

Using Research and Analysis to Inform the Business Case for Electric Vehicle Deployment

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Cenex

Centre of excellence for low carbon and fuel cell technologies



Scope of Presentation

- Introduction to Cenex
- Why do research and analysis to inform the business case for EV Deployment?
- What types of research?
- Where Cenex operates with some examples
- Conclusions

Introduction to Cenex

- ‘Not for Profit’ Consultancy and Research Organisation
 - 13 years helping accelerate the shift to a low carbon economy
 - Passionate about low carbon transport and energy innovation
 - Operate to supply market and supply chain development through teams focused on transport, energy systems and innovation support
 - Track record of successful RD&D projects for electric vehicles, hydrogen and bio-methane
 - Work across networks through collaboration and partnership working
 - Manager the delivery of the UK’s largest low carbon vehicle event (www.cenex-lcv.co.uk)

- Recent sponsors, clients and academic partners include;

Government\Government Innovation Agencies										
Fleets and Cities										
Academic Partners										

- Support to fleets and cities via;
 - Research and consultancy that informs the business case for transitioning to low carbon vehicles
 - Implementation support that helps progress from planning to delivery and on to evaluation and reporting

Why do research and analysis on EV Deployment?

- May want to understand the national or regional opportunity and what is required to unlock it
 - UK-wide, Scotland, along strategic road network, rural areas, islands, etc
- May want to understand a more specific local area or city context
 - How to boost EV uptake for a city or an airport
 - Clean Air Zone\Ultra Low Emission Zone operation
- May want to understand the opportunities related to a category of vehicle
 - Commercial vehicles, taxis, car clubs, etc
 - Battery electric (BEV), Plug-in hybrid (PHEV), Fuel cell electric (FCEV)
- May want a fleet-specific business case to transition to EVs
 - Company specific, depot specific, etc
- May want to understand one key aspect of the business case in more detail
 - Geofencing
 - Potential for integration with on-site renewables, smart charging inc. Vehicle-to-Grid, etc

Applying Techniques for Electric Taxi Studies (1)



Diesel



PHEV

OR



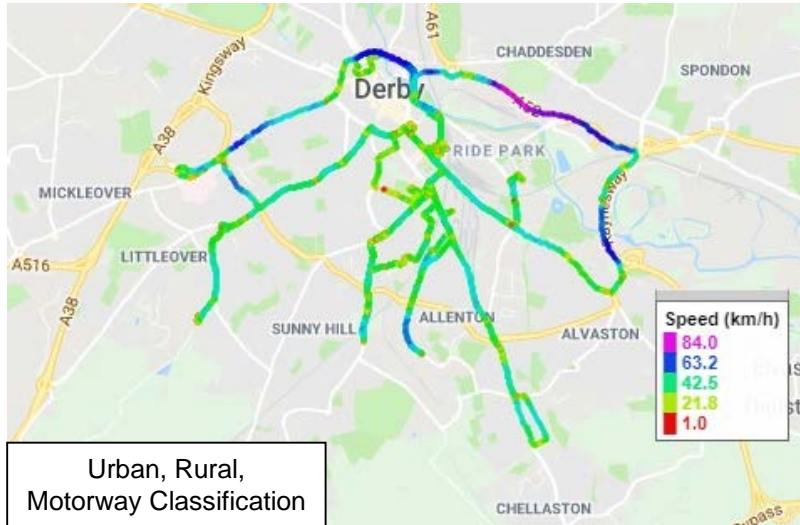
EV

	Major Concern	Minor Concern	Not a Concern
Purchase price too high	100%	0%	0%
Maintenance costs	88%	0%	13%
Fuel costs	50%	13%	38%
Customers won't like them	13%	25%	63%
Vehicle will be charging too long during shifts	50%	50%	0%
Knowledge of how they work and drive	25%	38%	38%
Range	75%	25%	0%
Battery reliability	100%	0%	0%
Vehicle reliability	88%	13%	0%
Lack of charging points	75%	25%	0%

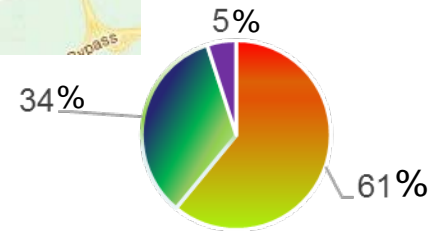
Human/User-centric approach

Emphasis on understanding user acceptance - Taxi driver key concerns captured through questionnaires

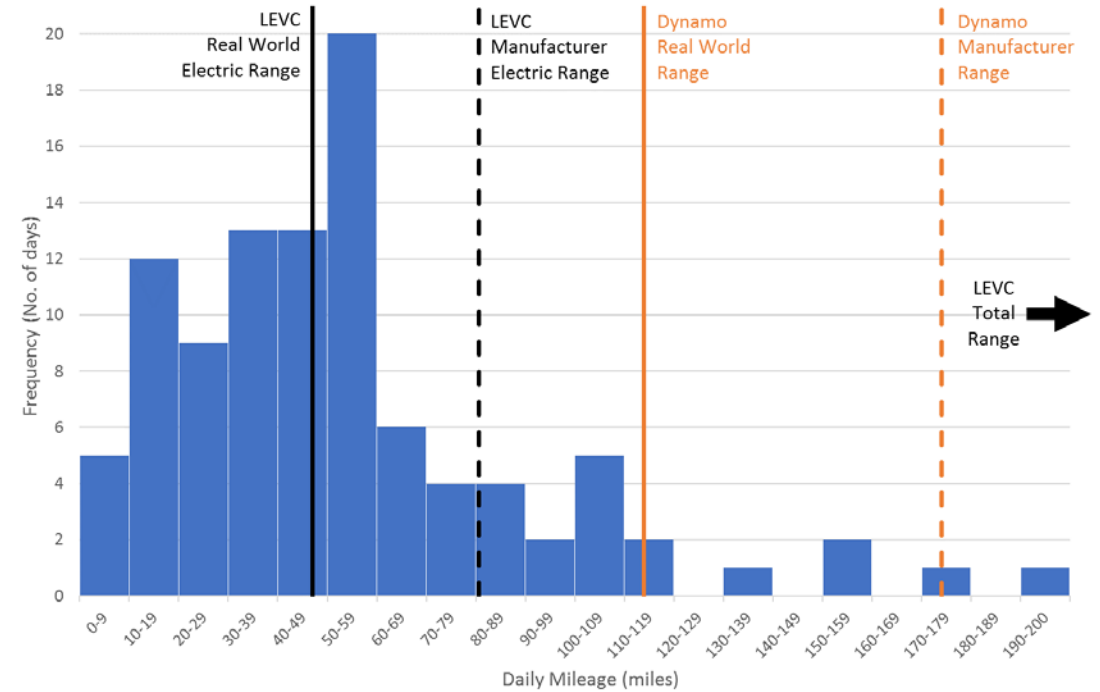
Applying Techniques for Electric Taxi Studies (2)



Urban, Rural, Motorway Classification



Urban Rural Motorway



Operational Centric Approach

Use of telemetry helps identify duty cycles - translate duty cycle data and into energy consumption

Applying Techniques for Electric Taxi Studies (3)



Ford Procab (Diesel)		Annual Mileage (miles)					
		10,000	15,000	20,000	25,000	30,000	35,000
Ownership period (years)	2	£1,076	£1,200	£1,312	£1,419	£1,521	£1,621
	3	£870	£985	£1,091	£1,194	£1,293	£1,391
	4	£761	£872	£977	£1,078	£1,178	£1,275
	5	£691	£796	£898	£997	£1,096	£1,193
	6	£623	£727	£829	£929	£1,028	£1,127
	7	£576	£681	£783	£884	£985	£1,084
	8	£534	£640	£743	£846	£948	£1,049
	9	£502	£609	£714	£818	£922	£1,025
	10	£477	£585	£692	£798	£903	£1,008



Difference in monthly cost of ownership relative to diesel (£)

LEVC TX (REEV) with 1 top up charge		Annual Mileage (miles)					
		10,000	15,000	20,000	25,000	30,000	35,000
Ownership period (years)	2	£238	£228	£205	£174	£139	£101
	3	£175	£139	£99	£56	£11	£-35
	4	£133	£93	£50	£5	£-42	£-89
	5	£86	£52	£11	£-32	£-77	£-124
	6	£67	£24	£-22	£-69	£-117	£-166
	7	£48	£3	£-44	£-91	£-140	£-189
	8	£29	£-17	£-64	£-112	£-161	£-210
	9	£14	£-32	£-80	£-128	£-177	£-227
	10	£2	£-44	£-92	£-141	£-190	£-240



Dynamo (BEV) without top up charge		Annual Mileage (miles)					
		10,000	15,000	20,000	25,000	30,000	35,000
Ownership period (years)	2	£194	£134	£70	£5	£-61	£-127
	3	£57	£-5	£-69	£-136	£-202	£-270
	4	£-7	£-70	£-137	£-204	£-272	£-340
	5	£-51	£-114	£-181	£-248	£-316	£-384
	6	£-70	£-134	£-201	£-268	£-337	£-406
	7	£-84	£-149	£-217	£-285	£-354	£-424
	8	£-93	£-160	£-228	£-297	£-367	£-437
	9	£-101	£-168	£-237	£-307	£-377	£-448
	10	£-107	£-175	£-245	£-315	£-386	£-457

Business Case-Centric Approach

Energy input from operational analysis feeds into financial modelling of Capex\Opex, Total Cost of Ownership and comparative costs to help determine payback periods

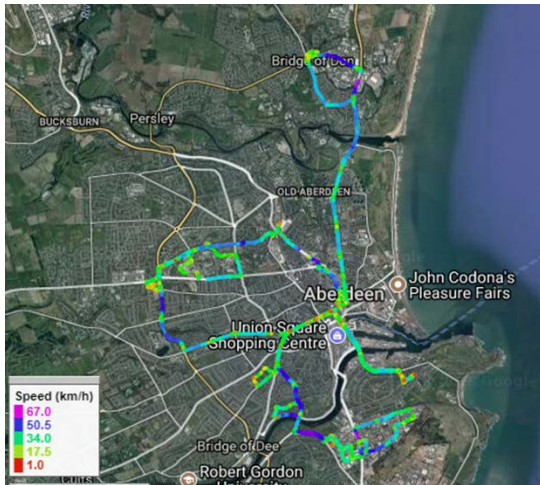
Other Projects: Monitoring FCEV in Scotland and Smart Charging for EVs



HyTrEc²
Hydrogen Transport Economy
for the North Sea Region

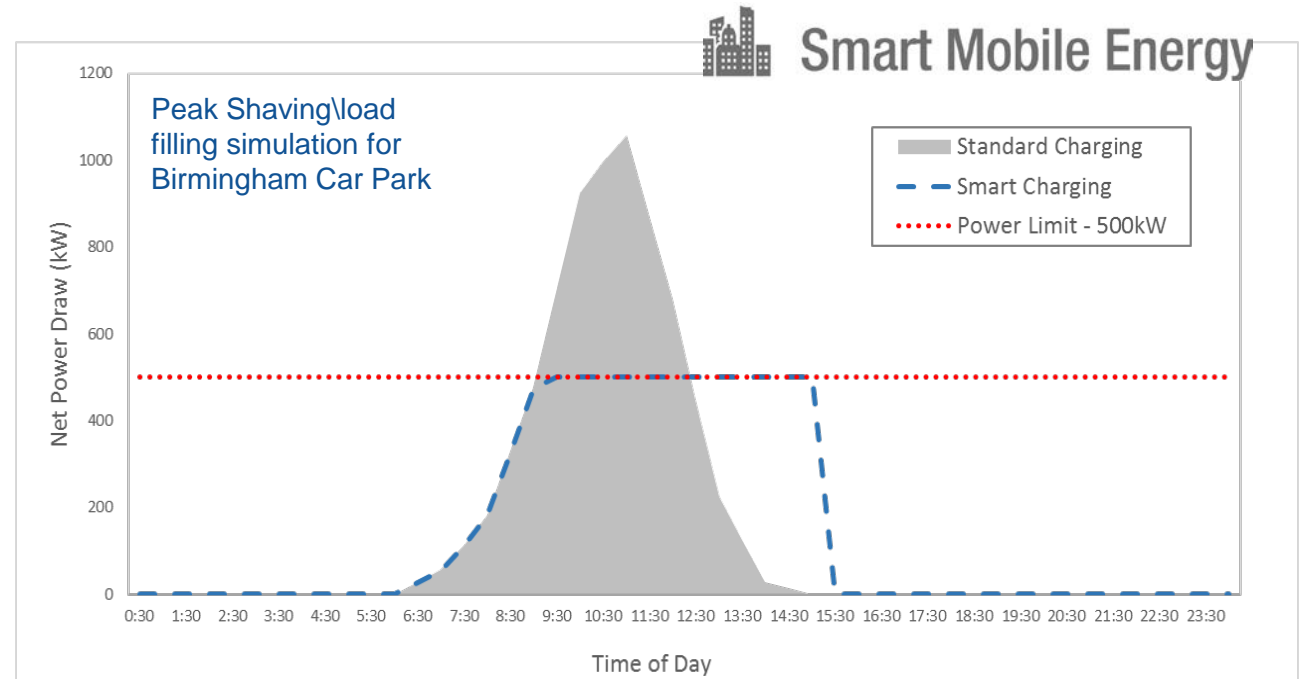


Monitoring and analysis of hydrogen FCEV in Aberdeen



northsearegion.eu/hytrec2

Interreg
North Sea Region
HyTrEc2
European Regional Development Fund EUROPEAN UNION



Part funded by:



Conclusions

- Many good reasons to do Research and Analysis on EV Deployment
- Research designs typically combine:
 - user-centric techniques
 - operational-centric techniques
 - business-case interests
- Cenex active in:
 - Research and analysis combining both transport and associated energy systems, notably smart charging of EVs
 - Disseminating case studies
 - Developing projects with cities, fleets and academic partners (keen to find new partners)

Thank you for listening

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www.cenex.co.uk

Follow our projects

V2G: www.cenex.co.uk/vehicle-grid/

HyTrec2: northsearegion.eu/hytrec2

See our fleet advice tools at



locity.org.uk

For Cenex-LCV Technology Showcasing and Networking Event visit: www.cenex-lcv.co.uk

