

Negative Weights

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UoS Methodology Definition

2.16 The zonal marginal km for demand zones are calculated as follows:

$$WNMkm_j = \frac{-1 * NMkm_j * Dem_j}{\sum_{j \in Di} Dem_j}$$

$$ZMkm_{Di} = \sum_{j \in Di} WNMkm_j$$

Where

Di = Demand zone
Dem = Nodal Demand from transport model

(i) calculate the demand weighted nodal shadow costs

For zone 14 this would be as follows:

Demand zone	Node	Nodal Marginal km	Demand (MW)	Demand Weighted Nodal Marginal km
14	ABHA4A	-381.25	148.5	-18.39
14	ABHA4B	-381.72	148.5	-18.42
14	ALVE4A	-328.31	113	-12.05
14	ALVE4B	-328.31	113	-12.05
14	AXMI40_SWEB	-337.53	117	-12.83
14	BRWA2A	-281.64	92.5	-8.46
14	BRWA2B	-281.72	92.5	-8.47
14	EXET40	-320.12	357	-37.13
14	HINP20	-247.67	4	-0.32
14	INDQ40	-401.28	450	-58.67
14	IROA20_SWEB	-194.88	594	-37.61
14	LAND40	-438.65	297	-42.33
14	MELK40_SWEB	-162.96	102	-5.40
14	SEAB40	-63.21	352	-7.23
14	TAUN4B	-273.79	97	-8.63
		Totals	3078	-287.99

(ii) sum the demand weighted nodal shadow cost to give a zonal figure. For zone 14 this is shown in the above table and is -287.99km.

Effect of Negative Weights

- Negative demand alters the weighting factor in two ways
- In a micro effect on a Nodal basis, and
- In a macro effect on a Zonal basis

Illustrative example

- To illustrate both effects, consider a simple 2 Node example

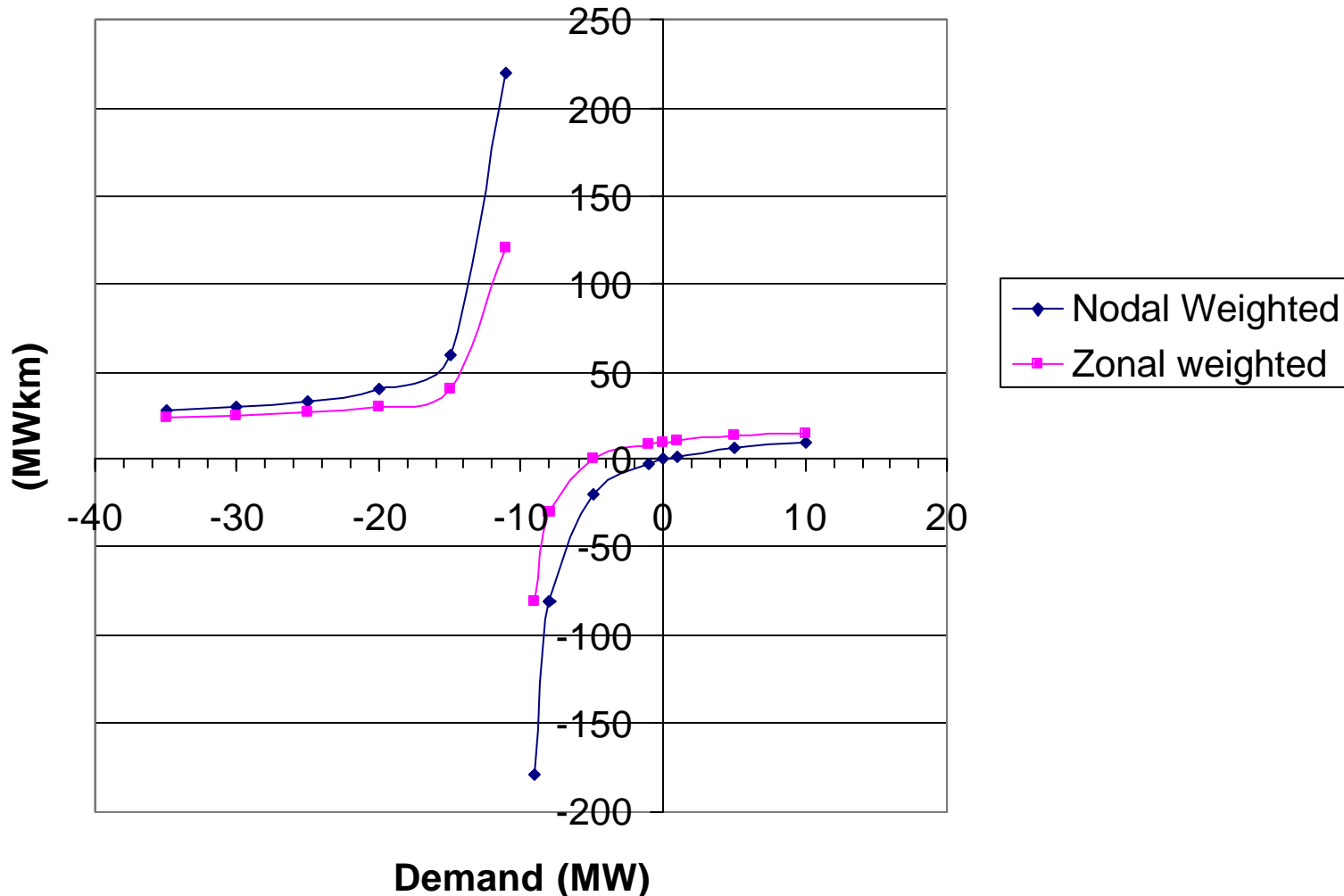
Node	Nodal Marginal km	Demand (MW)	Demand Weighted Nodal Marginal km
A	10	10	5.00
B	20	10	10.00
		Total Demand	Zonal Weighted Marginal km
		20	15.00

Illustrative example

- To illustrate both effects, consider a simple 2 Node example

Node	Nodal Marginal km	Demand (MW)	Demand Weighted Nodal Marginal km
A	10	10	20.00
B	20	-5	-20.00
		Total Demand	Zonal Weighted Marginal km
		5	0.00

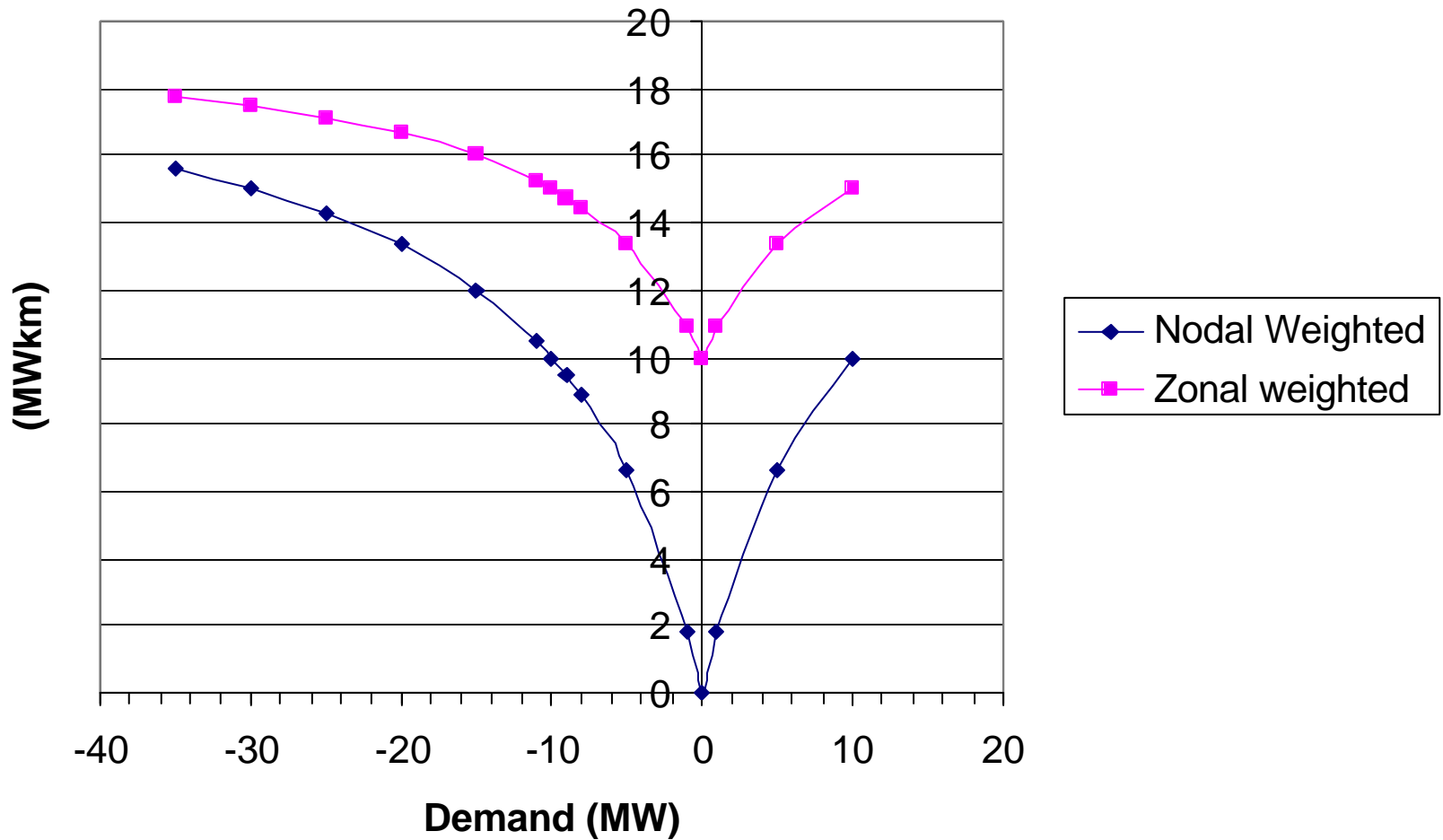
Plot of change of Demand (Node B) vs change in Marginal MWkm



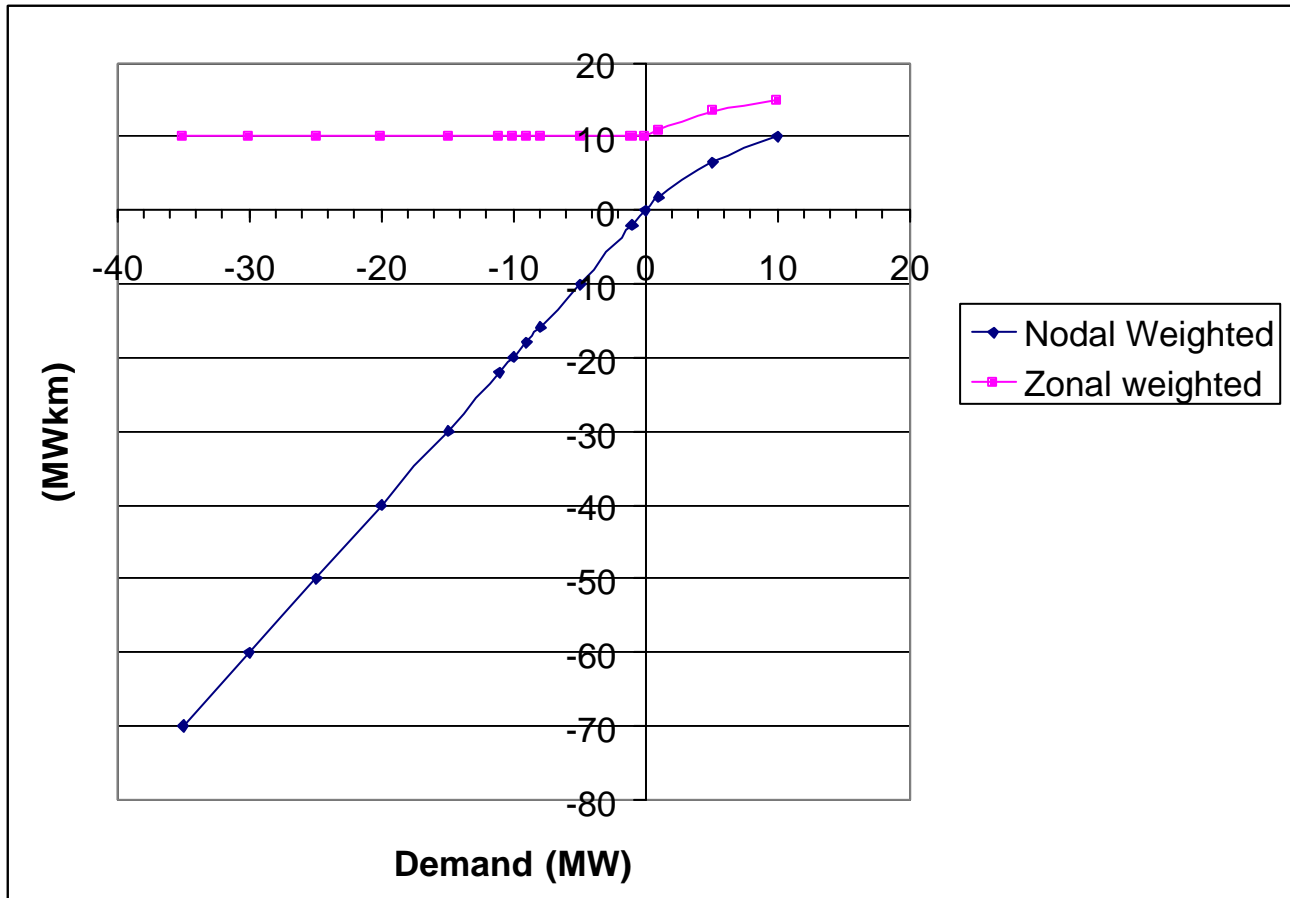
Alternative Options

- Use absolute values
- Exclude negative demand values
- Substitute 'average' value for negative demand values
- Don't weight, use average for zonal MWkms

Using absolute values



Excluding negative demand values



Using average Zonal MWkms values

Demand		2005/06 Tariffs	Using averages	
Zone No.	Zone Name.	HH Zonal Tariff (£/kW)	HH Zonal Tariff (£/kW)	Variance
1	Northern Scotland	0.0411	0.0465	0.0054
2	Southern Scotland	4.1144	4.1410	0.0266
3	Northern	7.3937	7.8091	0.4154
4	North West	11.1371	10.7222	-0.4149
5	Yorkshire	11.1821	11.3989	0.2168
6	N Wales & Mersey	11.2102	11.8284	0.6182
7	East Midlands	13.4658	13.4334	-0.0325
8	Midlands	15.0270	15.2715	0.2445
9	Eastern	14.0285	14.6611	0.6327
10	South Wales	18.3159	18.0776	-0.2384
11	South East	15.9894	15.6647	-0.3247
12	London	18.5167	16.6855	-1.8312
13	Southern	17.8334	18.3572	0.5238
14	South Western	20.4899	20.6729	0.1830

Further Analysis

- Using the existing DCLF transport model used for 2005/06 tariff setting
- Approx. 450MW embedded generation in Scotland is modelled net of DNO demand forecast
- Assessed effect of gross modelling of this demand and embedded generation
 - Note: no change to demand or generation charging bases.

Demand Tariffs for modelling Scottish embedded generation on a gross basis

Demand				
Zone No.	Zone Name.	HH Zonal Tariff (£/kW)	HH Zonal Tariff (£/kW)	Variance (£/kW)
1	Northern Scotland	0.041110	0.041114	0.000003
2	Southern Scotland	4.114438	4.173909	0.059471
3	Northern	7.393664	7.499245	0.105581
4	North West	11.137060	11.141256	0.004197
5	Yorkshire	11.182059	11.166475	-0.015584
6	N Wales & Mersey	11.210216	11.211213	0.000997
7	East Midlands	13.465848	13.451506	-0.014342
8	Midlands	15.026957	15.016536	-0.010421
9	Eastern	14.028455	14.012211	-0.016244
10	South Wales	18.315906	18.302510	-0.013396
11	South East	15.989410	15.974127	-0.015282
12	London	18.516693	18.501010	-0.015683
13	Southern	17.833397	17.818871	-0.014525
14	South Western	20.489868	20.475993	-0.013874

Generation Tariffs for modelling Scottish embedded generation on a gross basis

Zone No.	Zone Name	Zonal Tariff (£/kW)	Zonal Tariff (£/kW)	Variance (£/kW)
1	Peterhead	18.162236	18.082975	-0.079
2	North Scotland	20.929759	20.658156	-0.272
3	Skye	23.095483	22.881539	-0.214
4	Western Highland	18.920247	18.779658	-0.141
5	Central Highlands	15.360647	15.392294	0.032
6	Cruachan	15.852828	15.776730	-0.076
7	Argyll	13.441972	13.030202	-0.412
8	Stirlingshire	12.610665	12.544022	-0.067
9	South Scotland	11.820471	11.746449	-0.074
10	North East England	8.090616	8.057451	-0.033
11	Humber, Lancashire & SW Scotland	4.906290	4.918568	0.012
12	Anglesey	6.122706	6.126930	0.004
13	Dinorwig	8.705520	8.709744	0.004
14	South Yorks & North Wales	3.120190	3.135581	0.015
15	Midlands & South East	1.322966	1.339268	0.016
16	Central London	-5.712196	-5.695297	0.017
17	North London	-0.220327	-0.202667	0.018
18	Oxon & South Coast	-0.698936	-0.682900	0.016
19	South Wales & Gloucester	-2.552479	-2.537514	0.015
20	Wessex	-4.951295	-4.935671	0.016
21	Peninsula	-8.044943	-8.029418	0.016

Demand Zone 1 : Northern Scotland

- Of the 450MW of embedded generation approx 325MW is in zone 1
- What is the effect of:
 - Moving all this embedded generation to a single node
 - Sharing it 50:50 between two nodes
- Un-collared zone 1 demand tariff for 2005/06 is £-1.58
- Gross modelling all demand & embedded generation – tariff is £-1.57
- Modelling all embedded generation on node ABNE – tariff is £-1.27
- Modelling embedded generation 50:50 on nodes ABNE & BRAC – tariff is £-1.33
- Modelling embedded generation 50:50 on nodes BEAU & SLOY – tariff is £-1.23