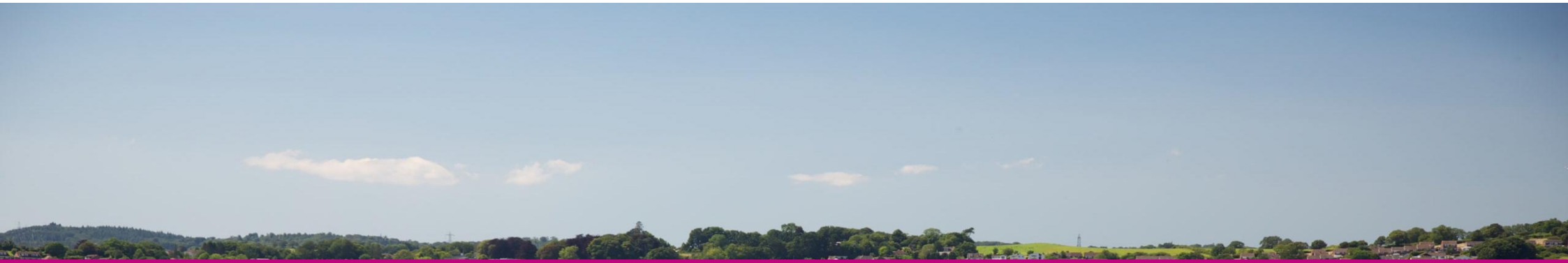

Exeter Net Zero Roadmap

WSP Review

EXECUTIVE SUMMARY

BRIEFING

WSP were employed by Exeter City Futures to review aspects of the Net Zero Exeter 2030 Plan: A Roadmap to Carbon Neutrality. The review considered ten of the priority actions identified in the report. These were predominantly around the area of renewable energy supply, property standards and transport. The aim was to assess the work undertaken so far, comment and revise where necessary, with a goal to give Exeter City Futures greater confidence around the costs and practicalities of these measures. Outside the actions analysis of the electrical grid situation and requirements was undertaken.

ANALYSIS

The analysis undertaken used reports and data provided or recommended by Exeter City Futures, as well as data familiar to WSP from other work. The work focused on reviewing the current analysis of the priority actions, considering capex, CO_2 saving, technical and political aspects. The review was high level, but included an attempt to quantify findings where possible.

RESULTS

The analysis indicated that in many cases the estimated capex and CO_2 savings were reasonable, in some cases the results are significantly different, and in others it has not been possible to give a robust number. Overall, the analysis indicates >£700m would be required to deliver the actions. A high level assessment, based on number of dwellings in Exeter City indicates that network upgrade costs to 2050 could be in the range of £26-43 million.

The annual CO_2 emissions saving would be around 350ktCO_2 per annum (based on 2020 emission factors). There will be interactivities in some of the results, but for the purpose of this work they have been treated discreetly. Not all actions would be funded in the same manner, some would need taxpayer funding, some have returns on investment that could attract private finance, and some will be met partially through natural change over time.

Recommendations / Next Steps -

- A core model is created of the baseline of Exeter's GHG emissions and energy. This would allow better analysis and comparison of actions, as well as mapping of "business as usual", and tracking of progress.
- A business model should be developed for each intervention to understand lifetime project costs and savings, returns on investment, legal and commercial structures and which party should lead.

Summary Review of Actions

No.	Intervention	Timescale	Investment Est.	Saving (kt CO_2 per annum)
2.1	Ensure 100% of energy consumed by city is from clean sources	Medium	£0m?	160
2.2	Conduct multi-authority strategic planning to exploit maximum potential for renewable generation	Long	£209m* *(based on wind)	140
3.3	Enable retrofit of homes to achieve energy performance of C+	Long	£200m	25
3.5	Retrofit council-owned properties using EnergieSprong (or equivalent).	Medium	>£133m	10.5
5.8	Build a network of work and healthcare hubs in Exeter's travel-to-work area, reducing need to travel into the city	Medium	Up to 10m per hub* *dependent upon new / retro fit and spec.	1.3
7.1	Replace existing buses in Exeter's network with Ultra Low Emission Vehicle (ULEV) Buses using non-fossil fuels.	Short / Medium	>£50m* *assumes all Exeter fleet	10.3
7.2	Ensure public sector fleet vehicles across the city are ULEV / non-fossil fuel.	Short / Med. / Long * duty cycle / use case dependent	DATA REQUIRED	DATA REQUIRED
7.3	Use licensing to require that Exeter's taxi and private hire companies transition their vehicles to ULEV / non-fossil fuels.	Short / Medium	Up to £150k Staff / consultants	0.6
7.4	Enable a shift to all private cars across the city being in the ULEV category.	Short / Medium / Long	>£10m* *supporting infra. inc. enforcement	8
7.5	Deliver a comprehensive network of electric vehicle charging points support transition to electric vehicles	Short / Medium / Long	>£50m (to cover whole fleet)	8

BACKGROUND

Background

Exeter City Futures has developed Net Zero Exeter 2030 Plan: A Roadmap to Carbon Neutrality. The plan is based on research, analysis and engagement with residents, business and the council. The document sets out broadly how Exeter can be net zero by 2030. It aims to set out the scale and areas where work is required. The Net Zero Framework sets out four areas with twelve goals within them:

ENERGY

- **Reduced Energy Consumption**
- **Access to Renewable Energy**
- **Affordable Homes**

MOBILITY

- **Reliable Journeys and Resilient Roads**
- **Reduced Dominance of Cars**

SUSTAINABILITY

- **Green Spaces and Local Produce**
- **Clean Air**
- **Efficient Resource Management**
- **Regenerative Design**

CAPABILITY

- **Collective Action**
- **An Analytical Approach**
- **Local Controlled Finance**

Within each area priority actions have been identified. For each one Exeter City Futures has prepared a financial cost and CO_2 emissions benefit estimate. Before they can be packaged into investments or plans there needs to be confidence around them. WSP was employed to analyse biggest interventions to reduce GHG emissions actions and sense check them around practicality, technical and commercial issues. To assist with this ECF provided several reports and the underlying calculations made.

Priority Actions Assessed

No.	Title
2.1	Ensure 100% of energy consumed by city is from clean sources
2.2	Conduct multi-authority strategic planning to exploit maximum potential for renewable generation
3.3	Enable retrofit of homes to achieve energy performance of C
3.5	Retrofit council-owned properties using programmes such as EnergieSprong (or equivalent).
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7.1	Replace existing buses in Exeter's network with Ultra Low Emission Vehicle (ULEV) Buses using non-fossil fuels.
7.2	Ensure public sector fleet vehicles across the city are ULEV / non-fossil fuel.
7.3	Use licensing to require that Exeter's taxi and private hire companies transition their vehicles to ULEV / non-fossil fuels.
7.4	Enable a shift to all private cars across the city being in the ULEV category.
7.5	Deliver a comprehensive network of electric vehicle charging points support transition to electric vehicles, with priority for shared vehicles.

SUMMARY FINDINGS

General Feedback on Data

- Clarity would be useful on why goals are chosen and link
- Clarity would be useful on whether it is Greater Exeter or City? – Who is responsible?
- Calculations
  - *Some CO_2 emissions savings aren't consistent (e.g. 2.1 and 2.2) – Some per year, some enduring, doesn't account for grid emission changes – Need simple model extrapolating*
  - *Inconsistent emissions factors used –*
    - 2.1 uses govt. Elec. factor of 0.283kgCO_2 per kWh, 2.2 use 0.500kgCO_2 per kWh
    - 2.2 – Uses 0.488kgCO_2 per kWh for gas but this is for gas used to generate elec. not used for heating – 0.200 is closer
- Costings reasonable but variable and some need more data / detailed analysis
- Allow for interactions – such as, don't upgrade homes to "C", if Energiespronged.
- 12 goals saving in CO_2e emissions – 329ktCO_2 (2018 - 436kt) – Needs recalculating
- Need underlying model of reality to allow consistent analysis of interventions
- Need Business-As-Usual trajectory
- Can we map costs against benefits on MACC basis? £ per unit saving.
- It is as important who/how paid, as "how much?". Some can be self-funding.

THE ACTIONS

WSP Summary Review of Actions

No.	Intervention	Timescale	Investment Est.	Saving (kt CO_2 per annum)
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2.1 - Ensure 100% of energy consumed by city is from clean sources

TIMESCALE		INVESTMENT		CARBON SAVING	
MEDIUM	**MEDIUM**	£0	**£0m?**	53.5 kTCO$_2$ / annum	**160 kTCO$_2$/annum**

POLITICAL

- Need to define what is clean sources – Additionality?
- Need to be clear this is electricity – green gas much rarer
- Will this be accepted as clean? (Accounting rather than real)
- Not possible to enforce – Companies and homes choose their own contracts
- Careful this doesn't increase costs

COMMERCIAL

- Contracts are very little different in price, but won't be cheapest
- Option to move to power purchase agreements (PPAs) – Link to generation

TECHNICAL

- No physical action required
- Calculation only shows benefit each year over 3 years – Needs annualising
- Variable price tariffs may be more beneficial than "green tariffs"
- Benefit will decline as grid emissions decline

2.2 Conduct multi-authority strategic planning to exploit maximum potential for renewable generation

TIMESCALE		INVESTMENT		CARBON SAVING	
ONGOING	LONG	>£50m	£209m (wind)	140 $kTCO_2$ / annum	140 $kTCO_2$/annum

POLITICAL

- Needs to be applied at Greater Exeter level, not city
- Why only focus on domestic sector?
- Wind and solar now back in favour of planning and UK politics
- Scale of wind and solar may be controversial

COMMERCIAL

- Unclear derivation of >£50m
- WSP estimate £209m on wind to achieve aim
- Wind /solar could be privately funded – Merchant basis, CfD, or PPA.
- Council could use land in JV with developer

TECHNICAL

- Report on wind/solar - valid data
- Wind/solar policy more favourable now
- Deployment would be outside city
- >200MW of wind (or mixed with solar) achievable but big change
- Likely to require grid upgrades
- CO_2 saving reduces with electrical grid emission factor

2.2 Summary Findings

- Only uses domestic energy, why?
- Miscalculation of emissions from gas and elec.
  - *Gas emission factor is 0.203 – not .488*
  - *Elec. emission factor is 0.238 – 0.500*
  - *Gas is used for heat but calc. implies used in gas power stations*
- Domestic energy data suggests emissions of 140tCO_2 per annum
- For analysis WSP used £50m notional budget to identify what wind/solar can do and then the amount required to deliver the 140t saving

	Solar	Wind
MW(p) with £50m	83	56
MWh per annum	83,333	146,000
tCO_2 per annum	19,833	34,748
MWp to offset totally	408	233
Cost to offset totally	£367m	£209m

3.3 – Enable retrofit of homes to achieve energy performance of C+

TIMESCALE

LONG

LONG

INVESTMENT

>£100m

£200m

CARBON SAVING

34 $kTCO_2$ / annum

25 $kTCO_2$ / annum

POLITICAL

- Social housing within control +RSLs
- Private property not in control and sensitive
- Non-financial benefits around health and fuel-poverty

COMMERCIAL

- Financials look about right
- Unlikely to be any return to investment by council
- Private homes unlikely to see as value for money
- Green Homes Grant could be catalyst, but very brief

TECHNICAL

- Should be achievable on almost all homes
- Important to make interventions that are “no regret”
  - No fossil-fuel in heating
  - HQ fabric upgrades
- Must not compromise health
- Supply chain is light
- Retrofitting to C+ is a reasonable benchmark.

3.3 Summary Findings

- Analysis seems reasonable
- Source of £100m+ matches WSP estimate, (used higher no. homes)
- ~8,000 social homes – Cost £35m
- ~40,000 Private homes - Cost £180m
- Ave. financial saving £400 before comfort take, £206 after comfort
- CO_2 saving from ECF is 34,kt pa, WSP estimate 26,kt (as below)

EPC Rating	A	B	C	D	E	F	G
% in band	8%		27%	40%	18%	5%	1%
Homes in Exeter	3,939		13,295	19,697	8,864	2,462	492
Elec. consumption	3,500	3,200	4,000	4,200	4,700	6,100	6,200
Gas consumption	10,000	9,400	10,000	12,200	15,500	16,200	12,100
TCO_2 per home per annum	2.9	2.7	3.0	3.5	4.3	4.7	3.9
Total tCO_2 per annum	170,558						
Total tCO_2 – After Upgrade to C	144,654						
Saving tCO_2 per annum	25,904						

- Minimum Energy Efficiency Standards for private rented will drive some improvement “for free”.

3.5 Retrofit council-owned properties using programmes such as EnergieSprong (or equivalent).

TIMESCALE		INVESTMENT		CARBON SAVING	
LONG	MEDIUM	=>£100m	>£133m	10 kTCO$_2$ / annum	10.5 kTCO$_2$ / annum

POLITICAL

- Likely to be popular with residents
- Substantial health & wellbeing benefits
- Very expensive to justify?

COMMERCIAL

- Very expensive per unit
- Economies of scale - Uncertain
- Savings not returned to investor
- Understood external funding is available

TECHNICAL

- Major works required
- Supply chain will be limited

3.5 Summary Findings

- Analysis seems reasonable –
- 80% of council homes retrofitted = 3,815
- Cost each £35,000 - £75,000
- Low estimate - £133m
- CO_2 saving total per annum – 2.75t per property
- Total CO_2 saving per annum 10.492t
- Very expensive savings - ~£13k per tCO_2 per annum
- Does not include substantial non-financial benefits

5.8 - Build a network of work and healthcare hubs in Exeter's travel-to-work area, contributing to a reduction in the need to travel into the city for work or health.

TIMESCALE

MEDIUM

MEDIUM

INVESTMENT

£5-£10 m per hub

Up to £10 m per hub*

*dependent upon new / retro fit and spec.

CARBON SAVING

2.15 $kTCO_2$ / annum

1.3 $kTCO_2$ / annum*

*due to increasing vehicle efficiency

POLITICAL

- Local support for disaggregated services
- Consistency of provision across hubs
- Localised impacts of induced traffic to hubs
- Potential impacts on public transport networks
- Careful identification of locations
- Need for a political champion

COMMERCIAL

- Agglomeration opportunity for wider services (co-working, community services, retail) to improve commerciality
- On-going revenue needs
- Roles and responsibilities of partners inc. community / voluntary
- Critical mass required
- New build vs. retro fit opportunities

TECHNICAL

- Role of first mile / last mile access to reduce sole occupancy car access to hubs
- Energy, comms and land requirements
- Legislative barriers
- Governance arrangements
- Commercial models
- Links with DCC thinking / trajectory

5.8 Summary Findings

- Cost assumptions could be over stated for retro-fit opportunities
- One side fits all approach may not be applicable to all locations
- Possible induced traffic impacts moved beyond city limits to external locations, danger of overstating benefits
- Need to balance urban, peri-urban and rural needs
- Trip lengths could be reduced for some activity types, but danger of assuming all will be walk / cycle
- Benefits could be enhanced with remote healthcare / working initiatives
- Possible post Covid-19 thinking could enhance / supersede
- Wider rural hubs thinking / opportunity for Greater Exeter area
- Unintended consequences / impacts on Exeter City activity and offer
- Danger of short distance car trips to hubs eroding CO_2 case
- Potential agglomeration of function mobility, healthcare, work, education, community energy, retail etc
- 5% behavioural shift could be very ambitious without other policy levers / incentives

7.1 - Replace existing buses in Exeter's network with Ultra Low Emission Vehicle (ULEV) Buses using non-fossil fuels.

TIMESCALE

MEDIUM

SHORT / MEDIUM

INVESTMENT

>£10 m

>£50 m*

*assumes all Exeter fleet

CARBON SAVING

10.1

$kTCO_2$ / annum

10.3

$kTCO_2$ / annum

(whole Exeter fleet)

POLITICAL

- Support as part of AQ initiatives
- Market is maturing rapidly
- Battery vs. hydrogen drivetrain solutions
- How to tackle difficult use cases

COMMERCIAL

- Some parts of Stagecoach fleet young
- Operational impacts on existing diagrams / services, e.g. long distance
- Depot constraints and viability of existing sites vs. new facilities
- Local grid capacity
- Small operator impacts
- Wider Stagecoach national strategy for trickle down and redeployment

TECHNICAL

- Needs based assessment for existing fleet diagrams / routes
- Operational impacts assessment
- Need for upskilling staff
- Viability of existing depot sites for new fuel types
- Potential for depot and/or opportunity charging en-route

7.1 Summary Findings

- With the support of operators could be short term start
- Market maturing quickly, but not without challenges
- Costs per vehicle are more than current diesel equivalent
- Battery vs. hydrogen solutions for duty cycle mix, whole life costs vs. benefits
- Cost of supporting infrastructure (depots / terminii) could be significant, some infra maybe required outside Exeter
- Pump prime funding (DfT) could be beneficial
- CO_2 savings could be overstated based on electricity source
- Needs public / private collaboration for effectively delivery
- Tie up with potential for Exeter AQ zone, could mean larger clean fleet may be required (for inbound longer trips)

7.2 - Ensure public sector fleet vehicles across the city are ULEV / non-fossil fuel.

TIMESCALE		INVESTMENT		CARBON SAVING	
SHORT	SHORT / MEDIUM / LONG * * duty cycle / use case dependent	<£2m	Data Required	0.58 $kTCO_2$ / annum	Data Required

POLITICAL

- Political will to transform city fleet
- Capital outlay and disruption versus long term benefits
- Tie in with wider AQ aims
- Responsibilities between ECC / DCC and term partners

COMMERCIAL

- Diversity of fleet means many vehicles do not have viable alternatives
- Operational and duty cycle impacts + need to maintain critical services
- Impacts on depots and home located vehicles (charging infrastructure)
- Local grid capacity at depot locations
- Existing fleet life and turnover needs

TECHNICAL

- Deep dive fleet review required to understand duty cycles and use cases
- Need to identify power requirements at depots / outstations and homes
- Upskilling of maintenance operatives
- Impacts assessment for critical services
- Need to consider contracts

7.2 Summary Findings

- Uncertainty over DCC / ECC fleet size and responsibility, accurate data needed including contractors
- Large parts of fleet may be DCC operated (Highways maintenance)
- Fleet is mixed, many vehicles do not currently have viable alternatives
- Analysis of use cases / duty cycles required to develop timed transition plan (short into medium term)
- Potential impacts on depots / operations / duty cycles
- Need to ensure zero impact on critical activities
- Difficult to assess overall cost given above uncertainties
- Assumption of £5k per vehicle understated as large proportion of fleet is commercial / specialist
- Need to consider term contractors beyond ECC own fleet (inc. DCC and those undertaking ECC / DCC activities on their behalf)

7.3 - Use licensing to require that Exeter's taxi and private hire companies transition their vehicles to ULEV / non-fossil fuels.

TIMESCALE

MEDIUM

SHORT / MEDIUM

INVESTMENT

£40k
Staff time

Up to £150k
Staff / consultants

CARBON SAVING

0.4
$kTCO_2$ / annum

0.6
$kTCO_2$ / annum

POLITICAL

- Potential impacts on taxi trade and in particular operators
- Tie-in with wider Exeter AQ initiatives
- Hackney vs. private hire
- Regulation of non Exeter registered vehicles
- Dedicated infrastructure for shared vehicles (mesh with car share)
- Legislative mechanisms
- Discussions with trade bodies

COMMERCIAL

- Costs for drivers and availability of suitable commercial models for EVs
- Fleet age profiles and renewal rates
- On-going energy costs and enabling a level playing field for those without private home parking

TECHNICAL

- Suitability for taxi duty cycles, particularly those undertaking long distance runs (including for SEN)
- Suitability of home based parking for charging infrastructure
- Dedicated fast/ultra fast charging taxis

7.3 Summary Findings

- Exeter registered vehicles vs. outside areas is complex
- Duty cycles for critical services (e.g. special education needs) require consideration
- Fleet renewal rates and owner / operator impacts
- Blend of supporting, dedicated infrastructure could be required (inc. fast / ultra fast)
- Engagement with trade bodies is essential
- Legislative levers need careful consideration
- Pump prime funding could be useful to ease transition
- Staff time costs (or specialist support) could be considerable as it is a complex area inc. legislative / funding considerations
- Detailed understanding of current usage required to inform decisions
- Impacts of intra-Exeter vehicles vs. Greater Exeter if AQZ in place

7.4 - Enable a shift to all private cars across the city being in the ULEV category.

TIMESCALE

LONG

SHORT / MEDIUM / LONG

INVESTMENT

>£5m

>£10m*

*supporting infra. inc. enforcement

CARBON SAVING

49.2 $kTCO_2$ / annum

8 $kTCO_2$ / annum (incremental)

POLITICAL

- Tie-in with wider AQ aims
- Political will and support
- Potential impacts on business
- Some clean air zone initiatives have stumbled post Covid-19
- Unintended consequences on some socio-economic groups

COMMERCIAL

- Legalities of scrappage / pump priming & DfT acceptance
- Realities of fleet age and needs
- Commercial case for blend of destination charging to suit use cases
- Public vs. private sector roles
- Behaviour change and individual benefits realisation

TECHNICAL

- Understanding EV uptake in detail
- Wider impacts of Greater Exeter commuters, visitors (tie in with hubs)
- Potential link with DCC Deletti charging project
- Wider challenges in rural communities
- On street parking challenges within Exeter City and appropriate solutions

7.4 Summary Findings

- Clean air zone requires significant political support and fortitude
- Impacts across socio-economic groups needs careful consideration
- Wider Greater Exeter vs. Exeter implications are large
- Supporting infrastructure needs carful though (see hubs and Deletti project under 7.5)
- Peri-urban and rural implications require careful consideration
- Initiatives already in place from DfT for private drivers and fleet providers
- Develop Exeter focused narrative
- Requires cross industry approach
- Roles and responsibilities need to be clear
- Legalities / acceptability of local scrappage / incentive scheme

7.5 - Deliver a comprehensive network of electric vehicle charging points support transition to electric vehicles, with priority for shared vehicles.

TIMESCALE

SHORT

SHORT / MEDIUM / LONG

INVESTMENT

>£1m

>£50m
(to cover whole fleet)

CARBON SAVING

4.9
$kTCO_2$ / annum

8
$kTCO_2$/ annum (incremental)

POLITICAL

- Political will and support
- Impacts on locations / communities
- Rigorous enforcement in EV bays
- Public / private collaboration
- Fast developing area
- Gov't policy / thinking

COMMERCIAL

- Public. vs Private roles & responsibilities
- Appropriate commercial model
- Tie in with existing EV car share (CoCars) and their ongoing expansion
- Need for equity balancing high value vs. lesser social need locations
- Pump priming from DfT and others
- Private car park role (work & public)

TECHNICAL

- Understanding EV uptake projections to driver commercial model
- Wider play with shared mobility and mobility hubs to enable access to EVs
- Need to take a modular / agile approach to avoid stranded assets
- Grid constraints at critical mass uptake
- Bend of standard, fast and ultra fast needed

7.5 Summary Findings

- Initial WSP analysis below illustrates potential
- Infrastructure will need to consider all use cases / users
- EV car share has the potential to deliver wider benefits
- Need to avoid redundant / stranded assets
- Need to consider public / private parking
- Costs could be greater (who pays)?
- Localised impacts / constraints
- Wider Gov't policy could accelerate
- With 7.4 benefits could be greater
- Exeter vs. Greater Exeter issue
- Rate of change (see initial figures)

WSP Initial EV uptake projection

Exeter	2019 (Actual)	2025	2030
Total Vehicles	86,895	88,358	89,827
% EVs			
Low	1.28%	5.96%	16.82%
Mid		7.91%	22.60%
High		12.96%	45.04%
Total EVs			
Low	1,113	5,270	15,021
Mid		6,988	20,178
High		11,571	40,218

Overall Impact on Power Network

POLITICAL

- Heat decarbonisation will be critical requiring national /local strategy –
- Heat decarbonisation by electrification or hydrogen usage will have very different impacts on the network
- Regulatory barrier to storage being removed, allowing network flexibility.

COMMERCIAL

- Cost of reinforcements are dependent on load locations
- Energy efficiency required to reduce heat demand and enable electrification of heat, large scale investment required for this
- Reinforcement costs could be reduced or deferred by DSR and battery storage
- A high level assessment, based on number of dwellings in Exeter City indicates that network upgrade costs to 2050 could be in the range of £26-43 million.

TECHNICAL

- Exeter City BSP is fed by two transformers and is close to firm loading limit.
- High Fault levels at substations in area
- Peak could be reduced by active management (flexibility, e.g. smart EV charging) and storage technologies
- Electrification of heat likely to have greater impact as it is less flexible.

Summary Findings

- Grid limitations in Exeter area due to transformer loading and fault levels.
- Limited capacity for new generation – active network management in place to avoid network reinforcement. Later entries to this scheme will have greater constraints.
- DSR / energy storage can reduce peak loads and costs, regulatory obstacles are reducing. Likely to be required to avoid / defer grid reinforcements.
- Timescales and costs for upgrading transmission network can be high.
- Need to determine how low carbon heat is to be achieved, as this will have a significant effect of grid requirements.

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Thank you

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