Hard coal reserves and resources in Poland according to the UNFC-2009

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1. Poland has 3 coal basins of carboniferrous age
   Lower Silesia Basin (totally abandoned)
   Upper Silesia Basin (center of coal production in Poland)
   Lublin Basin (only 1 mine, but huge)

2. The main role plays Upper Silesia Coal Basin, where the deposits of coal have been extracted from the end of XVII century. This basin is characterized by the greatest number of developed and undeveloped coal deposits and quantity of reserves and resources of steam and coking coal, sporadically anthracite.
Hard coal and lignite deposits in Poland (PGI-NRI)
3. According to main direction of use of the hard coal, it has been classified into 3 main groups:
   - steam (energetic) coal (31-33 and 38 types of old polish coal classification)
   - coking coal (34-37 types of old polish coal classification)
   - anthracite (41, 42 types of old polish coal classification)

4. The relation between Polish and UNFC Classification of reserves and resources has been indicated very well by Marek Nieć at many papers and presentations. We have used it as a one basic point for this presentation.

5. The Polish classification uses hierarchic system of category of reserves and resources.
prognostic 334 and prospective 344 resources

Anticipated subeconomic resources (32&33)

Anticipated economic resources (22&23)

Economic and non-economic resources (21&31)

Extractable reserves (11)

Total geological resources

Total geological resources of hard coal
HARD COAL – basic definition of the deposits

<table>
<thead>
<tr>
<th></th>
<th>resources</th>
<th>reserves</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depth</strong></td>
<td>1000 m (1250 m)</td>
<td>1000 (1250)</td>
</tr>
<tr>
<td><strong>Thickness</strong></td>
<td>min. 1.0 m (economic)</td>
<td>min. 1.5 m</td>
</tr>
<tr>
<td></td>
<td>0.6 m (uneconomic)</td>
<td></td>
</tr>
<tr>
<td><strong>Calorific value</strong></td>
<td>min. 15.0 MJ/kg (Poland)</td>
<td>17.5 MJ/kg (W Europe)</td>
</tr>
<tr>
<td><strong>Sulphur content</strong></td>
<td>max. 2%</td>
<td></td>
</tr>
</tbody>
</table>
COAL CLASSIFICATION

1) LIGNITE
   calorific value 6.3 – 12.5 MJ/kg/15 MJ/kg (Poland)/ ≥ 17.5 MJ/kg (W Europe)

2) STEAM COAL
   calorific value 12.5/15.0 MJ/kg (Poland)/ 17.5 MJ/kg (W Europe)
   15.0/17.5 – 23.9 MJ/kg subbituminous coal
   23.9 – 29.3 MJ/kg hard steam coal
   but 25.1 – 26.0 MJ/kg standard steam coal on market
   ≤ 12 % of ash
   ≤ 1 % of total sulphur
   ≤ 8 % of moisture

3) COKING COAL
   29.3 – 35.1 MJ/kg calorific value
   ≤ 6.9 % of ash
   ≤ 0.7 % of total sulphur
   ≤ 8.0 % of moisture
   ≤ 8.0 % of volatiles

4) ANTHRACITE
   ≥ 35.1 MJ/kg calorific value
   ≤ 5.6 % of ash
   ≤ 0.9 % of total sulphur
   ≤ 7.9 % of volatiles
Known coal deposits in the Upper Silesia Coal Basin (J. Jureczka et al 2010)
1 – abandoned deposits, 2 – extracted deposits, 3 – undeveloped deposits
Areas of the prognostic and prospective resources at the Upper Silesia Coal Basin (J. Jureczka et al. 2010)

1 – prognostic resources, 2 – perspective resources below 1000 m in the areas of known deposits
3 – perspective resources outside of the known deposits
Map of exploration status of Lublin Silesia Coal Basin (according to: A. Zdanowski, S. Wilk, 2010):

1 – category A – C2
2 – category C1
3 – category C2
4 – prognostic area I
5 – prognostic area II
6 – carboniferous area without prognostic resources
7 – range of carboniferous rocks
8 – faults
9 – isopachous line of overburden 750 and 1000 metres
### Hard coal reserves and resources in Poland according to the UNFC-2009 as of 31.12.2009

<table>
<thead>
<tr>
<th>Types of deposits</th>
<th>Number of deposits</th>
<th>Geological resources in place</th>
<th>Economic resources</th>
<th>Non-economic resources</th>
<th>Extractable resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>anticipated economic</td>
<td>anticipated</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>subeconomic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>developed deposits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>6 938.13</td>
<td>8 286.74</td>
<td>1 851.76</td>
<td>6 440.28</td>
</tr>
<tr>
<td>1. Deposits of operating mines</td>
<td>47</td>
<td>[22x]</td>
<td>[32x]</td>
<td>[21x]</td>
<td>[31x]</td>
</tr>
<tr>
<td>2. Mines during preparation process</td>
<td>2</td>
<td>373.92</td>
<td>366.54</td>
<td>193.98</td>
<td>249.82</td>
</tr>
<tr>
<td>undeveloped deposits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>26 397.59</td>
<td>15 951.31</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1. Deposits covered by detailed exploration</td>
<td>37</td>
<td>[23x]</td>
<td>[33x]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Deposits covered by preliminary exploration</td>
<td>13</td>
<td>[23x]</td>
<td>[33x]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Abandoned deposits</td>
<td>42</td>
<td>[23x]</td>
<td>[33x]</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### PROGNOSTIC RESOURCES

<table>
<thead>
<tr>
<th></th>
<th>Upper Silesian Coal Basin</th>
<th></th>
<th>Lublin Coal Basin</th>
<th></th>
<th>Lower Silesian Coal Basin</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>79</td>
<td>9 193.37</td>
<td>334</td>
<td>10 847.73</td>
<td>334</td>
<td>0.39</td>
</tr>
</tbody>
</table>

#### PROSPECTIVE RESOURCES

<table>
<thead>
<tr>
<th></th>
<th>Upper Silesian Coal Basin</th>
<th></th>
<th>Lublin Coal Basin</th>
<th></th>
<th>Lower Silesian Coal Basin</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>41</td>
<td>25 533.05</td>
<td>34x</td>
<td>5 887.61</td>
<td>34x</td>
<td>232.00</td>
</tr>
</tbody>
</table>
Coking coal reserves and resources in Poland according to UNFC-2009 as of 31.12.2009

Sales production

Extractable reserves - levels accessible (11x) 1090.02 mln tonnes

Extractable reserves - levels inaccessible (12x)

Economic resources (21x) 807.65 mln tonnes

Anticipated economic resources in developed deposits (22x) 3459.52 mln tonnes

Anticipated economic resources in undeveloped deposits (23x) 4487.86 mln tonnes

Non-economic resources (31x) 1790.48 mln tonnes

Anticipated subeconomic resources in developed deposits (32x) 2607.09 mln tonnes

Anticipated subeconomic resources in undeveloped deposits (33x) 4047.82 mln tonnes

Prognostic resources (334) 9305.45 mln tonnes

Prospective resources (34x) 3341.71 mln tonnes

Non-sales production

Mining plant operations plan

Deposit development plan

Geological report
Anthracite resources in Poland according to UNFC-2009 as of 31.12.2009

Anticipated economic resources in developed deposits (22x) 2.11 mln tonnes

Non-economic resources (31x) 0.15 mln tonnes

Anticipated subeconomic resources in undeveloped deposits (33x) 87.06 mln tonnes

Prognostic resources (334) 0.39 mln tonnes
Hard coal type 42 resources in Poland according to UNFC-2009 as of 31.12.2009
Steam coal reserves and resources in the Upper Silesia Coal Basin according to UNFC-2009 as of 31.12.2009

Extractable reserves - levels accessible (11x) 1269.40 mln tonnes
Extractable reserves - levels inaccessible (12x)

Economic resources (21x) 1005.38 mln tonnes
Anticipated economic resources in developed deposits (22x) 3218.87 mln tonnes
Anticipated economic resources in undeveloped deposits (23x) 14204.01 mln tonnes

Non-economic resources (31x) 4551.69 mln tonnes
Anticipated subeconomic resources in developed deposits (32x) 5302.24 mln tonnes
Anticipated subeconomic resources in undeveloped deposits (33x) 6183.29 mln tonnes

Prognostic resources (334) 1081.17 mln tonnes
Prospective resources (34x) 14880.37 mln tonnes
Coking coal reserves and resources in the Upper Silesia Coal Basin according to UNFC-2009 as of 31.12.2009

Extractable reserves - levels accessible (11x) 983.31 mln tonnes
Extractable reserves - levels inaccessible (12x)

Economic resources (21x) 779.04 mln tonnes
Anticipated economic resources in developed deposits (22x) 3443.17 mln tonnes

Anticipated economic resources in undeveloped deposits (23x) 3702.43 mln tonnes

Non-economic resources (31x) 1762.98 mln tonnes
Anticipated subeconomic resources in developed deposits (32x) 2515.66 mln tonnes
Anticipated subeconomic resources in undeveloped deposits (33x) 2998.93 mln tonnes

Prognostic resources (334) 8112.2 mln tonnes
Prospective resources (34x) 2592.07 mln tonnes
Anthracite resources in the Upper Silesia Coal Basin according to UNFC-2009 as of 31.12.2009

Anticipated economic resources in developed deposits (22x) 2.12 mln tonnes

Non-economic resources (31x) 0.15 mln tonnes

Anticipated subeconomic resources in undeveloped deposits (33x) 0.26 mln tonnes
Steam coal reserves and resources in the Lublin Coal Basin according to UNFC-2009 as of 31.12.2009

- Extractable reserves - levels accessible (11x) - 144.47 mln tonnes
- Extractable reserves - levels inaccessible (12x)

Economic resources (21x) 38.72 mln tonnes
- Anticipated economic resources in developed deposits (22x) 355.98 mln tonnes
- Anticipated economic resources in undeveloped deposits (23x) 7675.12 mln tonnes

Non-economic resources (31x) 97.96 mln tonnes
- Anticipated subeconomic resources in developed deposits (32x) 377.06 mln tonnes
- Anticipated subeconomic resources in undeveloped deposits (33x) 5547.12 mln tonnes

Prognostic resources (334) 9654.48 mln tonnes
- Prospective resources (34x) 5239.97 mln tonnes
Coking coal reserves and resources in the Lublin Coal Basin according to UNFC-2009 as of 31.12.2009

- Extractable reserves - levels accessible (11x) 106.71 mln tonnes
- Extractable reserves - levels inaccessible (12x)
- Economic resources (21x) 28.61 mln tonnes
- Anticipated economic resources in developed deposits (22x) 16.35 mln tonnes
- Anticipated economic resources in undeveloped deposits (23x) 785.43 mln tonnes
- Non-economic resources (31x) 27.5 mln tonnes
- Anticipated subeconomic resources in developed deposits (32x) 91.42 mln tonnes
- Anticipated subeconomic resources in undeveloped deposits (33x) 647.15 mln tonnes
- Prognostic resources (34x) 1193.25 mln tonnes
- Prospective resources (34x) 647.64 mln tonnes
Steam coal resources in the Lower Silesia Coal Basin according to UNFC-2009 as of 31.12.2009

Anticipated subeconomical resources in undeveloped deposits (33x) 27.47 mln tonnes

Prospective resources (34x) 18 mln tonnes
Coking coal resources in the Lower Silesia Coal Basin according to UNFC-2009 as of 31.12.2009

Sales production

Non-sales production

Mining plant operations plan

Deposit development plan

Geological report

Anticipated subeconomical resources in undeveloped deposits (33x) 201.75 mln tonnes

Prospective resources (34x) 102 mln tonnes
Anthracite resources in the Lower Silesia Coal Basin according to UNFC-2009 as of 31.12.2009

Sales production

Non-sales production

Mining plant operations plan

Deposit development plan

Geological report

Anticipated subeconomic resources in undeveloped deposits (33x) 86.8 mln tonnes

Prognostic resources (334) 0.39 mln tonnes
Hard coal type 42 resources in the Lower Silesia Coal Basin according to UNFC-2009 as of 31.12.2009

Anticipated subeconomic resources in undeveloped deposits (33x) 53.02 mln tonnes

Prospective resources (34x) 110 mln tonnes
Thank you for your attention