**Converting trade data to physical energy flows**

To link the BACI trade and IEA world energy balance (WEB) databases, I rely on a correspondence table that defines specific energy (MJ/kg) for each representative energy resource in the MESSAGE model. This specific energy value is region specific for crude (CRU) and coal (COAL), for which quality can vary by geographic source. This concordance is built using the following method:

Coal: Use the share of (lignite + sub-bituminous) compared to share of (bituminous + anthracite) in reserves, sourced from the BP Statistical Workbook (2007). Use a representative specific energy for each type of coal and find the lignite-subbituminous average and bituminous-anthracite average. Calculate the weighted average for a country (where country-specific data are available) or a region (where country-specific data are not available). Representative specific energy values are sourced from the Indiana Center for Coal Technology Research at Purdue University

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| --- | --- |
| **Coal Type** | **Representative specific energy value (MJ/t)** |
| Anthracite | 30,080 |
| Bituminous | 32,000 |
| Lignite | 16,000 |
| Sub-bituminous | 21,000 |
| Mean (Lignite + Sub-bituminous) | 18,500 |
| Mean (Anthracite + Bituminous) | 31,040 |

Crude: crude oil reserves vary in terms of weight (light to heavy) and sulfur content (sour to sweet). To differentiate specific energy values, we focus on variation in weight by region. We apply the following formula to obtain barrels of oil per ton using the representative API gravity for each benchmark crude, which are sourced from Petroleum.co.uk:

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| --- | --- |
| **Crude Benchmark** | **Representative API** |
| West Texas Intermediate (WTI) | 39.6 |
| Brent | 38.06 |
| Dubai | 31 |
| Orb (OPEC) | 32.7 |
| Minas | 35 |
| Tapis | 45.2 |
| Bonny Light | 32.9 |
| Isthmus Light | 33.74 |

Petroleum (PET), nuclear-uranium (NUC), bioenergy-biodiesel and peat (BIO) are not region-specific.