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CAWG 9

Repex cost assessment

9 May 2019

Classification: Confidential



SGN

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Reminder of discussion at CAWG 8

- Synthetic unit costs – advantages and disadvantages
- Unit cost analysis:
 - Unit costs have changed over time
 - Companies may be disadvantaged by work mix
 - Could distort the results
 - Higher diameter pipes have greater volatility
 - Usually bespoke projects – captured by regression?
 - Some innovative methods used – captured by regression?

Re-running GD1 models

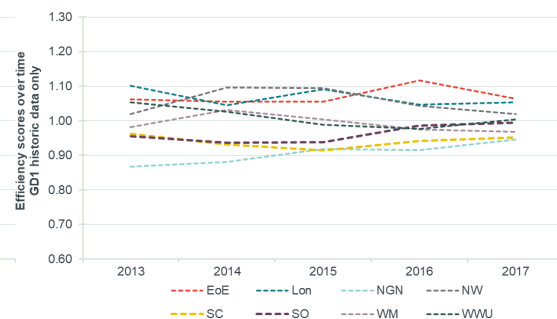
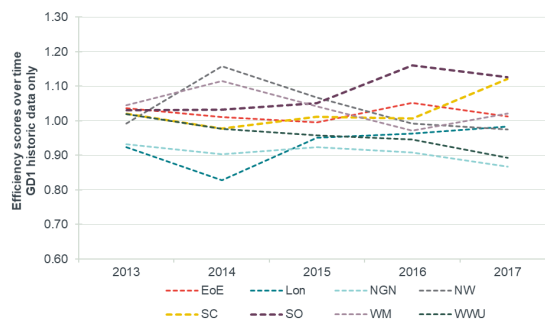
Updated results using latest outturn data

- Big movements year-on-year:
 - Eg NW 17% swing up in 13-14 then 9% swing down in next year 14-15
- Potentially unfair to use a single-year snapshot
 - Eg Lon consistently most efficient, but ends fourth on 2017 snapshot
 - Scotland has one atypical year (2017)
- Wide range of scores in 2017, arguably results are implausible – see next slide
- Overall suggests something is missing – synthetic unit cost does not give a full picture of efficiency

	2013/14		2014/15		2015/16		2016/17		2017/18	
	Eff score	Rank	Eff score	Rank	Eff score	Rank	Eff score	Rank	Eff score	Rank
EoE	1.04	7	1.01	5	1.00	4	1.05	7	1.01	5
Lon	0.92	1	0.83	1	0.95	2	0.96	3	0.98	4
NW	0.99	3	1.16	8	1.07	8	0.99	5	0.97	3
WM	1.04	8	1.12	7	1.04	6	0.97	4	1.02	6
NGN	0.93	2	0.90	2	0.92	1	0.91	1	0.87	1
SC	1.02	4	0.98	4	1.01	5	1.01	6	1.12	7
SO	1.03	6	1.03	6	1.05	7	1.16	8	1.13	8
WWU	1.02	5	0.98	3	0.96	3	0.95	2	0.89	2

*Results exclude capitalised repex

Repex scores (left) more variable than totex scores (right)



1. Volatility in regression results

Regression results are volatile

Repex regressions give a wide range of efficiency scores

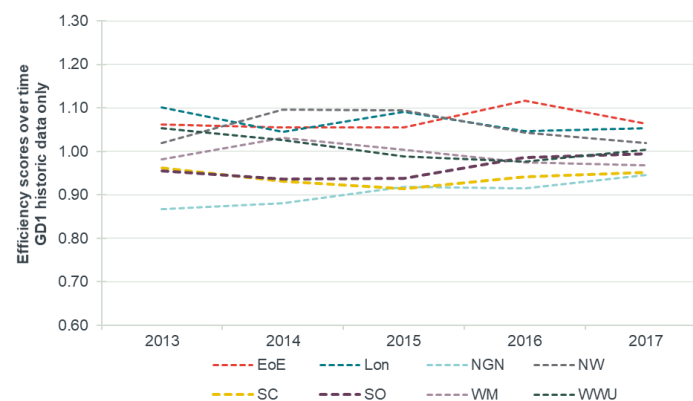
- Current results are volatile, single year results can be misleading
 - Between 2013/14 and 2015/16, London's efficiency score swung from 0.92 down to 0.83 in one year, and then back up to 0.95 the year after.
 - The score for North West spiked to 1.16 in 2014/15 before falling back to below average by 2016/17.
 - SGN Southern and Scotland both exhibit similar spikes, in 2016/17 and 2017/18 respectively.
- Current regressions compare unit costs; not credible that large and rapid swings in efficiency scores reflect genuine changes efficiency
 - On a unit cost basis, year-on-year changes of 10-15% do not seem realistic
- We suggest that this indicates some weaknesses in the underlying model, i.e. that it is not just capturing genuine changes in efficiency

Regression results are volatile

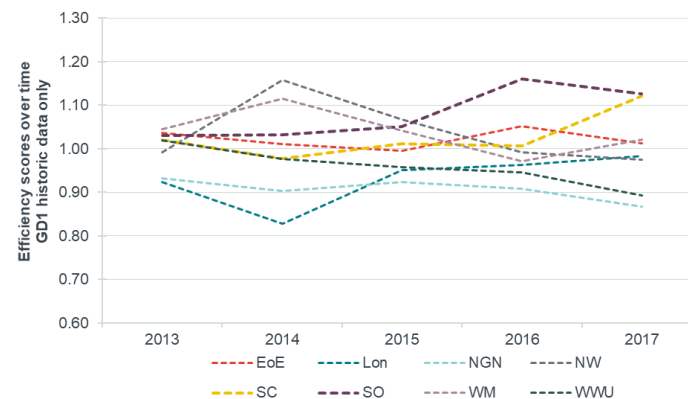
Repex regressions give a wider range of efficiency scores than a totex regression

- Comparing the volatility in repex to the volatility in totex, clear there are issues
- In totex:
 - there is a narrow band of efficiency in which companies operate (within +/- 10%); and
 - Little movement across the bands by one company (+/- 5%)
- In repex:
 - There is a much broader band of efficiency (+/-20%); and
 - Much greater volatility for individual companies (+/- 15%).
- Can account for volatility in different ways:
 - Smoothing costs using a moving average;
 - Aggregating workload and costs; or
 - Averaging single year regression results.

Totex efficiency scores



Repex efficiency scores

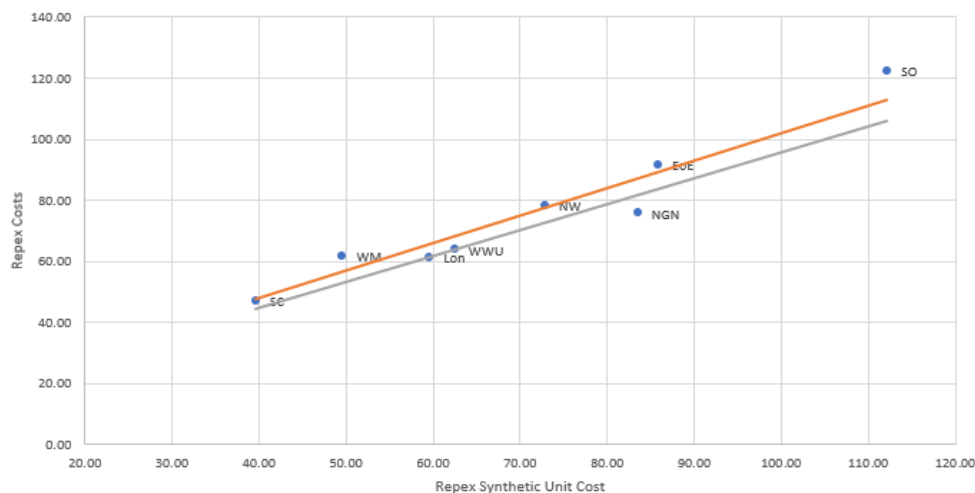


Repex Smoothed

Use a moving average cost to smooth lumpy Repex costs

- Using smoothed Repex costs (over a 7 year moving average, like capex) which minimises lumpy costs.
- This puts less emphasis on the costs in a 'snapshot' year, and takes into account costs over a whole price control
- However, it struggles conceptually:
 - The regression uses an annual workload driver and a moving average cost in each year
 - For a given year, the workload only refers to one year of costs, but it is regressed against a 7-year average of costs.
 - Therefore, the workload in one year is not a good explainer of costs over 7-years.

	Standardised Efficiency Score	Ranking
EoE	1.03	6
Lon	0.94	2
NW	1.01	4
WM	1.10	8
NGN	0.87	1
SC	1.01	5
SO	1.10	7
WWU	0.94	3

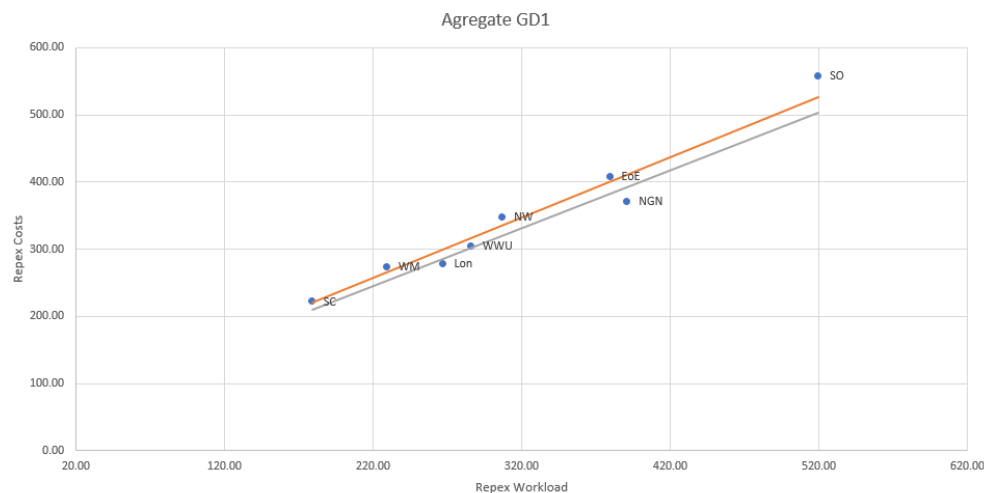


Aggregate GD1 regression

Instead of using a snapshot year, make efficiency costs based on costs aggregated over 5 years

- Total workload and costs over the price control, and perform one regression
- Efficiency of work done in a snapshot year may not be representative of the efficiency over a full price control
- The results versus the base case show:
 - A narrower range of efficiency scores, which suggests the regressions are now explaining actual efficiency (rather than spurious cost differences)
- Risk this doesn't capture efficiency improvements over price control – there will be a trade-off with volatility
- But also doesn't capture cost pressures that increase over time

	Standardised efficiency scores	Ranking
EoE	1.02	4
Lon	0.93	2
NW	1.04	6
WM	1.04	7
NGN	0.90	1
Sc	1.04	5
So	1.07	8
WWU	0.96	3



Aggregate vs average

An aggregate regression is also preferable to taking an average of yearly efficiency scores

- Another possibility to control for volatility is to average efficiency scores from the GD1 baseline model in each year
- This method shows similar results to aggregate efficiency scores
- Aggregate regression is preferred approach because:
 - Smoothed regression has a cost driver has does not intuitively explain the moving average cost
 - Average of regression results does not control for size of workload in a particular year – the aggregate regression is essentially a weighted average of the efficiency scores – it controls for relative size of cost and workload.

GDN	Smoothed		Aggregated		Averaged	
	Efficiency Score	Ranking	Efficiency Score	Ranking	Efficiency Score	Ranking
EoE	1.03	6	1.02	4	1.02	4
Lon	0.94	2	0.93	2	0.93	2
NW	1.01	4	1.04	6	1.03	6
WM	1.1	8	1.04	7	1.03	7
NGN	0.87	1	0.9	1	0.91	1
SC	1.01	5	1.04	5	1.02	5
SO	1.1	7	1.07	8	1.08	8
WWU	0.94	3	0.96	3	0.98	3

Discussion points

There are likely to be a number of discussion points, including:

- Is there a need to take into account volatility in efficiency scores?
- Do any of the suggested options sufficiently account for this?
 - Are there any other potential solutions to year-on-year volatility?
 - Are there any other issues with the suggested solutions?

2. Unit cost assessment

Unit costs have changed since GD1

- Table shows Ofgem's unit cost assumption vs. GD1 outturn data
- Smallest band has no material change
- Other bands have bigger changes – particularly higher diameter bands
- Unit cost assumption needs to be accurate to avoid unfairly penalising work mix variation (see annex) – plus it's not clear if high diameter pipes are suitable for unit cost analysis

2017/18 prices

Diameter band	Ofgem (existing)	GD1 average	% change
<=75mm	102	102	1%
>75mm to 125mm	113	120	6%
>125mm to 180mm	188	195	3%
>180mm to 250mm	320	296	-7%
>250mm to 355mm	431	379	-12%
>355mm to 500mm	640	690	8%
>500mm to 630mm	962	1526	59%
>630mm	1157	1757	52%

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Tier 1 only

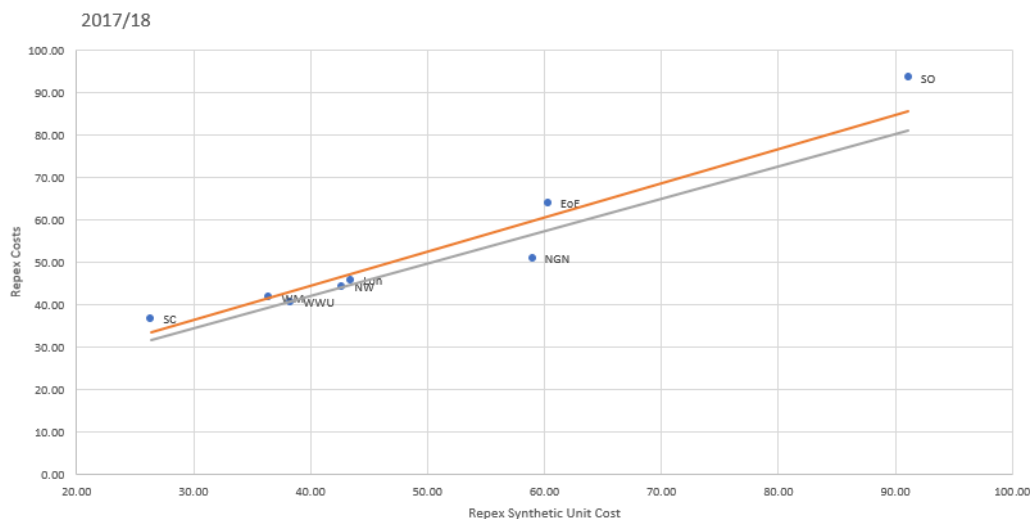
Using Tier 1 work only gives similar results to overall regressions

- Repex regression run with below 180mm (Tier 1) work only
 - This is work that appears to be most closely correlated cost and workload relationship
- However, the results do not show much difference between this and the GD1 baseline

Repex Tier 1 only

	2013/14		2014/15		2015/16		2016/17		2017/18	
EoE	1.08	7	1.02	6	0.99	3	0.98	4	1.05	6
Lon	0.92	2	0.83	1	0.91	1	0.90	1	0.96	4
NW	1.02	6	1.11	7	1.08	8	1.01	5	0.94	2
WM	1.09	8	1.14	8	1.03	6	0.96	3	1.01	5
NGN	0.90	1	0.92	2	0.91	2	0.93	2	0.85	1
SC	1.00	4	0.97	3	1.05	7	1.02	6	1.14	8
SO	1.00	5	1.02	5	1.02	5	1.17	8	1.11	7
WWU	0.98	3	0.99	4	1.01	4	1.03	7	0.95	3

R-Squared: 0.99962



Excluding Tier 1

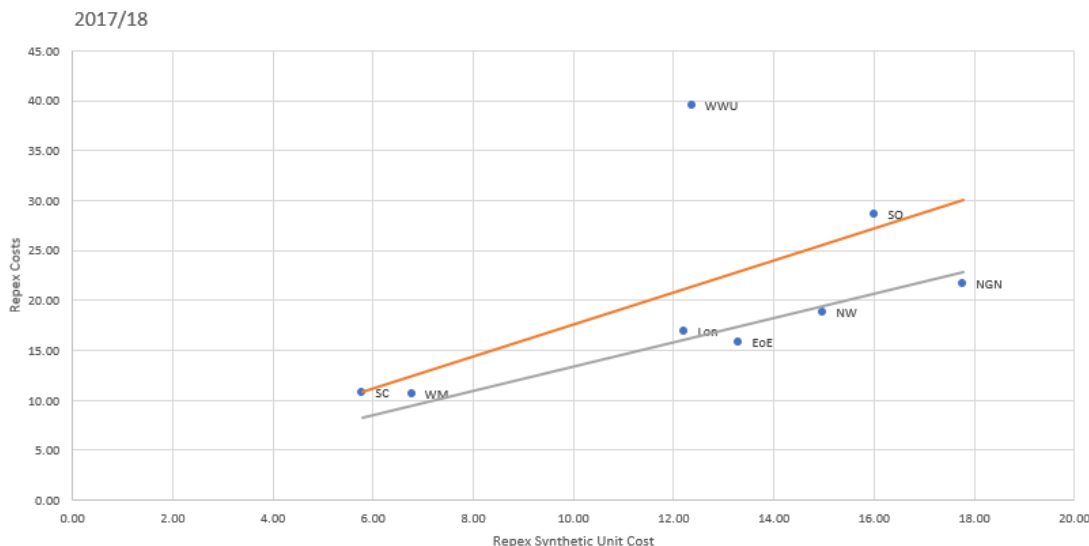
Analysing Tier 2/3 work only gives a wide range of efficiency scores

- Efficiency scores much wider on non-tier 1 work – with a range of 1.32 between the lowest and highest efficiency scores
- Synthetic unit costs may be a poor explainer of efficiency for these tiers of work
- And it is a consistently poor explainer across all years – lower R-squared
- Note: these results do not capture innovative techniques (see next section)

Repex Excluding Tier 1

	2013/14		2014/15		2015/16		2016/17		2017/18	
EoE	0.55	2	0.67	4	0.79	3	1.10	7	0.71	1
Lon	0.67	4	0.66	3	0.92	5	0.84	4	0.83	4
NW	0.63	3	0.87	5	0.72	1	0.66	1	0.76	3
WM	0.54	1	0.63	1	0.82	4	0.74	3	0.89	5
NGN	0.82	5	0.64	2	0.75	2	0.66	2	0.75	2
SC	1.36	7	1.14	7	0.97	6	1.07	5	1.05	6
SO	1.14	6	0.94	6	1.12	7	1.09	6	1.09	7
WWU	2.29	8	2.45	8	1.91	8	1.84	8	1.91	8

R-Squared: 0.981755



Discussion points

There are likely to be a number of discussion points, including:

- Are some pipe diameters not effectively considered by unit cost analysis?
- Should these pipes be considered differently? If so, how?
 - E.g. engineering assessment for large, complex or bespoke projects

3. Capturing innovative processes and design

Innovative processes

The goal of repex programme is not to lay pipes, it is to reduce risk from iron mains pipes

- Ofgem's regression demonstrates one method of doing this – laying new pipes
- May be more innovative ways to reduce risk than laying pipes:
 - Robotics for remove risk (CISBOT)
 - Optimise network design to avoid relaying every pipe
- Neither approach is recognised in the current repex regressions

Case study: SGN CISBOT

SGN has an example of an innovative process that is not taken into account by current regressions

- SGN's new technology, called CISBOT, which allows management of risk from large iron mains, without the costs associated with laying new pipe
 - CISBOT has a cost, but doesn't involve lay any pipe, skewing benchmarking performance
 - Large impact on Southern's efficiency score
- Ofgem need to understand whether other innovation is being used by other DNs and not included in benchmarking
 - Acknowledging current innovation on the benchmarking models will incentivise innovation in the next price control

Repex with CISBOT

	2013/14		2014/15		2015/16		2016/17		2017/18		Aggregate GD1	
EoE	1.04	7	1.02	5	1	5	1.06	7	1.02	5	1.03	4
Lon	0.9	1	0.83	1	0.95	2	0.97	3	0.99	4	0.93	2
NW	1	3	1.16	8	1.07	8	1	5	0.98	3	1.04	7
WM	1.04	8	1.11	7	1.05	7	0.97	4	1.03	6	1.04	6
NGN	0.94	2	0.91	2	0.93	1	0.91	1	0.88	1	0.91	1
SC	1.02	4	0.97	3	0.98	4	1	6	1.13	8	1.03	5
SO	1.04	6	1.03	6	1.04	6	1.14	8	1.06	7	1.06	8
WWU	1.02	5	0.98	4	0.96	3	0.95	2	0.9	2	0.97	3

Using abandonment in workload

Optimising the network, rather than replacing pipes

- Through strategic network optimisation, networks can (safely) abandon pipes without having to increase workload
- Active approach to network optimisation is often efficient, but not rewarded in benchmarking
- The principle of using mains abandoned as a cost driver appears sound, but there might be further work to refine exactly how this is done
- In reality, the results do not change significantly versus the approach using mains laid

Repex abandoned length (with CISBOT)

	2013/14		2014/15		2015/16		2016/17		2017/18		Aggregate GD1	
EoE	1.09	8	1.05	6	1.02	5	1.11	7	1.06	7	1.06	8
Lon	0.97	3	0.84	1	0.96	3	0.98	4	1.01	4	0.96	3
NW	1.00	4	1.16	7	1.09	8	1.00	5	0.97	3	1.05	6
WM	1.05	7	1.16	8	1.05	7	0.95	3	1.03	5	1.04	5
NGN	0.92	1	0.89	2	0.94	2	0.93	2	0.92	2	0.92	2
SC	1.00	5	0.97	4	1.01	4	1.01	6	1.06	6	1.03	4
SO	1.02	6	1.02	5	1.04	6	1.15	8	1.14	8	1.06	7
WWU	0.94	2	0.91	3	0.89	1	0.87	1	0.81	1	0.89	1

This regression replaces length of mains laid with length of mains abandoned in the synthetic unit cost

Discussion points

There are likely to be a number of discussion points, including:

- Are there any other innovative processes that should be taken into account in the regression?
- Are there any views on measuring abandonment rather than
- Relatedly, what unit costs should be applied to the abandoned workload? How to make a robust synthetic unit cost?

4. Quality and customer service

Quality and customer service

- It is extremely difficult to consider quality as part of the benchmarking models, but it should be noted that repex outputs are not homogenous – i.e. there are differing qualities of service between GDNs
- But the relatively high quality work comes at a cost; should DN's who produce relatively higher quality work be punished on cost assessment?
- A “sense-check” against some output metrics may be a practical way to ensure high-performing networks are not punished for relatively high cost performance

Discussion point: should Ofgem incorporate quality as a sense-check? If so, how?



5. Other issues

Excluding relaid after escape

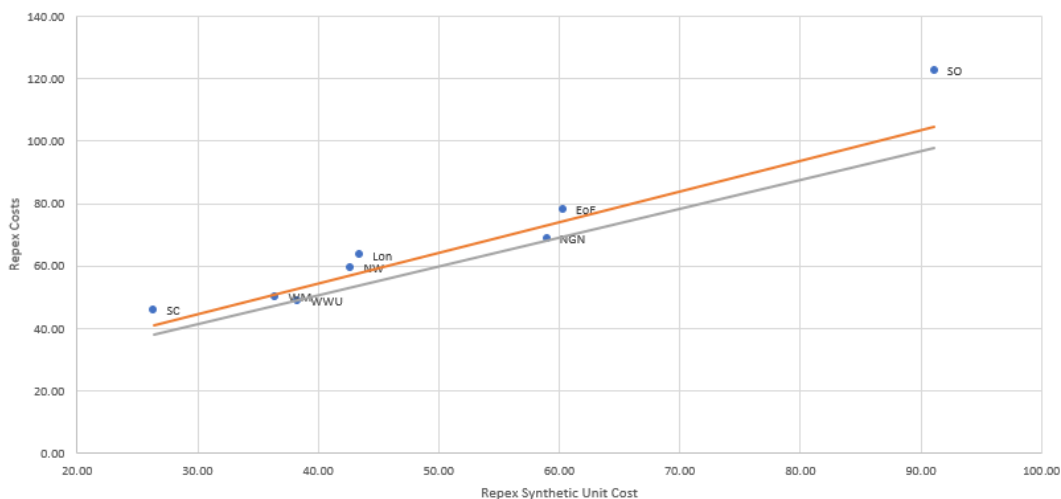
Relaid after escapes are volatile, and are not subject to the same drivers as other repex work

- Relaid after escapes category is inherently different to other repex categories
- Relaid after escapes work is often unplanned and using direct labour; whilst repex work is often planned and uses contract labour
- Likely to have more volatile costs and uncertain workloads
- Therefore, it is difficult to consider this in a unit cost assessment

Repex excluding relaid after escape

	2013/14		2014/15		2015/16		2016/17		2017/18	
EoE	0.98	3	0.98	4	0.96	2	0.92	2	1.00	5
Lon	0.93	1	0.86	1	1.01	5	1.07	7	1.04	6
NW	1.01	7	1.16	8	1.05	8	0.98	4	0.99	4
WM	1.01	6	1.10	7	1.00	4	0.95	3	0.95	3
NGN	0.99	5	0.95	3	0.93	1	0.91	1	0.89	2
SC	0.96	2	0.92	2	0.97	3	0.99	5	1.11	7
SO	0.98	4	1.00	5	1.02	6	1.15	8	1.13	8
WWU	1.13	8	1.03	6	1.05	7	1.04	6	0.89	1

2017/18



Other considerations

There are a number of other areas that might need some consideration

- Vital to keep regional adjustments and adjust for London effects
 - It's important to update these regional adjustments to reflect the most recent data
- Similarly, other normalisations will need to be updated for GD2, in particular Streetworks
- Each DN has a different business model
 - There is always the need for a totex “sense-check” to understand total efficiency, no matter the business model – this could influence the split between totex and bottom-up

Discussion points

There are likely to be a number of discussion points, including:

- Should relaid after escapes be part of repex cost assessment?
 - Are there any other costs to be excluded?
- Are there any other regional adjustments?
- How does the repex cost assessment account for different business models?

6. Overall results and discussion points

Overall results

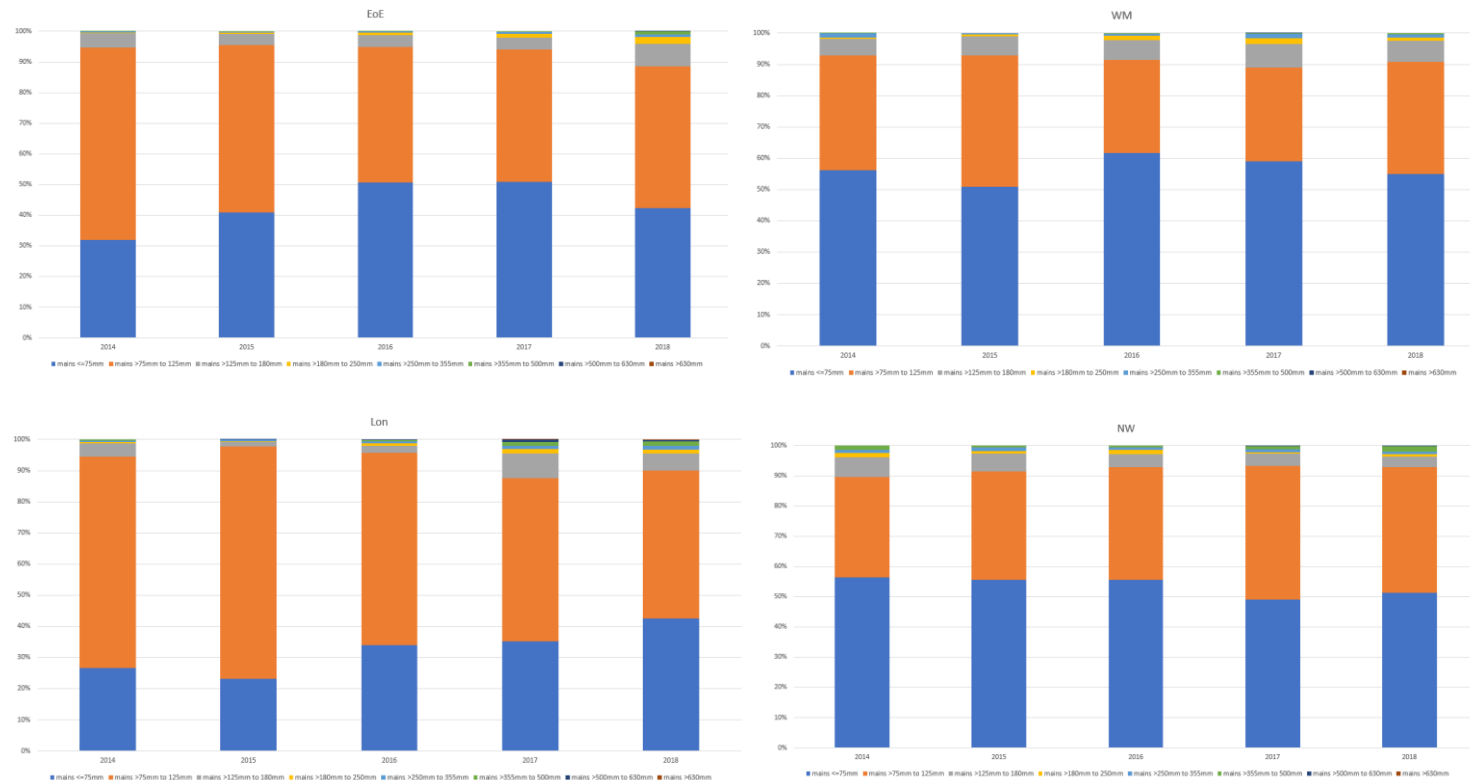
There have been a number of potential issues and remedies presented, below is a summary of discussion points

- Volatile regression results
 - Is there a need to adjust results for volatility?
 - Is aggregation the best method of doing this?
- Unit cost variation
 - Is it appropriate to remove higher diameter pipes from the regression analysis?
- Capturing innovative processes
 - Are there other innovative processes not accounted for?
- Quality & customer service
 - How should Ofgem incorporate quality into the regressions?
- Other issues
 - Should relaid after escapes be excluded from the regression analysis?
 - Are there are more normalisations or adjustments necessary for this analysis?

Annex. Network workloads and costs

Mains workload split by diameter band

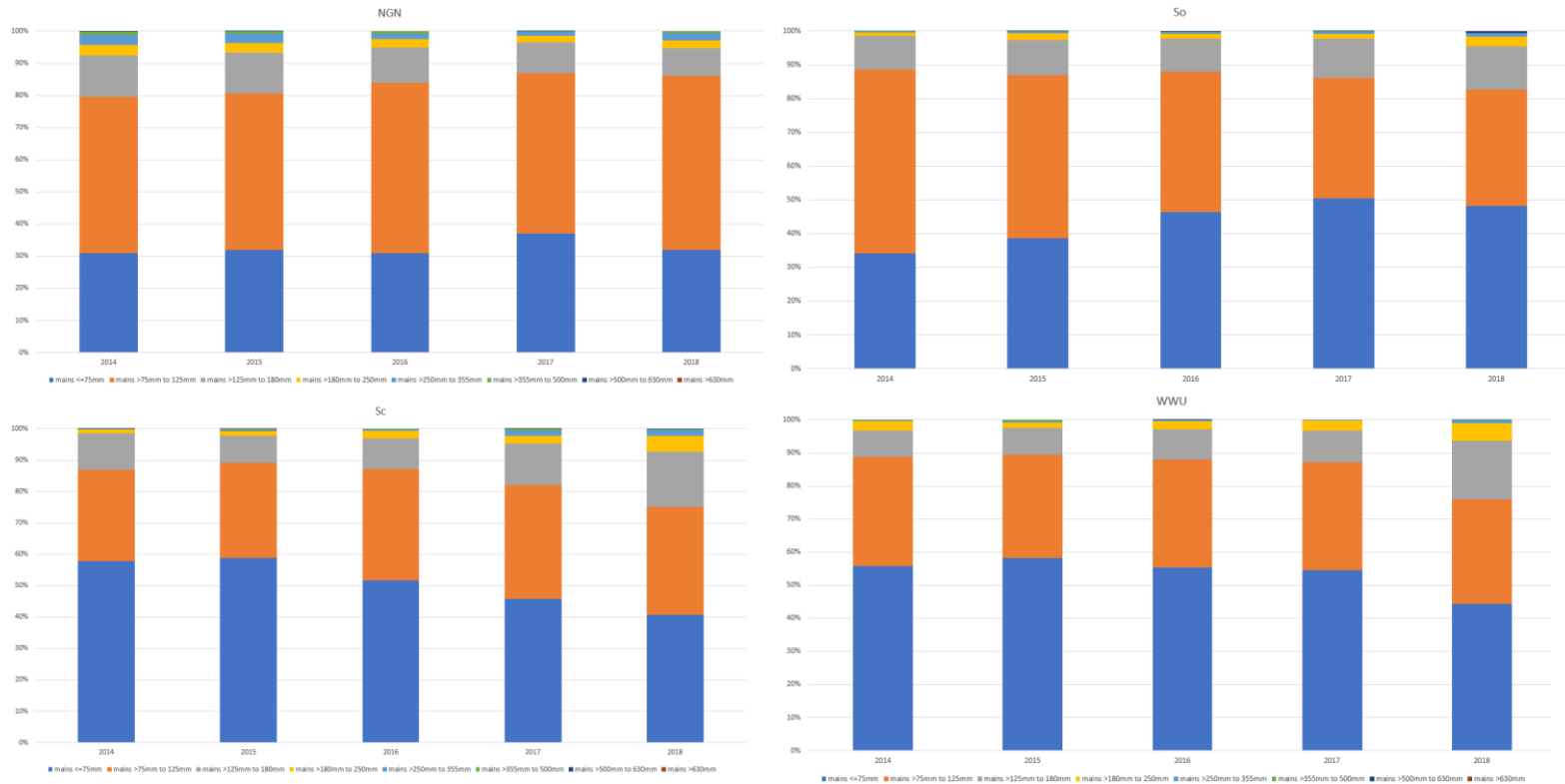
Different networks have different workloads that change over time



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Mains workload split by diameter band

Different networks have different workloads that change over time

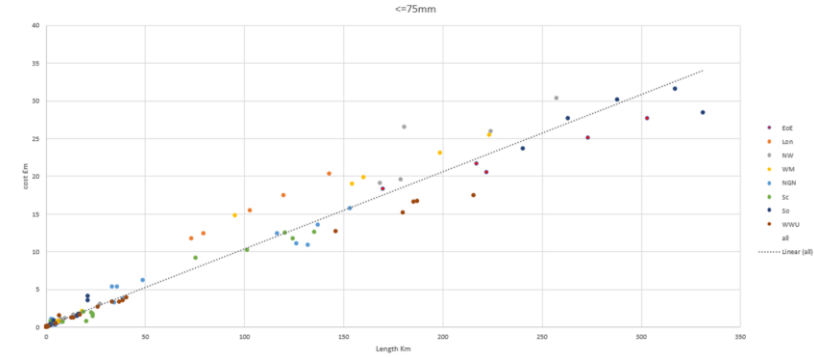


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Pipe diameters <180mm only

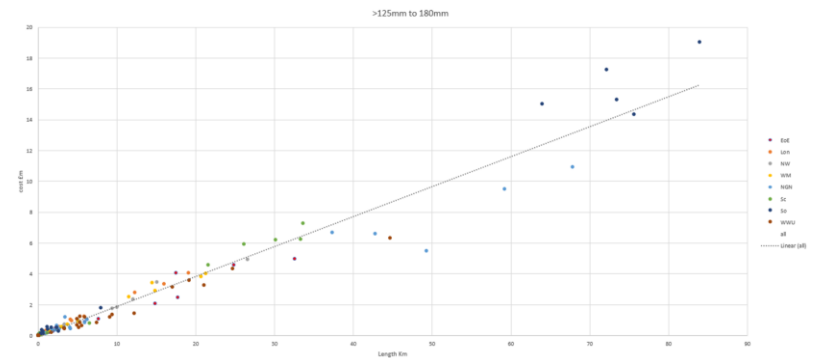
- The tables plotted here are for the three diameter bands below 180mm (Tier 1).
- The submitted costs are plotted against the submitted laid length.
- There is strong correlation between cost and length at these smaller diameters which makes it sensible to use regression benchmarking to measure efficiency.
- Visually, the points are clustered closely around the regression line, which suggests the workload in that category might explain costs reasonably well.

$\leq 75\text{mm}$



75mm to
125mm

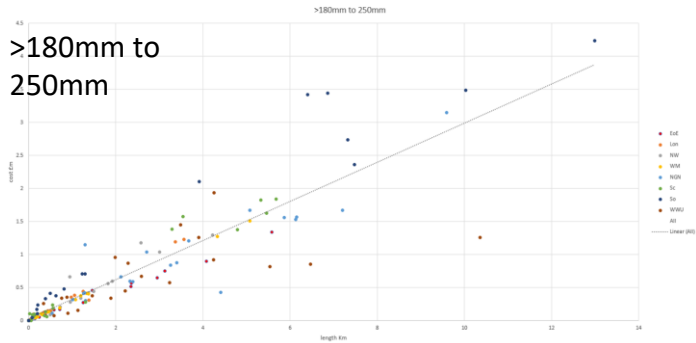
>125mm to
180mm



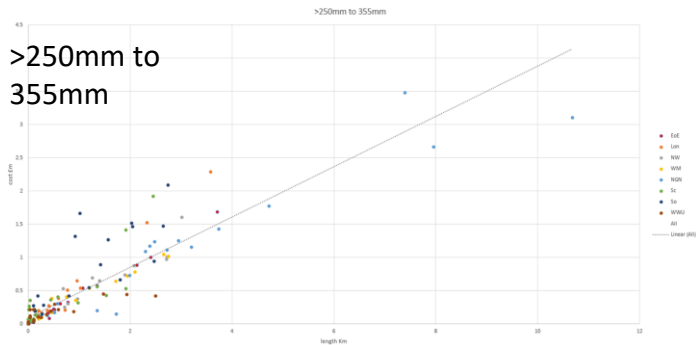
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Pipe diameters >180mm only

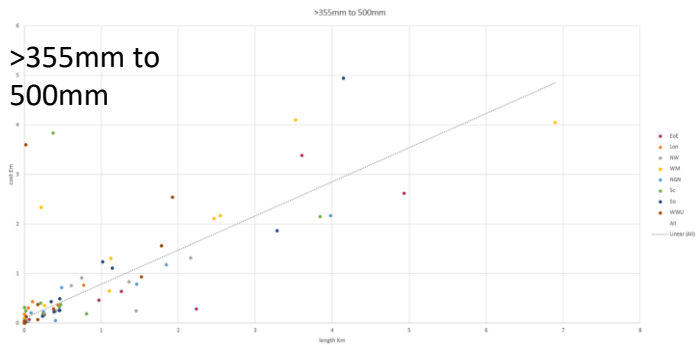
>180mm to 250mm



>250mm to
355mm



>355mm to 500mm



>500mm to 630mm

>630mm

- Visually, they appear very different from the narrow pipe band charts
- As the length laid increases the costs tend to be more variable, which suggests large projects are often more complex - not suitable for unit cost assessment
- As the pipe width increases, again, the costs tend to be more variable, which suggests projects on wider pipes are more bespoke – again, not suitable for unit cost assessment



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