COAL

Coal, Peat and Derived Fuels Overview

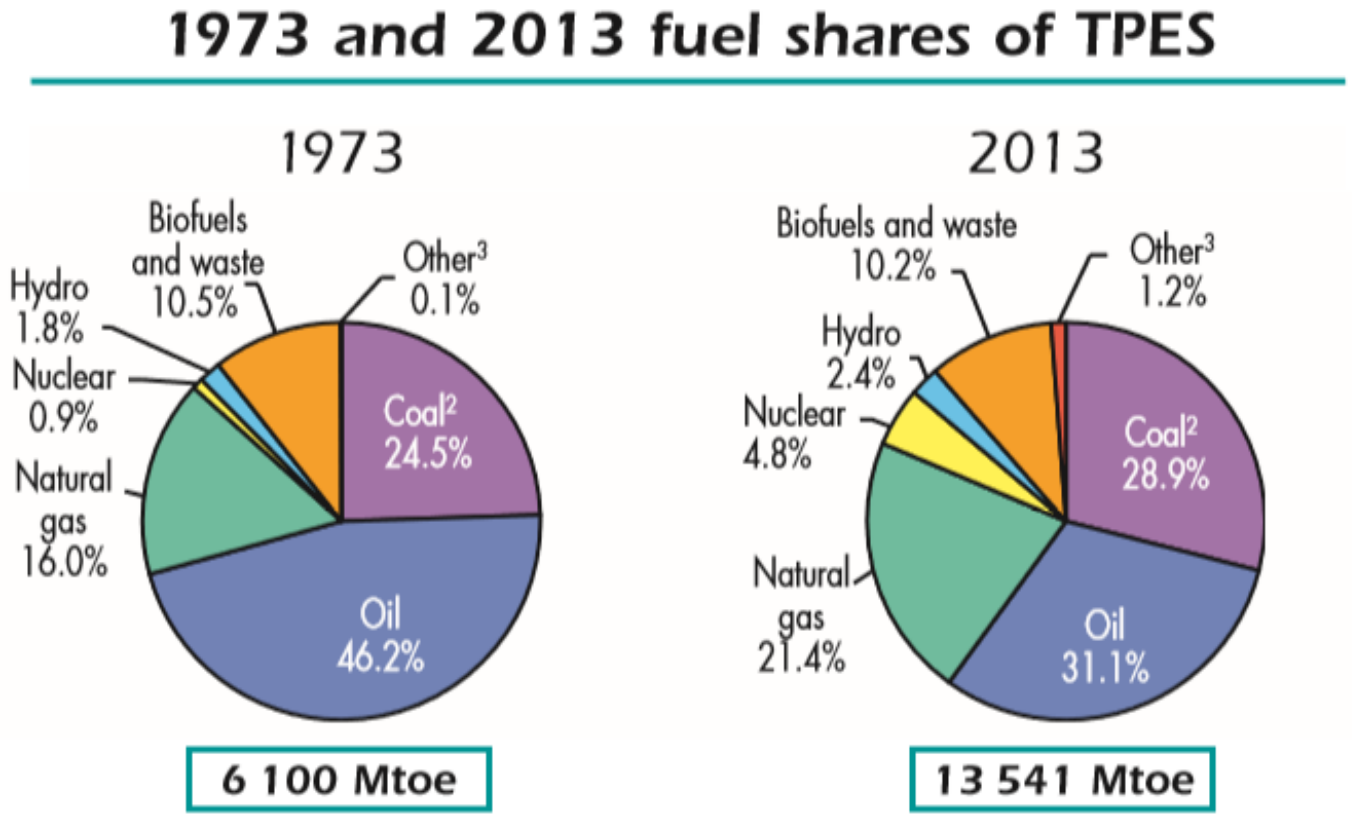
Manos Christinakis
Non Member Countries
Energy Data Centre
International Energy Agency

International Energy Agency

Overview

1. The role of coal
2. Coal classification
3. Coal transformation processes
4. Reporting coal data

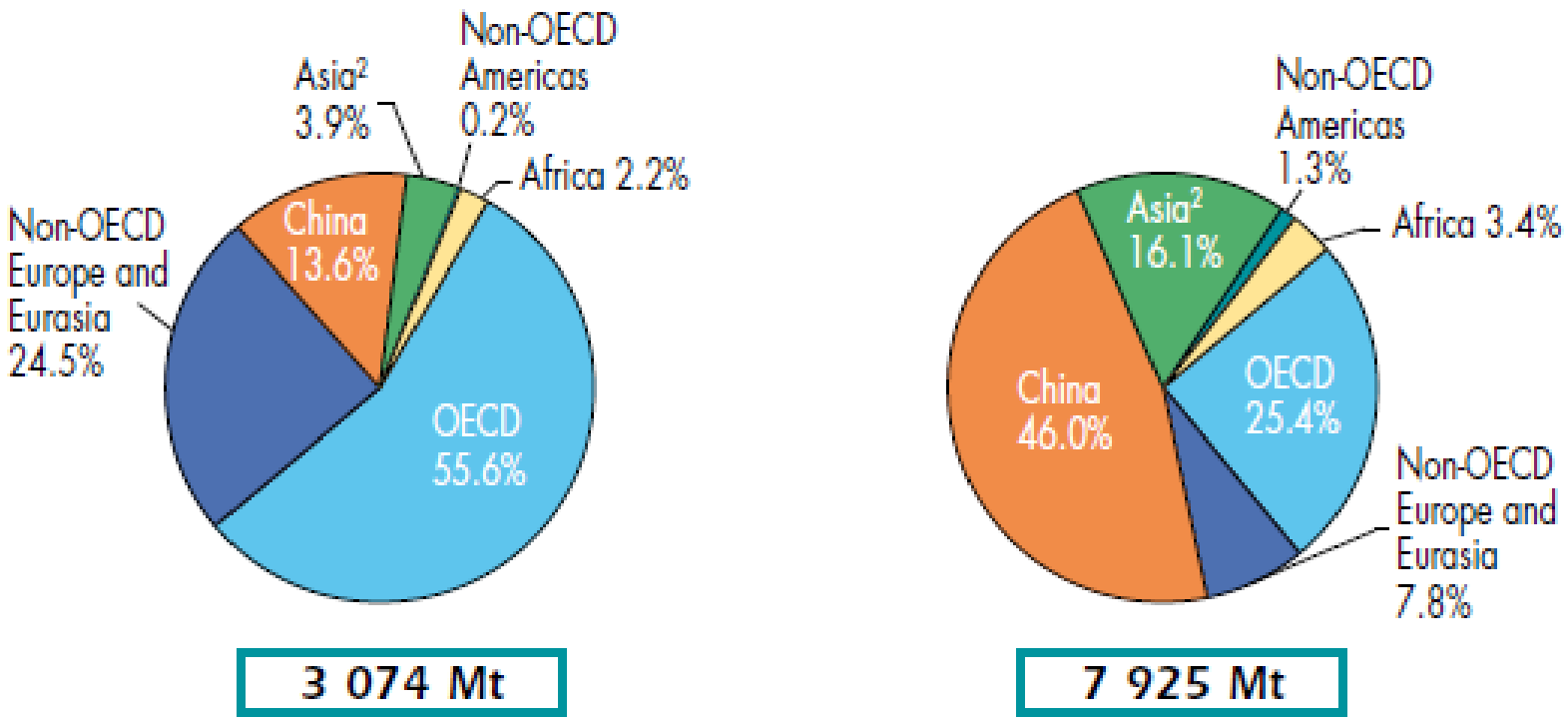
The importance of coal



- 2nd largest source of primary energy in 2013
- Largest source of electricity generation (41.3%)

Consumption changes over time

1973 and 2014 regional shares of coal[1] production

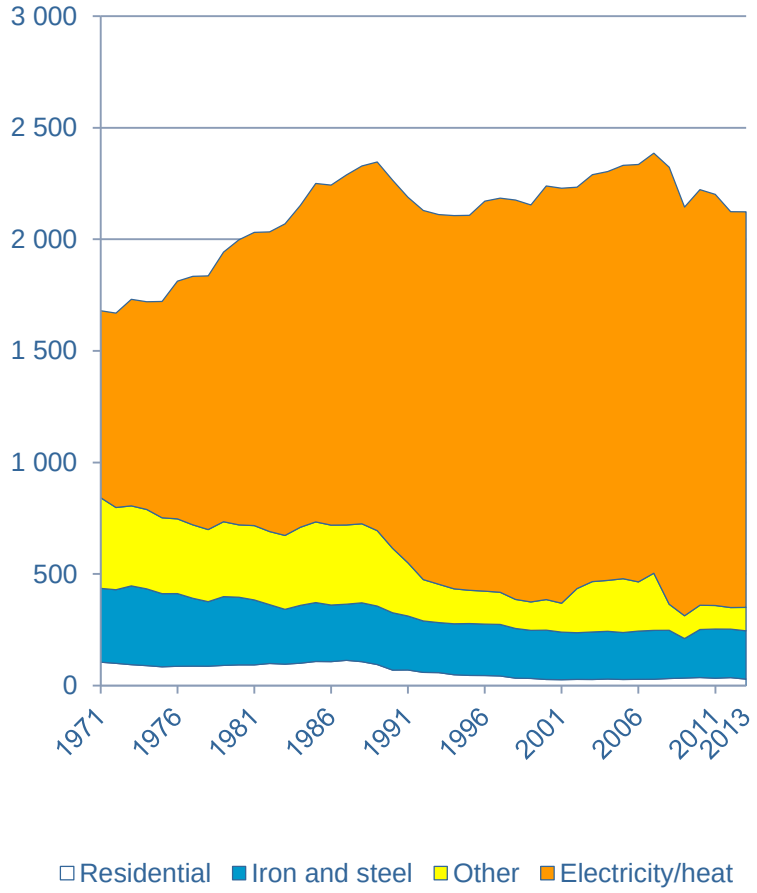


1. *Includes steam coal, coking coal, lignite and recovered coal.*
2. *Asia excludes China.*

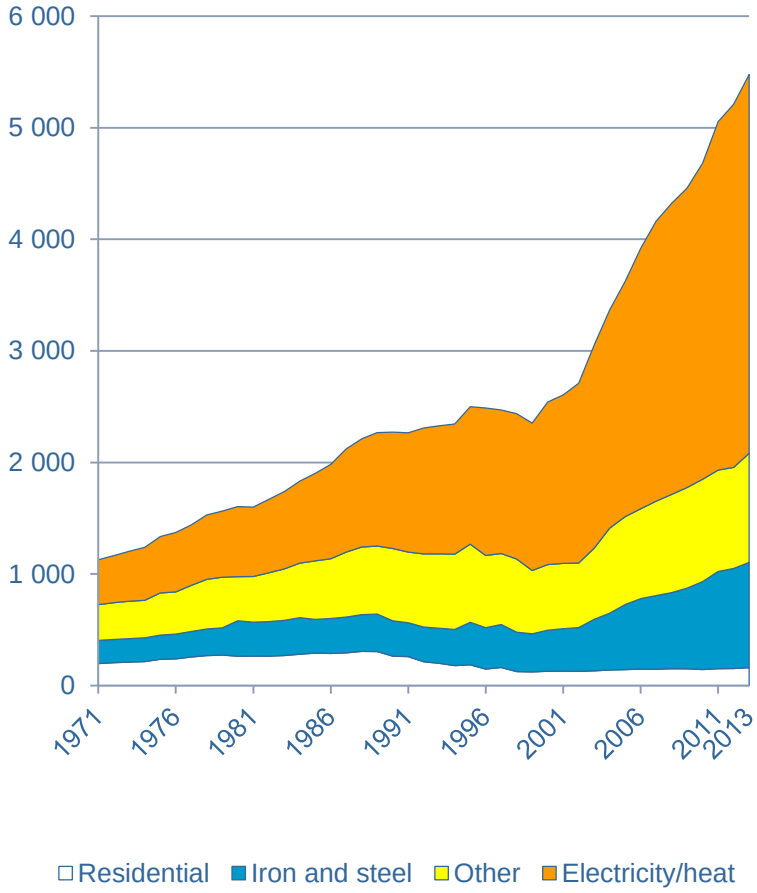
Consumption changes over time

Total coal (million tonnes)

OECD



Non-OECD



The importance of coal

- Abundant, cheap with low technology barriers
- Used for power generation, iron and steel production and cement manufacture
- Energy security can be enhanced with coal-to-liquids, gas or chemicals

But:

- Environmental concerns: largest CO_2 emission per unit of energy among conventional energy sources
  - Potential for development and deployment of clean coal technologies such as carbon capture and storage

Coal classification

Fuel	Type	Reporting unit	Expected calorific value (kJ/kg, MJ/ton)	GCV estimation
Coking coal	Fossil fuels	kt	25000 - 33000	≈ NCV + 5%
Anthracite		kt	22000 - 29000	≈ NCV + 5%
Other bituminous coal		kt	22000 - 29000	≈ NCV + 5%
Sub-bituminous coal		kt	16000 - 24000	≈ NCV + 5%
Lignite		kt	5000 - 18000	≈ NCV + 5%
Peat		kt	7000 - 13000	≈ NCV + 5%
Oil Shale		kt	2500 - 12000	≈ NCV + 5%
Coal tar	Derived solid products	kt	30000 - 44000	≈ NCV + 5%
Patent fuel		kt	25000 - 32000	≈ NCV + 5%
Coke oven coke		kt	24000 - 32000	≈ NCV
Gas coke		kt	24000 - 32000	≈ NCV + 5%
BKB		kt	15000 - 21000	≈ NCV + 5%
Peat products		kt	8000 - 14000	≈ NCV + 5%
Gas works gas	Manufactured gases	TJ	15000 - 22000	≈ NCV + 10%
Coke oven gas		TJ	15000 - 22000	≈ NCV + 10%
Blast furnace gas		TJ	2000 - 4000	≈ NCV
Other recovered gases		TJ	2000 - 20000	≈ NCV

Coal classification

- **Primary coal classification by physical and chemical characteristics**
  - **Generally, the higher the carbon content, the higher the rank**

Coking coal	Hard Coal	Metallurgical Coal
Anthracite		Steam Coal
Other bituminous coal		
Sub-bituminous coal	Brown Coal	
Lignite		
Peat		
Oil shale and oil sands		

Coal classification

- **Peat**
  - Solid fossil fuel, often a precursor to coal, particularly lignite

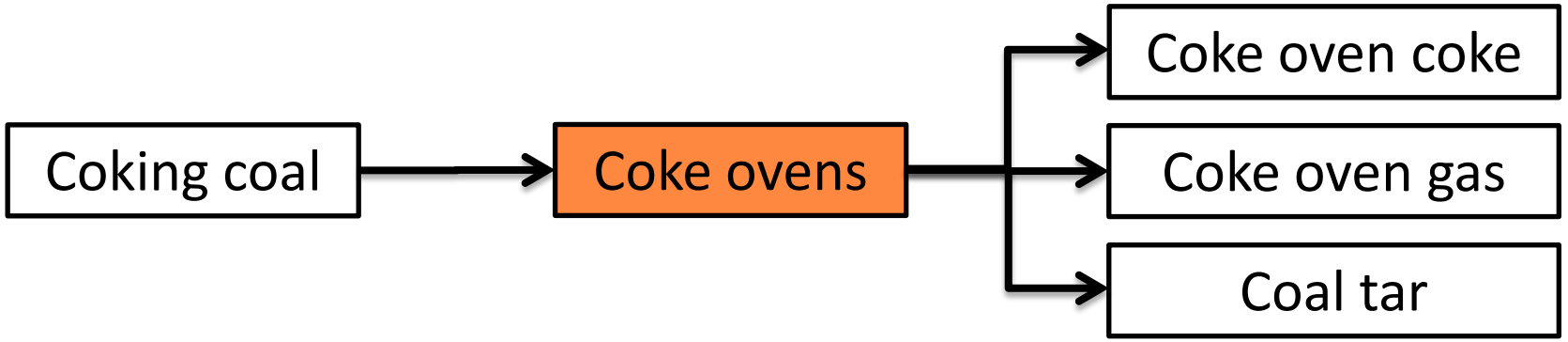
- **Oil shale and oil sands**
  - Sedimentary rock which contains organic matter in the form of kerogen, a precursor of petroleum
  - Oil shale may be burned directly or processed by heating to extract shale oil
  - Shale oil should be reported in the oil questionnaire

Coal transformation processes

- Transformation sector: includes fuels used for conversion of energy (coal to electricity) or for the transformation to derived energy products (coke ovens)
- The largest consumption of coal is in electricity and heat generation
- There are several transformation processes unique to the coal sector

Coal transformation processes

Coke ovens



Blast furnace

Gas works and coal gasification plants

Coal transformation processes

- Patent fuel: manufactured from hard coal fines with binding agent
- BKB or Brown coal briquettes: composite fuel manufactured from brown coal without binding agent
- Coal liquefaction (coal-to-liquid) plants utilize coal to create liquid fuels (diesel, naphtha, etc.).
  - The liquid fuels production must be reported in the ***Oil questionnaire***
- Peat products: products such as peat briquettes derived directly or indirectly from peat

Reporting coal data

Country SUPPLY AND TRANSFORMATION SECTOR		Anthracite 10^3 t A
Indigenous production	1	0
Underground production	2	0
Surface production	3	0
From other sources	4	0
Total imports (Balance)	5	0
Total exports (Balance)	6	0
International marine bunkers	7	0
Stock changes (National territory)	8	0
Inland consumption (Calculated)	9	0

1

Country		Anthracite 10^3 t A
Albania	1	0
Algeria	2	0
Argentina	3	0
Armenia	4	0
Australia	5	0
Austria	6	0

2

Country		Anthracite 10^3 t A
Albania	1	0
Armenia	2	0
Australia	3	0
Austria	4	0
Azerbaijan	5	0
Belarus	6	0
Belgium	7	0
Bosnia and Herzegovina	8	0

3

Country		Anthracite MJ/tonne A
Production	gross -	0
	net -	0
Imports	gross -	0
	net -	0
Exports	gross -	0
	net -	0

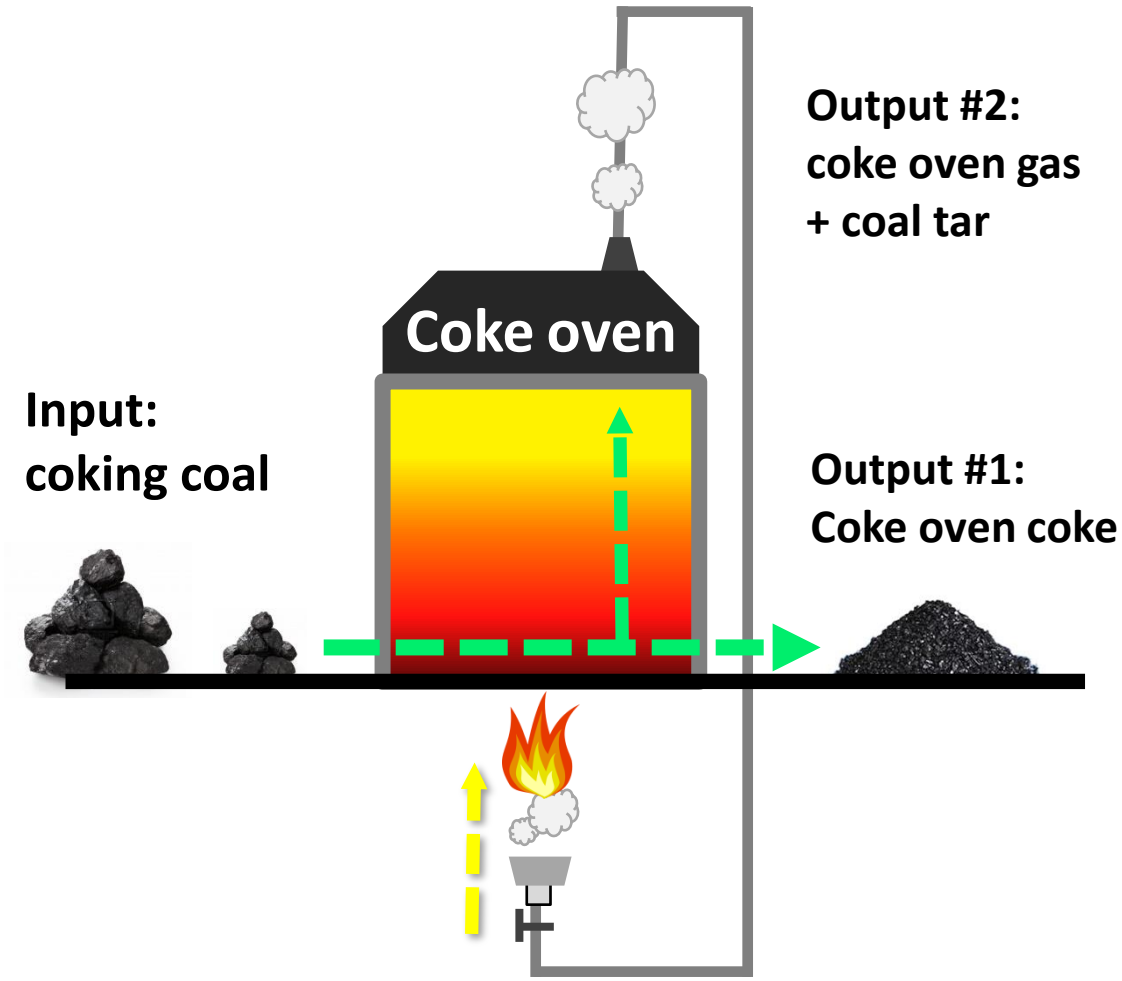
4

4 Tables

Anthracite Coking coal Other bituminous coal Sub-bituminous coal Lignite Peat Oil shale	Fossil fuels
Patent fuel Coke oven coke Gas coke Coal tar BKB Peat products	Derived solid products
Gas works gas Coke oven gas Blast furnace gas Other recovered gases	Manufactured gases

17 products

Reporting coal data



Fuels transformed into another energy form

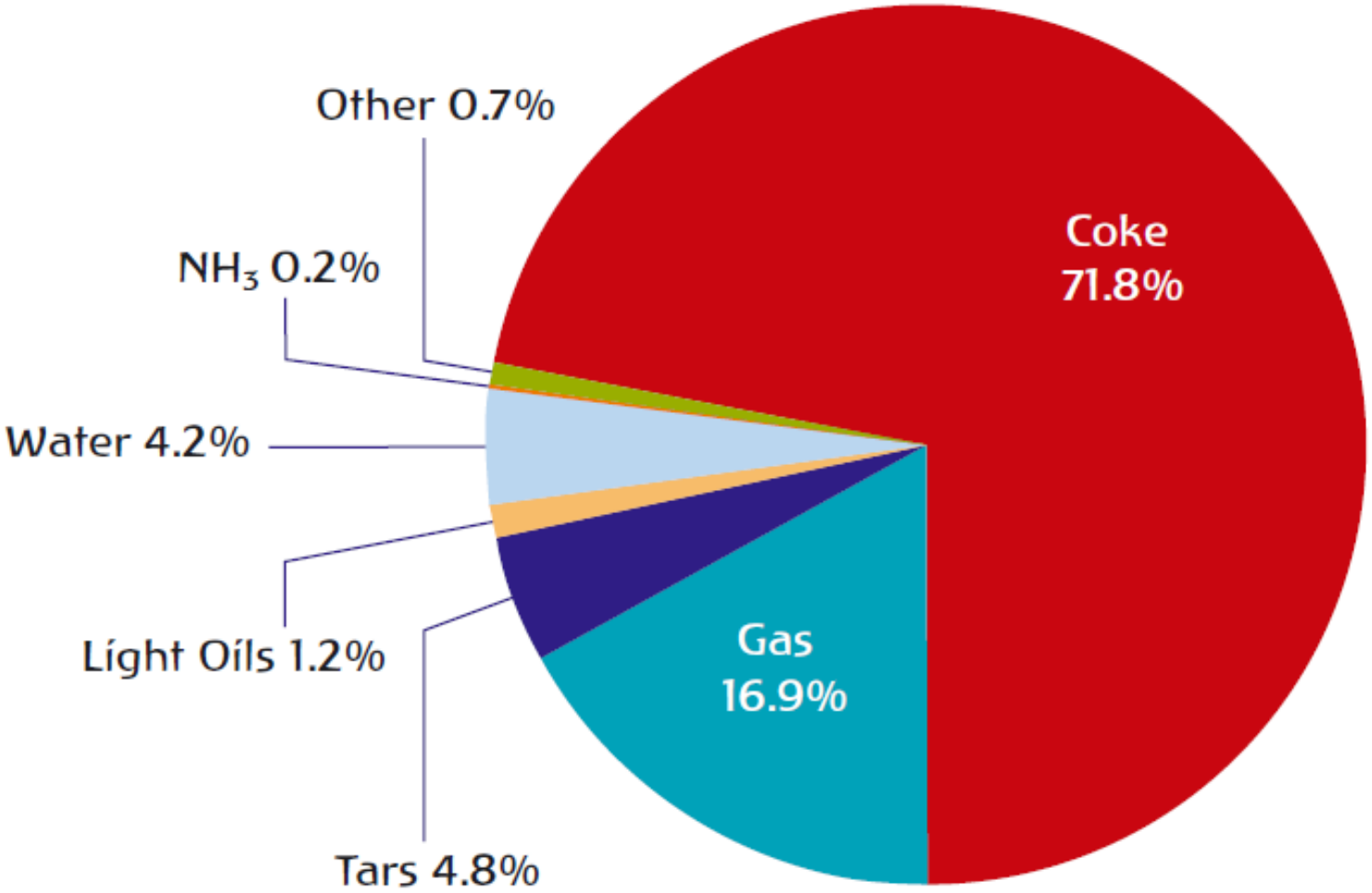
Transformation

Fuels consumed to support operations

Energy industry Own-use

Reporting coal data

- **Typical mass yields from coke ovens**



Reporting coal data

- **Calorific values of coal products may differ for different flows such as:**
  - **Production**
  - **Imports**
  - **Exports**

Domestic supply

Statistical difference on an energy basis

  - **Used in Coke Ovens**
  - **Used in Blast Furnaces**
  - **Used in main Activity Plants**
  - **Used in Industry**
  - **For Other Uses**

Total demand

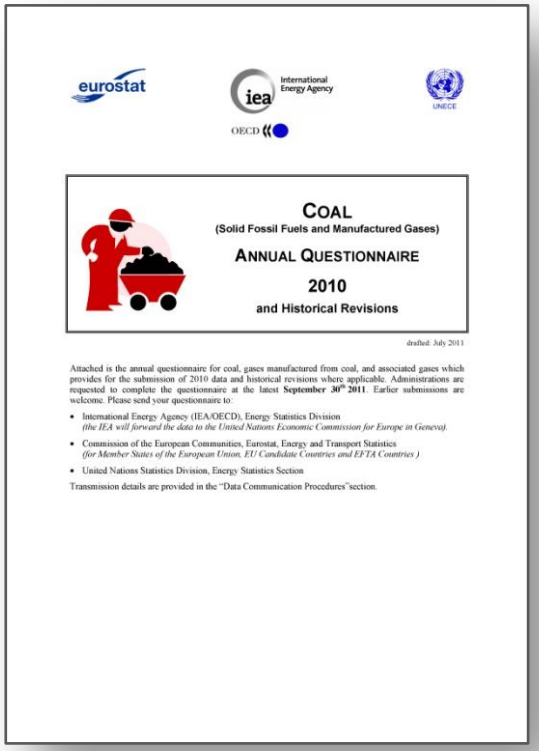
Reporting coal data

- **Coal washing**
  - Removes ash & impurities
  - Improves quality and price
  - Reduces emissions

- **Coal washing can significantly affect both the physical amount of coal available and its calorific value**
- **It is therefore very important to know <u>when</u> the quantity of coal and its NCV are measured**
- **Measuring these values just before a quantity of coal enters a transformation process is essential as only then the efficiency of the transformation process can be accurately calculated!**

Reporting coal data

- **Data quality checks:**
  - **Numbers (sums, signs, etc.)**
  - **Statistical differences**
  - **Time series consistency**
  - **Calorific values**
  - **Transformation efficiency**
  - **Comparison between tables**
  - **Physical vs. energy content balance**
  - **Comparison with other questionnaires**
  - **Data are complete and tell the correct story**
  - **Comparison with secondary and partner sources**



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COAL
(Solid Fossil Fuels and Manufactured Gases)
ANNUAL QUESTIONNAIRE
2010
and Historical Revisions

drafted: July 2011

Attached is the annual questionnaire for coal, gases manufactured from coal, and associated gases which provides for the submission of 2010 data and historical revisions where applicable. Administrations are requested to complete the questionnaire at the latest **September 30th 2011**. Earlier submissions are welcome. Please send your questionnaire to:

- International Energy Agency (IEA/OECD), Energy Statistics Division
  (the IEA will forward the data to the United Nations Economic Commission for Europe in Geneva).
- Commission of the European Communities, Eurostat, Energy and Transport Statistics
  (for Member States of the European Union, EU Candidate Countries and EFTA Countries)
- United Nations Statistics Division, Energy Statistics Section

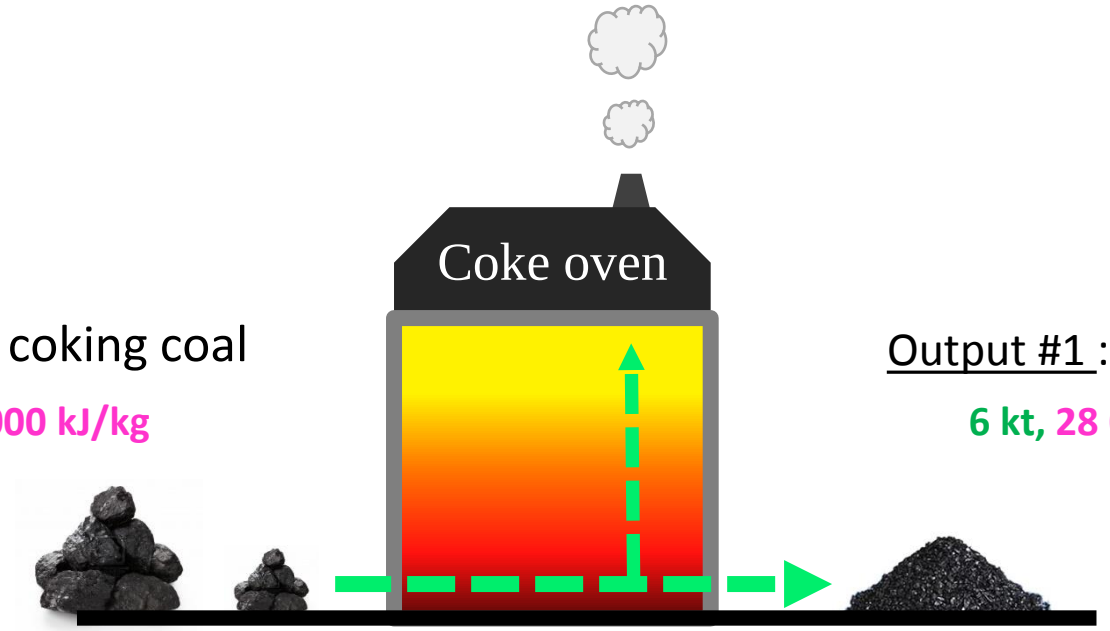
Transmission details are provided in the "Data Communication Procedures" section.

Transformation efficiency : example

Example : Coke oven

Output #2 : coke oven gas + coal tar

15 TJ (gross) + 1 kt, 35 000 kJ/kg



Input : coking coal

10 kt, 26 000 kJ/kg

Output #1 : Coke oven coke

6 kt, 28 000 kJ/kg

$$Efficiency = \frac{15*0.9 + 1*35 + 6*28}{10*26} = 83\%$$

Thank you

WED@iea.org