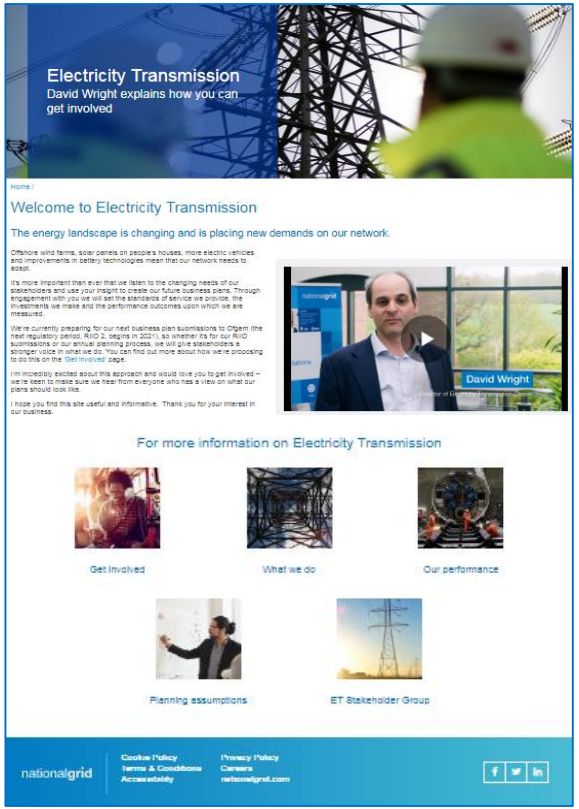
# Welcome to the Future of Electricity Transmission webinar

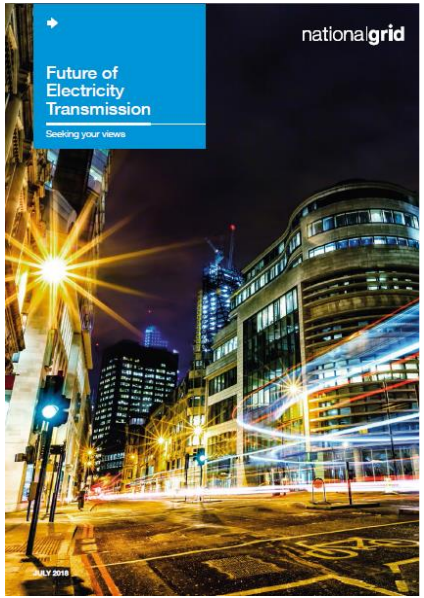
- Thank you for joining us! You will be joined in listen only mode.
- Please do not unmute yourself or turn your camera on
- You can ask questions via the chat function throughout
- There will also be an opportunity to ask voice questions in the Q&A session – dial in via telephone if you want to do this

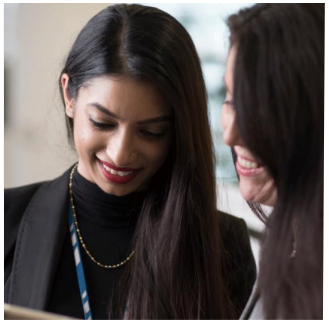
- Please note we will be recording this webinar
- Both the recording and slides will be made available on our website

For more information on how we're building our RIIO-2 plans with you can visit yourenergyfuture.nationalgrid.com/electricity-transmission



# Future of Electricity Transmission



## #RIIO2 webinar

15th August 2018

Electricity Transmission Owner

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View our discussion document here http://yourenergyfuture.nationalgrid.com/media/1472/future-of-electricity-transmission-seeking-your-views.pdf

# Agenda

1. Introduction
2. Context and macro drivers
3. Our analysis
4. Q&A
5. Next steps and close

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# How you can get involved today

**Throughout the presentation please feel free to provide feedback or ask questions via the chat function and we will pause at points to respond**

**We will be using a poll at certain stages during the presentation to collect your feedback**

**We hope to have a question and answer session at the end of the webinar. Please press the 'hand' icon next to your name and we will unmute your line.**

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# 1. Introduction

Karl Lawson

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# Electricity stakeholder priorities

Insight gathered through RIIO-T1 period and the ‘Listen’ phase of our RIIO-2 preparations

## Consumer priorities

- **I want an affordable energy bill**
- **I want to use energy as and when I want**
- **I want a sustainable energy system**

## Stakeholder priorities

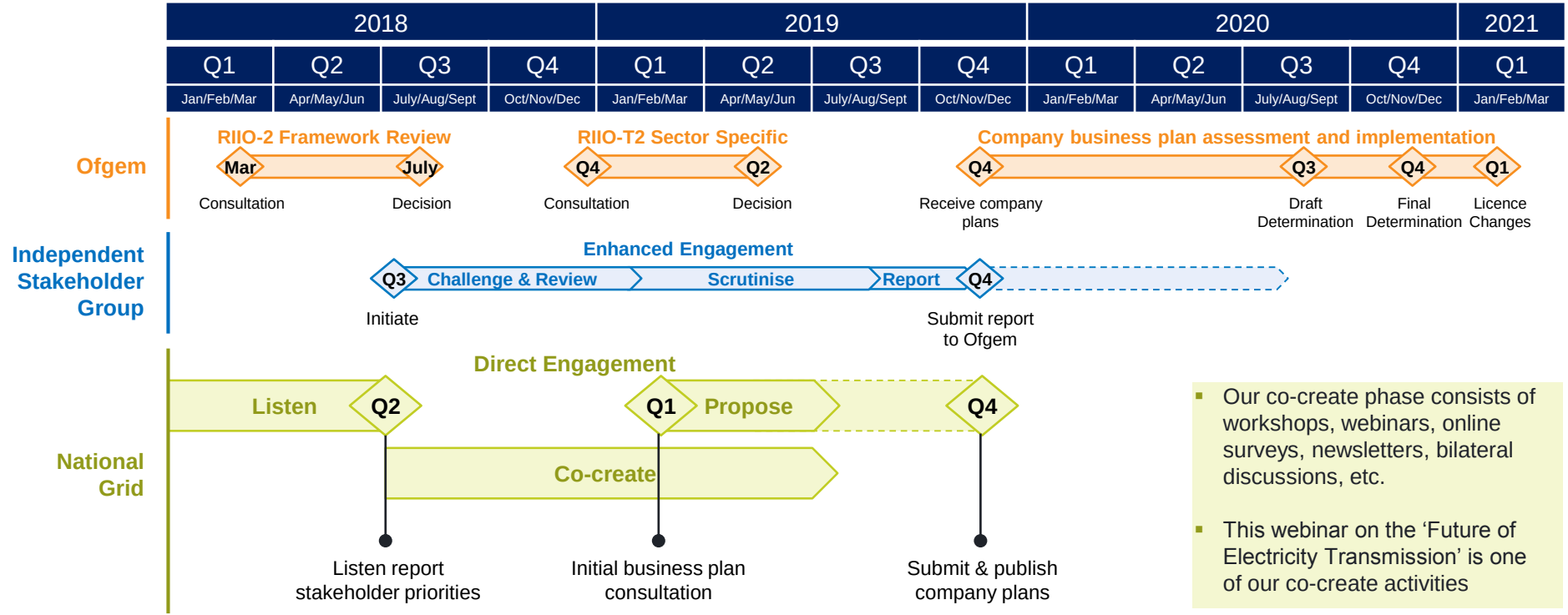
- I want you to provide a reliable network, so that electricity is there whenever I need it
- I want you to keep the network safe and protect it from external threats
- I want you to make it easy for me to connect to and use the electricity network
- I want you to enable the ongoing transition towards the energy system of the future
- I want you to provide value for money
- I want you to care for communities and the environment
- I want you to be transparent and easy to work with
- I want you to be innovative

**These will structure our engagement and business planning activity over the coming months**

# What are your priorities for the next decade?


Please tell us using free text function

# Your input is key to our ‘co-create’ phase of engagement




- Our co-create phase consists of workshops, webinars, online surveys, newsletters, bilateral discussions, etc.
- This webinar on the ‘Future of Electricity Transmission’ is one of our co-create activities

For more information on how we’re building our RIIO-2 plans with you can visit yourenergyfuture.nationalgrid.com/electricity-transmission

# 2. Context and macro drivers

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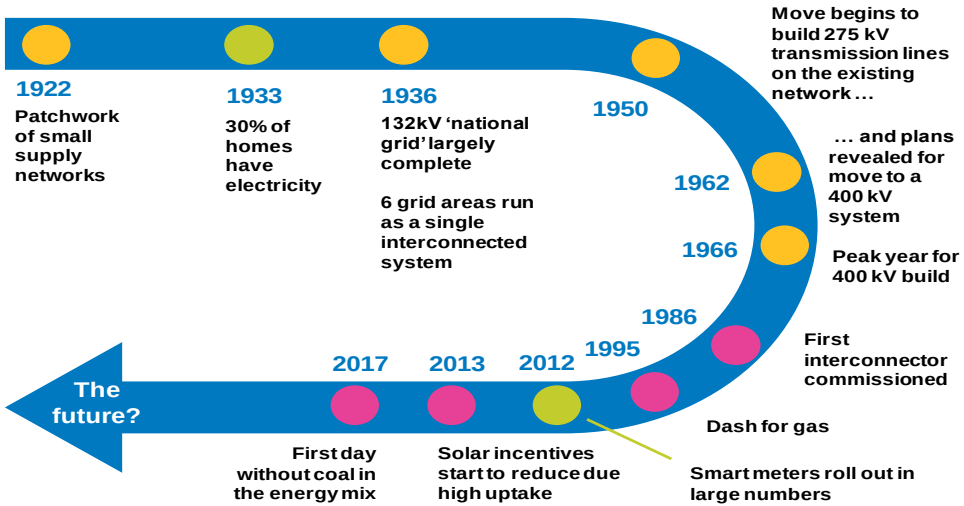
# The electricity transmission network has facilitated significant changes since its inception in the 1930s

## Evolution of the Transmission Network to date

The 'national grid' originally built to join up local networks – allowing access to cheapest sources of supply and sharing of reserves




*Source: DUKES 2017 and BEIS photovoltaic deployment report

## Notable changes*

- **Interconnectors** – connecting neighbouring markets to further extend access to cheapest supply sources (4GW in 2017)
- **Dash for gas** – exploiting a cheaper, lower carbon source of electricity; gas shifted from 1% of supply in 1992 to 36% in 2002
- **Wind generation** – 13% of electricity supplied in 2017 from onshore and offshore
- **Solar PV** – 12.5GW of cumulative GB capacity in 2018

# Today, the UK energy sector is changing at an unprecedented pace

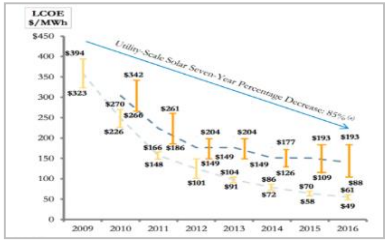
How energy is generated, transported and consumed is changing driven by a combination of factors:

## Government policy towards decarbonisation

- Climate Change Act 2008. To reduce the UK's emissions by at least 80% from 1990 levels by 2050.
- Financial support for low carbon technology (CfD, ROCs, FiT, grants for new EVs)

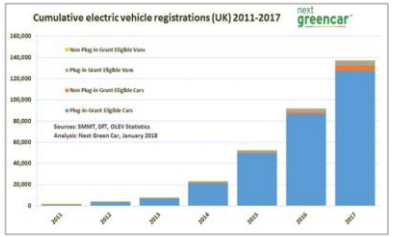
## Rapid reduction in the cost of distributed generation

- Since 2009 the cost of wind and solar PV generation has fallen 66% and 85% respectively




## Change in the end consumer behaviour

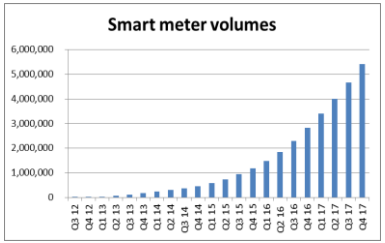
- Adoption of the EVs, increase in penetration of in-home technologies and smart tariffs are all changing end consumer behaviour




*Source: SMMT, OLEV, DfT Statistics; Analysis: Next Green Car, January 2018*

## Advances in digital technology

- Technological advances are transforming both supply and demand e.g. Smart meter deployment, residential load control

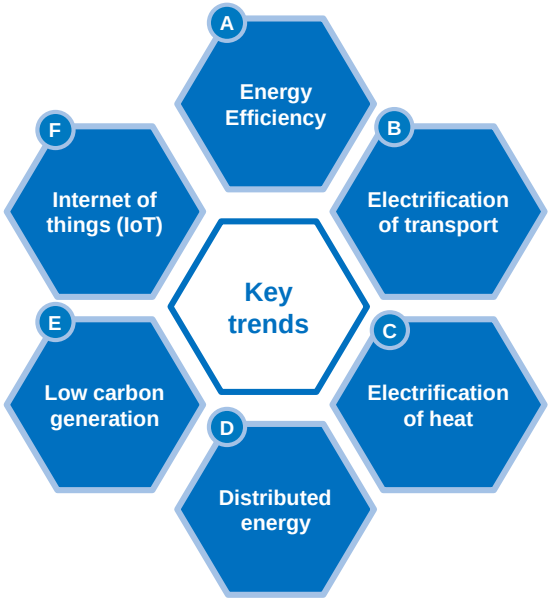



*Sources: BEIS-Statistical release and data: Smart Meters, Great Britain, quarter 4 2017*

# In this context we are facing 3 key uncertainties for the future of networks

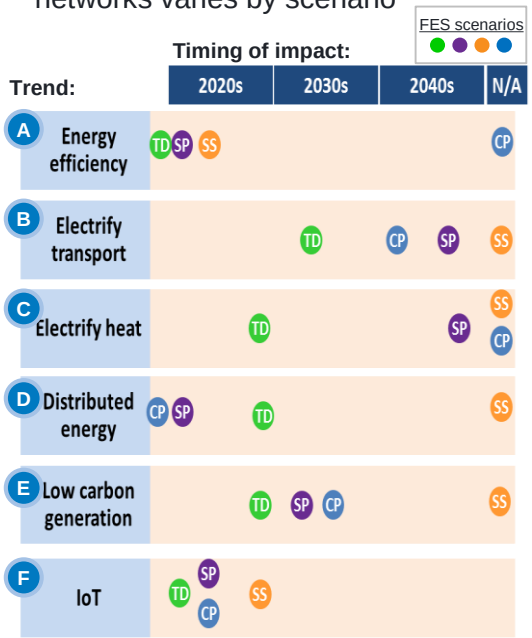
## Uncertainty over WHAT will happen

- We have identified key industry trends with the potential to materially impact our networks



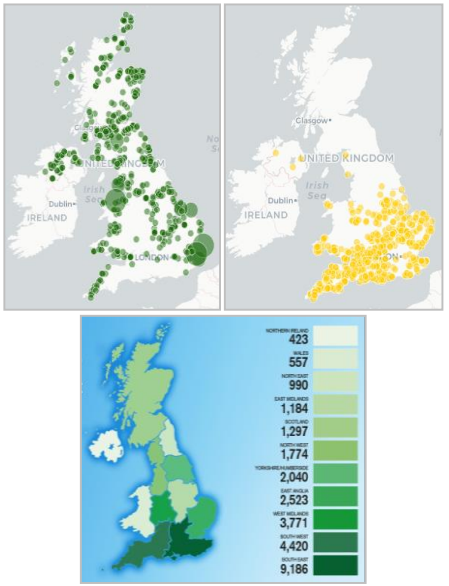

## Uncertainty over PACE of change

- The timing and pace of impact on networks varies by scenario




## Uncertainty over WHERE it occurs

- There are significant regional differences in adoption rate for some of the trends



# Which of the following trends do you think will have the greatest impact on the role of electricity transmission?

| Key Trends | |
|---|---|
| A | Energy Efficiency |
| B | Electrification of Transport |
| C | Electrification of Heat |
| D | Distributed Energy |
| E | Low Carbon Generation |
| F | Internet of Things |

# 3. Our analysis



Ivo Spreeuwenberg / Ljubo Mitrasevic

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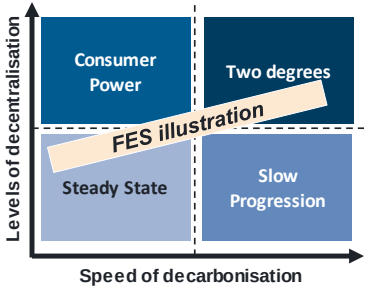
# Methods exist that manage uncertainty in the short to medium term

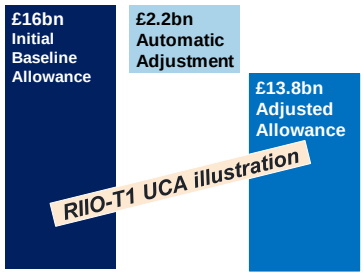
## Process and/or mechanism

***Future Energy Scenarios and Network Options Assessment***




*Annual **planning process** run by System Operator*

***Unit cost allowances***




*Annual **revenue adjustments** through regulatory mechanism*

## How uncertainty is managed

- ***FES*** outlines credible future energy pathways (what, when, where)
- ***Electricity Ten Year Statement*** shows likely future transmission requirements based on FES
- ***Network Options Assessment*** (NOA) recommends which requirements should go ahead and when to deliver greatest benefit
- (NOA being developed to include distribution network options and other solution providers - e.g. storage)

**Load-related (customer driven) investment:**

- Initial baseline allowance and unit cost allowances (£/MW) agreed up front for changes volumes during the regulatory period
- Allowance adjusted automatically through the price control period

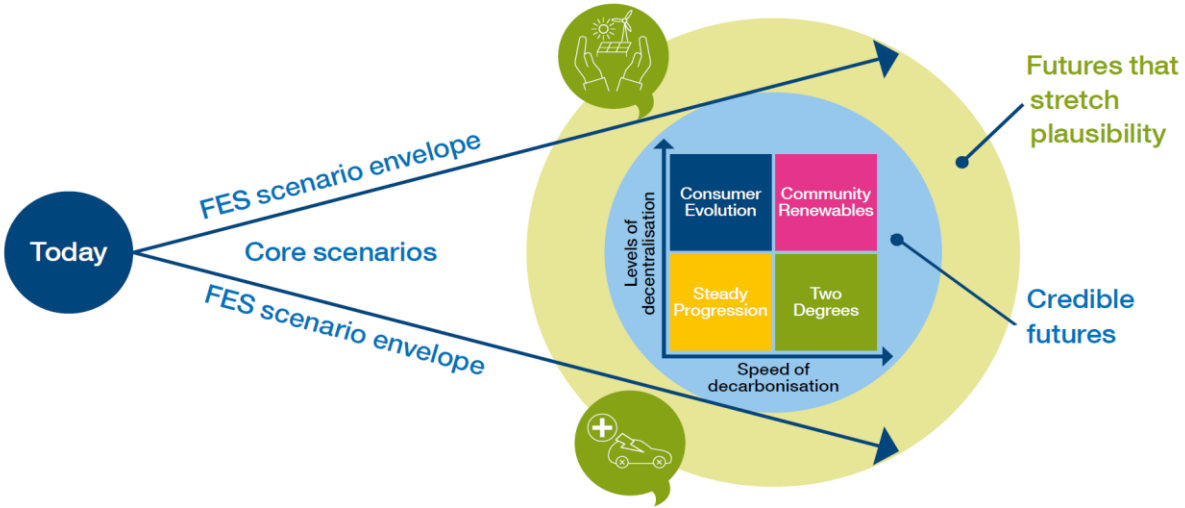
**Are these methods still robust, given longer term uncertainty?**

# We have used sensitivities that stretch plausibility beyond the FES envelope to explore the future role of transmission and answer 2 key questions

nationalgrid

## 1) High Decentralisation

1 Is the transmission network still needed in a high-decentralised future?




## 2) High Electrification of Transport

2 Would the transmission network be a blocker to rapid up-take in electric vehicles?

View our discussion document here http://yourenergyfuture.nationalgrid.com/media/1472/future-of-electricity-transmission-seeking-your-views.pdf

# What would you need to believe for our stretching sensitivities to materialise?

## High Decentralisation

- **5 fold increase in solar** capacity (63GW) - all Distribution network connected
- **4 fold increase in wind** capacity (65GW) in - majority connected in E&W at distribution level
- **Only 35% of generation capacity transmission connected** (currently 70%)
- **42GW of storage -** all distribution connected and co-located with wind & solar
- **16GW of interconnectors -** all transmission connected (currently 4GW)
- **20% reduction in transmission peak demand**

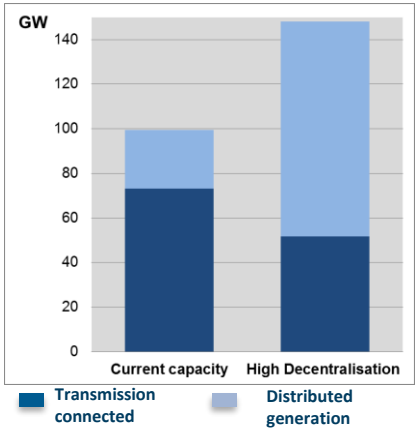
## High Electrification of Transport

- **No hybrid car sales by 2025 & pure EVs sales 100% by 2040**
- **Not all HGVs & buses electrify;** CNG and H2 play role
- **66% of homes have off-road charging** (20% peak charging and no peak impact from public parking charging)
- Consumer transport behaviours remain consistent with today - miles travelled (7,900 p.a)
- **Tx peak demand increases by c.50%** by 2050

# Analysis of a highly-decentralised future shows a continuing role for transmission

## 1 Continued need for large generation/demand

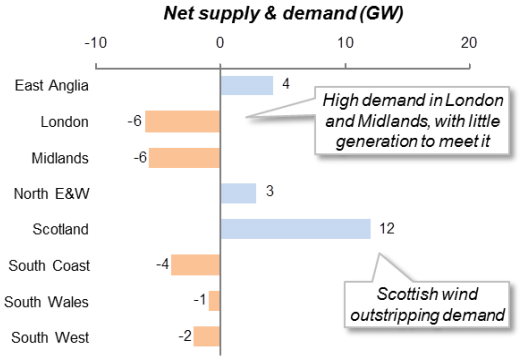
- ~50GW of transmission connected, large generation still required despite decentralization




- Allows for continued, cost effective decarbonisation

## 2 Efficient transfer of bulk power across regions required

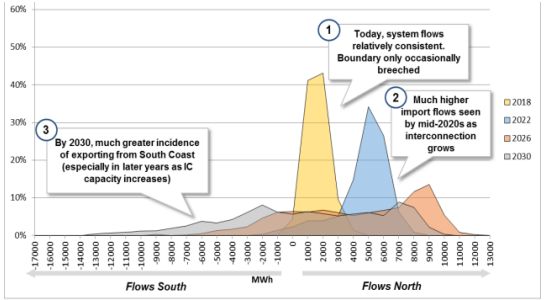
- Case studies show large urban areas cannot completely self balance




- Transmission facilitates competitive market and access to lowest cost supply across the year, minimising wholesale costs for consumers

## 3 Greater extremes of flows and volatility will need to be managed

- Greater extremes in power flows becoming the norm; challenge to manage

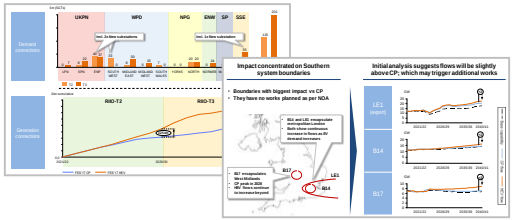



- Robustness of transmission network continues to ensure electricity is there when consumers want it

# Analysis of high-electrification of transport indicates transmission not a blocker and highlights importance of whole system approach

## 1 Manageable impact to 2030; whole system approach needed going forward

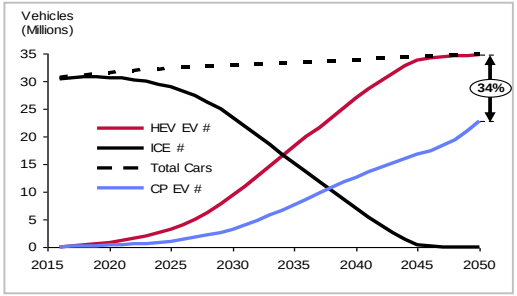
- Potential requirement for additional capacity at transmission / distribution interface and marginal increase in generation connections to 2030



- Rate of uptake between 2030 and 2040 in sensitivity doubles the impact on the transmission / distribution interface highlighting importance of whole system thinking

## 2 Need to monitor closely to meet quick onset tipping points

- Risks bottlenecks and high costs if rapid tipping points occur




- Signals for new demand infrastructure need to evolve so that industry can better anticipate

## 3 Low cost to maintain optionality for an uncertain future

- Cost to maintain transmission assets lower than decommissioning alone and lower than decommissioning and future re-build by an order of magnitude

- Analysis shows not decommissioning until end of life could avoid large regret cost (PV = present value)

| Potential futures | PV bid off | PV costs | PV total |
|---|---|---|---|
| Maintain 4 cts | £0m | £38m | £38m |
| Decommission 1ct & re-build in 20yrs. | £9m | £115m | £124m |
| Decommission 1 ct & re-build in 10yrs. | £4m | £145m | £149m |
| *Decommission & no re-build (maintain 3 cts)* | *£17m* | *£46m* | *£63m* |

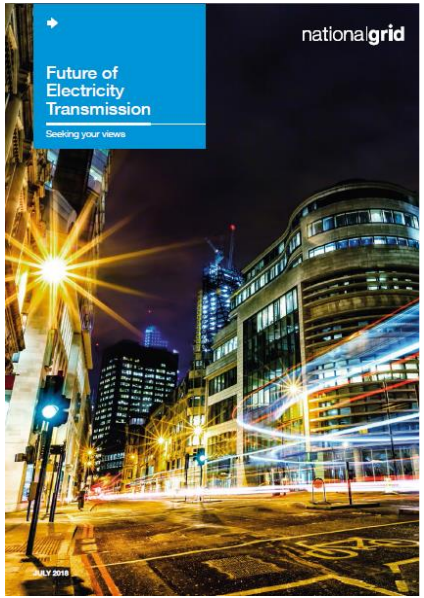
# Please tell us how strongly you agree with our key conclusions

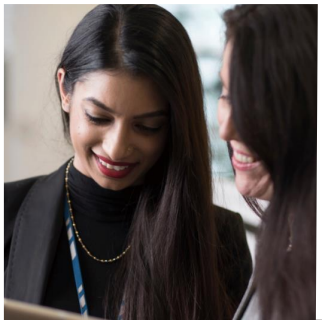
1. How strongly do you agree with our conclusion that, despite uncertainty, a continuing role for the electricity transmission network is evident?

2. How strongly do you agree with our conclusion that the transmission network is unlikely to be a barrier for rapid growth in electric vehicles?

3. How strongly do you agree that whole system thinking is essential to ensure a least cost transition to a low carbon world?

# 4. Q&A



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# 5. Next Steps

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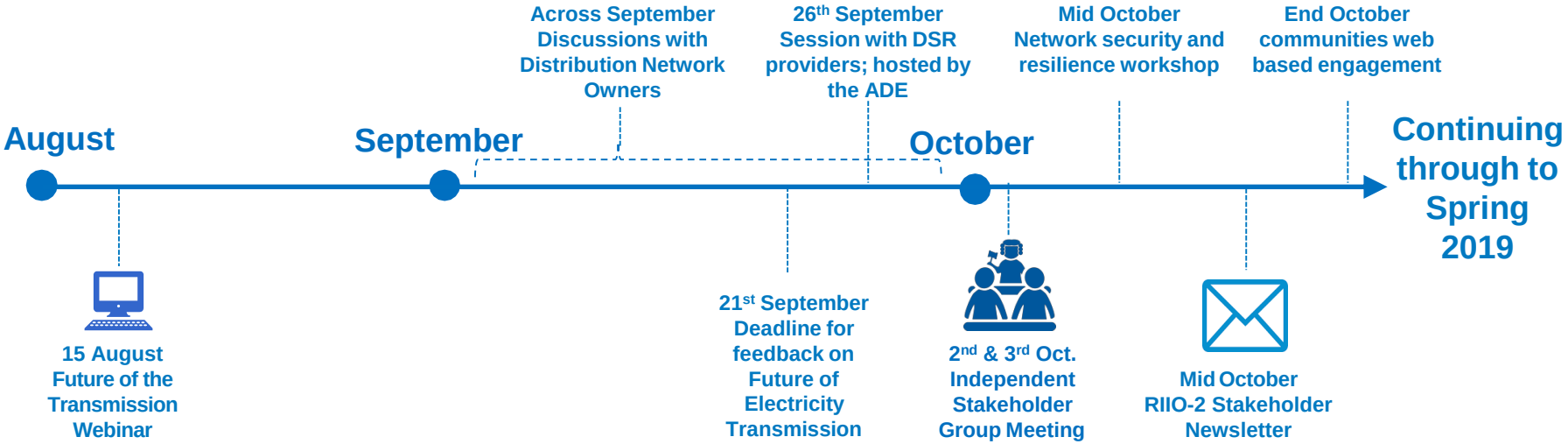
# Timeline of activity




**Have you seen our engagement to date on environment and innovation?**

Get involved in these and all upcoming engagements through out website:
http://yourenergyfuture.nationalgrid.com/electricity-transmission/get-involved/

DSR = Demand side response
ADE = Association for Decentralised Energy

# Please give us feedback so we can improve future engagement

1. How would you rate the content of this webinar?
2. How would you rate the deliver of content by our speakers?
3. How would you rate webinars as a vehicle for delivering content?
4. Any general comments? (free text)

# Thank you for attending!

## Your input is important – please help us shape the Future of Transmission


Full version of our discussion document is on our RIIO2 website:
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Please take the time to share your views with us by responding to our survey, which is available here:
https://www.surveymonkey.co.uk/r/foen_tx_ng

You can also email your feedback to
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by 21 September 2018