WESTERN POWER DISTRIBUTION

*Serving the Midlands, South West and Wales*

# Distribution Future Energy Scenarios

## Local Authority: Sir Gaerfyrddin - Carmarthenshire

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## What are Distribution Future Energy Scenarios?

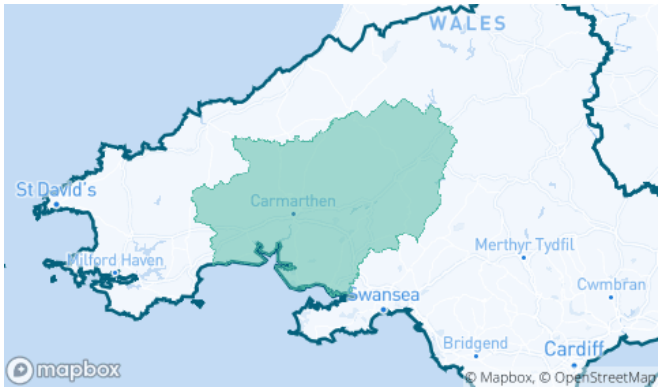
**Western Power Distribution run Distribution Future Energy Scenarios (DFES) on an annual cycle for all licence areas, and represent a range of credible future scenarios of what could connect to the distribution network.**

The scenarios use a scenario framework consistent with all electricity distribution network operators and the National Grid ESO Future Energy Scenarios. These aim to account for differing uptakes of Electric Vehicles, Heat Pumps, new domestic and I&C developments and distributed generation connections, that WPD use to assess the strategic development of our network.

A summary of the methodology and detailed reports are available on our website. DFES scenario projections are available on the interactive DFES map on the website here.

## Geographic Area Covered

This report covers the area of Sir Gaerfyrddin - Carmarthenshire covered by the WPD South Wales licence area.




## Scenario Summary

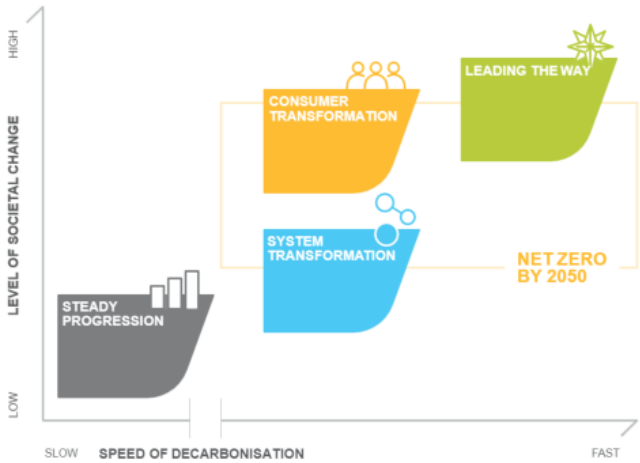
**This DFES scenario framework includes three scenarios that are compliant with UK government targets of Net Zero greenhouse gas emissions by 2050. A summary of each scenario is below:**

Steady Progression (SP) assumes non-compliance with the net zero emissions target. Low levels of decarbonisation and societal change.

System Transformation (ST) has high level of decarbonisation with lower societal change. Larger, more centralised solutions are developed. This scenario has the highest levels of hydrogen deployment.

Consumer Transformation (CT) has high levels of decarbonisation and societal change. Consumers adopt new technologies rapidly, and more decentralised solutions are developed. This scenario has significant electrification of domestic heat.

Leading the Way (LW) has very high levels of decarbonisation and societal change. Consumers adopt new technologies rapidly, and a mix of solutions are developed. This scenario aims for the "fastest credible" decarbonisation pathway.



## Scenario Projections: at a glance

The DFES scenario projections at a Local Authority level include all customers connected to the distribution network within the area of the Local Authority at all voltage levels. Customers connected to the transmission network are not included in this analysis. The table below shows a breakdown of the total for Sir Gaerfyrddin - Carmarthenshire for two specific years in the DFES analysis.

WPD also create a 5th 'Best View' scenario for the purposes of regulatory reporting. This is a hybrid scenario built on local stakeholder engagement, which maps which of the four DFES scenarios aligns most closely with regional ambition and delivery capabilities. The WPD Best View informs the likely amount of investment on the network across a licence area, and is supplemented by uncertainty mechanisms which can flex to accommodate changes in regional growth projections.

For the DFES 2020 analysis, Sir Gaerfyrddin - Carmarthenshire has been assigned the Steady Progression scenario for the WPD Best View.

| Technology | Units | Baseline Total | 2030 | | | | 2050 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | SP | ST | CT | LW | SP | ST | CT | LW |
| Air conditioning | Number of domestic air conditioning units | 898 | 3670 | 3051 | 3051 | 982 | 63203 | 35527 | 35527 | 1166 |
| Direct electric heating | Number of customers with direct electric heating | 2882 | 3243 | 3268 | 3244 | 3370 | 4347 | 3631 | 3365 | 3856 |
| Domestic | Number of new dwellings | 0 | 3338 | 4548 | 4548 | 6156 | 11667 | 16100 | 16100 | 23155 |
| Electric vehicles | Number of electric vehicles | 689 | 14590 | 20439 | 32407 | 40797 | 116334 | 103726 | 87488 | 76489 |
| EV Charge Point | Number of EV charge points | 289 | 6811 | 10436 | 22347 | 26931 | 72556 | 72440 | 69707 | 72420 |
| Heat pumps | Number of heat pumps | 925 | 2111 | 8889 | 25444 | 29214 | 22389 | 37301 | 75418 | 74812 |
| Non domestic | Floorspace (metres squared) of new I&C developments | 0.0 | 79636.9 | 110252.3 | 110252.3 | 145182.9 | 247104.9 | 269519.3 | 269519.3 | 269282.9 |
| Other Distributed Generation | MW (installed capacity) | 50.3 | 58.3 | 50.3 | 50.3 | 50.5 | 66.0 | 50.3 | 51.7 | 1.9 |
| Solar Generation | MW (installed capacity) | 103.3 | 113.0 | 186.1 | 204.7 | 188.6 | 143.7 | 340.2 | 429.4 | 505.5 |
| Storage | MW (installed capacity) | 0.0 | 1.7 | 0.8 | 3.6 | 5.6 | 6.5 | 1.8 | 32.6 | 47.5 |
| Wind | MW (installed capacity) | 144.3 | 150.3 | 158.9 | 222.8 | 198.5 | 194.2 | 271.4 | 676.6 | 480.4 |

## What does this mean for the local distribution network?

As the DFES scenario projections do not imply any electrical behaviour to the base units, electrical profiles are assigned to each technology type for different yearly snapshots. The profiled demand and generation outputs can be overlaid onto a network model and used to identify where there may be future network constraints on the Extra High Voltage (EHV) networks. The customer behaviour assumptions are summarised in the DFES: Customer Behaviour Report., and the detailed network review forms a key input to the Network Development Plan due to be published in 2022.

## Incorporating your feedback

WPD is committed to continually improving the DFES process. Future work in 2021 will deliver projected energy consumption figures for each Local Authority alongside the volume projections. To validate the DFES process, we would like to sense check our scenario projections against the ambitions of the relevant Local Authorities in our area. WPD Distribution Managers will be engaging with local stakeholders throughout 2021 and any feedback will be incorporated in the 2021 Distribution Future Energy Scenarios analysis.

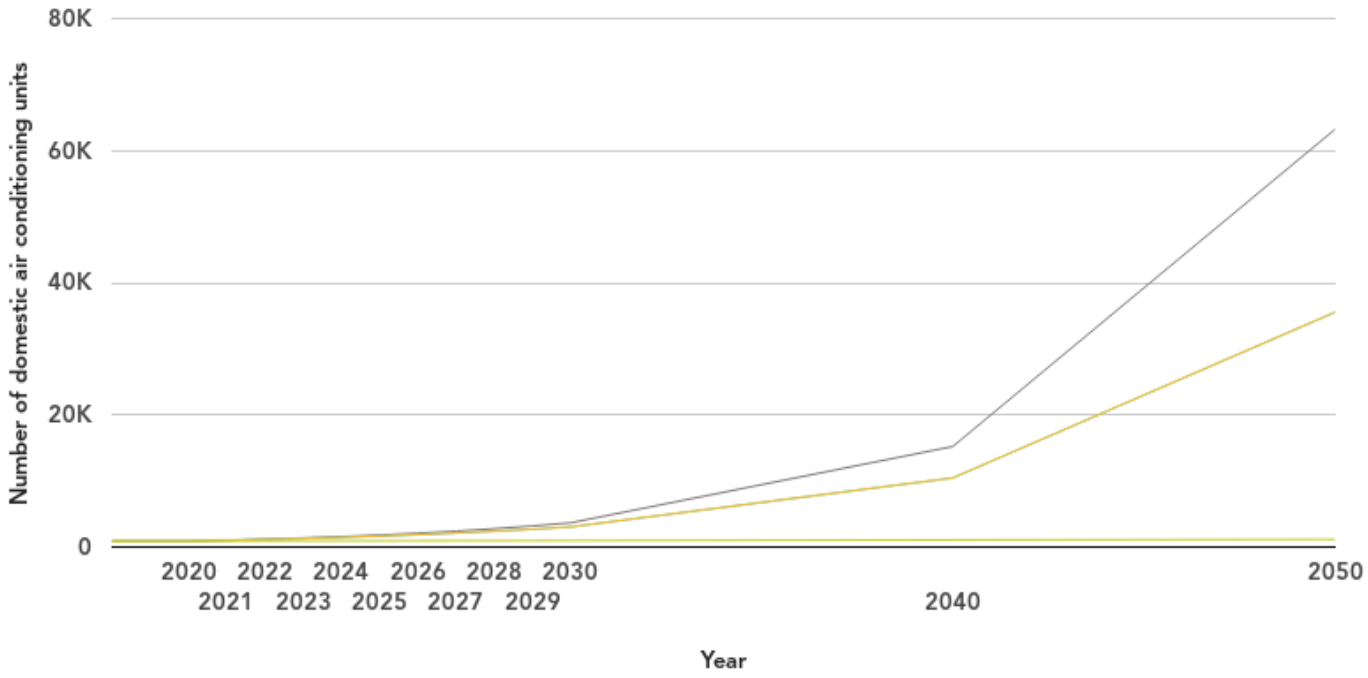
If you have any comments or queries regarding these reports, please contact wpdnetworkstrategy@westernpower.co.uk.

# Technology Summary: Air conditioning

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 898 | 898 | 898 | 898 |
| 2020 | 901 | 902 | 902 | 903 |
| 2021 | 1041 | 1018 | 1018 | 908 |
| 2022 | 1192 | 1152 | 1152 | 916 |
| 2023 | 1372 | 1297 | 1297 | 923 |
| 2024 | 1579 | 1465 | 1465 | 928 |
| 2025 | 1816 | 1659 | 1659 | 937 |
| 2026 | 2090 | 1866 | 1866 | 945 |
| 2027 | 2402 | 2113 | 2113 | 952 |
| 2028 | 2769 | 2388 | 2388 | 962 |
| 2029 | 3187 | 2695 | 2695 | 969 |
| 2030 | 3670 | 3051 | 3051 | 982 |
| 2040 | 15220 | 10457 | 10457 | 1080 |
| 2050 | 63203 | 35527 | 35527 | 1166 |

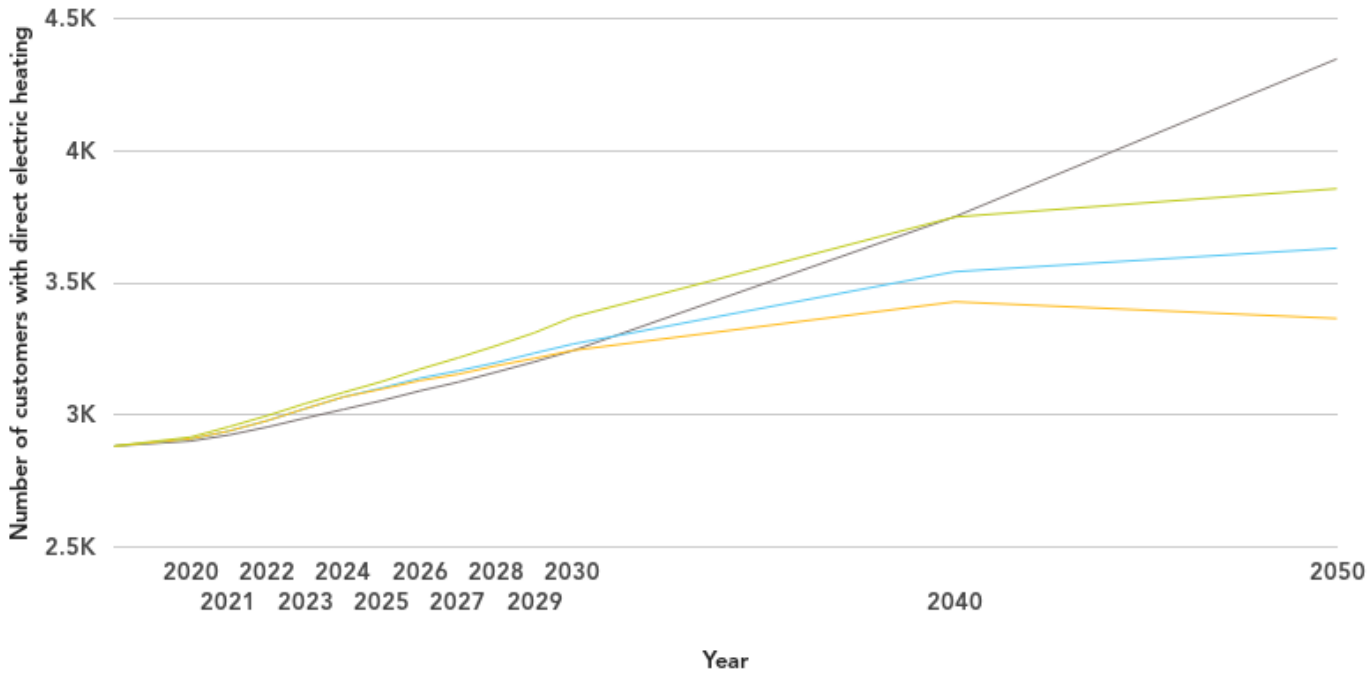


# Technology Summary: Direct electric heating

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 2882 | 2882 | 2882 | 2882 |
| 2020 | 2901 | 2909 | 2909 | 2916 |
| 2021 | 2924 | 2939 | 2939 | 2955 |
| 2022 | 2954 | 2978 | 2978 | 2997 |
| 2023 | 2988 | 3024 | 3024 | 3043 |
| 2024 | 3021 | 3068 | 3068 | 3085 |
| 2025 | 3054 | 3102 | 3098 | 3126 |
| 2026 | 3091 | 3139 | 3130 | 3173 |
| 2027 | 3124 | 3167 | 3154 | 3216 |
| 2028 | 3162 | 3198 | 3186 | 3262 |
| 2029 | 3201 | 3234 | 3214 | 3311 |
| 2030 | 3243 | 3268 | 3244 | 3370 |
| 2040 | 3750 | 3542 | 3428 | 3749 |
| 2050 | 4347 | 3631 | 3365 | 3856 |

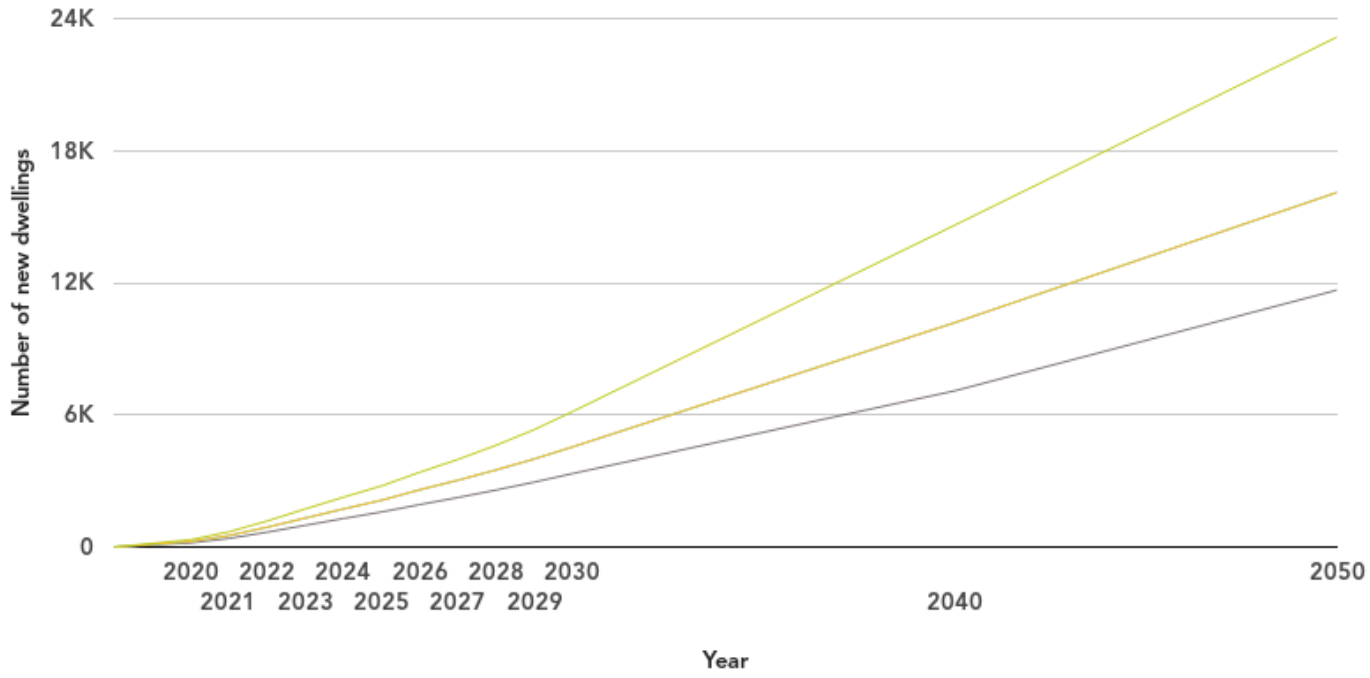


# Technology Summary: Domestic

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 0 | 0 | 0 | 0 |
| 2020 | 187 | 247 | 247 | 332 |
| 2021 | 391 | 521 | 521 | 691 |
| 2022 | 674 | 897 | 897 | 1181 |
| 2023 | 986 | 1315 | 1315 | 1729 |
| 2024 | 1295 | 1729 | 1729 | 2263 |
| 2025 | 1594 | 2127 | 2127 | 2777 |
| 2026 | 1928 | 2602 | 2602 | 3398 |
| 2027 | 2249 | 3036 | 3036 | 3981 |
| 2028 | 2589 | 3503 | 3503 | 4625 |
| 2029 | 2951 | 4003 | 4003 | 5337 |
| 2030 | 3338 | 4548 | 4548 | 6156 |
| 2040 | 7093 | 10190 | 10190 | 14616 |
| 2050 | 11667 | 16100 | 16100 | 23155 |

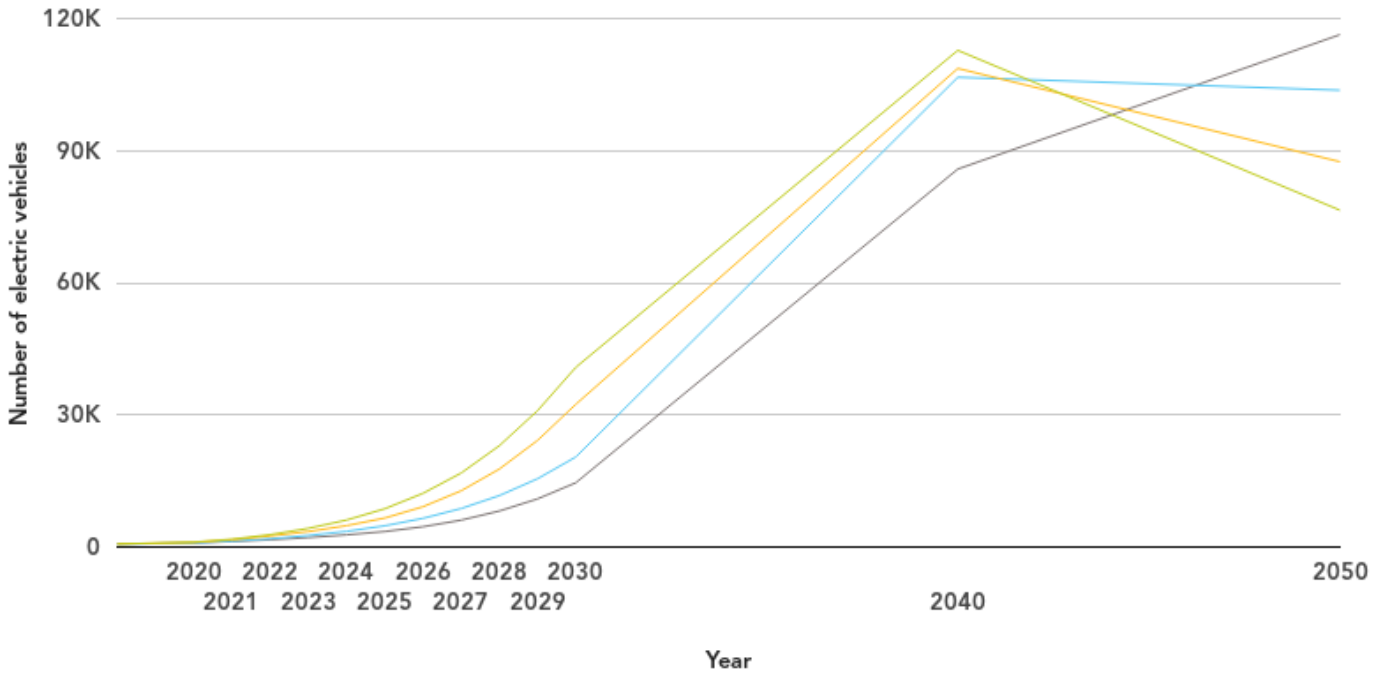


# Technology Summary: Electric vehicles

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 689 | 689 | 689 | 689 |
| 2020 | 923 | 948 | 1055 | 1100 |
| 2021 | 1248 | 1336 | 1649 | 1775 |
| 2022 | 1655 | 1881 | 2504 | 2797 |
| 2023 | 2149 | 2611 | 3507 | 4239 |
| 2024 | 2760 | 3561 | 4853 | 6121 |
| 2025 | 3519 | 4818 | 6580 | 8690 |
| 2026 | 4608 | 6514 | 9154 | 12186 |
| 2027 | 6106 | 8745 | 12771 | 16802 |
| 2028 | 8183 | 11678 | 17710 | 23009 |
| 2029 | 10933 | 15508 | 24213 | 30967 |
| 2030 | 14590 | 20439 | 32407 | 40797 |
| 2040 | 85821 | 106661 | 108670 | 112771 |
| 2050 | 116334 | 103726 | 87488 | 76489 |

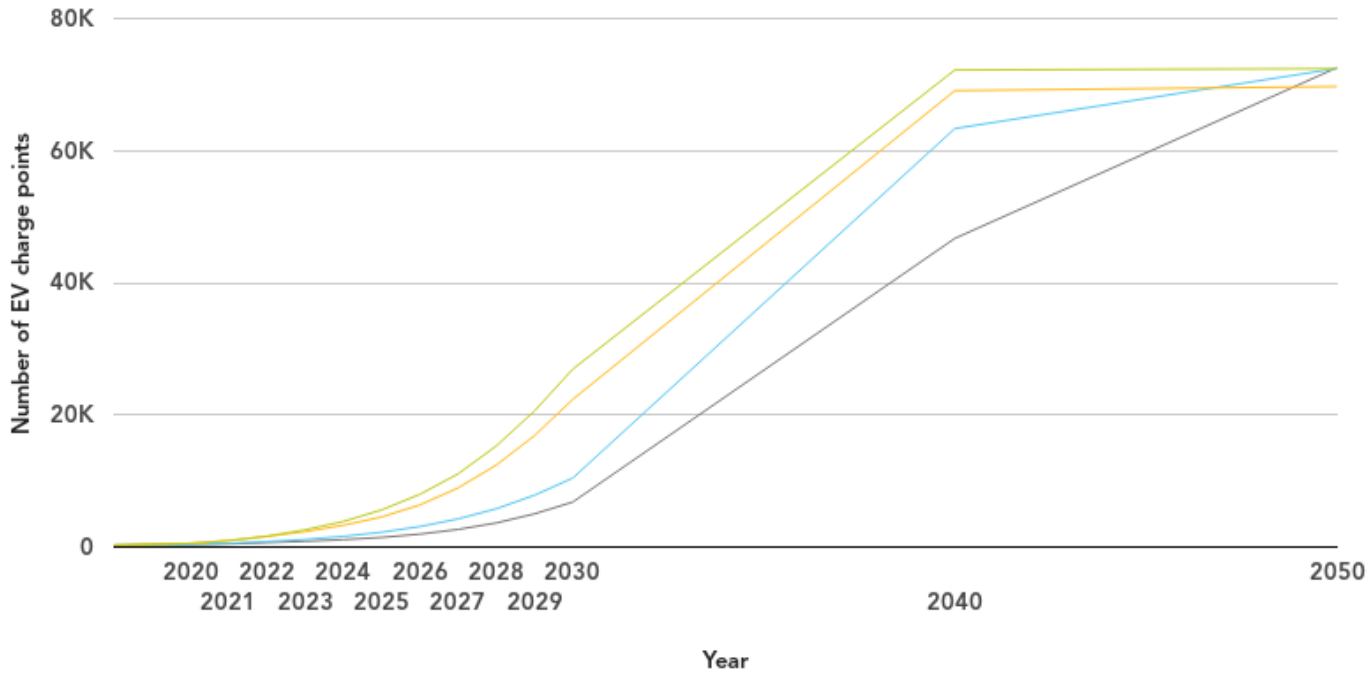


# Technology Summary: EV Charge Point

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 289 | 289 | 289 | 289 |
| 2020 | 350 | 372 | 555 | 548 |
| 2021 | 480 | 544 | 982 | 969 |
| 2022 | 675 | 817 | 1611 | 1641 |
| 2023 | 862 | 1147 | 2330 | 2607 |
| 2024 | 1117 | 1614 | 3295 | 3879 |
| 2025 | 1457 | 2239 | 4553 | 5627 |
| 2026 | 1955 | 3098 | 6377 | 7983 |
| 2027 | 2666 | 4262 | 8956 | 11080 |
| 2028 | 3648 | 5798 | 12410 | 15308 |
| 2029 | 5023 | 7848 | 16877 | 20610 |
| 2030 | 6811 | 10436 | 22347 | 26931 |
| 2040 | 46717 | 63345 | 69086 | 72209 |
| 2050 | 72556 | 72440 | 69707 | 72420 |

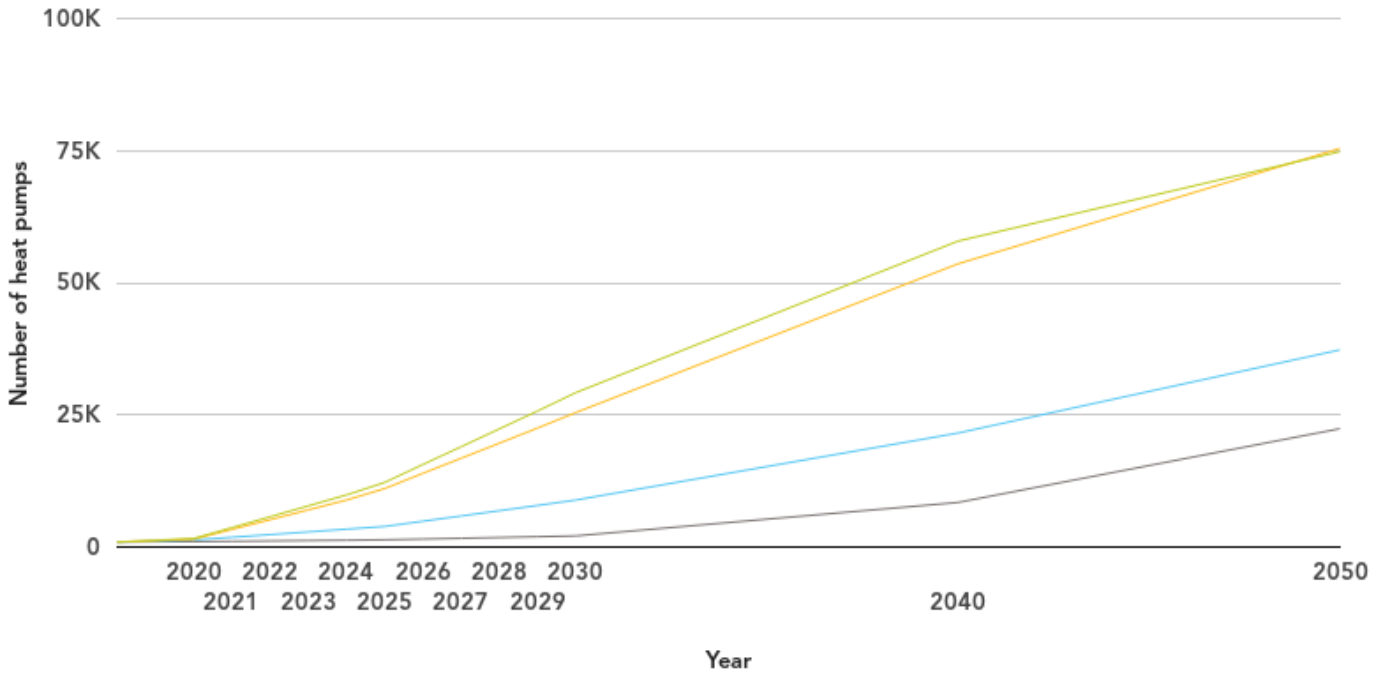


# Technology Summary: Heat pumps

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 925 | 925 | 925 | 925 |
| 2020 | 1023 | 1344 | 1485 | 1618 |
| 2021 | 1081 | 1847 | 3324 | 3665 |
| 2022 | 1152 | 2350 | 5173 | 5724 |
| 2023 | 1220 | 2863 | 7031 | 7787 |
| 2024 | 1290 | 3379 | 8893 | 9857 |
| 2025 | 1365 | 3893 | 11067 | 12226 |
| 2026 | 1509 | 4884 | 13955 | 15625 |
| 2027 | 1658 | 5871 | 16797 | 18975 |
| 2028 | 1806 | 6869 | 19651 | 22356 |
| 2029 | 1953 | 7869 | 22516 | 25740 |
| 2030 | 2111 | 8889 | 25444 | 29214 |
| 2040 | 8427 | 21561 | 53576 | 57871 |
| 2050 | 22389 | 37301 | 75418 | 74812 |

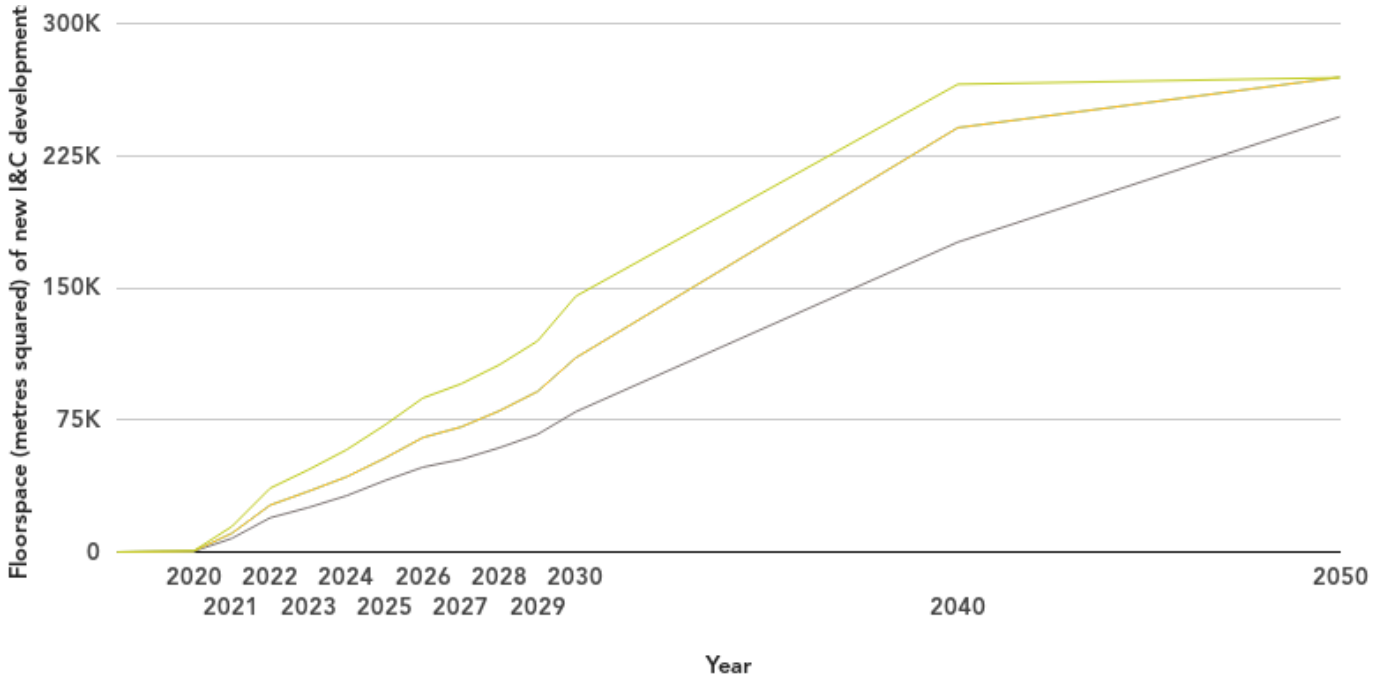


# Technology Summary: Non domestic

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 0.0 | 0.0 | 0.0 | 0.0 |
| 2020 | 368.0 | 490.0 | 490.0 | 653.0 |
| 2021 | 7762.0 | 10650.0 | 10650.0 | 14493.0 |
| 2022 | 19425.0 | 26630.0 | 26630.0 | 36222.0 |
| 2023 | 25254.0 | 34432.0 | 34432.0 | 46680.0 |
| 2024 | 31965.4 | 42647.4 | 42647.4 | 58047.4 |
| 2025 | 40519.9 | 53266.9 | 53266.9 | 72029.9 |
| 2026 | 48172.9 | 64987.3 | 64987.3 | 87417.9 |
| 2027 | 52627.9 | 70988.3 | 70988.3 | 95467.9 |
| 2028 | 59189.9 | 80114.3 | 80114.3 | 106269.9 |
| 2029 | 66830.9 | 91134.3 | 91134.3 | 119778.9 |
| 2030 | 79636.9 | 110252.3 | 110252.3 | 145182.9 |
| 2040 | 175913.9 | 240865.3 | 240865.3 | 265515.9 |
| 2050 | 247104.9 | 269519.3 | 269519.3 | 269282.9 |

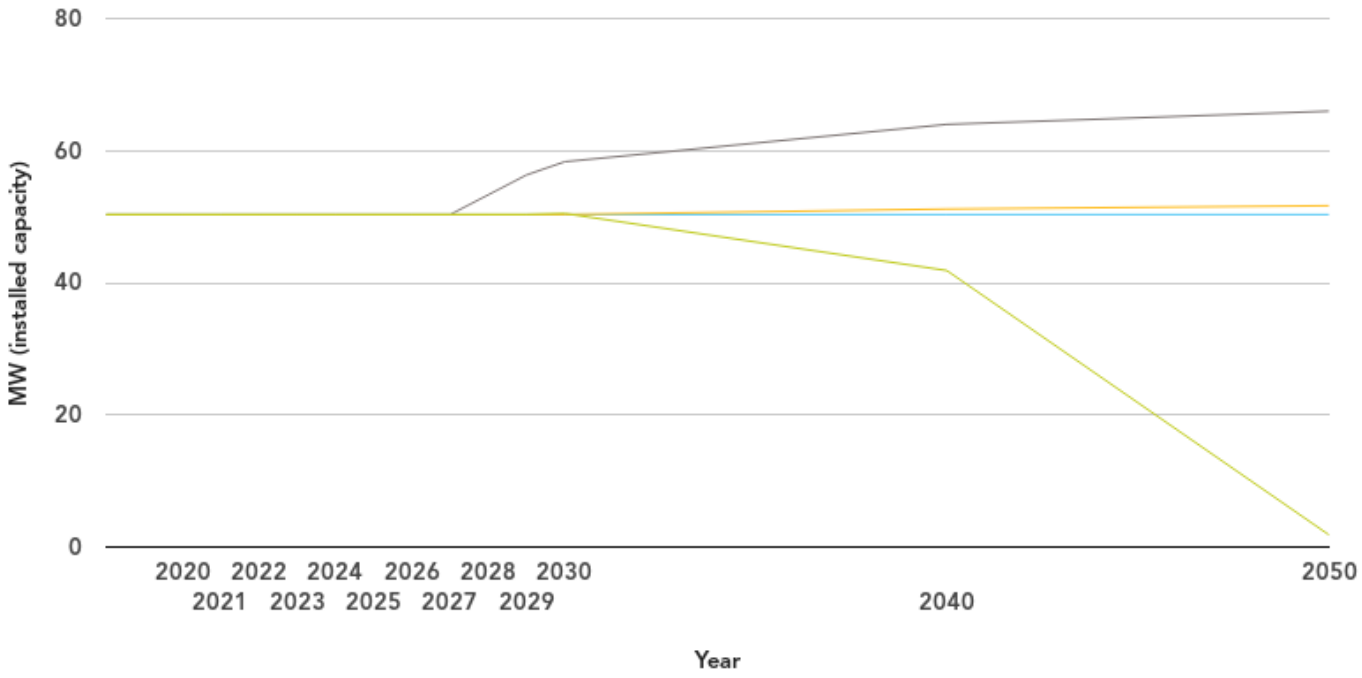


# Technology Summary: Other Distributed Generation

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 50.3 | 50.3 | 50.3 | 50.3 |
| 2020 | 50.3 | 50.3 | 50.3 | 50.3 |
| 2021 | 50.3 | 50.3 | 50.3 | 50.3 |
| 2022 | 50.3 | 50.3 | 50.3 | 50.3 |
| 2023 | 50.3 | 50.3 | 50.3 | 50.3 |
| 2024 | 50.3 | 50.3 | 50.3 | 50.3 |
| 2025 | 50.3 | 50.3 | 50.3 | 50.3 |
| 2026 | 50.3 | 50.3 | 50.3 | 50.3 |
| 2027 | 50.3 | 50.3 | 50.3 | 50.3 |
| 2028 | 53.3 | 50.3 | 50.3 | 50.3 |
| 2029 | 56.3 | 50.3 | 50.3 | 50.3 |
| 2030 | 58.3 | 50.3 | 50.3 | 50.5 |
| 2040 | 64.0 | 50.3 | 51.2 | 41.9 |
| 2050 | 66.0 | 50.3 | 51.7 | 1.9 |

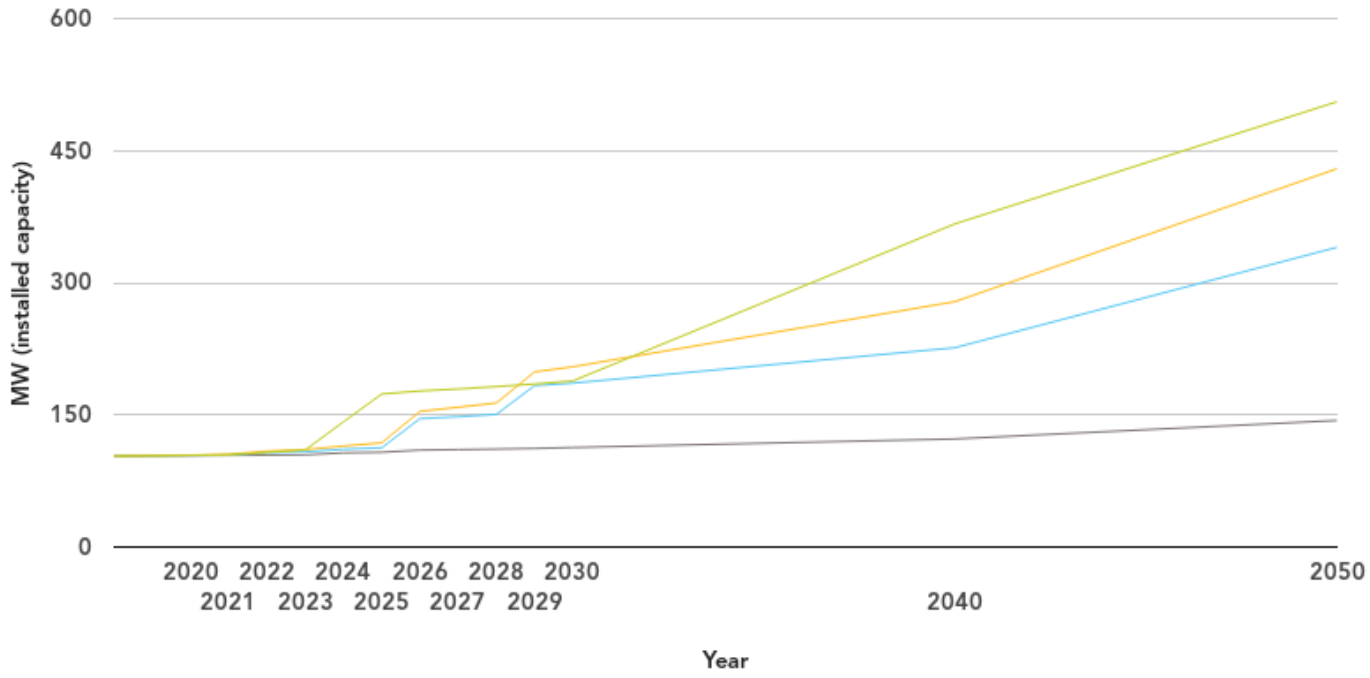


# Technology Summary: Solar Generation

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 103.3 | 103.3 | 103.3 | 103.3 |
| 2020 | 103.8 | 104.1 | 104.3 | 104.1 |
| 2021 | 104.1 | 104.5 | 105.4 | 104.8 |
| 2022 | 104.4 | 107.2 | 108.8 | 107.5 |
| 2023 | 104.7 | 108.0 | 110.6 | 110.2 |
| 2024 | 107.0 | 111.0 | 114.7 | 142.2 |
| 2025 | 107.6 | 112.7 | 118.3 | 173.7 |
| 2026 | 110.0 | 145.8 | 154.0 | 177.2 |
| 2027 | 110.5 | 148.0 | 158.7 | 179.4 |
| 2028 | 111.2 | 150.6 | 163.5 | 182.2 |
| 2029 | 112.0 | 183.2 | 198.8 | 185.1 |
| 2030 | 113.0 | 186.1 | 204.7 | 188.6 |
| 2040 | 122.7 | 226.3 | 278.6 | 366.8 |
| 2050 | 143.7 | 340.2 | 429.4 | 505.5 |

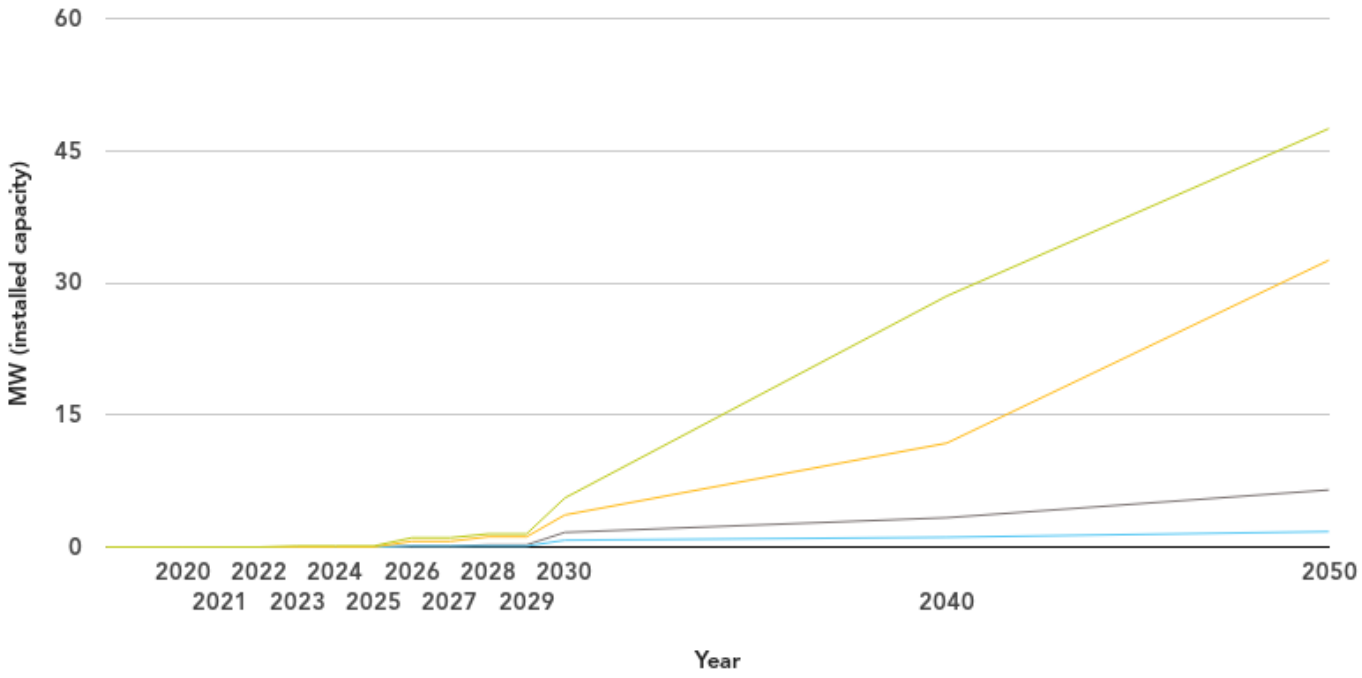


# Technology Summary: Storage

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 0.0 | 0.0 | 0.0 | 0.0 |
| 2020 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2021 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2022 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2023 | 0.0 | 0.0 | 0.0 | 0.1 |
| 2024 | 0.0 | 0.0 | 0.0 | 0.1 |
| 2025 | 0.0 | 0.0 | 0.0 | 0.1 |
| 2026 | 0.1 | 0.1 | 0.6 | 1.1 |
| 2027 | 0.1 | 0.1 | 0.6 | 1.1 |
| 2028 | 0.2 | 0.1 | 1.2 | 1.5 |
| 2029 | 0.2 | 0.1 | 1.2 | 1.5 |
| 2030 | 1.7 | 0.8 | 3.6 | 5.6 |
| 2040 | 3.3 | 1.1 | 11.8 | 28.5 |
| 2050 | 6.5 | 1.8 | 32.6 | 47.5 |

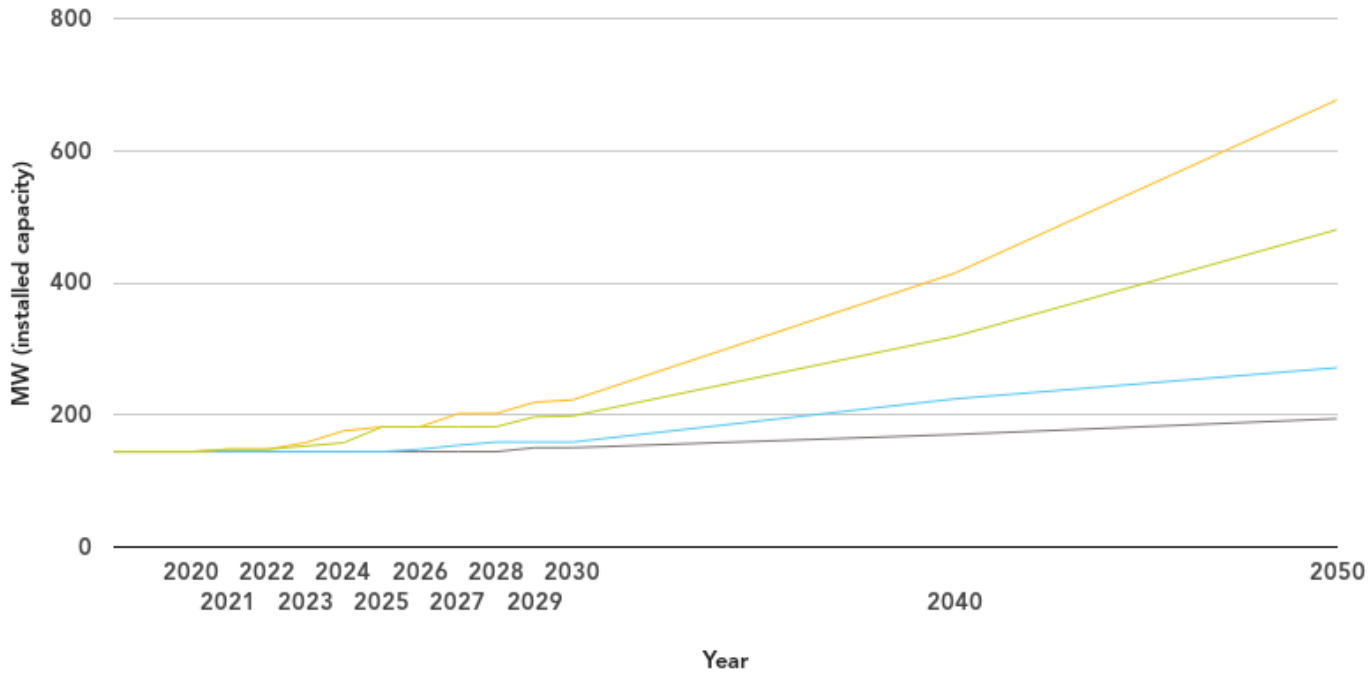


# Technology Summary: Wind

The table and graph below show the scenario projections for each of the DFES scenarios.

WPD Best View scenario: aligned to Steady Progression

| Year | Scenario | | | |
|---|---|---|---|---|
| | Steady Progression | System Transformation | Consumer Transformation | Leading the Way |
| Baseline | 144.3 | 144.3 | 144.3 | 144.3 |
| 2020 | 144.3 | 144.3 | 144.3 | 144.3 |
| 2021 | 144.3 | 144.3 | 147.9 | 147.9 |
| 2022 | 144.3 | 144.3 | 147.9 | 147.9 |
| 2023 | 144.3 | 144.3 | 157.8 | 152.8 |
| 2024 | 144.3 | 144.3 | 175.8 | 157.8 |
| 2025 | 144.3 | 144.3 | 181.8 | 181.8 |
| 2026 | 144.3 | 147.9 | 181.9 | 181.9 |
| 2027 | 144.3 | 153.9 | 201.9 | 181.9 |
| 2028 | 144.3 | 158.9 | 202.2 | 182.1 |
| 2029 | 150.3 | 158.9 | 219.2 | 197.1 |
| 2030 | 150.3 | 158.9 | 222.8 | 198.5 |
| 2040 | 170.3 | 224.2 | 414.5 | 318.8 |
| 2050 | 194.2 | 271.4 | 676.6 | 480.4 |



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