



**QUANTIFIED MARGINAL EXTERNAL COSTS OF ELECTRICITY PRODUCTION IN GERMANY<sup>2</sup>**  
(IN € CENT PER kWh)

|                        | Coal        | Lignite     | Gas         | Nuclear     | PV          | Wind        | Hydro       |
|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Damage costs</b>    |             |             |             |             |             |             |             |
| Noise                  | 0           | 0           | 0           | 0           | 0           | 0.005       | 0           |
| Health                 | 0.73        | 0.99        | 0.34        | 0.17        | 0.45        | 0.072       | 0.051       |
| Material               | 0.015       | 0.020       | 0.007       | 0.002       | 0.012       | 0.002       | 0.001       |
| Crops                  | 0           | 0           | 0           | 0.0008      | 0           | 0.0007      | 0.0002      |
| <b>Total</b>           | <b>0.75</b> | <b>1.01</b> | <b>0.35</b> | <b>0.17</b> | <b>0.46</b> | <b>0.08</b> | <b>0.05</b> |
| <b>Avoidance costs</b> |             |             |             |             |             |             |             |
| Ecosystems             | 0.20        | 0.78        | 0.04        | 0.05        | 0.04        | 0.04        | 0.03        |
| Global Warming         | 1.60        | 2.00        | 0.73        | 0.03        | 0.33        | 0.04        | 0.03        |

????PV????????0.83????????????????????0.16????????????????????OECD????????????????????  
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**External and Direct Costs of Electricity Generation in the EU**  
(m€/kWh)

| External costs      | Coal & Lignite | Oil          | Gas          | Nuclear      | Biomass      | Solar PV       | Wind         |
|---------------------|----------------|--------------|--------------|--------------|--------------|----------------|--------------|
| Austria             |                |              | 11-26        |              | 24-25        |                |              |
| Belgium             | 37-150         |              | 11-22        | 4-4.7        |              |                |              |
| Germany             | 30-55          | 51-78        | 12-23        | 4.4-7        | 28-29        | 1.4-3.3        | 0.5-0.6      |
| Denmark             | 35-65          |              | 15-30        |              | 12-14        |                | 0.9-1.6      |
| Spain               | 48-77          |              | 11-22        |              | 29-52        |                | 1.8-1.9      |
| Finland             | 20-44          |              |              |              | 8-11         |                |              |
| France              | 69-99          | 84-109       | 24-35        | 2.5          | 6-7          |                |              |
| Greece              | 46-84          | 26-48        | 7-13         |              | 1-8          |                | 2.4-2.6      |
| Ireland             | 59-84          |              |              |              |              |                |              |
| Italy               |                | 34-56        | 15-27        |              |              |                |              |
| Netherlands         | 28-42          |              | 5-19         | 7.4          | 4-5          |                |              |
| Norway              |                |              | 8-19         |              | 2.4          |                | 0.5-2.5      |
| Portugal            | 42-67          |              | 8-21         |              | 14-18        |                |              |
| Sweden              | 18-42          |              |              |              | 2.7-3        |                |              |
| UK                  | 42-67          | 29-47        | 11-22        | 2.4-2.7      | 5.3-5.7      |                | 1.3-1.5      |
| <b>Direct costs</b> | <b>32-50</b>   | <b>49-52</b> | <b>26-35</b> | <b>34-59</b> | <b>34-43</b> | <b>512-853</b> | <b>67-72</b> |

(OECD/NEA 2003)

??/kWh??

????36.5?61.5

???37.2?46.2

???57.5?75.5

???68.6?73.6

????520.3?861.3

??kWh????

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??(kWh)????????????????????????????????

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2012?8?20?????????

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