



International Benchmarking of Electricity Transmission System Operators

e³GRID PROJECT – APPENDIX

2009-03-09

Disclaimer

This is the appendix to the final report for the e³GRID project for benchmarking of transmission system operators by SUMICSID, van Dijk Management Consultants and Tractebel Engineering SA. The document draws on confidential data submitted by the commissioning authorities.

The report is submitted to a subgroup of the CEER Workstream-Incentive based Regulation and Efficiency Benchmarking (WS EFB) of the CEER Unbundling, Reporting and Benchmarking Task Force (URB TF) as a final deliverable of the project.

The findings, conclusions and recommendations in the report only represent the viewpoint of the authors based on the analyses made in the project and cannot be taken as economic advice on the performance, optimal regulation or feasible policy of any given operator.

e³GRID Final Results: Appendix
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Appendix A: OLS results – single addition

Appendix New

Call:
lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-156401450	-34108779	22670225	66863038	531076671

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	719.8	108.6	6.628	1.87e-06 ***
yPower.gen.wind	-9458.3	13014.8	-0.727	0.476

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 140500000 on 20 degrees of freedom
Multiple R-squared: 0.832, Adjusted R-squared: 0.8151
F-statistic: 49.51 on 2 and 20 DF, p-value: 1.796e-08

Call:
lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-162301160	-36261520	25359239	57745032	544643031

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	690.4	117.5	5.874	9.56e-06 ***
yPower.gen.ren.excl.hydro	-4441.2	12936.8	-0.343	0.735

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 141900000 on 20 degrees of freedom
Multiple R-squared: 0.8285, Adjusted R-squared: 0.8114
F-statistic: 48.32 on 2 and 20 DF, p-value: 2.198e-08

Call:
lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-187644119	-32580684	9563320	46546547	479648168

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	551.7	91.5	6.030	6.78e-06 ***
yPower.gen.ren.incl.hydro	5430.6	3404.4	1.595	0.126

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.34e+08 on 20 degrees of freedom
Multiple R-squared: 0.847, Adjusted R-squared: 0.8317
F-statistic: 55.35 on 2 and 20 DF, p-value: 7.038e-09



Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-162761780 -57403688 6981214 53159104 234217282

Coefficients:
Estimate Std. Error t value Pr(>|t|)
yNGTotex 280.63 94.66 2.965 0.007659 **
yPower.gen.nonren 7244.28 1581.75 4.580 0.000182 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 99430000 on 20 degrees of freedom
Multiple R-squared: 0.9158, Adjusted R-squared: 0.9074
F-statistic: 108.8 on 2 and 20 DF, p-value: 1.789e-11

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-179081317 -38870736 -1927131 57714042 213126144

Coefficients:
Estimate Std. Error t value Pr(>|t|)
yNGTotex 296.03 88.61 3.341 0.003258 **
yPower.gen.thermal 7632.24 1601.39 4.766 0.000118 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 97380000 on 20 degrees of freedom
Multiple R-squared: 0.9192, Adjusted R-squared: 0.9112
F-statistic: 113.8 on 2 and 20 DF, p-value: 1.181e-11

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-158137006 -43943288 23409685 63047221 430098829

Coefficients:
Estimate Std. Error t value Pr(>|t|)
yNGTotex 889.3 107.4 8.282 6.8e-08 ***
yPower.gen.nuclear -27663.7 10761.9 -2.571 0.0183 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 123400000 on 20 degrees of freedom
Multiple R-squared: 0.8703, Adjusted R-squared: 0.8574
F-statistic: 67.13 on 2 and 20 DF, p-value: 1.342e-09

Call:
lm(formula = fm)



Residuals:

Min	1Q	Median	3Q	Max
-270667516	-22477446	-2687859	50321316	229854679

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	272.789	92.735	2.942	0.008068 **
yService.pop	8.543	1.791	4.771	0.000117 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 97330000 on 20 degrees of freedom
 Multiple R-squared: 0.9193, Adjusted R-squared: 0.9113
 F-statistic: 114 on 2 and 20 DF, p-value: 1.168e-11

Call:
 lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-159601295	-28554996	25041434	62168269	531445918

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	623.9	102.6	6.082	6.05e-06 ***
yEnv.area	94603.2	221087.7	0.428	0.673

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 141700000 on 20 degrees of freedom
 Multiple R-squared: 0.8291, Adjusted R-squared: 0.812
 F-statistic: 48.51 on 2 and 20 DF, p-value: 2.128e-08

Call:
 lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-168649858	-36360274	31168702	58673338	543963677

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	661.32	69.06	9.576	6.53e-09 ***
yEnv.area.forest	-33810.81	139247.15	-0.243	0.81

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 142100000 on 20 degrees of freedom
 Multiple R-squared: 0.828, Adjusted R-squared: 0.8108
 F-statistic: 48.15 on 2 and 20 DF, p-value: 2.264e-08

Call:
 lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-182529379	-36350653	23366941	64921190	475314811



Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	512.2	116.4	4.399	0.000277 ***
yEnv.area.agri	843186.2	566703.1	1.488	0.152381

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.35e+08 on 20 degrees of freedom
Multiple R-squared: 0.8447, Adjusted R-squared: 0.8292
F-statistic: 54.39 on 2 and 20 DF, p-value: 8.16e-09

Call:

lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-161308076	-60397996	-21048323	17078935	510204857

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	5.624e+02	8.918e+01	6.306	3.72e-06 ***
yEnv.temp.summer	3.495e+06	2.305e+06	1.516	0.145

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 134800000 on 20 degrees of freedom
Multiple R-squared: 0.8453, Adjusted R-squared: 0.8298
F-statistic: 54.64 on 2 and 20 DF, p-value: 7.857e-09

Call:

lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-142227684	-40047785	6627240	38921530	473153151

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	6.002e+02	6.580e+01	9.121	1.45e-08 ***
yEnv.temp.winter	1.254e+07	5.763e+06	2.175	0.0418 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.28e+08 on 20 degrees of freedom
Multiple R-squared: 0.8605, Adjusted R-squared: 0.8466
F-statistic: 61.69 on 2 and 20 DF, p-value: 2.787e-09

Call:

lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-140723070	-68475126	-24086631	10384795	497811432

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	546.4	87.5	6.245	4.25e-06 ***



```
yEnv.temp.max30 5090845.4 2823989.9 1.803 0.0865 .
```

```
---  
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 1.32e+08 on 20 degrees of freedom
Multiple R-squared: 0.8516, Adjusted R-squared: 0.8368
F-statistic: 57.4 on 2 and 20 DF, p-value: 5.172e-09

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-149585125 -67968823 -44160540 15818989 464858224

```
Coefficients:  
Estimate Std. Error t value Pr(>|t|)  
yNGTotex 5.375e+02 7.795e+01 6.896 1.07e-06 ***  
yEnv.temp.min30 1.281e+07 5.414e+06 2.367 0.0281 *
```

```
---  
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 125800000 on 20 degrees of freedom
Multiple R-squared: 0.8653, Adjusted R-squared: 0.8518
F-statistic: 64.21 on 2 and 20 DF, p-value: 1.973e-09

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-136471258 -52024174 -18338437 34458986 523724887

```
Coefficients:  
Estimate Std. Error t value Pr(>|t|)  
yNGTotex 573.89 85.02 6.75 1.45e-06 ***  
yDensity 311.27 210.27 1.48 0.154
```

```
---  
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 135100000 on 20 degrees of freedom
Multiple R-squared: 0.8445, Adjusted R-squared: 0.829
F-statistic: 54.33 on 2 and 20 DF, p-value: 8.242e-09

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-150485787 -66393140 6654128 30446483 539603205

```
Coefficients:  
Estimate Std. Error t value Pr(>|t|)  
yNGTotex 5.979e+02 9.009e+01 6.637 1.84e-06 ***  
zDMU 2.756e+06 2.868e+06 0.961 0.348
```

```
---  
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```




Residual standard error: 139100000 on 20 degrees of freedom
Multiple R-squared: 0.8351, Adjusted R-squared: 0.8186
F-statistic: 50.65 on 2 and 20 DF, p-value: 1.484e-08

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-161758640 -55810509 -9193554 26783167 532248243

Coefficients:
Estimate Std. Error t value Pr(>|t|)
yNGTotex 588.20 90.11 6.528 2.31e-06 ***
zYear 22522.95 20312.80 1.109 0.281

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 138100000 on 20 degrees of freedom
Multiple R-squared: 0.8375, Adjusted R-squared: 0.8213
F-statistic: 51.54 on 2 and 20 DF, p-value: 1.284e-08

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-180389092 -29034540 25198272 59830139 536730457

Coefficients:
Estimate Std. Error t value Pr(>|t|)
yNGTotex 671.37 66.85 10.042 2.95e-09 ***
zTowers.wood -4197.83 4107.51 -1.022 0.319

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 138700000 on 20 degrees of freedom
Multiple R-squared: 0.8361, Adjusted R-squared: 0.8197
F-statistic: 51 on 2 and 20 DF, p-value: 1.401e-08

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-164732723 -34995712 17757692 58307122 544114614

Coefficients:
Estimate Std. Error t value Pr(>|t|)
yNGTotex 656.28 66.95 9.802 4.42e-09 ***
zTowers.other 2321.94 6636.68 0.350 0.73

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 141900000 on 20 degrees of freedom
Multiple R-squared: 0.8286, Adjusted R-squared: 0.8114
F-statistic: 48.33 on 2 and 20 DF, p-value: 2.193e-08



Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-165641386 -35529333 25837778 58733970 543778578

Coefficients:
Estimate Std. Error t value Pr(>|t|)
yNGTotex 6.569e+02 9.081e+01 7.234 5.33e-07 ***
zAge1 8.789e+03 1.380e+06 0.006 0.995

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 142300000 on 20 degrees of freedom
Multiple R-squared: 0.8275, Adjusted R-squared: 0.8103
F-statistic: 47.98 on 2 and 20 DF, p-value: 2.331e-08

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-161358725 -42798326 17825166 52196996 548420278

Coefficients:
Estimate Std. Error t value Pr(>|t|)
yNGTotex 6.431e+02 8.924e+01 7.207 5.63e-07 ***
zAgem 4.539e+05 1.887e+06 0.241 0.812

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 142100000 on 20 degrees of freedom
Multiple R-squared: 0.828, Adjusted R-squared: 0.8108
F-statistic: 48.14 on 2 and 20 DF, p-value: 2.265e-08



Appendix B: Log-linear results – single addition

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-146654023 -119322572 -58821962 14162758 479673888

Coefficients:	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	10670263	17167429	0.622	0.541
log(yPower.gen.ren.excl.hydro)	7543471	29095601	0.259	0.798

Residual standard error: 170200000 on 20 degrees of freedom
Multiple R-squared: 0.5594, Adjusted R-squared: 0.5154
F-statistic: 12.7 on 2 and 20 DF, p-value: 0.0002756

2 10670263 7543471 17167429 29095601 0.6215411 0.259265 0.5412642 0.7980807 12.69696 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-144510522 -120662417 -59618929 -2400588 479138896

Coefficients:	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	10785004	29174482	0.370	0.716
log(yPower.gen.ren.incl.hydro)	6158007	41870644	0.147	0.885

Residual standard error: 170400000 on 20 degrees of freedom
Multiple R-squared: 0.5584, Adjusted R-squared: 0.5143
F-statistic: 12.65 on 2 and 20 DF, p-value: 0.0002820

3 10785005 6158007 29174483 41870644 0.3696725 0.1470722 0.7155119 0.8845475 12.6454 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-167553675 -117577353 -64139430 22182701 427846979

Coefficients:	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	-13840835	21461224	-0.645	0.526
log(yPower.gen.nonren)	39110759	28789515	1.359	0.189

Residual standard error: 163200000 on 20 degrees of freedom
Multiple R-squared: 0.5953, Adjusted R-squared: 0.5548
F-statistic: 14.71 on 2 and 20 DF, p-value: 0.0001179

4 -13840835 39110759 21461224 28789515 -0.6449229 1.358507 0.5263065 0.1894296 14.70833 2 20

Call:
lm(formula = fm)



Residuals:

Min	1Q	Median	3Q	Max
-162891292	-113485427	-68555792	19933744	426353683

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	-13891579	21552670	-0.645	0.527
log(yPower.gen.thermal)	39393433	29072220	1.355	0.191

Residual standard error: 163200000 on 20 degrees of freedom
 Multiple R-squared: 0.5951, Adjusted R-squared: 0.5546
 F-statistic: 14.7 on 2 and 20 DF, p-value: 0.0001184

5 -13891579 39393433 21552670 29072220 -0.644541 1.355020 0.526549 0.1905198 14.69763 2 20

Call:

lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-187895308	-106818439	-60722482	-7992671	511322410

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	65217913	63134039	1.033	0.314
log(yService.pop)	-38232381	48064134	-0.795	0.436

Residual standard error: 167900000 on 20 degrees of freedom
 Multiple R-squared: 0.5715, Adjusted R-squared: 0.5286
 F-statistic: 13.34 on 2 and 20 DF, p-value: 0.0002088

7 65217913 -38232381 63134039 48064134 1.033007 -0.7954451 0.3139310 0.4356941 13.33659 2 20

Call:

lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-189924729	-122728142	-42099441	-3418637	453865421

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	1190073	14348268	0.083	0.935
log(yEnv.area)	37202583	37695773	0.987	0.335

Residual standard error: 166500000 on 20 degrees of freedom
 Multiple R-squared: 0.5785, Adjusted R-squared: 0.5363
 F-statistic: 13.72 on 2 and 20 DF, p-value: 0.0001772

8 1190073 37202583 14348268 37695773 0.08294194 0.9869166 0.9347222 0.3354736 13.72258 2 20

Call:

lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-144305629	-125616683	-61192406	7776137	484947042

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
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log(yNGTotex)	15211304	7000411	2.173	0.042 *
log(yEnv.area.forest)	-573633	22940089	-0.025	0.980

 Signif. codes: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1 ' ', 1

Residual standard error: 170500000 on 20 degrees of freedom
 Multiple R-squared: 0.5579, Adjusted R-squared: 0.5137
 F-statistic: 12.62 on 2 and 20 DF, p-value: 0.0002849

9 15211304 -573633.2 7000411 22940089 2.172916 -0.02500571 0.04197716 0.9802982 12.62164 2 20

Call:
lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-245594835	-104201266	-22558475	87798831	374844841

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	-10935980	10772155	-1.015	0.3221
log(yEnv.area.agri)	88153983	35442857	2.487	0.0218 *

 Signif. codes: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1 ' ', 1

Residual standard error: 1.49e+08 on 20 degrees of freedom
 Multiple R-squared: 0.6624, Adjusted R-squared: 0.6286
 F-statistic: 19.62 on 2 and 20 DF, p-value: 1.925e-05

10 -10935980 88153983 10772155 35442857 -1.015208 2.487214 0.3221315 0.0218207 19.61786 2 20

Call:
lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-184364837	-103458257	-38424914	31816859	501534813

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	56963398	24550073	2.320	0.031 *
log(yEnv.temp.summer)	-180892342	105272639	-1.718	0.101

 Signif. codes: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1 ' ', 1

Residual standard error: 159200000 on 20 degrees of freedom
 Multiple R-squared: 0.6148, Adjusted R-squared: 0.5763
 F-statistic: 15.96 on 2 and 20 DF, p-value: 7.192e-05

11 56963398 -180892342 24550073 105272639 2.320294 -1.718322 0.03101286 0.1011811 15.9605 2 20

Call:
lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-170672648	-119203377	-57446005	-2939844	493981624

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	23111927	20138861	1.148	0.265



log(yEnv.temp.max30) -38597132 95388822 -0.405 0.690

Residual standard error: 169800000 on 20 degrees of freedom
Multiple R-squared: 0.5615, Adjusted R-squared: 0.5177
F-statistic: 12.81 on 2 and 20 DF, p-value: 0.0002627

13 23111927 -38597132 20138861 95388822 1.147628 -0.4046295 0.2646651 0.6900447 12.80612 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-203349755 -113826285 -36705875 -5306902 481289209

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 39521586 23219118 1.702 0.104
log(yDensity) -26045081 24519658 -1.062 0.301

Residual standard error: 165900000 on 20 degrees of freedom
Multiple R-squared: 0.5815, Adjusted R-squared: 0.5397
F-statistic: 13.9 on 2 and 20 DF, p-value: 0.0001646

15 39521586 -26045081 23219118 24519658 1.702114 -1.062212 0.1042281 0.3007979 13.89709 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-143287672 -124628240 -61101136 7773824 484469529

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 14519118 8873319 1.636 0.117
log(zDMU) 2865650 44823363 0.064 0.950

Residual standard error: 170500000 on 20 degrees of freedom
Multiple R-squared: 0.558, Adjusted R-squared: 0.5138
F-statistic: 12.63 on 2 and 20 DF, p-value: 0.0002845

16 14519118 2865650 8873319 44823363 1.636267 0.06393207 0.1174240 0.949659 12.62556 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-184110588 -68770680 -21577822 63257488 405875878

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 102004764 22708259 4.492 0.000223 ***
log(zYear) -139458401 36238296 -3.848 0.001003 **

Signif. codes: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1, 1

Residual standard error: 129300000 on 20 degrees of freedom
Multiple R-squared: 0.746, Adjusted R-squared: 0.7206
F-statistic: 29.37 on 2 and 20 DF, p-value: 1.117e-06



17 102004764 -139458401 22708259 36238296 4.491968 -3.848371 0.0002229039 0.001002678 29.37169 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-160073717 -54051142 -22468064 51105774 155915923

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 96485064 9730104 9.916 3.64e-09 ***
log(zAge1) -300835832 35571772 -8.457 4.89e-08 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 79720000 on 20 degrees of freedom
Multiple R-squared: 0.9034, Adjusted R-squared: 0.8937
F-statistic: 93.52 on 2 and 20 DF, p-value: 7.077e-11

20 96485064 -300835831 9730104 35571772 9.91614 -8.45715 3.644402e-09 4.888206e-08 93.51724 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-241692688 -76142692 -25155815 84116489 196869137

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 75853354 13036803 5.818 1.08e-05 ***
log(zAgem) -252651319 53492941 -4.723 0.000130 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 117200000 on 20 degrees of freedom
Multiple R-squared: 0.791, Adjusted R-squared: 0.7701
F-statistic: 37.85 on 2 and 20 DF, p-value: 1.589e-07

21 75853354 -252651319 13036803 53492941 5.818401 -4.723078 1.081221e-05 0.0001302608 37.85172 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-189693417 -160559314 -102274564 -5006582 601373068

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 20307713 22909565 0.886 0.386
log(yPower.gen.ren.excl.hydro) -257973 38827452 -0.007 0.995

Residual standard error: 227200000 on 20 degrees of freedom
Multiple R-squared: 0.5605, Adjusted R-squared: 0.5165
F-statistic: 12.75 on 2 and 20 DF, p-value: 0.0002691



2 20307713 -257973.3 22909565 38827452 0.8864294 -0.006644095 0.3859211 0.9947646 12.75152 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-189974720 -161033687 -102635873 -3612102 601997105

Coefficients:				
	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	20777654	38888264	0.534	0.599
log(yPower.gen.ren.incl.hydro)	-894286	55811672	-0.016	0.987

Residual standard error: 227200000 on 20 degrees of freedom
Multiple R-squared: 0.5605, Adjusted R-squared: 0.5165
F-statistic: 12.75 on 2 and 20 DF, p-value: 0.0002691

3 20777654 -894285.5 38888264 55811672 0.5342911 -0.01602327 0.5990298 0.9873746 12.75177 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-214292526 -149595915 -88049095 -10602019 521708612

Coefficients:				
	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	-20318744	28451821	-0.714	0.483
log(yPower.gen.nonren)	54788992	38167169	1.436	0.167

Residual standard error: 216300000 on 20 degrees of freedom
Multiple R-squared: 0.6015, Adjusted R-squared: 0.5617
F-statistic: 15.1 on 2 and 20 DF, p-value: 0.0001009

4 -20318744 54788993 28451821 38167169 -0.7141456 1.435501 0.4833893 0.1666004 15.09563 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-206558282 -153572241 -79726765 -15585819 522025131

Coefficients:				
	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	-19192888	28658830	-0.670	0.511
log(yPower.gen.thermal)	53555956	38657661	1.385	0.181

Residual standard error: 2.17e+08 on 20 degrees of freedom
Multiple R-squared: 0.599, Adjusted R-squared: 0.5588
F-statistic: 14.93 on 2 and 20 DF, p-value: 0.0001076

5 -19192888 53555956 28658830 38657661 -0.6697024 1.385390 0.510706 0.1811909 14.93483 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max



-246988358 -123123464 -77897588 -24749341 637235758

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	87784030	84078058	1.044	0.309
log(yService.pop)	-51540321	64008877	-0.805	0.430

Residual standard error: 223600000 on 20 degrees of freedom
 Multiple R-squared: 0.5743, Adjusted R-squared: 0.5317
 F-statistic: 13.49 on 2 and 20 DF, p-value: 0.0001956

7 87784030 -51540321 84078057 64008877 1.044078 -0.8052058 0.3089057 0.4301702 13.48903 2 20

Call:

lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-253285954	-153760212	-59883105	-3830310	554048572

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	-1115880	18962660	-0.059	0.954
log(yEnv.area)	57089773	49818704	1.146	0.265

Residual standard error: 220100000 on 20 degrees of freedom
 Multiple R-squared: 0.5875, Adjusted R-squared: 0.5463
 F-statistic: 14.25 on 2 and 20 DF, p-value: 0.0001425

8 -1115880 57089773 18962660 49818704 -0.05884618 1.145951 0.9536586 0.2653425 14.24534 2 20

Call:

lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-192574107	-158188561	-100229978	-6270759	600311769

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	19756745	9325866	2.118	0.0468 *
log(yEnv.area.forest)	1454258	30560522	0.048	0.9625

Signif. codes: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1 ' ', 1

Residual standard error: 227200000 on 20 degrees of freedom
 Multiple R-squared: 0.5605, Adjusted R-squared: 0.5166
 F-statistic: 12.75 on 2 and 20 DF, p-value: 0.0002688

9 19756745 1454258 9325866 30560522 2.118489 0.04758615 0.04684938 0.962518 12.75405 2 20

Call:

lm(formula = fm)

Residuals:

Min	1Q	Median	3Q	Max
-318742649	-136678832	-47037944	107818226	439411788

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	-18155178	13843986	-1.311	0.20458



Log(yEnv.area.agri) 129956293 45549886 2.853 0.00983 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 191500000 on 20 degrees of freedom
Multiple R-squared: 0.6876, Adjusted R-squared: 0.6564
F-statistic: 22.01 on 2 and 20 DF, p-value: 8.85e-06

10 -18155178 129956293 13843986 45549886 -1.311413 2.853054 0.204575 0.009830053 22.01123 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-243266272 -130643630 -66702230 7248360 624492541

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 77772691 32549887 2.389 0.0268 *
log(yEnv.temp.summer) -248676036 139576471 -1.782 0.0900 .

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 211100000 on 20 degrees of freedom
Multiple R-squared: 0.6207, Adjusted R-squared: 0.5827
F-statistic: 16.36 on 2 and 20 DF, p-value: 6.168e-05

11 77772691 -248676037 32549887 139576471 2.389338 -1.781647 0.02684421 0.08999882 16.36244 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-226295165 -135410067 -89773848 -21753124 614797522

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 31827536 26809925 1.187 0.249
log(yEnv.temp.max30) -55891148 126986685 -0.440 0.665

Residual standard error: 226100000 on 20 degrees of freedom
Multiple R-squared: 0.5647, Adjusted R-squared: 0.5212
F-statistic: 12.97 on 2 and 20 DF, p-value: 0.0002444

13 31827536 -55891148 26809925 126986685 1.187155 -0.4401339 0.2490761 0.66456 12.97184 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-274398441 -120619494 -56713546 -18942092 596373302

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 55921263 30755307 1.818 0.084 .
log(yDensity) -38067801 32477960 -1.172 0.255

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1



Residual standard error: 219800000 on 20 degrees of freedom
Multiple R-squared: 0.5887, Adjusted R-squared: 0.5476
F-statistic: 14.31 on 2 and 20 DF, p-value: 0.0001385

15 55921263 -38067801 30755307 32477960 1.818264 -1.172112 0.08403387 0.2549257 14.31433 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-197665459 -148543028 -102910822 -9090643 600511615

Coefficients:	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	17202956	11801768	1.458	0.160
log(zDMU)	15857611	59616356	0.266	0.793

Residual standard error: 226800000 on 20 degrees of freedom
Multiple R-squared: 0.562, Adjusted R-squared: 0.5182
F-statistic: 12.83 on 2 and 20 DF, p-value: 0.0002598

16 17202956 15857611 11801768 59616357 1.457659 0.2659943 0.1604586 0.7929664 12.83196 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-242147341 -87546029 -39528803 58875878 494554080

Coefficients:	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	137962504	29867446	4.619	0.000166 ***
log(zYear)	-188942345	47663068	-3.964	0.000765 ***

Signif. codes: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1 ' ', 1

Residual standard error: 1.7e+08 on 20 degrees of freedom
Multiple R-squared: 0.7539, Adjusted R-squared: 0.7292
F-statistic: 30.63 on 2 and 20 DF, p-value: 8.162e-07

17 137962504 -188942345 29867445 47663068 4.61916 -3.964125 0.0001657942 0.0007650758 30.62763 2 20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-208981028 -67416054 -24263727 46327137 231122449

Coefficients:	Estimate	Std. Error	t value	Pr(> t)
log(yNGTotex)	127146264	13583980	9.360	9.51e-09 ***
log(zAge1)	-395249632	49660954	-7.959	1.26e-07 ***

Signif. codes: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1 ' ', 1

Residual standard error: 111300000 on 20 degrees of freedom



Multiple R-squared: 0.8945, Adjusted R-squared: 0.884
F-statistic: 84.81 on 2 and 20 DF, p-value: 1.704e-10

20 127146264 -395249632 13583980 49660954 9.360016 -7.958962 9.506496e-09 1.261945e-07 84.81116 2
20

Call:
lm(formula = fm)

Residuals:
Min 1Q Median 3Q Max
-322765812 -100314369 -8686647 84788600 344339212

Coefficients:
Estimate Std. Error t value Pr(>|t|)
log(yNGTotex) 101058781 17392019 5.811 1.1e-05 ***
log(zAgem) -336178386 71363374 -4.711 0.000134 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 156400000 on 20 degrees of freedom
Multiple R-squared: 0.7916, Adjusted R-squared: 0.7708
F-statistic: 38 on 2 and 20 DF, p-value: 1.541e-07

21 101058781 -336178386 17392019 71363374 5.810641 -4.710797 1.099983e-05 0.0001340229 37.99607 2
20

There were 45 warnings (use warnings() to see them)

Appendix C: Summary variables

Table C-1 Sources

Code	Source
B	Bureau of Labor Statistics
C	OANDA
E	EUROSTAT, EU
I	OECD statistics
M	NORDEL Annual statistics
N	NRA request
O	Electricity Information 2007, IEA
Q	CEER TF Quality of Supply/Electricity
U	UCTE Statistical yearbook 2006
W	worldweather.wmo.int
X	Calculated

Table C-2 Indicator groups

	Group	Prefix	Period	Scope
A	Transportation service	yEnergy.	2003-2006	TSO
B	Capacity provision	yPower.	2003-2006	TSO
C	Customer service	yService.	2003-2006	Service area
D	Physical environment	yEnv.	2003-2006	Service area
E	Economic environment	yInd.	2003-2006	Country
F	Macro-economic environment	yInd.	1965-2006	Country
Q	Quality	zEns	2003-2006	TSO
T	Towers	zTowers	2006	TSO

Table C-3 Indicators Transportation services

A	Indicator	Name
E	Total delivered electrical energy (excl. losses)	yEnergy.del
E	Total delivered electrical energy to residential cust	yEnergy.del.res
E	Total delivered electrical energy to commerce	yEnergy.del.com
E	Total delivered electrical energy to industry	yEnergy.del.ind
N	Total losses in transmission	yEnergy.losses.transm
E	Total losses in distribution	yEnergy.losses.distr
O	Total Import of electricity	yEnergy.import
O	Total Export of electricity	yEnergy.export
O	Total electricity generation from renewables (ex hydro)	yEnergy.gen.ren
O	Total electricity generation from hydropower	yEnergy.gen.hydro
O	Total electricity generation from DG	yEnergy.gen.DG
O	Total electricity generation from CHP	yEnergy.gen.CHP

Table C-4 Indicators Capacity provision

<i>B</i>	<i>Indicator</i>	<i>Name</i>	<i>Calculation</i>
E	Total generation capacity	yPower.gen	Net installed capacity - total
E	Total generation capacity non-renewables	yPower.gen.nonren	yPower.gen - yPower.gen.ren.incl.hydro
X	Total generation capacity renewables including hydro	yPower.gen.ren.incl.hydro	yPower.gen.ren.excl.hydro + yPower.gen.hydro
X	Total generation capacity renewables excluding hydro	yPower.gen.ren.excl.hydro	Net installed capacity - Wind-turbines + Net installed capacity - Photovoltaic systems + Net installed capacity - Solar thermal systems + Net installed capacity - Geothermal plants + Net installed capacity - wood / wood wastes + Net installed capacity - biogas
E	Total generation capacity solar panels	yPower.gen.solar	Net installed capacity : Photovoltaic systems + Net installed capacity - Solar thermal systems
E	Total generation capacity wind mills	yPower.gen.wind	Net installed capacity - Wind-turbines
E	Total generation capacity hydropower	yPower.gen.hydro	Net installed capacity - Hydro power stations
E	Total generation capacity gas turbines	yPower.gen.gas	Net installed capacity - Gas turbine power plants + Net installed capacity - Combined cycle power plants
E	Total generation capacity nuclear power	yPower.gen.nuclear	Net installed capacity - Nuclear power stations
E	Total generation capacity thermal plants	yPower.gen.thermal	Net installed capacity - Thermal power stations
M	Total generation capacity CHP (electricity)	yPower.gen.chp	NORDEL Annual statistics
M	Interconnector capacity	yPower.interconnect	NORDEL Annual statistics
U	Maximum peak demand	yPower.peak	Statistical yearbook UCTE 2005, 2006 for UCTE members NORDEL Annual statistics for NORDEL members
U	Reserve according to UCTE definition	yPower.reserve	System Adequacy Forecast 2003 - 2005, 2004 - 2010, 2005 - 2015, 2006 - 2015, UCTE www.ucte.org

Table C-5 Indicators Customer services

C	Indicator	Name	Comment
E	Population	yService.pop	
E	Households	yService.res	
E	Projected population growth	yService.popgrowth	
N	Direct connections to transmission grid EHV	yService.connection.ehv	EUROSTAT def connections directly to the 220-400 kV grid operated and owned by the TSO
N	Direct connections to transmission grid HV	yService.connection.hv	number of connections directly onto the 70-200 kV grid operated and owned by the TSO
D	Existence of power exchange for OTC	yService.market	1= the TSO is a stakeholder (owner, operator or associate) in an electricity exchange open for the downstream clients of its country, 0 = else
N	Volume of national trade at power exchange (MWh)	yService.market.volume	Electricity traded annually at a marketplace associated with the TSO.
N	Electricity trade at power exchange (spot) (Currency)	yService.market.value	Value (in relevant currency) of annual electricity trade at a marketplace associated with the TSO.
E	Market share of largest generator	yService.market.incumbent	
E	Electricity prices (industrial users)	yService.price.ind	
E	Electricity prices (households)	yService.price.res	
E	Implicit tax rate on energy (EUROSTAT)	yService.tax	

Table C-6 Indicators Physical environment

D	Indicator	Name	Comment
E	Surface area (total)	yEnv.area	Cities by NRA choice
E	Area for built-up and related land (eg residential, industrial, commercial land, land used for transport and communication) (km ²)	yEnv.area2	
E	Area for lakes, marshland and swamps	yEnv.area.lake	
E	Forest and wooded area	yEnv.area.forest	
E	Agricultural area	yEnv.area.agri	
E	Area for road and rail infrastructure	yEnv.area.roads	
E	Surface area above forestation level	yEnv.area.alps	
W	Average temperature (Summer)	yEnv.temp.summer	
W	Average temperature (Winter)	yEnv.temp.winter	
W	Average maximum temperature (30 years)	yEnv.temp.max30	
W	Average minimum temperature (30 years)	yEnv.temp.min30	
E	Average precipitation	yEnv.rain	

Table C-7 Indicators Economic environment (short series)

E	Indicator	Name
E	Member of EU (0/1)	yInd.member
E	EUR (introduction year, 0 if none)	yInd.eur
E	Labour productivity per hour worked	yInd.prod1
E	Labour productivity per person employed	yInd.prod2
E	Market Integration – Trade integration of goods	yInd.integration.goods
E	Market Integration – Trade integration of services	yInd.integration.service
E	Energy intensity of the economy (EUROSTAT def)	yInd.ei
B	Hourly compensation costs for production workers manuf.	yInd.salary
E	GDP per capita	yInd.gdp
E	Real GDP growth rate	yInd.gdpgrowth
B	Social insurance expenditure and other taxes as % of comp	yInd.charges

Table C-8 Indicators Macro-economic environment (1965-2006)

F	Indicator	Name	Comment
E	Comparative price levels (EUROSTAT def)	yInd.ppp1	OECD except DK, CPI 1965-1966 was taken from BLS, 08/06/2007 "Consumer price indexes, Sixteen countries, 1950-2006". For LT, the public CPI from the Dep of Statistics is used from 1991-2006.
I	Purchasing Power Parity	yInd.ppp2	
I	Consumer price index	yInd.cpi	
I	Retail price index	yInd.rpi	
I	Producer price index	yInd.ppi	
I	Retail price index	yInd.rpi	
C	Exchange rate (average annual) Currency/USD	yInd.exch.usd.tt	
C	Exchange rate (average annual) Currency/EUR	yInd.exch.eur.tt	

Table C-9 Indicators Continuity of service

Q	Indicator	Name
Q	ENS (T, not exceptional events)	zENS

Table C-10 Tower data

T	Indicator	Name	Comment
N	Steel towers (number)	zTowers.steel	zTowers.steel + zTowers.cable + zTowers.wood + zTowers.other
N	Cable-stayed towers (number)	zTowers.cable	
N	Wooden towers (number)	zTowers.wood	
N	Towers other than steel, cable and wood (number)	zTowers.other	
X	Total number of towers	zTowers.tot	

Table C-11 Calculated indicators (2003-2006)

<i>Indicator</i>	<i>Name</i>	<i>Calculation</i>
Normalized grid Opex (kEUR)	yNGOpex	Ch 4
Normalized grid Capex (kEUR)	yNGCapex	Ch 4
Normalized grid Totex (kEUR)	yNGTotex	Ch 4
Density (pers/km ²)	yDensity	yService.pop/yEnv.area
Average age lines (yrs)	zAge1	weighted within asset category
Average age cables (yrs)	zAge2	weighted within asset category
Average age circuit ends (yrs)	zAge3	weighted within asset category
Average age transformers (yrs)	zAge4	weighted within asset category
Average age comp. dev. (yrs)	zAge5	weighted within asset category
Average age series comp. (yrs)	zAge6	weighted within asset category
Average age control centers (yrs)	zAge7	weighted within asset category
Average age other assets (yrs)	zAge8	weighted within asset category
Average age all assets (yrs)	zAgem	weighted across all assets

Table C-12 Descriptive statistics indicators

Indicator	# NA obs	Min	Mean	Max
yNGOpex	0	3.225,07	105.252,70	399.823,90
yNGCapex	0	4.214,41	207.269,20	777.111,60
yNGTotex	0	7.439,47	312.521,90	1.176.935,00
yEnergy.del	3	4.431,00	95.058,23	317.533,00
yEnergy.del.res	7	797,00	22.680,33	67.603,00
yEnergy.del.com	7	1.210,00	24.310,27	88.277,00
yEnergy.del.ind	7	596,00	40.967,20	156.151,00
yEnergy.losses.transm	14	562,00	1.601,00	3.017,00
yEnergy.losses.distr	7	132,00	6.433,27	22.955,00
yEnergy.import	3	0,00	17.103,11	54.571,00
yEnergy.export	3	0,00	14.549,32	54.670,00
yEnergy.gen.ren	3	0,00	8.871,26	52.239,00
yEnergy.gen.hydro	7	0,00	22.024,33	119.799,00
yEnergy.gen.DG	20	9.703,20	23.490,60	37.278,00
yEnergy.gen.CHP	11	0,00	8.368,64	27.569,00
yPower.gen	4	1.134,00	25.322,63	89.449,00
yPower.gen.wind	0	0,00	2.028,04	11.736,00
yPower.gen.solar	4	0,00	47,19	536,00
yPower.gen.chp	12	0,00	2.882,90	8.254,00
yPower.gen.hydro	0	0,00	5.552,60	28.691,00
yPower.gen.ren.excl.hydro	0	60,00	2.598,13	12.462,00
yPower.gen.ren.incl.hydro	0	536,00	8.113,05	30.776,00
yPower.gen.nonren	0	139,00	18.218,74	68.155,00
yPower.gen.thermal	0	140,00	17.034,94	66.467,00
yPower.gen.nuclear	0	0,00	2.615,29	12.659,00
yPower.gen.gas	0	0,00	4.970,45	32.863,00
yPower.interconnect	13	0,00	3.122,00	9.910,00
yPower.peak	5	1.035,00	18.816,41	55.619,00
yPower.reserve	9	0,00	0,05	0,09



Indicator	# NA obs	Min	Mean	Max
yService.pop	0	299.891,00	16.133.176,00	58.751.711,00
yService.res	9	179.982,00	6.015.902,00	22.496.470,00
yService.pop.urban	13	278.547,00	8.289.502,00	23.404.233,00
yService.res.urban	13	880.628,00	3.447.896,00	8.174.851,00
yService.popgrowth	3	-39.242,00	64.694,26	716.381,00
yService.connection.ehv	8	2,00	82,50	314,00
yService.connection.hv	9	1,00	162,85	705,00
yService.market	16	1,00	1,00	1,00
yService.market.volume	16	6.079.337,00	497.604.897,00	2.378.891.541,00
yService.market.value	17	1.120.750.763,00	21.896.130.131,00	84.909.499.894,00
yService.market.incumbent	11	17,30	44,70	100,00
yService.price.ind	1	0,05	0,08	0,11
yService.price.res	1	0,06	0,11	0,15
yService.tax	3	79,70	187,37	317,80
yEnv.area	0	2,59	151,47	504,78
yEnv.area2	6	1,98	85,19	840,00
yEnv.area.lake	5	0,44	14,00	82,00
yEnv.area.forest	0	1,31	99,16	950,00
yEnv.area.agri	0	1,41	59,53	306,66
yEnv.area.roads	10	1,34	139,00	938,00
yEnv.area.alps	18	0,00	7,13	11,00
yEnv.area.resid	13	2,24	107,14	739,00
yEnv.temp.summer	0	10,15	17,16	25,77
yEnv.temp.winter	0	-7,13	2,05	12,45
yEnv.temp.max30	0	6,96	13,35	24,32
yEnv.temp.min30	0	-0,18	5,58	13,72
yEnv.rain	0	26,67	58,85	103,92
yDensity	0	2.911,56	145.262,20	393.349,00
zTowers.steel	0	330,00	20.337,73	102.646,00
zTowers.cable	0	0,00	1.830,59	18.950,00
zTowers.wood	0	0,00	2.894,05	25.194,00
zTowers.other	0	0,00	1.049,86	21.364,00
zENS	3	0,00	790,27	10.416,70
zAge1	0	5,70	28,69	38,98
zAge2	1	0,00	16,97	41,00
zAge3	1	5,51	19,36	33,18
zAge4	1	5,64	21,30	30,65
zAge5	1	3,98	17,87	41,66
zAge6	14	1,65	12,91	26,40
zAge7	15	0,00	18,79	50,00
zAge8	18	11,00	16,09	21,03
zAgem	0	4,75	20,23	30,33
xStaff_X	45	0,00	12,62	82,16
xStaff_S	45	0,00	128,98	617,00
xStaff_P	49	0,00	24,99	210,33
xStaff_C	49	0,00	56,22	255,00
xStaff_M	49	1,00	225,73	2.214,30
xStaff_A	45	0,00	103,54	476,00
xStaff.tot	44	8,20	534,08	3.338,62





Appendix D: Robust OLS results – single addition

Robust residual standard error: 49480000
Convergence in 10 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);
2 weights are ~ = 1. The remaining 19 ones are summarized as

Min. 1st Qu. Median Mean 3rd Qu. Max.
0.6536 0.8948 0.9500 0.9182 0.9906 0.9985

Algorithmic parameters:

tuning.chi bb tuning.psi refine.tol rel.tol
1.5476400 0.5000000 4.6850610 0.0000001 0.0000001
nResample max.it groups n.group best.r.s k.fast.s k.max trace.lev compute.rd
500 50 5 400 2 1 200 0 0
seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min 1Q Median 3Q Max
-124844599 -11775387 35803386 71755025 569402348

Coefficients:

Estimate Std. Error t value Pr(>|t|)
yNGTotex 615.77 84.43 7.293 4.72e-07 ***
yPower.gen.wind -2863.90 7982.75 -0.359 0.724

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 79280000
Convergence in 14 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);
2 weights are ~ = 1. The remaining 19 ones are summarized as

Min. 1st Qu. Median Mean 3rd Qu. Max.
0.7868 0.8805 0.9536 0.9321 0.9815 0.9985

Algorithmic parameters:

tuning.chi bb tuning.psi refine.tol rel.tol
1.5476400 0.5000000 4.6850610 0.0000001 0.0000001
nResample max.it groups n.group best.r.s k.fast.s k.max trace.lev compute.rd
500 50 5 400 2 1 200 0 0
seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min 1Q Median 3Q Max
-121910409 -10055883 35547368 69305527 574420549

Coefficients:

Estimate Std. Error t value Pr(>|t|)
yNGTotex 637.69 66.62 9.572 6.56e-09 ***
yPower.gen.ren.excl.hydro -5463.02 6519.90 -0.838 0.412



Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 82110000

Convergence in 11 IRWLS iterations

Robustness weights:

observation 11 is an outlier with $lweightl = 0$ (< 0.0045);

3 weights are ~ 1 . The remaining 18 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.8092	0.9057	0.9415	0.9348	0.9782	0.9980

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-118130979	-10524616	30197257	69977208	553933749

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	549.8	136.6	4.025	0.000664 ***
yPower.gen.ren.incl.hydro	1986.5	4256.0	0.467	0.645723

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 66480000

Convergence in 24 IRWLS iterations

Robustness weights:

observation 11 is an outlier with $lweightl = 0$ (< 0.0045);

3 weights are ~ 1 . The remaining 18 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.5896	0.8830	0.9356	0.9007	0.9803	0.9970

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-112001095	-17267420	29852670	63731388	474918814

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	489.82	71.63	6.838	1.20e-06 ***
yPower.gen.nonren	2210.52	1513.86	1.460	0.160

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 67630000



Convergence in 12 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);
3 weights are ~ = 1. The remaining 18 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.7116	0.8684	0.9413	0.9104	0.9760	0.9909

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-113259216	-14288477	24246359	73783489	480305140

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	505.47	77.81	6.496	2.48e-06 ***
yPower.gen.thermal	2070.42	1768.07	1.171	0.255

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 65740000

Convergence in 13 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);
3 weights are ~ = 1. The remaining 18 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.7139	0.8603	0.9167	0.9034	0.9756	0.9939

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-118391086	-13150282	30269682	71094268	526794953

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	691.7	55.5	12.46	6.94e-11 ***
yPower.gen.nuclear	-11283.4	4307.2	-2.62	0.0164 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 78400000

Convergence in 8 IRWLS iterations

Robustness weights:



observation 11 is an outlier with lweightl = 0 (< 0.0045);
2 weights are ~ = 1. The remaining 19 ones are summarized as

Min. 1st Qu. Median Mean 3rd Qu. Max.
0.8030 0.9192 0.9432 0.9405 0.9862 0.9980

Algorithmic parameters:

tuning.chi bb tuning.psi refine.tol rel.tol
1.5476400 0.5000000 4.6850610 0.0000001 0.0000001
nResample max.it groups n.group best.r.s k.fast.s k.max trace.lev compute.rd
500 50 5 400 2 1 200 0 0
seed : int(0)

Call:
lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-120603811	-17901101	23120576	67724869	450030779

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	463.931	140.137	3.311	0.00349 **
yService.pop	3.204	3.648	0.878	0.39032

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 67110000
Convergence in 17 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);
one weight is ~ = 1. The remaining 20 ones are summarized as

Min. 1st Qu. Median Mean 3rd Qu. Max.
0.7274 0.8706 0.9625 0.9207 0.9881 0.9989

Algorithmic parameters:

tuning.chi bb tuning.psi refine.tol rel.tol
1.5476400 0.5000000 4.6850610 0.0000001 0.0000001
nResample max.it groups n.group best.r.s k.fast.s k.max trace.lev compute.rd
500 50 5 400 2 1 200 0 0
seed : int(0)

Call:
lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-128739079	-11219547	33189671	68913628	588003929

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	636.65	97.83	6.508	2.42e-06 ***
yEnv.area	-113816.14	180020.33	-0.632	0.534

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 73220000
Convergence in 16 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);
2 weights are ~ = 1. The remaining 19 ones are summarized as

Min. 1st Qu. Median Mean 3rd Qu. Max.



```

0.7382 0.8808 0.9531 0.9228 0.9865 0.9979
Algorithmic parameters:
tuning.chi      bb tuning.psi refine.tol  rel.tol
1.5476400 0.5000000 4.6850610 0.0000001 0.0000001
nResample      max.it      groups    n.group    best.r.s    k.fast.s    k.max    trace.lev    compute.rd
500            50          5         400        2           1           200     0           0
seed : int(0)

```

Call:
lmrob(formula = fm)

```

Weighted Residuals:
      Min       1Q   Median       3Q      Max
-111775898 -12311784 36141884  70457593 574743090

```

```

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
yNGTotex      598.6      44.9   13.332 2.07e-11 ***
yEnv.area.forest -34781.9  46731.2  -0.744  0.465
---

```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 76250000
Convergence in 13 IRWLS iterations

Robustness weights:
observation 11 is an outlier with $lweightl = 0$ (< 0.0045);
one weight is ~ 1 . The remaining 20 ones are summarized as

```

      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
0.8138 0.8847 0.9578 0.9308 0.9832 0.9981

```

```

Algorithmic parameters:
tuning.chi      bb tuning.psi refine.tol  rel.tol
1.5476400 0.5000000 4.6850610 0.0000001 0.0000001
nResample      max.it      groups    n.group    best.r.s    k.fast.s    k.max    trace.lev    compute.rd
500            50          5         400        2           1           200     0           0
seed : int(0)

```

Call:
lmrob(formula = fm)

```

Weighted Residuals:
      Min       1Q   Median       3Q      Max
-118076363 -11878330 34813152  71134975 573638296

```

```

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
yNGTotex      592.1      102.6   5.772 1.20e-05 ***
yEnv.area.agri 11449.9  342796.3  0.033  0.974
---

```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 76430000
Convergence in 18 IRWLS iterations

Robustness weights:
observation 11 is an outlier with $lweightl = 0$ (< 0.0045);
2 weights are ~ 1 . The remaining 19 ones are summarized as

```

      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
0.7944 0.8637 0.9479 0.9264 0.9815 0.9988

```

```

Algorithmic parameters:
tuning.chi      bb tuning.psi refine.tol  rel.tol

```



```

1.5476400 0.5000000 4.6850610 0.0000001 0.0000001
nResample max.it groups n.group best.r.s k.fast.s k.max trace.lev compute.rd
500 50 5 400 2 1 200 0 0
seed : int(0)

```

Call:
lmrob(formula = fm)

Weighted Residuals:				
Min	1Q	Median	3Q	Max
-132155622	-33256991	10156498	46708845	554979563

Coefficients:				
	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	5.344e+02	5.643e+01	9.471	7.83e-09 ***
yEnv.temp.summer	2.135e+06	9.022e+05	2.367	0.0281 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 69140000
Convergence in 11 IRWLS iterations

Robustness weights:
observation 11 is an outlier with lweightl = 0 (< 0.0045);
2 weights are ~ 1. The remaining 19 ones are summarized as
Min. 1st Qu. Median Mean 3rd Qu. Max.
0.6739 0.9079 0.9626 0.9235 0.9848 0.9955

Algorithmic parameters:
tuning.chi bb tuning.psi refine.tol rel.tol
1.5476400 0.5000000 4.6850610 0.0000001 0.0000001
nResample max.it groups n.group best.r.s k.fast.s k.max trace.lev compute.rd
500 50 5 400 2 1 200 0 0
seed : int(0)

Call:
lmrob(formula = fm)

Weighted Residuals:				
Min	1Q	Median	3Q	Max
-71790838	-28358548	18190555	53811591	539206125

Coefficients:				
	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	559.1	55.0	10.166	2.4e-09 ***
yEnv.temp.winter	6681531.5	2827447.9	2.363	0.0284 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 61420000
Convergence in 13 IRWLS iterations

Robustness weights:
observation 11 is an outlier with lweightl = 0 (< 0.0045);
one weight is ~ 1. The remaining 20 ones are summarized as
Min. 1st Qu. Median Mean 3rd Qu. Max.
0.6737 0.9061 0.9460 0.9149 0.9780 0.9986

Algorithmic parameters:
tuning.chi bb tuning.psi refine.tol rel.tol
1.5476400 0.5000000 4.6850610 0.0000001 0.0000001
nResample max.it groups n.group best.r.s k.fast.s k.max trace.lev compute.rd
500 50 5 400 2 1 200 0 0



```
seed : int(0)
```

```
Call:
lmrob(formula = fm)
```

Weighted Residuals:

Min	1Q	Median	3Q	Max
-119180058	-39689866	9751599	39243615	549169883

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
yNGTotex	5.266e+02	5.718e+01	9.209	1.24e-08	***
yEnv.temp.max30	2.971e+06	1.119e+06	2.655	0.0152	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 69210000

Convergence in 11 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);

2 weights are ~ = 1. The remaining 19 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.6687	0.9153	0.9674	0.9274	0.9793	0.9948

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol					
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001					
nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd	
500	50	5	400	2	1	200	0	0	

```
seed : int(0)
```

```
Call:
lmrob(formula = fm)
```

Weighted Residuals:

Min	1Q	Median	3Q	Max
-93822338	-36708411	5099889	41074920	534294056

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
yNGTotex	5.187e+02	6.432e+01	8.065	1.03e-07	***
yEnv.temp.min30	7.196e+06	3.076e+06	2.339	0.0298	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 61040000

Convergence in 14 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);

2 weights are ~ = 1. The remaining 19 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.5378	0.8927	0.9587	0.9148	0.9855	0.9970

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol					
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001					
nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd	
500	50	5	400	2	1	200	0	0	

```
seed : int(0)
```

```
Call:
```

**lmrob(formula = fm)**

Weighted Residuals:

Min	1Q	Median	3Q	Max
-104349120	-33423739	11358899	50163979	559554614

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	537.60	39.98	13.446	1.78e-11 ***
yDensity	218.61	61.59	3.549	0.00201 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 72990000

Convergence in 9 IRWLS iterations

Robustness weights:

observation 11 is an outlier with $lweightl = 0$ (< 0.0045);
one weight is ~ 1 . The remaining 20 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.8028	0.8940	0.9636	0.9401	0.9896	0.9989

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

Call:**lmrob(formula = fm)**

Weighted Residuals:

Min	1Q	Median	3Q	Max
-131724158	-28299310	17862958	38729109	570156524

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	536.0	45.3	11.831	1.75e-10 ***
zDMU	2734786.1	1603315.9	1.706	0.104

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 58740000

Convergence in 12 IRWLS iterations

Robustness weights:

observation 11 is an outlier with $lweightl = 0$ (< 0.0045);
2 weights are ~ 1 . The remaining 19 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.5942	0.8759	0.9604	0.8968	0.9805	0.9988

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

Call:**lmrob(formula = fm)**

Weighted Residuals:



Min	1Q	Median	3Q	Max
-137374770	-33479954	8843855	43609575	565683152

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	538.08	51.04	10.543	1.29e-09 ***
zYear	18083.86	7485.35	2.416	0.0254 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 68530000

Convergence in 7 IRWLS iterations

Robustness weights:

observation 11 is an outlier with $lweightl = 0$ (< 0.0045);
one weight is ~ 1 . The remaining 20 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.6674	0.9000	0.9649	0.9259	0.9942	0.9986

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	1	200	0	0
nResample	max.it	groups	n.group	best.r.s				
500	50	5	400	2				

seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-113801610	-13911058	31734889	76478341	568135723

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	607.19	48.59	12.495	6.63e-11 ***
zTowers.wood	-3553.62	1565.06	-2.271	0.0344 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 71340000

Convergence in 14 IRWLS iterations

Robustness weights:

observation 11 is an outlier with $lweightl = 0$ (< 0.0045);
2 weights are ~ 1 . The remaining 19 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.7816	0.8854	0.9660	0.9274	0.9833	0.9989

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	1	200	0	0
nResample	max.it	groups	n.group	best.r.s				
500	50	5	400	2				

seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-120235726	-11594086	29005111	71218997	575121666



Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	592.9	43.4	13.66	1.33e-11 ***
zTowers.other	2624.5	253.0	10.37	1.70e-09 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 80420000

Convergence in 10 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);

3 weights are ~ = 1. The remaining 18 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.8067	0.8716	0.9509	0.9320	0.9844	0.9989

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-133392758	-31258712	11980311	48777356	593119547

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	5.440e+02	5.651e+01	9.625	5.99e-09 ***
zAge1	1.045e+06	5.938e+05	1.760	0.0937 .

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 68690000

Convergence in 11 IRWLS iterations

Robustness weights:

observation 11 is an outlier with lweightl = 0 (< 0.0045);

2 weights are ~ = 1. The remaining 19 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.6859	0.8910	0.9639	0.9186	0.9915	0.9982

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

Call:

lmrob(formula = fm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-130432670	-30714413	16613670	45579157	593787640

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	5.386e+02	5.018e+01	10.733	9.5e-10 ***



```
zAgem 1.671e+06 7.341e+05 2.276 0.034 *
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Robust residual standard error: 68790000

Convergence in 12 IRWLS iterations

Robustness weights:

observation 11 is an outlier with `lweightl = 0` (`< 0.0045`);

3 weights are `~= 1`. The remaining 18 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.6993	0.9077	0.9462	0.9192	0.9883	0.9956

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol					
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001					
nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd	
500	50	5	400	2	1	200	0	0	

seed : `int(0)`

There were 50 or more warnings (use `warnings()` to see the first 50)





Appendix E: Stepwise Addition Unit Cost

```
.... removing empty columns: yEnergy.del.res yEnergy.del.com yEnergy.del.ind
yEnergy.losses.transm yEnergy.losses.distr yEnergy.gen.hydro yEnergy.gen.DG yEnergy.gen.CHP
yPower.gen.chp yPower.interconnect yPower.peak yPower.reserve yService.res yService.pop.urban
yService.res.urban yService.connection.ehv yService.connection.hv yService.market
yService.market.volume yService.market.value yService.market.incumbent yEnv.area2 yEnv.area.lake
yEnv.area.roads yEnv.area.alps yEnv.area.resid zAge6 zAge7 zAge8
```

BIC for new model: 370.5575

Call:
lm(formula = paste("lvar~", basem, sep = ""))

Residuals:

Min	1Q	Median	3Q	Max
-809.1	105.7	755.1	1152.7	1914.1

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	0.0012114	0.0004611	2.627	0.0158 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 978.1 on 21 degrees of freedom
Multiple R-squared: 0.2473, Adjusted R-squared: 0.2115
F-statistic: 6.901 on 1 and 21 DF, p-value: 0.01575

Call:
lmrob(formula = mod.lm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-779.8	116.6	760.0	1155.2	1914.9

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	0.0011865	0.0003412	3.477	0.00225 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 1132
Convergence in 7 IRWLS iterations

Robustness weights:

2 weights are ~ = 1. The remaining 20 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.7564	0.9012	0.9543	0.9312	0.9819	0.9989

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

yNGTotex condition index = 1 Good, multicollinearity not a problem



Selecting variable: yService.price.ind
 Current model: 0+yNGTotex+yService.price.ind
 BIC for new model: 317.0158

Call:
 lm(formula = paste("lvar~", basem, sep = ""))

Residuals:
 Min 1Q Median 3Q Max
 -519.89 -329.99 -49.57 251.76 770.56

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	-4.929e-04	2.555e-04	-1.929	0.0688 .
yService.price.ind	1.448e+04	1.526e+03	9.485	1.23e-08 ***

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 388.2 on 19 degrees of freedom
 (1 observation deleted due to missingness)
 Multiple R-squared: 0.8748, Adjusted R-squared: 0.8617
 F-statistic: 66.4 on 2 and 19 DF, p-value: 2.668e-09

Call:
 lmrob(formula = mod.lm)

Weighted Residuals:
 Min 1Q Median 3Q Max
 -498.46 -310.50 -28.41 282.23 783.88

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
yNGTotex	-4.882e-04	1.423e-04	-3.431	0.00280 **
yService.price.ind	1.420e+04	1.444e+03	9.838	6.84e-09 ***

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 395.3
 Convergence in 9 IRWLS iterations

Robustness weights:
 2 weights are ~ = 1. The remaining 19 ones are summarized as
 Min. 1st Qu. Median Mean 3rd Qu. Max.
 0.6737 0.9032 0.9446 0.9164 0.9829 0.9961

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)
 yNGTotex condition index = 1 Good, multicollinearity not a problem
 yService.price.ind condition index = 2.369700 Good, multicollinearity not a problem
 Selecting variable: zAge5
 Current model: 0+yNGTotex+yService.price.ind+zAge5
 BIC for new model: 299.2842

Call:
 lm(formula = paste("lvar~", basem, sep = ""))



Residuals:

Min	1Q	Median	3Q	Max
-511.42	-187.54	-21.11	176.26	618.46

Coefficients:

Estimate	Std. Error	t value	Pr(> t)
yNGTotex	-5.375e-04	2.339e-04	-2.298 0.0345 *
yService.price.ind	1.907e+04	2.205e+03	8.647 1.25e-07 ***
zAge5	-1.821e+01	7.055e+00	-2.582 0.0194 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 345.5 on 17 degrees of freedom

(2 observations deleted due to missingness)

Multiple R-squared: 0.907, Adjusted R-squared: 0.8906

F-statistic: 55.27 on 3 and 17 DF, p-value: 5.603e-09

Call:

lmrob(formula = mod.lm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-501.738	-172.036	-3.938	189.856	624.517

Coefficients:

Estimate	Std. Error	t value	Pr(> t)
yNGTotex	-5.295e-04	1.109e-04	-4.773 0.000177 ***
yService.price.ind	1.896e+04	2.093e+03	9.062 6.42e-08 ***
zAge5	-1.861e+01	7.077e+00	-2.630 0.017562 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 329.8

Convergence in 8 IRWLS iterations

Robustness weights:

4 weights are ~ = 1. The remaining 16 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.7000	0.8385	0.9546	0.8993	0.9781	0.9976

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

yNGTotex condition index = 1 Good, multicollinearity not a problem

yService.price.ind condition index = 2.431523 Good, multicollinearity not a problem

zAge5 condition index = 4.377439 Good, multicollinearity not a problem

Selecting variable: yEnv.rain

Current model: 0+yNGTotex+yService.price.ind+zAge5+yEnv.rain

BIC for new model: 294.9509

Call:

lm(formula = paste("lvar~", basem, sep = ""))

Residuals:

Min	1Q	Median	3Q	Max
-557.80	-139.72	21.20	156.34	425.60



Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
yNGTotex	-6.285e-04	2.036e-04	-3.087	0.00707	**
yService.price.ind	1.457e+04	2.537e+03	5.741	3.04e-05	***
zAge5	-2.696e+01	6.889e+00	-3.913	0.00124	**
yEnv.rain	9.592e+00	3.604e+00	2.661	0.01708	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 296.5 on 16 degrees of freedom
(2 observations deleted due to missingness)

Multiple R-squared: 0.9355, Adjusted R-squared: 0.9194

F-statistic: 58.05 on 4 and 16 DF, p-value: 2.529e-09

Call:

lmrob(formula = mod.lm)

Weighted Residuals:

Min	1Q	Median	3Q	Max
-570.28	-142.15	19.47	152.77	419.36

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
yNGTotex	-6.355e-04	1.303e-04	-4.877	0.000168	***
yService.price.ind	1.477e+04	2.327e+03	6.348	9.68e-06	***
zAge5	-2.771e+01	7.320e+00	-3.785	0.001622	**
yEnv.rain	9.682e+00	2.656e+00	3.645	0.002180	**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Robust residual standard error: 323.3

Convergence in 10 IRWLS iterations

Robustness weights:

one weight is ~ 1. The remaining 19 ones are summarized as

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.7367	0.8945	0.9669	0.9377	0.9899	0.9983

Algorithmic parameters:

tuning.chi	bb	tuning.psi	refine.tol	rel.tol	nResample	max.it	groups	n.group	best.r.s	k.fast.s	k.max	trace.lev	compute.rd
1.5476400	0.5000000	4.6850610	0.0000001	0.0000001	500	50	5	400	2	1	200	0	0

seed : int(0)

yNGTotex condition index = 1 Good, multicollinearity not a problem

yService.price.ind condition index = 2.780373 Good, multicollinearity not a problem

zAge5 condition index = 4.923349 Good, multicollinearity not a problem

yEnv.rain condition index = 7.42102 Good, multicollinearity not a problem

No significant addition found - model saturated at level 0.4803365

Appendix F: OLS results single factor

dxOpexCMPA~yEnergy.del				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	5.401.474,00	12.605.191,00	0,43	0,67
yEnergy.del	646,99	100,16	6,46	0,00
Adjusted R-square		0,69		
dxOpexCMPA~yEnergy.import				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	41.314.652,00	21.397.435,00	1,93	0,07
yEnergy.import	1.496,14	930,41	1,61	0,13
Adjusted R-square		0,08		
dxOpexCMPA~yEnergy.export				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	60.973.062,00	21.651.033,00	2,82	0,01
yEnergy.export	407,59	1.053,80	0,39	0,70
Adjusted R-square		-0,05		
dxOpexCMPA~yEnergy.gen.ren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	38.116.315,00	13.865.500,00	2,75	0,01
yEnergy.gen.ren	3.244,97	881,19	3,68	0,00
Adjusted R-square		0,41		
dxOpexCMPA~yPower.gen				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	2.245.746,00	10.378.458,00	0,22	0,83
yPower.gen	2.744,13	284,96	9,63	0,00
Adjusted R-square		0,84		
dxOpexCMPA~yPower.gen.wind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	48.280.246,00	16.541.530,00	2,92	0,01
yPower.gen.wind	11.707,08	4.383,94	2,67	0,01
Adjusted R-square		0,23		
dxOpexCMPA~yPower.gen.solar				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	72.207.819,00	20.821.051,00	3,47	0,00
yPower.gen.solar	-13.590,31	155.503,30	-0,09	0,93
Adjusted R-square		-0,06		
dxOpexCMPA~yPower.gen.ren.excl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	41.114.846,00	17.900.108,00	2,30	0,03
yPower.gen.ren.excl.hydro	11.896,18	4.356,85	2,73	0,01
Adjusted R-square		0,24		
dxOpexCMPA~yPower.gen.ren.incl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	40.751.779,00	18.989.695,00	2,15	0,04
yPower.gen.ren.incl.hydro	3.878,30	1.562,85	2,48	0,02
Adjusted R-square		0,20		
dxOpexCMPA~yPower.gen.nonren				

	Estimate	Std. Error	t value	Pr(> t)
Intercept	13.818.091,00	10.442.344,00	1,32	0,20
yPower.gen.nonren	3.194,76	385,87	8,28	0,00
Adjusted R-square		0,76		
dxOpexCMPA~yPower.gen.thermal				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	15.128.943,00	11.945.675,00	1,27	0,22
yPower.gen.thermal	3.339,83	477,38	7,00	0,00
Adjusted R-square		0,70		
dxOpexCMPA~yPower.gen.nuclear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	47.414.162,00	17.532.306,00	2,70	0,01
yPower.gen.nuclear	9.409,47	3.885,71	2,42	0,03
Adjusted R-square		0,19		
dxOpexCMPA~yService.pop				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	10.306.930,00	10.055.935,00	1,02	0,32
yService.pop	3,83	0,43	8,91	0,00
Adjusted R-square		0,79		
dxOpexCMPA~yService.poppgrowth				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	47.900.347,00	9.347.307,00	5,12	0,00
yService.poppgrowth	293,73	49,64	5,92	0,00
Adjusted R-square		0,65		
dxOpexCMPA~yService.price.ind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	47.436.815,00	83.612.350,00	0,57	0,58
yService.price.ind	359.851.990,00	1.079.192.887,00	0,33	0,74
Adjusted R-square		-0,05		
dxOpexCMPA~yService.price.res				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	46.173.340,00	76.466.943,00	0,60	0,55
yService.price.res	259.833.334,00	678.375.961,00	0,38	0,71
dxOpexCMPA~yService.tax				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	59.053.592,00	62.057.482,00	0,95	0,35
yService.tax	90.477,14	315.966,10	0,29	0,78
Adjusted R-square		-0,05		
dxOpexCMPA~yEnv.area				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	34.728.057,00	20.439.033,00	1,70	0,10
yEnv.area	246.209,80	97.407,54	2,53	0,02
Adjusted R-square		0,20		
dxOpexCMPA~yEnv.area.forest				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	77.466.203,00	17.902.600,00	4,33	0,00
yEnv.area.forest	-54.896,40	79.819,98	-0,69	0,50
Adjusted R-square		-0,03		
dxOpexCMPA~yEnv.area.agri				



	Estimate	Std. Error	t value	Pr(> t)
Intercept	23.513.920,00	12.689.061,00	1,85	0,08
yEnv.area.agri	814.899,00	136.559,20	5,97	0,00
	Adjusted R-square	0,62		
dxOpexCMPA~yEnv.temp.summer				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-31.605.386,00	79.817.906,00	-0,40	0,70
yEnv.temp.summer	6.039.941,00	4.562.701,00	1,32	0,20
	Adjusted R-square	0,03		
dxOpexCMPA~yEnv.temp.winter				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	61.693.294,00	16.724.855,00	3,69	0,00
yEnv.temp.winter	5.033.459,00	3.239.534,00	1,55	0,14
	Adjusted R-square	0,06		
dxOpexCMPA~yEnv.temp.max30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-4.564.122,00	50.325.667,00	-0,09	0,93
yEnv.temp.max30	5.737.843,00	3.591.907,00	1,60	0,13
	Adjusted R-square	0,07		
dxOpexCMPA~yEnv.temp.min30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	34.517.286,00	30.062.270,00	1,15	0,26
yEnv.temp.min30	6.715.540,00	4.617.514,00	1,45	0,16
	Adjusted R-square	0,05		
dxOpexCMPA~yDensity				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	46.839.078,00	25.793.990,00	1,82	0,08
yDensity	173,37	141,07	1,23	0,23
	Adjusted R-square	0,02		
dxOpexCMPA~zDMU				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	32.087.760,00	30.957.978,00	1,04	0,31
zDMU	3.241.948,00	2.179.422,00	1,49	0,15
	Adjusted R-square	0,05		
dxOpexCMPA~zYear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	72.022.671,00	15.855.145,00	4,54	0,00
	Adjusted R-square	0,00		
dxOpexCMPA~zTowers.wood				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	79.661.051,00	17.127.716,00	4,65	0,00
zTowers.wood	-2.639,34	2.327,07	-1,13	0,27
	Adjusted R-square	0,01		
dxOpexCMPA~zTowers.other				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	72.675.467,00	16.682.741,00	4,36	0,00
zTowers.other	-621,79	3.656,92	-0,17	0,87
	Adjusted R-square	-0,05		
dxOpexCMPA~zENS				
	Estimate	Std. Error	t value	Pr(> t)



Intercept	79.524.867,00	19.408.525,00	4,10	0,00
zENS	-1.847,82	7.975,12	-0,23	0,82
	Adjusted R-square	-0,06		
dxOpexCMPA~zAge1				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	135.343.658,00	59.543.821,00	2,27	0,03
zAge1	-2.207.042,00	2.001.239,00	-1,10	0,28
	Adjusted R-square	0,01		
dxOpexCMPA~zAge2				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	82.881.876,00	31.198.086,00	2,66	0,02
zAge2	-553.574,50	1.544.057,00	-0,36	0,72
	Adjusted R-square	-0,05		
dxOpexCMPA~zAge3				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	100.118.530,00	56.677.559,00	1,77	0,09
zAge3	-1.309.663,00	2.797.034,00	-0,47	0,64
	Adjusted R-square	-0,04		
dxOpexCMPA~zAge4				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	121.166.269,00	62.367.626,00	1,94	0,07
zAge4	-2.151.911,00	2.825.047,00	-0,76	0,46
	Adjusted R-square	-0,02		
dxOpexCMPA~zAge5				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	111.050.736,00	31.765.401,00	3,50	0,00
zAge5	-1.998.927,00	1.536.414,00	-1,30	0,21
	Adjusted R-square	0,03		
dxOpexCMPA~zAgem				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	106.251.892,00	49.347.743,00	2,15	0,04
zAgem	-1.692.298,00	2.307.408,00	-0,73	0,47
	Adjusted R-square	-0,02		
dxCapexCMPA~yEnergy.del				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-3.510.251,00	34.653.684,00	-0,10	0,92
yEnergy.del	1.771,30	275,35	6,43	0,00
	Adjusted R-square	0,69		
dxCapexCMPA~yEnergy.import				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	36.546.424,00	47.031.426,00	0,78	0,45
yEnergy.import	7.502,71	2.045,04	3,67	0,00
	Adjusted R-square	0,41		
dxCapexCMPA~yEnergy.export				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	133.157.430,00	58.609.584,00	2,27	0,04
yEnergy.export	2.179,39	2.852,64	0,76	0,46
	Adjusted R-square	-0,02		
dxCapexCMPA~yEnergy.gen.ren				



	Estimate	Std. Error	t value	Pr(> t)
Intercept	84.625.205,00	37.485.565,00	2,26	0,04
yEnergy.gen.ren	9.045,03	2.382,31	3,80	0,00
	Adjusted R-square	0,43		
dxCapexCMPA~yPower.gen				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-5.646.305,00	23.087.398,00	-0,24	0,81
yPower.gen	6.404,69	633,91	10,10	0,00
	Adjusted R-square	0,86		
dxCapexCMPA~yPower.gen.wind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	115.632.240,00	40.152.030,00	2,88	0,01
yPower.gen.wind	27.369,60	10.641,34	2,57	0,02
	Adjusted R-square	0,21		
dxCapexCMPA~yPower.gen.solar				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	159.611.091,00	48.216.049,00	3,31	0,00
yPower.gen.solar	-73.430,87	360.104,60	-0,20	0,84
	Adjusted R-square	-0,06		
dxCapexCMPA~yPower.gen.ren.excl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	98.143.886,00	43.314.397,00	2,27	0,03
yPower.gen.ren.excl.hydro	28.095,20	10.542,63	2,66	0,01
	Adjusted R-square	0,23		
dxCapexCMPA~yPower.gen.ren.incl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	87.267.986,00	43.901.473,00	1,99	0,06
yPower.gen.ren.incl.hydro	10.401,88	3.613,09	2,88	0,01
	Adjusted R-square	0,26		
dxCapexCMPA~yPower.gen.nonren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	34.129.712,00	26.824.838,00	1,27	0,22
yPower.gen.nonren	7.520,23	991,26	7,59	0,00
dxCapexCMPA~yPower.gen.thermal				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	29.761.895,00	26.208.125,00	1,14	0,27
yPower.gen.thermal	8.299,23	1.047,34	7,92	0,00
	Adjusted R-square	0,75		
dxCapexCMPA~yPower.gen.nuclear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	120.620.855,00	43.792.140,00	2,75	0,01
yPower.gen.nuclear	19.316,40	9.705,71	1,99	0,06
	Adjusted R-square	0,12		
dxCapexCMPA~yService.pop				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	28.643.432,00	27.651.684,00	1,04	0,31
yService.pop	8,83	1,18	7,48	0,00
	Adjusted R-square	0,72		
dxCapexCMPA~yService.pogrowth				



	Estimate	Std. Error	t value	Pr(> t)
Intercept	123.770.995,00	34.159.676,00	3,62	0,00
yService.popgrowth	635,22	181,42	3,50	0,00
Adjusted R-square 0,38				
dxCapexCMPA~yService.price.ind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-42.253.142,00	195.429.237,00	-0,22	0,83
yService.price.ind	2.890.891.348,00	2.522.424.532,00	1,15	0,27
Adjusted R-square 0,02				
dxCapexCMPA~yService.price.res				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-126.655.893,00	170.622.834,00	-0,74	0,47
yService.price.res	2.762.496.672,00	1.513.679.308,00	1,83	0,08
Adjusted R-square 0,10				
dxCapexCMPA~yService.tax				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	22.403.753,00	144.551.050,00	0,15	0,88
yService.tax	829.065,20	735.982,70	1,13	0,28
Adjusted R-square 0,01				
dxCapexCMPA~yEnv.area				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	101.175.959,00	52.118.011,00	1,94	0,07
yEnv.area	461.877,80	248.382,00	1,86	0,08
Adjusted R-square 0,10				
dxCapexCMPA~yEnv.area.forest				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	186.931.437,00	42.807.721,00	4,37	0,00
yEnv.area.forest	-159.263,50	190.861,20	-0,83	0,41
Adjusted R-square -0,01				
dxCapexCMPA~yEnv.area.agri				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	77.682.910,00	39.032.776,00	1,99	0,06
yEnv.area.agri	1.569.967,00	420.069,20	3,74	0,00
Adjusted R-square 0,38				
dxCapexCMPA~yEnv.temp.summer				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-120.702.364,00	188.739.390,00	-0,64	0,53
yEnv.temp.summer	17.009.907,00	10.789.076,00	1,58	0,13
Adjusted R-square 0,07				
dxCapexCMPA~yEnv.temp.winter				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	142.205.077,00	39.331.924,00	3,62	0,00
yEnv.temp.winter	14.099.301,00	7.618.429,00	1,85	0,08
Adjusted R-square 0,10				
dxCapexCMPA~yEnv.temp.max30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-35.153.278,00	119.003.884,00	-0,30	0,77
yEnv.temp.max30	15.455.301,00	8.493.695,00	1,82	0,08
Adjusted R-square 0,10				
dxCapexCMPA~yEnv.temp.min30				



	Estimate	Std. Error	t value	Pr(> t)
Intercept	60.977.632,00	70.366.356,00	0,87	0,40
yEnv.temp.min30	19.724.959,00	10.808.153,00	1,83	0,08
	Adjusted R-square	0,10		
dxCapexCMPA~yDensity				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	88.538.661,00	59.962.085,00	1,48	0,16
yDensity	568,63	327,93	1,73	0,10
	Adjusted R-square	0,09		
dxCapexCMPA~zDMU				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	120.753.109,00	77.353.393,00	1,56	0,13
zDMU	4.090.356,00	5.445.630,00	0,75	0,46
	Adjusted R-square	-0,02		
dxCapexCMPA~zYear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	171.138.857,00	38.118.148,00	4,49	0,00
	Adjusted R-square	0,00		
dxCapexCMPA~zTowers.wood				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	191.912.286,00	40.805.591,00	4,70	0,00
zTowers.wood	-7.177,99	5.544,07	-1,29	0,21
	Adjusted R-square	0,03		
dxCapexCMPA~zTowers.other				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	178.204.804,00	39.545.244,00	4,51	0,00
zTowers.other	-6.730,35	8.668,46	-0,78	0,45
	Adjusted R-square	-0,02		
dxCapexCMPA~zENS				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	195.517.800,00	46.018.751,00	4,25	0,00
zENS	-10.195,40	18.909,48	-0,54	0,60
	Adjusted R-square	-0,04		
dxCapexCMPA~zAge1				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	385.326.068,00	138.823.062,00	2,78	0,01
zAge1	-7.465.458,00	4.665.775,00	-1,60	0,13
	Adjusted R-square	0,07		
dxCapexCMPA~zAge2				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	185.637.241,00	74.566.486,00	2,49	0,02
zAge2	-493.845,40	3.690.448,00	-0,13	0,89
	Adjusted R-square	-0,05		
dxCapexCMPA~zAge3				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	320.992.823,00	132.419.061,00	2,42	0,03
zAge3	-7.379.442,00	6.534.873,00	-1,13	0,27
	Adjusted R-square	0,01		
dxCapexCMPA~zAge4				
	Estimate	Std. Error	t value	Pr(> t)



Intercept	294.749.592,00	149.763.141,00	1,97	0,06
zAge4	-5.433.063,00	6.783.773,00	-0,80	0,43
Adjusted R-square		-0,02		
dxCapexCMPA~zAge5				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	225.010.070,00	78.788.270,00	2,86	0,01
zAge5	-2.572.799,00	3.810.794,00	-0,68	0,51
Adjusted R-square		-0,03		
dxCapexCMPA~zAgem				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	265.363.418,00	118.142.125,00	2,25	0,04
zAgem	-4.658.476,00	5.524.105,00	-0,84	0,41
Adjusted R-square		-0,01		
dxTotexCMPA~yEnergy.del				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.891.223,00	43.562.613,00	0,04	0,97
yEnergy.del	2.418,29	346,14	6,99	0,00
Adjusted R-square		0,73		
dxTotexCMPA~yEnergy.import				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	77.861.076,00	67.383.215,00	1,16	0,26
yEnergy.import	8.998,85	2.929,99	3,07	0,01
Adjusted R-square		0,32		
dxTotexCMPA~yEnergy.export				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	194.130.492,00	78.504.549,00	2,47	0,02
yEnergy.export	2.586,98	3.820,97	0,68	0,51
Adjusted R-square		-0,03		
dxTotexCMPA~yEnergy.gen.ren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	122.741.520,00	49.252.177,00	2,49	0,02
yEnergy.gen.ren	12.290,00	3.130,11	3,93	0,00
Adjusted R-square		0,44		
dxTotexCMPA~yPower.gen				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-3.400.559,00	28.196.709,00	-0,12	0,91
yPower.gen	9.148,82	774,19	11,82	0,00
Adjusted R-square		0,89		
dxTotexCMPA~yPower.gen.wind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	163.912.486,00	54.884.833,00	2,99	0,01
yPower.gen.wind	39.076,68	14.545,92	2,69	0,01
Adjusted R-square		0,23		
dxTotexCMPA~yPower.gen.solar				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	231.818.910,00	67.632.666,00	3,43	0,00
yPower.gen.solar	-87.021,18	505.118,90	-0,17	0,87
Adjusted R-square		-0,06		
dxTotexCMPA~yPower.gen.ren.excl.hydro				
	Estimate	Std. Error	t value	Pr(> t)



Intercept	139.258.732,00	59.227.562,00	2,35	0,03
yPower.gen.ren.excl.hydro	39.991,38	14.415,87	2,77	0,01
	Adjusted R-square	0,24		
dxTotexCMPA~yPower.gen.ren.incl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	128.019.766,00	60.855.623,00	2,10	0,05
yPower.gen.ren.incl.hydro	14.280,18	5.008,41	2,85	0,01
	Adjusted R-square	0,25		
dxTotexCMPA~yPower.gen.nonren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	47.947.802,00	33.580.836,00	1,43	0,17
yPower.gen.nonren	10.715,00	1.240,91	8,63	0,00
	Adjusted R-square	0,78		
dxTotexCMPA~yPower.gen.thermal				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	44.890.838,00	34.518.135,00	1,30	0,21
yPower.gen.thermal	11.639,06	1.379,43	8,44	0,00
	Adjusted R-square	0,77		
dxTotexCMPA~yPower.gen.nuclear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	168.035.017,00	59.582.328,00	2,82	0,01
yPower.gen.nuclear	28.725,87	13.205,31	2,18	0,04
	Adjusted R-square	0,15		
dxTotexCMPA~yService.pop				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	38.950.361,00	33.984.253,00	1,15	0,27
yService.pop	12,66	1,45	8,72	0,00
	Adjusted R-square	0,78		
dxTotexCMPA~yService.popprowth				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	171.671.342,00	42.165.573,00	4,07	0,00
yService.popprowth	928,95	223,94	4,15	0,00
	Adjusted R-square	0,47		
dxTotexCMPA~yService.price.ind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	5.183.673,00	272.901.165,00	0,02	0,99
yService.price.ind	3.250.743.337,00	3.522.362.373,00	0,92	0,37
	Adjusted R-square	-0,01		
dxTotexCMPA~yService.price.res				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-80.482.553,00	243.093.787,00	-0,33	0,74
yService.price.res	3.022.330.006,00	2.156.604.866,00	1,40	0,18
	Adjusted R-square	0,05		
dxTotexCMPA~yService.tax				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	81.457.345,00	202.322.359,00	0,40	0,69
yService.tax	919.542,30	1.030.126,00	0,89	0,38
	Adjusted R-square	-0,01		



dxTotexCMPA~yEnv.area				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	135.904.017,00	70.595.024,00	1,93	0,07
yEnv.area	708.087,60	336.439,00	2,10	0,05
Adjusted R-square		0,14		
dxTotexCMPA~yEnv.area.forest				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	264.397.640,00	59.227.977,00	4,46	0,00
yEnv.area.forest	-214.159,80	264.072,00	-0,81	0,43
Adjusted R-square		-0,02		
dxTotexCMPA~yEnv.area.agri				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	101.196.830,00	49.888.721,00	2,03	0,06
yEnv.area.agri	2.384.866,00	536.900,50	4,44	0,00
Adjusted R-square		0,47		
dxTotexCMPA~yEnv.temp.summer				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-152.307.750,00	261.523.900,00	-0,58	0,57
yEnv.temp.summer	23.049.848,00	14.949.721,00	1,54	0,14
Adjusted R-square		0,06		
dxTotexCMPA~yEnv.temp.winter				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	203.898.370,00	54.536.690,00	3,74	0,00
yEnv.temp.winter	19.132.760,00	10.563.529,00	1,81	0,09
Adjusted R-square		0,10		
dxTotexCMPA~yEnv.temp.max30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-39.717.399,00	164.714.421,00	-0,24	0,81
yEnv.temp.max30	21.193.144,00	11.756.206,00	1,80	0,09
Adjusted R-square		0,10		
dxTotexCMPA~yEnv.temp.min30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	95.494.918,00	97.748.366,00	0,98	0,34
yEnv.temp.min30	26.440.499,00	15.013.984,00	1,76	0,09
Adjusted R-square		0,09		
dxTotexCMPA~yDensity				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	135.377.739,00	83.560.524,00	1,62	0,12
yDensity	742,00	456,99	1,62	0,12
Adjusted R-square		0,07		
dxTotexCMPA~zDMU				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	152.840.869,00	105.891.732,00	1,44	0,16
zDMU	7.332.304,00	7.454.711,00	0,98	0,34
Adjusted R-square		0,00		
dxTotexCMPA~zYear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	243.161.528,00	52.690.371,00	4,61	0,00
Adjusted R-square		0,00		
dxTotexCMPA~zTowers.wood				

	Estimate	Std. Error	t value	Pr(> t)
Intercept	271.573.337,00	56.454.818,00	4,81	0,00
zTowers.wood	-9.817,33	7.670,26	-1,28	0,22
	Adjusted R-square	0,03		
dxTotexCMPA~zTowers.other				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	250.880.271,00	54.971.477,00	4,56	0,00
zTowers.other	-7.352,14	12.049,94	-0,61	0,55
	Adjusted R-square	-0,03		
dxTotexCMPA~zENS				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	275.042.666,00	63.954.990,00	4,30	0,00
zENS	-12.043,22	26.279,62	-0,46	0,65
	Adjusted R-square	-0,05		
dxTotexCMPA~zAge1				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	520.669.725,00	193.379.770,00	2,69	0,01
zAge1	-9.672.499,00	6.499.399,00	-1,49	0,15
	Adjusted R-square	0,05		
dxTotexCMPA~zAge2				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	268.519.116,00	103.273.970,00	2,60	0,02
zAge2	-1.047.420,00	5.111.240,00	-0,20	0,84
	Adjusted R-square	-0,05		
dxTotexCMPA~zAge3				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	421.111.353,00	184.667.982,00	2,28	0,03
zAge3	-8.689.105,00	9.113.354,00	-0,95	0,35
	Adjusted R-square	0,00		
dxTotexCMPA~zAge4				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	415.915.860,00	206.684.336,00	2,01	0,06
zAge4	-7.584.974,00	9.362.115,00	-0,81	0,43
	Adjusted R-square	-0,02		
dxTotexCMPA~zAge5				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	336.060.806,00	107.915.037,00	3,11	0,01
zAge5	-4.571.726,00	5.219.584,00	-0,88	0,39
	Adjusted R-square	-0,01		
dxTotexCMPA~zAgem				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	371.615.310,00	163.386.114,00	2,27	0,03
zAgem	-6.350.774,00	7.639.629,00	-0,83	0,42
	Adjusted R-square	-0,01		
dUC~yEnergy.del				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.133,33	182,50	6,21	0,00
yEnergy.del	0,00	0,00	-0,79	0,44
	Adjusted R-square	-0,02		
dUC~yEnergy.import				

	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.101,78	180,40	6,11	0,00
yEnergy.import	0,00	0,01	-0,57	0,57
Adjusted R-square				
dUC~yEnergy.export				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.267,26	151,13	8,39	0,00
yEnergy.export	-0,02	0,01	-2,27	0,04
Adjusted R-square				
dUC~yEnergy.gen.ren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	998,87	147,01	6,79	0,00
yEnergy.gen.ren	0,00	0,01	0,31	0,76
Adjusted R-square				
dUC~yPower.gen				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.108,70	174,29	6,36	0,00
yPower.gen	0,00	0,00	-0,47	0,65
Adjusted R-square				
dUC~yPower.gen.wind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.072,32	122,42	8,76	0,00
yPower.gen.wind	-0,04	0,03	-1,22	0,24
Adjusted R-square				
dUC~yPower.gen.solar				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	990,10	127,65	7,76	0,00
yPower.gen.solar	1,32	0,95	1,38	0,19
Adjusted R-square				
dUC~yPower.gen.ren.excl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.107,95	131,92	8,40	0,00
yPower.gen.ren.excl.hydro	-0,04	0,03	-1,39	0,18
Adjusted R-square				
dUC~yPower.gen.ren.incl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.044,87	141,93	7,36	0,00
yPower.gen.ren.incl.hydro	-0,01	0,01	-0,56	0,58
Adjusted R-square				
dUC~yPower.gen.nonren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.048,99	143,48	7,31	0,00
yPower.gen.nonren	0,00	0,01	-0,59	0,56
Adjusted R-square				
dUC~yPower.gen.thermal				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.035,87	145,37	7,13	0,00
yPower.gen.thermal	0,00	0,01	-0,44	0,66
Adjusted R-square				
dUC~yPower.gen.nuclear				

	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.176,93	110,27	10,67	0,00
yPower.gen.nuclear	-0,07	0,02	-2,89	0,01
	Adjusted R-square	0,26		
dUC~yService.pop				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.047,59	146,52	7,15	0,00
yService.pop	0,00	0,00	-0,55	0,59
	Adjusted R-square	-0,03		
dUC~yService.popgrowth				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.020,27	129,62	7,87	0,00
yService.popgrowth	0,00	0,00	0,10	0,92
	Adjusted R-square	-0,06		
dUC~yService.price.ind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	83,68	461,86	0,18	0,86
yService.price.ind	11.365,41	5.961,26	1,91	0,07
	Adjusted R-square	0,12		
dUC~yService.price.res				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	430,46	445,23	0,97	0,35
yService.price.res	4.690,66	3.949,82	1,19	0,25
	Adjusted R-square	0,02		
dUC~yService.tax				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	748,33	370,05	2,02	0,06
yService.tax	0,99	1,88	0,53	0,61
	Adjusted R-square	-0,04		
dUC~yEnv.area				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.189,71	142,00	8,38	0,00
yEnv.area	-1,30	0,68	-1,93	0,07
	Adjusted R-square	0,11		
dUC~yEnv.area.forest				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.035,77	117,23	8,83	0,00
yEnv.area.forest	-0,44	0,52	-0,84	0,41
	Adjusted R-square	-0,01		
dUC~yEnv.area.agri				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.068,88	136,76	7,82	0,00
yEnv.area.agri	-1,29	1,47	-0,88	0,39
	Adjusted R-square	-0,01		
dUC~yEnv.temp.summer				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	401,29	531,45	0,76	0,46
yEnv.temp.summer	34,43	30,38	1,13	0,27
	Adjusted R-square	0,01		
dUC~yEnv.temp.winter				



	Estimate	Std. Error	t value	Pr(> t)
Intercept	907,77	106,53	8,52	0,00
yEnv.temp.winter	41,08	20,64	1,99	0,06
Adjusted R-square				
0,12				
dUC~yEnv.temp.max30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	524,62	334,44	1,57	0,13
yEnv.temp.max30	35,02	23,87	1,47	0,16
Adjusted R-square				
0,05				
dUC~yEnv.temp.min30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	651,79	188,37	3,46	0,00
yEnv.temp.min30	60,93	28,93	2,11	0,05
Adjusted R-square				
0,14				
dUC~yDensity				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.022,60	175,98	5,81	0,00
yDensity	0,00	0,00	-0,22	0,83
Adjusted R-square				
-0,05				
dUC~zDMU				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.209,15	207,47	5,83	0,00
zDMU	-17,62	14,61	-1,21	0,24
Adjusted R-square				
0,02				
dUC~zYear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	992,08	104,43	9,50	0,00
Adjusted R-square				
0,00				
dUC~zTowers.wood				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.048,68	111,84	9,38	0,00
zTowers.wood	-0,02	0,02	-1,29	0,21
Adjusted R-square				
0,03				
dUC~zTowers.other				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	967,70	107,38	9,01	0,00
zTowers.other	0,02	0,02	0,99	0,34
Adjusted R-square				
0,00				
dUC~zENS				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	953,00	126,31	7,54	0,00
zENS	-0,01	0,05	-0,20	0,84
Adjusted R-square				
-0,06				
dUC~zAge1				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.967,99	334,58	5,88	0,00
zAge1	-34,02	11,24	-3,02	0,01
Adjusted R-square				
0,28				
dUC~zAge2				
	Estimate	Std. Error	t value	Pr(> t)



Intercept	1.193,85	198,36	6,02	0,00
zAge2	-10,98	9,82	-1,12	0,28
	Adjusted R-square	0,01		
dUC~zAge3				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.483,25	326,37	4,54	0,00
zAge3	-27,49	16,11	-1,71	0,10
	Adjusted R-square	0,09		
dUC~zAge4				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.901,69	367,14	5,18	0,00
zAge4	-42,80	16,63	-2,57	0,02
	Adjusted R-square	0,22		
dUC~zAge5				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.391,09	196,24	7,09	0,00
zAge5	-22,44	9,49	-2,36	0,03
	Adjusted R-square	0,19		
dUC~zAgem				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	1.579,89	298,61	5,29	0,00
zAgem	-29,06	13,96	-2,08	0,05
	Adjusted R-square	0,14		
dUCopex~yEnergy.del				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	405,60	67,57	6,00	0,00
yEnergy.del	0,00	0,00	-1,58	0,13
	Adjusted R-square	0,08		
dUCopex~yEnergy.import				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	420,42	63,73	6,60	0,00
yEnergy.import	-0,01	0,00	-2,02	0,06
	Adjusted R-square	0,15		
dUCopex~yEnergy.export				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	416,32	59,42	7,01	0,00
yEnergy.export	-0,01	0,00	-2,17	0,04
	Adjusted R-square	0,17		
dUCopex~yEnergy.gen.ren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	339,10	57,10	5,94	0,00
yEnergy.gen.ren	0,00	0,00	-0,44	0,66
	Adjusted R-square	-0,05		
dUCopex~yPower.gen				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	386,60	63,91	6,05	0,00
yPower.gen	0,00	0,00	-0,98	0,34
	Adjusted R-square	0,00		
dUCopex~yPower.gen.wind				
	Estimate	Std. Error	t value	Pr(> t)



Intercept	342,59	47,43	7,22	0,00
yPower.gen.wind	-0,02	0,01	-1,23	0,23
	Adjusted R-square	0,02		
dUCopex ~ yPower.gen.solar				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	316,70	47,10	6,72	0,00
yPower.gen.solar	0,56	0,35	1,58	0,13
	Adjusted R-square	0,08		
dUCopex ~ yPower.gen.ren.excl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	355,71	51,19	6,95	0,00
yPower.gen.ren.excl.hydro	-0,02	0,01	-1,37	0,18
	Adjusted R-square	0,04		
dUCopex ~ yPower.gen.ren.incl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	354,94	53,46	6,64	0,00
yPower.gen.ren.incl.hydro	-0,01	0,00	-1,23	0,23
	Adjusted R-square	0,02		
dUCopex ~ yPower.gen.nonren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	343,63	55,06	6,24	0,00
yPower.gen.nonren	0,00	0,00	-0,87	0,39
	Adjusted R-square	-0,01		
dUCopex ~ yPower.gen.thermal				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	344,84	55,54	6,21	0,00
yPower.gen.thermal	0,00	0,00	-0,89	0,38
	Adjusted R-square	-0,01		
dUCopex ~ yPower.gen.nuclear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	367,16	46,11	7,96	0,00
yPower.gen.nuclear	-0,02	0,01	-2,09	0,05
	Adjusted R-square	0,14		
dUCopex ~ yService.pop				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	341,93	56,36	6,07	0,00
yService.pop	0,00	0,00	-0,79	0,44
	Adjusted R-square	-0,02		
dUCopex ~ yService.popgrowth				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	328,60	50,43	6,52	0,00
yService.popgrowth	0,00	0,00	-0,21	0,83
	Adjusted R-square	-0,06		
dUCopex ~ yService.price.ind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	238,10	212,06	1,12	0,28
yService.price.ind	852,55	2.737,12	0,31	0,76
	Adjusted R-square	-0,05		
dUCopex ~ yService.price.res				
	Estimate	Std. Error	t value	Pr(> t)



Intercept	453,95	191,34	2,37	0,03
yService.price.res	-1.374,10	1.697,51	-0,81	0,43
Adjusted R-square		-0,02		
dUCopex ~ yService.tax				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	479,20	150,75	3,18	0,01
yService.tax	-0,94	0,77	-1,22	0,24
Adjusted R-square		0,03		
dUCopex ~ yEnv.area				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	372,76	56,84	6,56	0,00
yEnv.area	-0,41	0,27	-1,50	0,15
Adjusted R-square		0,06		
dUCopex ~ yEnv.area.forest				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	322,09	45,92	7,01	0,00
yEnv.area.forest	-0,11	0,20	-0,53	0,60
Adjusted R-square		-0,04		
dUCopex ~ yEnv.area.agri				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	327,79	53,71	6,10	0,00
yEnv.area.agri	-0,28	0,58	-0,48	0,64
Adjusted R-square		-0,04		
dUCopex ~ yEnv.temp.summer				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	79,35	205,86	0,39	0,70
yEnv.temp.summer	13,52	11,77	1,15	0,26
Adjusted R-square		0,01		
dUCopex ~ yEnv.temp.winter				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	295,93	44,38	6,67	0,00
yEnv.temp.winter	7,46	8,60	0,87	0,40
Adjusted R-square		-0,01		
dUCopex ~ yEnv.temp.max30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	177,71	132,80	1,34	0,20
yEnv.temp.max30	10,00	9,48	1,06	0,30
Adjusted R-square		0,01		
dUCopex ~ yEnv.temp.min30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	228,58	77,79	2,94	0,01
yEnv.temp.min30	14,80	11,95	1,24	0,23
Adjusted R-square		0,02		
dUCopex ~ yDensity				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	368,08	66,40	5,54	0,00
yDensity	0,00	0,00	-1,08	0,29
Adjusted R-square		0,01		
dUCopex ~ zDMU				
	Estimate	Std. Error	t value	Pr(> t)



Intercept	371,74	81,83	4,54	0,00
zDMU	-4,91	5,76	-0,85	0,40
Adjusted R-square		-0,01		
dUCopex ~ zYear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	311,23	40,48	7,69	0,00
Adjusted R-square		0,00		
dUCopex ~ zTowers.wood				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	331,29	43,65	7,59	0,00
zTowers.wood	-0,01	0,01	-1,17	0,26
Adjusted R-square		0,02		
dUCopex ~ zTowers.other				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	281,56	31,40	8,97	0,00
zTowers.other	0,03	0,01	4,11	0,00
Adjusted R-square		0,43		
dUCopex ~ zENS				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	274,26	37,08	7,40	0,00
zENS	0,01	0,02	0,65	0,53
Adjusted R-square		-0,03		
dUCopex ~ zAge1				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	539,01	147,41	3,66	0,00
zAge1	-7,94	4,95	-1,60	0,12
Adjusted R-square		0,07		
dUCopex ~ zAge2				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	432,84	72,80	5,95	0,00
zAge2	-7,26	3,60	-2,01	0,06
Adjusted R-square		0,13		
dUCopex ~ zAge3				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	310,04	132,13	2,35	0,03
zAge3	-0,87	6,52	-0,13	0,89
Adjusted R-square		-0,05		
dUCopex ~ zAge4				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	667,72	141,65	4,71	0,00
zAge4	-16,80	6,42	-2,62	0,02
Adjusted R-square		0,23		
dUCopex ~ zAge5				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	516,86	66,85	7,73	0,00
zAge5	-11,58	3,23	-3,58	0,00
Adjusted R-square		0,37		
dUCopex ~ zAgem				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	497,67	119,83	4,15	0,00



zAgem	-9,22	5,60	-1,65	0,12
	Adjusted R-square	0,08		
dUCcapex ~ yEnergy.del				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	766,63	146,99	5,22	0,00
yEnergy.del	0,00	0,00	-0,27	0,79
	Adjusted R-square	-0,05		
dUCcapex ~ yEnergy.import				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	718,07	144,30	4,98	0,00
yEnergy.import	0,00	0,01	0,17	0,87
	Adjusted R-square	-0,06		
dUCcapex ~ yEnergy.export				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	894,03	125,59	7,12	0,00
yEnergy.export	-0,01	0,01	-1,78	0,09
	Adjusted R-square	0,11		
dUCcapex ~ yEnergy.gen.ren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	694,85	115,55	6,01	0,00
yEnergy.gen.ren	0,00	0,01	0,63	0,54
	Adjusted R-square	-0,03		
dUCcapex ~ yPower.gen				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	759,41	141,62	5,36	0,00
yPower.gen	0,00	0,00	-0,14	0,89
	Adjusted R-square	-0,06		
dUCcapex ~ yPower.gen.wind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	766,85	98,39	7,79	0,00
yPower.gen.wind	-0,03	0,03	-0,97	0,34
	Adjusted R-square	0,00		
dUCcapex ~ yPower.gen.solar				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	710,11	106,14	6,69	0,00
yPower.gen.solar	0,75	0,79	0,95	0,36
	Adjusted R-square	-0,01		
dUCcapex ~ yPower.gen.ren.excl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	790,51	106,34	7,43	0,00
yPower.gen.ren.excl.hydro	-0,03	0,03	-1,11	0,28
	Adjusted R-square	0,01		
dUCcapex ~ yPower.gen.ren.incl.hydro				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	725,70	113,42	6,40	0,00
yPower.gen.ren.incl.hydro	0,00	0,01	-0,13	0,90
	Adjusted R-square	-0,05		
dUCcapex ~ yPower.gen.nonren				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	741,51	114,48	6,48	0,00

yPower.gen.nonren	0,00	0,00	-0,34	0,74
Adjusted R-square		-0,04		
dUCcapex ~ yPower.gen.thermal				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	726,66	115,83	6,27	0,00
yPower.gen.thermal	0,00	0,00	-0,14	0,89
Adjusted R-square		-0,05		
dUCcapex ~ yPower.gen.nuclear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	850,20	90,32	9,41	0,00
yPower.gen.nuclear	-0,05	0,02	-2,57	0,02
Adjusted R-square		0,21		
dUCcapex ~ yService.pop				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	741,62	116,81	6,35	0,00
yService.pop	0,00	0,00	-0,32	0,75
Adjusted R-square		-0,04		
dUCcapex ~ yService.popgrowth				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	727,67	102,64	7,09	0,00
yService.popgrowth	0,00	0,00	0,24	0,81
Adjusted R-square		-0,06		
dUCcapex ~ yService.price.ind				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-134,07	343,33	-0,39	0,70
yService.price.ind	10.680,37	4.431,34	2,41	0,03
Adjusted R-square		0,19		
dUCcapex ~ yService.price.res				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-8,09	321,01	-0,03	0,98
yService.price.res	6.225,46	2.847,88	2,19	0,04
Adjusted R-square		0,16		
dUCcapex ~ yService.tax				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	296,84	273,67	1,08	0,29
yService.tax	1,95	1,39	1,40	0,18
Adjusted R-square		0,05		
dUCcapex ~ yEnv.area				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	857,61	114,52	7,49	0,00
yEnv.area	-0,94	0,55	-1,72	0,10
Adjusted R-square		0,08		
dUCcapex ~ yEnv.area.forest				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	748,43	93,18	8,03	0,00
yEnv.area.forest	-0,33	0,42	-0,80	0,44
Adjusted R-square		-0,02		
dUCcapex ~ yEnv.area.agri				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	777,91	108,40	7,18	0,00



yEnv.area.agri	-1,05	1,17	-0,90	0,38
Adjusted R-square		-0,01		
dUCcapex ~ yEnv.temp.summer				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	352,01	426,96	0,82	0,42
yEnv.temp.summer	21,20	24,41	0,87	0,40
Adjusted R-square		-0,01		
dUCcapex ~ yEnv.temp.winter				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	645,26	83,61	7,72	0,00
yEnv.temp.winter	34,30	16,19	2,12	0,05
Adjusted R-square		0,14		
dUCcapex ~ yEnv.temp.max30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	376,87	267,66	1,41	0,17
yEnv.temp.max30	25,38	19,10	1,33	0,20
Adjusted R-square		0,04		
dUCcapex ~ yEnv.temp.min30				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	452,07	150,20	3,01	0,01
yEnv.temp.min30	47,20	23,07	2,05	0,05
Adjusted R-square		0,13		
dUCcapex ~ yDensity				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	689,81	139,58	4,94	0,00
yDensity	0,00	0,00	0,23	0,82
Adjusted R-square		-0,05		
dUCcapex ~ zDMU				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	876,99	165,32	5,30	0,00
zDMU	-13,10	11,64	-1,13	0,27
Adjusted R-square		0,01		
dUCcapex ~ zYear				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	715,65	82,84	8,64	0,00
Adjusted R-square		0,00		
dUCcapex ~ zTowers.wood				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	753,96	89,72	8,40	0,00
zTowers.wood	-0,01	0,01	-1,09	0,29
Adjusted R-square		0,01		
dUCcapex ~ zTowers.other				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	719,66	87,14	8,26	0,00
zTowers.other	0,00	0,02	-0,20	0,84
Adjusted R-square		-0,05		
dUCcapex ~ zENS				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	710,66	100,08	7,10	0,00
zENS	-0,02	0,04	-0,50	0,62



		Adjusted R-square			
dUCcapex ~ zAge1			-0,04		
	Estimate	Std. Error	t value	Pr(> t)	
Intercept	1.494,20	264,74	5,64	0,00	
zAge1	-27,14	8,90	-3,05	0,01	
		Adjusted R-square	0,28		
dUCcapex ~ zAge2					
	Estimate	Std. Error	t value	Pr(> t)	
Intercept	802,37	159,36	5,03	0,00	
zAge2	-4,07	7,89	-0,52	0,61	
		Adjusted R-square	-0,04		
dUCcapex ~ zAge3					
	Estimate	Std. Error	t value	Pr(> t)	
Intercept	1.228,52	260,59	4,71	0,00	
zAge3	-27,67	12,86	-2,15	0,04	
		Adjusted R-square	0,15		
dUCcapex ~ zAge4					
	Estimate	Std. Error	t value	Pr(> t)	
Intercept	1.292,97	308,99	4,18	0,00	
zAge4	-27,17	14,00	-1,94	0,07	
		Adjusted R-square	0,12		
dUCcapex ~ zAge5					
	Estimate	Std. Error	t value	Pr(> t)	
Intercept	921,19	168,37	5,47	0,00	
zAge5	-11,58	8,14	-1,42	0,17	
		Adjusted R-square	0,05		
dUCcapex ~ zAgem					
	Estimate	Std. Error	t value	Pr(> t)	
Intercept	1.136,09	241,64	4,70	0,00	
zAgem	-20,79	11,30	-1,84	0,08	
		Adjusted R-square	0,10		



Appendix G: Correlation results Y



	yNGTotex	yPower.gen.wind	yPower.gen.hydro	yPower.gen.ren.excl.hydro	yPower.gen.ren.incl.hydro	yPower.gen.nonren	yPower.gen.thermal	yPower.gen.nuclear	yPower.gen.gas	yService.pop	yEnv.area	yEnv.area.forest	yEnv.area.agri	yEnv.temp.summer	yEnv.temp.winter	yEnv.temp.max30	yEnv.temp.min30	yEnv.rain
yNGTotex	1,00	0,69	0,27	0,69	0,49	0,75	0,73	0,75	0,53	0,75	0,52	-0,10	0,71	0,17	0,19	0,20	0,15	-0,03
yPower.gen.wind	0,69	1,00	0,15	0,97	0,50	0,35	0,38	0,41	0,13	0,39	0,30	-0,10	0,58	0,26	0,27	0,28	0,27	-0,12
yPower.gen.hydro	0,27	0,15	1,00	0,26	0,93	0,23	0,21	0,06	0,27	0,29	0,72	0,10	0,36	0,17	0,03	0,09	0,07	0,38
yPower.gen.ren.excl.hydro	0,69	0,97	0,26	1,00	0,59	0,38	0,41	0,46	0,18	0,41	0,44	-0,06	0,60	0,30	0,21	0,27	0,24	-0,20
yPower.gen.ren.incl.hydro	0,49	0,50	0,93	0,59	1,00	0,30	0,29	0,25	0,23	0,36	0,76	0,06	0,50	0,23	0,07	0,14	0,12	0,26
yPower.gen.nonren	0,75	0,35	0,23	0,38	0,30	1,00	0,99	0,42	0,89	0,97	0,41	-0,15	0,71	0,28	0,26	0,30	0,26	-0,11
yPower.gen.thermal	0,73	0,38	0,21	0,41	0,29	0,99	1,00	0,37	0,89	0,97	0,37	-0,17	0,70	0,32	0,27	0,33	0,29	-0,10
yPower.gen.nuclear	0,75	0,41	0,06	0,46	0,25	0,42	0,37	1,00	0,20	0,35	0,36	-0,01	0,29	-0,04	-0,11	-0,06	-0,14	-0,10
yPower.gen.gas	0,53	0,13	0,27	0,18	0,23	0,89	0,89	0,20	1,00	0,83	0,23	-0,12	0,45	0,27	0,30	0,30	0,30	0,00
yService.pop	0,75	0,39	0,29	0,41	0,36	0,97	0,97	0,35	0,83	1,00	0,46	-0,16	0,80	0,33	0,29	0,35	0,31	-0,10
yEnv.area	0,52	0,30	0,72	0,44	0,76	0,41	0,37	0,36	0,23	0,46	1,00	0,12	0,64	0,05	-0,19	-0,08	-0,16	0,01
yEnv.area.forest	-0,10	-0,10	0,10	-0,06	0,06	-0,15	-0,17	-0,01	-0,12	-0,16	0,12	1,00	-0,07	-0,08	-0,21	-0,15	-0,19	0,18
yEnv.area.agri	0,71	0,58	0,36	0,60	0,50	0,71	0,70	0,29	0,45	0,80	0,64	-0,07	1,00	0,33	0,29	0,35	0,30	-0,20
yEnv.temp.summer	0,17	0,26	0,17	0,30	0,23	0,28	0,32	-0,04	0,27	0,33	0,05	-0,08	0,33	1,00	0,69	0,92	0,86	-0,41
yEnv.temp.winter	0,19	0,27	0,03	0,21	0,07	0,26	0,27	-0,11	0,30	0,29	-0,19	-0,21	0,29	0,69	1,00	0,91	0,95	-0,11
yEnv.temp.max30	0,20	0,28	0,09	0,27	0,14	0,30	0,33	-0,06	0,30	0,35	-0,08	-0,15	0,35	0,92	0,91	1,00	0,98	-0,30
yEnv.temp.min30	0,15	0,27	0,07	0,24	0,12	0,26	0,29	-0,14	0,30	0,31	-0,16	-0,19	0,30	0,86	0,95	0,98	1,00	-0,22
yEnv.rain	-0,03	-0,12	0,38	-0,20	0,26	-0,11	-0,10	-0,10	0,00	-0,10	0,01	0,18	-0,20	-0,41	-0,11	-0,30	-0,22	1,00
yDensity	0,26	0,10	-0,33	0,02	-0,28	0,52	0,55	0,19	0,49	0,45	-0,36	-0,11	0,04	0,15	0,26	0,23	0,25	0,07



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