Electric Vehicle Energy Taskforce

Work Package Three:
Smart charging technical requirements
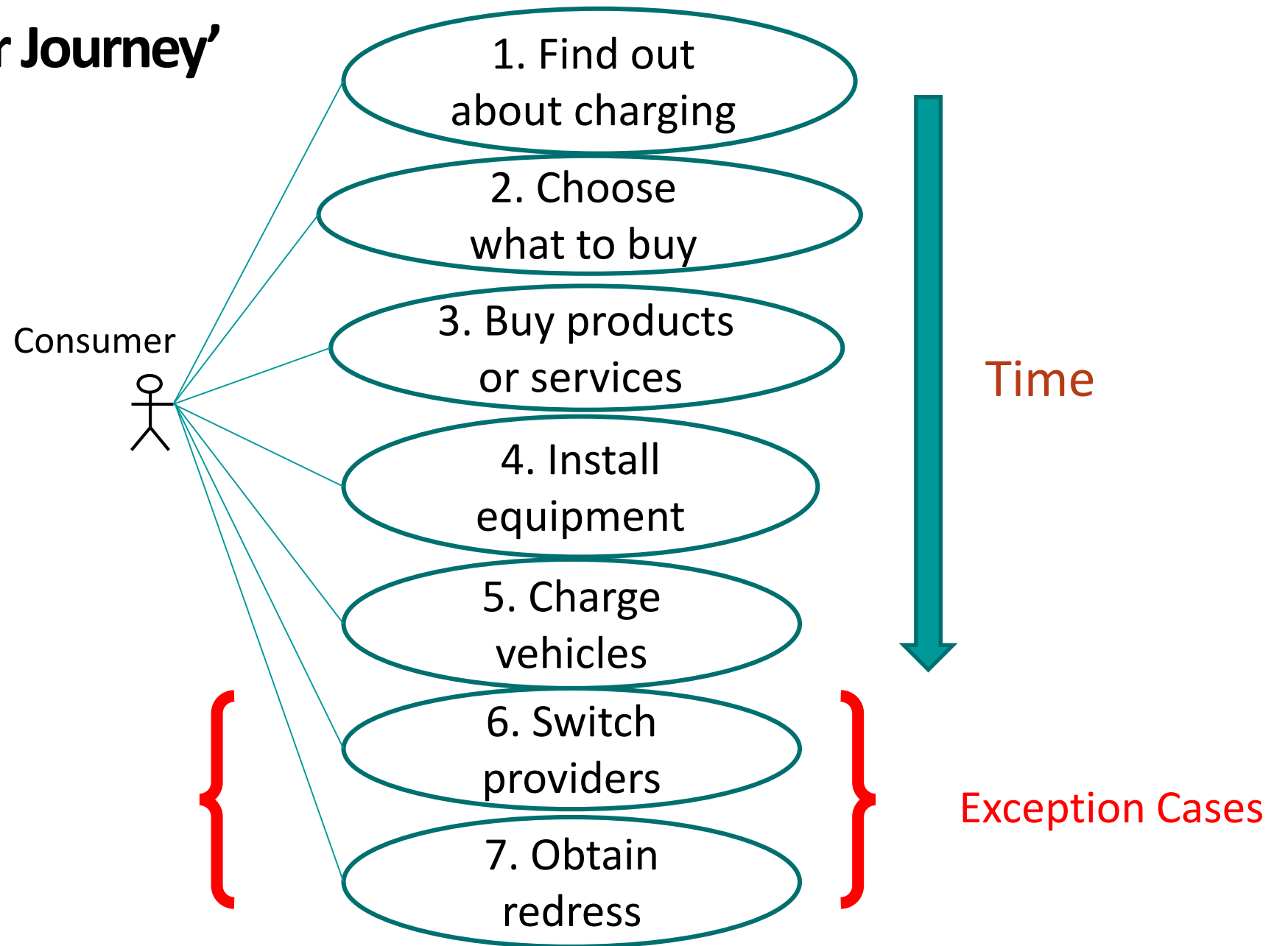
Use Cases for Smart Charging:

A Glimpse of the Future?

Ian Alexander & Robert Evans

What a Use Case is

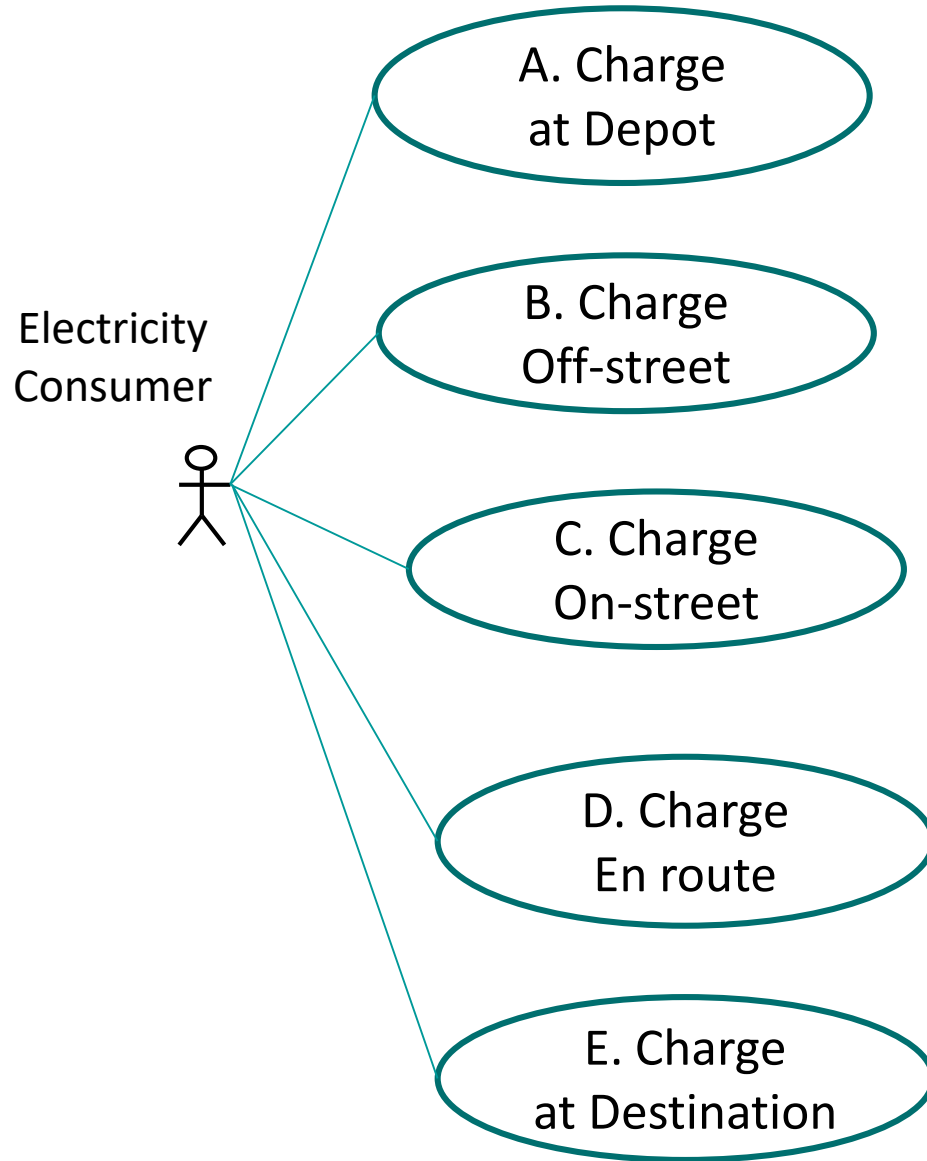© Ian Alexander 2019

Charging Usage Patterns

Electricity Consumer

- A. Charge at Depot
- B. Charge Off-street
- C. Charge On-street
- D. Charge En route
- E. Charge at Destination

Fleet: power usage could vary sharply

Residential, private, e.g. on front drive

On public road, multiple usage, ID payee, smart pricing (Quick? Staying all night?)

Always rapid charging, short stay; price premium, e.g. by location

Long stay, e.g. all day at work; bundled offers possible, e.g. "free" at supermarket

CATAPULT Energy Systems

LowCVP Low Carbon Vehicle Partnership

Office for Low Emission Vehicles

Combining the Two Views

Customer Journey →

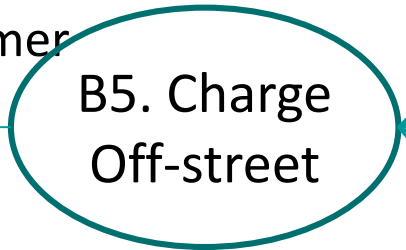| ↓ C h a r g i n g		1. Find out	2. Choose	3. Buy	4. Install Equipment	5. Charge	6. Switch Providers	7. Obtain Redress
	A: Charging at Depot							
	B: Charging Off-street					B5. Charge Off-street		
	C: Charging On-street							
	D: Charging En route							
	E: Charging at Destination							

Earlier cases might help DNO to predict future electricity usage

One important Use Case

Off-Street (27 million consumers)

Domestic Consumer

Base case

B5. Charge Off-street

...and other ways it might be managed

- *includes* → B5.1. Economy 7 Tariff
- → B5.2. Managed by CPNO
- *includes* → B5.3. Aggregator Service
- *includes* → B5.4. EV Supply Contract
- *includes* → B5.5. Market Driven, HEMS Chooses Load Profile
- *includes* → B5.6. Vehicle to Grid
- *includes* → B5.7. EV Managed by OEM
- *includes* → B5.8. Hybrid DNO / Market Driven
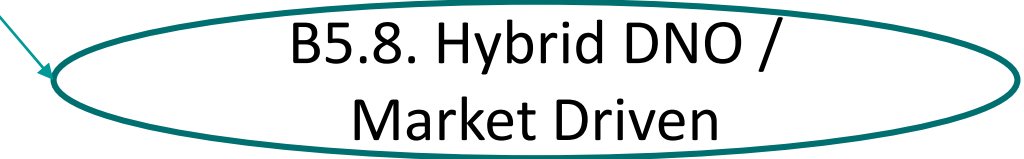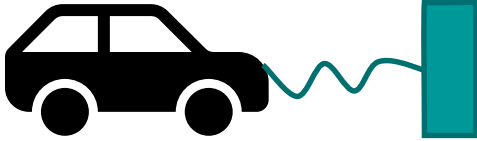
These are simply ways to pass a signal from a DNO to a charge point to manage its load point – we have no preferences

B5. Charge Off-street: Basic Story

Use Case stories raise questions!

1. Consumer connects EV

2. Charging point verifies EV is authorised

   Necessary? Always? Sometimes? Never?

3. Consumer authorises account *(PIN, password, …)*

4. Charging point charges EV at full charge rate

5. House meter measures load in normal domestic contract

B5. Charge Off-street: Exceptions

- **DNO needs to reduce network load:**

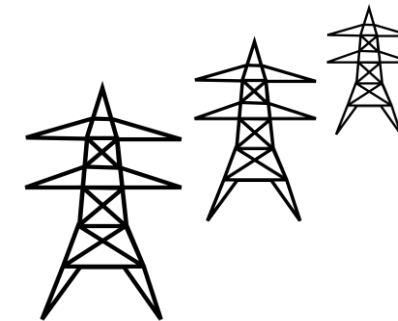   *Charging rate is reduced*

- **Data connection lost:**

- **Black start:**

- **Visitor's vehicle:**

- **Customer override:**

Central to "Smart Charging"

Could DNO broadcast signal, so customers don't need to register?

Consumer accepts bill ?

Consumer accepts vehicle, visitor accepts bill ?

Always allowed ? At what price ?

B5. Charge Off-street: Threats

- *Thief* steals electricity from charge point

- *Hacker* breaks into domestic Wi-Fi network via CP, smart meter, or EV

  Implies Security Requirements

- *Vandal* damages CP

  Implies Default Operation Mode?

- *Hacker* interferes with Wi-Fi signal to disrupt communication between meter and CP

  Mass Wi-Fi attack?

B5. Charge Off-street: Guarantees ✓

1. Domestic consumer is billed at applicable tariff (normal, Economy 7, Smart/variable?) ✓

2. Electric Vehicle is fully charged within chosen period ?

> Can't guarantee this if DNO needs to reduce load on network!

3. Domestic consumer is informed when charging is predicted to complete ✓

> e.g. on Economy 7 Tariff, may wait hours before charging

> Is this needed?

Use Cases

- Tell the Stories of possible approaches

- Identify Exceptions, **Threats**, Guarantees

- Raise Questions for project to consider

- Many of these may lead to Recommendations

Thank you for listening

WP3 Process

- We have set up a spreadsheet for all smart charging scenarios – begun to populate off-street charging (B5)

- We are examining the different options for:
  - Communication and protocol options
  - Cybersecurity and Data privacy
  - Innovation
  - Safety

As per the questions set for WP3

Approach and Objective of WP3

- Identify relevant use cases and scenarios and provide a consistent format to analyse them

- Undertake a technical analysis of these to provide an evidential base for decisions

- To identify

  - Questions – what do we need to find out?

  - Implications – what must follow given a specific use case

  - Conclusions – result of our analysis

- Potentially to comment to government and industry on what is missing to deliver the scenarios

We are not deciding between the options

For instance, price driven approach needs localised and 1/2 hr network charging

How to engage

- WP3 core group will do a first run analysis of off-street parking by 15th Feb

- The spreadsheet will be released to the full expert group 18th Feb

- Result to be reviewed at Synthesis Group meeting on 26th Feb

- If you want to get involved contact WP3 Lead:

  john.parsons@beama.org.uk