



PR19 - Innovation and Efficiency Gains from the TOTEX Framework

Workshop discussion

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Agenda

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Activity	Responsible	Time
Registration – Tea and Coffee	All	9:30 – 10:00
Welcome, introduction and purpose of this work	Ofwat & KPMG	10:00 – 10:05
How are companies responding to the shift to totex and outcomes in AMP 6 and is there more that companies could do in AMP 7?	United Utilities and Severn Trent	10.05 – 10.35
How can companies maximise the benefits from totex and outcomes in AMP 7?	Serverlec	10.35 – 10.50
Key findings from bottom-up work	Aqua	10.50 – 11.05
Break		11.05 – 11.20
Key findings from the top-down work	KPMG	11.20 – 11.50
Group discussion		11:50 – 12:20
Next steps	KPMG & Ofwat	12:20 – 12:30
Lunch		12.30 –



Introduction & purpose of this work

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How are companies responding to the totex and outcomes frameworks in AMP 6?

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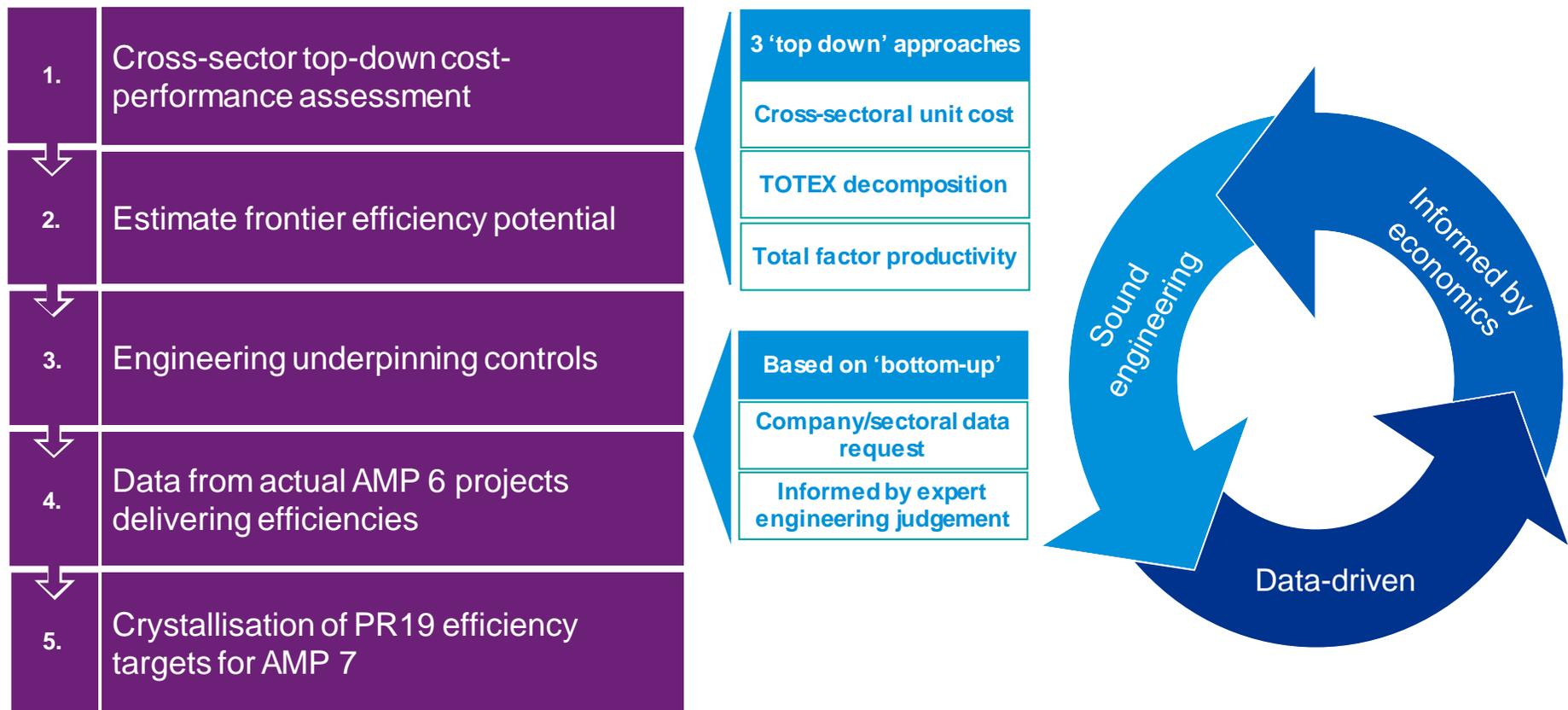
Key findings from bottom up work

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Overall approach

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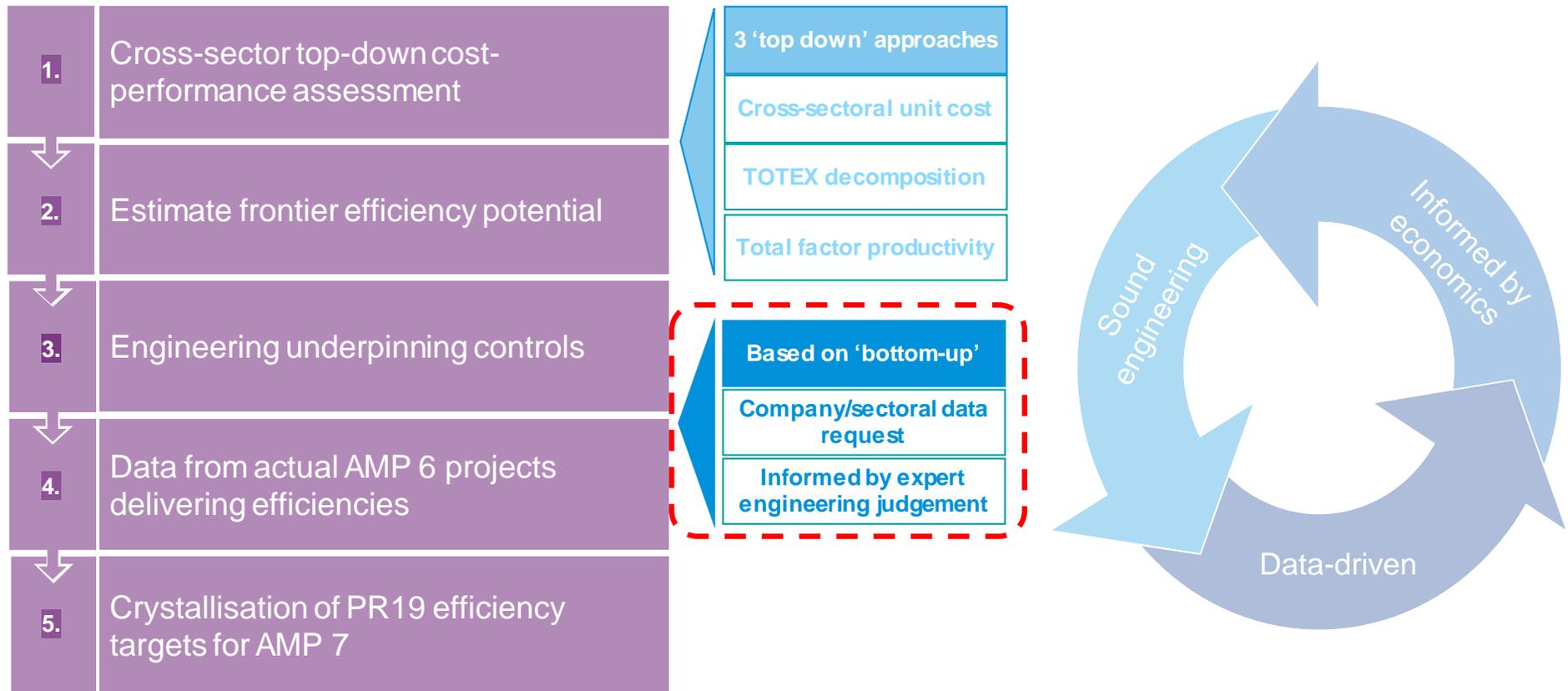
Our overall approach used a range of evidence sources to examine the relationship between efficiency and totex and outcomes.



Overall approach

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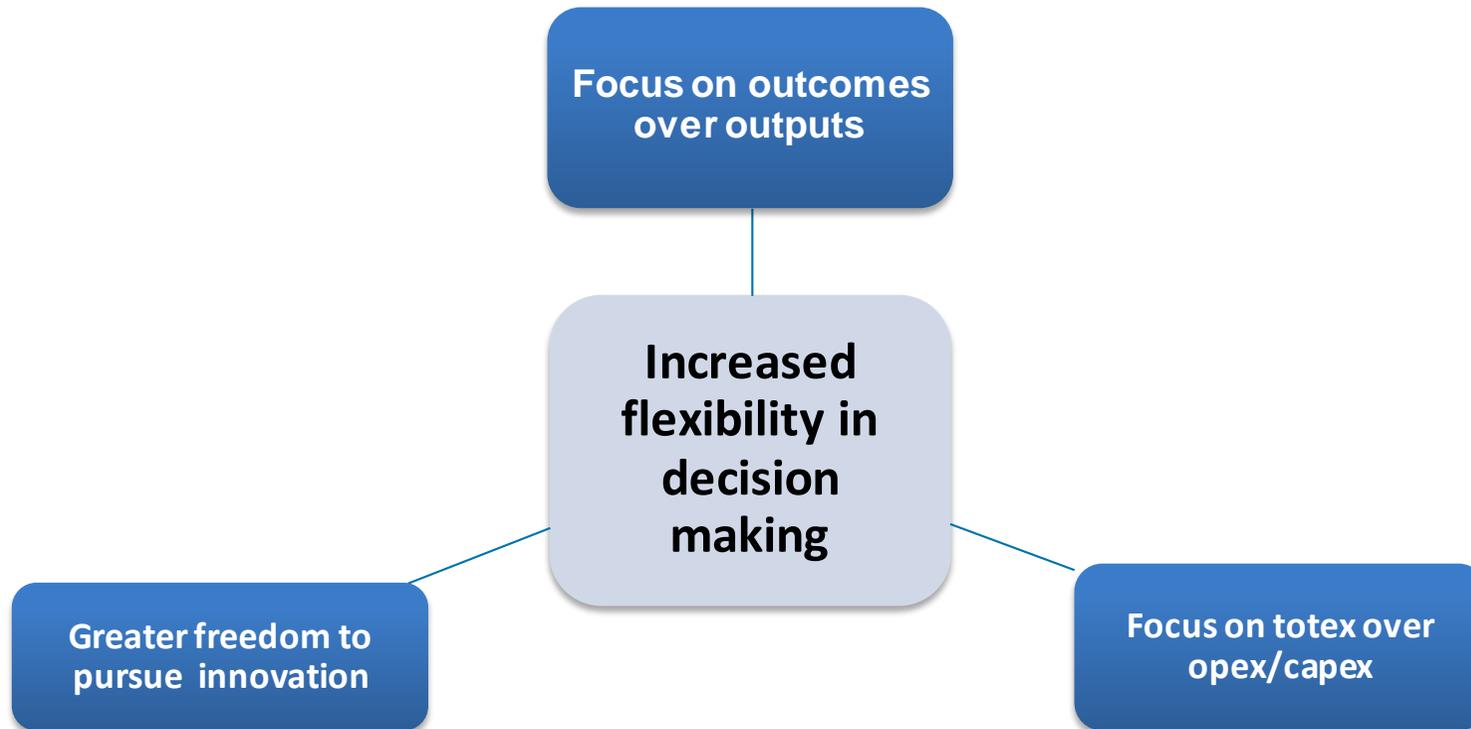
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Reported flexibility of the totex framework

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Shifting the focus from efficient cost delivery of outputs to lowest totex delivery of outcomes



Reports of tangible efficiency savings, replicable more widely during AMP7

Data Request

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Engagement with Companies and Supply Chain

1.	Data Request Design and issue a standardised data request for Totex examples to both water companies and industry
2.	First Filter Assess the initial responses and select a smaller shortlist of examples of particular interest
3.	Second Data Request Issue 2nd targeted data request, building on the information already provided by respondents
4.	Analysis Engineering and cost analysis of examples, taking a view on potential replicability of identified efficiencies and innovations
5.	Report Summarise analysis and conclusions and co-ordinate with the top-down analysis



Repeatability



Time Horizon



Impact

Data Request Responses

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respondents to the
data request
15 from Companies, 4 from
Supply Chain

19

35%

average reported saving
from application of totex
framework

case studies returned
across all price controls

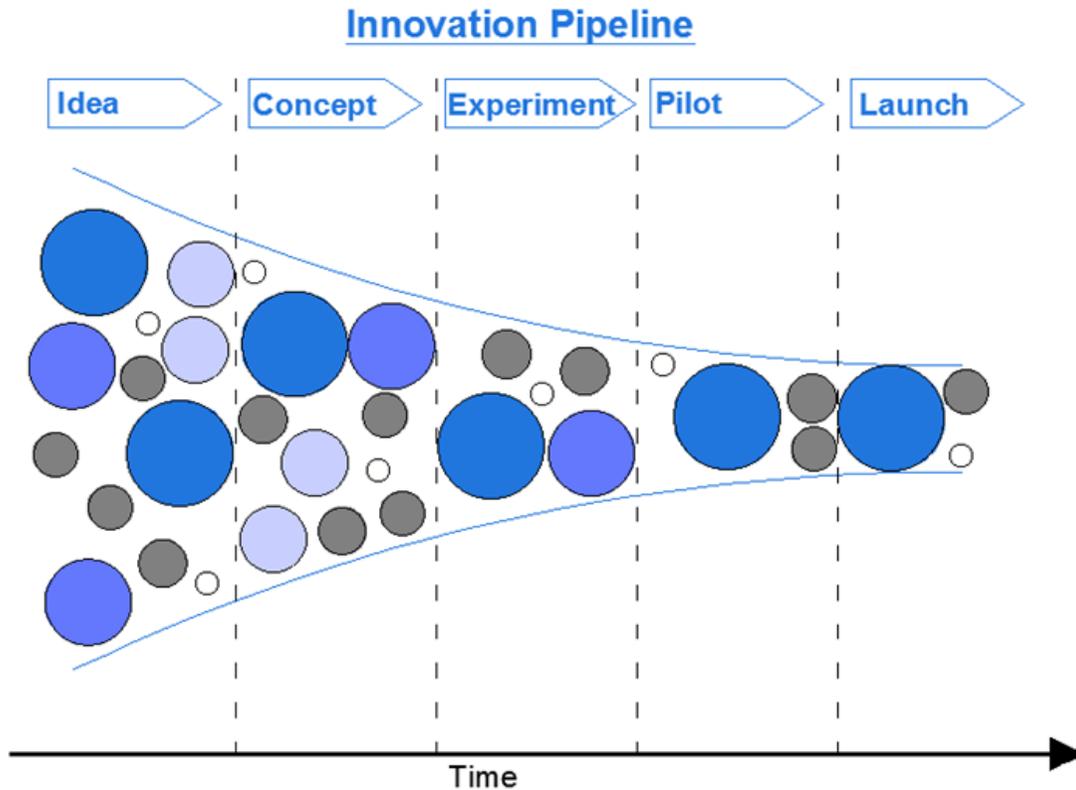
~200

6

key trends identified

1. Leakage reduction
2. "Big Data" & Internet of Things
3. Catchment management
4. Customer awareness & education
5. SuDS and other "green" solutions
6. Innovation teams

Totex case studies



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1.	Ideas & Concepts Potential to add efficiency to the water industry yet difficult to assess due to early stage of implementation
2.	Experimentation, Trials & Pilots Innovation has begun to be regarded as the normal process
3.	Deployment and Launch Case studies supplied by companies with information on the costs and efficiencies realised from the projects
4.	Medium & Longer Term Deployment Case studies where materials, methods and processes are being developed that could start to deliver benefits in the medium to longer term
5.	Future Innovation Reported “game-changing” trends that could deliver significant efficiency potential in the long term

Totex case studies

"Having real time information on all our assets and processes... would mean that we could **operate as efficiently as possible** and **respond rapidly** to unexpected events.

It could also give us a **better understanding of those we serve** – their needs and wants and how they use our service."



Demonstration of an acoustic mains condition assessment technique at Anglian Water



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LOW PHOSPHORUS DEMONSTRATION TRIALS

Why

Water Framework Directive (WFD) will require Water Companies to meet significantly tighter phosphorus (P) permits. The conventional approach to remove P is to dose iron, itself a specific pollutant, but this will not achieve the low levels of P required.

What

We invested £4m in an industry leading, two year (2014 -2016) demonstration trial at Packington STW with the following objectives:

- Identify which technologies can deliver very low effluent phosphorus standards (~0.1 mg/l).
- Assess process and asset reliability.
- Assess operability of the solution.
- Quantify operating costs.
- Assess process ability to remove other pollutants (e.g. heavy metals).

How

Six technologies were evaluated in a side by side demonstration trial. The selected technologies include adsorption, chemical precipitation with enhanced solids removal, and biological processes.

Benefits

We have already built three full scale phosphorus removal plants, with another six in detailed design. Our current estimation is that these schemes will deliver TOTEX efficiencies of over £13.6m. Over the remainder of AMP6 and AMP7 we envisage further TOTEX savings of a similar scale.

Without Innovation

- We wouldn't have known that it was possible to reach such low levels of phosphorus.
- We would have invested in oversized treatment solutions.

£13.6m
TOTEX
efficiency



World's first algal bead bio-reactor



ATKINS Cranfield UNIVERSITY

SEVERN
TRENT

Innovation

Totex case studies

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"Having real time information on all our assets and processes... would mean that we could **operate as efficiently as possible** and **respond rapidly** to unexpected events.

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Wessex Water



LOW PHOSPHORUS DEMONSTRATION TRIALS

Why

Water Framework Directive (WFD) will require Water Companies to meet significantly tighter phosphorus (P) permits. The conventional approach to remove P is to dose iron, itself a specific pollutant, but this will not achieve the low levels of P required.

What

13.6m
TOTEX
efficiency

De
cc

Ice Pigging:
Innovation becomes business as usual



ePulse tech

- We wouldn't have known that it was possible to reach such low levels of phosphorus.
- We would have invested in oversized treatment solutions.

SEVERN
TRENT
Innovation

Summary of reported savings

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Price Control	Number of detailed case studies received	Average totex saving over 5 years (%)
Water Resources	8	34
Water Network Plus	8	44
Wastewater Network Plus	24	40
Bioresources	4	-12
Retail	1	52
Multiple	3	37
Total	48	35



Break

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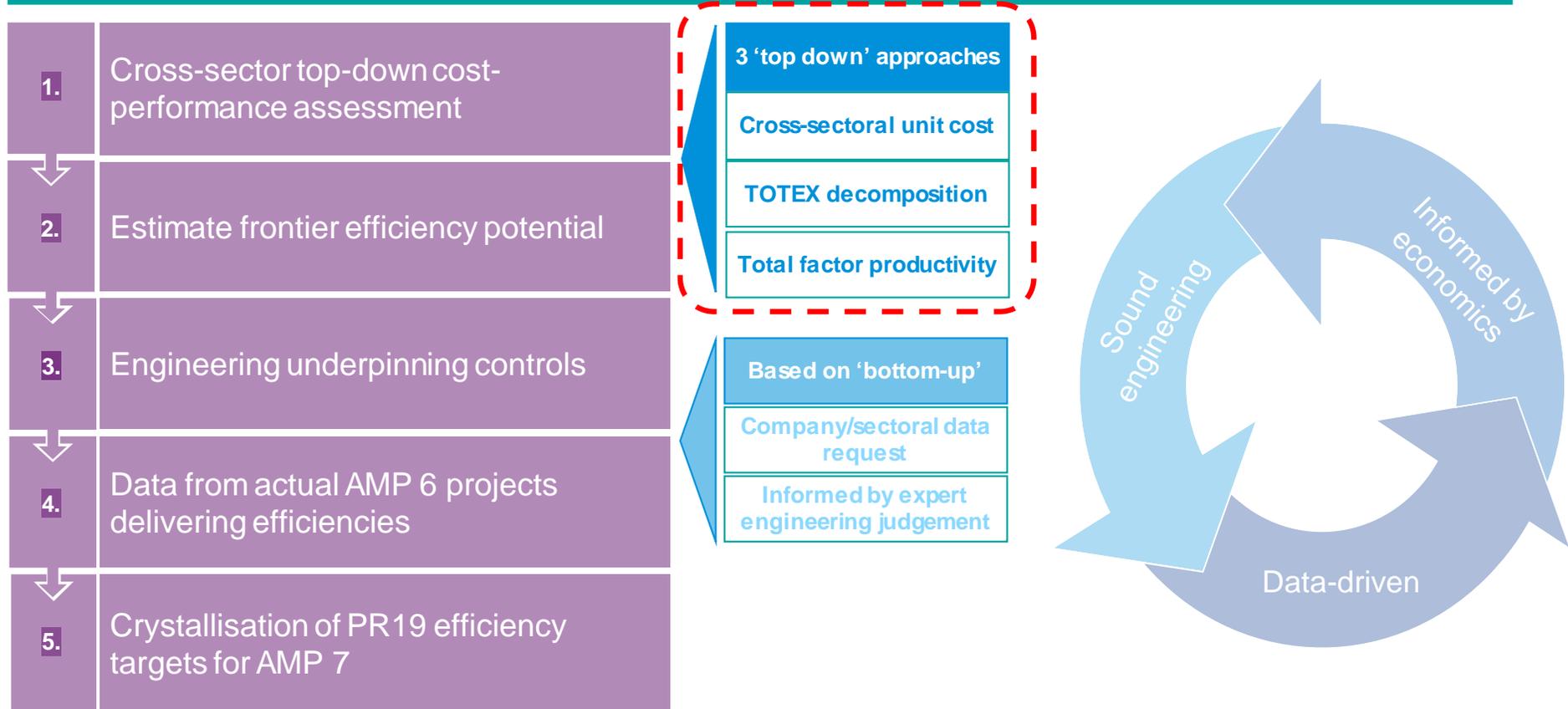
Key findings from the top-down work

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Overall approach

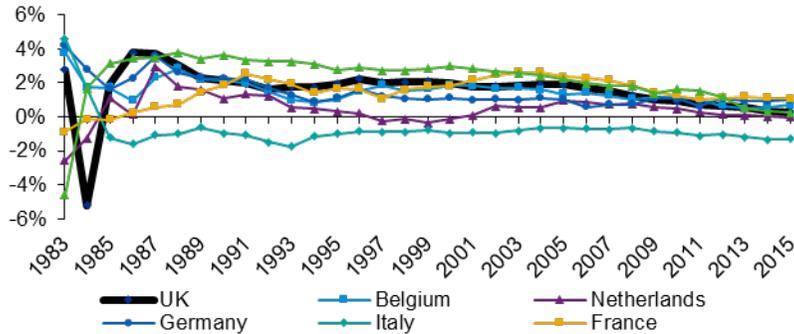
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Our overall approach used a range of evidence sources to examine the relationship between efficiency and totex and outcomes.



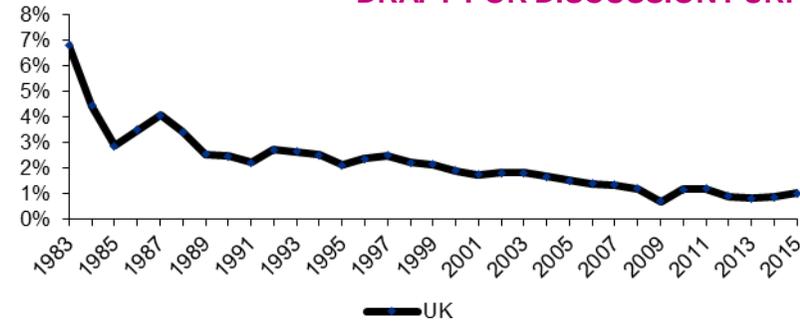
Frontier shift - wholesale

TFP growth in utilities sector



TFP growth in construction sector

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Adjustment	Region	1994-08	2009-14	1982-08
None	UK	0.9%	-3.3%	1.3%
	EU ex UK*	0.9%	-2.8%	0.9%
Capital intensity	UK	0.4%	-4.1%	0.9%
	EU ex UK*	0.7%	-3.1%	NA

Adjustment	Region	1994-08	2009-14	1982-08
None	UK	0.0%	1.6%	1.2%

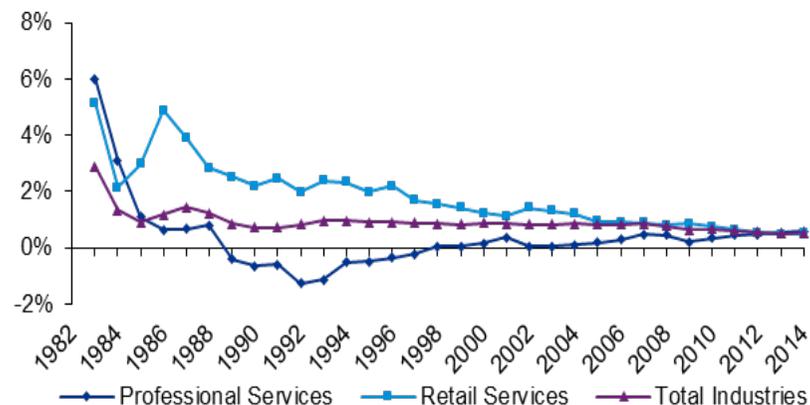
- UK data over complete business cycles suggest a frontier shift range of around 0.4% - 1.3% for utilities.
- EU average suggest frontier shift range around 0.7% to 0.9%, i.e. within the UK range.
- Consistent with recent regulatory decisions on wholesale frontier shift.

- Construction sector provides alternative benchmark, but more relevant for capex than opex.
- Relied on by Ofgem in estimating capex frontier shift at RIIO-1.
- UK construction TFP over business cycles is 0.0 to 1.2%.

In the round, wholesale frontier shift may be towards the upper end of the range between 0.4% and 1.2% p.a or 2-6% over AMP 7

Frontier shift - retail

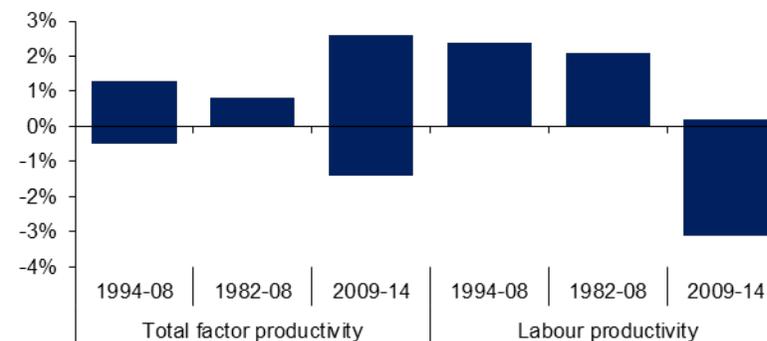
TFP growth in relevant sectors for retail activities



Sector	Sector	1994-08	2009-14	1982-08
Professional services	TFP	1.3%	2.6%	0.5%
	Labour	2.4%	-3.1%	1.4%
Retail services	TFP	-0.5%	-1.4%	0.8%
	Labour	1.3%	0.2%	2.1%
Total industries	TFP	0.6%	-0.1%	0.8%
	Labour	1.6%	-0.3%	1.8%

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Range of TFP and labour productivity gains



- Retail comprises mainly labour costs. Analysis therefore covers both total factor and labour productivity.
- Long-run average TFP gains are in range between 0.5% and 0.8% and labour productivity gains in the range between 1.4% and 2.1%.
- Labour productivity gains sharply declined during the current cycle. Labour productivity could trend back towards the long-run average. If so, this would support efficiency gains for AMP7 towards the upper end of the range.

In the round, retail frontier shift may be in the range between 0.8% and 1.8% or 4-9% over AMP7.

Totex cost performance analysis

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Estimates of efficiency gains from totex and outcomes framework based on an analysis of water and energy totex cost performance under four hypotheses										
Diminishing impact on efficiency gains of a new regulatory change over time										
<table border="1"> <thead> <tr> <th></th> <th>No</th> <th>Yes</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Attribution of outperformance to efficiency gains from totex</td> <td> <p>Entire outperformance</p> <ul style="list-style-type: none"> Regulator takes account of ALL previous period outperformance when setting a new price control All outperformance over first totex price controls attributable to efficiency gains from totex framework Enduring impact of totex framework <p>Hypothesis 1 (H1)</p> </td> <td> <ul style="list-style-type: none"> Regulator takes account of ALL previous period outperformance when setting a new price control All outperformance over first totex price controls attributable to efficiency gains from totex framework Impact of totex framework diminishes over the second totex control (by 1/3 based on analysis of ED1) <p>Hypothesis 3 (H3)</p> </td> </tr> <tr> <td> <p>Totex outperformance less pre-totex outperformance</p> <ul style="list-style-type: none"> Company performance perfectly correlates from one price control to the next Enduring unobservable efficiency gains from one price control to the next Incremental outperformance between totex and pre-totex price controls reflect efficiency gains due to totex Enduring impact of totex framework <p>Hypothesis 2 (H2)</p> </td> <td> <ul style="list-style-type: none"> Company performance perfectly correlates from one price control to the next Enduring unobservable efficiency gains from one price control to the next Incremental outperformance between totex and pre-totex price controls reflect efficiency gains due to totex Diminishing impact of totex framework <p>Hypothesis 4 (H4)</p> </td> </tr> </tbody> </table>				No	Yes	Attribution of outperformance to efficiency gains from totex	<p>Entire outperformance</p> <ul style="list-style-type: none"> Regulator takes account of ALL previous period outperformance when setting a new price control All outperformance over first totex price controls attributable to efficiency gains from totex framework Enduring impact of totex framework <p>Hypothesis 1 (H1)</p>	<ul style="list-style-type: none"> Regulator takes account of ALL previous period outperformance when setting a new price control All outperformance over first totex price controls attributable to efficiency gains from totex framework Impact of totex framework diminishes over the second totex control (by 1/3 based on analysis of ED1) <p>Hypothesis 3 (H3)</p>	<p>Totex outperformance less pre-totex outperformance</p> <ul style="list-style-type: none"> Company performance perfectly correlates from one price control to the next Enduring unobservable efficiency gains from one price control to the next Incremental outperformance between totex and pre-totex price controls reflect efficiency gains due to totex Enduring impact of totex framework <p>Hypothesis 2 (H2)</p>	<ul style="list-style-type: none"> Company performance perfectly correlates from one price control to the next Enduring unobservable efficiency gains from one price control to the next Incremental outperformance between totex and pre-totex price controls reflect efficiency gains due to totex Diminishing impact of totex framework <p>Hypothesis 4 (H4)</p>
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Totex analysis- Energy totex performance

H1/H3: Totex price control cost performance

Price control	Median	UQ	Max
DPCR5 (actual)	6.6%	9.6%	15.5%
RIIO-T1 (forecast)	4.7%	7.2%	11.8%
RIIO-GD1 (forecast)	15.5%	16.8%	17.0%
Total	7.1%	12.2%	17.0%
RIIO-ED1 (forecast)	0.7%	5.6%	20.7%

Greater weight placed on DPCR5 as it is the only complete totex price control. Large gap between UQ and maximum, so upper bound limited at UQ.
H1 range 6 – 10%. H3 range is 4 – 7%.

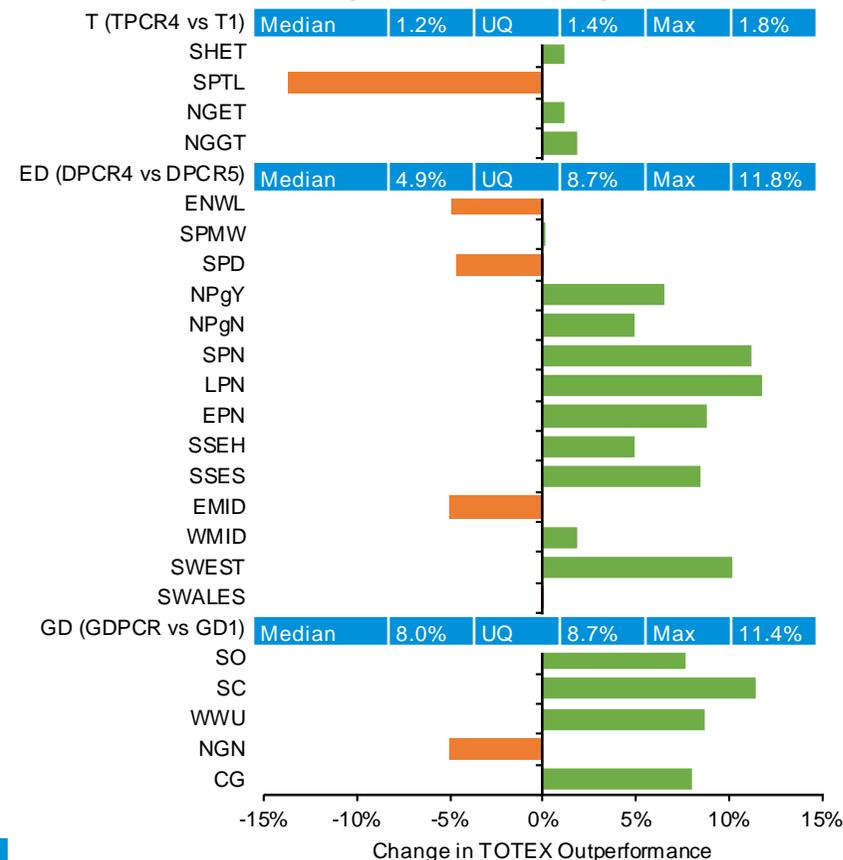
H4: Incremental totex price control outperformance with diminishing return

Price control	Median	UQ	Max
DPCR5 (actual)	3.9%	5.6%	8.0%
RIIO-T1 (forecast)	-0.2%	2.1%	3.2%
RIIO-GD1 (forecast)	6.8%	7.5%	8.8%
Total	3.7%	6.3%	8.8%

Assuming diminishing return and placing greater weight DPCR5, the range under H4 is 6 – 8%.

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H2: Incremental totex price control outperformance



Broad-based gains in totex outperformance.
H2 range is 5 – 12%.

Totex analysis- Water totex performance

H1/H3: PR14 RoRE-based totex performance

	Median	UQ	Max
WoC	-0.2%	7.2%	10.9%
WaSC	7.8%	9.9%	21.7%
Total	4.6%	9.7%	21.7%

Max value driven by two outliers so upper bound capped at upper quartile. H1 Range is 5 – 10%. H3 range is 3 – 7%

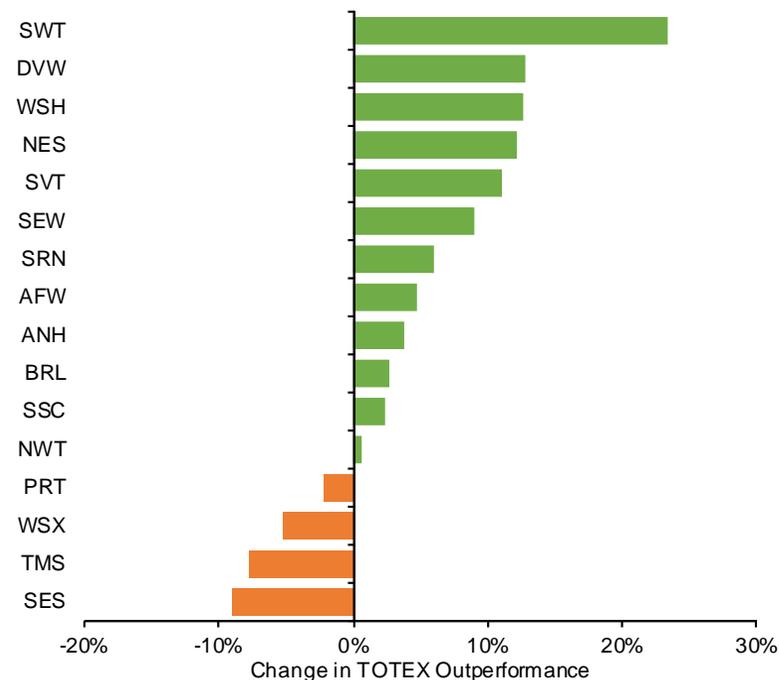
H4: Incremental PR14 outperformance with diminishing return

	Median	UQ	Max
WoC	1.7%	4.1%	8.0%
WaSC	4.2%	7.1%	15.1%
Total	3.1%	6.2%	15.1%

Assuming diminishing return, the range under H4 is 3 – 6%

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H2: Totex performance comparison PR09 vs PR14

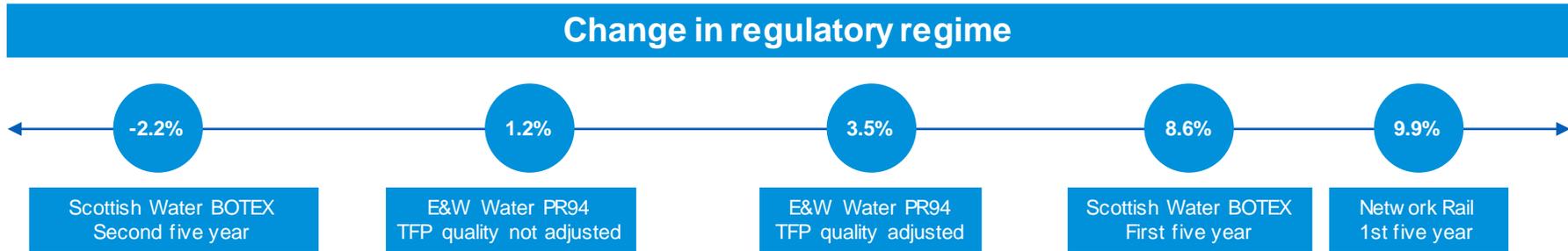


Total	Median	4.2%	UQ	11.4%	Max	23.4%
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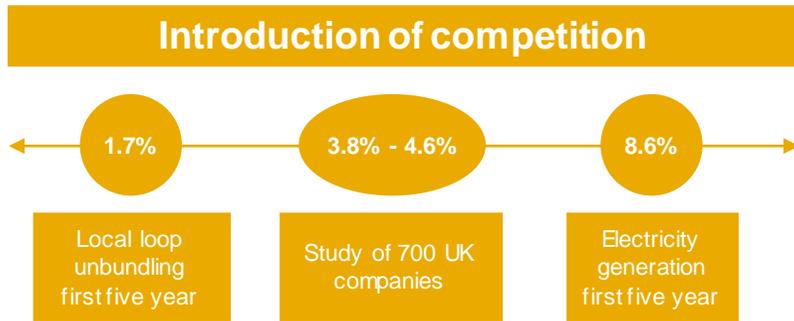
Broad-based gains in totex outperformance. Large gap between UQ and max so capped upper bound at UQ
H2 range is 4 – 11%

Efficiency gains from significant changes

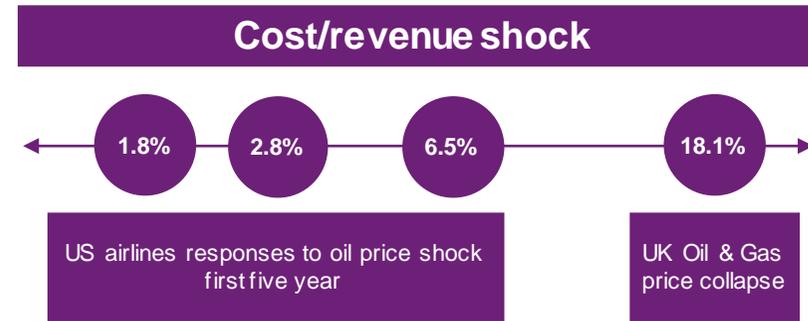
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1% - 3% per annum (net of frontier shift) based on TFP study for E&W Water.



3 - 5% per annum based on academic studies



1 -3% per annum based on US low cost and regional airlines.

As a cross check- efficiency gains from TOTEX may be circa 1-3% per annum based on examples of efficiency gains elsewhere

Overall results

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Total efficiency potential for AMP7 applicable to base year efficient cost net of catch-up efficiency (per year)



Wholesale activities

0.4% - 1.3%

Based on TFP analysis and in line with previous regulatory decisions

H1 1.0 - 2.0%

H3 0.6 - 1.4%

H2 0.8 - 2.4%

H4 0.6 - 1.6%

H1 1.4 - 3.3%

H3 1.0 - 2.7%

H2 1.2 - 3.7%

H4 1.0 - 2.9%

Totex and outcomes framework unlock further innovation and efficiency gains. Outperformance increases in both the water and energy sectors. Attribution of outperformance to the totex framework is unclear. Range supported by examples of efficiency gains

Retail activities

0.8% - 1.8%

Not applicable

0.8% - 1.8%



Group discussions

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Breakout groups

1. Do you have any comments on the approach to the study?
2. Do companies support the hypothesis that totex and outcomes have increased the scope for efficiency and outperformance?
3. What are the opportunities to make more use of totex and outcomes and how much more can companies achieve in AMP7?
4. What factors other than the totex and outcomes shift are driving outperformance in AMP 6?
5. Are companies expecting to deliver efficiencies in the ranges provided in AMP 7?
6. How does this differ across different controls?

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Next steps

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Next steps

1. Incorporate comments and feedback from today
2. Comments to be provided by 30 March
3. Report to be finalised by mid April
4. Ofwat to consider findings from the report and company business plan submissions during PR19

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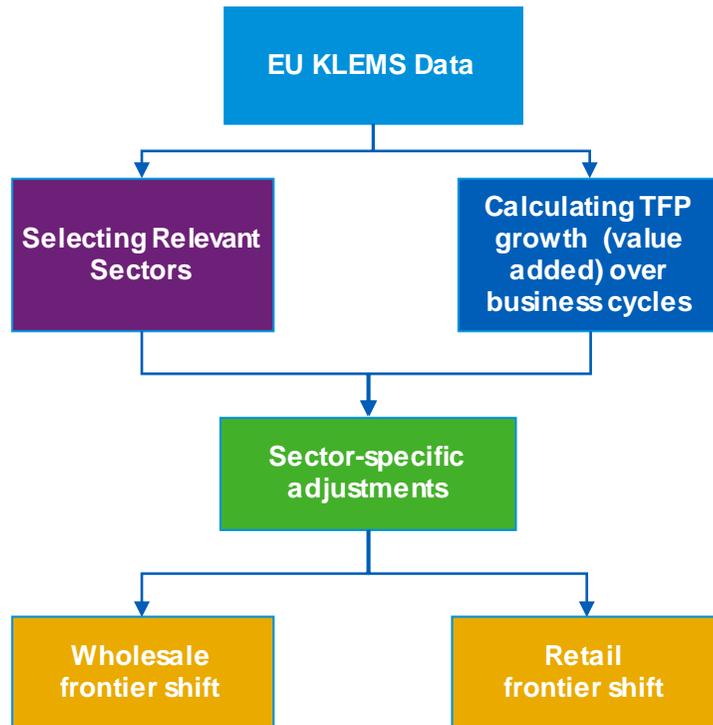




Annex

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Approach to frontier shift analysis



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Selecting Relevant Sectors	
Wholesale	<ul style="list-style-type: none"> Electricity, gas and water supply (utilities) Construction
Retail	<ul style="list-style-type: none"> Professional services Retail trade, except motor vehicles Total industries

TFP growth over business cycles		
Cycle 1: 1982 - 1991	Cycle 2: 1991 - 2008 (base)	Cycle 3: 2009 - 2014 (Incomplete cycle)
Long-run average 1982 - 2008		
Sector-specific adjustments		
Wholesale	<ul style="list-style-type: none"> Water-specific capital intensity 	
Retail	<ul style="list-style-type: none"> Labour productivity 	



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