Welsh Government Zero Emissions Waste and Recycling Programme:

Insights: Improving the Economic Performance of Electric RCVs

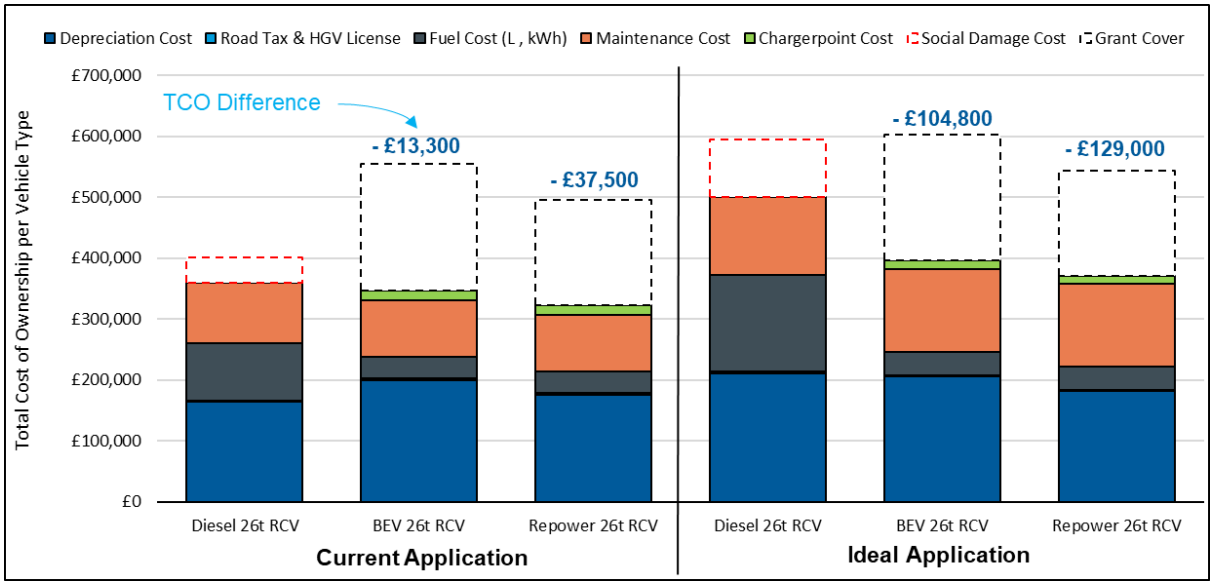
Learn how to increase your cost savings from operating eRCVs by up to 500%

Improving Performance

Purpose. The purpose of this document is to demonstrate the benefits of improving the utilisation of battery electric RCVs (eRCV). It shows the impact of round mileage, driving/charging behaviour, and ownership conditions on vehicle total cost of ownership and emissions. This information is based on data collected from six Welsh Local Authorities operating 25 Dennis Eagle eRCVs as part of the Welsh Government's ULEV Waste and Recycling programme. The analysis was undertaken by Cenex.

Current eRCV Operational Performance. Across all vehicles studied an average eRCV operates for 8.2 hours a day, driving a distance of 29.5 miles per day and consuming 44.6% of the vehicle battery. Considering the battery utilization alone, we can see that the vehicles could be better utilized to increase their cost effectiveness.

Current and Potential eRCV Economic Performance[1]. The figure below describes two scenarios. The first one considering the average operations of the eRCVs throughout Wales, and the second scenario shows the potential with optimised utilisation of the vehicles and charging regime. Both scenarios are inclusive of the Welsh Government purchase grant.



Improving Performance. The chart above shows that improving vehicle utilisation and operating practises can increase TCO savings by up to ~ 500%! Operating the vehicles over

[1] **Current application** based on annual mileage 7,700. Electricity/Fuel costs 16p/kWh and 1.43 £/L. Ownership period 7 years. Efficiency 0.237 miles/kWh and 3.75 mpg. **Ideal application** based on annual mileage 12,000. Electricity/Fuel costs 11p/kWh and 1.44 £/L. Ownership period 9 years for EV (Scrapped) and 7 years for Diesel (2 years of new vehicle). Efficiency 0.3 miles/kWh and 4.46 mpg.

longer distances would help to save money, improve air quality, and reduce carbon emissions. Hence, Cenex has compiled a list of steps that any Local Authority can apply to reduce costs and increase utilisation.

- **Charge using night rate electricity** Most vehicle chargepoints can be set to charge at night through software, moving from 15.9 p/kWh to 10.8 p/kWh, would **save £ 1,700 per annum** (with an annual mileage of 7,700 miles).
- **Increase your annual mileage** Currently eRCVs are being operated under shorter rounds, achieving 7,700 MPA. If they are changed to longer rounds of 12,000 MPA (Wales 26t RCV average) they would **increase fuel savings by £ 5,100 and emissions savings by 31% per annum** (9.7t CO_2e[2], 20.6 kg NOx and 133 g PM2.5 further reductions).
- Repowered diesel vehicles have so far proven to be equally reliable as the new eRCVs but at a reduced cost for the fleet, with a purchase cost difference of £ 70,000.
- **Invest in driver training** Aggressive driving is proven to reduce fuel efficiency and electric vehicles have regenerative breaking, which extends vehicle range. Hence, driver training can increase greatly the drive efficiency, **saving £ 1,150 per annum**.[3]
- **Increase vehicle lifetime** Electric powertrains contain fewer moving parts and wear out at slower rates than their diesel counterparts. If the vehicles are operated for 9 years rather than 7 years, assuming that the vehicle is well maintained and still fit for purpose (some vehicles cannot be kept longer). There are potential further **savings of £ 26,000 in fuel, £ 2,600 in engine related maintenance**, and £ 52,400 in Social Damage[4].

Vehicle Capability

The information provided here has been based on the performance of the Dennis Eagle eCollect 26t eRCV. The vehicles specifications are below. To understand how this vehicle might perform over your rounds, please see link to further project resources below.

Configuration: 26t 6x2 Rear Steer

Battery Capacity: 300 kWh (270 kWh usable)

Motor Power: 200 kW motor

Charge time: 6.75 h (20 – 100%)

Avg. drive efficiency: 0.23 $^{mi}/_{kWh}$ (real-world)

Urban collection range: ~ 40 miles (real-world)

Rural collection range: ~ 80 miles (real-world)

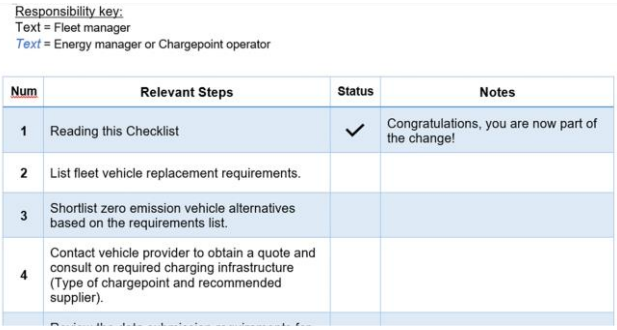
[2] Carbon Dioxide equivalents is a metric used to evaluate the global warming potential of all gasses emitted, respective to CO_2.
[3] Eco-driving studies have shown fuel saving improvements of 10 – 50%. In this example we have applied 20% fuel saving based on a simplistic comparison of the fuel efficiency of the average compared to best scoring eRCVs rated by the DE driver efficiency index.
[4] Social damage costs represent the cost to society from polluting vehicles, which include climate response and local health care costs. Calculated in line with UK Government TAG guidance.

Other Planning Tools and Support Available

More information and useful tools can be found on the programme website below and on request from the Welsh Government or Cenex.

See Programme Website

New Electric Vehicle Checklist – To simplify the work of fleet/energy managers during acquisition and planning for new ULEVs.



Responsibility key:
Text = Fleet manager
Text = Energy manager or Chargepoint operator

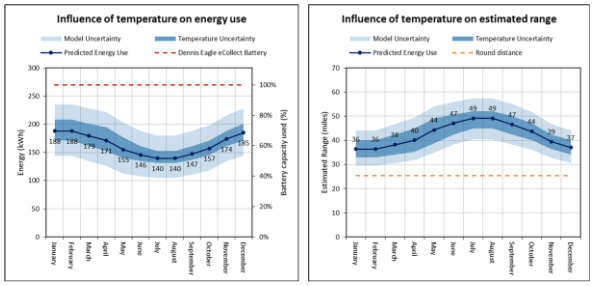
Num	Relevant Steps	Status	Notes
1	Reading this Checklist	✓	Congratulations, you are now part of the change!
2	List fleet vehicle replacement requirements.		
3	Shortlist zero emission vehicle alternatives based on the requirements list.		
4	Contact vehicle provider to obtain a quote and consult on required charging infrastructure (Type of chargepoint and recommended supplier).		

The tool lays out all the steps involved in new EV onboarding, from research to deployment. Including details on infrastructure and vehicle steps.

ZE Vehicle Catalogue – For fleet/waste managers to reduce research time on ULEV RCVs, RRVs, and Sweepers available in the market.

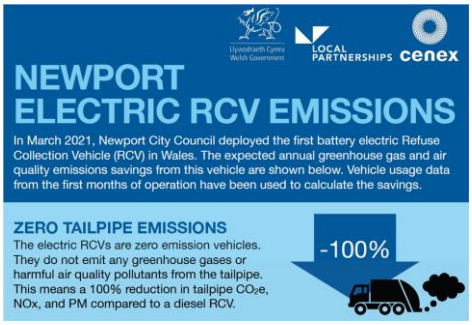
The catalogue is updated every quarter, to ensure that time is saved for all fleets. All technologies are available for fleet wide deployments or trials.

Vehicle Energy Consumption Model – For fleet/waste managers to estimate how much battery they could use based on their round characteristics, and for energy managers to understand the amount of energy required to charge the vehicle each day.



It should be used by all local authorities before trialling and deploying eRCVs to make sure the battery is sufficient for their needs, and they understand how energy might vary across the year.

Bespoke Support from Cenex – Cenex provides support as part of the programme, any LA can request advice in planning, acquisition, and deployment of low emission vehicles and their required infrastructure.



Fleet reviews, Infrastructure assessment, and operational advice can alleviate the load on the LA and accelerate ULEV transition.