Impact of potential changes to the TNUoS Expansion Constant

Analysis to support CMP 353 consultation response

SSE

19 November 2020

Executive summary

- SSE commissioned Baringa to carry out analysis of the potential impact of the change to the Expansion Constant in 2021/22 as a result of RIIO-T2. This is to support SSE's response to the consultation on Code Modification Proposal (CMP) 353
- CMP 353 is an urgent CUSC modification which proposes using an inflated RIIO-T1 Expansion Constant rather than moving to the new value that would otherwise be calculated for RIIO-T2, using costs of transmission projects in the RIIO-T1 period.
- Based on data from the TOs, the ESO has calculated a draft value for the new Expansion Constant for RIIO-T2 as 27.83 £/MWkm, compared to a value of 15.13 £/MWkm if the current value for 2020/21 is inflated by RPI, as proposed under CMP 353.

- Our approach has been to use the published DCLF ICRP Transport & Tariff model from 2021/22 from ESO's latest 5 year forecast (published in August 2020)
  - **Run 2021/22 model with no changes, and compare tariffs from model to published values.** Differences are expected because the published models contain contracted Transmission Entry Capacity (TEC) values rather than the ESO's own views as used for forecasting. These differences are small for charging year 2021/22
  - **Run 2021/22 model with updated Expansion Constant, and compare to values published by ESO in Annex 4 of the CMP 353 consultation**. Differences here are be partly attributable to the TEC differences, but additionally we understand that the ESO has updated the Expansion Factors as well as the Expansion Constant, but has not published the Expansion Factor values used. Results therefore have to be used with some caution
  - **Compare the total amount paid by zone by generation and demand, to show generation and demand zonal transfers.** We have looked at this in two ways:
    - Scotland to England & Wales: increase in Scottish generation tariffs by **£130m**, a **61%** increase. Increase in England & Wales demand tariffs by **£91m**
    - All gaining zones vs. all losing zones: increase in Scotland/north England generation tariffs by **£145m**, increase in Southern England and Wales demand tariffs by **£129m**
  - We note that the ESO will have access to the actual values from its own analysis, and hence would be able to provide a refined estimate of these numbers to industry and Ofgem.

RIIO-T1 Expansion Constant – 2021/22

Using the Transport and Tariff model, we produce tariffs which differ slightly from published values, most likely due to differences in TEC background

		Published tariffs (August forecast)					Tariffs from published T&T model			
Zone No.	Zone Name	Peak Security (£/kW)	Year Round Shared (£/kW)	Year Round Not Shared (£/kW)	Residual (£/kW)		Peak Security (£/kW)	Year Round Shared (£/kW)	Year Round Not Shared (£/kW)	Residual (£/kW)
1	North Scotland	4.342065	20.090101	18.866291	- 0.232751		4.020906	19.810261	19.198340	-0.403324
2	East Aberdeenshire	3.251840	10.650928	18.866291	- 0.232751		2.319343	10.837543	19.198340	-0.403324
3	Western Highlands	3.979920	18.288499	18.205231	- 0.232751		3.684964	18.059708	18.479140	-0.403324
4	Skye and Lochalsh	- 2.495443	18.288499	18.108400	- 0.232751		-2.405926	18.059708	18.752999	-0.403324
5	Eastern Grampian and Tayside	4.450991	13.378695	15.525705	- 0.232751		4.206666	13.242922	15.598198	-0.403324
6	Central Grampian	4.446109	14.400194	16.644875	- 0.232751		4.164920	14.265964	16.772619	-0.403324
7	Argyll	3.675455	12.382620	26.117508	- 0.232751		3.300603	12.269934	26.175852	-0.403324
8	The Trossachs	3.827726	12.382620	14.391109	- 0.232751		3.563232	12.269934	14.438417	-0.403324
9	Stirlingshire and Fife	2.648027	10.835846	13.137368	- 0.232751		2.439911	10.763422	13.156513	-0.403324
10	South West Scotlands	3.005321	11.165296	13.379006	- 0.232751		2.780778	11.060994	13.386073	-0.403324
11	Lothian and Borders	2.905501	11.165296	6.590487	- 0.232751		2.752948	11.060994	6.638358	-0.403324
12	Solway and Cheviot	2.423044	7.313546	7.402865	- 0.232751		2.168490	7.259644	7.317781	-0.403324
13	North East England	3.611493	5.574672	4.549843	- 0.232751		3.513470	5.643139	4.593095	-0.403324
14	North Lancashire and The Lakes	2.485067	5.574672	1.216187	- 0.232751		2.043988	5.643139	0.832810	-0.403324
15	South Lancashire, Yorkshire and Humber	4.018904	1.885191	0.352052	- 0.232751		4.242471	1.961098	0.304443	-0.403324
16	North Midlands and North Wales	3.384821	0.269928	-	- 0.232751		3.254199	0.414956	-	-0.403324
17	South Lincolnshire and North Norfolk	1.810333	0.528105	-	- 0.232751		1.841442	0.943763	-	-0.403324
18	Mid Wales and The Midlands	1.273927	0.853057	-	- 0.232751		1.641266	1.368371	-	-0.403324
19	Anglesey and Snowdon	5.610335	- 0.068323	-	- 0.232751		4.636372	0.386657	-	-0.403324
20	Pembrokeshire	9.473688	- 4.907724	-	- 0.232751		9.371561	-4.829510	-	-0.403324
21	South Wales & Gloucester	6.050596	- 5.023364	-	- 0.232751		5.963258	-4.951991	-	-0.403324
22	Cotswold	2.617863	3.820598	- 8.882383	- 0.232751		2.547243	3.725109	-8.723162	-0.403324
23	Central London	- 4.237683	3.820598	- 5.933549	- 0.232751		-4.018820	3.725109	-5.845334	-0.403324
24	Essex and Kent	- 4.102577	3.820598	-	- 0.232751		-3.904252	3.725109	-	-0.403324
25	Oxfordshire, Surrey and Sussex	- 1.124600	- 2.157597	-	- 0.232751		-1.067218	-2.083431	-	-0.403324
26	Somerset and Wessex	- 1.931156	- 3.151614	-	- 0.232751		-1.956451	-3.226103	-	-0.403324
27	West Devon and Cornwall	- 0.361854	- 5.783941	-	- 0.232751		-0.385510	-5.781167	-	-0.403324

- **Run 2021/22 model with no changes, and compare tariffs from model to published values.** Differences are expected because the published models contain contracted Transmission Entry Capacity (TEC) values rather than the ESO's own views as used for forecasting. These differences are small for charging year 2021/22
- Differences are typically in the range +/-£0.5/kW. We consider modelled tariffs to be a sufficiently good approximation for further analysis

RIIO-T2 Expansion Constant – 2021/22 tariffs

Our modelled tariffs have greater differences to published values, most likely due to changes by the ESO to the Expansion Factors, which have not been published

		Published tariffs (CMP 353 annex 4)					Modelled tariffs			
Zone No.	Zone Name	Peak Security (£/kW)	Year Round Shared (£/kW)	Year Round Not Shared (£/kW)	Residual (£/kW)		Peak Security (£/kW)	Year Round Shared (£/kW)	Year Round Not Shared (£/kW)	Residual (£/kW)
1	North Scotland	7.230021	35.495924	32.971932	- 4.086882		7.275450	35.844795	34.737581	-4.285027
2	East Aberdeenshire	3.586921	19.069280	32.971932	- 4.086882		4.196631	19.609510	34.737581	-4.285027
3	Western Highlands	6.676010	32.545211	31.889230	- 4.086882		6.667593	32.677334	33.436258	-4.285027
4	Skye and Lochalsh	- 16.560603	32.545211	31.709633	- 4.086882		-4.353296	32.677334	33.931780	-4.285027
5	Eastern Grampian and Tayside	8.601388	23.831827	27.133901	- 4.086882		7.611564	23.961816	28.223465	-4.285027
6	Central Grampian	7.949862	27.140278	30.758688	- 4.086882		7.536029	25.812913	30.348468	-4.285027
7	Argyll	5.612070	22.316869	48.638544	- 4.086882		5.972129	22.201285	47.362729	-4.285027
8	The Trossachs	6.244011	22.316869	25.370615	- 4.086882		6.447331	22.201285	26.124950	-4.285027
9	Stirlingshire and Fife	4.118398	19.497741	23.085565	- 4.086882		4.414789	19.475395	23.805466	-4.285027
10	South West Scotlands	4.758736	19.954439	23.420535	- 4.086882		5.031554	20.013823	24.220833	-4.285027
11	Lothian and Borders	4.648367	19.954439	11.600371	- 4.086882		4.981199	20.013823	12.011482	-4.285027
12	Solway and Cheviot	3.470625	12.901644	12.477846	- 4.086882		3.923677	13.135639	13.240832	-4.285027
13	North East England	5.677345	10.040345	7.783229	- 4.086882		6.357292	10.210726	8.310770	-4.285027
14	North Lancashire and The Lakes	3.839592	10.040345	1.486755	- 4.086882		3.698404	10.210726	1.506891	-4.285027
15	South Lancashire, Yorkshire and Humber	6.105261	3.755575	0.632590	- 4.086882		7.676350	3.548421	0.550861	-4.285027
16	North Midlands and North Wales	5.083670	0.853165	-	- 4.086882		5.888165	0.750824	-	-4.285027
17	South Lincolnshire and North Norfolk	2.076663	0.767139	-	- 4.086882		3.331916	1.707651	-	-4.285027
18	Mid Wales and The Midlands	1.134634	1.513005	-	- 4.086882		2.969715	2.475938	-	-4.285027
19	Anglesey and Snowdon	8.774360	0.617825	-	- 4.086882		8.389077	0.699619	-	-4.285027
20	Pembrokeshire	15.431676	- 8.146536	-	- 4.086882		16.956953	-8.738542	-	-4.285027
21	South Wales & Gloucester	9.193106	- 8.350841	-	- 4.086882		10.789952	-8.960160	-	-4.285027
22	Cotswold	4.574012	3.268471	- 11.702696	- 4.086882		4.608995	6.740232	-15.783737	-4.285027
23	Central London	- 7.291715	3.268471	- 8.353563	- 4.086882		-7.271676	6.740232	-10.576580	-4.285027
24	Essex and Kent	- 5.830921	3.268471	-	- 4.086882		-7.064376	6.740232	-	-4.285027
25	Oxfordshire, Surrey and Sussex	- 1.990501	- 4.386118	-	- 4.086882		-1.931031	-3.769772	-	-4.285027
26	Somerset and Wessex	- 3.017675	- 5.680392	-	- 4.086882		-3.540013	-5.837329	-	-4.285027
27	West Devon and Cornwall	- 0.346884	- 9.996204	-	- 4.086882		-0.697543	-10.460476	-	-4.285027

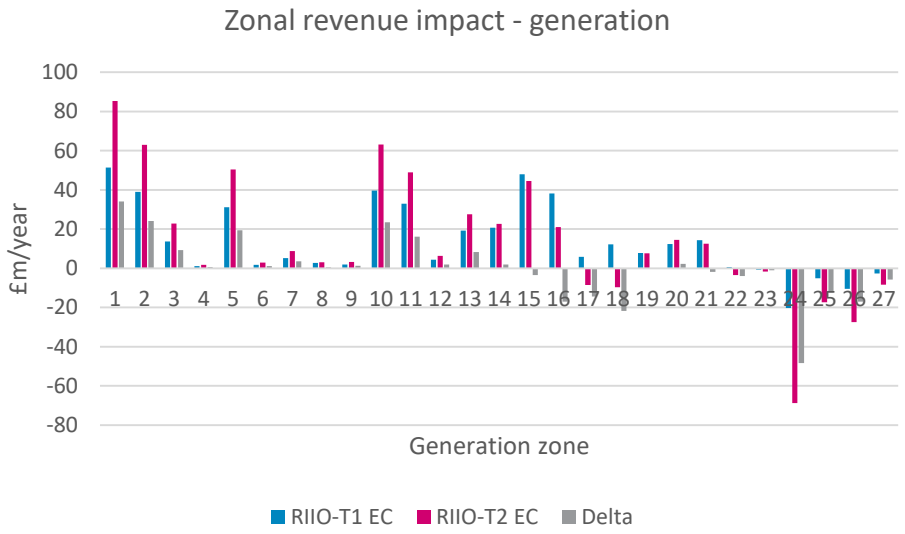
- **Run 2021/22 model with updated Expansion Constant of 27.83 £/MWkm, and compare to values published by ESO in Annex 4 of the CMP 353 consultation**. Differences here are be partly attributable to the TEC differences, but additionally we understand that the ESO has updated the Expansion Factors as well as the Expansion Constant, but has not published the Expansion Factor values used. Results therefore have to be used with some caution
- Differences are typically in the range +/-£1-2/kW, except in zone 4 (Skye and Lochalsh) where there are major differences. Modelled tariffs are used as a good approximation for further analysis

Zonal revenue - generation

If CMP 353 is not approved, the increase in total wider TNUoS charges on generation in Scotland & North England is around **£145m** in 2021/22

- Using the calculated tariff and the TEC values in the published T&T model, we have calculated the revenue the ESO receives from each zone in a RIIO-T1 Expansion Constant case (CMP 353 approved) compared to the case using the RIIO-T2 Expansion Constant
- In Scotland as a whole, transmission connected generators pay an additional £133m (61% increase), with a corresponding reduction for England & Wales
- In Zone 1 alone, there is an additional cost of £34m.
- Grouping together all zones that see an increase (zones 1-14), there is a total increase of £145m, an increase of 55%.
- Intermittent low carbon generation (onshore wind and offshore wind) would see an increase in tariffs of around £53m, conventional low carbon generation (nuclear, hydro) increased of around £32m, with conventional carbon generation seeing a reduction of £85m.
- Onshore wind alone would see an increase of £41m, equating to £7/kW

- As noted above, calculated tariffs differ from the ESO published values and hence there is some uncertainty on these values. We expect that our estimates are in the range +/- £10m compare to the values the ESO would obtain.



Zonal revenue transfers (£m, 2021/22)

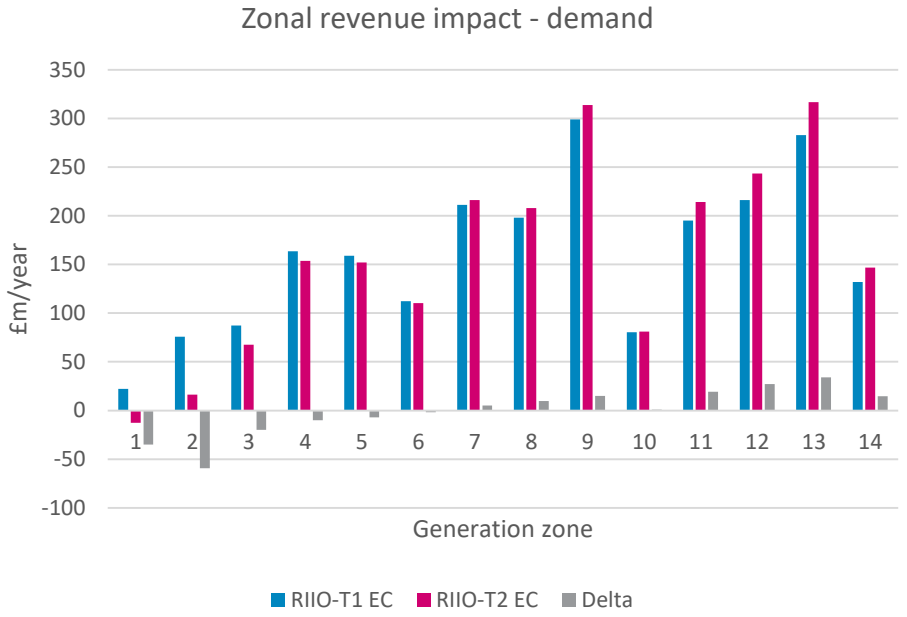
	Scotland (zones 1-11)[1]	England & Wales (12-27)	Zones 1-14	Zones 15-27
RIIO-T1 EC	220	144	264	100
RIIO-T2 EC	353	11	410	-45
Delta	**133**	**-133**	**145**	**-145**

1: Note that generation zone 12 covers parts of Scotland and England, but as been treated as England for the purposes of this analysis

Zonal revenue – demand

If CMP 353 is not approved, the increase in total southern England and Wales demand tariffs is around **£125m**

- In Scotland (demand zones 1 and 2), demand charges reduce by £94m with a similar size increase in England and Wales.
- This assumes demand tariffs in Scotland are permitted to be negative. From April 2022, this is likely to change based on the outcome of the current code modifications to implement the move to a fixed TNUoS demand residual, as decided in the Targeted Charging Review. The removal of the residual from current £/kW demand tariffs would in any case create negative tariffs in Scotland in 2022/23 if not otherwise floored and hence various options have been proposed including flooring demand tariffs at zero and including a credit in the fixed tariff
- Grouping together all zones that see an increase (zones 7-14), there is a total increase of £125m, or 8%.
- Impacts are similarly sized to generation impacts although they appear small as a percentage change on the total demand tariff due to the size of the demand residual as the major component of demand tariffs.
- Changes do not sum to zero in this case, due to reductions in the residual as a result of higher recovery from onshore local circuit tariffs
- As noted above, calculated tariffs differ from the ESO published values and hence there is some uncertainty on these values. We expect that our estimates are in the range +/- £10m compare to the values the ESO would obtain.



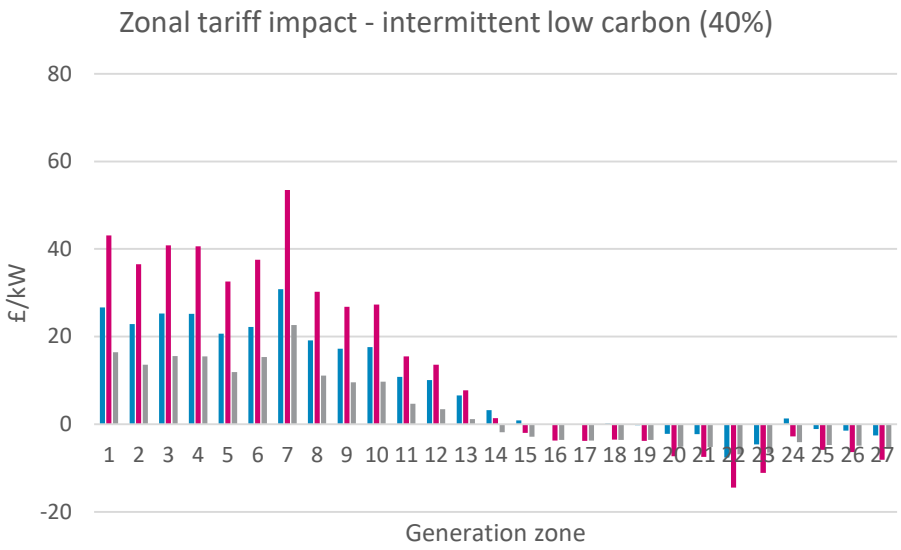
Zonal revenue transfers (£m, 2021/22)

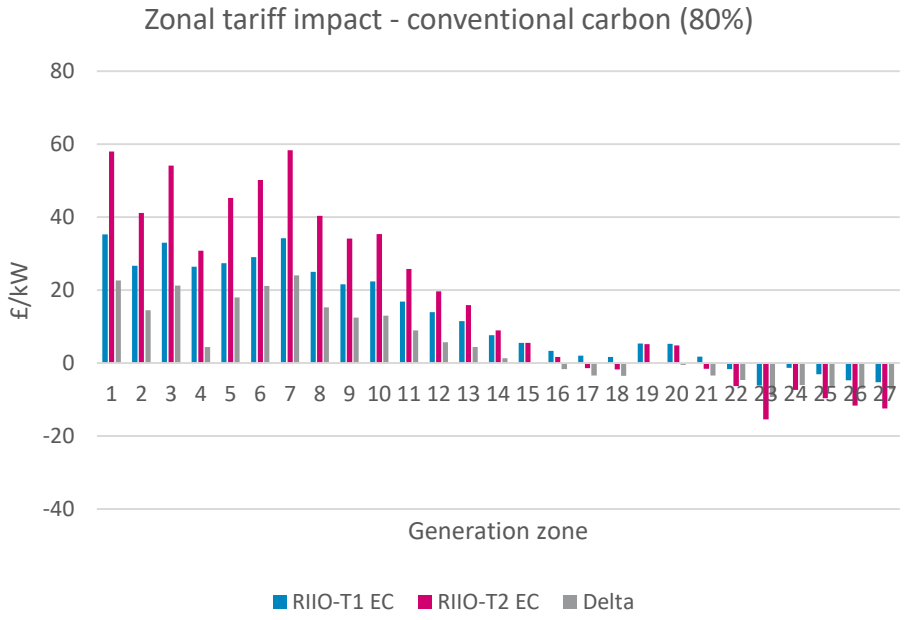
	Scotland (zones 1 & 2)	England & Wales	Zones 1-6	Zones 7-14
RIIO-T1 EC	98	2,137	620	1,615
RIIO-T2 EC	4	2,224	487	1,740
Delta	**-94**	**87**	**-133**	**125**

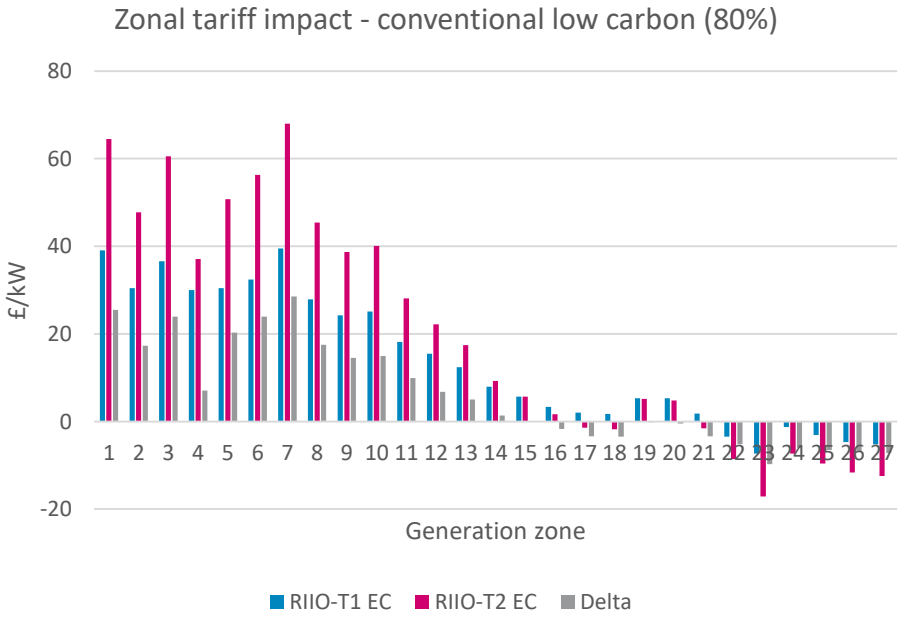
Generation tariff comparison

Based on NG published tariffs

- Tariff analysis is based on NG published analysis rather than Baringa modelled tariffs
- Increases throughout Scotland are significant, with for example an increase of £16/kW (62% increase) in zone 1 for an intermittent generator with a 40% annual load factor, equating to £4.70/MWh.
- The largest decreases are in southern England where the decrease can more than double the current negative tariff







Demand tariff comparison

Based on NG published analysis and material provided to SSE

- Based on NG published analysis and additional material on demand tariffs provided to SSE
- Tariffs in Scotland become negative, which may lead to perverse incentives in Triad periods (c.f. discussion on negative tariffs as a result of implementation of a fixed charge for the residual under the Targeted Charging Review).
- HH tariffs for customers in Southern England and Wales increase by between £1.4/kW and £5.3/kW with an average increase of £3.5/kW
- A NHH customer would see there tariff in Southern England and Wales would see their tariff increase by between 3% and 10% with an average of around 7%.
- We estimate that a typical domestic customer in Southern England and Wales could see their bill increase by around £1-£4 with an average of around £2.50