APSE Transport & Vehicle Maintenance Seminar

Managing Capital Assets during transition

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Agenda

- Insight to Change Management In Fleet
- Emerging evidence on BEV Asset/Vehicle life cycles costs
- Strategic capital forecasts and associated budgets
- Future Asset/Vehicle replacement strategy

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Change Management in Fleet

- Global warning is rapidly driving the change to Alternative Fueled Assets
  - GHG + 60% since 1994 - 80% of global net increase in CO2 since 2000 came from road freight
  - The dependance on fossil fuels as our main energy source has been the problem
- We basically have two competing ideas
  - Saving the plant together with the needs to provide service and move goods by road, sea & air
- The need to decarbonized and provide sustainable AFV solutions is the biggest change Fleet Manages have faced in my 45 years
- BEV's and Hydrogen technology has been around for years as solution
- ***INFRASTRUCTURE*** will be the challenge we all face
  - Delivery of energy to the customer over the ***final meter***
- A bespoke electrification strategy will need to focus on
  - Customer Engagement, Consultation & Planning at Exec level
  - It will involve more discussion with more departments

Change Management in Fleet

- As Fleet Managers we now have to kick the ball further down the road
- Digitalisation is bringing Drivers, Operational managers and the charging infrastructures to the door of Fleet Managers
- We now have to make our digitilised Fleet Products as easy as possible for our customers to use in the Jungle of operations
- ***Sustainability, Safety & Compliance*** is our goal and we will need data to provide the necessary business intelligence, business cases and baseline data to measure improvements
- How Fleet Managers work with your Environmental, Energy and Facilities colleagues to deliver the required ***Infrastructure for the Last Meter*** will be a key component to consider

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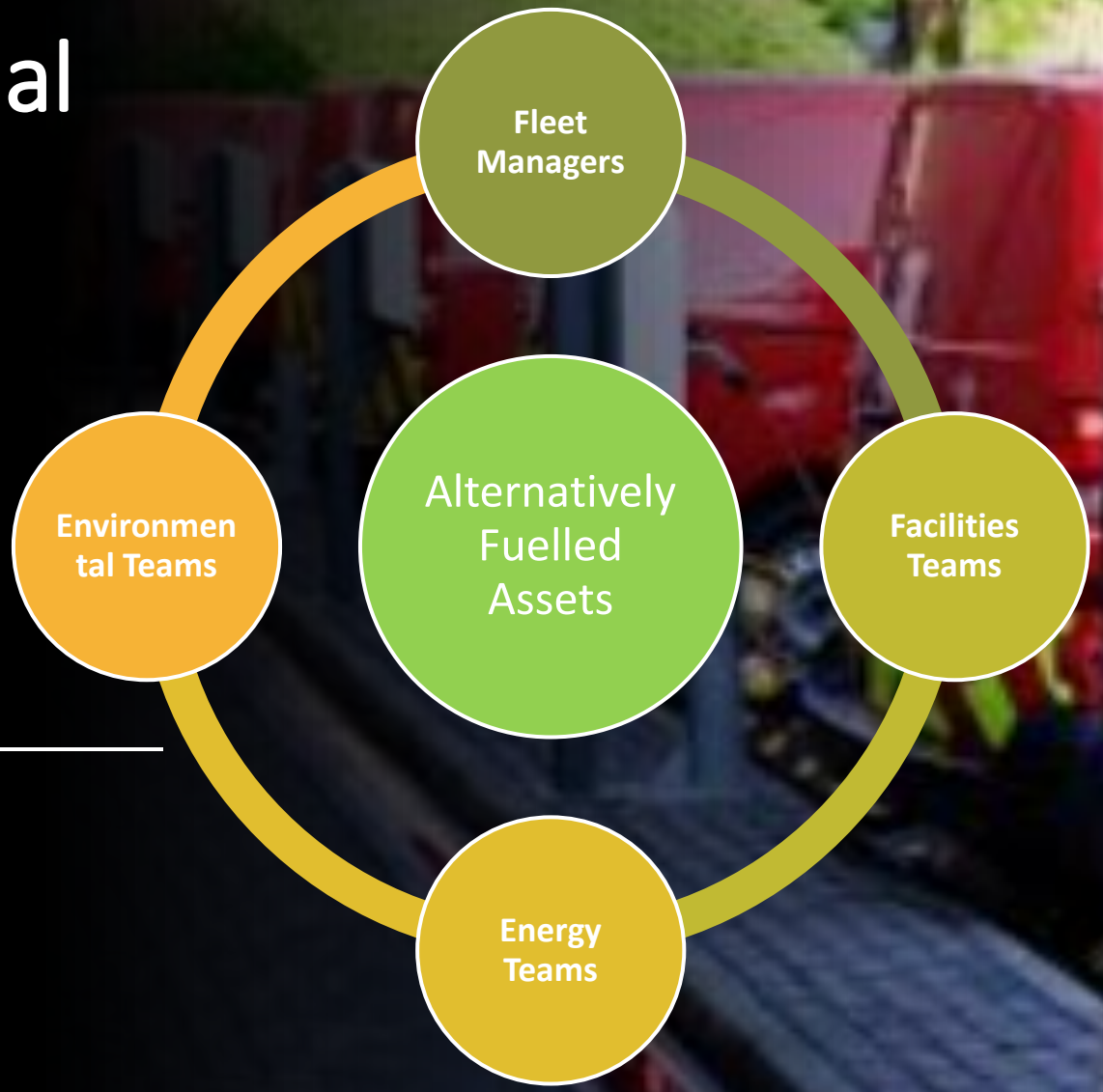
Delivering the final Meter

Infrastructure Programme Management



Emerging evidence on Electric Vehicle life cycles costs

Can be based on APSE category coding structure

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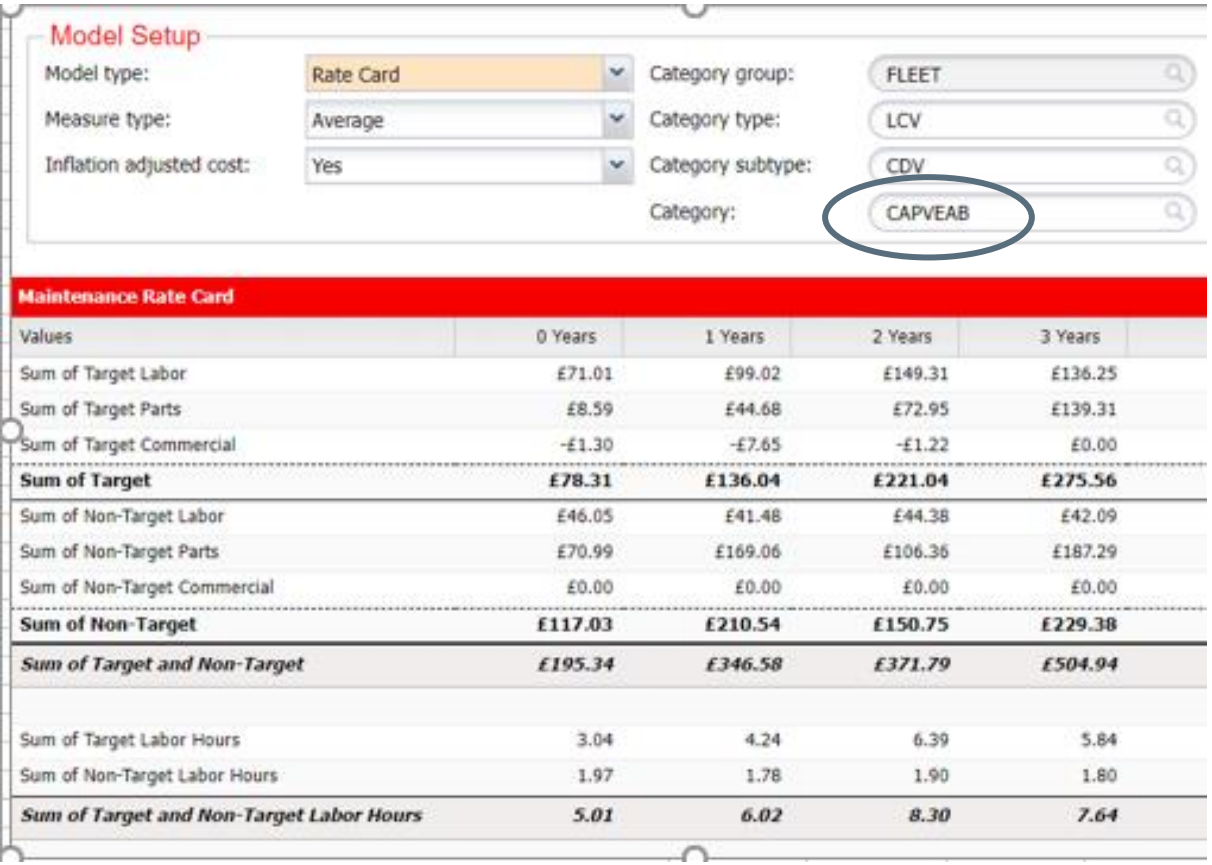
CAM Maintenance Forecasts: Rate Card by Vehicle Category

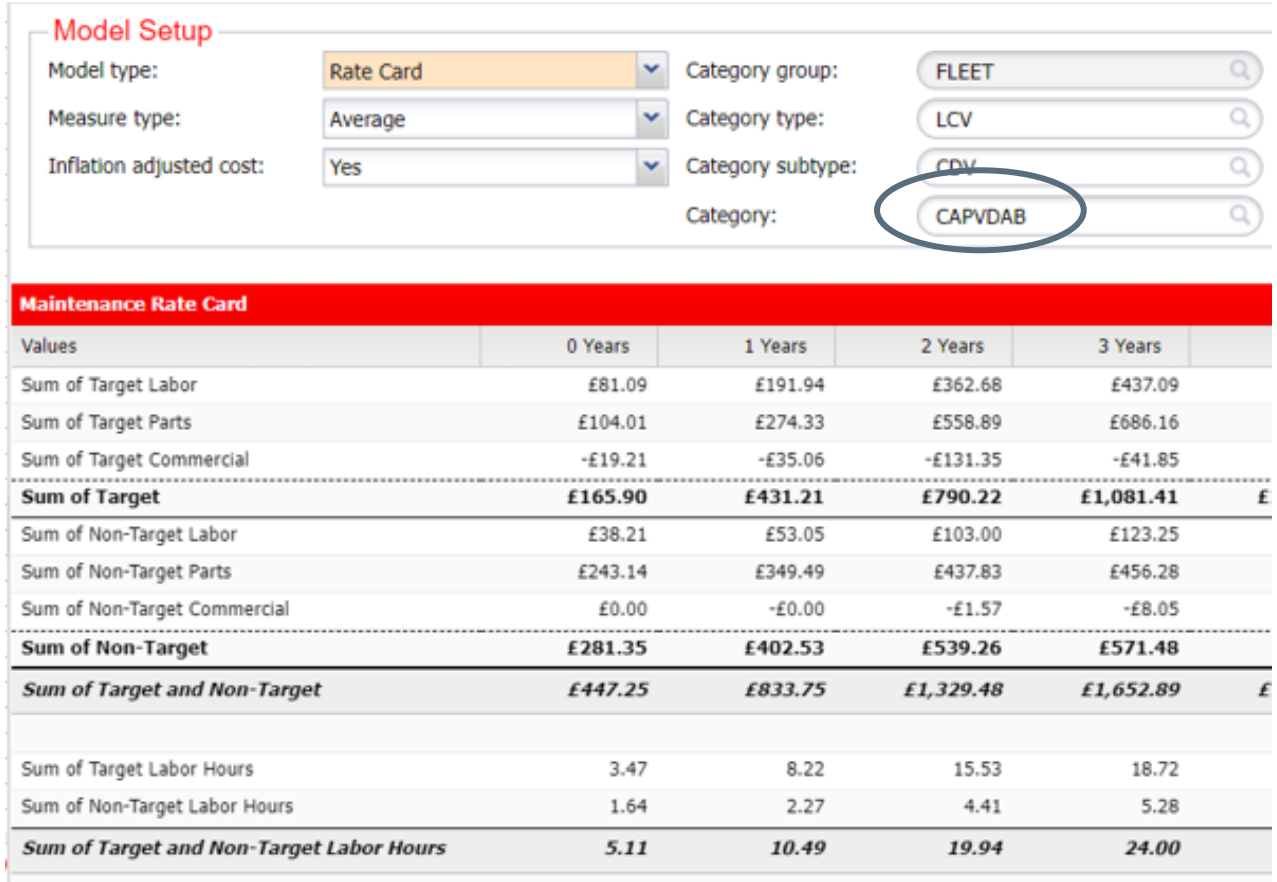


Model Setup

Model type:	Rate Card	Category group:	FLEET
Measure type:	Average	Category type:	LCV
Inflation adjusted cost:	Yes	Category subtype:	CDV
		Category:	CAPVEAB

Maintenance Rate Card

Values	0 Years	1 Years	2 Years	3 Years
Sum of Target Labor	£71.01	£99.02	£149.31	£136.25
Sum of Target Parts	£8.59	£44.68	£72.95	£139.31
Sum of Target Commercial	-£1.30	-£7.65	-£1.22	£0.00
Sum of Target	**£78.31**	**£136.04**	**£221.04**	**£275.56**
Sum of Non-Target Labor	£46.05	£41.48	£44.38	£42.09
Sum of Non-Target Parts	£70.99	£169.06	£106.36	£187.29
Sum of Non-Target Commercial	£0.00	£0.00	£0.00	£0.00
Sum of Non-Target	**£117.03**	**£210.54**	**£150.75**	**£229.38**
Sum of Target and Non-Target	***£195.34***	***£346.58***	***£371.79***	***£504.94***
Sum of Target Labor Hours	3.04	4.24	6.39	5.84
Sum of Non-Target Labor Hours	1.97	1.78	1.90	1.80
Sum of Target and Non-Target Labor Hours	***5.01***	***6.02***	***8.30***	***7.64***



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		Category:	CAPVDAB

Maintenance Rate Card

Values	0 Years	1 Years	2 Years	3 Years
Sum of Target Labor	£81.09	£191.94	£362.68	£437.09
Sum of Target Parts	£104.01	£274.33	£558.89	£686.16
Sum of Target Commercial	-£19.21	-£35.06	-£131.35	-£41.85
Sum of Target	**£165.90**	**£431.21**	**£790.22**	**£1,081.41**
Sum of Non-Target Labor	£38.21	£53.05	£103.00	£123.25
Sum of Non-Target Parts	£243.14	£349.49	£437.83	£456.28
Sum of Non-Target Commercial	£0.00	-£0.00	-£1.57	-£8.05
Sum of Non-Target	**£281.35**	**£402.53**	**£539.26**	**£571.48**
Sum of Target and Non-Target	***£447.25***	***£833.75***	***£1,329.48***	***£1,652.89***
Sum of Target Labor Hours	3.47	8.22	15.53	18.72
Sum of Non-Target Labor Hours	1.64	2.27	4.41	5.28
Sum of Target and Non-Target Labor Hours	***5.11***	***10.49***	***19.94***	***24.00***

Costs separated into SMR and non-FW&T buckets, broken out for labour, parts and commercial costs

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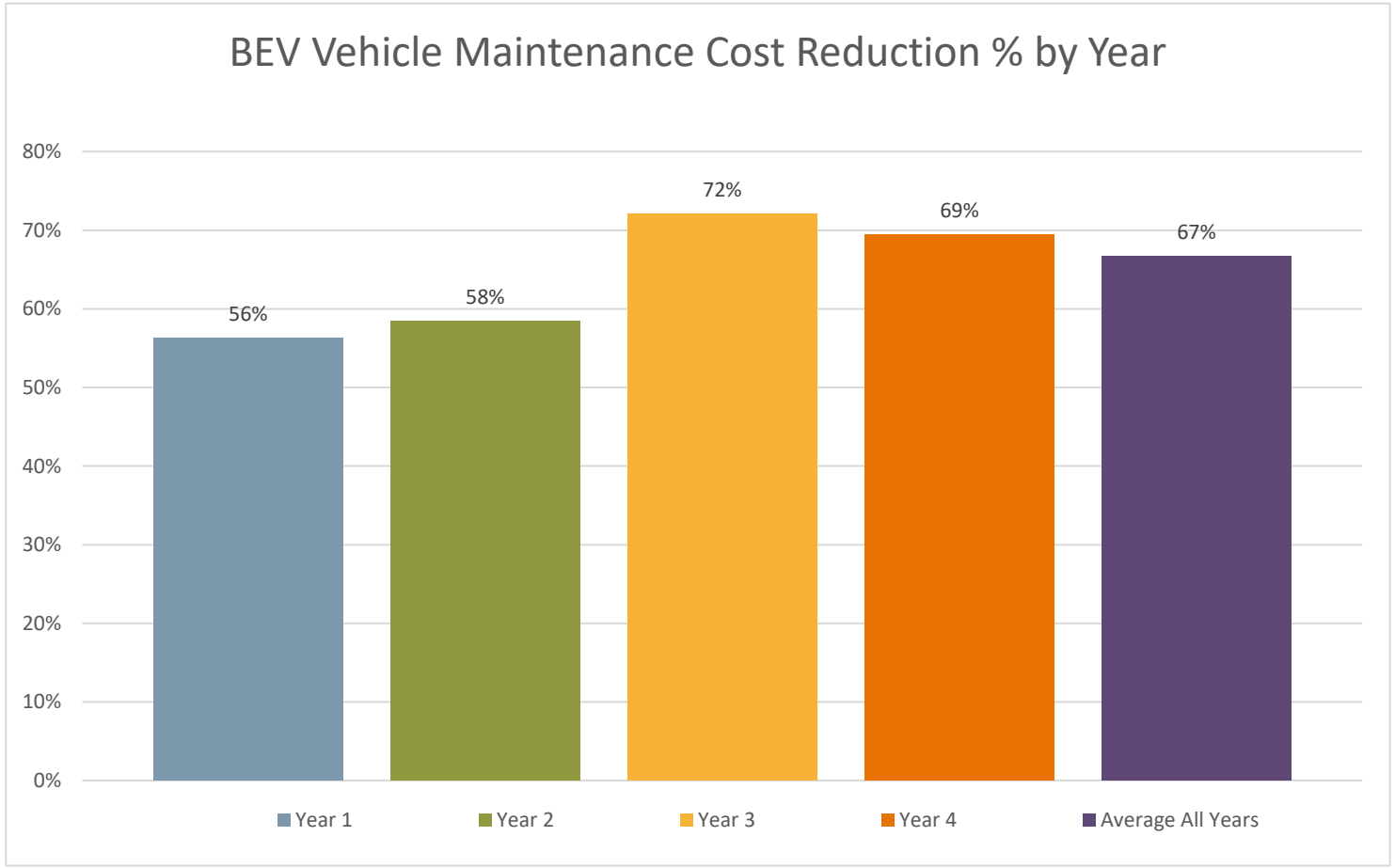
BEV Vehicle Maintenance Cost Reduction % by Year



Delivers Improved Asset Utilisation & Downtime

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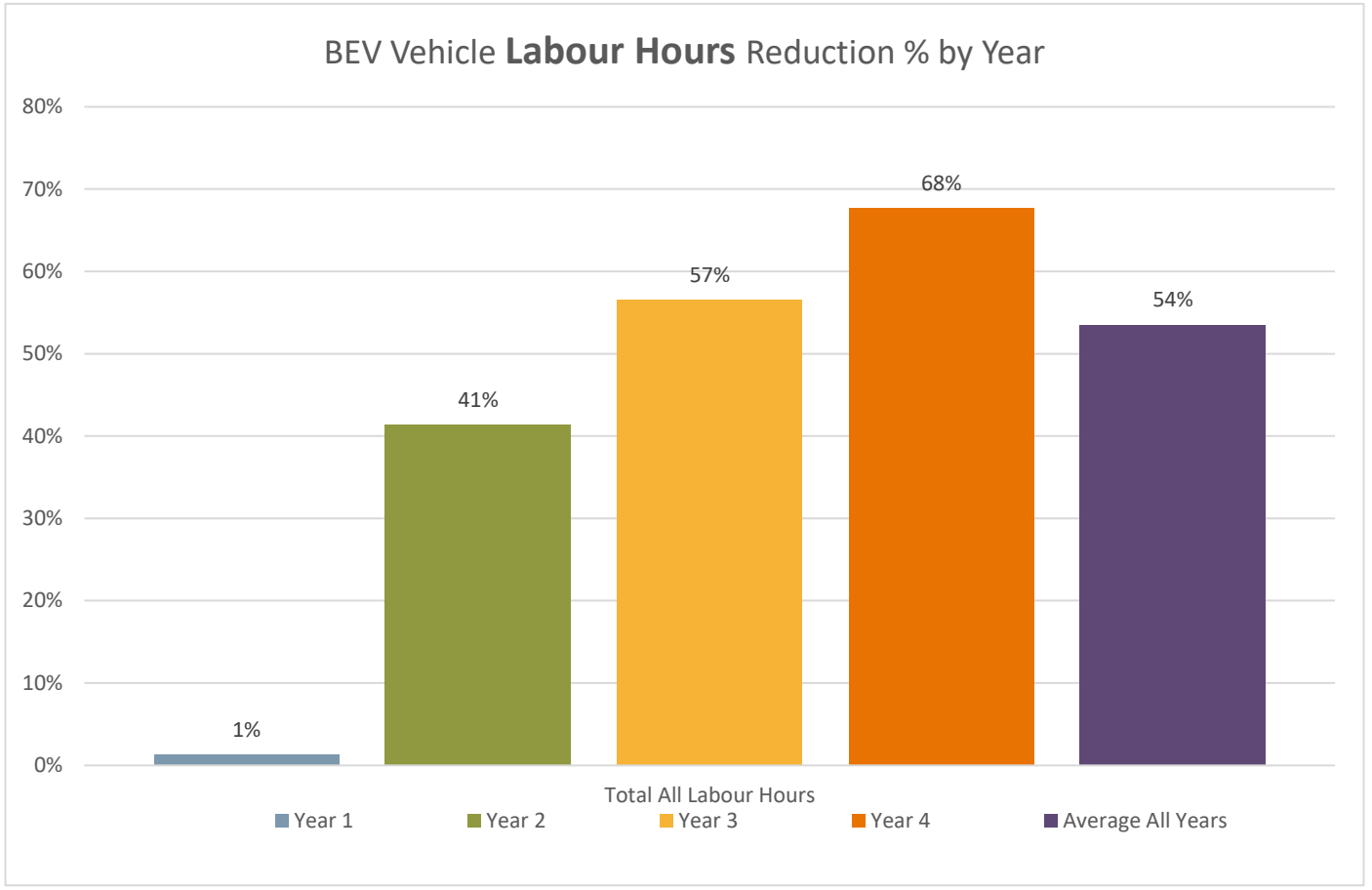
BEV Vehicle Labour Cost Reduction % by Year



Impact on Workshop hours and variable costs such as overtime

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Strategic capital forecasts and associated budgets

Using **AssetWorks CAM** to automate life-cycle cost analysis

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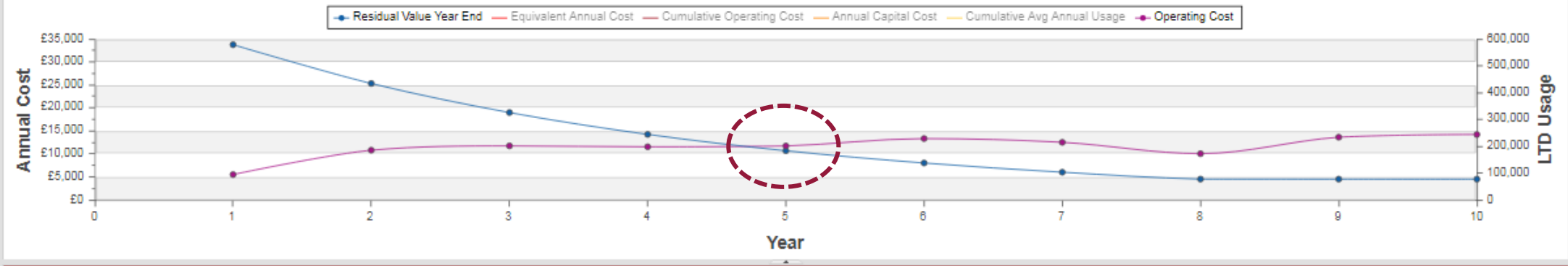
Life-Cycle Analysis- Lowest MEAC by Category

Assets | Allocation Adjustment | Life Cycle Model | Maintenance Forecast | Asset Analysis | Plan Forecast | Allocation Agreement | Requests | Build Order | Orders | Plan Adjustment | Categories | Budget Lines | Plan Manager | Enter

Save | Save Copy As... | Run | Clear | Delete

Model Setup | Model Results | MEAC Model | Cost Trends | Cost Per Use | Data Distribution



Life-Cycle Calculator

Lowest MEAC: £15,885

Lowest MEAC Year: Year 10

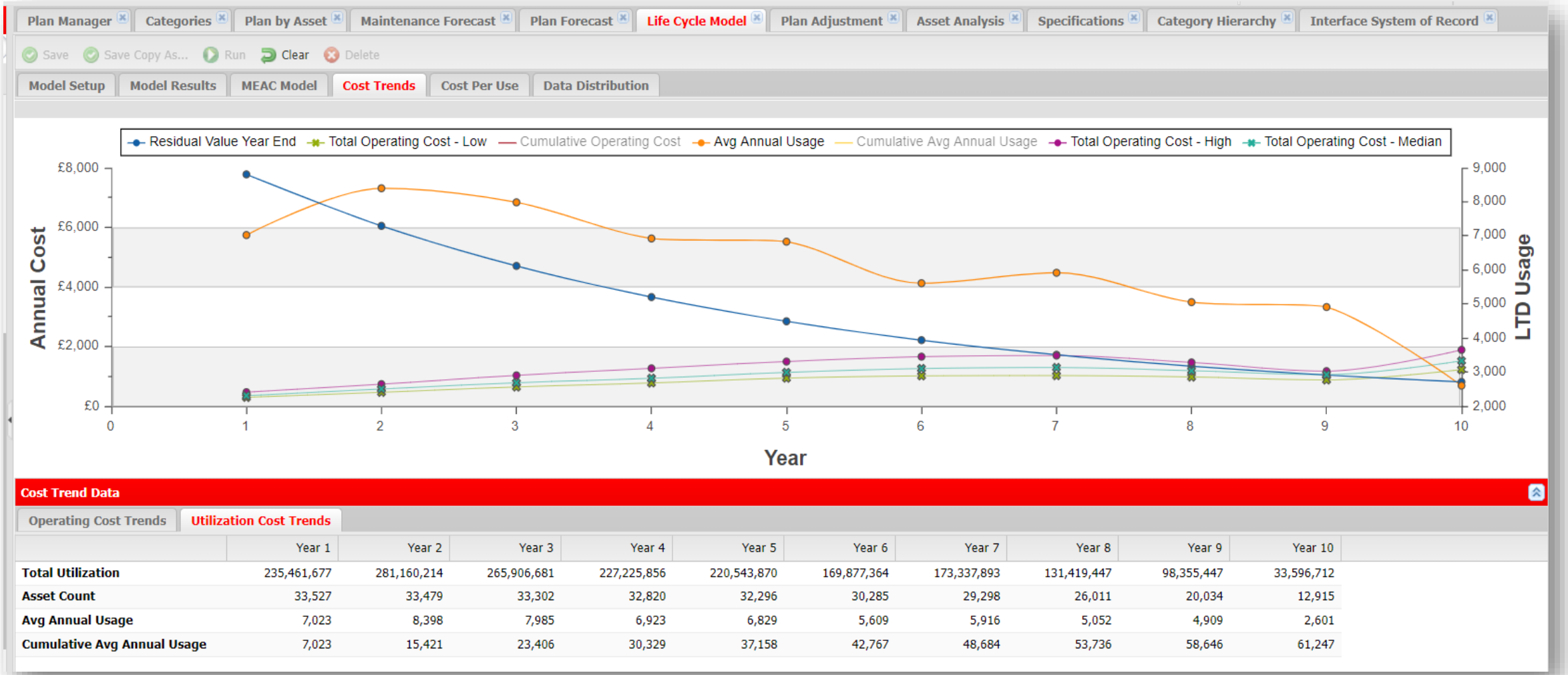
Cumulative Utilization in MEAC Year: 553,551

Formula Input

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cumulative Avg Annual Usage	46,124	126,915	199,903	252,044	298,493	362,727	426,181	475,967	518,536	553,551
Residual Value Year End	£33,750	£25,313	£18,984	£14,238	£10,679	£8,009	£6,007	£4,505	£4,500	£4,500
Annual Capital Cost	£11,250	£8,438	£6,328	£4,746	£3,560	£2,670	£2,002	£1,502	£5	£0
Maintenance Cost	£3,558	£5,394	£6,375	£5,559	£5,917	£8,969	£9,155	£7,609	£9,417	£10,069
Downtime Cost	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Energy Cost	£1,943	£5,403	£5,361	£5,982	£5,804	£4,355	£3,355	£2,431	£4,210	£4,138
Total Operating Cost	**£5,500**	**£10,797**	**£11,736**	**£11,541**	**£11,721**	**£13,323**	**£12,510**	**£10,040**	**£13,627**	**£14,207**
Cumulative Operating Cost	**£5,500**	**£16,297**	**£28,033**	**£39,574**	**£51,294**	**£64,618**	**£77,128**	**£87,167**	**£100,794**	**£115,001**
Cumulative Discounted Cost	£15,654	£32,455	£47,200	£59,625	£70,520	£81,177	£90,214	£96,931	£104,346	£111,568
Equivalency Factor	1.0700	0.5531	0.3811	0.2952	0.2439	0.2098	0.1856	0.1675	0.1535	0.1424
Equivalent Annual Cost	**£16,750**	**£17,950**	**£17,986**	**£17,603**	**£17,199**	**£17,031**	**£16,740**	**£16,233**	**£16,016**	**£15,885**

Note Energy Costs shown on Life Cycle Analysis

Life-Cycle Analysis- Category Cost Trends



	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total Utilization	235,461,677	281,160,214	265,906,681	227,225,856	220,543,870	169,877,364	173,337,893	131,419,447	98,355,447	33,596,712
Asset Count	33,527	33,479	33,302	32,820	32,296	30,285	29,298	26,011	20,034	12,915
Avg Annual Usage	7,023	8,398	7,985	6,923	6,829	5,609	5,916	5,052	4,909	2,601
Cumulative Avg Annual Usage	7,023	15,421	23,406	30,329	37,158	42,767	48,684	53,736	58,646	61,247

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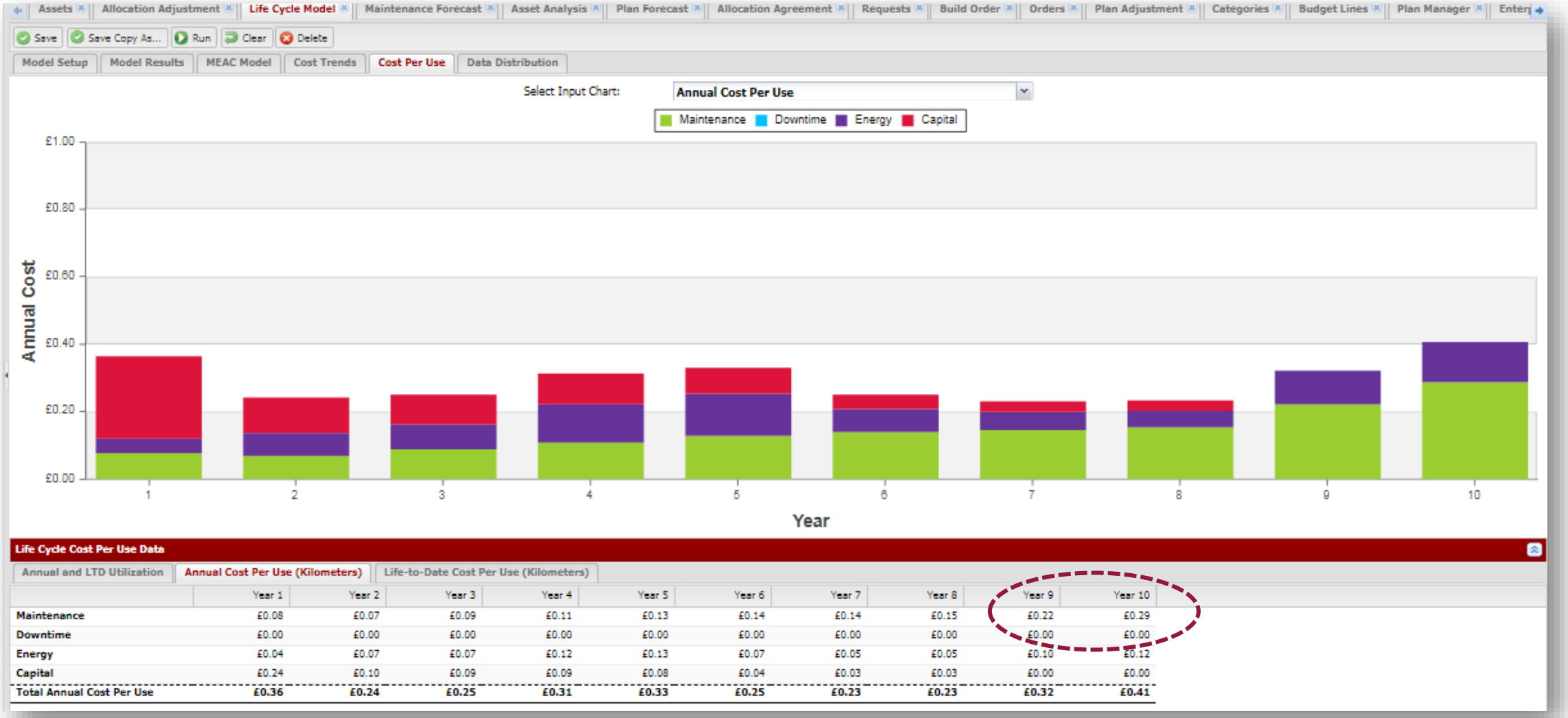
Life-Cycle Analysis- PPM by Category



	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Maintenance	£0.08	£0.07	£0.09	£0.11	£0.13	£0.14	£0.14	£0.15	£0.22	£0.29
Downtime	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Energy	£0.04	£0.07	£0.07	£0.12	£0.13	£0.07	£0.05	£0.05	£0.10	£0.12
Capital	£0.24	£0.10	£0.09	£0.09	£0.08	£0.04	£0.03	£0.03	£0.00	£0.00
Total Annual Cost Per Use	**£0.36**	**£0.24**	**£0.25**	**£0.31**	**£0.33**	**£0.25**	**£0.23**	**£0.23**	**£0.32**	**£0.41**

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Future Asset Replacement Strategy

Using **AssetWorks CAM** to automate life-cycle cost analysis

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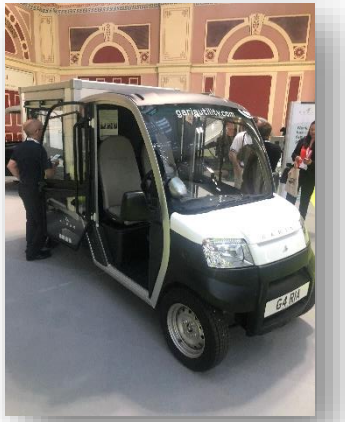
Consider management all types of fleet assets



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Decarbonisation Scoping Options & Scenario Planning

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Daily Range — BEV → 200 miles — BEV & RE → 300 miles — FCEV → 500+ miles

Cars

Powered light vehicles

Waste & recycling

Urban distribution

Urban buses

Long haul distribution

Urban construction

Heavy consutrction <26t

Regional haul <26t

Emergency services

Stranded assets

Coaches long haul

225-325km annually

Long haul >26t

200-400km annually

ULEZ Expansion London

Hybrid/BE cars

Ride hailing

BE vans

Bus electrification

E-cargo bikes

Taxi AFV

BE FLS trucks

Car sharing/pooling

Euro 6 diesel trucks

Plant AFV

Powered light vehicles

Additional Clean Air Zone

BEV road charging infrastructure

BE/AF light trucks

Hydrogen Infrastructure Strategy

Hydrogen long haul/ heavy duty trucks

Drones

Multi-Modal

City PODs

Autonomous delivery robots

Autonomous vehicles

Emission Free City Centers

City center rail freight hotels

Raill system electrification

ICE cars

3.5> 26T

HCV vehicles

Above 26T

HCV vehicles

Decarbonised Transport Infrastructure

Shipping via biofuel, hybrid, or electrification

Air freight via biofuel, hybrid or electrification

Low carbon technology

Net Zero

2021

Enabler to electrification
Manufacturer fines for every vehicle sold
>95g per KM CO2

2022

Risk: Lithium supply for batteries
Demand oustrips supply

2025

2030

2035

2040

2050

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Considerations before investing in Alternatively Fueled Vehicles…

Prepare your fleet data

- How clean is your data?
- Does your data exist is spreadsheets or silos?
- Do you have defined baselines for your current fleet Capital & Revenue costs by product
- Do you have defined ***baselines*** for emissions. CO2, NOx and PM's ?
- What is your current Carbon footprint ?
- Am I able to provide a report with recommendation to the board ?

Answer the following questions with your fleet data:

- Can I create a strategic Asset capital forecast for the next 5-10 years with options?
- Can I create a maintenance Opex forecast?
- What is my optimal vehicle replacement cycle by vehicle type ?
- What range considerations do I need to consider by duty cycle & vehicle type
- Should I repair a current vehicle or replace it with an EV?
- Do I need to consider CAZ proposals? (3 way moves of vehicles)

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True (High Level) TCO considerations

Should include all core vehicle costs plus additional items for EV transition

- Fleet Systems
- Asset Depreciation, Interest & Lifecycle Management
- Operational Range & Duty Considerations
- Charging Infrastructure
- Maintenance Costs / Operational facilities & Staff Costs ?
- Tyres
- Payloads
- Insurance
- Taxes / Tax relief
- Energy / Fuel Costs
- Technician & Driver Training
- Consultancy / Management Fees ?

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Programme Considerations for Optimised deployment

Fleet

- Life Cycles by Asset Category (APSE codes)
- Capital Costs (outright purchase) / Capital Costs (Lease)
- Mobility Optimisation Hire vs Grey fleet & Motor Pool Vehicles
- Depreciation & Interest
- Asset suitability / lead times considerations
- Technician training
- Service, Maintenance and Repairs
- Tyre technology, construction & changes
- Utilisation & Downtime
- Warranties – Batteries
- Telematics – Data integration
- Range - Duty Cycles (inc. terrain) & Mileage
- Energy/Fuel Type/Alternative fuels
  - increase in Diesel / Petrol costs
- Driver Engagement / Training
- ***You will be seen as doing the right thing***

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Programme Considerations for Optimised deployment (inc. Partners)

Partners - Facilities / Environment / Energy Teams

- Green energy supply ?
- ChargePoint Supplier
- Depots - ChargePoint's infrastructure – AC/DC Considerations for Type by Vehicle
- Full depot design and build infrastructure
- kWh/ph consumed - charge rates per vehicle required
- Programme metrics. CPD, CPV, PPM, TCO
- On the go ChargePoint data and integration into business systems

Systems

- Digital data upload for charge per vehicle and associated costs/time of day
- Depot ChargePoint & optimised bay Utilisation plan
- Vehicle to Grid considerations

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The last Meter – AFV Infrastructure Implementation Plan

Home, Depot or on route charging

- Depot – Programme team – Facilities / Environment & Energy teams involved
  - CAPEX required / benefits and years to payback
- Full depot design and build infrastructure
- On the go route – driver will need to plan journeys
- Energy Management - How do we capture the data?
- Make Parking & charging as simple as possible for the driver (App)
- System evolving to pay the ChargePoint supplier directly
- Charging as a service options (no upfront costs – PPM charges)

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Don’t forget the driver engagement

- Operation & familiarity of Alternatively fuelled vehicle
  - Easier to drive when trained
  - Driver roadshows and comms
- How and when to charge – Cables 20% to 80% etc.
- Impacts of time of day to charge
- Eco driving - Regenerative braking techniques
- Battery Management
- Geography and terrain (up hills / down dale)
- Impacts on use of auxiliary equipment, Lifts, sweepers, Air con, Climate Control, lights. Heater impacts
- Towing of equipment
- CANBus & Telematics
  - Battery health
  - Driver safety reporting
  - Turning data into insight
  - HR policy – Driver privacy options
  - Driver energy consumption reporting

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Decarbonisation plan 2030 & beyond

Using **AssetWorks CAM** to automate life-cycle cost analysis

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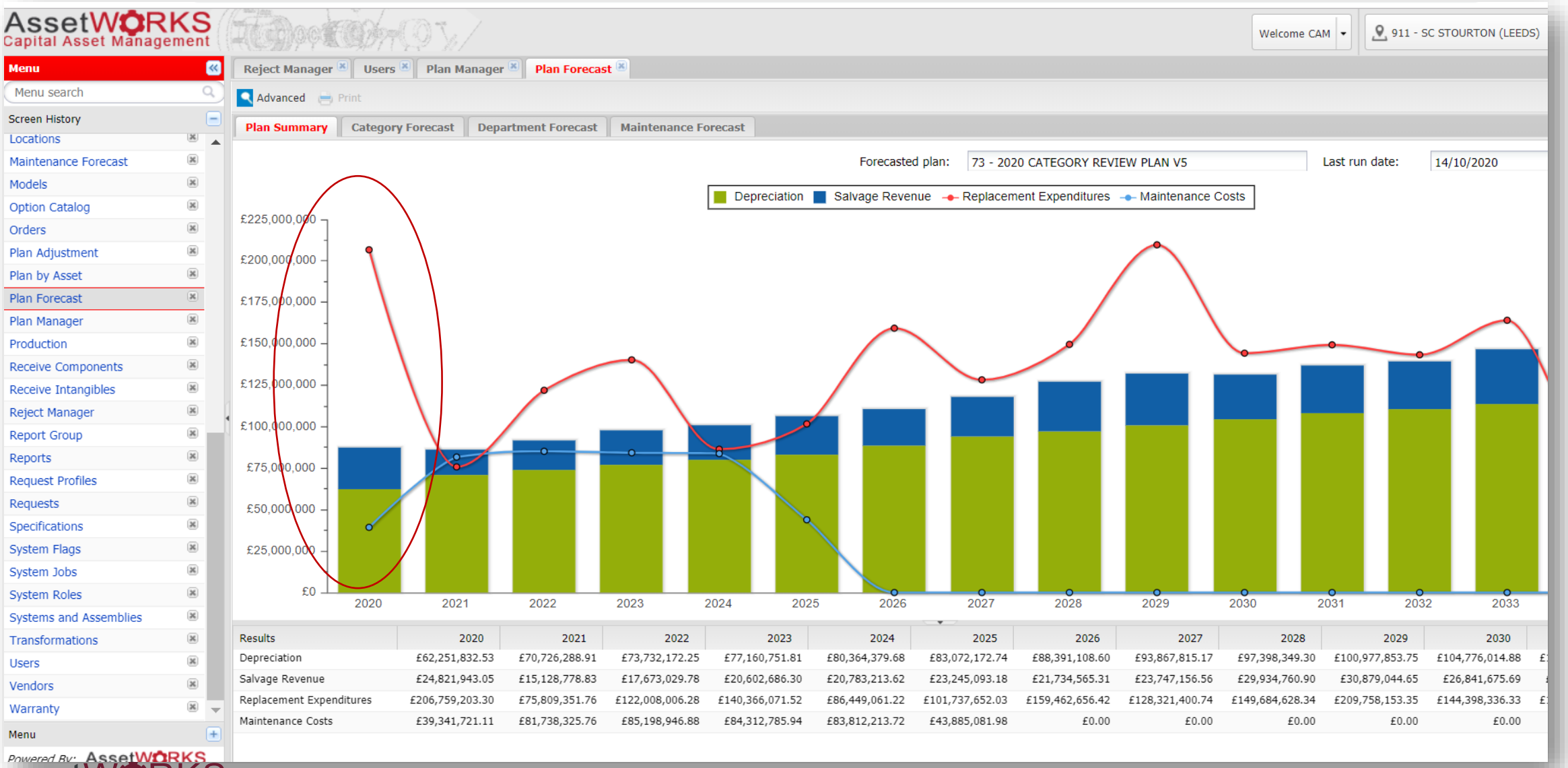
Baseline Capital Forecast Replacement Plans



Results	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Depreciation	£62,251,832.53	£70,726,288.91	£73,732,172.25	£77,160,751.81	£80,364,379.68	£83,072,172.74	£88,391,108.60	£93,867,815.17	£97,398,349.30	£100,977,853.75	£104,776,014.88
Salvage Revenue	£24,821,943.05	£15,128,778.83	£17,673,029.78	£20,602,686.30	£20,783,213.62	£23,245,093.18	£21,734,565.31	£23,747,156.56	£29,934,760.90	£30,879,044.65	£26,841,675.69
Replacement Expenditures	£206,759,203.30	£75,809,351.76	£122,008,006.28	£140,366,071.52	£86,449,061.22	£101,737,652.03	£159,462,656.42	£128,321,400.74	£149,684,628.34	£209,758,153.35	£144,398,336.33
Maintenance Costs	£39,341,721.11	£81,738,325.76	£85,198,946.88	£84,312,785.94	£83,812,213.72	£43,885,081.98	£0.00	£0.00	£0.00	£0.00	£0.00

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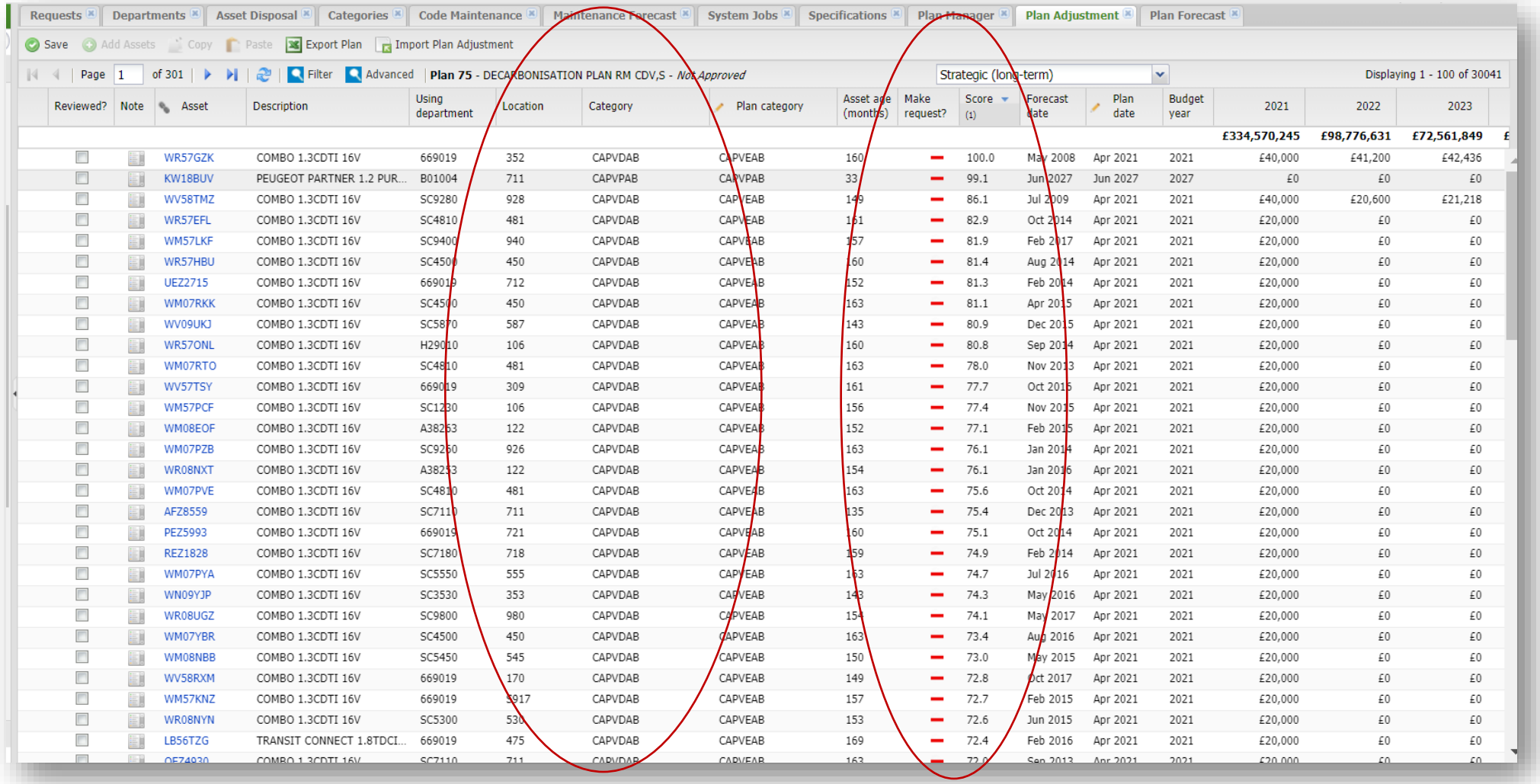
Decarbonisation Plan: ICE Swapped for BEV



Requests | Departments | Asset Disposal | Categories | Code Maintenance | Maintenance Forecast | System Jobs | Specifications | Plan Manager | Plan Adjustment | Plan Forecast

Save | Add Assets | Copy | Paste | Export Plan | Import Plan Adjustment

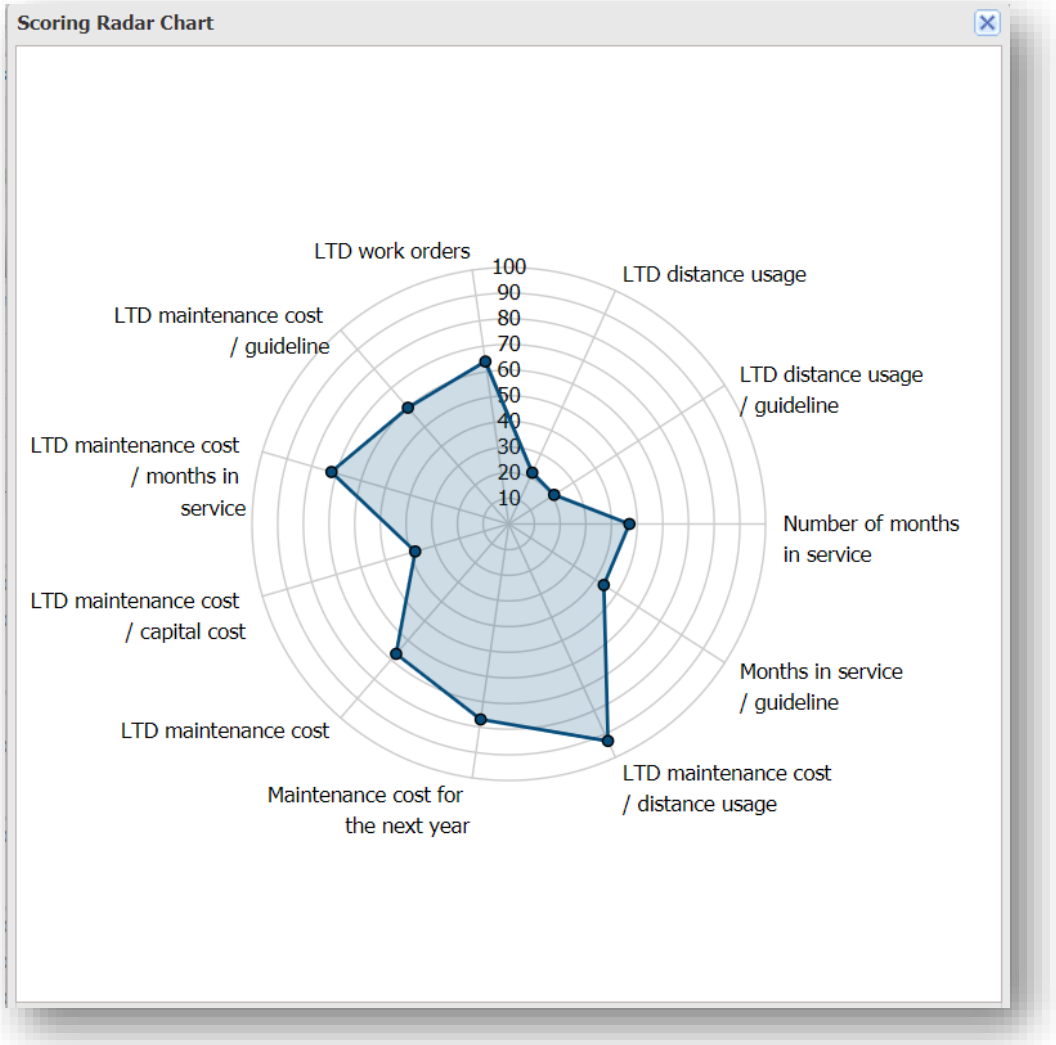
Page 1 of 301 | Filter | Advanced | **Plan 75** - DECARBONISATION PLAN RM CDV,S - *Not Approved* | Strategic (long-term) | Displaying 1 - 100 of 30041

Reviewed?	Note	Asset	Description	Using department	Location	Category	Plan category	Asset age (months)	Make request?	Score (1)	Forecast date	Plan date	Budget year	2021	2022	2023	£
														£334,570,245	**£98,776,631**	**£72,561,849**	**£**
☐		WR57GZK	COMBO 1.3CDTI 16V	669019	352	CAPVDAB	CAPVEAB	160	—	100.0	May 2008	Apr 2021	2021	£40,000	£41,200	£42,436	
☐		KW18BUV	PEUGEOT PARTNER 1.2 PUR...	B01004	711	CAPVPAB	CAPVPAB	33	—	99.1	Jun 2027	Jun 2027	2027	£0	£0	£0	
☐		WV58TMZ	COMBO 1.3CDTI 16V	SC9280	928	CAPVDAB	CAPVEAB	149	—	86.1	Jul 2009	Apr 2021	2021	£40,000	£20,600	£21,218	
☐		WR57EFL	COMBO 1.3CDTI 16V	SC4810	481	CAPVDAB	CAPVEAB	161	—	82.9	Oct 2014	Apr 2021	2021	£20,000	£0	£0	
☐		WM57LKF	COMBO 1.3CDTI 16V	SC9400	940	CAPVDAB	CAPVEAB	157	—	81.9	Feb 2017	Apr 2021	2021	£20,000	£0	£0	
☐		WR57HBU	COMBO 1.3CDTI 16V	SC4500	450	CAPVDAB	CAPVEAB	160	—	81.4	Aug 2014	Apr 2021	2021	£20,000	£0	£0	
☐		UEZ2715	COMBO 1.3CDTI 16V	669019	712	CAPVDAB	CAPVEAB	152	—	81.3	Feb 2014	Apr 2021	2021	£20,000	£0	£0	
☐		WM07RKK	COMBO 1.3CDTI 16V	SC4500	450	CAPVDAB	CAPVEAB	163	—	81.1	Apr 2015	Apr 2021	2021	£20,000	£0	£0	
☐		WV09UKJ	COMBO 1.3CDTI 16V	SC5870	587	CAPVDAB	CAPVEAB	143	—	80.9	Dec 2015	Apr 2021	2021	£20,000	£0	£0	
☐		WR57ONL	COMBO 1.3CDTI 16V	H29010	106	CAPVDAB	CAPVEAB	160	—	80.8	Sep 2014	Apr 2021	2021	£20,000	£0	£0	
☐		WM07RTO	COMBO 1.3CDTI 16V	SC4810	481	CAPVDAB	CAPVEAB	163	—	78.0	Nov 2013	Apr 2021	2021	£20,000	£0	£0	
☐		WV57TSY	COMBO 1.3CDTI 16V	669019	309	CAPVDAB	CAPVEAB	161	—	77.7	Oct 2016	Apr 2021	2021	£20,000	£0	£0	
☐		WM57PCF	COMBO 1.3CDTI 16V	SC1230	106	CAPVDAB	CAPVEAB	156	—	77.4	Nov 2015	Apr 2021	2021	£20,000	£0	£0	
☐		WM08EOF	COMBO 1.3CDTI 16V	A38263	122	CAPVDAB	CAPVEAB	152	—	77.1	Feb 2015	Apr 2021	2021	£20,000	£0	£0	
☐		WM07PZB	COMBO 1.3CDTI 16V	SC9260	926	CAPVDAB	CAPVEAB	163	—	76.1	Jan 2014	Apr 2021	2021	£20,000	£0	£0	
☐		WR08NXT	COMBO 1.3CDTI 16V	A38253	122	CAPVDAB	CAPVEAB	154	—	76.1	Jan 2016	Apr 2021	2021	£20,000	£0	£0	
☐		WM07PVE	COMBO 1.3CDTI 16V	SC4810	481	CAPVDAB	CAPVEAB	163	—	75.6	Oct 2014	Apr 2021	2021	£20,000	£0	£0	
☐		AFZ8559	COMBO 1.3CDTI 16V	SC7110	711	CAPVDAB	CAPVEAB	135	—	75.4	Dec 2013	Apr 2021	2021	£20,000	£0	£0	
☐		PEZ5993	COMBO 1.3CDTI 16V	669019	721	CAPVDAB	CAPVEAB	160	—	75.1	Oct 2014	Apr 2021	2021	£20,000	£0	£0	
☐		REZ1828	COMBO 1.3CDTI 16V	SC7180	718	CAPVDAB	CAPVEAB	159	—	74.9	Feb 2014	Apr 2021	2021	£20,000	£0	£0	
☐		WM07PYA	COMBO 1.3CDTI 16V	SC5550	555	CAPVDAB	CAPVEAB	163	—	74.7	Jul 2016	Apr 2021	2021	£20,000	£0	£0	
☐		WN09YJP	COMBO 1.3CDTI 16V	SC3530	353	CAPVDAB	CAPVEAB	143	—	74.3	May 2016	Apr 2021	2021	£20,000	£0	£0	
☐		WR08UGZ	COMBO 1.3CDTI 16V	SC9800	980	CAPVDAB	CAPVEAB	154	—	74.1	May 2017	Apr 2021	2021	£20,000	£0	£0	
☐		WM07YBR	COMBO 1.3CDTI 16V	SC4500	450	CAPVDAB	CAPVEAB	163	—	73.4	Aug 2016	Apr 2021	2021	£20,000	£0	£0	
☐		WM08NBB	COMBO 1.3CDTI 16V	SC5450	545	CAPVDAB	CAPVEAB	150	—	73.0	May 2015	Apr 2021	2021	£20,000	£0	£0	
☐		WV58RXM	COMBO 1.3CDTI 16V	669019	170	CAPVDAB	CAPVEAB	149	—	72.8	Oct 2017	Apr 2021	2021	£20,000	£0	£0	
☐		WM57KNZ	COMBO 1.3CDTI 16V	669019	5917	CAPVDAB	CAPVEAB	157	—	72.7	Feb 2015	Apr 2021	2021	£20,000	£0	£0	
☐		WR08NYN	COMBO 1.3CDTI 16V	SC5300	530	CAPVDAB	CAPVEAB	153	—	72.6	Jun 2015	Apr 2021	2021	£20,000	£0	£0	
☐		LB56TZG	TRANSIT CONNECT 1.8TDCI...	669019	475	CAPVDAB	CAPVEAB	169	—	72.4	Feb 2016	Apr 2021	2021	£20,000	£0	£0	
☐		OEZ4930	COMBO 1.3CDTI 16V	SC7110	711	CAPVDAB	CAPVEAB	163	—	72.0	Sep 2013	Apr 2021	2021	£20,000	£0	£0	

AssetWORKS

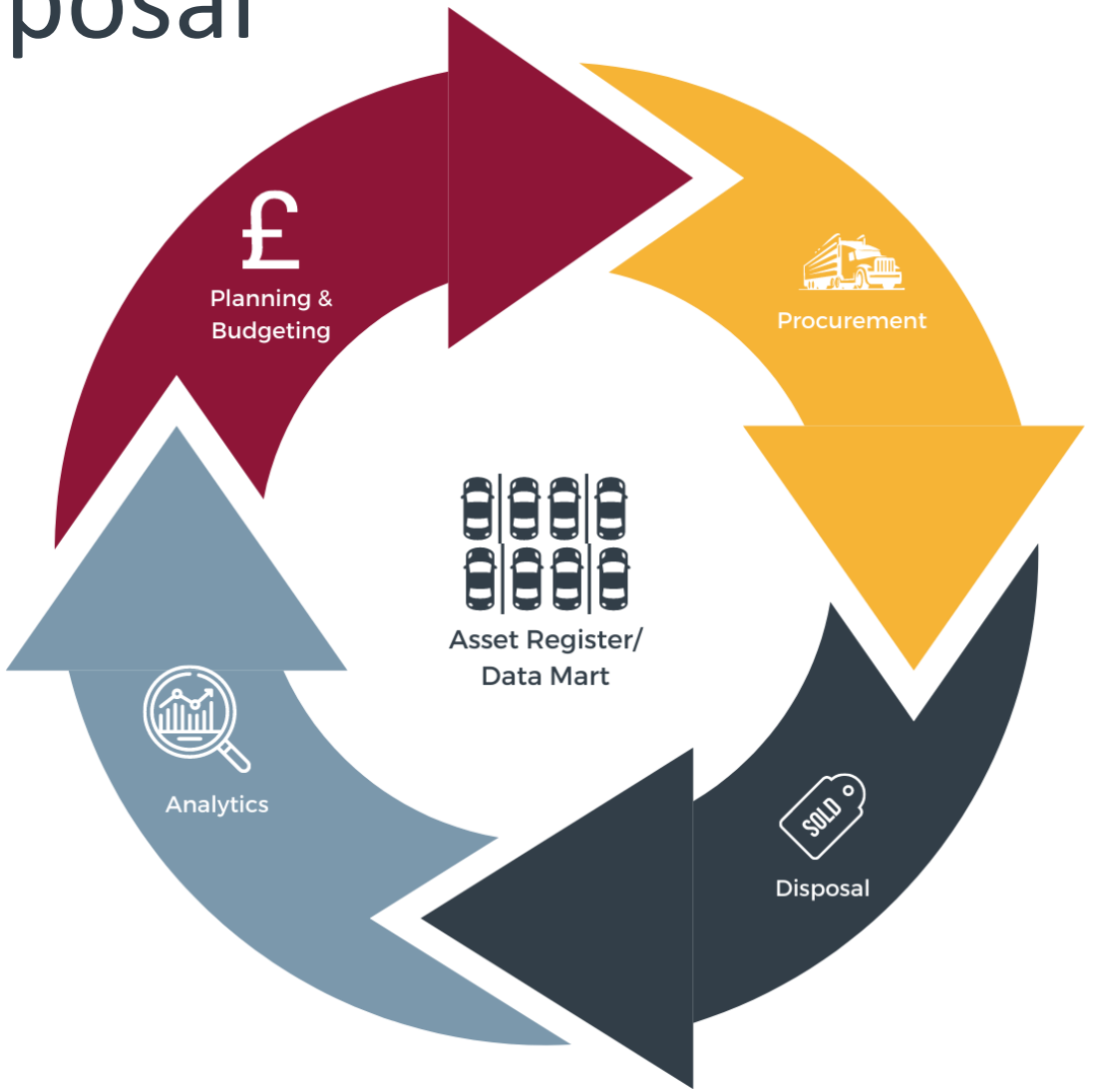
Asset Scoring: Replacement Priority

- 50 calculated metrics prioritizes assets
- Weigh measures to meet your goals
- Score against any level of the asset hierarchy
- Normalized score: 0 (best) -100 (worst)
- Prioritizes eligible Assets



AssetWORKS

CAM: Managing assets' full life-cycles from plan to disposal



FleetFocus
Maintenance System

ERP system
PO
Fixed Asset

AssetWORKS

CAM Data Mart

FleetFocus™

XML

Maintenance:
Labour, Parts, & Commercial

Downtime

Energy

Usage

Capital

CAM

In Summary

- Global warning is driving the change to AFV
- The fleet industry is rapidly changing
- Infrastructure & the last Meter requires close management
- To succeed with EVs in fleet:
  - Identify programme partners for infrastructure management
  - Gather specifications for assets
  - Build capital forecast for a Decarbonisation plans
  - Understand total cost of ownership
  - Build EV infrastructure plan
  - Build tactical plan for EV
  - Build charging and grid balancing plan
  - Present the results to stakeholders

AssetWORKS

Questions?

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