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# The Building Blocks Approach – Part II

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Albert Banal-Estanol

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# Allowable costs

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# Operating Expenditures (Opex)

- “Expenditures from running the business” including
  - Administrative expenses and overhead, salaries, marketing costs
  - Research and development expenditures
  
- Regulator observes current operating costs from regulatory accounts
  - Pro-forma profit and loss, balance sheet and cash-flow statements
  - Regulated business ring-fenced from other businesses
  
- Regulator needs to...
  - In transmission, adjust current expenditures by exceptional items and expected increases in opex and roll forward by assumed expected efficiency improvements
  - In distribution, start with benchmarked costs (relative performance, expected changes in sector productivity and expected catch-up) (see next chapter)

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# Capital Expenditures (Capex)

- “Cash required for investment activities”
  - Purchases of new property, plant, and equipment
- How to estimate future capital expenditure ex-ante?
  - Engineers’ reports
  - Benchmarking against other businesses
  - Submission of business plans
- How to adjust actual expenditures ex-post?

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# Approaches to setting initial RAB value

- Accounting based
  - HCA, CCA, Replacement costs
- Market based
  - Market Capitalisation, Sale price
- Model based
  - MEA, DCF, DORC, Deprival rule

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# Accounting based approaches

- **Historic cost accounting**
  - assets are valued at their original purchase cost and are depreciated over their accounting lives
- **Current cost accounting**
  - assets are valued at original purchase cost but value on books is updated by general inflation every year
- **Replacement costs**
  - assets are valued by inflating historic costs by an index specific to those assets or the industry considered

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# Market-based approaches

- **Market Capitalisation:**
  - Company valued using stock market valuation (share-price x number of shares) plus net debt
- **Initial sales price:**
  - based on the initial sales price at privatisation
  - E.g. electricity: initial share price adjusted by 15% (for under-pricing) plus net debt is added

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# Model based approaches

- **Modern Equivalent Asset**
  - Assets are valued at the cost of buying a new asset that would perform the same function
  - Or at the recoverable value of the existing asset if they are not worth replacing
- **Discounted Cash-flow:**
  - The valuation of the company is based on the net present value (NPV) of the future stream of profits
- **Depreciated Optimised Replacement Cost**
  - Modern engineering equivalent or the optimal configuration is used to determine the standard replacement cost and then assets are depreciated



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# Example: Distribution in the UK

- Method: adjusted flotation value
  - Value of the companies on the day of flotation
  - Less value attributed to other parts of the business (transmission holdings, generation and supply)
  - 50% uprate for an increase in share values and changes in cost of capital since privatisation
  - Following “reopener”, uprate reduced to 15%

# Example: Gas distribution

Table 1:Regulatory Asset Values for Gas Distribution (£ Millions, 2000 prices)

Regional Network	RAVs at 1 <sup>st</sup> April 2002	RAVs at 1 <sup>st</sup> April 2007
Scotland	670	707
North England	1,072	1,108
North West	1,137	1,134
East England	1,865	1,791
West Midlands	903	909
Wales and West	915	947
London	1,024	1,000
South England	1,789	1,785
Total	9,376	9,382

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# Rolling forward the RAV

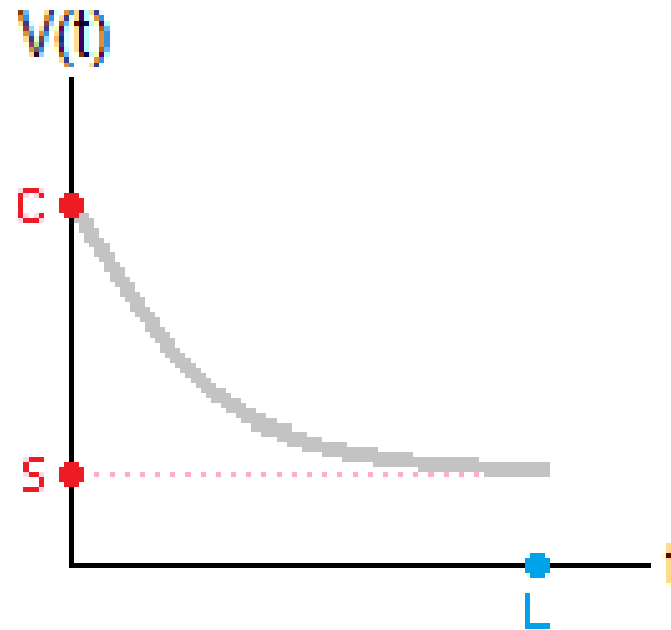
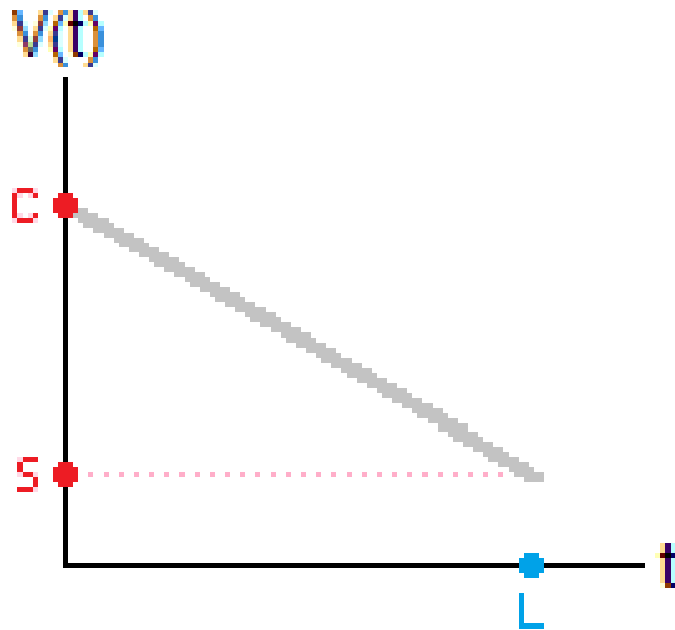
- After initial value, forecast changes during price control period
  - Investment in the system
  - Depreciation of existing components
- At the start of the next price control, adjust to reflect:
  - actual level of capex spend, subject to meeting with efficiency conditions
  - inflation
- Important for certainty, fairness etc that once a starting value of RAV has been established, it is not changed

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# Depreciation

- Calculated by making assumptions on...
  - Assets' expected average life (e.g. 20-30 years)
  - Rate of depreciation:
    - Straight-line method: equal amounts of depreciation
    - Reducing balance method: decreasing amounts of depreciation
  - Issues:
    - Depreciation related to life or rate of use?
  
- Applied to the RAV

# Straight and accelerated depreciation

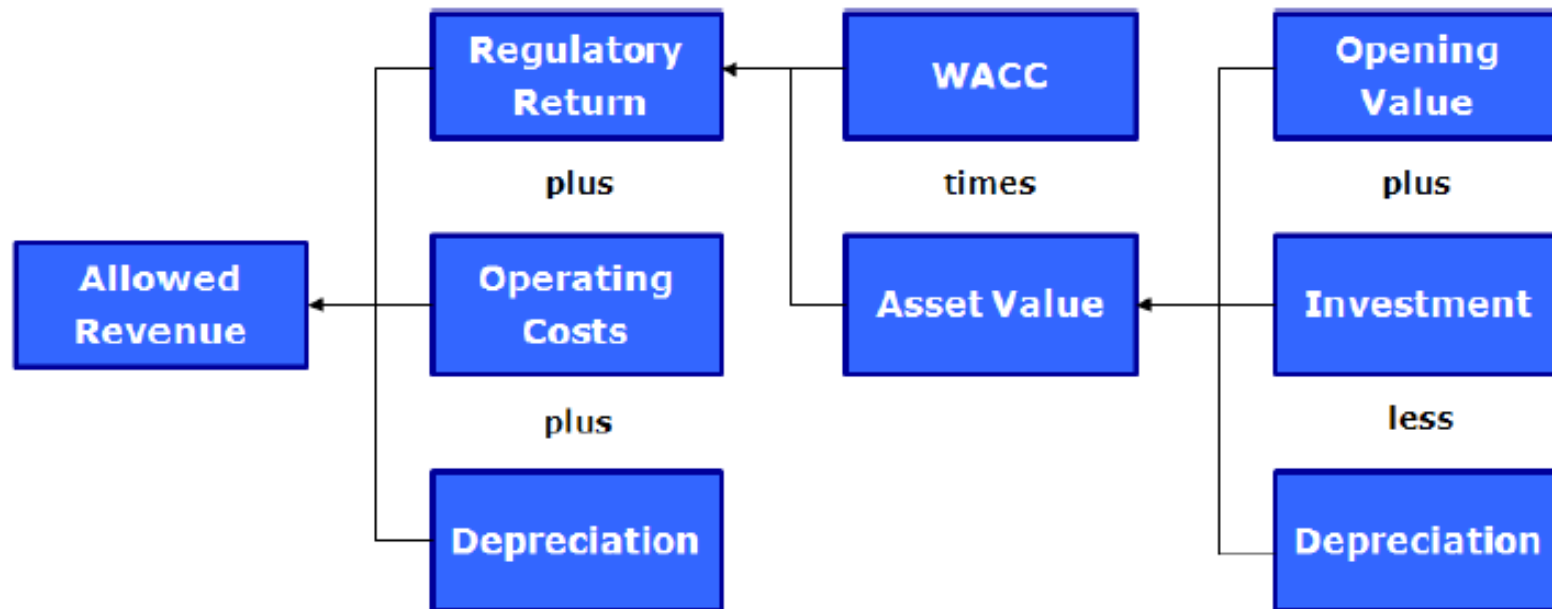


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# Computing allowable revenues

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# Essential idea



# Implementation in practice (1/2)

Essentially,

$$R_1 = Opex_1 + r_{WACC} * RAB_0 + Dep_1$$

adding and subtracting terms...

$$R_1 = Opex_1 + Capex_1 + (1 + r_{WACC})RAB_0 - (RAB_0 - Dep_1 + Capex_1)$$

and by definition of  $RAB_1$

$$R_1 = Opex_1 + Capex_1 + (1 + r_{WACC}) * RAB_0 - RAB_1$$

and rearranging:

$$\frac{R_1}{(1 + r_{WACC})} = \frac{Opex_1 + Capex_1}{(1 + r_{WACC})} - \left( \frac{RAB_1}{(1 + r_{WACC})} - RAB_0 \right)$$



# Implementation in practice (2/2)

- For a period of five years...

$$\frac{R_1}{(1+r_{WACC})^1} + \dots + \frac{R_5}{(1+r_{WACC})^5} = \frac{Opex_1 + Capex_1}{(1+r_{WACC})^1} + \dots + \frac{Opex_5 + Capex_5}{(1+r_{WACC})^5} - \left( \frac{RAB_5}{(1+r_{WACC})^5} - RAB_0 \right)$$

- That is, as in the financial modelling section, given costs and RAVs, find  $R_1, \dots, R_5$  s.t.

$$\frac{R_1}{(1+r_{WACC})^1} - \frac{Opex_1 + Capex_1}{(1+r_{WACC})^1} + \dots + \frac{R_5}{(1+r_{WACC})^5} - \frac{Opex_5 + Capex_5}{(1+r_{WACC})^5} - RAB_0 + \frac{RAB_5}{(1+r_{WACC})^5} = 0$$

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# Modifications

- Total allowed costs may also incorporate:
  - adjustments for specific incentive allowances
  - under or over-recoveries from previous periods
  
- Forecast pass through-costs might also be added:
  - Items outside control of firm (e.g. licence fees)
  - If actual  $\neq$  forecast, passed on directly to consumers
  - revenue adjustment at interim or at the next price review

# Example: NGG TO (Ofgem 2006)

All prices are £m in 2004/05 terms

	Licensee – NGGT TO	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
		£m	£m	£m	£m	£m	£m
	Regulatory Asset Value (RAV)						
1	Opening asset value		2,928.9	3,296.1	3,396.5	3,335.7	3,268.3
2	Total capital expenditure		464.3	206.3	48.3	41.3	36.9
3	Depreciation		-97.1	-105.9	-109.1	-108.7	-108.1
4	Closing asset value		3,296.1	3,396.5	3,335.7	3,268.3	3,197.1
5	Present value of opening/closing RAV		2,928.9				2,524.2
6	5 year movement in PV of RAV						404.8
	Allowed items						
7	Operating costs (excluding pensions)		137.8	136.5	137.2	136.4	138.2
8	Capital expenditure		464.3	206.3	48.3	41.3	36.9
9	Pensions allowance		38.3	37.7	37.1	37.0	36.6
10	Tax allowance		36.1	31.4	35.9	41.1	45.2
11	Total of allowed items		676.4	411.9	258.4	255.7	256.9
12	Present value of allowed items		660.6	383.7	229.6	216.7	207.7
13	5 year movement in PV of RAV						404.8
14	Total present value over 5 years						2,103.2
	Revenue						
15	Revenue index		1.000	1.000	1.000	1.000	1.000
16	Discounted revenue index		0.977	0.932	0.889	0.848	0.808
17	Price control revenue		472.3	472.3	472.3	472.3	472.3
18	Present value of PC revenue		461.3	440.0	419.7	400.3	381.8
19	Total present value over 5 years						2,103.2
20	IFI revenue (0.4% of line 17)		1.9	1.9	1.9	1.9	1.9
21	Total price control revenue		474.2	474.2	474.2	474.2	474.2

Discounted at WACC = 5%

X = 0

# Example: NGET TO (Ofgem 2006)

All prices are £m in 2004/05 terms

Licensee = NGET TO	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	£m	£m	£m	£m	£m	£m
<b>Regulatory Asset Value (RAV)</b>						
1 Opening asset value		5,415.6	5,634.2	5,761.3	5,931.6	6,187.4
2 Total capital expenditure		601.3	524.9	581.1	655.6	677.9
3 Depreciation		-382.7	-397.8	-410.9	-399.8	-416.1
4 Closing asset value		5,634.2	5,761.3	5,931.6	6,187.4	6,449.2
5 Present value of opening/closing RAV		5,415.6				5,041.1
6 5 year movement in PV of RAV						374.5
<b>Allowed items</b>						
7 Operating costs (excluding pensions)		266.0	259.7	254.3	254.0	254.0
8 Capital expenditure		601.3	524.9	581.1	655.6	677.9
9 Pensions allowance		38.5	37.8	37.4	37.3	36.9
10 Tax allowance		101.1	105.6	110.4	110.2	108.1
11 Total of allowed items		1,006.9	928.1	983.2	1,057.1	1,077.7
12 Present value of allowed items		982.4	861.9	869.3	889.7	863.4
13 5 year movement in PV of RAV						374.5
14 Total present value over 5 years						4,841.3
<b>Revenue</b>						
15 Revenue index		1.000	1.020	1.040	1.061	1.082
16 Discounted revenue index		0.976	0.947	0.920	0.893	0.867
<b>17 Base price control revenue</b>	<b>924.9</b>	<b>985.5</b>	<b>1,005.2</b>	<b>1,025.3</b>	<b>1,045.8</b>	<b>1,066.7</b>
18 Excluded service revenue	58.2	58.4	64.3	71.9	75.8	76.1
19 Total TO revenues	983.1	1,043.9	1,069.5	1,097.2	1,121.6	1,142.8
20 Present value of total revenue		1,018.5	993.3	970.0	943.9	915.6
21 Total present value over 5 years						4,841.3
22 IFI revenue forecast		3.9	4.0	4.1	4.2	4.3
23 Price control extension reconciliation		0.7	0.0	0.0	0.0	0.0
24 Total price control revenue		1,048.5	1,073.5	1,101.3	1,125.8	1,147.1

Discounted at WACC=5%

X = 2%

# Computations

- Movement in the RAV:
  - Closing value (line 4) becomes next year's opening value (line 1)
- Difference between present values of opening and closing (line 6)
- Allowed levels of costs and associated items (lines 7 to 14)
- Allowed revenues (line 17):
  - Index, increasing by 2% (line 15), discounted at wacc (line 16)
  - Distribute allowed costs (line 14) except for excluded services revenue (line 18), according to the revenue indices
- Discounted revenue (line 21) = total allowed costs (line 14)
  
- $NPV=0$  if  $r=wacc$  ensures that investors obtain return equal to wacc

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# Determining $P_0$ and $X$

- Choice of specific values of  $P_0$  and  $X$  is a matter of judgment
- Historically, a “glide path” approach
  - firms should be given some time to achieve reductions in operating costs to the efficient benchmarked level
  - relatively high initial value for  $P_0$  and a value of  $X$  that brings operating costs to their efficient levels over the review period
- However, in the electricity distribution price review of 2004
  - $X=0$  for all firms (for  $P_0$ s, see next slide)
  - Maybe because if a high  $P_0$  was set would have meant a large price increase due to large increase in target investment expenditures

### Final proposals for P0

DNOs	June Initial Proposals	Change	September Update	Change	November Final Proposals
	%	%	%	%	%
CN - Midlands	-6.5%	2.0%	-4.5%	1.6%	-2.9%
CN - East Midlands	-10.8%	3.3%	-7.5%	1.8%	-5.7%
United Utilities	-1.8%	7.4%	5.6%	2.4%	8.0%
CE - NEDL	-11.5%	8.6%	-2.9%	-0.8%	-3.7%
CE - YEDL	-14.7%	1.8%	-12.9%	3.7%	-9.2%
WPD-South West	-0.2%	1.8%	1.6%	-0.1%	1.5%
WPD-South Wales	1.7%	5.6%	7.3%	-1.1%	6.2%
EDF - LPN	-2.5%	-1.7%	-4.2%	1.8%	-2.4%
EDF - SPN (note 2)	-3.7%	6.7%	3.0%	4.2%	7.2%
EDF - EPN	-4.6%	2.5%	-2.1%	2.0%	-0.1%
SP Distribution	8.4%	2.2%	10.6%	1.3%	11.9%
SP Manweb	4.0%	-9.5%	-5.5%	-0.4%	-5.9%
SSE - Hydro	-0.1%	2.8%	2.7%	1.2%	3.9%
SSE - Southern	6.1%	3.1%	9.2%	0.1%	9.3%
<b>Average</b>	<b>-2.5%</b>	<b>2.5%</b>	<b>0.0%</b>	<b>1.3%</b>	<b>1.3%</b>

**Note:**

1. The P0 figures for November include allowances for Innovation Funding Incentive (IFI). Those for June and September do not include IFI.
2. For comparability, EDF - SPN is shown on the basis of  $X=0$ . Actual P0 will be 3.1%, with RPI + 2.

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# Form of control

- What the price control is going to be applied to?
  - So far, as if it was on total revenues
  - But could also apply on average revenue: i.e. if quantity is larger than expected, allowed revenues are greater
  - If average revenue used, what is the quantity' that revenue is divided by to get an 'average' price:
    - If volume is used, incentive to sell more volume
    - If number of customers, incentive to connect more
- Need to also account for simplicity/transparency



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# Examples

- Revenue cap regulation:
  - Regulated firm does not face quantity risk. Appropriate where...
    - quantity demanded largely outside the control of the regulated firm
    - costs insensitive to short-term variations in quantity demanded
- Electricity transmission in the UK:
  - Originally, average revenue cap
  - Later amended to a total revenue cap
- Electricity distribution in the UK:
  - First price control review: average revenue based on volumes:
    - revenues increase adjusted to number of units distributed
  - Later: change in revenue drivers
    - 50% linked to units and 50% to customer numbers
- Form of control might affect profiling (see next example)

# Distribution example (1/2)

2002/03 Prices

		2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
		£m	£m	£m	£m	£m	£m
	<b>RAV</b>						
1	Opening asset value		947.9	989.2	1,030.2	1,064.8	1,093.2
2	Total capex		117.8	117.5	117.0	116.6	116.4
3	Depreciation		(76.5)	(76.5)	(82.4)	(88.2)	(94.1)
4	Closing asset value		989.2	1,030.2	1,064.8	1,093.2	1,115.6
5	Present value of opening / closing RAV		947.9				851.7
6	5 Year movement in closing RAV						96.2
	<b>ALLOWED ITEMS</b>						
7	Operating costs (excluding pensions)		75.2	77.7	78.2	76.9	76.2
8	Capital expenditure (excluding pensions)		110.3	109.9	109.4	109.0	108.8
9	Pensions allowance		13.0	13.1	13.1	13.1	13.1
10	Tax allowance		26.6	25.7	25.8	26.2	26.2
11	Capex incentive scheme		(0.8)	0.6	(0.6)	(0.6)	(0.2)
12	Sliding scale additional income		1.4	1.4	1.5	1.5	1.6
13	Opex incentive / Other adjustments		-	-	-	-	-
14	Quality reward		-	-	-	-	-
15	DPCR3 costs		1.5	-	-	-	-
16	<b>Total allowed items</b>		<b>227.1</b>	<b>228.4</b>	<b>227.4</b>	<b>226.1</b>	<b>225.6</b>
17	Present value of allowed items		221.1	210.6	198.7	187.2	176.9
18	5 Year movement in closing RAV						96.2
19	<b>TOTAL PRESENT VALUE OVER 5 YEARS</b>						<b>1,090.7</b>

# Distribution example (2/2)

REVENUE							
20	Revenue index		1.000	1.009	1.020	1.033	1.044
21	Discounted revenue index		0.973	0.931	0.891	0.855	0.819
22	Price control revenue	256.2	240.6	242.8	245.5	248.5	251.2
23	Excluded services revenue		3.5	3.5	3.5	3.5	3.5
24	Total revenue		244.1	246.3	249.0	252.0	254.7
25	Present value of total revenue		237.6	227.2	217.5	208.6	199.8
26	<b>TOTAL PRESENT VALUE OVER 5 YEARS</b>						<b>1,090.7</b>
27	PO based on the above Revenue (line 22)		(6.1%)				
28	PO for Innovation Funding Incentive (IFI)		0.4%				
29							
30	<b>Total PO for comparison purposes</b>		<b>(5.7%)</b>				
31	X		0.0%				
	Analysis of PO (%):						
32	Include EHV	1.3%					
33	Exclude metering	(1.6%)					
34	Change in Opex	(2.9%)					
35	Depreciation	(2.7%)					
36	Return	1.9%					
37	Rates	0.8%					
38	Tax	5.4%					
39	Other	(7.7%)					
40	<b>Total</b>	<b>(5.7%)</b>					

Revenue increased by expected change in revenue drivers (Volume)

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# Financeability

- Determine whether regulated business is financeable under proposed control.
- Using a range of different financial ratios (similar to those used by rating agencies)
- If there are concerns, adjustments can be made to the control

# OFWAT

Indicator	Formula	Threshold
Cash interest cover	Funds from operation (FFO) /gross interest	Around 3 times
Adjusted cash interest cover	FFO less capital charges: gross interest	Around 1.6 times
Adjusted cash interest cover	FFO less capital maintenance expenditure: gross interest	Around 2 times
	FFO : debt	Greater than 13%
	Retained cash flow : debt	Greater than 7%
Gearing	net debt: RCV	Below 65%

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## Five step process

- After deciding on financial thresholds...
  - Compute firms' notional financial indicators (consistent with underlying regulatory assumptions)
  - Forecast indicators for each company
- Assess if and to which extent breaches occur:
  - If temporary, re-profile revenues regulatory (same NPV)
  - If persistent, increase revenues

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# Incentives in Practice: Opex

- If operating efficiencies higher than expected...
  - earn revenue based on expected costs but spend less
  - Additional profit during the price control period
  - Shared with consumers at the end of price control or through a rolling mechanism (e.g. 5 years)
- If company overspends...
  - exposed to additional costs throughout the period
  - However, overspend assessed at next price review
  - Firm might be compensated if expenses were efficient

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# Distortions of incentives

- Benefit to company depends on when the saving was made
  - savings shared with consumers at the start of next price review (new opex allowances based on benchmark historical costs)
  - Solution: introduction of rolling opex mechanism, allowing firms to retain benefits of out-performance for a fixed period from (and including) the year in which the saving was originally made
- Value depends on relative performance and efficiency target set
  - if benchmark costs require companies to reach average upper quartile performance (rather than top), the top performing companies will retain a proportion of their savings for longer (see next chapter)



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# Incentives in Practice: Capex

- If capital expenditure lower than assumed:
  - revenues based on expected depreciation and return on expected capital costs but needs to spend less
  - Additional profit earned and retained either until the end of period or until fixed period in time
  - Explicit sharing rule can be used (% of savings retained)
- Concerns
  - Underspend comes from work not undertaken
  - Accounting allocation between opex and capex:
    - Differential in incentive rates between, but unclear allocation of costs
    - Incentive for distributors to capitalise costs

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# Specific incentive mechanisms

- Incentives to undertake specific activities:
  - Environmental, social policy, quality of service
  - Specify return earned if expected output delivered (e.g. undertakes a particular research and development project)
- Example 1: Innovation Funding Incentive (IFI):
  - Stimulate R&D to facilitate sustainable development
  - Makes available ring-fenced funding for this activity
- Example 2: Interruptions Incentive Scheme (IIS):
  - Improve quality of service (incidence and duration of inter.)
  - Reward/penalise performance relative to predefined targets

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# Adjustments

- Price controls based on forecasts
  - Inevitable element of uncertainty about changes in costs, demand, and other factors
  - Many changes adjusted at subsequent reviews
- Some adjustments within the price control:
  - Pass-through: automatic for exogenous costs
  - Revenue drivers: changes in specific parameters (volume, number of customers, or costs);
  - Re-openers: specific events (e.g. change in legislation) or circumstances (e.g. change financeability)

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# Example of revenue drivers

- Capex subject to uncertain future volumes
  - Allowances modified to by uncertain user-driven investments
  - Might set capex allowances via revenue drivers linked to volume
- Ofgem adjust transmission revenue on zonal basis: in each
  - A profile of generation and demand based on baseline capex allowances
  - Revenue drivers used to calculate adjustments to capex allowances
- The revenue drivers would be calculated at two levels, reflecting
  - Difference in local infrastructure costs in connecting more (or less) MW
  - Wider network infrastructure impacts of changes in flows
- Calculated on a £ per MW basis and known at the end of period

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# Example of a re-opener

- Government commits to stimulate growth in renewable energy (2003):
  - Target to provide 10% of UK electricity in 2010
  - Aspiration to double this by 2020
  - Significant amount of new investment needed prior to the onset of the next price control period
- Ofgem initiated a reopener:
  - adjust allowed capex within price control to provide funding for new investment

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