electricity demand by a factor of 4, it will require transformers to be replaced across the network to handle the increased load. Some of this demand could be offset by domestic solar generation.

But daytime EV charging achieves two things:

- it keeps batteries topped up to a good state of charge during the day (eliminating downtime for fleet owners and reducing range anxiety for all)
- it provides demand during the hours of peak supply of wind and solar, allowing demand to exactly match fluctuating supply, without storage losses.

The toughest part of the transport fleet to decarbonise is undoubtedly heavy vehicles. New Zealand is a long, thin country, and a good deal of our freight is transported by road. Completing the electrification of the main trunk and transporting more goods by rail will assist with decarbonisation. But each railhead is the node of a road distribution network. Within cities, road transport is more practical.

New technology for providing ultrafast charging for heavy vehicles is still <10 years away. The benefits of such technology is that the battery weight for each vehicle can be reduced. In-road dynamic charging on the main arterial routes will reduce the amount of time that must be spent charging. Both will improve the value proposition for transporting goods using heavy duty EVs. It seems likely that green hydrogen will also be part of the solution to decarbonise heavy transport, and that the zero-carbon solution will comprise a mix of options.

Accurate costings are important. It is important that planners and investors can factor in the true cost of carbon. But carbon is not the only cost to be considered. Understanding the true cost of the negative externalities of internal combustion engines, such as the effect of air pollution on people's health, will assist rational decision-making.

**2.2 Discussion question 5**

The answer to your question about encouraging low-carbon journeys is multi-faceted. Some aspects we have covered above. Safety of pedestrians and cyclists is important: only if people feel safe will they be prepared to mode-shift.

Safety should not be construed too narrowly. Pedestrians and cyclists are impacted by vehicle emissions, including $NO_2$ and ozone, which can cause asthma, and PM 2.5 emissions, which have been shown to cross the blood-brain barrier. PM 2.5 particles have been found on the foetus side of the placenta. Air pollution cases premature deaths and chronic illness. Accelerating the switch to EVs will clean up our dirty air and make walking and cycling both safer and more pleasant.

**2.3 Discussion question 5**

You suggest that New Zealand may need to build spare transmission capacity to encourage the growth of future renewable generation. Our modelling suggests that the switch to EVs will be facilitated by significant investment in small-scale generation. Efficient charging of the heavy-duty transport fleet will require new investment in larger renewable generation, ideally located close to HD charging hubs. Our modelling shows two alternatives:

- many high-power charging stations, each charger >1 MW power, or
- more in-road dynamic charging, with fewer high-power charging stations.

**2.4 Discussion question 15**

Our Māori research partners have indicated their interest in investing in renewable generation as part of their transition to low-carbon future. The Māori concept of

kaitiakitanga in respect of Papatūānuku, and the commitment to intergenerational planning horizons are relevant.