

# Electric Vehicle Infrastructure Strategic Planning

## Executive Summary

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Renewable Energy Vehicle Project



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(Photo from fastned.nl)



## Executive Summary

### Necessity of a State-Wide EV Charging Infrastructure

1. This report was compiled at the request of the WA EV Working Group – Infrastructure Sub-Committee in response to the MOU for Sub-National Collaboration on Electric Vehicles.
2. All stakeholders interviewed have acknowledged the significant potential economic, technical, and health benefits of Electric Vehicles (EVs).
3. It is generally accepted that a state-wide DC fast-charging infrastructure is required to make EVs mainstream and to allow EV owners to travel state-wide. It will give potential EV buyers more confidence in the technology and boost EV uptake.
4. WA has currently just 13 publicly accessible DC charging sites, plus 1 Tesla-only site:
  - UWA operates one site in Crawley with 1 x 50kW
  - City of Swan operates one site with 1 x 50kW
  - RAC funded 11 sites between Perth and Augusta with 1 x 50kW
  - Tesla has one site in Bunbury with 6 x 125 kW (*exclusive use for Tesla vehicles*)In comparison, the whole of Australia has 57 DC charging sites (plus 22 Tesla-only), while New Zealand has 169 DC charging sites (plus 6 Tesla-only).  
In Australia, 43 BEVs share a DC charging site, in NZ 26, in Japan 14, and in China only 11.
5. There is a necessity to act now on EV charging infrastructure, as new generation EVs with longer range, shorter charging times and lower total cost of ownership are being imported.

### Electric Vehicle Uptake in Western Australia

6. The current uptake of EVs/PHEVs in WA is still very low (about 0.1% of new passenger vehicle sales), but major growth is likely, as in most other countries. Without introducing any incentives, we expect that EVs/PHEVs sales will reach 1% of all new vehicles in WA in the year 2022, and that they will reach 1% of the WA vehicle fleet around 2025/2026. If incentives are introduced, then these uptake rates can be reached significantly earlier. At present, WA is behind the rest of Australia in terms of EV uptake rate by a factor of two.
7. Published predictions of future EV uptake show large discrepancies. This reflects the current high level of growth uncertainty in this market. Favourable policies can quickly change EV growth scenarios, as best demonstrated in Norway (with EVs being 52% of all new vehicle sales) and California (5% of all new vehicle sales).
8. Availability of EVs in the low and medium price ranges, including second-hand cars, and the variety in EV models play a major role in customer purchase behaviour.
9. Many automotive OEMs are reluctant to introduce their new EVs into Australia as they perceive the market to be weak due to the lack of subsidies and the lack of political support.
10. Truck electrification is expected to occur at a slower pace than the electrification of the light and passenger vehicle market. The short-haul truck segment (up to 200 km) will be first to be electrified, while the long-haul truck segment will rely on fossil fuels for a longer period, and may adopt other EV technologies, such as overhead power lines.
11. Electric buses are expected to enter the market before electric trucks and possibly even before electric light vehicles. Specific charging stations for buses will be required. Depending on their daily routes, these can either be slow-AC for night-charging or fast-DC for charging during operational hours.
12. Fuel-cell electric vehicles (FCEV) are emission-free if their hydrogen is generated with renewable energy and may play a role in long-haul trucks, but face a number of challenges:
  - FCEVs require about 3 x the energy per km compared to an EV and cannot be charged at home
  - FCEVs require an expensive station network at ~\$2 million per station (~\$5 million incl. H<sub>2</sub> gen.)
  - FCEVs and modern EVs are about on par in terms of range and filling times

## Charging Station Technology

13. Only fast-DC charging technology can enable longer daily trips for EVs.
14. Standards Australia has so far not proposed any EV charging standard.
15. Combined Charging System Type 2 (CCS-2), norm IEC 62196-3, is the recommended choice for the proposed state-wide charging grid. All new fast-chargeable EVs (incl. Tesla 3) currently being imported into Australia support this standard. Power levels for CCS-2 range from 50 kW to 350 kW per station (with prototypes at 475 kW).
16. Japanese standard CHAdeMO (currently limited to 50 kW) is suggested to be included as an additional charging outlet to support legacy cars. All charging station manufacturers offer combined CCS-2 / CHAdeMO stations that meet the requirements of all fast-chargeable EV models currently on the Australian market. This is also installed in other jurisdictions.
17. A power level of 150 kW or above should be used wherever the existing electricity grid is capable of supplying this.
18. With charging stations placed at a 200 km grid, driving this distance will require around 37 kWh (at 185 Wh/km). The recharging time under ideal conditions (constant energy flow, no cooling requirements) will then be:
  - 44 min at a 50 kW station
  - 15 min at a 150 kW station
  - 6 min at a 350 kW station

In practice these times can be significantly higher, as many EVs cannot sustain charging at the highest power level, e.g. due to batteries heating up from driving and charging. DC charging normally stops at an 80% charge level, as any further charging will take disproportionately long.

19. While most 2019 EV models are limited to charging at 150 kW, it is expected that most 2020 EV models and onwards will be able to charge at 350 kW (already confirmed by some OEM).
20. Multiple (minimum of two) charging bays per site are required in order to have some redundancy against equipment failure, sufficient capacity for sites with higher EV throughput, and to reduce site cost for surveillance and potential amenities (e.g. toilets and shops).
21. Charging sites for long distance travel should be chosen close to the highways. The ideal sites are service stations that offer amenities, as these sites will also have a certain level of security. Placing charging stations in regional city centres or off-highway locations in remote areas will make them unattractive for long-distance travellers. A landline phone or mobile communication is required for billing purposes and potential load balancing.
22. Consistent state-wide and nationwide EV signage displaying directions and types of charging stations will give essential information to users as well as reassurance for potential new adopters. Signage should include all relevant technical details, such as connector-type, max. power available, number of chargers, and any amenities on site.

## EV Charging Infrastructure and Geographic Locations

23. It is being proposed to establish a state-wide EV charging grid along the major highways of WA with sites not more than 200 km apart and two or more charging stations per site with 50 kW – 350 kW power level.
24. EV uptake and installed charging infrastructure level are influenced by government incentives or by the direct investment that governments make in EV charging infrastructure
25. Most of the proposed sites will be grid-connected, however, several proposed locations, such as remote roadhouse sites, are not connected to any electricity supply network and need to rely on stand-alone power supply systems (SAPS). Extending the electricity network



to these locations is unlikely to be financially viable. For these sites, the lowest cost option is either upgrading an existing SAPS or installing a separate hybrid power supply system, comprising solar-PV generation coupled with battery storage and a backup diesel generator. Still, any of these off-grid charging solutions will create less emissions than a diesel car.

26. Supplying the required electricity for EV charging stations in many grid-connected regional locations may be problematic. In many cases the electricity is supplied via weak electricity radial distribution feeders that may be unable to support DC charging. The cost of upgrading the network in these locations may be prohibitive.

### **Immediate Needs and Proposed Rollout Plan**

27. The majority of EVs will be in the Perth metro area. We can expect between 80%–90% of all charging events to occur at home (overnight) or at work (daytime). Public charging facilities will be required for only the remaining 10%–20% of EVs.
28. Four full capacity sites with 6 x 350 kW stations should be established in the Perth metro area, two North of the river and two South of the river.
29. An additional 57 sites with 2 bays each should be established in WA's regional and remote areas to create a state-wide grid. Each bay will have a power level between 50 kW and 350 kW, depending on grid support and initial demand.
30. It is recommended that EV public charging infrastructure be rolled out in a route-by-route fashion, so more and more regions will become reachable for EVs. The number of locations, the number of stations per site and the power levels should be reviewed and updated on an annual basis to meet the requirements of increasing EV uptake and charger use.
31. A common payment system for all newly installed charging stations should be mandatory. This could be as simple as accepting standard credit cards for payment or one standard mobile app. for payment (as opposed to proprietary apps or individual tokens for each network).
32. There is a need for coordination of public charging station installations, as low regulatory hurdles for installation approval may lead to a non-optimal distribution. Government should use its planning powers to seek integration of EV charging stations into new or existing service stations and to generally ensure that a coherent approach for station placement and billing interoperability across the state is achieved.

### **Identifying Partners for EV Infrastructure**

33. Shared usage of service stations for EV charging could be an ideal scenario, as service station owners/operators have strategically located sites, the infrastructure and amenities. While future electricity sales may make this model attractive, the current commercial situation may require subsidies to get service stations involved.
34. National charging network operators Chargefox and Fast Cities, have recently been established in Australia, however, their activities will be predominantly in the Eastern States. Chargefox has firm plans for installing chargers in 3 sites (2 x 350 kW) in the Perth metro and South-West WA area in 2019. Fast Cities is considering 2-3 sites for the Perth metro area, but may be affected by first mover Chargefox. Both companies are looking for co-funding from various sources, incl. government, automotive OEMs and ARENA grants and are unlikely to install stations in regional or remote WA.
35. Tesla Motors has installed one charging site near Bunbury with 6 x 125 kW DC chargers for exclusive use by Tesla drivers and is planning another site in the Perth metro area. No other EV-OEM has plans to establish public EV charging infrastructure outside of their dealerships. However, some are planning to support an EV charging consortium by signing charging

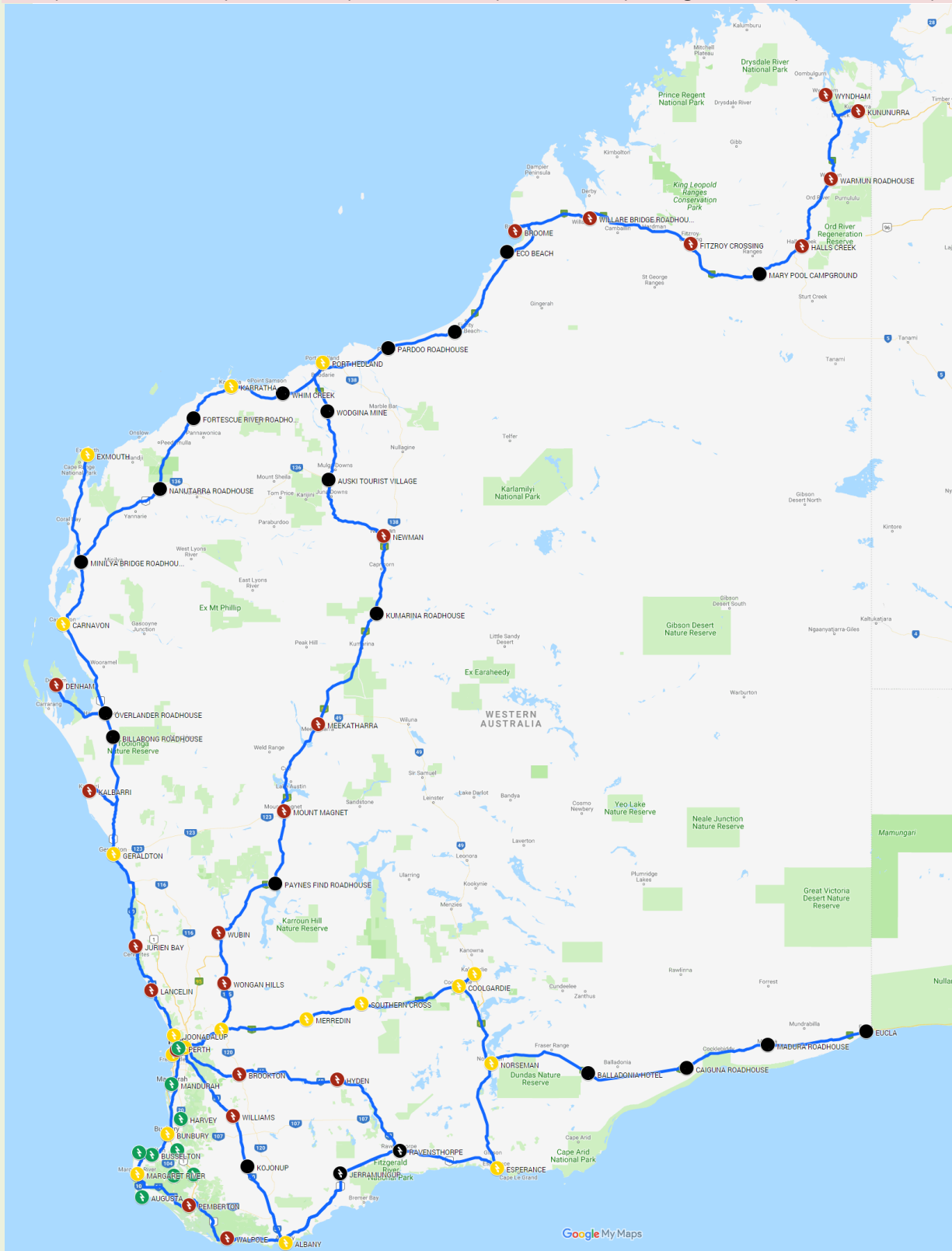
subscriptions with a consortium on behalf of their customers, funded through a higher vehicle purchase price.

36. Owners of large commercial properties such as shopping centres are currently assessing opportunities for installing public DC fast charging from 'behind the electricity meter', as potential business opportunities. However, these businesses will not invest until it is clear that the investment would be profitable. Most will likely install stations only at those sites with a sufficient throughput of EVs to justify the commercial investment.
37. Internationally, power utilities (network operators and retailers) are one of the major investors and driving forces in establishing EV charging infrastructure networks, as they anticipate to be a major beneficiary of the electrification of transport. However, larger investments in EV charging infrastructure by WA power utilities have not happened, which could be because there is no provision for an EV charging infrastructure in the current budget of the WA government.
38. EVs offer an array of benefits in terms of management of electricity network operators, including the creation of new large controllable charging loads and managing high penetrations of variable renewable energy generation (solar PV systems and wind turbines). Furthermore, the additional energy demand for EV charging could help with problems caused by declining usage of some customer groups and solar PV oversupply ("death spiral of the grid" and "solar peak").
39. The expected electricity demand created by a 1% EV penetration will be 44 GWh/year, which is approximately 0.1% of the current total electricity demand in WA. A 10% EV penetration would increase electricity demand by 440 GWh/year, which is approximately 1% of current total electricity load in WA, and a full EV fleet will add 4,400 GWh/year or 10% to the current total load.
40. The total revenue for WA in electricity sales from a future 100% electric vehicle fleet will exceed \$1 billion per year (including home solar-PV charging), when assuming a standard home tariff. This represents a significant flow-on effect for the local economy, as these funds will no longer be invested into imported petroleum products.

#### **Recommendations for Complementary Policies for EV Uptake**

41. It is strongly recommended that all stakeholders, all major government contract fleets and all electricity utilities introduce a substantive EV fleet target policy, e.g. 25%. This could be achieved at moderate cost because of the buying power of the state vehicle fleet – and is offset by the economic and health benefits of EVs. This would create a major positive impact on the uptake of EVs in WA by creating a second-hand EV market and by increasing the number of EV models available.
42. In the absence of any other financial incentives, the WA government could consider other options, such as temporary zero stamp duty and free EV registration, as have been implemented by governments of other countries and Australian states.

**Map of Proposed Charging Infrastructure for WA with estimated cost of \$23.6 million (not including land value). It comprises a total of 61 sites (138 stations), with 4 sites (24 stations) in Perth metro (\$5.4 million), and 57 sites (114 stations) in regional WA (\$18.2 million).**



**Fig. A: Proposed 200 km charging grid for WA, green: existing 1x50 kW, black: proposed 2x50 kW, red: proposed 2x150 kW, yellow: proposed 2-6x350 kW. all black sites without power symbol are off-grid; Ravensthorpe, Jerramungup have a weak grid.**

**Map of Minimal Charging Infrastructure for WA with estimated cost of \$18.9 million** (not including land value; savings of \$4.7 million compared to proposal). It comprises a total of 61 sites (138 stations), with 4 sites (24 stations) in Perth metro (\$5.4 million), and 57 sites (114 stations) in regional WA (\$13.5 million).

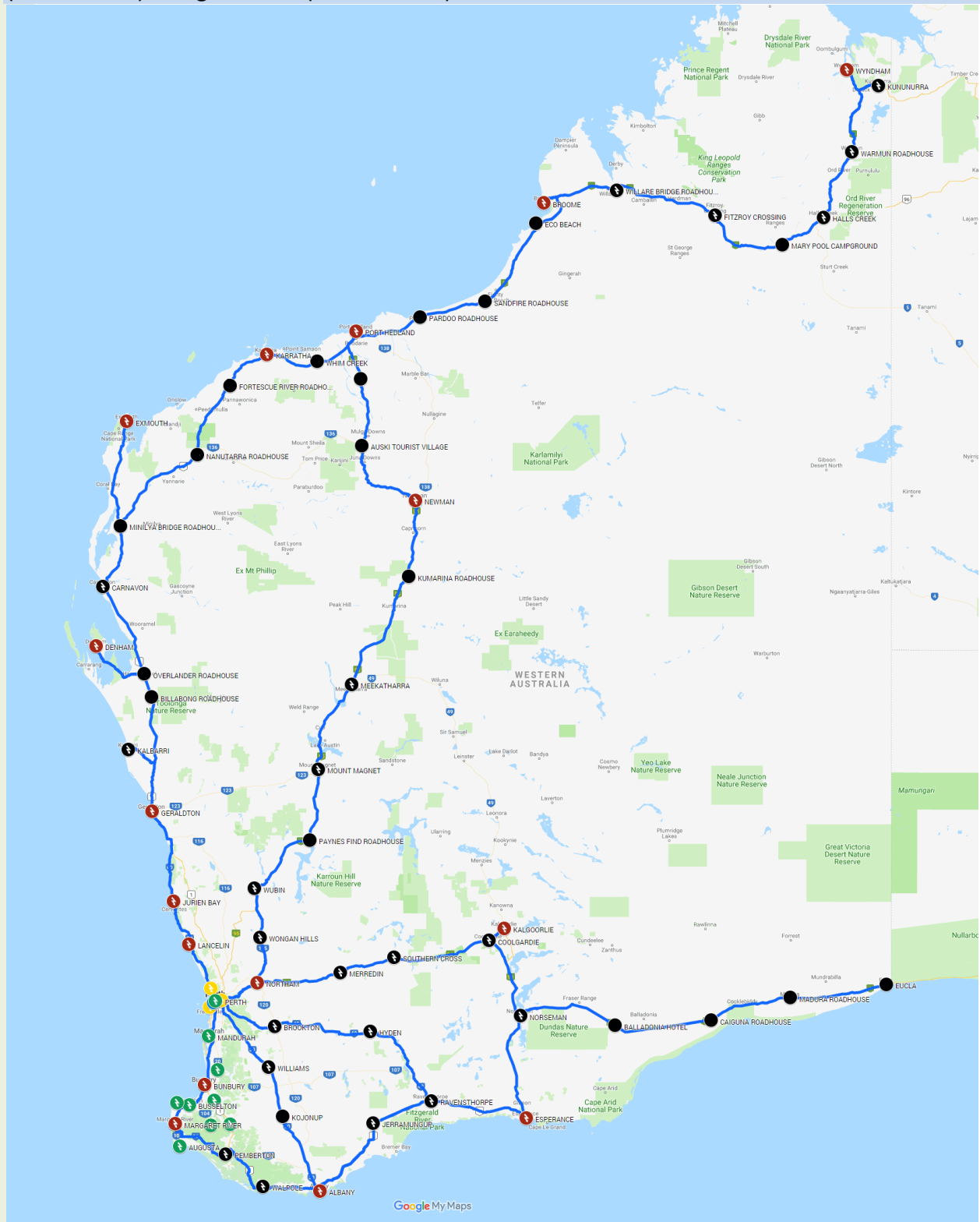


Fig. B: **Minimal 200 km charging grid for WA**, green: existing 1x50 kW, black: proposed 2x50 kW, red: proposed 2x150 kW, yellow: proposed 2-6x350 kW, sites without power symbol are off-grid

**Map of Extended Charging Infrastructure for WA with estimated cost of \$28.4 million** (not including land value; additional cost of \$4.8 million compared to proposal). It comprises extended highway coverage of a total of 70 sites (156 stations), with 4 sites (24 stations) in Perth metro (\$5.4 million), and 66 sites (132 stations) in regional WA (\$23.0 million). All stations are either 150 kW or 350 kW, there are no entry-level 50 kW stations.

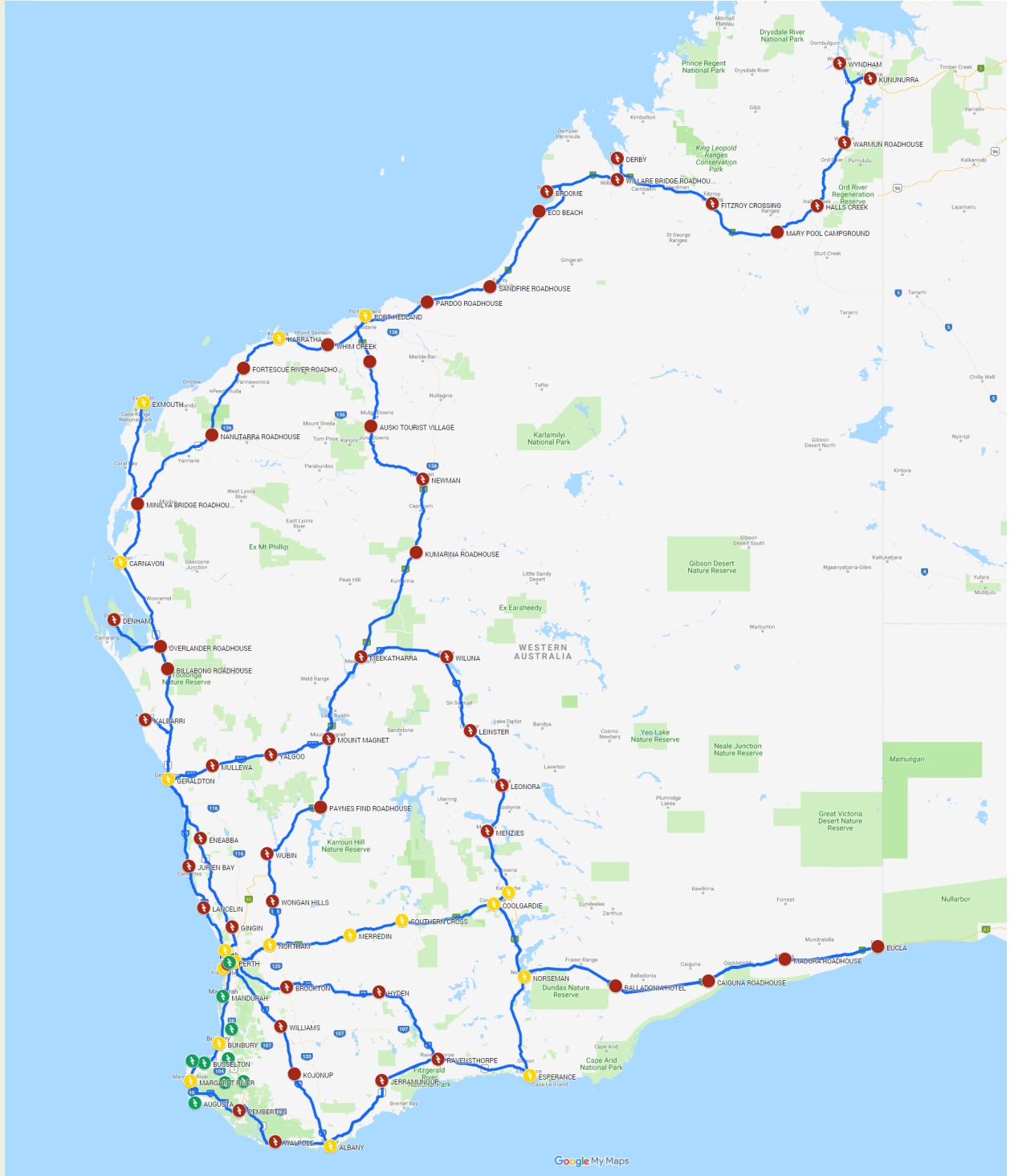


Fig. C: **Extended 200 km charging grid for WA**, green: existing 1x50 kW, red: proposed 2x150 kW, yellow: proposed 2-6x350 kW, sites without power symbol are off-grid



Table 1: Charging infrastructure configuration

PROPOSED			Residents	Residents	Traffic	Total req.	De-rated			Bays	Bays	Bays	
Site Location	Population	Local Evs a	charging	peak hour	peak hour	peak hour	Installed	Installed	Total	[kW]	[kW]	[kW]	
		1% uptake	[kWh]	power [kW]	power [kW]	power [kW]	power [kW]	power [kW]	power [kW]	Bays	350	150	50
<b>METRO</b>													
	2'300'000	14'030											
1 PERTH / WEST PERTH / LEEDERVILLE	575'000	3'508	3'315	398	100	498	1'470	2100	6	6			
2 JOONADALUP	575'000	3'508	3'315	398	100	498	1'470	2100	6	6			
3 FREMANTLE	575'000	3'508	3'315	398	100	498	1'470	2100	6	6			
4 SOUTH PERTH / VICTORIA PARK	575'000	3'508	3'315	398	100	498	1'470	2100	6	6			
<b>SOUTH-WEST</b>													
5 BUNBURY	72'403	442	417	50	116	166	490	700	2	2			
6 MARGARET RIVER	7'654	47	44	5	39	44	490	700	2	2			
7 PEMBERTON	974	6	6	1	27	28	240	300	2		2		
8 WALPOLE	439	3	3	0	18	18	240	300	2		2		
9 ALBANY	29'373	179	169	20	146	166	490	700	2	2			
10 KOJONUP	1'298	8	7	1	40	41	490	700	2	2			
11 WILLIAMS	948	6	5	1	83	84	240	300	2		2		
<b>SOUTH COAST</b>													
12 BROOKTON	756	5	4	1	20	21	240	300	2		2		
13 HYDEN	377	2	2	0	17	17	240	300	2		2		
14 RAVENSTHORPE	498	3	3	0	34	34	88	100	2			2	
15 JERRAMUNGUP	356	2	2	0	9	9	88	100	2			2	
16 ESPERANCE	12'107	74	70	8	28	36	490	700	2	2			
<b>GOLDFIELDS</b>													
17 NORTHAM	6'548	40	38	5	68	73	490	700	2	2			
18 MERREDIN	2'636	16	15	2	25	27	490	700	2	2			
19 SOUTHERN CROSS	638	4	4	0	13	13	490	700	2	2			
20 COOLGARDIE	878	5	5	1	18	19	490	700	2	2			
21 KALGOORLIE	30'509	186	176	21	9	30	490	700	2	2			
22 NORSEMAN	581	4	3	0	14	14	490	700	2	2			
<b>NULLARBOR</b>													
23 BALLADONIA HOTEL	10	0	0	0	11	11	88	100	2			2	
24 CAIGUNA ROADHOUSE	10	0	0	0	14	14	88	100	2			2	
25 MADURA ROADHOUSE	10	0	0	0	10	10	88	100	2			2	
26 EUCLA	53	0	0	0	13	13	88	100	2			2	
<b>MIDWEST</b>													
27 LANCELIN	714	4	4	0	51	51	240	300	2		2		
28 JURIE BAY	1'761	11	10	1	64	65	240	300	2		2		
29 GERALDTON	37'432	228	216	26	77	103	490	700	2	2			
30 KALBARRI	1'557	9	9	1	10	11	240	300	2		2		
31 BILLABONG ROADHOUSE	10	0	0	0	27	27	88	100	2			2	
32 OVERLANDER ROADHOUSE	10	0	0	0	6	6	88	100	2			2	
33 DENHAM	754	5	4	1	11	12	240	300	2		2		
<b>GASCOYNE / PILBARA</b>													
34 CARNAVON	4'426	27	26	3	25	28	490	700	2	2			
35 MINILYA BRIDGE ROADHOUSE	10	0	0	0	8	8	88	100	2			2	
36 EXMOUTH	2'514	15	14	2	20	22	490	700	2	2			
37 NANUTARRA ROADHOUSE	10	0	0	0	12	12	88	100	2			2	
38 FORTESCUE RIVER ROADHOUSE	10	0	0	0	16	16	88	100	2			2	
39 KARRATHA	15'828	97	91	11	11	22	490	700	2	2			
40 WHIM CREEK	32	0	0	0	10	10	88	100	2			2	
41 PORT HEDLAND	13'828	84	80	10	14	24	490	700	2	2			
<b>KIMBERLEY</b>													
42 PARDOO ROADHOUSE	10	0	0	0	8	8	88	100	2			2	
43 SANDFIRE ROADHOUSE	10	0	0	0	7	7	88	100	2			2	
44 ECO BEACH	10	0	0	0	11	11	88	100	2			2	
45 BROOME	13'984	85	81	10	9	19	240	300	2	2			
46 WILLARE BRIDGE ROADHOUSE	3'511	21	20	2	21	23	240	300	2	2			
47 FITZROY CROSSING	1'297	8	7	1	16	17	240	300	2		2		
48 MARY POOL CAMPGROUND	10	0	0	0	11	11	88	100	2			2	
49 HALLS CREEK	1'499	9	9	1	18	19	240	300	2	2			
50 WARMUN ROADHOUSE	10	0	0	0	17	17	240	300	2		2		
51 WYNDHAM	780	5	4	1	10	11	240	300	2	2			
52 KUNUNURRA	5'308	32	31	4	9	13	240	300	2	2			
<b>INLAND</b>													
53 WONGAN HILLS	898	5	5	1	10	11	240	300	2		2		
54 WUBIN	103	1	1	0	4	4	240	300	2		2		
55 PAYNES FIND ROADHOUSE	10	0	0	0	5	5	88	100	2			2	
56 MOUNT MAGNET	470	3	3	0	10	10	240	300	2	2			
57 MEEKATHARRA	708	4	4	0	6	6	240	300	2		2		
58 KUMARINA ROADHOUSE	75	0	0	0	6	6	88	100	2			2	
59 NEWMAN	7'238	44	42	5	7	12	240	300	2	2			
60 AUSKI TOURIST VILLAGE	10	0	0	0	7	7	88	100	2			2	
61 WODGINA MINE	210	1	1	0	8	8	88	100	2			2	
<b>Major cities</b>					<b>combined routes</b>			<b>Total power [MW]</b>					
<b>Major holiday destinations</b>					<b>1.79</b>	<b>1.73</b>	<b>3.52</b>	<b>20.52</b>	<b>27.90</b>	<b>138</b>	<b>56</b>	<b>42</b>	<b>40</b>

Table 2: Estimated charging infrastructure costs

PROPOSED Site Location	Station cost	Install cost	Grid Provider	Grid connect or SAPS	Grid cost 700kVA	Grid cost 300kVA	Grid cost 100kVA	Site cost	Route Subtotal
<b>METRO</b>									
1 PERTH / WEST PERTH / LEEDERVILLE	\$762'000	\$90'000	Western Power	\$628'000	\$436'000			\$1'480'000	\$5'380'000
2 JOONADALUP	\$762'000	\$90'000	Western Power	\$448'000	\$273'000		\$1'300'000		
3 FREMANTLE	\$762'000	\$90'000	Western Power	\$448'000	\$273'000		\$1'300'000		
4 SOUTH PERTH / VICTORIA PARK	\$762'000	\$90'000	Western Power	\$448'000	\$273'000		\$1'300'000		
<b>SOUTH-WEST</b>									
5 BUNBURY	\$254'000	\$30'000	Western Power	\$255'000	\$255'000	\$215'000	\$198'000	\$539'000	\$3'355'000
6 MARGARET RIVER	\$254'000	\$30'000	Western Power	\$274'000	\$274'000	\$231'000	\$213'000	\$558'000	
7 PEMBERTON	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	
8 WALPOLE	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	
9 ALBANY	\$254'000	\$30'000	Western Power	\$255'000	\$255'000	\$215'000	\$198'000	\$539'000	
10 KOJONUP	\$254'000	\$30'000	Western Power	\$274'000	\$274'000	\$231'000	\$213'000	\$558'000	
11 WILLIAMS	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	
<b>SOUTH COAST</b>									
12 BROOKTON	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	\$1'799'000
13 HYDEN	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	
14 RAVENSTHORPE	\$60'000	\$10'000	Western Power	\$213'000		\$70'000	\$213'000	\$283'000	
15 JERRAMUNGUP	\$60'000	\$10'000	Western Power	\$213'000		\$70'000	\$213'000	\$283'000	
16 ESPERANCE	\$254'000	\$30'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$459'000	
<b>GOLDFIELDS</b>									
17 NORTHAM	\$254'000	\$30'000	Western Power	\$255'000	\$255'000	\$215'000	\$198'000	\$539'000	\$3'211'000
18 MERREDIN	\$254'000	\$30'000	Western Power	\$274'000	\$274'000	\$231'000	\$213'000	\$558'000	
19 SOUTHERN CROSS	\$254'000	\$30'000	Western Power	\$274'000	\$274'000	\$231'000	\$213'000	\$558'000	
20 COOLGARDIE	\$254'000	\$30'000	Western Power	\$274'000	\$274'000	\$231'000	\$213'000	\$558'000	
21 KALGOORLIE	\$254'000	\$30'000	Western Power	\$255'000	\$255'000	\$215'000	\$198'000	\$539'000	
22 NORSEMAN	\$254'000	\$30'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$459'000	
<b>NULLARBOR</b>									
23 BALLADONIA HOTEL	\$60'000	\$10'000	SAPS	\$34'000		\$110'000	\$34'000	\$104'000	\$416'000
24 CAIGUNA ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
25 MADURA ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
26 EUCLA	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
<b>MIDWEST</b>									
27 LANCELIN	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	\$2'239'000
28 JURIE BAY	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	
29 GERALDTON	\$254'000	\$30'000	Western Power	\$255'000	\$255'000	\$215'000	\$198'000	\$539'000	
30 KALBARRI	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	
31 BILLABONG ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
32 OVERLANDER ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
33 DENHAM	\$140'000	\$16'000	Horizon Power	\$175'000		\$175'000	\$175'000	\$331'000	
<b>GASCOYNE / PILBARA</b>									
34 CARNAVON	\$254'000	\$30'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$459'000	\$2'252'000
35 MINILYA BRIDGE ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
36 EXMOUTH	\$254'000	\$30'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$459'000	
37 NANUTARRA ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
38 FORTESCUE RIVER ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
39 KARRATHA	\$254'000	\$30'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$459'000	
40 WHIM CREEK	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
41 PORT HEDLAND	\$254'000	\$30'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$459'000	
<b>KIMBERLEY</b>									
42 PARDOO ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	\$2'733'000
43 SANDFIRE ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
44 ECO BEACH	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
45 BROOME	\$140'000	\$16'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$331'000	
46 WILLARE BRIDGE ROADHOUSE	\$140'000	\$16'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$331'000	
47 FITZROY CROSSING	\$140'000	\$16'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$331'000	
48 MARY POOL CAMPGROUND	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
49 HALLS CREEK	\$140'000	\$16'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$331'000	
50 WARMUN ROADHOUSE	\$140'000	\$16'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$331'000	
51 WYNDHAM	\$140'000	\$16'000	Horizon Power	\$175'000		\$175'000	\$175'000	\$331'000	
52 KUNUNURRA	\$140'000	\$16'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$331'000	
<b>INLAND</b>									
53 WONGAN HILLS	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	\$2'183'000
54 WUBIN	\$140'000	\$16'000	Western Power	\$231'000		\$231'000	\$213'000	\$387'000	
55 PAYNES FIND ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
56 MOUNT MAGNET	\$140'000	\$16'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$331'000	
57 MEEKATHARRA	\$140'000	\$16'000	Horizon Power	\$175'000	\$175'000	\$175'000	\$175'000	\$331'000	
58 KUMARINA ROADHOUSE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
59 NEWMAN	\$140'000	\$16'000	BHP	\$175'000	\$175'000	\$175'000	\$175'000	\$331'000	
60 AUSKI TOURIST VILLAGE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
61 WODGINA MINE	\$60'000	\$10'000	SAPS	\$34'000		\$70'000	\$34'000	\$104'000	
<b>Summary</b>									
Major cities	Stations	Install		Grid / SAPS				Grand Total	
Major holiday destinations	\$11'252'000	\$1'376'000		\$10'940'000				\$23'568'000	\$23'568'000