

# Distribution Future Energy Scenarios 2022

Local Authority:  
Cardiff

## What are Distribution Future Energy Scenarios?

National Grid 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 NGED 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 Cardiff covered by the NGED licence areas.



## 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:

**Falling Short (FS)** 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 Cardiff for two specific years in the DFES analysis.

NGED also created a 5th 'Best View' forecast for the purposes of regulatory reporting and strategic network planning. This is a hybrid forecast built on local stakeholder engagement and historic performance, which reflects local authority ambition for the technologies where its influence is greatest. The Best View informs the likely amount of investment on the network across a licence area; however, changes in regional growth projections that affect investment requirements are supported through the uncertainty mechanism funding process.

Technology	Units	Baseline Total	2030				2050			
			FS	ST	CT	LW	FS	ST	CT	LW
Air conditioning	Domestic air conditioning units	2456	6903	5942	5942	2456	68044	41436	41436	2459
Domestic	New dwellings	0	8846	9685	9685	11411	23082	22878	22878	22740
Electric vehicles	Electric vehicles	2264	35906	42166	78704	78411	254766	236314	247044	182781
EV Charge Point	EV charge points	1516	17079	22964	43820	47648	132767	119947	124949	130981
Heat pumps	Heat pump installations	201	8581	6963	27023	42526	83003	94127	158418	133028
Hydrogen electrolysis	MW (installed capacity)	0.0	0.0	0.7	0.0	4.3	1.5	3.2	1.8	9.2
Non domestic	Floorspace (metres squared) of new I&C developments	0	135472	172128	172128	183503	352773	352773	352773	352773
Other Distributed Generation	MW (installed capacity)	32.5	24.5	23.8	23.9	13.5	23.5	31.5	31.8	40.5
Resistive electric heating	Resistive electric heating units	21914	19657	18734	19292	18970	14499	7539	14268	14548
Solar Generation	MW (installed capacity)	18.6	27.7	44.5	74.6	73.5	71.0	144.0	265.4	269.1
Storage	MW (installed capacity)	0.1	1.1	3.2	7.5	10.6	10.5	26.0	65.2	80.4
Wind	MW (installed capacity)	2.3	2.3	2.5	4.4	3.7	3.1	6.4	18.5	15.7

## 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 NGED investment planning process, which includes the Network Development Plan and Distribution Network Options Assessment.

## Incorporating your feedback

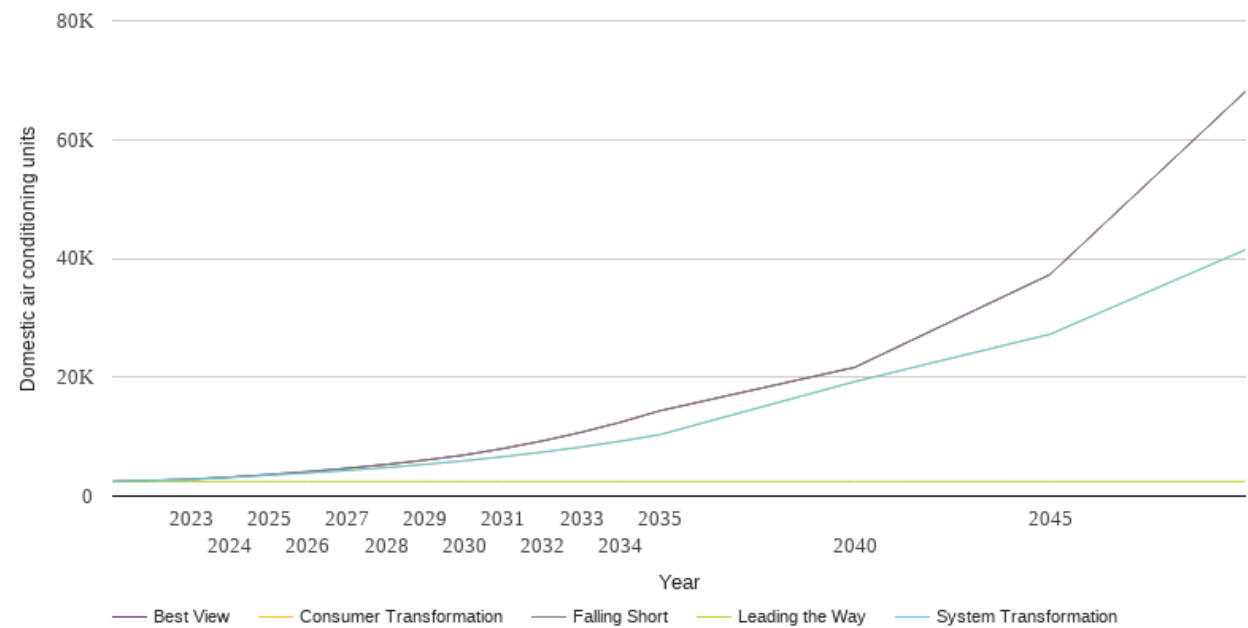
NGED is committed to continually improving the DFES process. To ensure the DFES projections fully capture local ambition, in 2022 we have appointed two DSO Strategic Engagement Officers to engage with local authorities. Any feedback will be incorporated into future Distribution Future Energy Scenarios analysis.

If you have any comments or queries regarding these reports, please contact [nged.energyplanning@nationalgrid.co.uk](mailto:nged.energyplanning@nationalgrid.co.uk).

# Technology Summary: Air conditioning

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

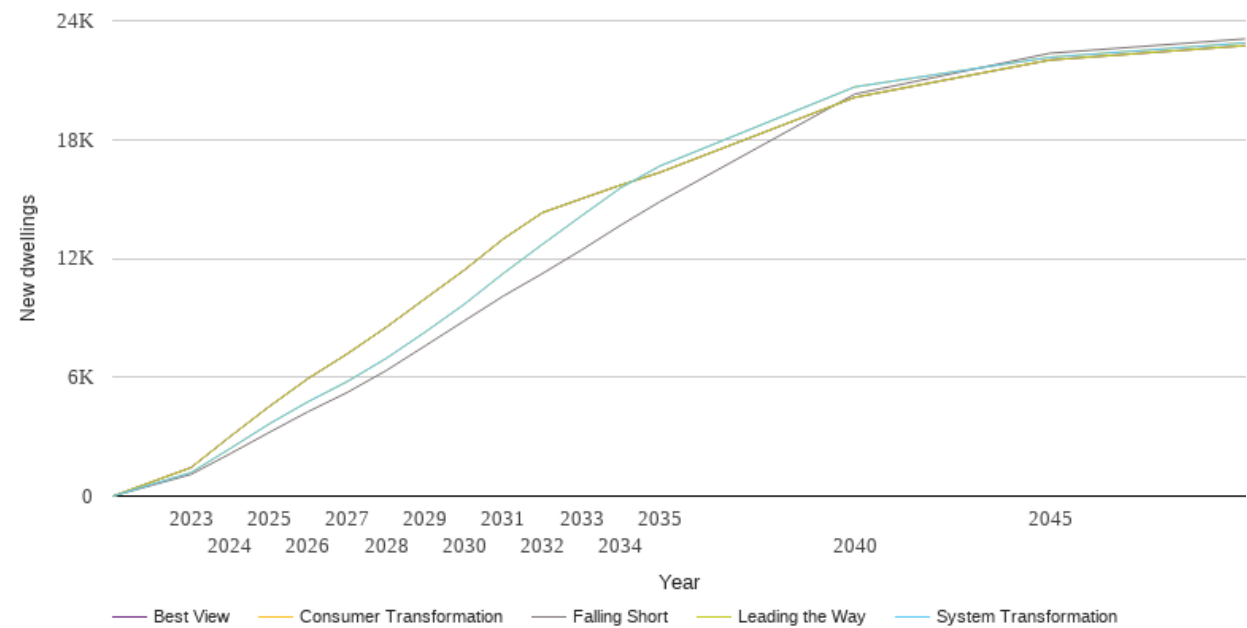
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	2456	2456	2456	2456	2456
2023	2827	2784	2784	2456	2827
2024	3194	3122	3122	2456	3194
2025	3624	3516	3516	2456	3624
2026	4115	3892	3892	2456	4115
2027	4678	4313	4313	2456	4678
2028	5316	4796	4796	2456	5316
2029	6061	5340	5340	2456	6061
2030	6903	5942	5942	2456	6903
2031	8011	6629	6629	2456	8011
2032	9282	7398	7398	2456	9282
2033	10744	8261	8261	2456	10744
2034	12423	9239	9239	2456	12423
2035	14340	10323	10323	2456	14340
2040	21668	19268	19268	2458	21668
2045	37282	27226	27226	2459	37282
2050	68044	41436	41436	2459	68044



# Technology Summary: Domestic

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

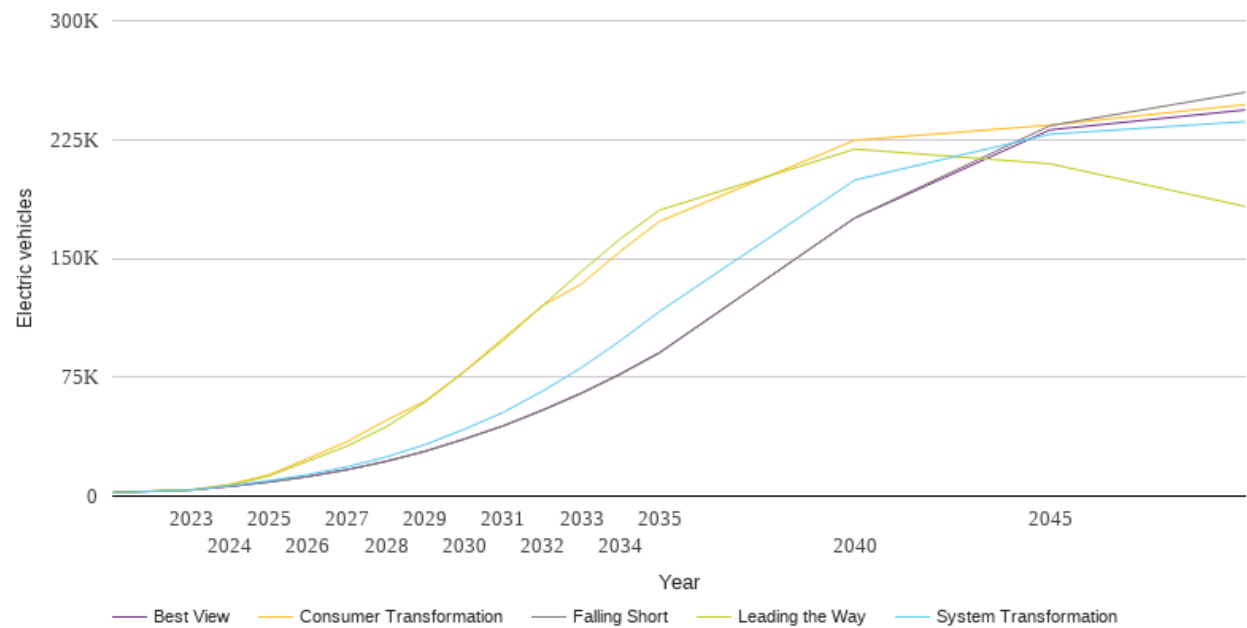
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	0	0	0	0	0
2023	1097	1186	1186	1440	1440
2024	2136	2397	2397	3003	3003
2025	3213	3642	3642	4518	4518
2026	4263	4766	4766	5937	5937
2027	5231	5781	5781	7180	7180
2028	6338	6952	6952	8524	8524
2029	7588	8283	8283	9972	9972
2030	8846	9685	9685	11411	11411
2031	10100	11243	11243	12986	12986
2032	11234	12711	12711	14308	14308
2033	12423	14146	14146	15010	15010
2034	13669	15555	15555	15697	15697
2035	14851	16655	16655	16335	16335
2040	20293	20656	20656	20128	20128
2045	22356	22152	22152	22014	22014
2050	23082	22878	22878	22740	22740



# Technology Summary: Electric vehicles

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

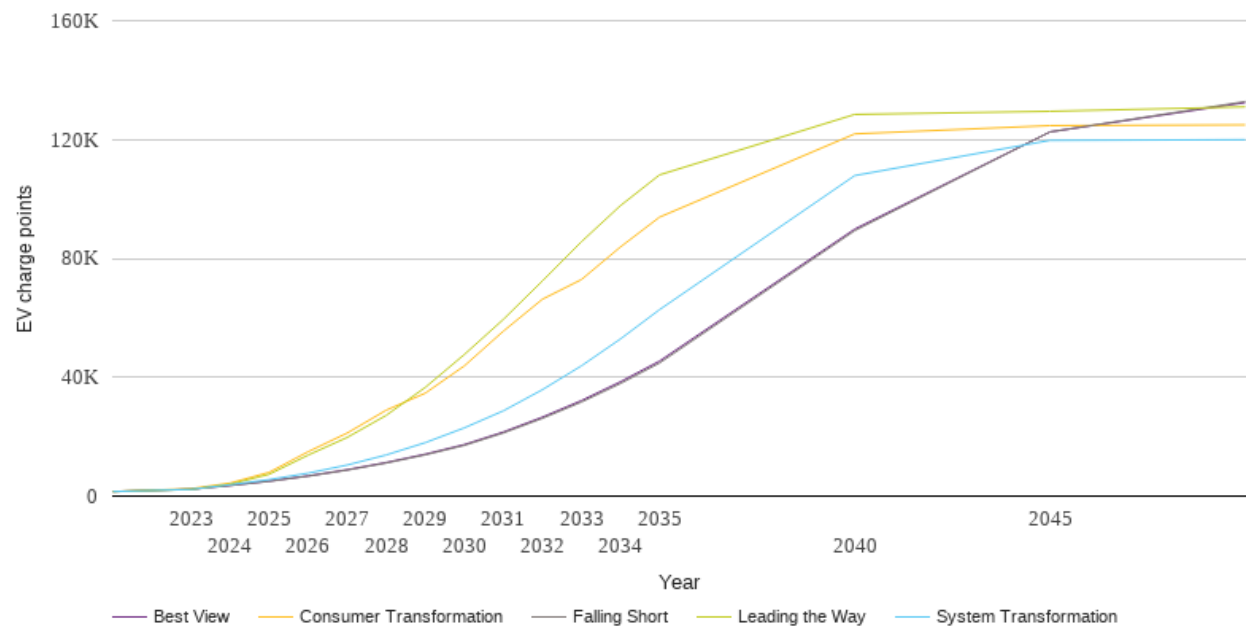
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	2264	2264	2264	2264	2264
2023	3801	3773	4055	3903	3805
2024	6133	6553	7348	7064	6148
2025	8901	9739	13443	12738	8927
2026	12330	13559	23822	22190	12367
2027	16628	18489	34303	31631	16682
2028	21878	24713	47890	43743	21951
2029	28259	32530	60051	59407	28355
2030	35906	42166	78704	78411	36030
2031	44240	52897	99723	98332	44399
2032	54045	66165	120076	120106	54300
2033	64747	81083	133859	141758	65048
2034	76851	98094	154529	162441	77193
2035	90261	116453	173348	180447	90626
2040	175583	199443	224538	218962	175448
2045	233748	228354	234117	209728	231087
2050	254766	236314	247044	182781	243658



# Technology Summary: EV Charge Point

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

Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	1516	1516	1516	1516	1516
2023	2308	2262	2490	2265	2306
2024	3570	3839	4366	3986	3584
2025	4989	5549	7995	7335	5034
2026	6712	7719	14937	13803	6793
2027	8746	10459	21221	19749	8876
2028	11136	13850	28914	27177	11304
2029	13891	17987	34642	36583	14100
2030	17079	22964	43820	47648	17332
2031	21246	28704	55503	59478	21565
2032	26163	35813	66255	72408	26565
2033	31659	43841	72880	85612	32143
2034	37907	52899	83859	97774	38470
2035	44802	62748	93883	108108	45440
2040	89347	107871	121899	128459	89863
2045	122572	119718	124685	129500	122551
2050	132767	119947	124949	130981	132439

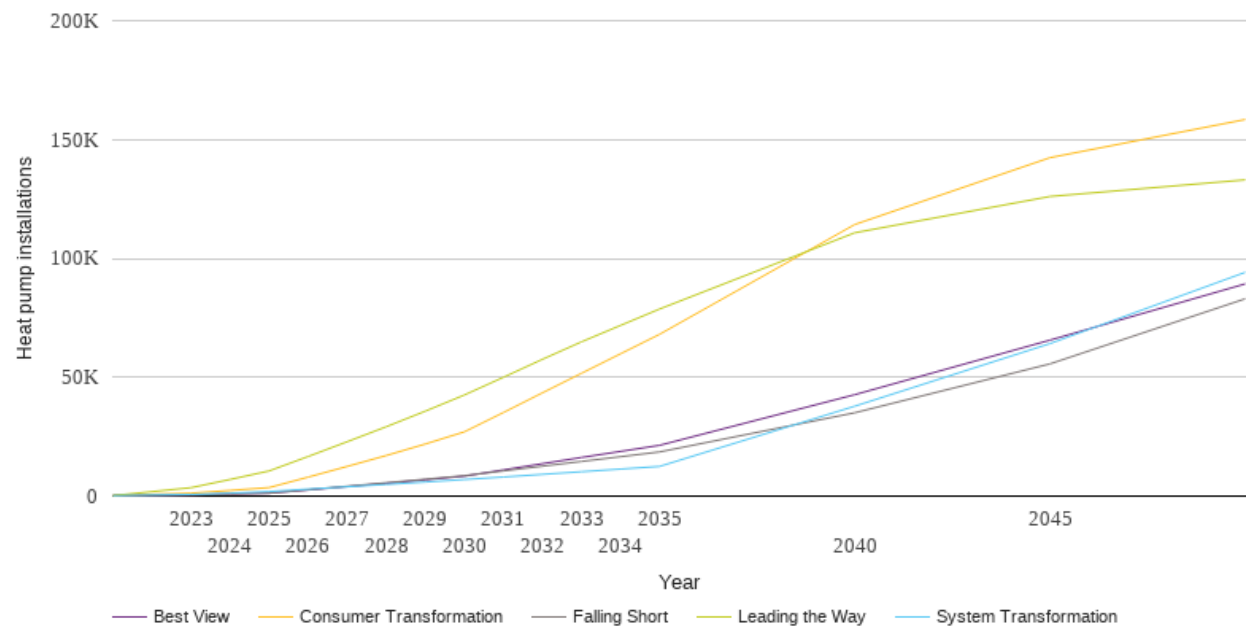




# Technology Summary: Heat pumps

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

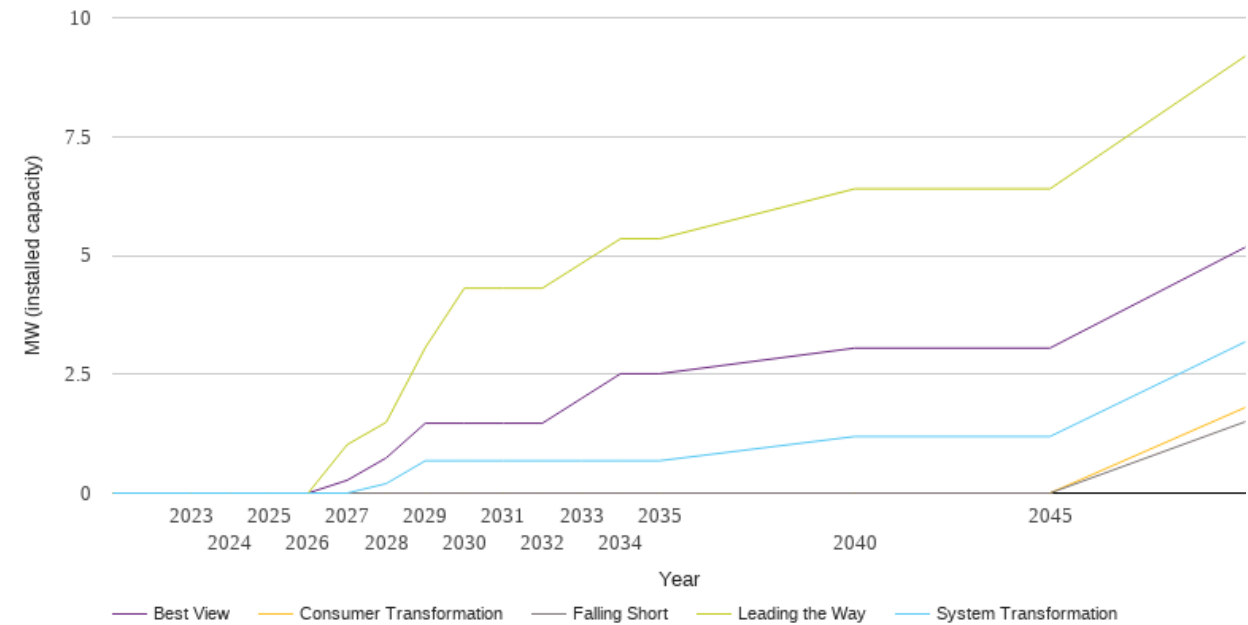
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	201	201	201	201	201
2023	522	678	1230	3537	522
2024	870	1252	2364	6992	870
2025	1224	1913	3579	10582	1224
2026	2682	2933	7980	16658	2590
2027	4149	3927	12481	22875	3984
2028	5608	4909	17066	29179	5373
2029	7090	5913	21906	35724	6837
2030	8581	6963	27023	42526	8389
2031	10596	8024	35157	49974	11015
2032	12581	9143	43445	57541	13631
2033	14578	10247	51658	64885	16245
2034	16571	11363	59861	71798	18794
2035	18576	12488	68060	78695	21361
2040	35050	37821	114247	110769	42672
2045	55613	64148	142367	126043	65611
2050	83003	94127	158418	133028	89276



# Technology Summary: Hydrogen electrolysis

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

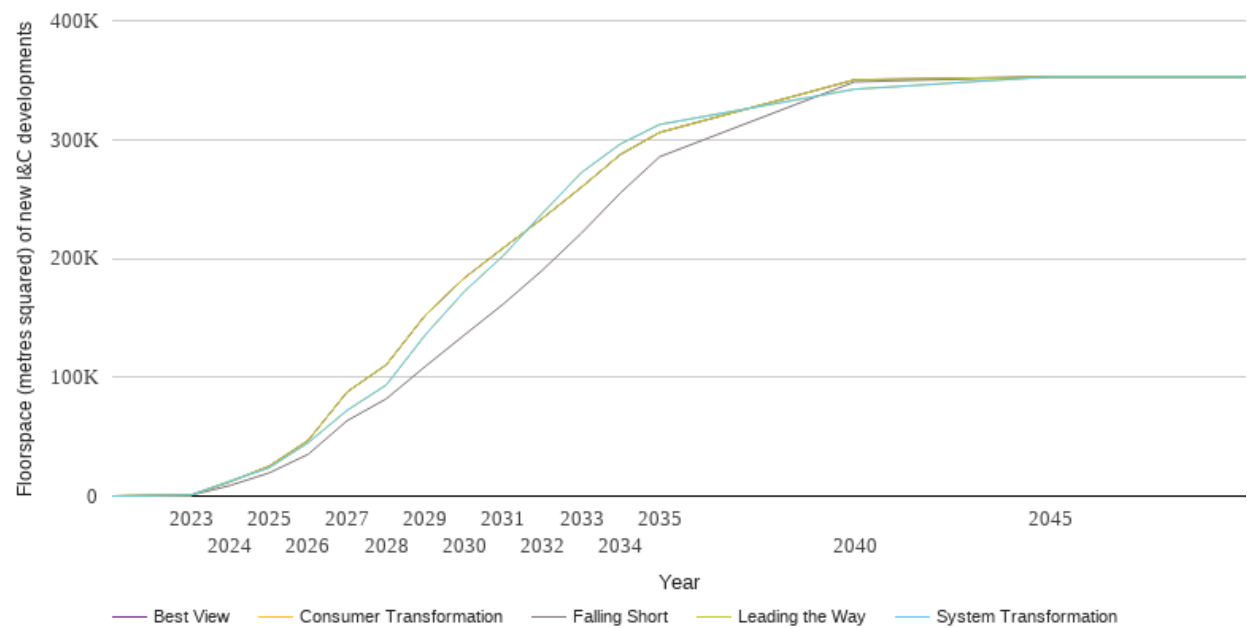
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	0.0	0.0	0.0	0.0	0.0
2023	0.0	0.0	0.0	0.0	0.0
2024	0.0	0.0	0.0	0.0	0.0
2025	0.0	0.0	0.0	0.0	0.0
2026	0.0	0.0	0.0	0.0	0.0
2027	0.0	0.0	0.0	1.0	0.3
2028	0.0	0.2	0.0	1.5	0.7
2029	0.0	0.7	0.0	3.1	1.5
2030	0.0	0.7	0.0	4.3	1.5
2031	0.0	0.7	0.0	4.3	1.5
2032	0.0	0.7	0.0	4.3	1.5
2033	0.0	0.7	0.0	4.8	2.0
2034	0.0	0.7	0.0	5.3	2.5
2035	0.0	0.7	0.0	5.3	2.5
2040	0.0	1.2	0.0	6.4	3.1
2045	0.0	1.2	0.0	6.4	3.1
2050	1.5	3.2	1.8	9.2	5.2



# Technology Summary: Non domestic

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

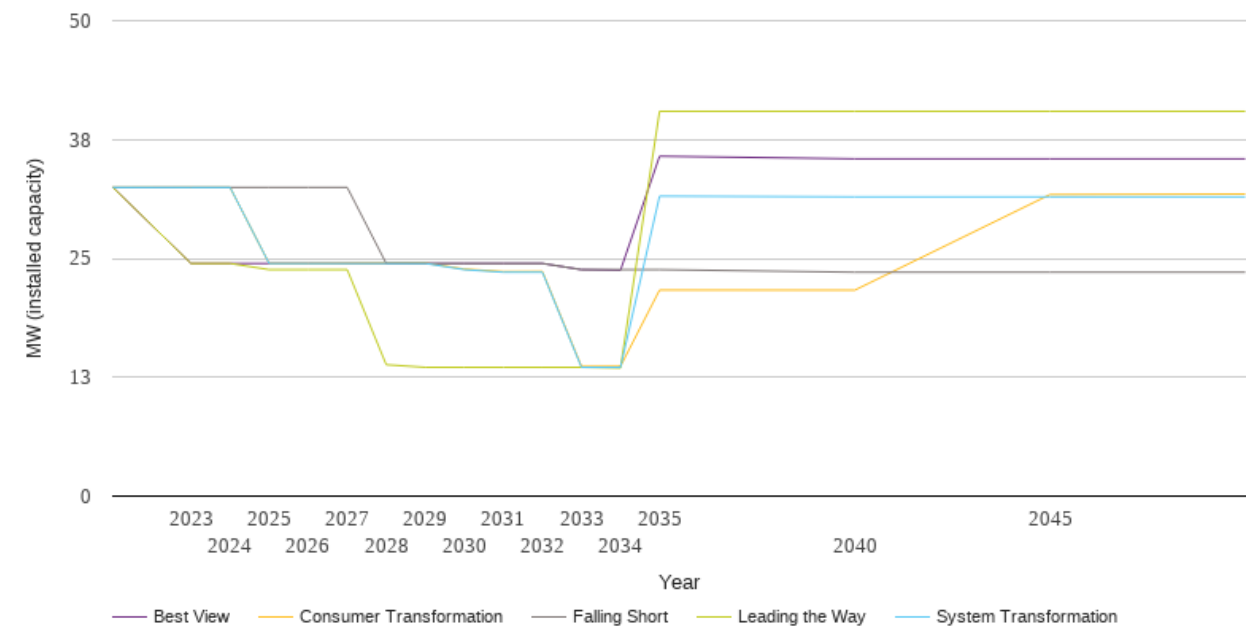
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	0	0	0	0	0
2023	700	900	900	950	950
2024	8912	12609	12609	12079	12079
2025	19491	23783	23783	25145	25145
2026	35162	44887	44887	46839	46839
2027	63491	72238	72238	87687	87687
2028	81820	93460	93460	110469	110469
2029	109113	135640	135640	152164	152164
2030	135472	172128	172128	183503	183503
2031	161589	202328	202328	208808	208808
2032	190065	237970	237970	233668	233668
2033	221261	272251	272251	259893	259893
2034	255147	296335	296335	287478	287478
2035	285511	312621	312621	305915	305915
2040	348554	342365	342365	350289	350289
2045	352773	352773	352773	352773	352773
2050	352773	352773	352773	352773	352773



# Technology Summary: Other Distributed Generation

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

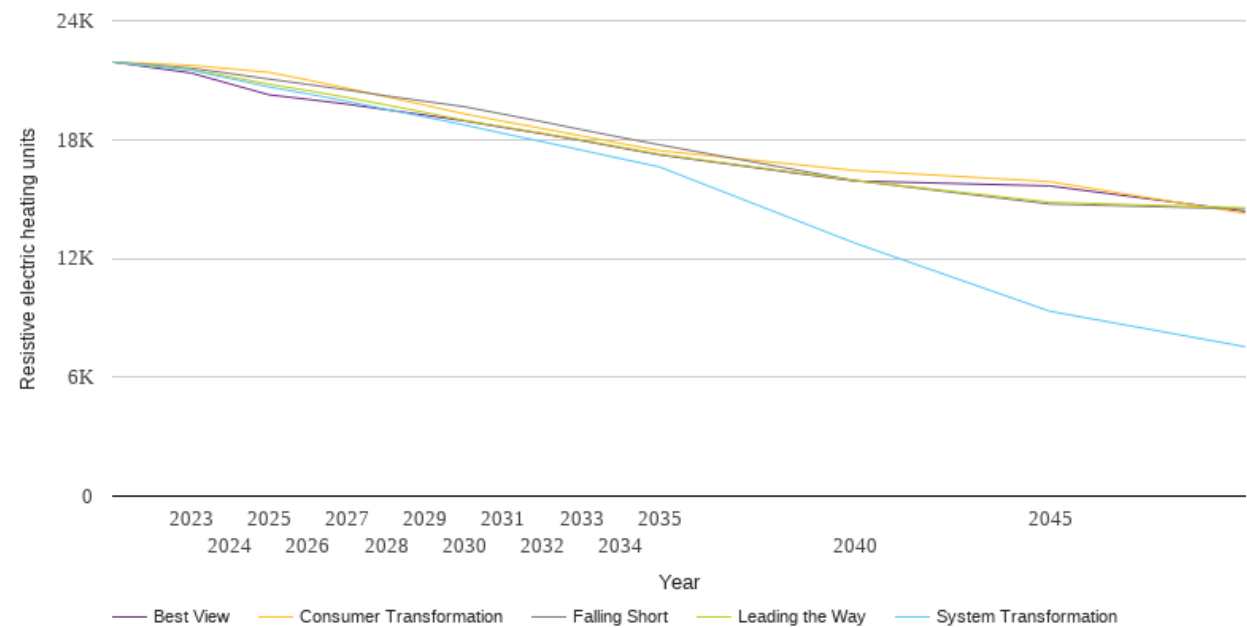
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	32.5	32.5	32.5	32.5	32.5
2023	32.5	32.5	32.5	24.5	24.5
2024	32.5	32.5	32.5	24.5	24.5
2025	32.5	24.5	24.5	23.8	24.5
2026	32.5	24.5	24.5	23.8	24.5
2027	32.5	24.5	24.5	23.8	24.5
2028	24.5	24.5	24.5	13.8	24.5
2029	24.5	24.5	24.5	13.5	24.5
2030	24.5	23.8	23.9	13.5	24.5
2031	24.5	23.5	23.6	13.5	24.5
2032	24.5	23.5	23.6	13.5	24.5
2033	23.8	13.5	13.6	13.5	23.8
2034	23.8	13.5	13.7	13.5	23.7
2035	23.8	31.5	21.7	40.5	35.7
2040	23.5	31.5	21.7	40.5	35.5
2045	23.5	31.5	31.7	40.5	35.5
2050	23.5	31.5	31.8	40.5	35.5



# Technology Summary: Resistive electric heating

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

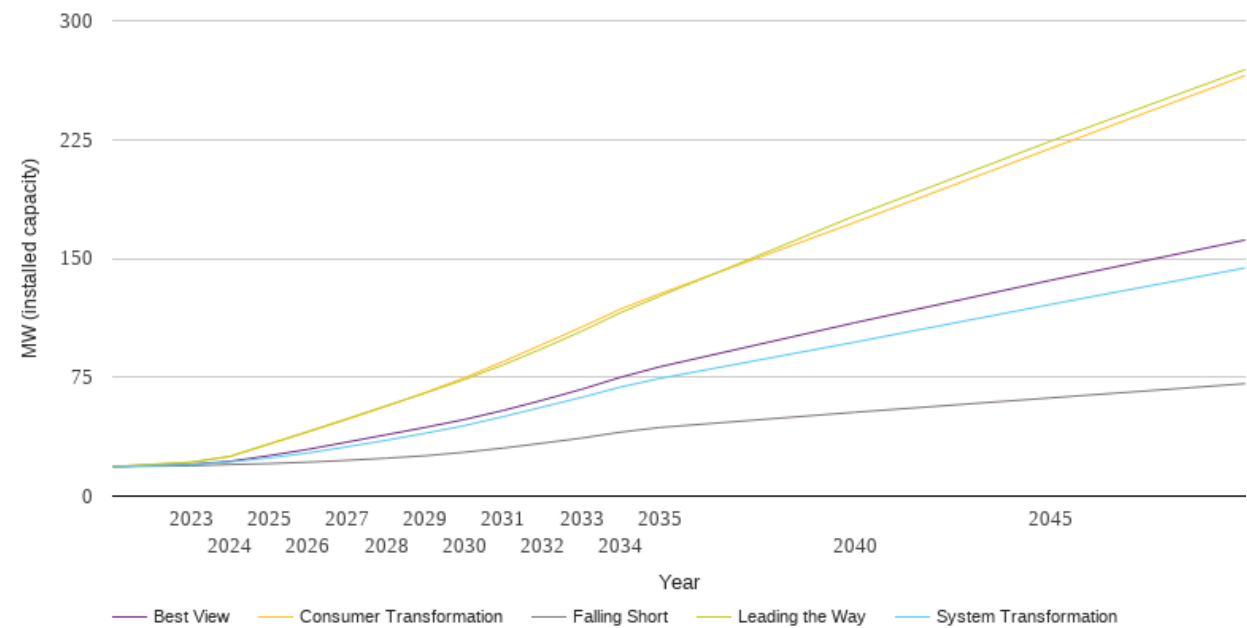
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	21914	21914	21914	21914	21914
2023	21606	21502	21747	21533	21358
2024	21332	21079	21570	21165	20805
2025	21050	20654	21391	20793	20257
2026	20780	20303	20999	20469	20028
2027	20501	19928	20591	20122	19785
2028	20206	19529	20157	19745	19506
2029	19927	19136	19730	19366	19234
2030	19657	18734	19292	18970	18941
2031	19277	18308	18919	18641	18609
2032	18899	17889	18555	18321	18292
2033	18500	17466	18182	17983	17953
2034	18111	17040	17807	17618	17586
2035	17735	16617	17438	17260	17229
2040	15928	12775	16438	15938	15908
2045	14744	9329	15872	14834	15656
2050	14499	7539	14268	14548	14374



# Technology Summary: Solar Generation

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

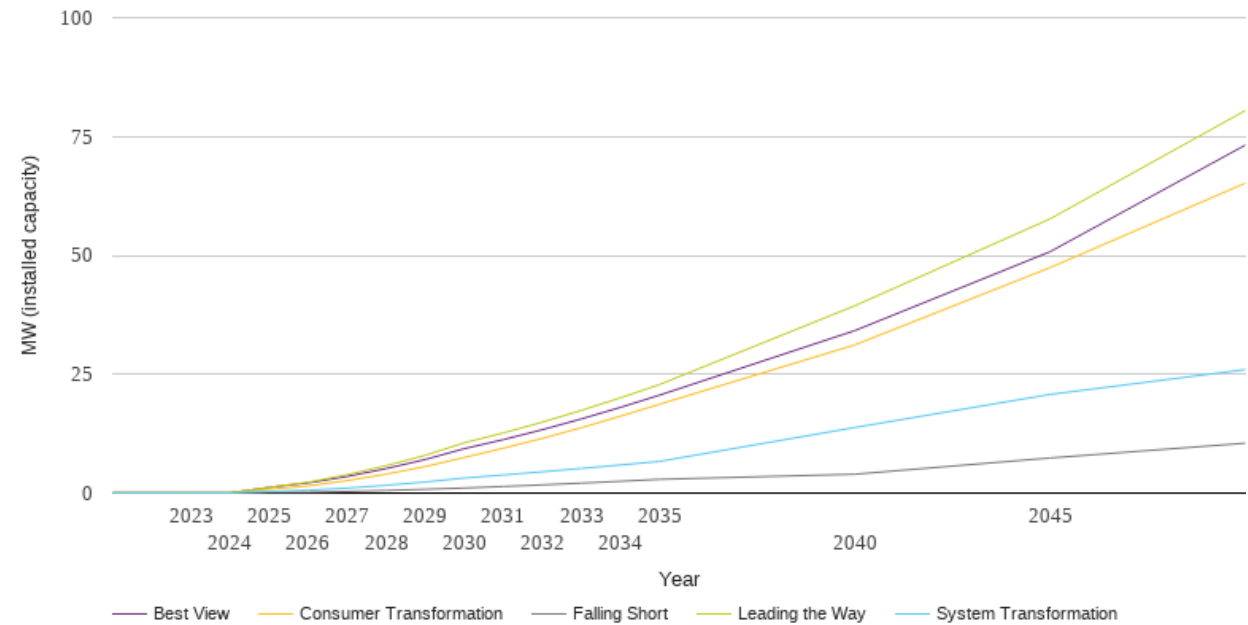
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	18.6	18.6	18.6	18.6	18.6
2023	19.1	20.0	21.3	21.4	20.1
2024	19.9	21.5	25.0	25.1	21.9
2025	20.5	24.1	32.7	33.0	25.5
2026	21.4	27.2	40.5	40.8	29.5
2027	22.6	31.1	48.5	48.9	34.1
2028	23.9	35.2	56.7	57.0	38.7
2029	25.5	39.6	65.3	65.0	43.4
2030	27.7	44.5	74.6	73.5	48.3
2031	30.3	50.2	84.9	82.9	54.1
2032	33.4	56.2	95.7	93.1	60.5
2033	36.6	62.3	106.5	104.0	67.4
2034	40.3	68.8	118.0	115.7	75.0
2035	43.3	74.2	127.6	126.1	81.5
2040	52.9	97.1	172.7	176.8	109.4
2045	61.9	120.9	219.3	223.8	136.1
2050	71.0	144.0	265.4	269.1	161.6



# Technology Summary: Storage

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

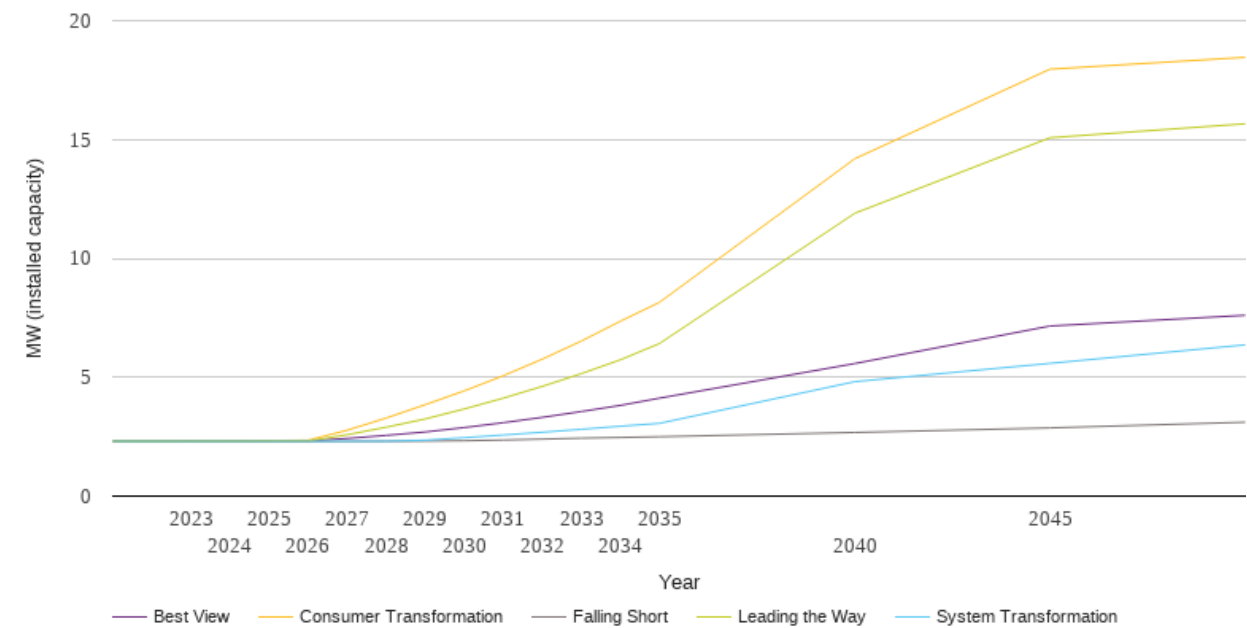
Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	0.1	0.1	0.1	0.1	0.1
2023	0.1	0.1	0.1	0.1	0.1
2024	0.1	0.1	0.1	0.1	0.1
2025	0.2	0.3	0.8	1.2	1.2
2026	0.2	0.6	1.5	2.3	2.1
2027	0.3	1.0	2.6	3.9	3.5
2028	0.6	1.6	4.0	5.8	5.2
2029	0.8	2.3	5.6	7.9	7.1
2030	1.1	3.2	7.5	10.6	9.3
2031	1.4	3.8	9.4	12.7	11.3
2032	1.7	4.5	11.5	14.9	13.3
2033	2.1	5.2	13.8	17.4	15.6
2034	2.5	5.9	16.2	20.0	18.0
2035	2.9	6.7	18.7	22.8	20.6
2040	4.0	13.8	31.2	39.4	34.2
2045	7.4	20.7	47.4	57.7	50.8
2050	10.5	26.0	65.2	80.4	73.2



# Technology Summary: Wind

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

Year	Scenario				
	Falling Short	System Transformation	Consumer Transformation	Leading the Way	Best View
Baseline	2.3	2.3	2.3	2.3	2.3
2023	2.3	2.3	2.3	2.3	2.3
2024	2.3	2.3	2.3	2.3	2.3
2025	2.3	2.3	2.3	2.3	2.3
2026	2.3	2.3	2.3	2.3	2.3
2027	2.3	2.3	2.8	2.6	2.4
2028	2.3	2.3	3.3	2.9	2.6
2029	2.3	2.4	3.8	3.2	2.7
2030	2.3	2.5	4.4	3.7	2.9
2031	2.4	2.6	5.1	4.1	3.1
2032	2.4	2.7	5.8	4.6	3.3
2033	2.4	2.8	6.5	5.2	3.6
2034	2.5	2.9	7.4	5.7	3.8
2035	2.5	3.1	8.2	6.4	4.1
2040	2.7	4.8	14.2	11.9	5.6
2045	2.9	5.6	18.0	15.1	7.2
2050	3.1	6.4	18.5	15.7	7.6





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