

Preliminary projections of small-scale embedded technologies

FRG meeting

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Outline

- Methodology
- Scenario assumptions
- Preliminary projection results

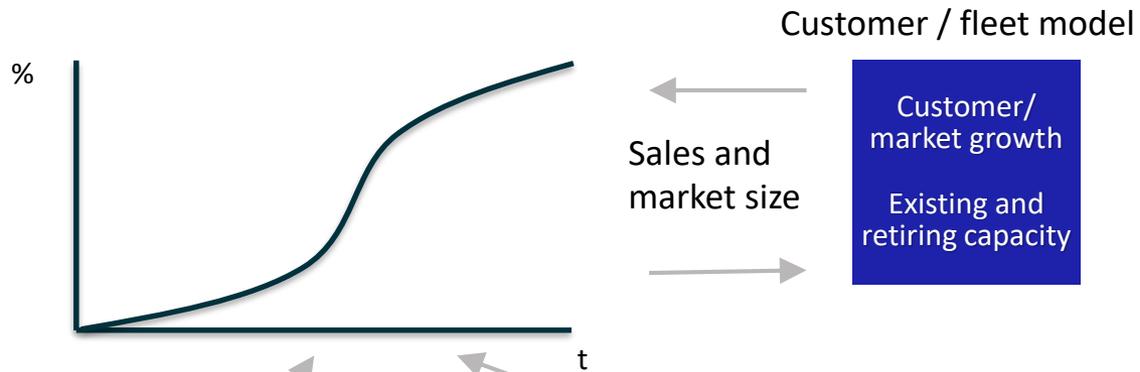
Methodology

- Rooftop top solar is at payback periods of <5 years; EVs are expected to reach vehicle cost parity
- In such an environment should sales go to 100%?

Not necessarily...We assume these technologies will follow the consumer technology adoption curve

- **Early adopters:** will purchase even if payback period is long
- **Followers:** mainstream adoption at short payback
- **Late followers:** may never adopt no matter the low cost

Technology adoption curve calibration



Calculations

Payback period

Non-price factors

Segmentation

Multiple representative customer loads; Vehicle types and utilization rates ; ABS spatial categories

Key inputs

Existing and new electricity load

Technology cost and electricity tariff

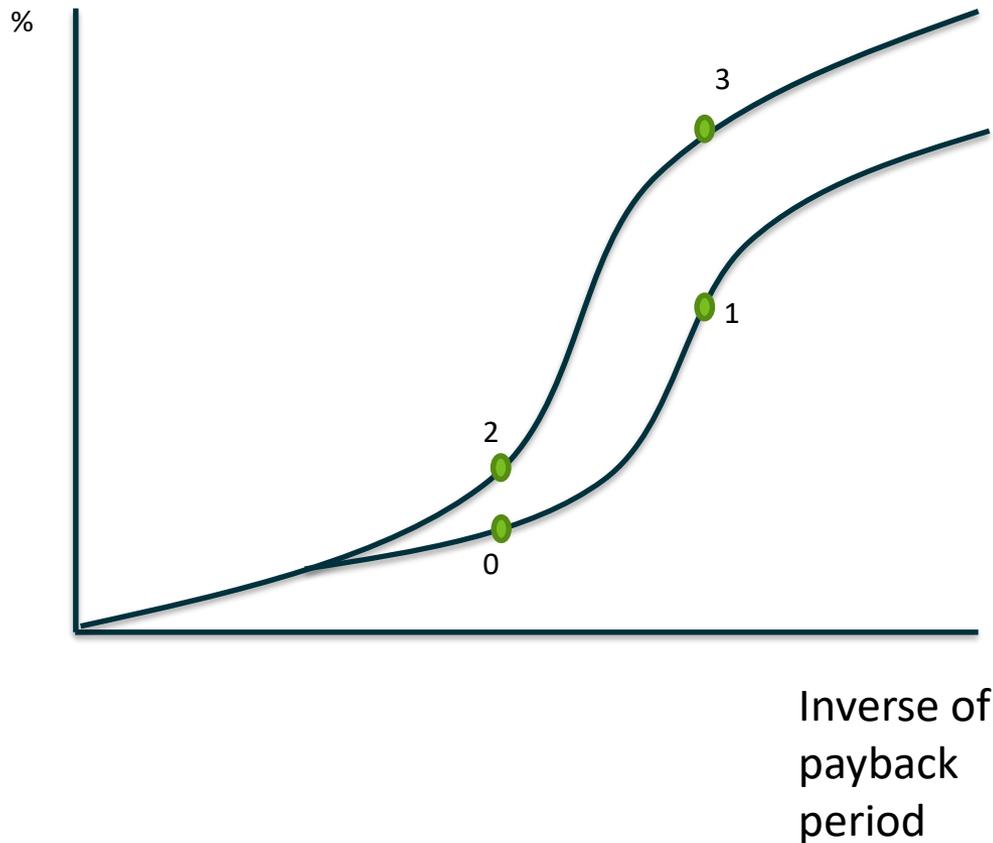
Age

Type/ownership of building

Educational attainment

Discretionary income

Two sources of changes in adoption



0 to 1: movement along adoption curve reflecting lower payback period (*a model output*)

0 to 2: increase in size of market potential from reduced infrastructure constraints (*a scenario input*)

0 to 3: impact of both

Methodology

- There is an adoption curve for each SA2 level region
- The shape of the adoption curve is set as a function of:
 - Current market share in the SA2 region
 - Demographic characteristics of the region
 - Scenario assumptions about future market limits defined by infrastructure and business model innovation
- The saturation level of the adoption curve is only reached if the payback period is low
 - The financial assumptions therefore have a significant impact on the timing and size of adoption

Extended scenario definitions

Driver:	Neutral	Slow change	Fast change	High DER	Low DER
Economic					
Economic growth and population	Neutral	Weak	Strong	Neutral	Neutral
Cost of solar photovoltaics and battery storage	As per GenCost 2018 report	As per GenCost 2018 report +20%	As per GenCost 2018 report	As per GenCost 2018 report	As per GenCost 2018 report +20%
Timing of cost parity of short range electric vehicles (<300km range) with ICE	2030	2035	2025	2025	2035
Cost of fuel cell vehicles	Medium	High	Low	High	Low
Customers accessing tariffs that support prosumer behaviour and system integration	10% by 2030, 20% by 2050	15% by 2030, 15% thereafter	50% by 2030, 70% by 2050	60% by 2030, 75% by 2050	7.5% by 2030, 10% thereafter
LGCs or other subsidies (e.g. to meet state renewable targets)	\$40/MWh falling to near zero by 2021	\$40/MWh falling to near zero by 2021	\$40/MWh increasing to \$50/MWh by 2030, declining thereafter	\$40/MWh increasing to \$50/MWh by 2030, declining thereafter	\$40/MWh falling to near zero by 2021

Extended scenario definitions

Driver:	Neutral	Slow change	Fast change	High DER	Low DER
Infrastructure					
Growth in apartment share of dwellings	Medium	Low	High	High	Low
Decline in home ownership	Medium	High	Low	Low	High
Extent of access to variety of charging options	Medium	Low	High	High	Low

Extended scenario definitions

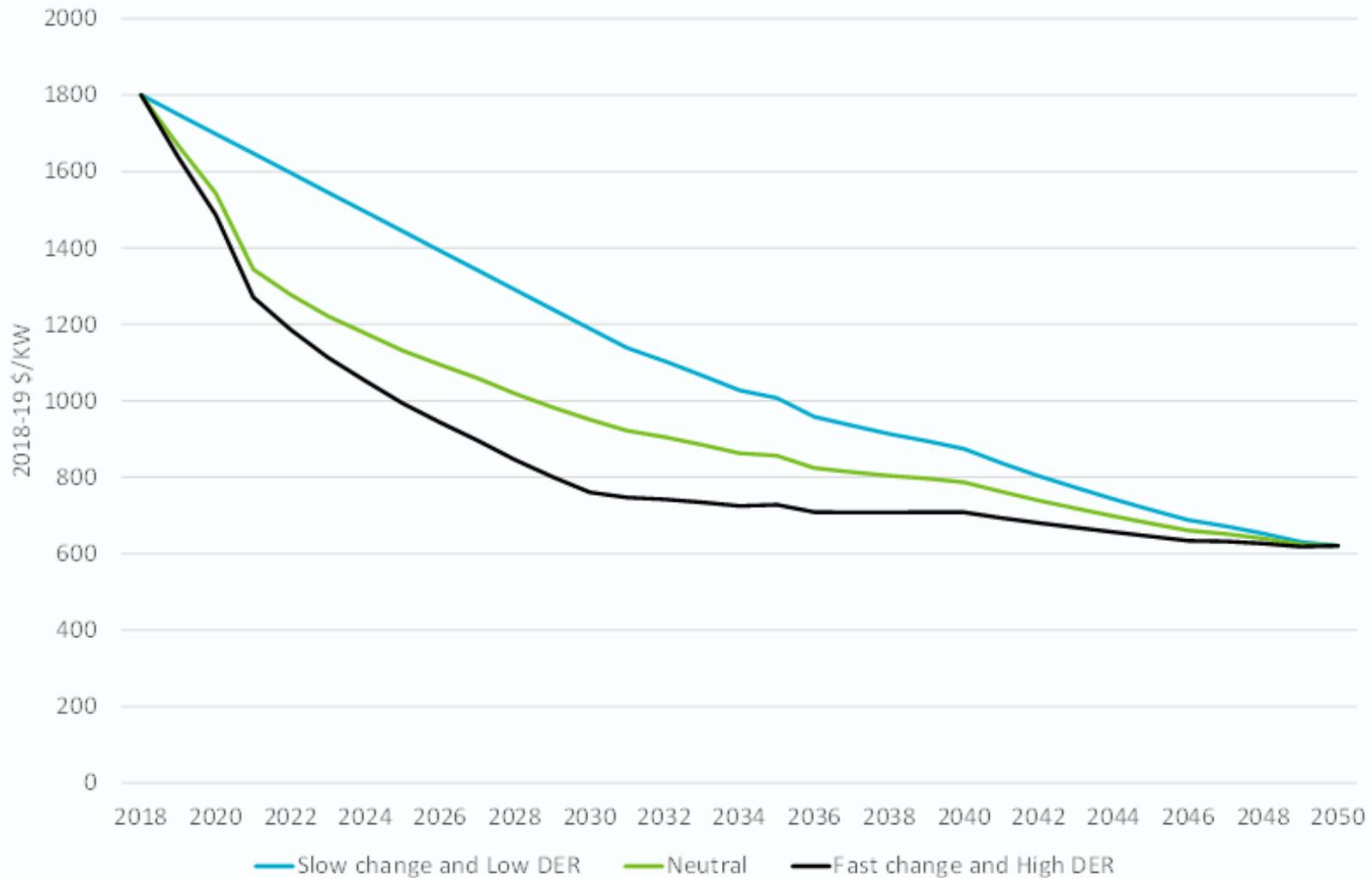
Driver:	Neutral	Slow change	Fast change	High DER	Low DER
Business model					
Tariff and DER incentive arrangements	No significant change	No significant change	Significant change.	Significant change	No significant change
System architecture changes support greater incentives to DER participation	Medium	Low	High	High	Low
Feasibility of vehicle to home storage	Low	Low	Medium	High	Low
Feasibility of ride sharing services	Medium	Low	High	High	Low
Feasibility of participation of apartment dwellers and renters in DER	Low	Low	High	High	Low
Affordable public charging availability	Medium	Low	High	High	Low
Vehicle to home	No	No	No	Yes from 2040	No
Hydrogen export industry supports hydrogen fuel supply	No	No	Yes	No	No

Adoption curve scenario assumptions

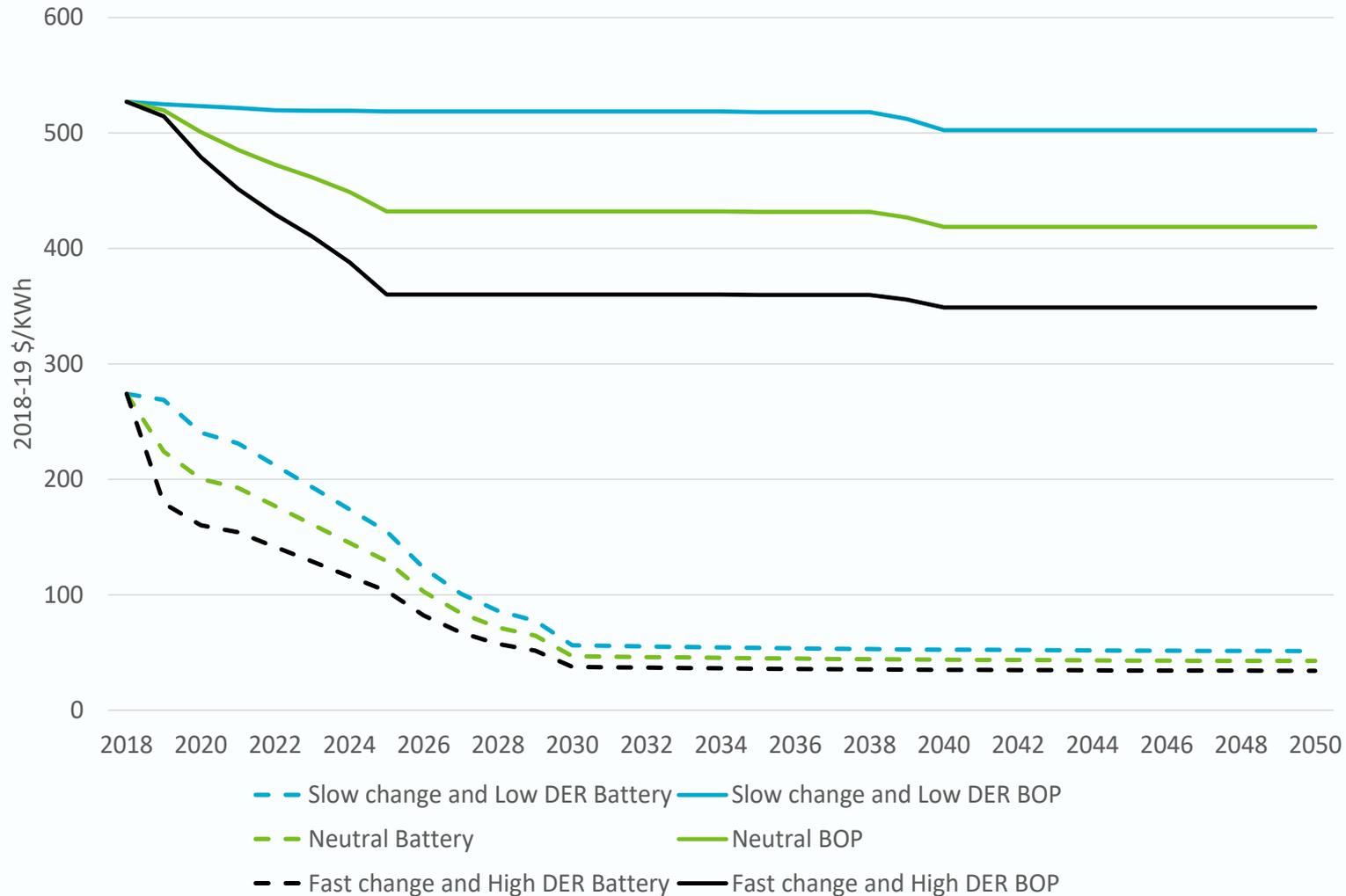
The rationale and percentages for the maximum market shares are set out in:

- Table 4-6
- Table 4-7
- Table 4-8
- Table 4-9

Cost assumptions – rooftop solar



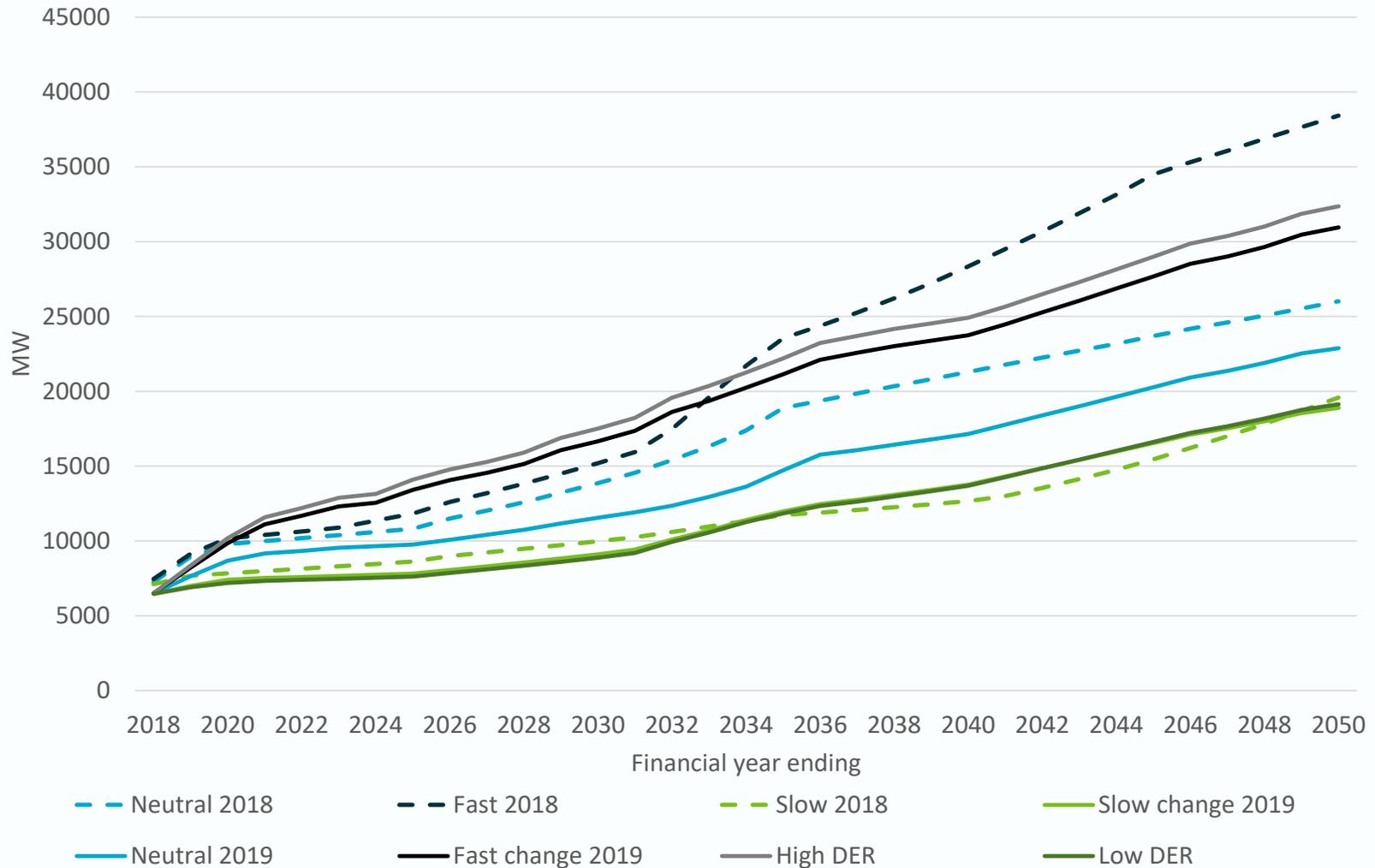
Cost assumptions – stationary batteries



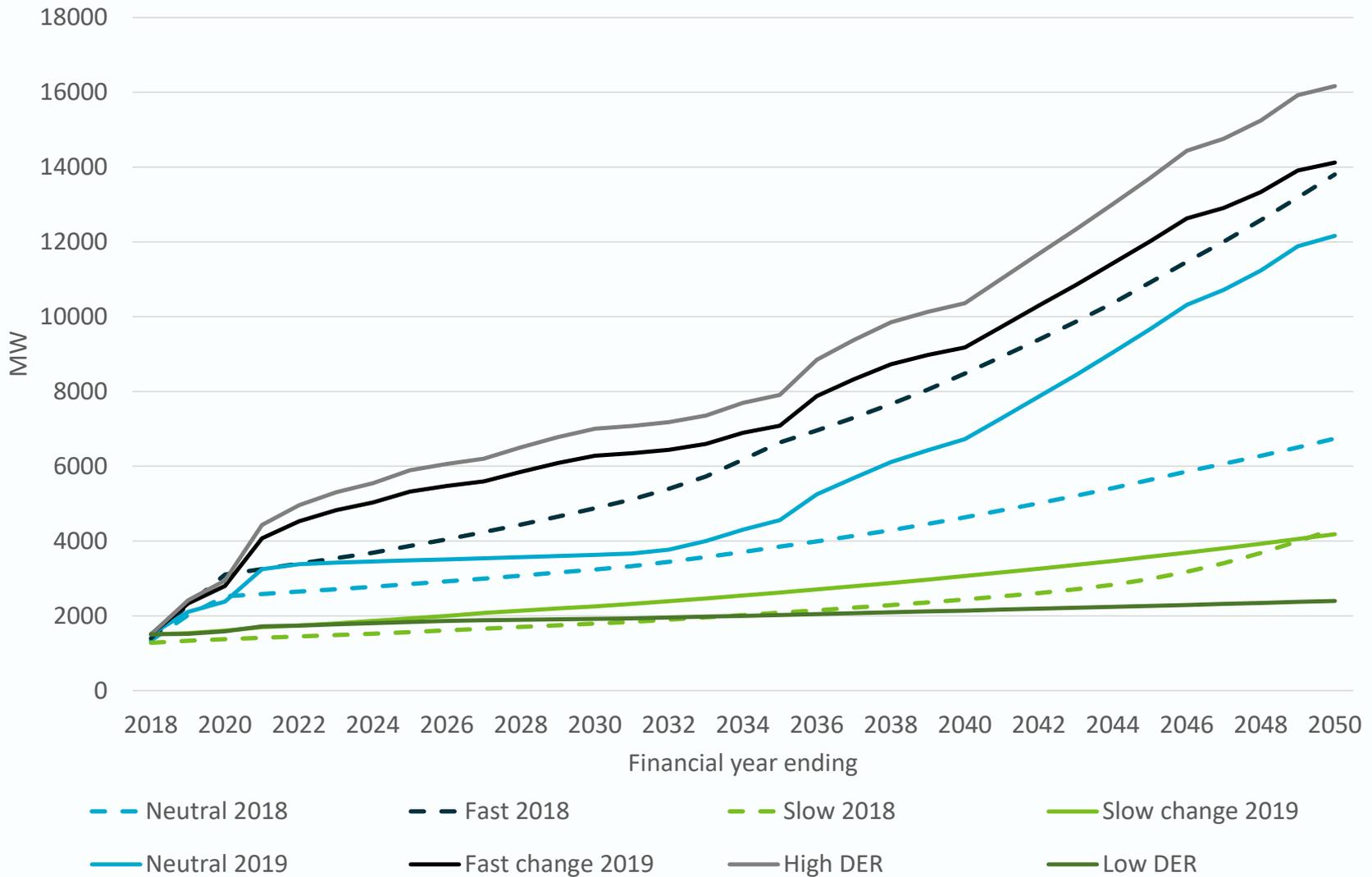
Cost assumptions – vehicles

	2020	2025	2030	2035	2040	2045	2050
Internal combustion engine							
Light/small car - petrol	15	15	15	15	15	15	15
Medium car - petrol	25	25	25	25	25	25	25
Large/heavy car - petrol	41	41	41	41	41	41	41
Rigid truck - diesel	61	61	61	61	61	61	61
Articulated truck - diesel	300	300	300	300	300	300	300
Bus - diesel	180	180	180	180	180	180	180
Electric vehicle short range							
Light/small	27	21	15	15	15	15	15
Medium	47	36	25	25	25	25	25
Large/heavy	65	53	41	41	41	41	41
Rigid truck - diesel	104	92	80	70	61	61	61
Bus - diesel	269	246	223	200	180	180	180
Electric vehicle long range							
Light/small	39	28	20	20	20	20	20
Medium	59	42	30	30	30	30	30
Large/heavy	80	61	46	46	46	46	46
Rigid truck - diesel	143	125	109	95	83	82	81
Articulated truck - diesel	901	694	535	468	410	404	400
Bus - diesel	310	279	252	227	204	203	202
Plug-in hybrid electric vehicle							
Medium car - petrol	37	35	33	33	33	33	33
Large/heavy car - petrol	58	53	49	49	49	49	49
Rigid truck - diesel	N.A.	122	81	81	81	81	81
Articulated truck - diesel	N.A.	606	396	396	396	396	396
Fuel cell vehicle							
Light/small	45	35	32	27	24	22	22
Medium	50	41	37	33	30	29	28
Large/heavy	62	51	48	43	40	38	37
Rigid truck - diesel	112	96	84	77	71	70	68
Articulated truck - diesel	558	479	419	385	357	350	342
Bus - diesel	242	221	207	199	192	190	188

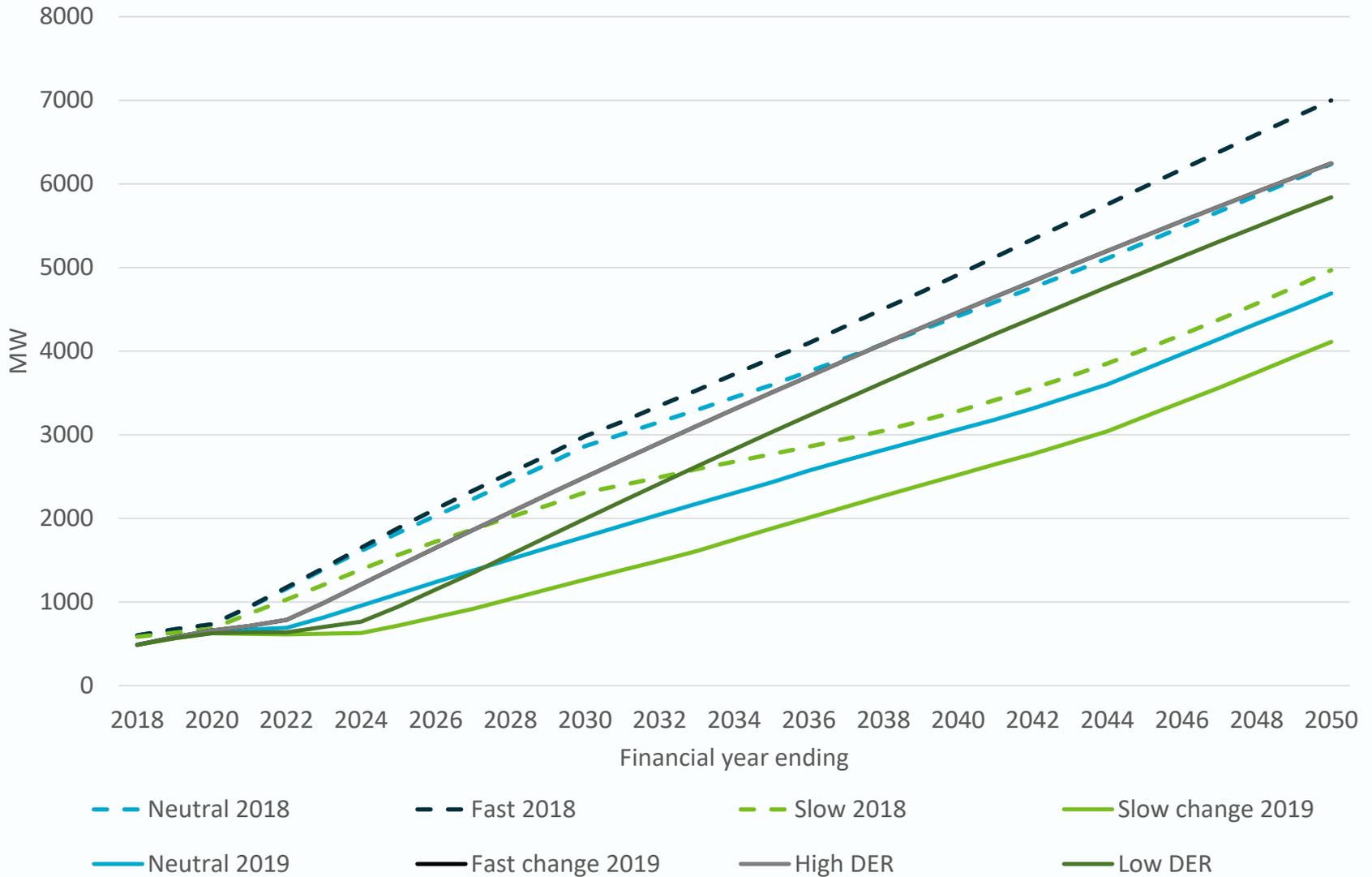
Preliminary projections – Residential solar



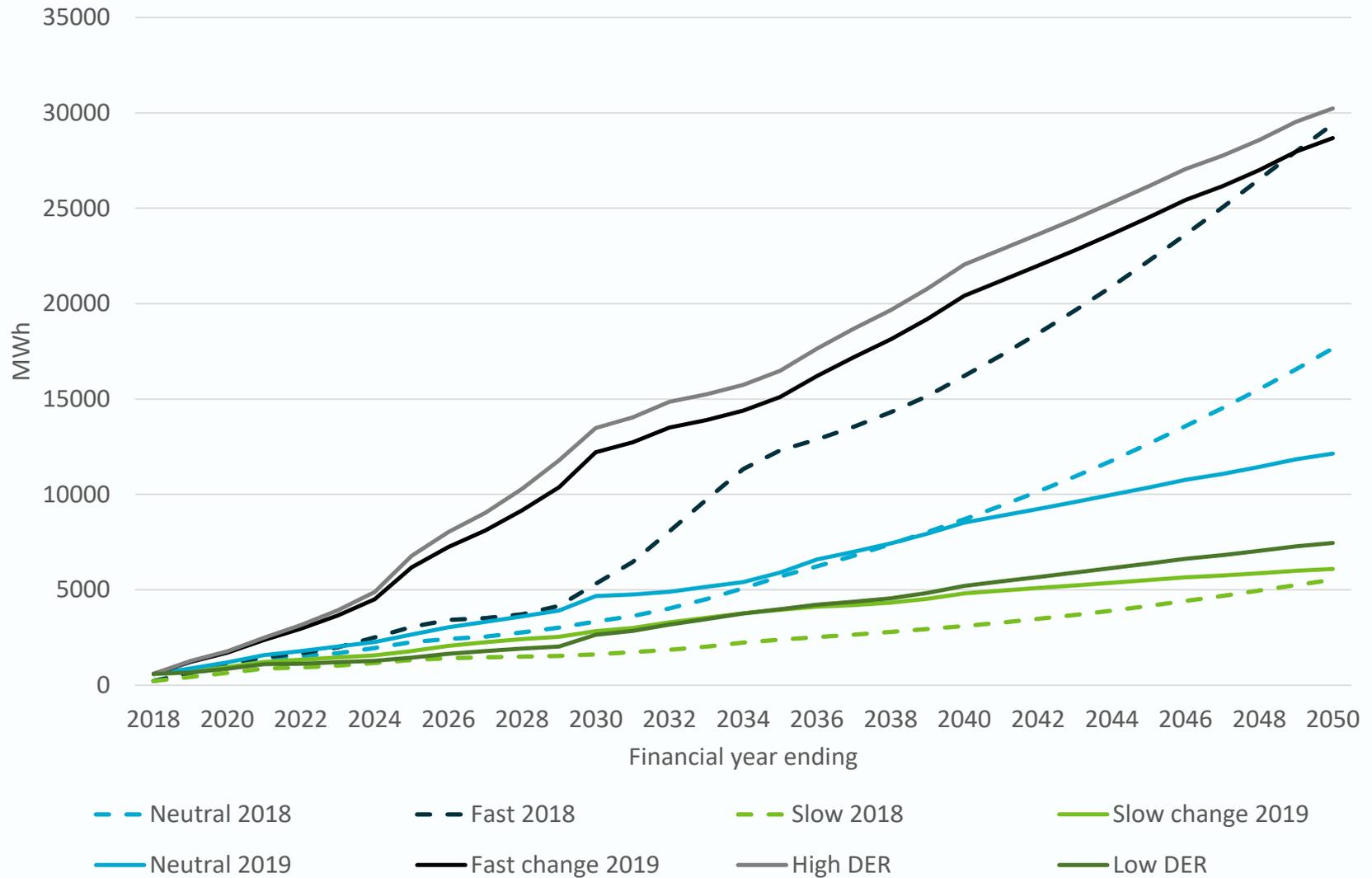
Preliminary projections – Commercial solar <100kw



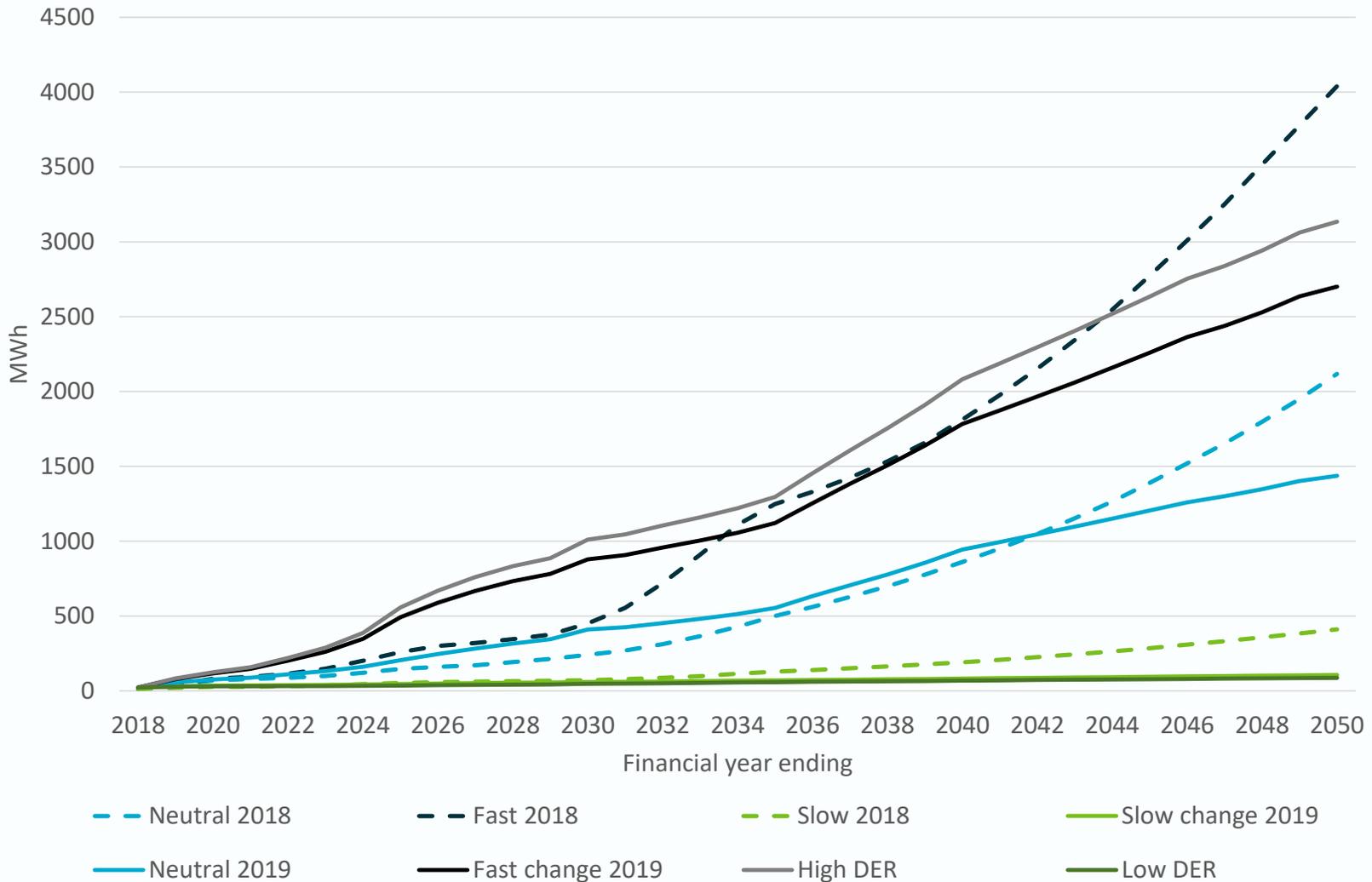
Preliminary projections – Commercial solar up to 30MW



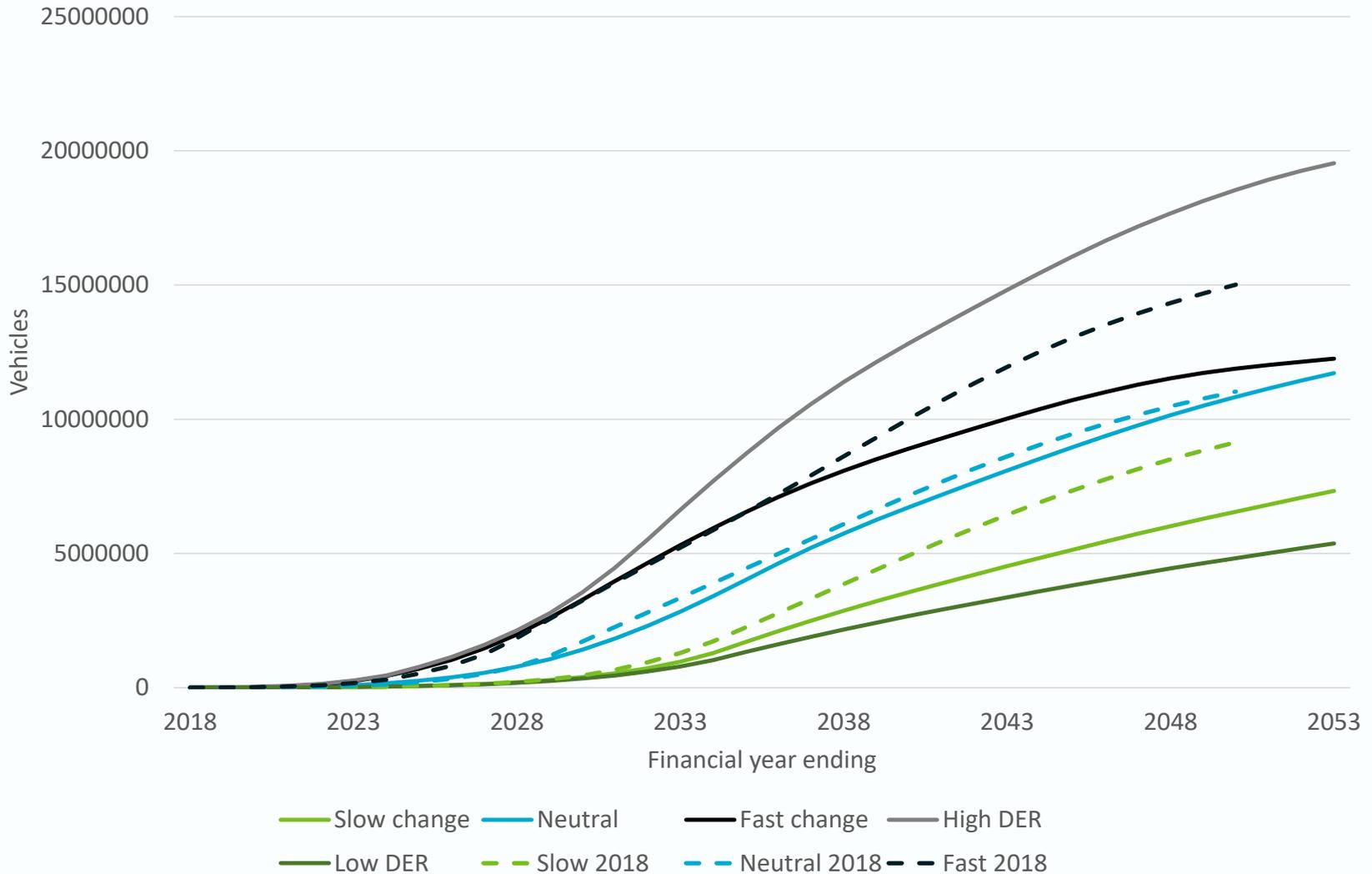
Preliminary projections – Residential batteries



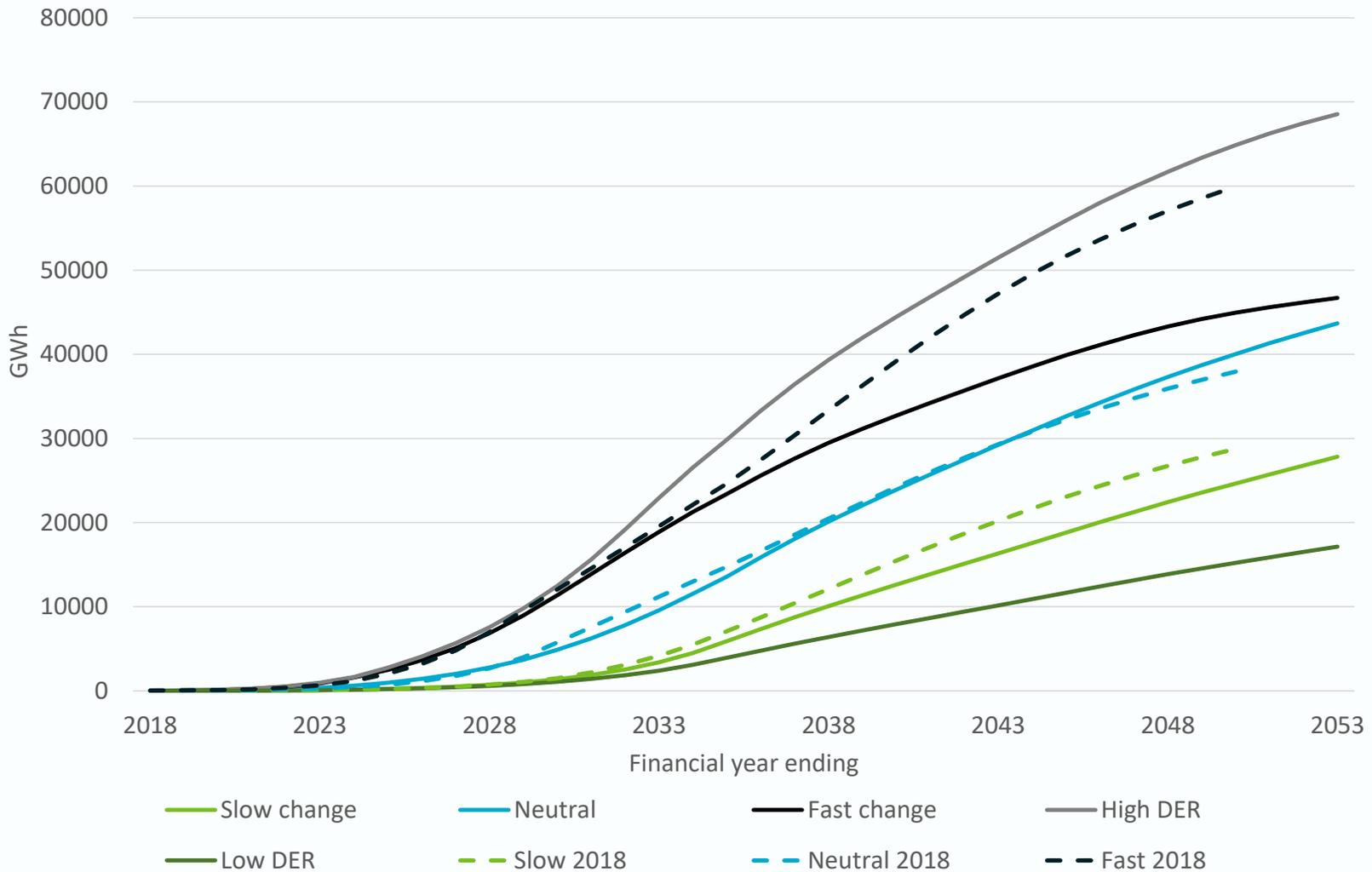
Preliminary projections – Commercial batteries



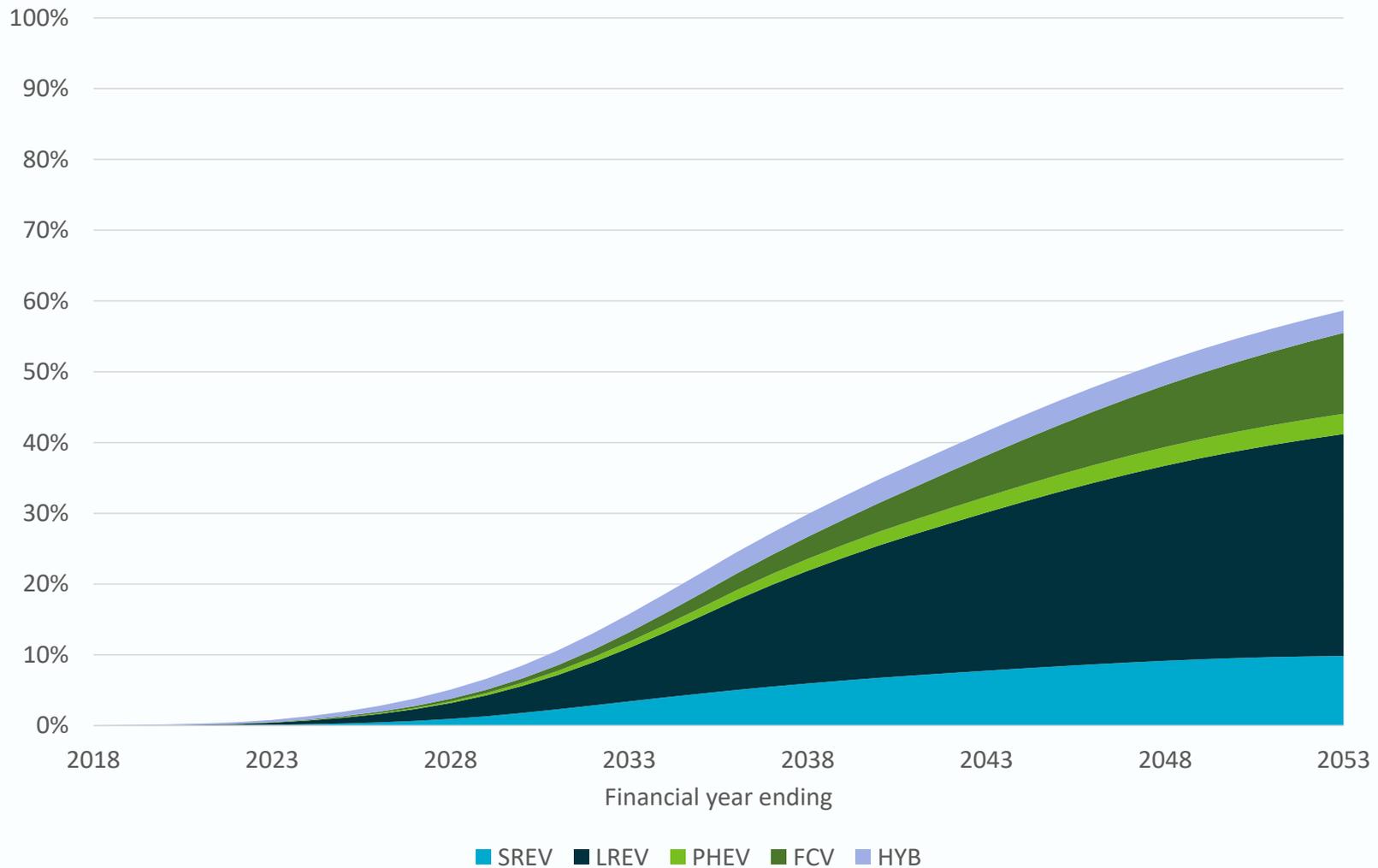
Preliminary projections – Electric vehicles



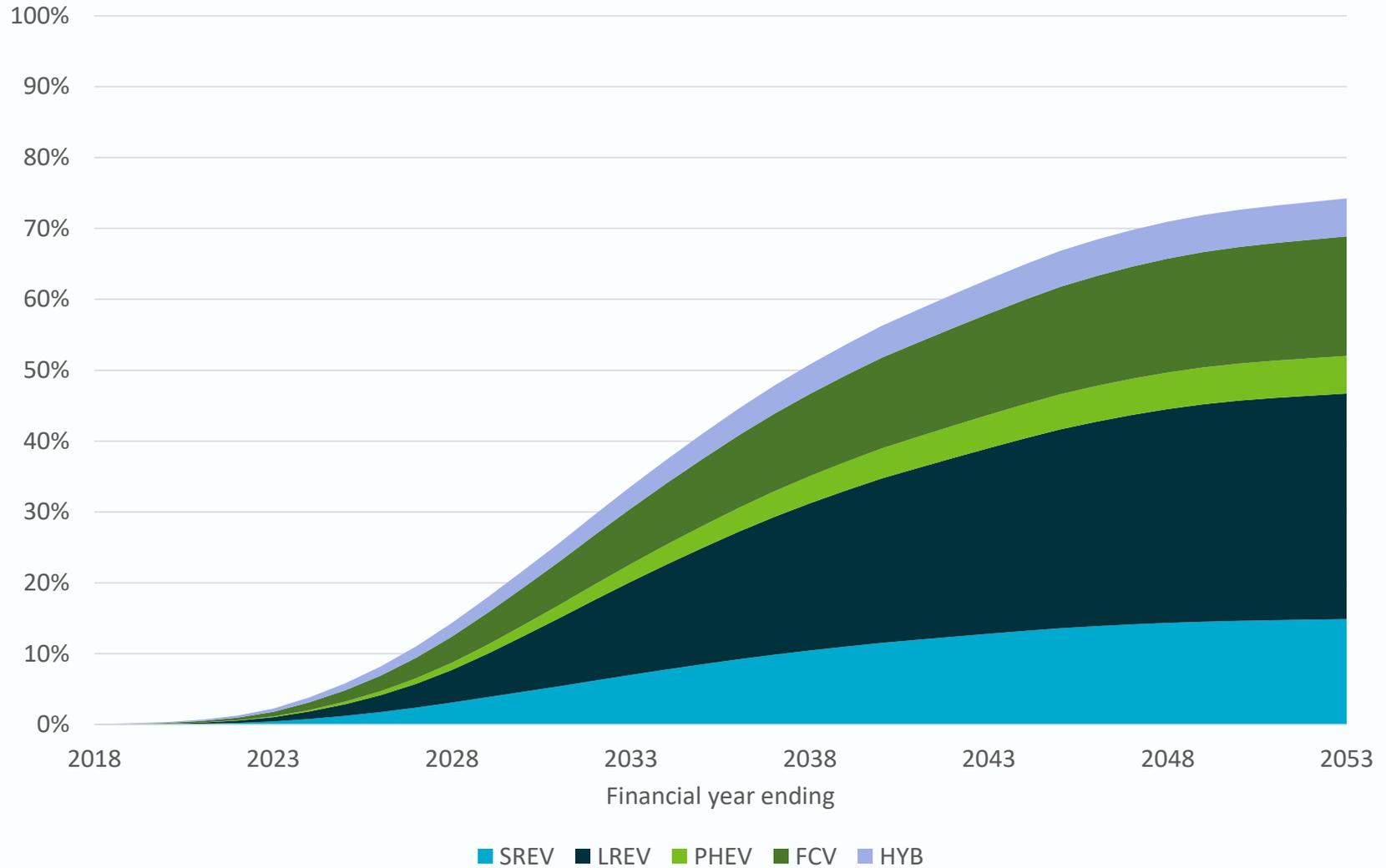
Preliminary projections – EV consumption



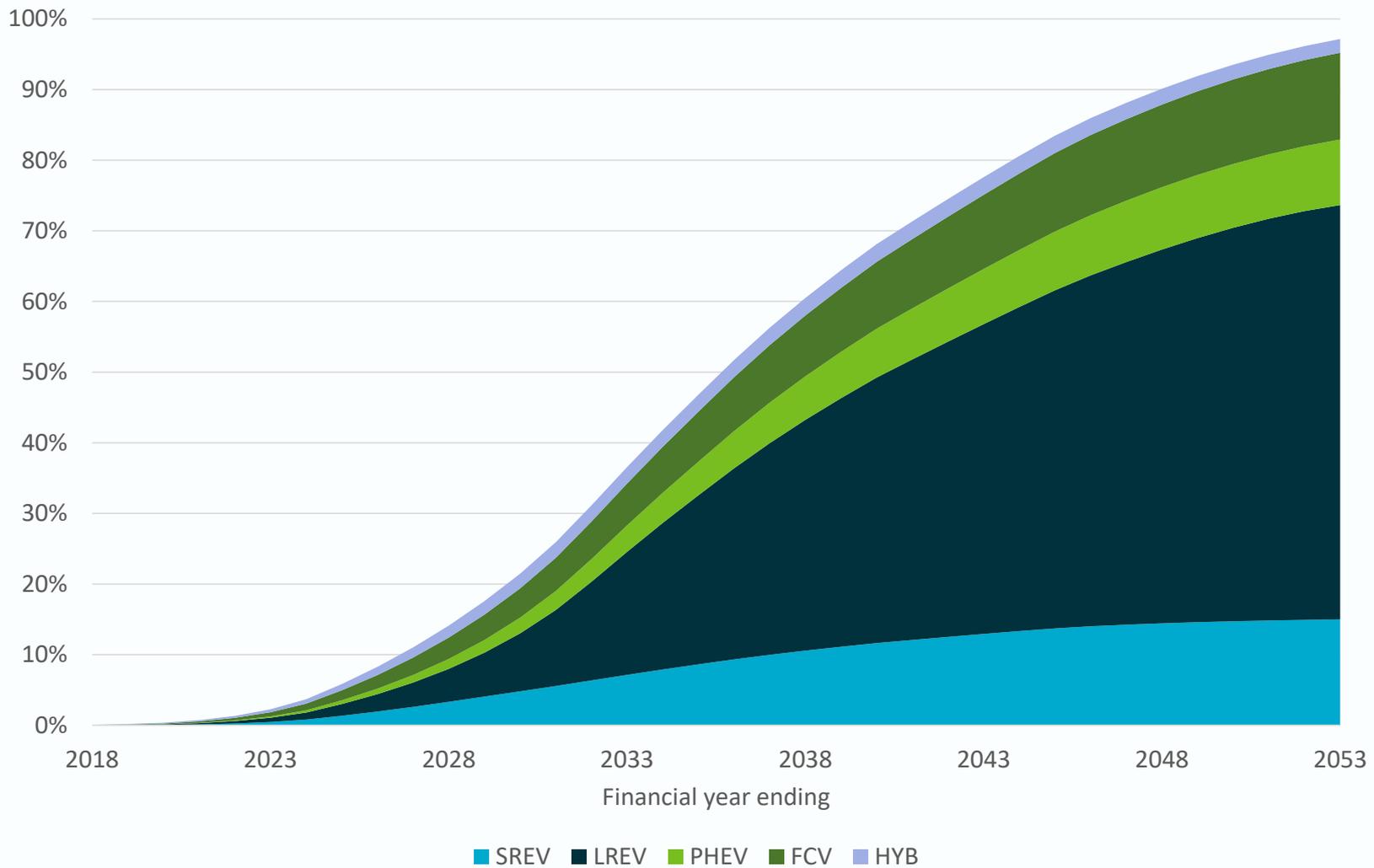
Preliminary projections – Fleet share Neutral



Preliminary projections – Fleet share Fast change



Preliminary projections – Fleet share High DER



Battery and vehicle operation profiles

- Three options for batteries
 - Solar shifting on flat tariff
 - Solar shifting plus peak period sensitive (i.e. TOU or Demand tariff response)
 - Operated by third party for system needs (VPP)
- Options for vehicles (passenger, LCV, trucks&buses)
 - Convenience
 - Night/Day time off-peak
 - Fast/Highway charge
 - Vehicle to home
- Percentages of each profile defined by scenario & weather year using 50-60 customers per network area

Thank you

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