Black Country Transport

Advisory Note

ULEV Strategy

Black Country

15 January 2021

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Document Revisions

No.	Details	Date
1	Initial note	14 Jan 21
2	Version for client review	15 Jan 21

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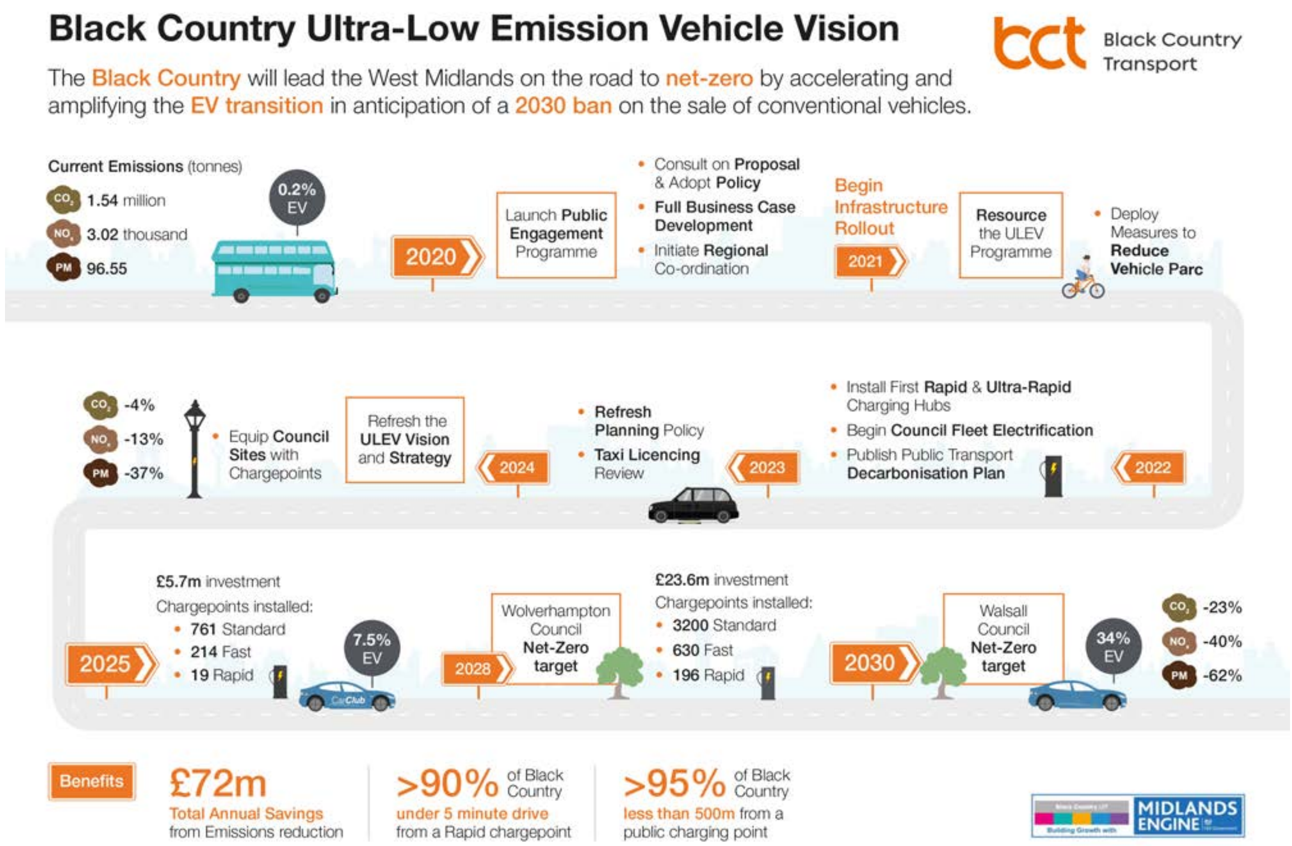
1 Introduction

1.1 Introduction to the Project

On 15th May 2020, Cenex completed its ULEV Strategy, Vision and Implementation project for the four Local Authorities in the Black Country consisting of Dudley, Sandwell, Walsall and Wolverhampton Councils. The deliverables included a ULEV Vision (below) and recommendations for implementation:



The recommendations were accepted by ABCA and put out to consultation in August and September. Around 800 responses were received, the results of which have been combined with internal work to construct a proposed Black Country ULEV Programme.

The Black Country Transport team is now preparing to present the strategy to the ABCA Chief Executives for approval in early 2021.

The team requested Cenex's help to support the construction of the economic and financial cases, and to update some of the original analysis in-light of the UK Government's recent announcements on the ban on the sale of conventionally-fuelled cars by 2030.

1.2 Navigation

Key conclusions, recommendations or takeaways are highlighted like this.

Important notes are highlighted like this.

Possible further pieces of work that could be undertaken are highlighted like this.

2 WP7 – Updated Scenarios

This work package updated the original modelling in-line with the Government's recent announcement to ban the sale of new petrol and diesel cars and vans in 2030 and to phase-out all hybrid cars by 2035. This will be referred to as the "2030 Ban".

Some of the finer details of the recent announcement are yet to be consulted-upon, including the exact definition of which hybrids are considered to "drive a significant distance without emitting carbon", which may alter the eventual EV uptake figures.

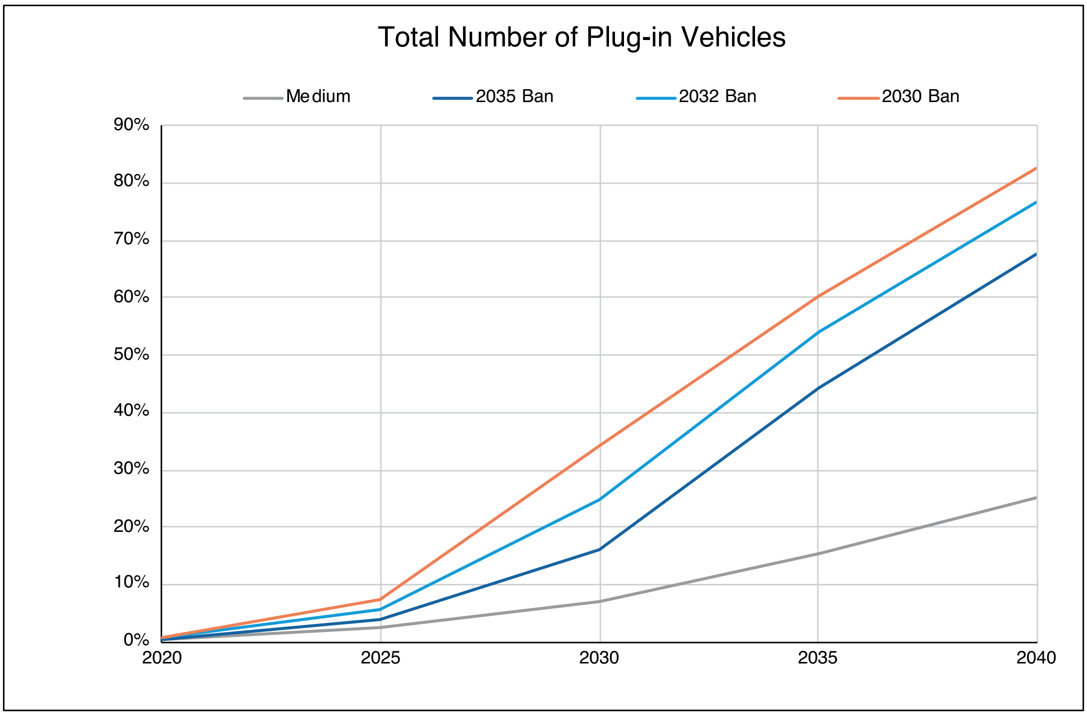


Figure 1: Update to Figure 19 – Projected EV Uptake

Figure 1 shows the addition of the 2030 ban projection for the total number of Plug-in Vehicles in the Black Country. In absolute terms, this represents an increase of around 10,500 vehicles by 2025 and 42,700 by 2040 compared to the 2032 ban.

The EV uptake projections have been translated to estimate the number and type of infrastructure which will be required to service this demand, according to the original modelled assumptions. Figure 2 shows the update to Figure 21 from the original report.

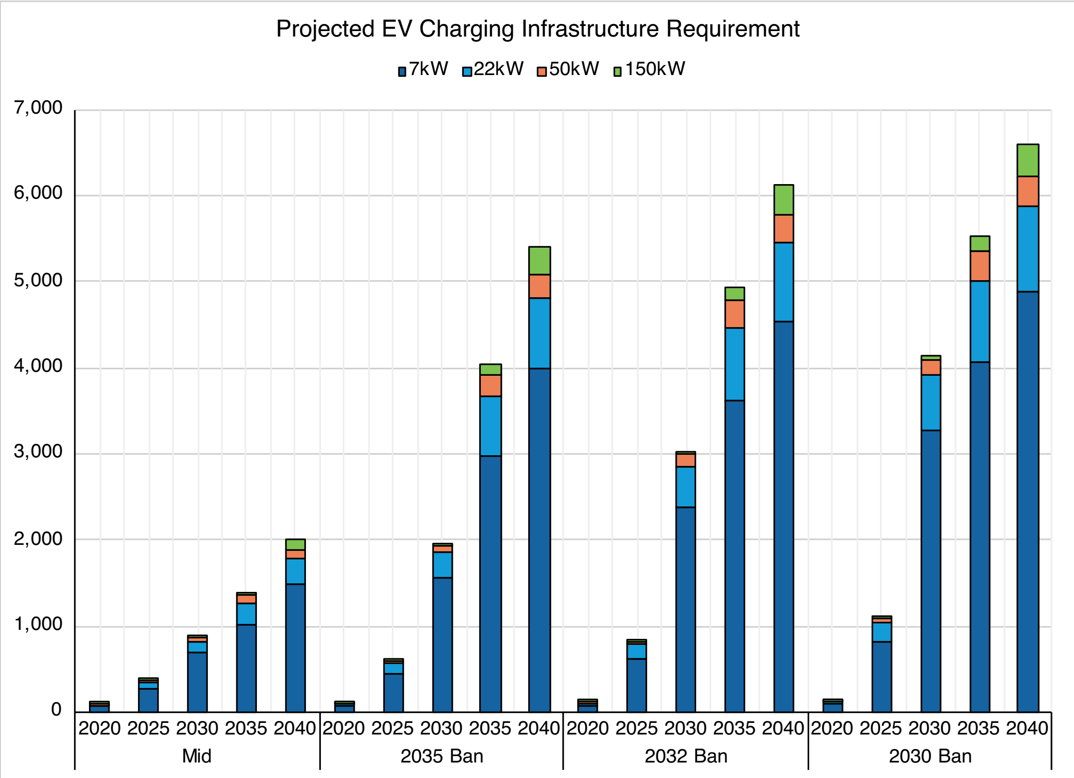


Figure 2: Update to Figure 21 - Projected infrastructure demand by scenario

The gap analysis has been updated and is shown in Table 1 for 2025. This shows that the level of provision is roughly double that required under the 2035 Ban scenario previously proposed for the Black Country ULEV Strategy.

Table 1: Update to Table 10 - Gap analysis for additional public EV sockets required to meet 2025 demand under the 2030 Ban Scenario

	Additional sockets in 2030 Ban Scenario			
	7 kW	22 kW	50 kW	150 kW
Dudley	215	62	6	1
Sandwell	175	49	6	1
Walsall	163	47	4	1
Wolverhampton	208	56	-1	1
Total	**761**	**214**	**15**	**4**

3 WP 8 – Detailed Benefits Analysis

3.1 CO_2, NO_X, and PM emissions reductions

The projected CO_2, NO_X, and PM reduction from 2019 levels are shown in Table 12, 13 and 14 in the original report. Those tables have been updated to include the 2030 Ban scenario in Table 2, Table 3 and Table 4 respectively.

All figures assume a growing vehicle parc as per the main analysis in the original report.

Table 2: Update to Table 12 - TTW CO_2 reduction vs. 2019 figures.

		2025	2030	2035	2040
TTW CO_2	Medium	0.2%	0.6%	2.9%	8.4%
	2035 Ban	1.3%	8.0%	29.5%	52.3%
	2032 Ban	2.5%	15.1%	38.4%	61.6%
	2030 Ban	3.8%	22.7%	44.3%	67.8%

Table 3: Update to Table 13 - NO_X reduction vs. 2019 figures.

		2025	2030	2035	2040
NO_X	Medium	8.2%	16.6%	25.4%	35.3%
	2035 Ban	9.7%	24.6%	50.2%	71.3%
	2032 Ban	11.1%	32.2%	58.6%	79.0%
	2030 Ban	12.8%	40.2%	64.1%	84.0%

Table 4: Update to Table 14 - PM reduction vs. 2019 figures.

		2025	2030	2035	2040
PM	Medium	33.6%	47.3%	55.5%	63.1%
	2035 Ban	34.6%	52.2%	70.0%	83.2%
	2032 Ban	35.6%	56.9%	74.9%	87.5%
	2030 Ban	36.8%	61.9%	78.1%	90.4%

The general trends seen between the Ban scenarios and reported in the original report are accentuated by the 2030 Ban scenario.

The absolute projected CO_2, NO_X and PM figures are displayed in Figure 3, Figure 4, and Figure 5 through to 2040. These figures are updated from Figure 25, Figure 26, and Figure 27 to include the 2030 Ban scenario.

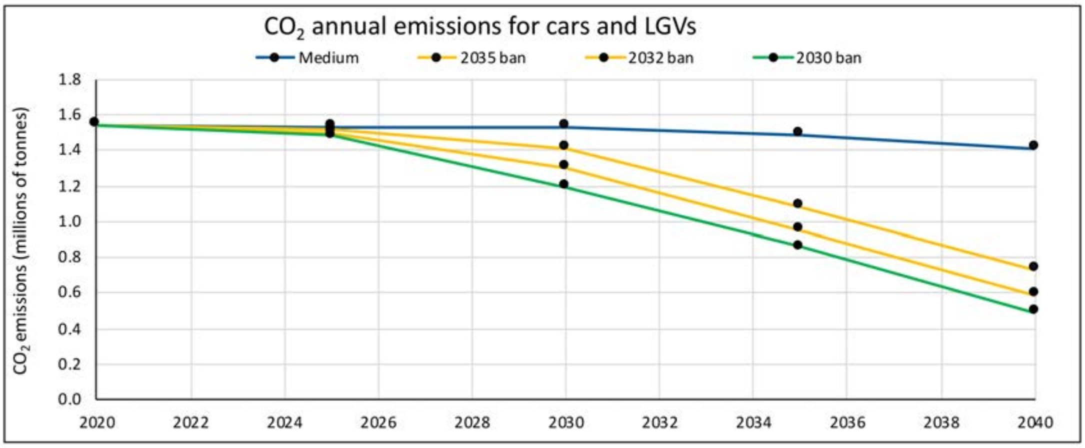


Figure 3: Update to Figure 25 - Projected annual CO_2 emissions for cars and LGVs.

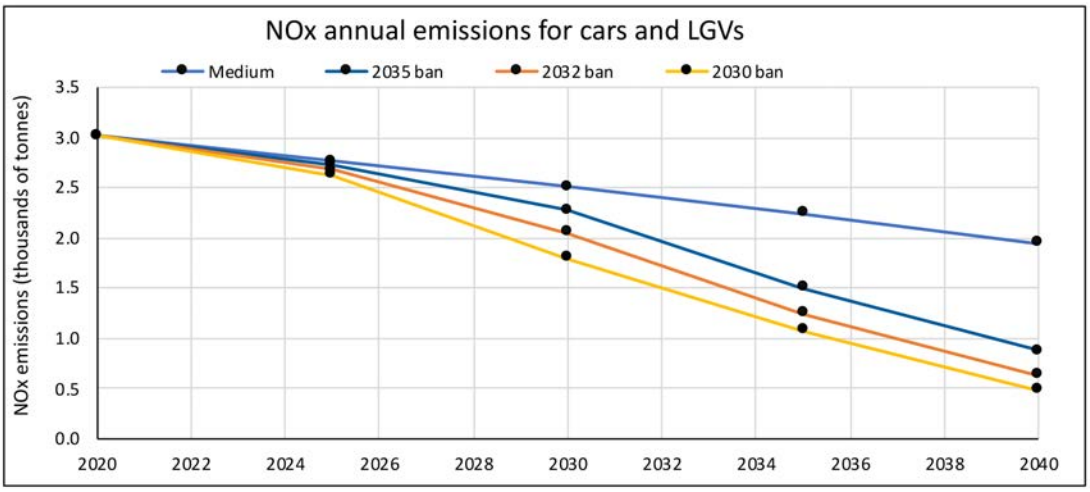


Figure 4: Update to Figure 26 - Projected annual NO_X emissions for cars and LGVs.

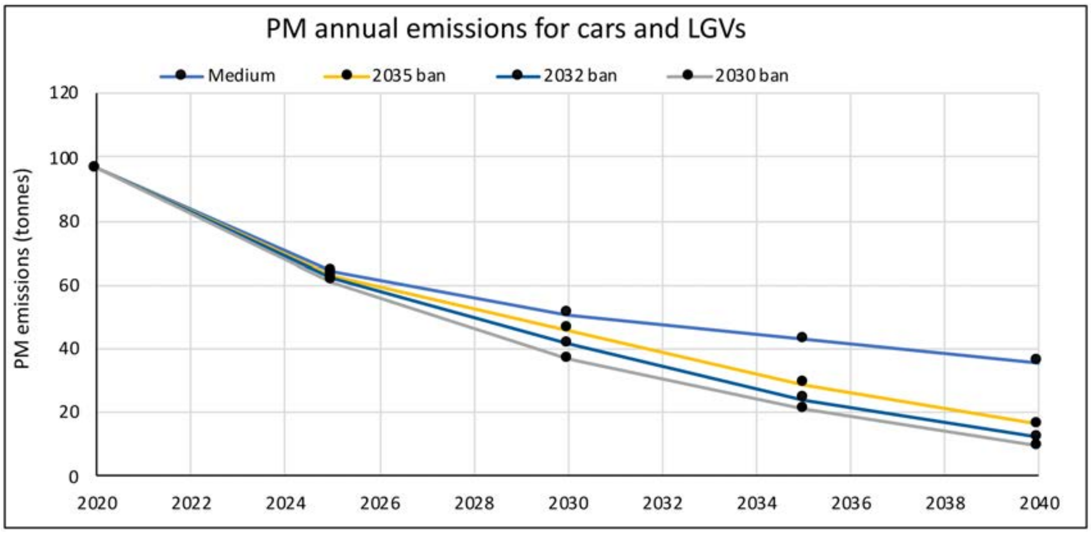


Figure 5: Update to Figure 27 - Projected annual PM emissions for cars and LGVs.

3.1.1 Breakdown by Local Authority

For the 2030 Ban scenario, the emissions reductions have been broken down by Local Authority to enable the benefits case for EV infrastructure to be defined at a more local level.

Differences from the overall Black Country values are due to slight differences in the current vehicle parc makeup. For instance, Dudley shows a smaller projected emissions reduction than other Local Authorities as it currently has a lower proportion of diesel cars. This means Dudley benefits less in the initial years of the forecast when EV uptake is lower and much of the emissions reduction occurs as the vehicle parc shifts to petrol vehicles. Dudley also currently has the highest proportion of EVs in its vehicle parc.

Table 5: TTW CO_2 reduction vs. 2019 figures broken down by Local Authority for 2030 Ban scenario.

		2025	2030	2035	2040
TTW CO_2	Dudley	2.7%	21.3%	43.3%	67.1%
	Sandwell	3.8%	22.7%	44.7%	68.4%
	Walsall	3.6%	22.2%	44.0%	67.6%
	Wolverhampton	3.6%	22.0%	43.8%	67.4%

Table 6: NO_X reduction vs. 2019 figures broken down by Local Authority for 2030 Ban scenario.

		2025	2030	2035	2040
NO_X	Dudley	8.7%	37.4%	62.5%	83.4%
	Sandwell	12.0%	38.7%	62.9%	83.4%
	Walsall	13.2%	40.3%	64.1%	84.0%
	Wolverhampton	13.3%	40.6%	64.4%	84.2%

Table 7: PM reduction vs. 2019 figures broken down by Local Authority for 2030 Ban scenario.

		2025	2030	2035	2040
PM	Dudley	33.5%	59.9%	77.0%	89.9%
	Sandwell	36.6%	61.0%	77.5%	90.1%
	Walsall	37.5%	62.1%	78.3%	90.4%
	Wolverhampton	37.5%	62.3%	78.4%	90.5%

3.2 Damage Costs Mitigated due to Emissions

Known damage costs for each emission type have been applied to the savings achieved by each scenario to estimate and monetise the social benefits of these emissions savings. This has allowed Table 15 from the original report to be updated (see Table 9). The values for 2025 are also presented in Table 8. These assumptions account for inflation and are the agreed DfT figures for the year 2030[1].

Table 8: Projected annual costs mitigated in 2025.

	CO_2 Annual Cost Saving	NO_X Annual Cost Saving	PM Annual Cost Saving	Total Annual Cost Saving
Medium	£353,000	£4,525,000	£7,543,000	£12,421,000
2035 Ban	£2,161,000	£5,304,000	£7,770,000	£15,235,000
2032 Ban	£4,012,000	£6,101,000	£8,003,000	£18,116,000
2030 Ban	£6,133,000	£7,013,000	£8,269,000	£21,415,000

Table 9: Update to Table 15 - Projected annual costs mitigated in 2030.

	CO_2 Annual Cost Saving	NO_X Annual Cost Saving	PM Annual Cost Saving	Total Annual Cost Saving
Medium	£901,000	£9,139,000	£10,621,000	£20,661,000
2035 Ban	£12,816,000	£13,486,000	£11,725,000	£38,027,000
2032 Ban	£24,261,000	£17,661,000	£12,784,000	£54,706,000
2030 Ban	£36,405,000	£22,094,000	£13,909,000	£72,408,000

3.2.1 Breakdown by Local Authority

For the 2030 Ban scenario, the damage costs have been broken down by the Local Authority they are estimated to occur in based on the relative emissions reduction shown in Section 3.1.1, again for the years 2025 (Table 10) and 2030 (Table 11).

Table 10: Projected annual costs mitigated in 2025 for 2030 Ban scenario.

	CO_2 Annual Cost Saving	NO_X Annual Cost Saving	PM Annual Cost Saving	Total Annual Cost Saving
Dudley	£1,455,000	£1,461,000	£2,133,000	£5,064,000
Sandwell	£1,817,000	£2,031,000	£2,329,000	£6,171,000
Walsall	£1,534,000	£1,888,000	£2,045,000	£5,463,000
Wolverhampton	£1,327,000	£1,632,000	£1,762,000	£4,717,000
TOTAL	£6,133,000	£7,013,000	£8,269,000	£21,415,000

Table 11: Update to Table 15 - Projected annual costs mitigated in 2030 for 2030 Ban scenario.

	CO_2 Annual Cost Saving	NO_X Annual Cost Saving	PM Annual Cost Saving	Total Annual Cost Saving
Dudley	£10,349,000	£5,879,000	£3,786,000	£20,014,000
Sandwell	£9,998,000	£6,169,000	£3,856,000	£20,024,000
Walsall	£8,604,000	£5,393,000	£3,363,000	£17,361,000
Wolverhampton	£7,454,000	£4,652,000	£2,903,000	£15,010,000
TOTAL	£36,405,000	£22,094,000	£13,909,000	£72,408,000

[1] £0.105 per kg in 2030, DfT WebTag table A3.4 – Non traded values of CO_2e
£18.20 per kg in 2030, DfT WebTag table A3.2 – Damage cost values by pollutant
£232.73 per kg in 2030, DfT WebTag table A3.2 – Damage cost values by pollutant

3.3 Noise

As an update to the original noise reduction analysis, Table 12 shows the impact of EV uptake on noise for 2025 and Table 13 now includes the results of the 2030 Ban scenario (to update the original Table 17).

Table 12: Effect of EVs on noise at the roadside at 20mph in 2025.

	Max. EV noise differential (dB)	% of EVs in the vehicle parc in 2030	Estimated noise difference (dB)	Cost per Household (£)	Total Cost to Black Country (£)
Medium	4.5	2.5%	0.11	£1.08	£524,000
2035 Ban		4.0%	0.18	£1.73	£839,000
2032 Ban		5.6%	0.25	£2.42	£1,175,000
2030 Ban		7.5%	0.34	£3.24	£1,573,000

Table 13: Update to Table 17 - Effect of EVs on noise at the roadside at 20mph in 2030.

	Max. EV noise differential (dB)	% of EVs in the vehicle parc in 2030	Estimated noise difference (dB)	Cost per Household (£)	Total Cost to Black Country (£)
Medium	4.5	7.1%	0.32	£3.07	£1,492,000
2035 Ban		16.2%	0.73	£7.01	£3,405,000
2032 Ban		25.0%	1.13	£10.82	£5,254,000
2030 Ban		34.2%	1.54	£14.79	£7,173,000

For the 2030 Ban scenario, the cost savings have been broken down by the Local Authority those savings will be made in. The total damage cost mitigated in 2025 and 2030 was divided proportional to the number of households in each Local Authority[2].

Table 14: Breakdown by Local Authority of the effect of EV noise for 2030 Ban scenario.

	2025	2030
Dudley	£439,000	£2,004,000
Sandwell	£415,000	£1,893,000
Walsall	£361,000	£1,646,000
Wolverhampton	£357,000	£1,630,000

2 Office for National Statistics, Estimated number of households by local authorities of England, 2004 to 2016.

4 WP 9 – Extended Business Modelling

This section presents a detailed financial assessment of the four ownership models for EV charging infrastructure deployment described in the original report: Own and Operate, External Operator, Lease, and Concession.

A summary of the proportion of cost incurred and revenue retained by the landowner in different ownership models is shown in Table 15.

Table 15: Proportion of costs incurred, and revenue retained by landowner for different ownership models

	Hardware	Groundworks	Back-office	Electricity	Maintenance	Revenue
Own and Operate	100%	100%	100%	100%	100%	100%
External Operator	100%	100%	0%	100%	100%	90%
Lease	100%	0%	0%	0%	0%	25%
Concession	0%	100%	0%	0%	0%	25%

The capital and operating costs and possible revenue for the landlord in each model are shown in the sections below. Installation costs include the cost of equipment, electrical components and enabling works. Electricity consumption costs are included in the total operating cost. The electricity costs and revenue have been calculated using a £/kWh tariff.

All of the business modelling is according to the 2030 Ban Scenario.

4.1 Assumptions

A number of further assumptions have been added to the assumptions which were used in the ULEV Strategy to project the EV uptake and infrastructure needs (see Appendix 2 of the original report).

Table 16 documents industry-averaged hardware and warranty costs, sourced from four confidential quotes from major industry players.

Table 16: Assumed hardware and warranty capital costs for business models

Item Chargepoints	Averaged Capital Cost (hardware+warranty)
7 kW	£1,894.23 + £1,274.00
22 kW	£2,095.58 + £1,300.00
50 kW	£19,744.54 + £3,466.00
150 kW	£80,000.00 + £3,466.00

Connection costs are difficult to estimate as they vary dramatically from site to site. For this reason, they are not included in this analysis.

From Cenex's experience, a reasonable rule of thumb for estimates is that they double the installation capital cost.

Table 17 outlines the assumed operating costs which are used alongside electricity costs to estimate the annual running costs for the chargepoints.

Table 17: Assumed operating costs for business models

Item	Averaged Operating Cost
4G Data Connection	£151.33
Annual Maintenance Agreement (per chargepoint)	£100.00
CP Management Costs (per socket)	£250.00

Finally, Table 18 shows the assumed tariff costs used in the business models.

Table 18: Assumed tariff costs for business models

Tariff	7 kW	22 kW	50 kW	150 kW
Per kWh	£0.20	£0.20	£0.20	£0.20

4.2 Own and Operate

Capital Costs:

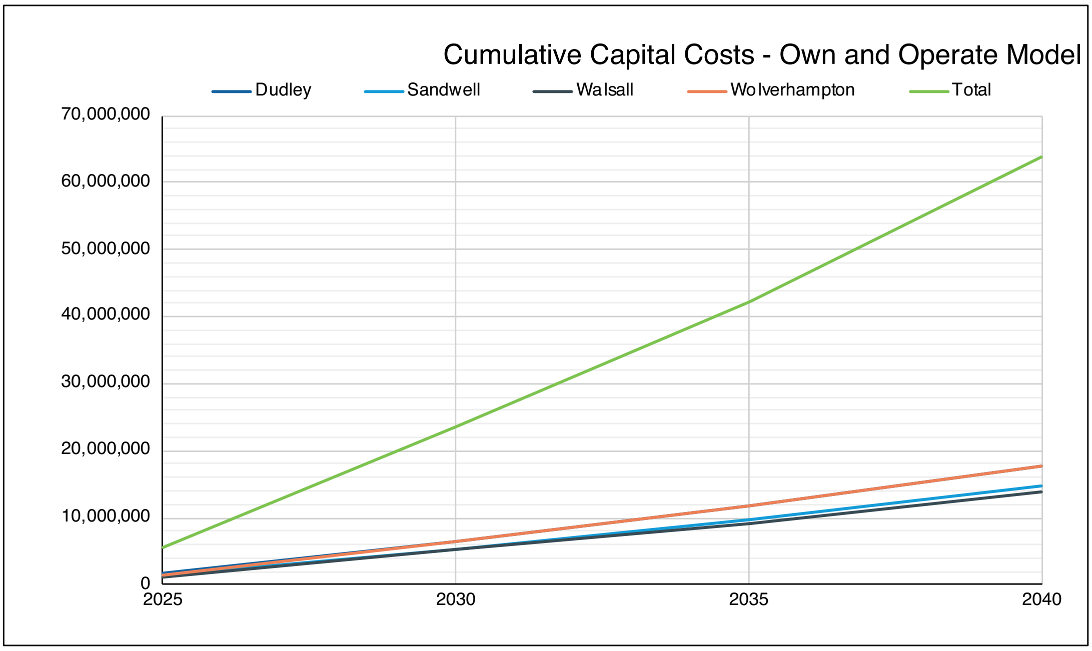


Figure 6: Cumulative capital costs for EV charging infrastructure for the landlord according to the Own and Operate Model

Annual Operating Costs:

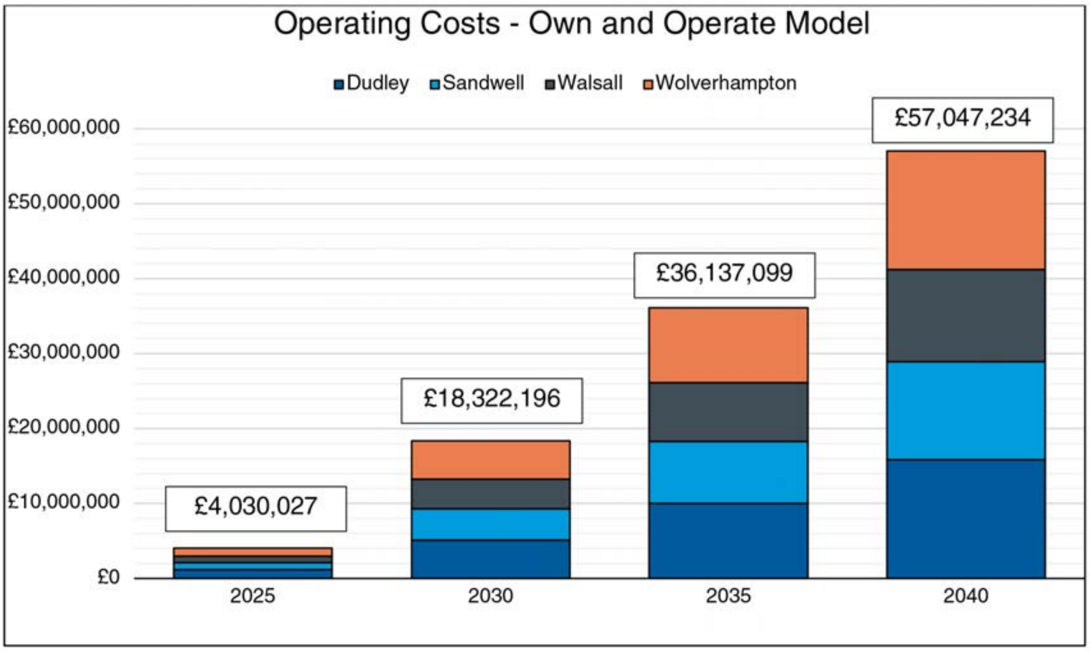


Figure 7: Operating costs for the landlord according to the Own and Operate Model

Annual Revenue:

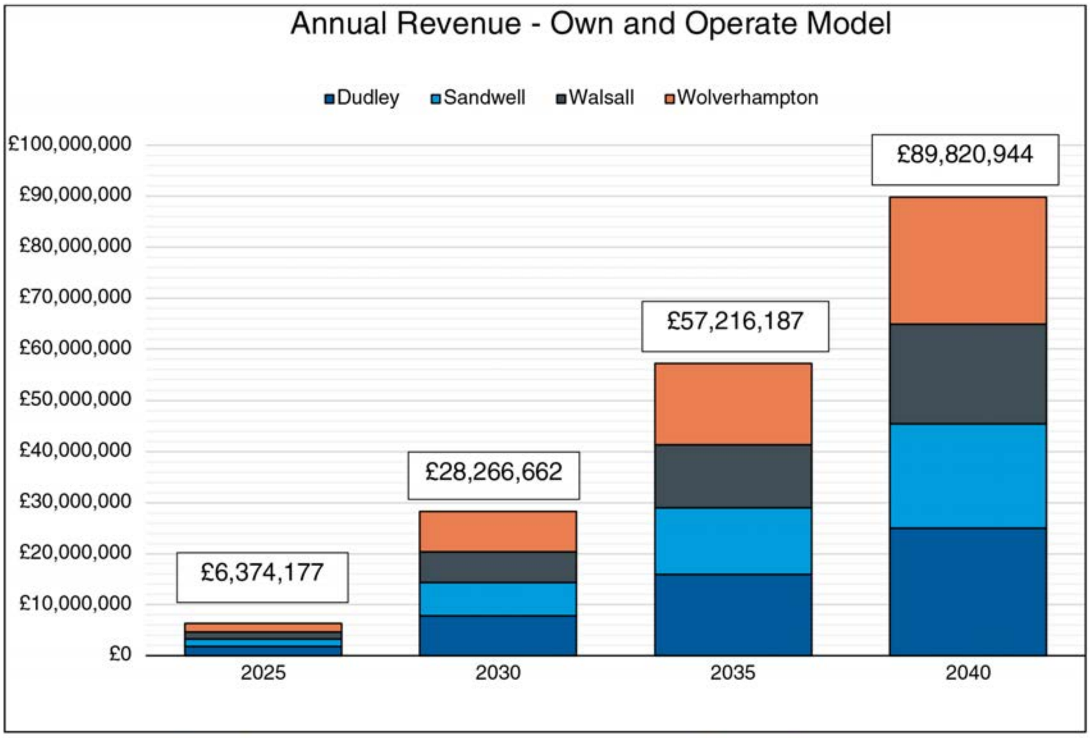


Figure 8: Annual revenue for the landlord according to the Own and Operate Model

4.3 External Operator

Capital Costs:

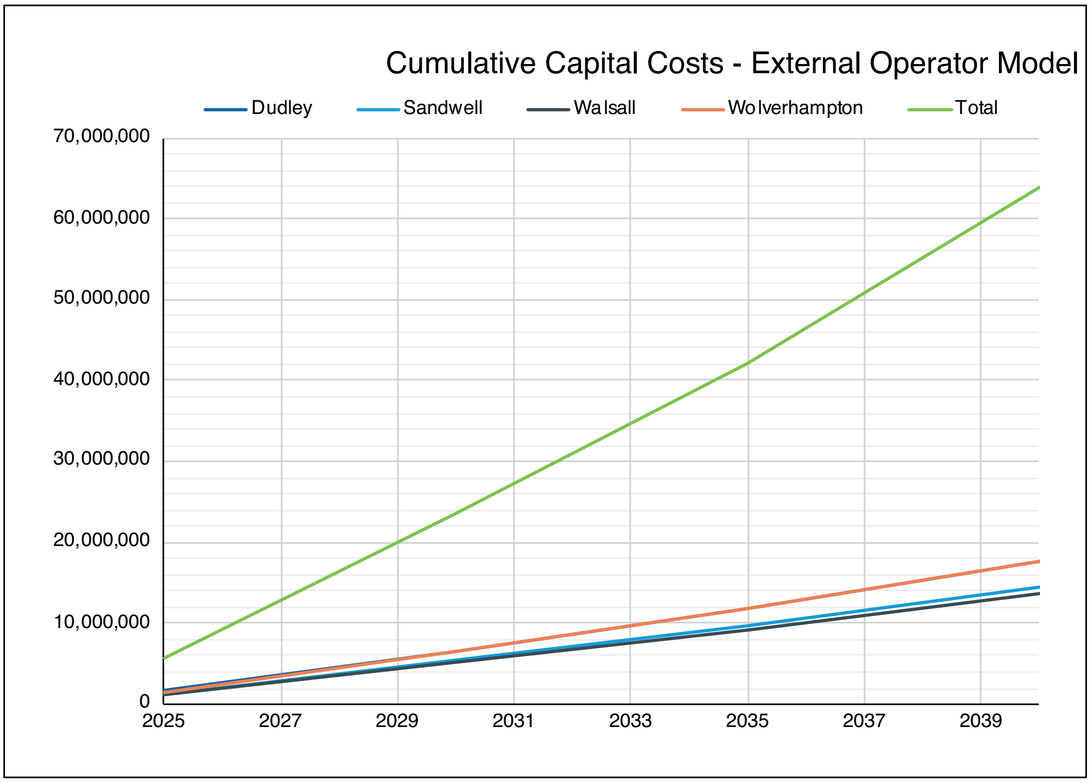


Figure 9: Cumulative capital costs for EV charging infrastructure for the landlord according to the External Operator Model

Annual Operating Costs:

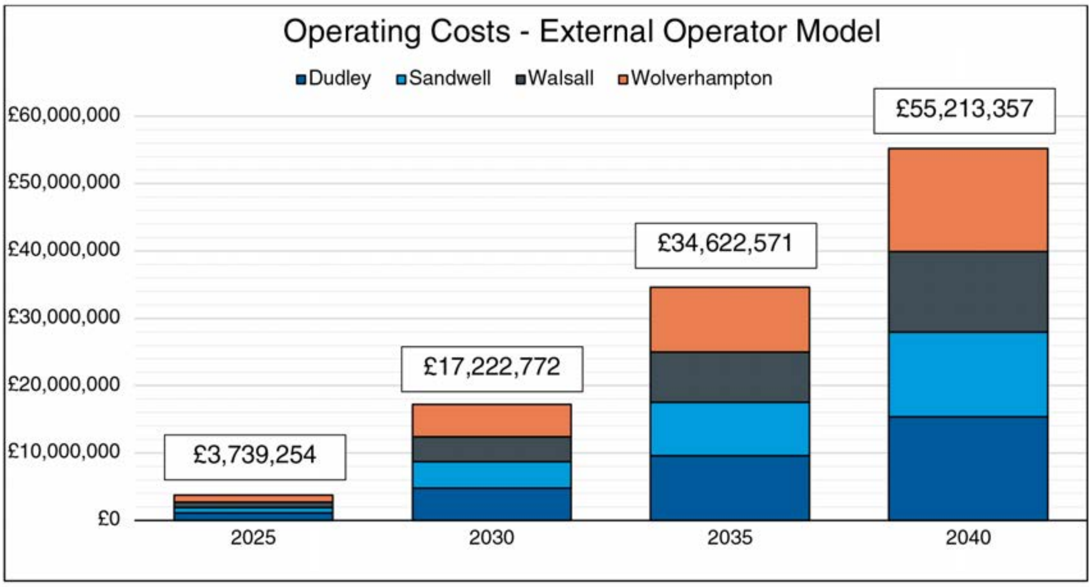


Figure 10: Operating costs for the landlord according to the External Operator Model

Annual Revenue:

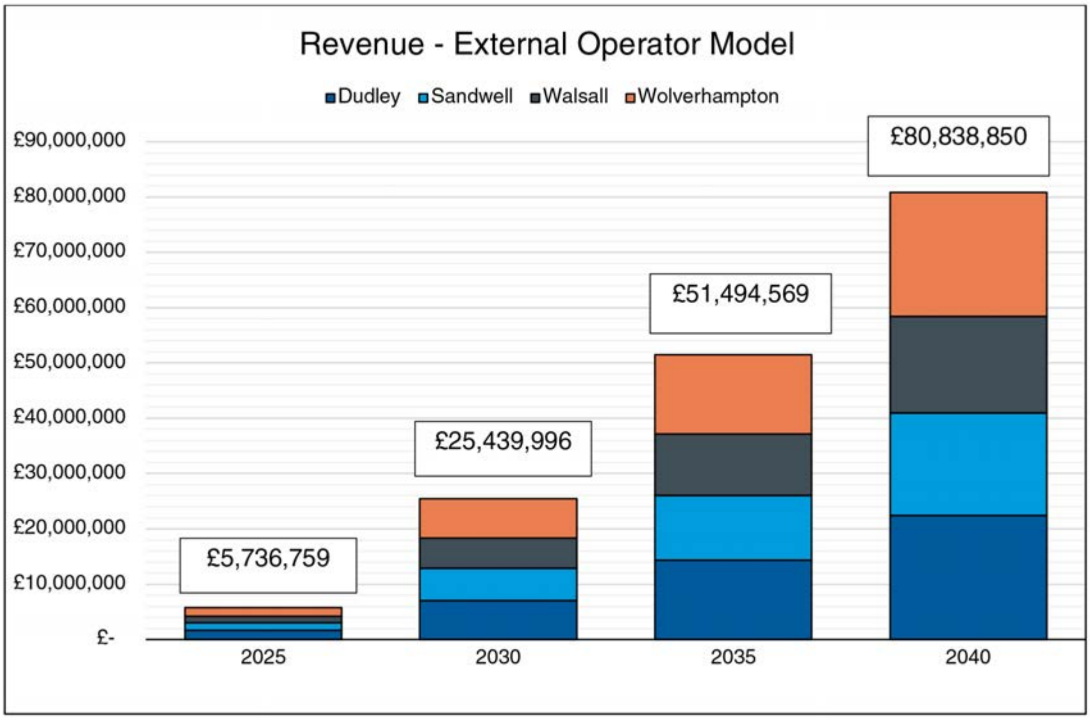


Figure 11: Annual revenue for the landlord according to the External Operator Model

4.4 Lease

Capital Costs:

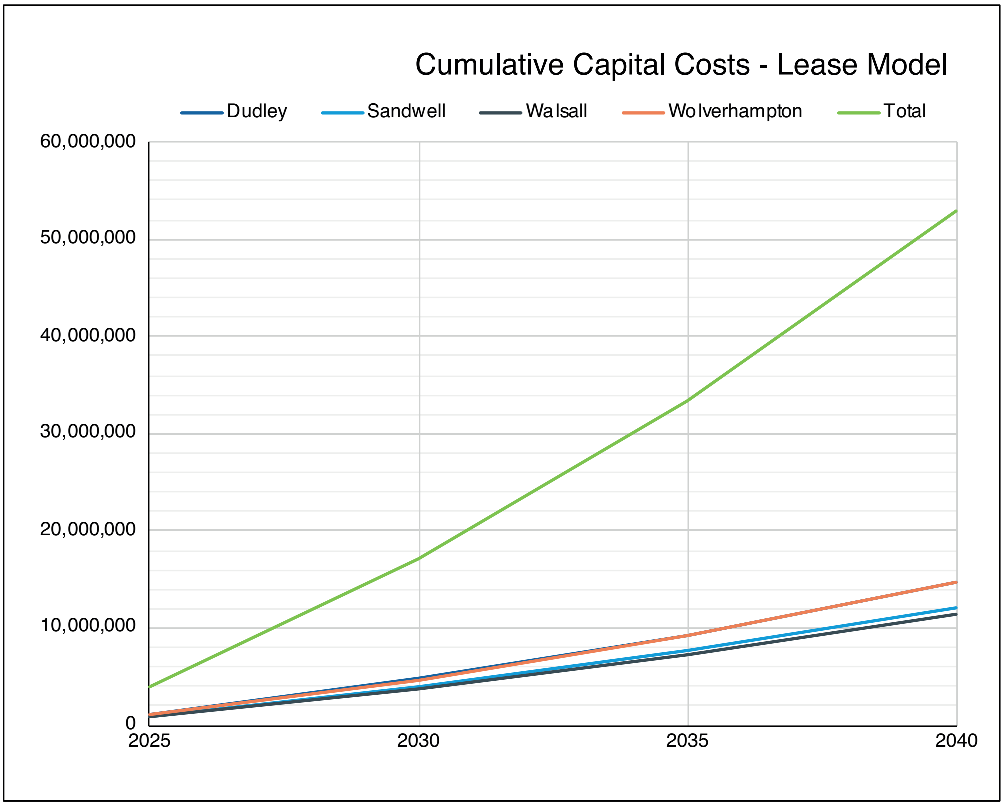


Figure 12: Cumulative capital costs for EV charging infrastructure for the landlord according to the Lease Model

Annual Operating Costs:

There are no operating costs to the landlord in this model.

Annual Revenues:

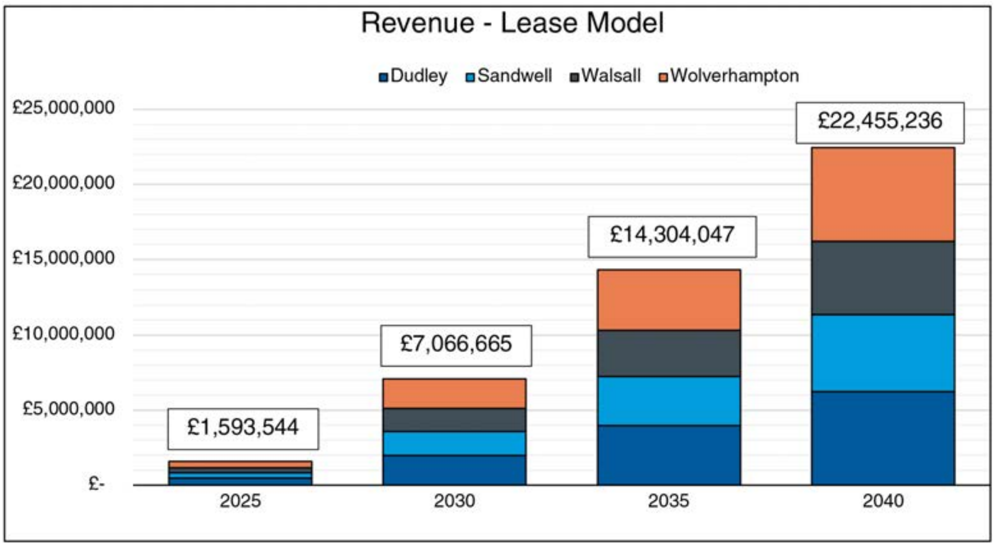


Figure 13: Annual revenue for the landlord according to the Lease Model

4.5 Concession

Capital Costs:

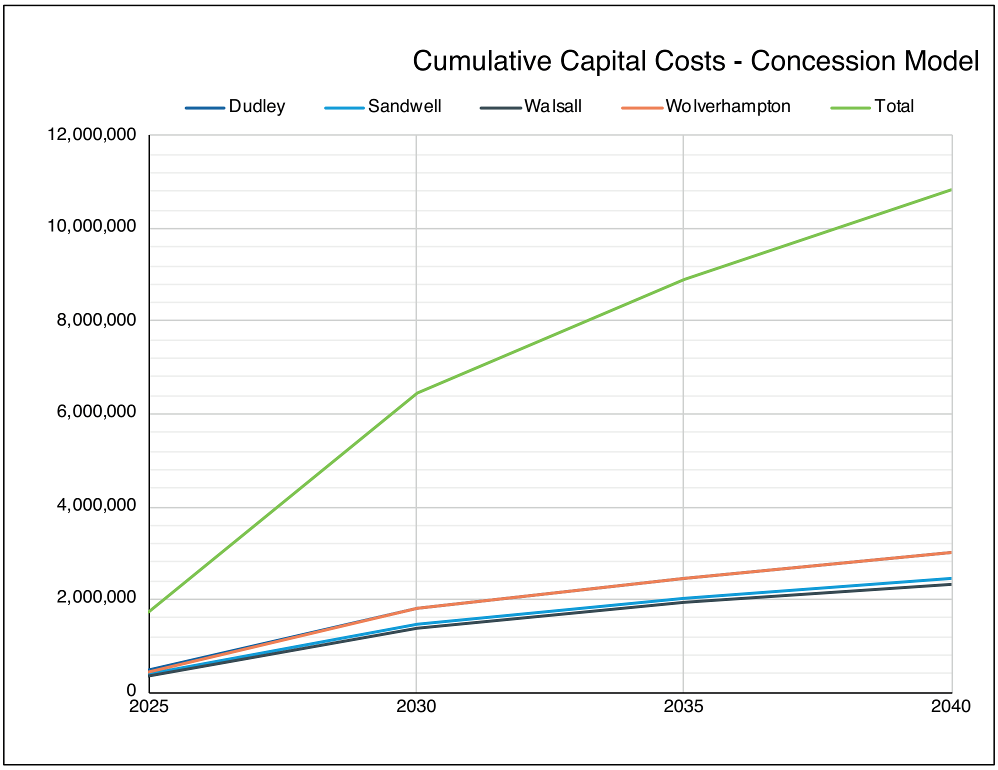


Figure 14: Cumulative capital costs for EV charging infrastructure for the landowner according to the Concession Model

Annual Operating Costs:

There are no operating costs to the landlord in this model.

Annual Revenues:

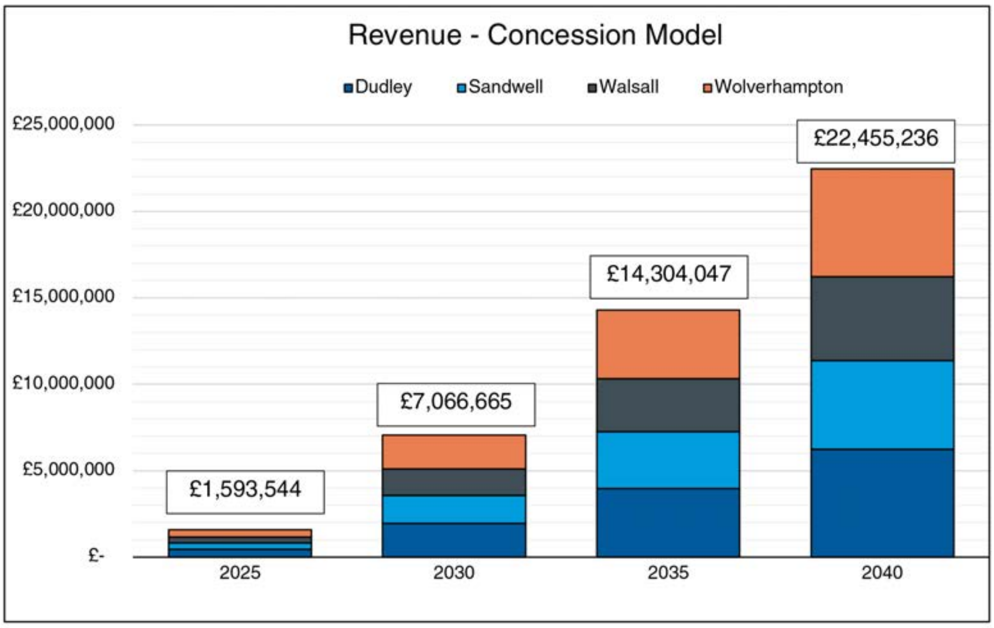


Figure 15: Annual revenue for the landlord according to the Concession Model

4.7 Conclusion

Taking the detailed modelling results together, it is clear that the Own and Operate, and External Operator models bring the greatest revenue. However, both these models also incur the greatest costs, which aligns with the input assumptions and the qualitative analysis completed in the original report.

Looking at the 2030 Ban in the year 2025 and 2030, the revenues and operating costs for the landlord are shown in Table 19 and Table 20 respectively.

Table 19: 2025 business model values for the 2030 Ban scenario

	Own and Operate	External Operator	Lease	Concession
Cumulative Capital Costs	£5,665,444	£5,665,444	£3,955,069	£1,710,376
Annual Operating Cost	£4,030,027	£3,739,254	£0	£0
Annual Revenue	£6,374,177	£5,736,759	£1,593,544	£1,593,544
Annual Operating Surplus	+2,344,150	+£1,997,505	+£1,593,544	+£1,593,544
Capital Cost as % of annual operating surplus	242%	284%	248%	107%

Table 20: 2030 business model values for the 2030 Ban scenario

	Own and Operate	External Operator	Lease	Concession
Cumulative Capital Costs	£23,564,190	£23,564,190	£17,097,201	£6,466,989
Annual Operating Cost	£18,322,196	£17,222,772	£0	£0
Annual Revenue	£28,266,662	£25,439,996	£7,066,665	£7,066,665
Annual Operating Surplus	£9,944,466	£8,217,224	£7,066,665	£7,066,665
Capital Cost as % of annual operating surplus	237%	287%	242%	92%

Given the significant increase in infrastructure demand in a 2030 Ban scenario (as compared to the 2035 Ban scenario), it is unsurprising that the cumulative capital costs are significantly higher than the £2.25m estimate that was presented in the ULEV Strategy (see Table 28 of the original report).

However, Table 19 and Table 20 demonstrate that all the business models are surplus-generating with revenues exceeding operating costs by £1.5m to £2.3m in 2025 and £7m to £10m in 2030, depending on operating model.

Although it was beyond the scope of this follow-up report to complete a full business case analysis, the bottom line of both tables expresses the cumulative capital costs as a proportion of the annual operating surplus to give an indication of the level of surplus or loss which each model might generate for the Black Country authorities.

In the short-term, it appears that the **Concession** model is more profitable because cumulative capital costs are nearly the same as the annual operating surplus, indicating that infrastructure deployed under this model could pay for itself, even including connection fees.

At the other end of the spectrum, the **Own and Operate** cumulative capital costs are two to three times annual surplus, which indicates that a positive business case may be harder to secure in the short-term.

The commentary on the operating models (see Section 6.3 in the original report) indicated that the Own and Operate or External Operator models are best suited to increase the provision of residential and destination charging in the Black Country, given the distribution of risks and the ability of the landlord to control the customer experience.

The figures presented above do not undermine these conclusions but local authorities should be aware that they may have to invest in infrastructure without a positive financial return on investment in the short-term.

The Black Country Transport analysis which this work will feed into will be able to articulate this more clearly, so the modelling outputs have been supplied with this report to support ongoing analysis.

Black Country Transport

in partnership with

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Black Country LEP

MIDLANDS ENGINE HM Government

Transport for West Midlands

Dudley Metropolitan Borough Council

Sandwell Metropolitan Borough Council

Walsall Council

CITY OF WOLVERHAMPTON COUNCIL

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