

# CAWG 14

Model selection – current working level views



1. Summary of preliminary modelling results
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**Note**

Preliminary modelling results and model selection issues for discussion are based on the latest working level Ofgem analysis and are subject to change.

Neither the working team nor the Authority have made relevant decisions on the issues in this presentation, but the team considers it useful to allow the GDNs to provide comment on the preliminary thinking and potential issues.

# Summary of latest working level modelling results



## Preliminary Econometric Models Results – Historical Data

TD/BU	Cost	Driver	Coefficient	R <sup>2</sup>	Diagnostic tests
BU	Work Management	MEAV		0.301	
BU	Emergency	Emergency CSV		0.811	RESET fails
BU	Maintenance	Maintenance MEAV		0.714	
BU	Repairs	Tot. Ext. Cond. Reports		0.780	RESET fails
BU	Connections	Synthetic cost (workload driver)		0.853	
BU	Reinforcement	Synthetic cost (workload driver)		0.755	
BU	Repex	Synthetic cost (workload driver)		0.903	RESET fails
TD	Totex	Totex CSV		0.851	RESET fails

**Note.** Models included in current runs. Log-log specification, linear time trend.

\* Coefficient rating based on expected sign and statistical significance.

## Preliminary Econometric Models Results – RIIO-GD1+GD2

TD/BU	Cost	Driver	Coefficient	R <sup>2</sup>	Diagnostic tests
BU	Work Management	MEAV		0.453	
BU	Emergency	Emergency CSV		0.784	RESET fails
BU	Maintenance	Maintenance MEAV		0.765	RESET fails
BU	Repairs	Tot. Ext. Cond. Reports		0.745	RESET fails
BU	Connections	Synthetic cost (workload driver)		0.817	
BU	Reinforcement	Synthetic cost (workload driver)		0.560	RESET fails
BU	Repex	Synthetic cost (workload driver)		0.883	RESET fails
TD	Totex	Totex CSV		0.860	RESET fails

**Note.** Models included in current runs. Log-log specification, linear time trend.

\* Coefficient rating based on expected sign and statistical significance.

TD/BU	Cost	Driver	Coefficient	R <sup>2</sup>	Diagnostic tests
BU	Work Management	MEAV		0.354	RESET fails
BU	Emergency	Emergency CSV		0.808	
BU	Maintenance	Maintenance MEAV		0.695	RESET fails
BU	Repairs	Tot. Ext. Cond. Reports		0.763	RESET fails
BU	Connections	Synthetic cost (workload driver)		0.840	
BU	Reinforcement	Synthetic cost (workload driver)		0.750	
BU	Repex	Synthetic cost (workload driver)		0.873	RESET fails
TD	Totex	Totex CSV		0.852	RESET fails

**Note.** Models included in current runs. Log-log specification, linear time trend.

\* Coefficient rating based on expected sign and statistical significance.

TD/BU	Cost	Driver	Coefficient	R <sup>2</sup>	Diagnostic tests
BU	Work Management	MEAV		0.511	
BU	Emergency	Emergency CSV		0.727	RESET fails
BU	Maintenance	Maintenance MEAV		0.635	RESET fails
BU	Repairs	Tot. Ext. Cond. Reports		0.793	RESET fails
BU	Connections	Synthetic cost (workload driver)		0.823	RESET fails
BU	Reinforcement	Synthetic cost (workload driver)		0.301	RESET fails
BU	Repex	Synthetic cost (workload driver)		0.926	RESET fails
TD	Totex	Totex CSV		0.868	RESET fails

**Note.** Models included in current runs. Log-log specification, linear time trend.

\* Coefficient rating based on expected sign and statistical significance.

## **Work Management**

- Removal of certain sub-activities
- Model performance improves if we only consider Asset Management and Operations Management
- No improvement if we exclude Systems Control only

## **Reinforcement**

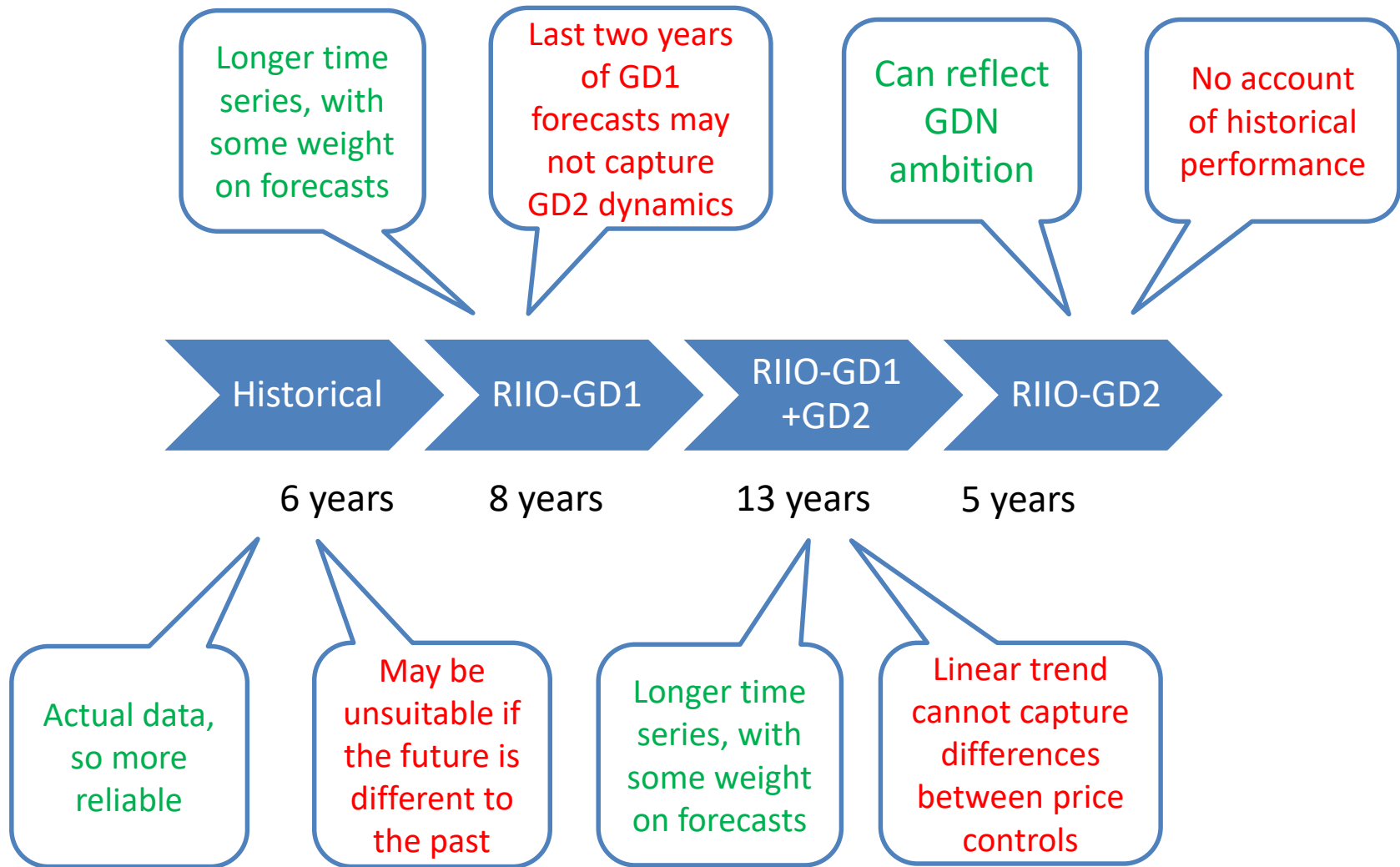
- The  $R^2$  decreases once GD2 data are included
- Still looking into additional normalisations



- Independently of the selected time period, Opex Plus and Pool2A perform well in terms of  $R^2$  and efficiency score range
- Reduced models performance for other cost pools
- If we were to select Opex Plus or Pool2A, need robust models for cost activities excluded from the pools
  - This is an issue particularly for Reinforcement

# Model selection: Time period





## **CEPA (2019, Annex to RIIO-2 Tools for Cost Assessment):**

*"In general, Ofgem should seek to maintain as consistent sample periods as possible across its benchmarking, as was the case at GD1. However, there may be circumstances where there is justification for adopting different approaches."*

- Historical costs represent a more independent benchmark
- Mixture of historical and forecast costs may account for changing industry (e.g. mixture of work in repex programmes)
- Forecast costs alone unsuitable for benchmarking
- Forecasts in remaining years of RIIO-GD1 are potentially less reliable

Model	Historical	GD1+GD2	GD1	GD2
<b>Totex</b>				
R <sup>2</sup>	0.85	0.86	0.85	0.87
RESET test	Fail	Fail	Fail	Fail
Eff. score range	0.26	0.24	0.26	0.24

- Model generally performs well and is consistent across time periods
- Efficiency scores range decreases over time
- Relatively consistent rankings, but higher year-on-year variability with historical data
- For all time periods, results are generally robust to removal of individual years or GDNs
  - Still high R<sup>2</sup>
  - Estimated coefficients show higher variation if individual GDNs are removed
  - Random Effects model also performs well, but lower estimated coefficient

Model	Historical	GD1+GD2	GD1	GD2
<b>Bottom-up models</b>				
R <sup>2</sup> (number of models below 0.60)	1/7	2/7	6/7	2/7
RESET test (number of models failed)	3/7	5/7	4/7	6/7
Eff. score range (lowest/highest)	0.21/0.54	0.23/0.55	0.24/0.54	0.21/0.62

- Frontier GDN changes depending on the activity
- Highest efficiency score range for Reinforcement and Work Management, lowest for Repex
- Coefficient sensitivity to removal of individual years/GDNs varies across models (e.g. lower sensitivity to year removal for Repex than for Reinforcement, but the opposite in terms of sensitivity to GDNs removal)
- Similar performance of corresponding Random Effects models, but lower estimated coefficients

### Historical

- Work Management regression exhibits low  $R^2$  (0.30)
- Highest  $R^2$  for Emergency, Connections and Reinforcement

### GD1+GD2

- Work Management - improvement on historical regression ( $R^2$  of 0.45). Reduced reinforcement regression performance compared to historical regression ( $R^2$  of 0.56)
- Highest  $R^2$  for Maintenance

### GD1

- Work Management regression exhibits low  $R^2$  (0.35)
- Highest  $R^2$  for Repex

### GD2

- Reinforcement regression exhibits low  $R^2$  (0.30)
- Work Management regression also shows low  $R^2$  ( $< 0.60$ ), although it improves compared to other time periods
- Highest  $R^2$  also for Repairs and Repex

# Model selection: Model aggregation





Potentially stronger relationships  
between costs and cost drivers

Accounts more fully for trade-offs  
and reporting inconsistencies

**Bottom-up**

**Top-down**

Doesn't account for trade-offs and  
differences in business practices

Potentially difficult to identify  
appropriate cost driver

**Model selection criteria**

Economic/technical rationale

Transparency

Robustness

## **RIIO-GD1 Initial Proposals:**

*"We consider the different modelling approaches provide useful information in assessing GDNs' comparative efficiency. For example, totex models ensure that we consider GDNs' opex-capex trade-offs in our comparative efficiency assessment, ie that we can identify those GDNs that have minimised total costs."*

*"Activity level analysis enables a richer model specification, ie we can take into account a greater number of potential factors that explain costs. Our models based on the principal expenditure lines, opex, capex, and repex, strike a balance between ensuring that we consider trade-offs between cost areas but allow a richer model specification than the high-level totex model."*

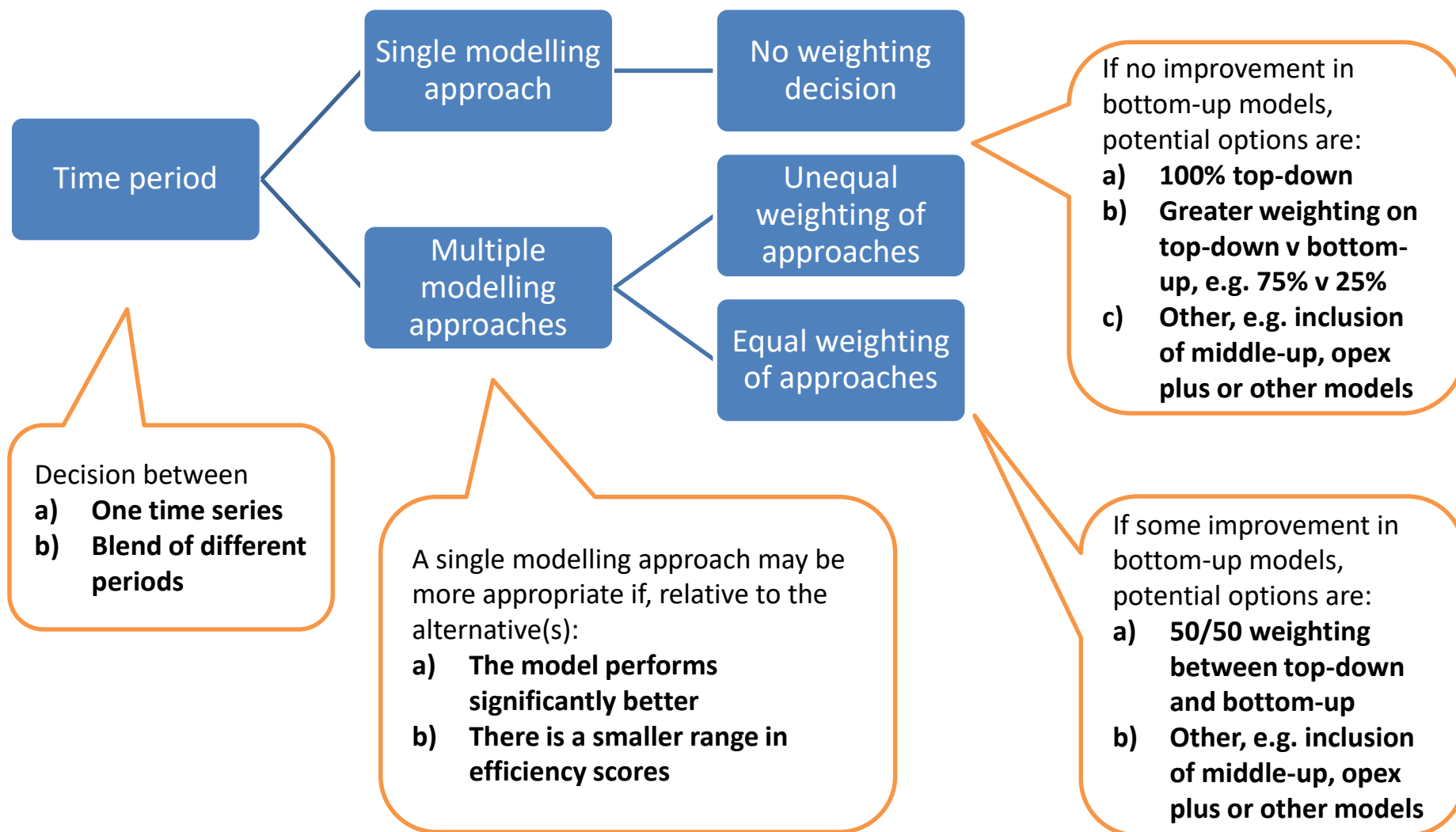
Disaggregation allows **better identification of cost drivers**, but there are associated **risks**:

- Not accounting for **cost trade-offs, differences in business practices**
- A GDN might look inefficient in a specific area, but have overall lower costs than others

# Discussion

## Modelling scenarios





**Our core purpose is to ensure that all consumers can get good value and service from the energy market. In support of this we favour market solutions where practical, incentive regulation for monopolies and an approach that seeks to enable innovation and beneficial change whilst protecting consumers.**

**We will ensure that Ofgem will operate as an efficient organisation, driven by skilled and empowered staff, that will act quickly, predictably and effectively in the consumer interest, based on independent and transparent insight into consumers' experiences and the operation of energy systems and markets.**