



# World Road Association (UK) 2018 Congress:

Cutting the Gas:  
Positive steps towards low carbon transport





Session 2:  
Electric Road Systems (ERS) –  
International Perspective:  
Chair: Jim Barton, former UK First  
Delegate & Non-executive Chairman,  
BEAR Scotland



ARUP





# Electric Road Systems Project: Miguel Caso Flórez, Technical Director of the World Road Association and Dominic Leal, Researcher, TRL





# Sweden's approach to Electric Road Systems - Björn Hasselgren, Senior Adviser, PhD, Trafikverket



**Business models for  
Electric Road Systems –  
heavy vehicles**  
*Swedish ERS program*

**World Road Association  
(UK) Congress 2018  
Cardiff  
15 November 2018**

**Björn Hasselgren PhD**



**TRAFIKVERKET**  
SWEDISH TRANSPORT ADMINISTRATION

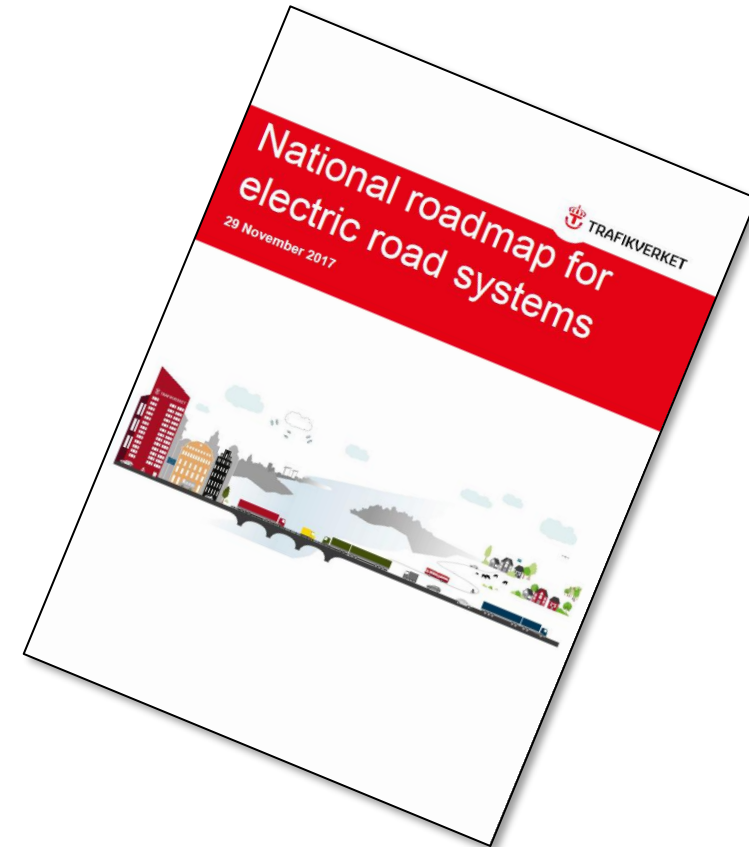
# Climate related objectives and visions

- Paris agreement
- “Sweden will become one of the world’s first fossil-free welfare societies”
- Vehicle fleet independent of fossil fuels by 2030
  - Interpreted as reduction of emission of CO<sub>2</sub> with 70% compared with 2010 (Parliamentary Cross-Party Committee proposal)



# National roadmap for electric road systems in brief

- Market and funding
- Promote, contribute to and pave the way for a broadened market and greater competition between the transmission systems by raising more systems to TRL level 5-6.
- Prepare and implement a major electric road system pilot
- Create a long-term plan for the construction and development of electric road systems



# Freight transport in Sweden

65% of the land-based annual performance (tonnekm) on roads.

- 2/3 of this freight is concentrated to a few major roads.
- An average transport on road is about 100 kilometers.
- Public funded roads 217 000 km



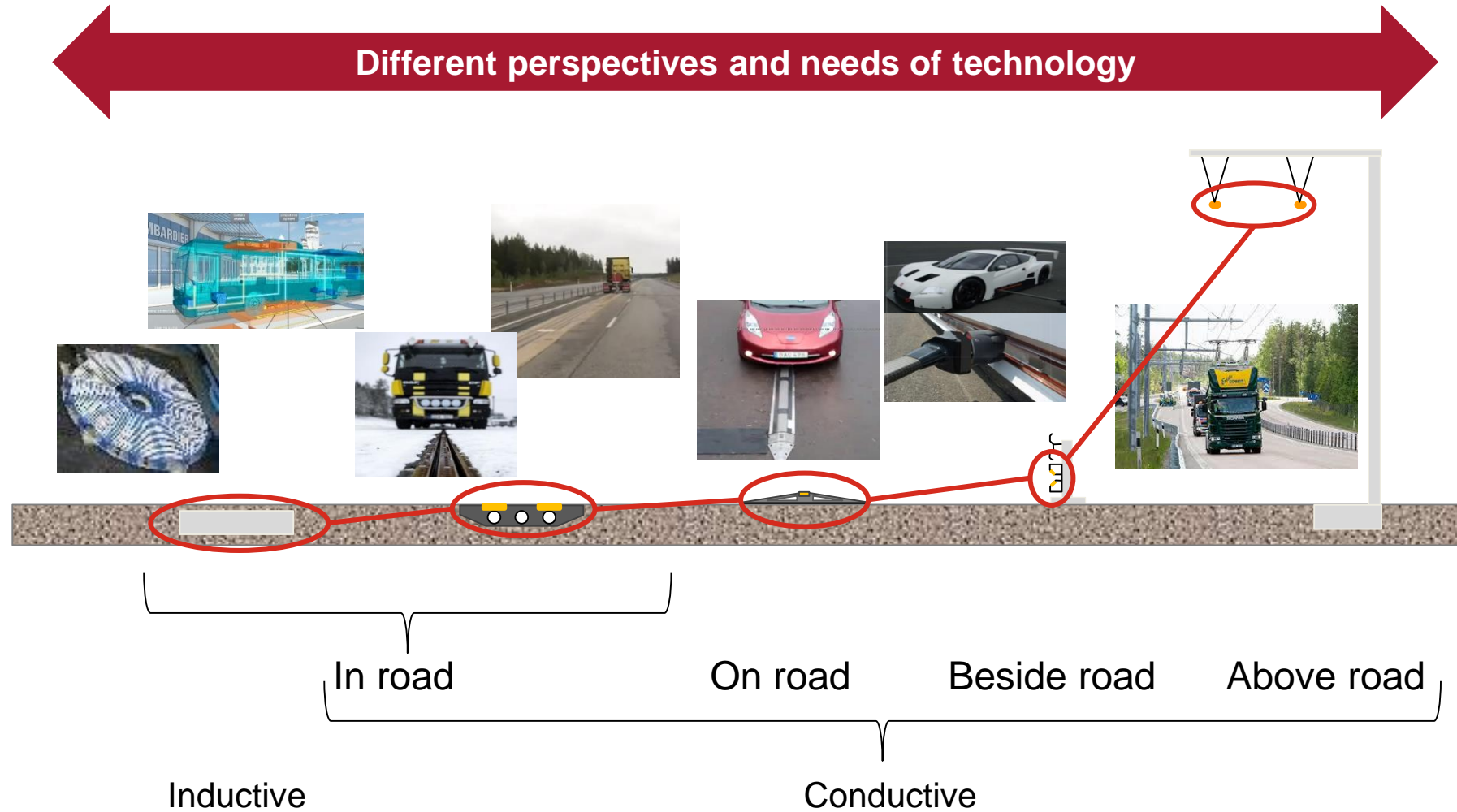
35% of the land-based annual transport performance (tonnekm) by rail (EU average 17%).

- Primarily long distances and very heavy transports
- Rail capacity is limited and constrained
- Public funded railroad 14 100 km

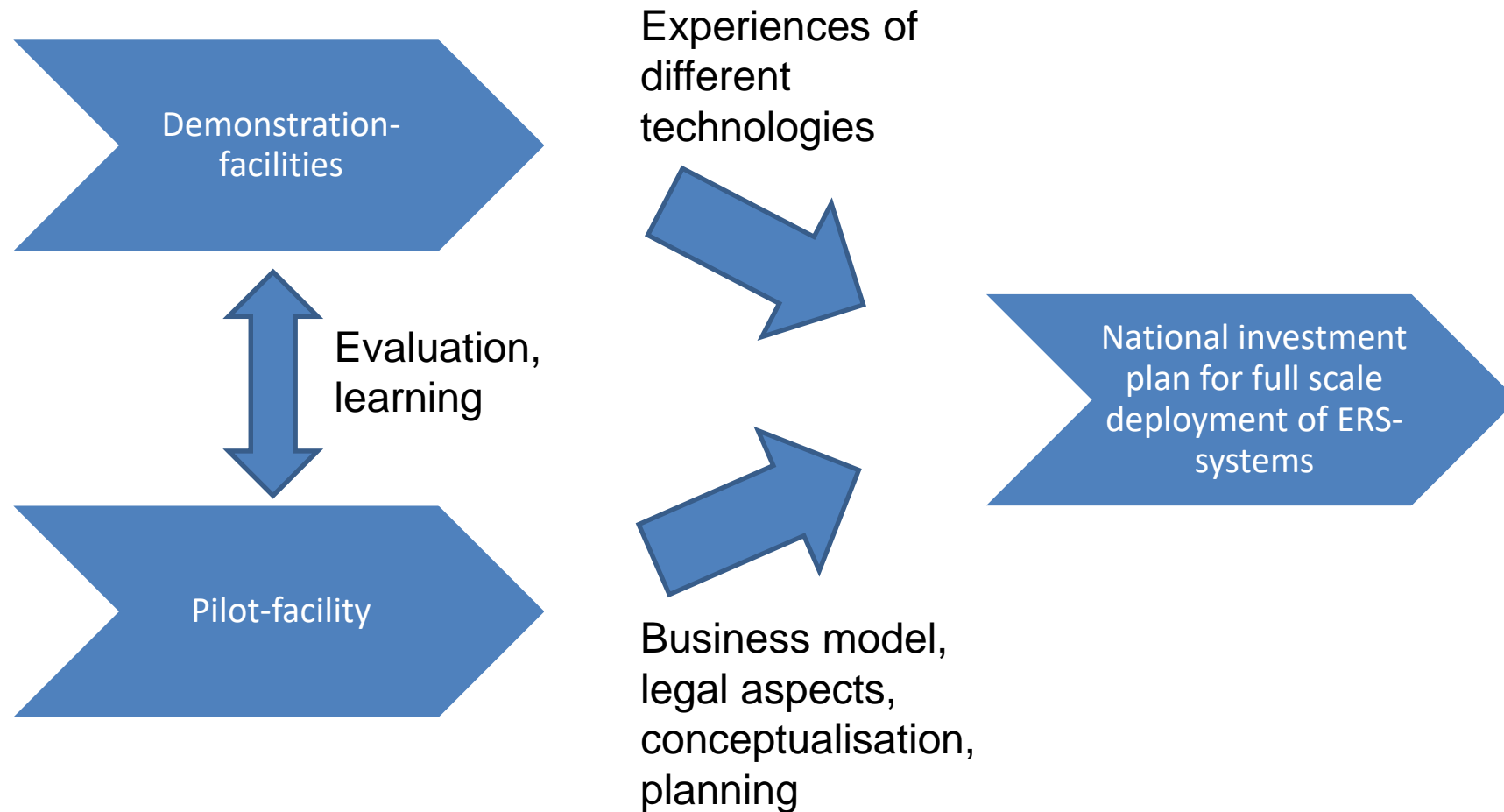




# Many ERS concepts are developed



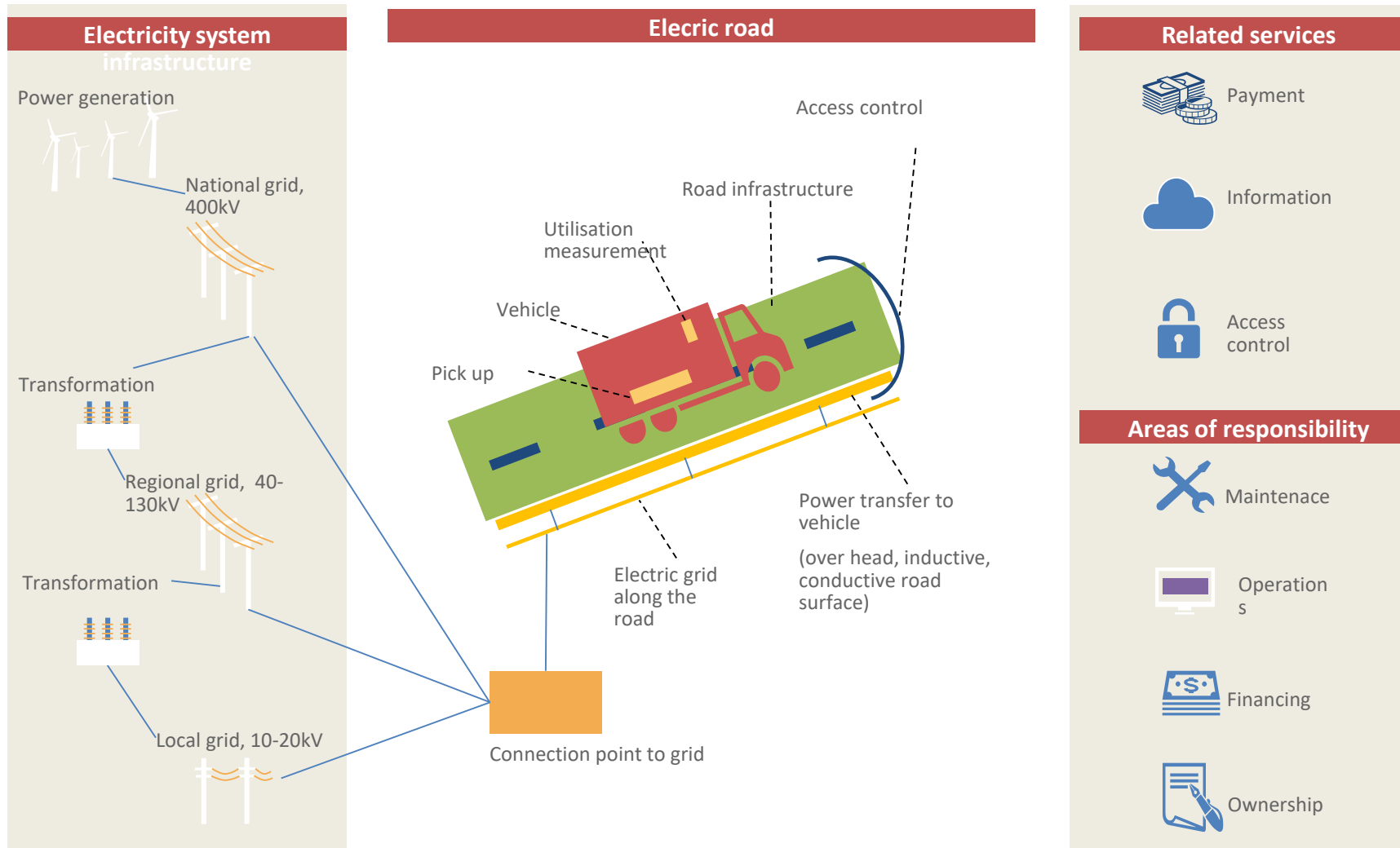
# Continued work in the ERS-program (2018-22)



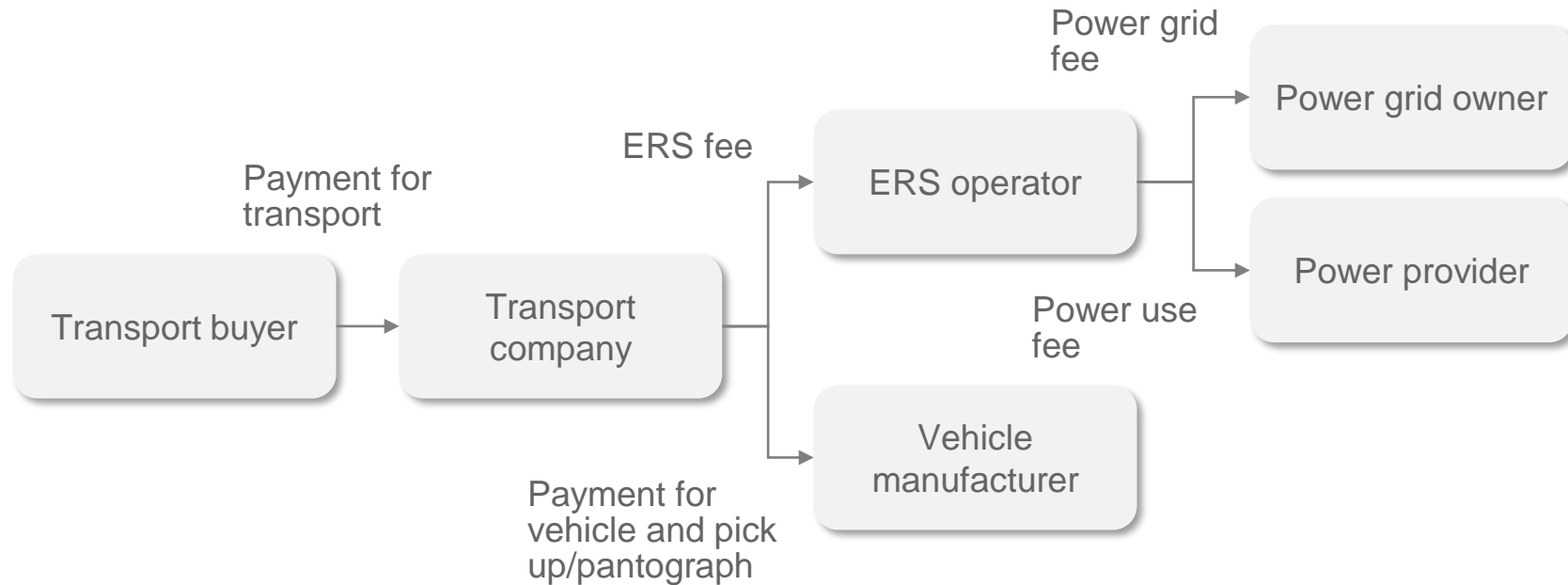
# Goals with pilot-facility/-ies

- Full scale testing of all aspects of ERS-stretch
- Only TRL-8 technologies
- Testing, but considered as a permanent facility
- Evaluation important (following 1, 3, 5 yrs)
- 300 MSEK Sw Transport Adm/ 300 MSEK private actors
- Etc.

# Business model components in an ERS-system



# A model for interaction and financial flows



# Different actors for different "building blocks"

	Responsible actor	Concession or public procurement	Public sector involvement
Business package 1: Existing power grid	Power grid operator	Power grid concession	Under regulation of Swedish Energy Markets Inspectorate (EI)
Business package 2: Electric road infrastructure	Swedish Transport Administration (initial phase)	In the short run; both forms During full scale deployment: concession	Procurer in pilots and full scale phases
Business package 3: Vehicles	Vehicle manufacturer	NA	NA (except for subsidies)
Business package 4: Systems for access control and measurement	ERS operator (?)	Preferably not	Preferably not

# Four business-model building blocks

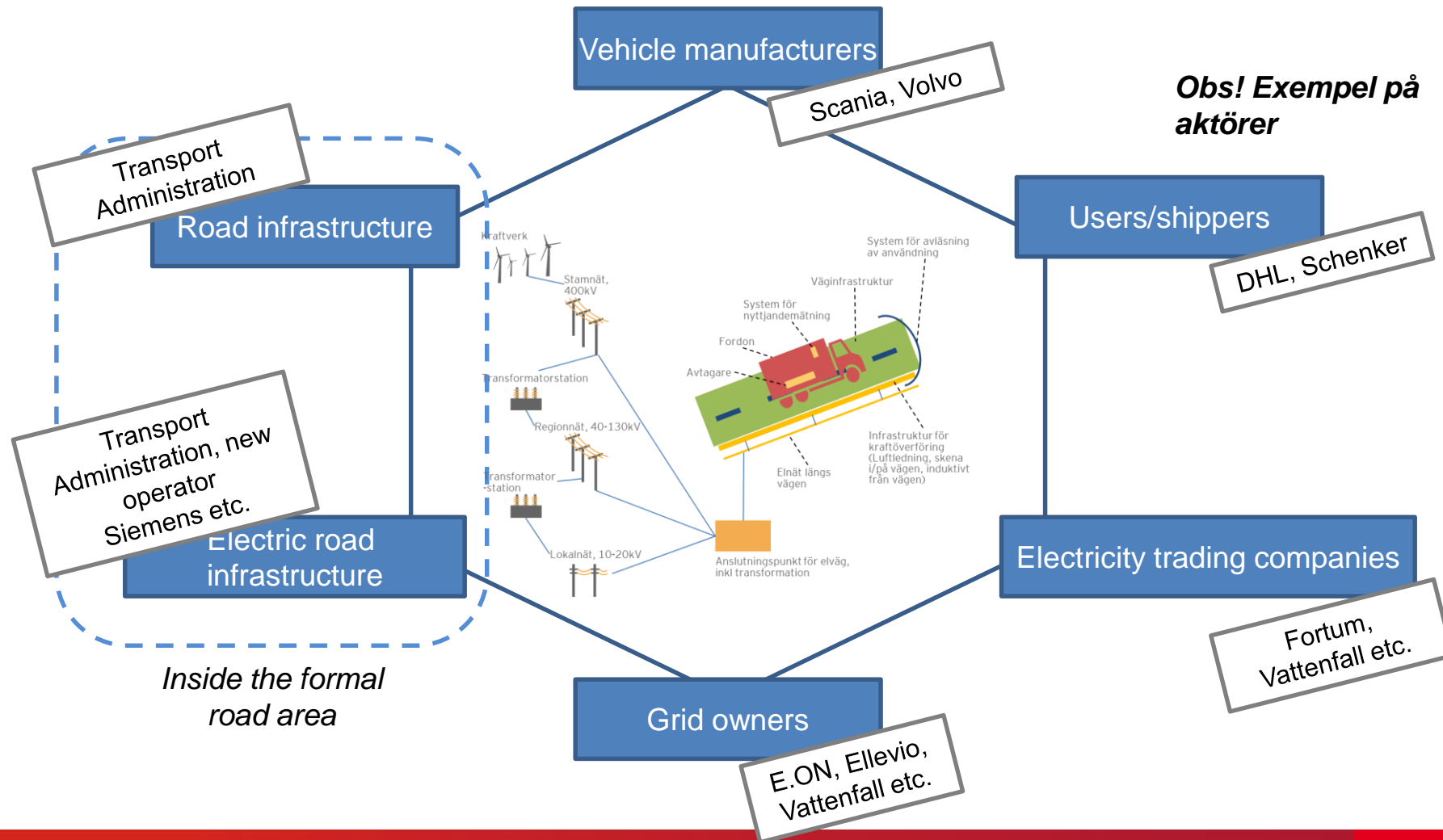
"Block"	Owner	Financing	Legislation	Supplier/customer
1. Access and measurement	Private sector a) Separate b) Combined with 3/4	User fees		ERS operator/separate provider – single user
2. Vehicles	Transport services operator	Owners/customers	General market regulation	Manufacturer - customer
3. ERS infrastructure	a) Transport Administration (STA) b) Electricity company	User fees (public) User fees 4. a/b	Sw Road Law, EU legislation on fees etc	STA/El. grid/ERS operator – single user
4. Electric grid and power supply	Electricity market players a) Regulated b) Unregulated	User fees, access fees	"Electricity Act", EU legislation	El. grid company – single user/ERS operator

# How to handle risk in pilot?

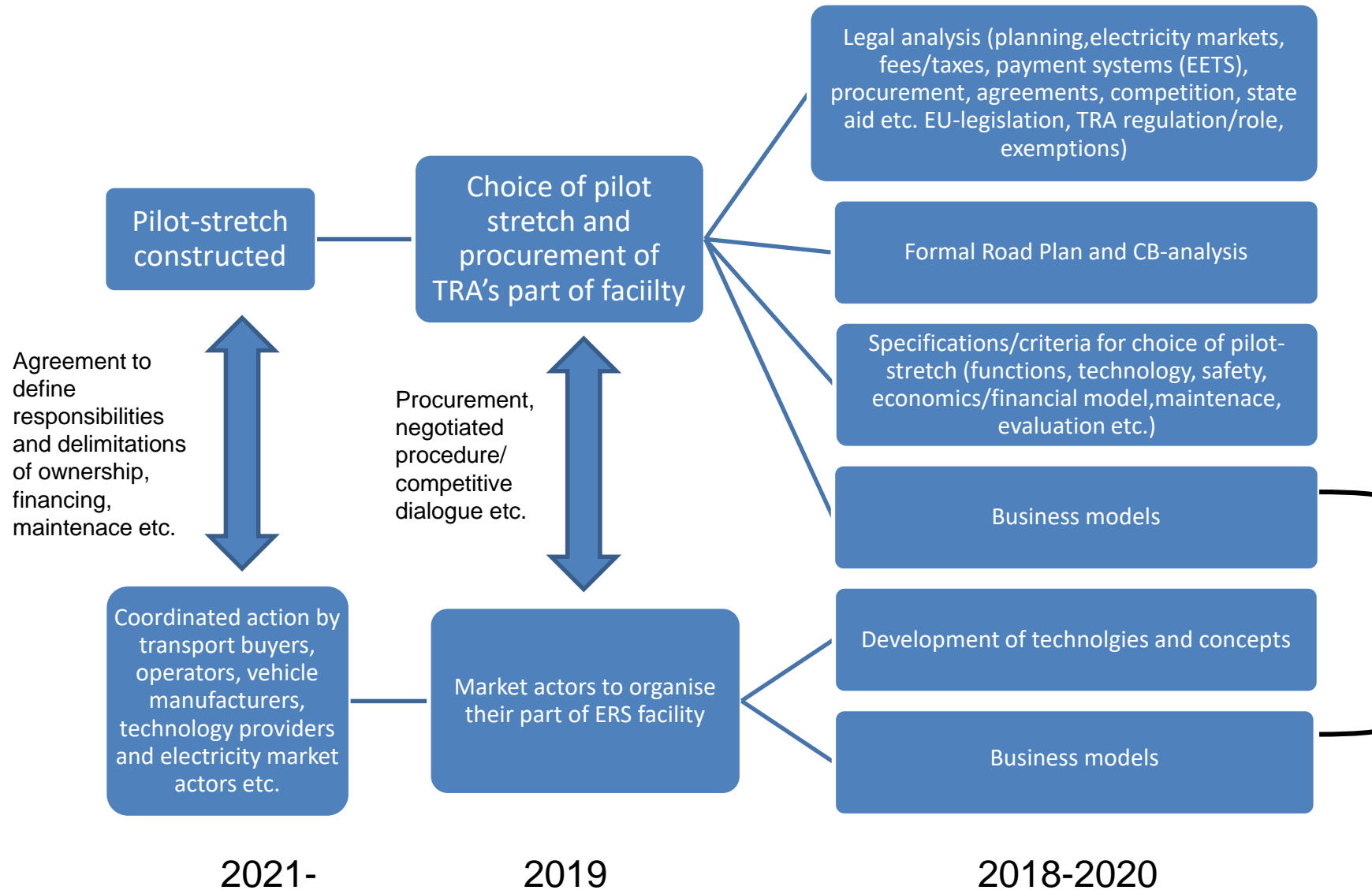
Risk-category	What?	Who covers?	How to mitigate?	
Market	Less use than expected		Support to vehicle owners Guarantee? Sell-option?	
Technology	Unsufficient function Short life time of technology		Only TRL 8/9 allowed	
Planning	Delays and redesign	Sw Transport Adm?	Early planning process, cooperation and dialogue	



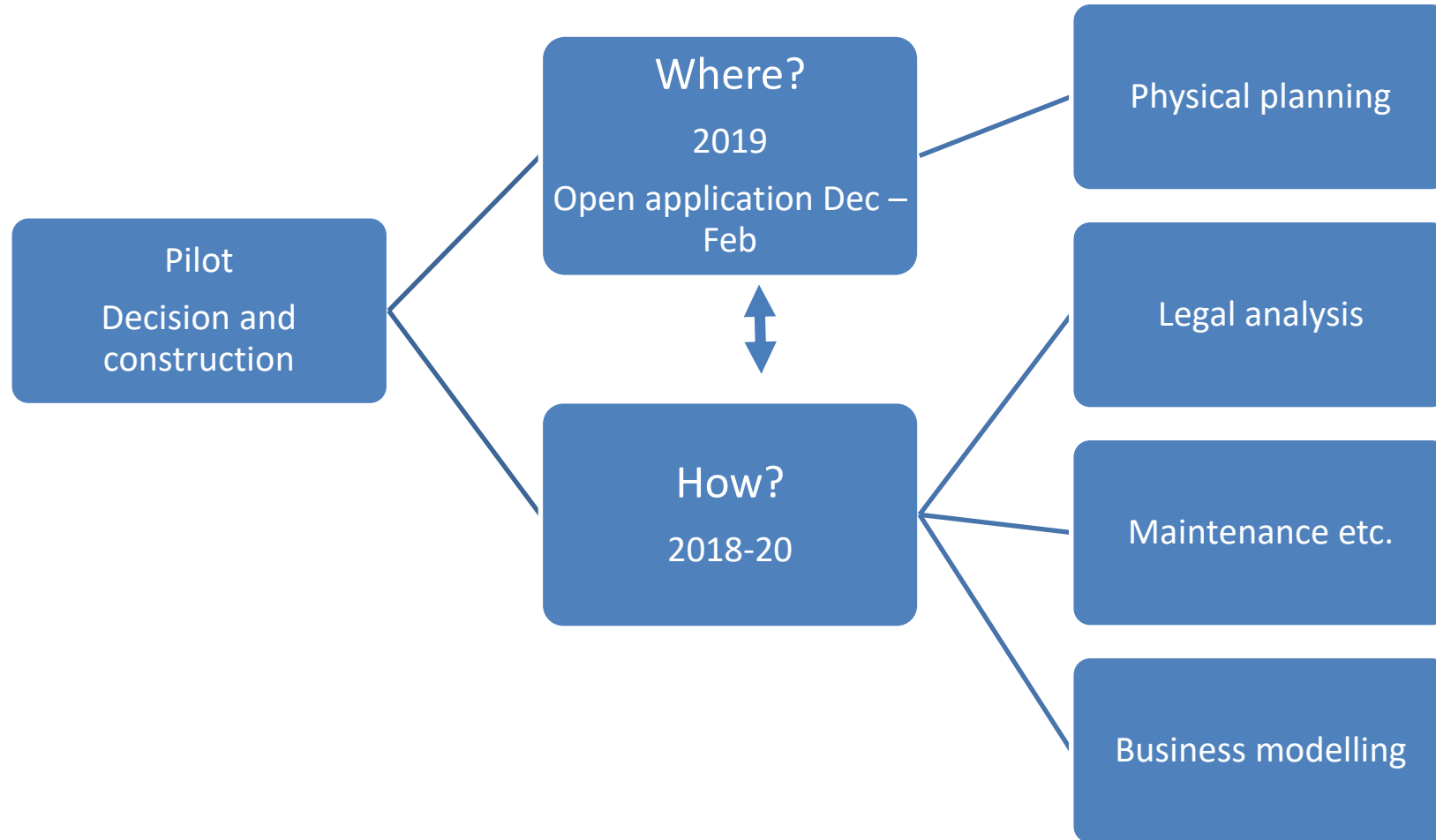
# Business packages and possible actors



# Necessary actions ahead – pilot phase



# From now and until 2021 – two parallel processes



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# Scotland's approach to Electric Road Systems:

Laurence Kenney, Team Leader, ULEV Delivery, Transport Scotland



# Scotland's approach to electric vehicle charging



Laurence Kenney, MEng, MSc, CEng, MCIHT

ULEV Delivery

Low Carbon Economy Directorate

Transport Scotland

Scottish Government



# Mission: Phase out the need for new petrol and diesel cars and vans by 2032



“We will step up our work in the year ahead...”

**Priority 1**  
Support a user focused, state-of-the-art network of charge points supporting Scotland's energy needs

**Priority 2**  
Embed new skills and capabilities into the Scottish workforce

**Priority 3**  
Scottish businesses engage in and benefit from the shift to ULEVs

**Priority 4**  
Incentivise consumers to make informed choices on the purchase, access and use of ULEVs

## OUTCOMES

Scotland at the forefront of growth in ULEV markets.  
A fair distribution of investment costs, benefiting all consumers.  
Business benefitting from new markets and technologies



ChargePlace Scotland  
electric vehicle charging

# ChargePlace Scotland



TRANSPORT  
SCOTLAND  
CÒMHDHAIL ALBA



- Grant programmes:
  - Local Authorities
  - Commercial
  - Domestic
- Back Office System

Helpline:  
**0141 648 0750**

[www.chargeplacescotland.org](http://www.chargeplacescotland.org)

[admin@chargeplacescotland.org](mailto:admin@chargeplacescotland.org)

@ChargePlaceScot ChargePlaceScotland



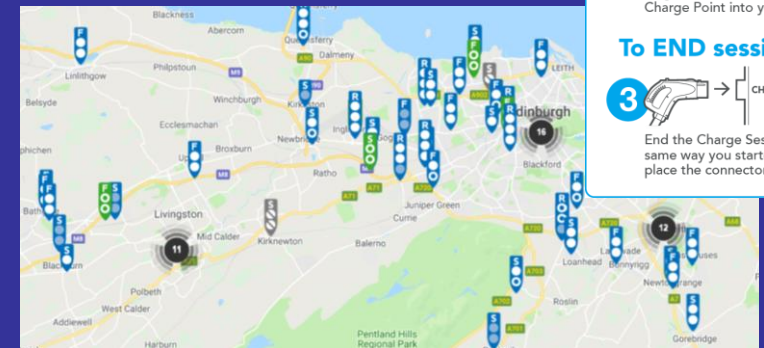
### To START session

**1** ACCESS CARD   
Begin the Charge Session either by presenting your CPS Access Card, using the App or by Calling **0141 648 0755**...

**2**   
Plug the connector from the Charge Point into your vehicle...

### To END session

**3**   
End the Charge Session in the same way you started. Please place the connector in its holder.

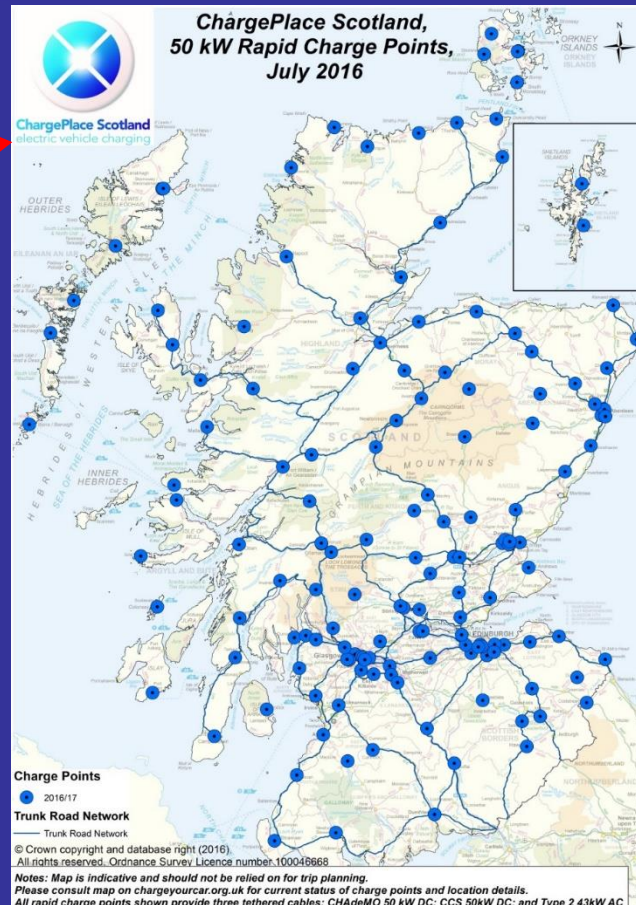




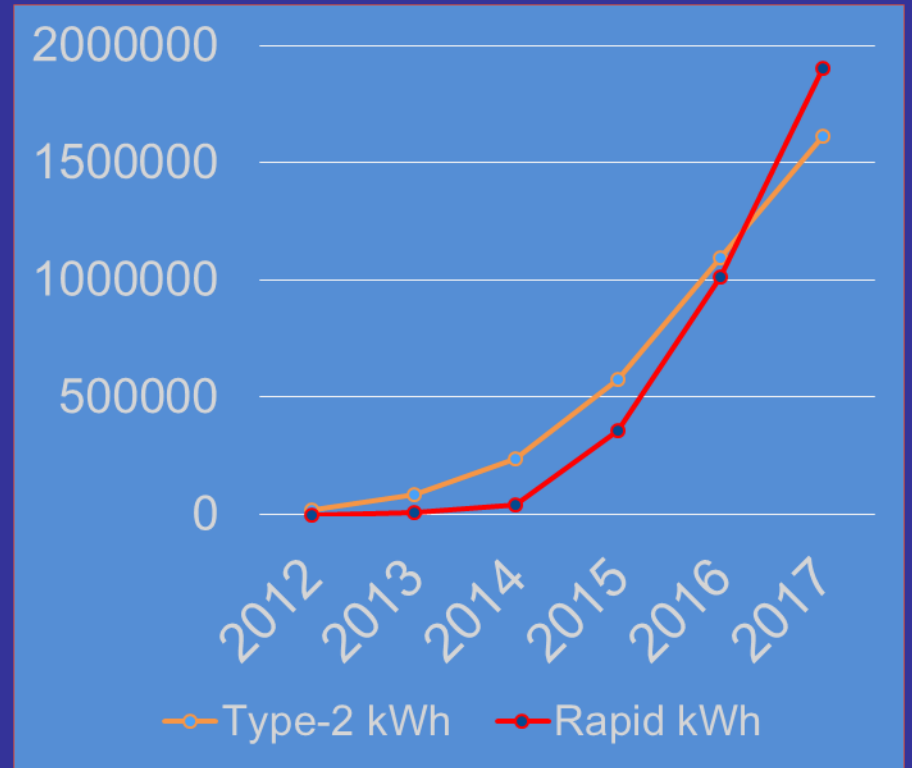


ChargePlace Scotland  
electric vehicle charging

# Network Growth



## Total kWh drawn by year

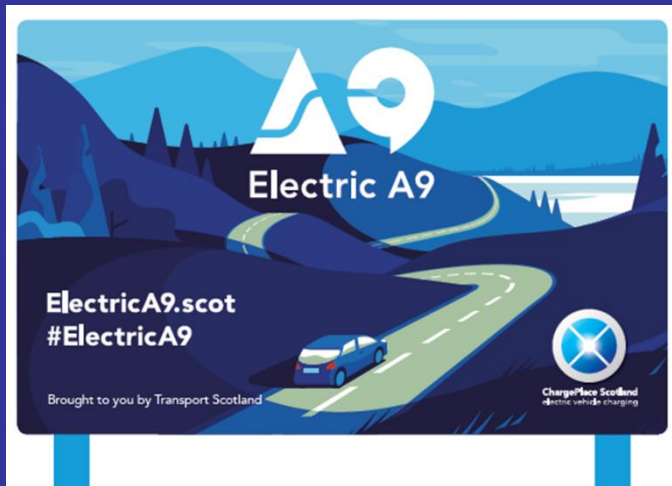
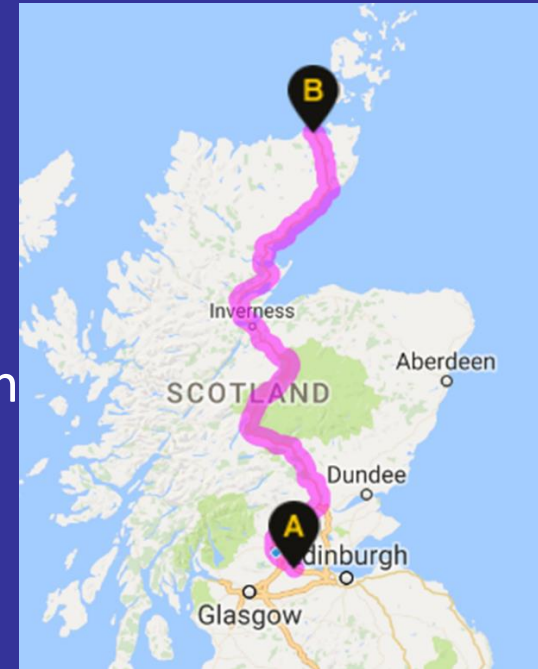




# Electric A9



- Multiple EV charge place hubs
- Hubs located in or around local communities
- Multiple charge points with access to associated amenities
- Expand and reinforce Scotland's existing EV infrastructure
- Accommodate all users - journey, destination, local



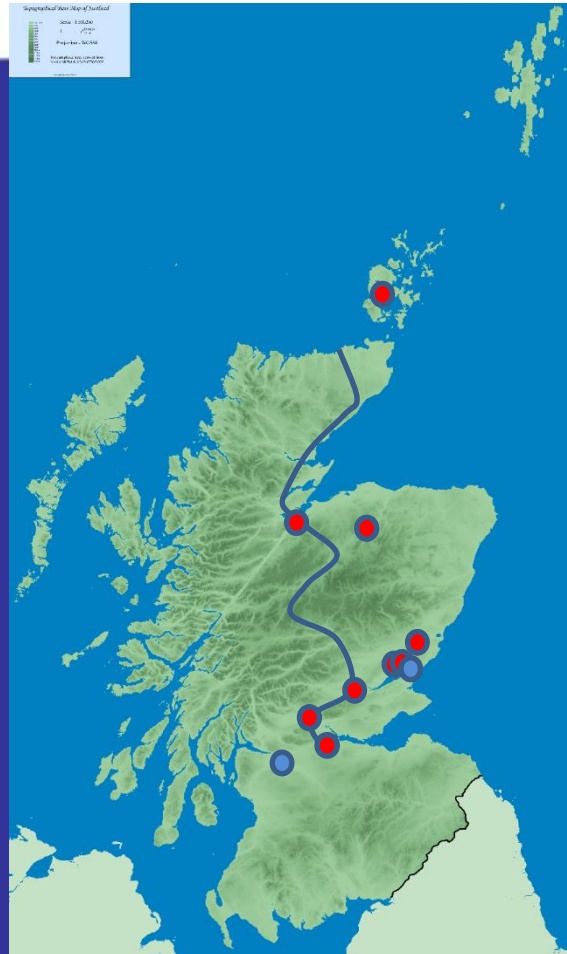
# Charging Hubs

## ERDF Low carbon transport hubs

- Aberlour
- Dundee x2
- Falkirk
- Forfar
- Inverness
- Perth
- Stirling
- Stromness

## Other hubs

- Dundee GUL
- Glasgow H2020



Battery Storage

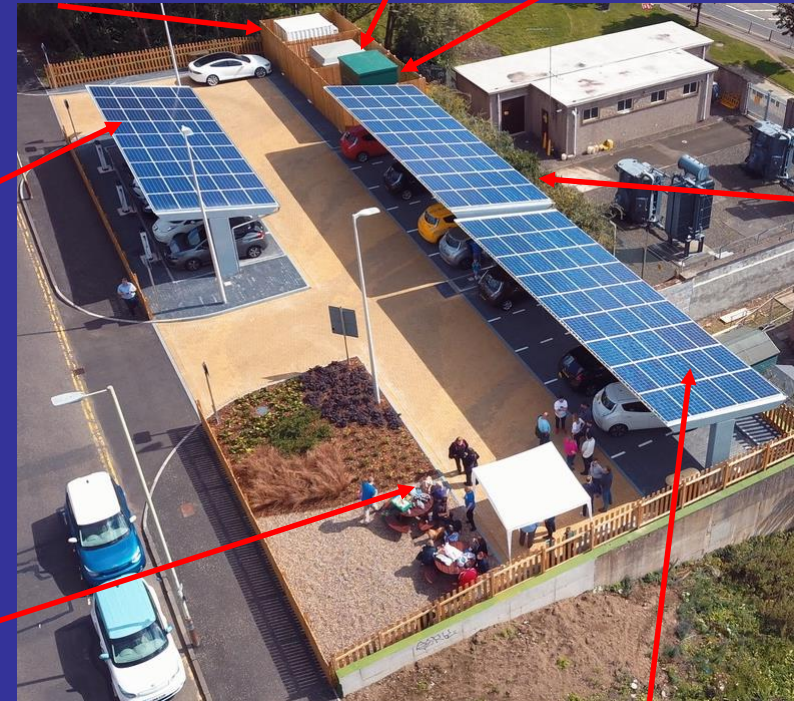
Sub Station

Switch Cabinet

3 x 22kW charge points

6 x rapid charge points

Seating Area



Solar Panels

# Thank You

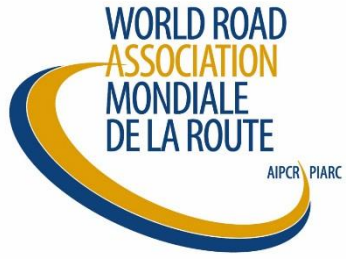


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# Question and Answer Session





# Tea/Coffee and Exhibition

