



Low Carbon Ukraine

Policy advice on low-carbon policies for Ukraine

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CO₂ taxation in Ukraine

Clemens Stiewe, Dr. Frank Meissner & Dr. Georg Zachmann

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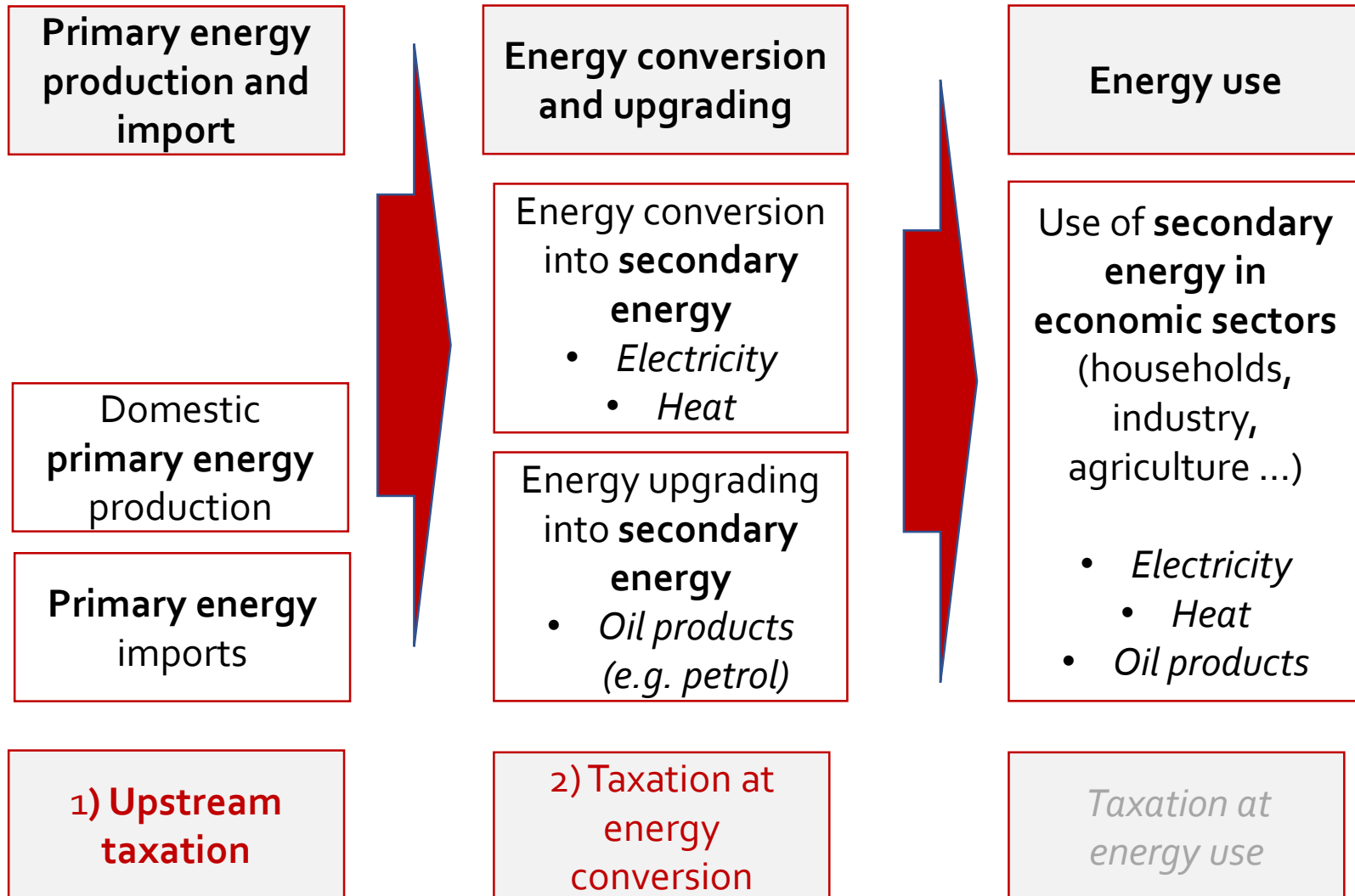
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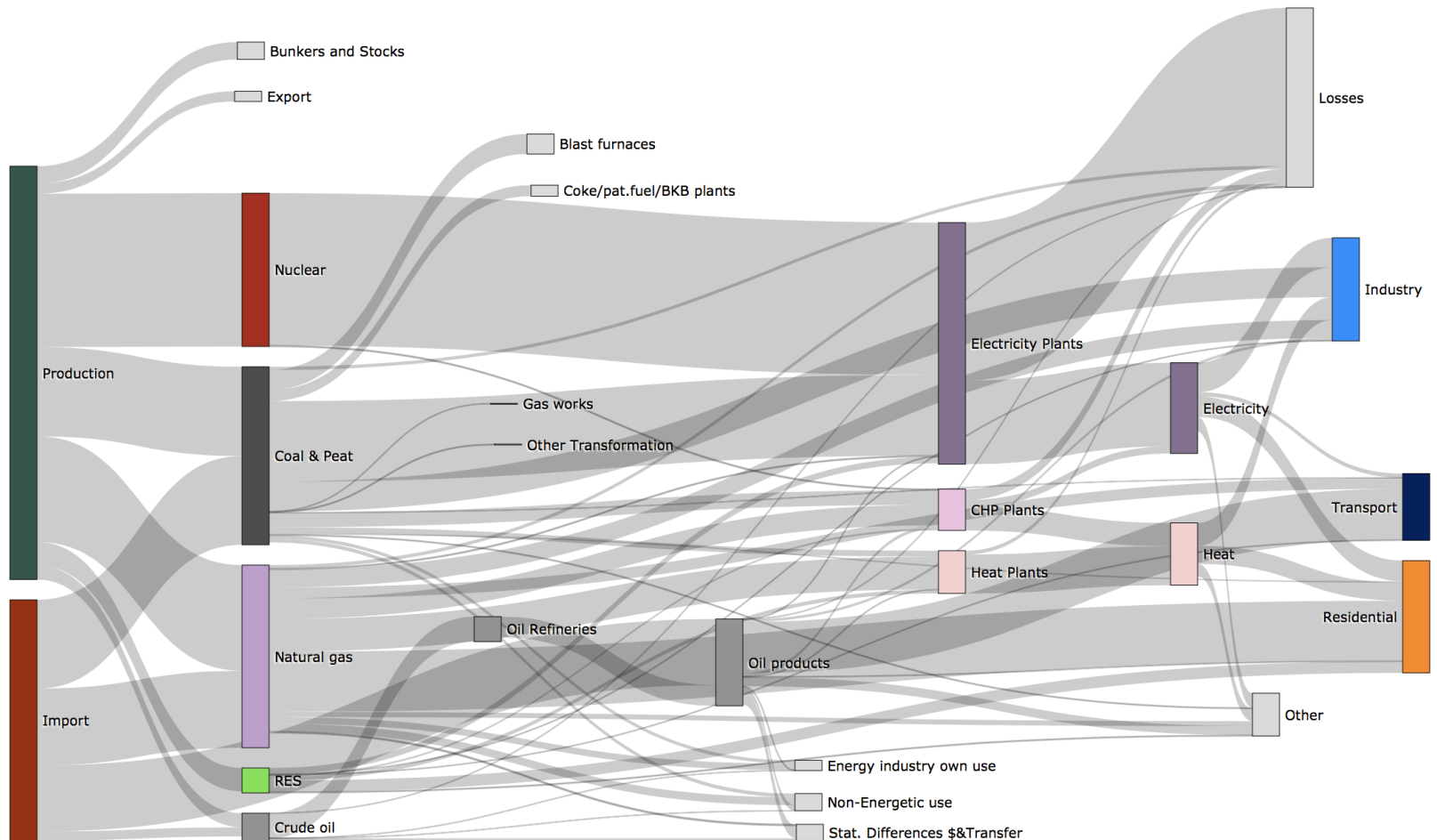
Key Messages

- 1 The revenues of taxing the CO₂ content of fuels with 27 UAH/t CO₂ are estimated between UAH 5.6 and 6.1 bln per year depending on draft law option for taxation (based on 2017 energy balance and fuel-specific CO₂ contents).
- 2 The highest price increase from taxation results for coal (between +3.5 and +4.3%). Effects on prices for transport fuels, electricity, natural gas and household district heating tariffs are estimated between +0.2 and +2.7 %.
- 3 Depending on whether wholesale electricity prices (including CO₂ tax) reach price caps, non-fossil electricity producer on might make windfall profits.

Carbon can be taxed at different stages of the value chain



Ukraine's energy flow overview (2017) – An upstream carbon tax would propagate through the value chain



Source: Ukrstat

The benefits of upstream taxation

- Today, carbon taxation is largely based on self-reporting of large emitters
- Upstream tax basis might be easier to implement (e.g., tonnes of coal delivered from a mine might be measured more easily than the amount of coal a plant burns)
- Losses in the conversion process would be taxed – and thus discouraged

Methodology

- CO₂ tax revenue (Tax) is defined as the product of either the energy content of a fuel (E in e.g. **TOE**) or the volume (O in **ton**) multiplied by the respective CO₂ content (K in **t CO₂ per energy** or **mass unit**) and the CO₂ tax rate (C in **UAH/t CO₂**)

$$Tax \text{ UAH} = E \text{ TOE} \cdot K \frac{t \text{ CO}_2}{\text{TOE}} \cdot C \frac{\text{UAH}}{t \text{ CO}_2}$$

$$Tax \text{ UAH} = O \text{ ton} \cdot K \frac{t \text{ CO}_2}{\text{ton}} \cdot C \frac{\text{UAH}}{t \text{ CO}_2}$$

- According to the draft laws, two options are under discussion
- While **option II** considers fuel-specific CO₂ contents (K in ton CO₂ per ton fuel), **option I** considers a uniform CO₂ content K of 3 t CO₂ per ton of fuel
- For both options, tax rate C is defined as 1 EUR/ tCO₂ (27 UAH/tCO₂)

Methodology for options I and II

- The following primary energy fuels, reported in the energy balance of Ukraine 2017, were considered: **Coal & Peat, Crude oil, Oil products and Natural gas**
- CO₂ tax of 1 EUR/t CO₂

Option I

- Uniform emission factor of 3 t CO₂ per ton of fuel

Option II

- Specific emission factors based on CO₂ contents per energy unit (TJ) for each fuel (following IPCC 2006) and assumptions on calorific values of fuel volume units

Estimation of tax revenues: Option I

Energy carrier	TPES (Production + Imports - Stock change), ktoe	TPES, ton of fuel	Emission factor, tCO ₂ / ton of fuel	Taxed emissions, in Mt CO ₂	Tax revenue, mln UAH
Coal & Peat	26,000	43,700	3	131	3,500
Natural gas	25,000	20,000	3	60	1,600
Crude Oil	3,000	3,000	3	9	200
Oil products	10,000	9,400	3	28	800
Non-fossil	26,000	-	-	-	-
Total	90,000	-	-	228	6,100

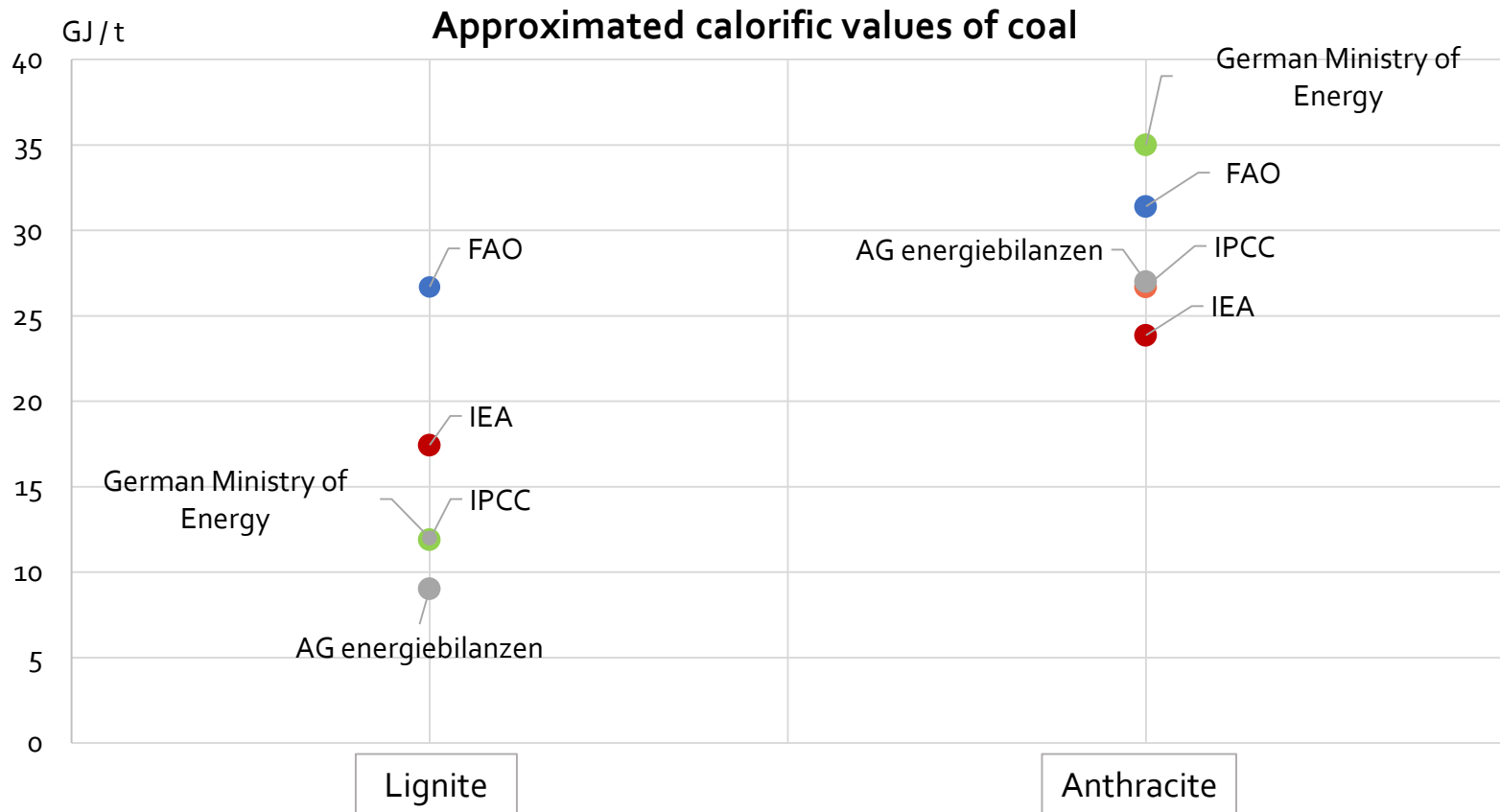
Source: Ukrstat, IPCC 2006, UN, Umweltbundesamt

Estimation of tax revenues: Option II

Energy carrier	TPES (Production + Imports - Stock change), ktoe	TPES, ton of fuel	Emission factor, tCO ₂ / ton of fuel	Taxed emissions, in Mt CO ₂	Tax revenue, mln UAH
Coal & Peat	26,000	43,700	2.4	107	2,900
Natural gas	25,000	20,000	2.9	58	1,600
Crude Oil	3,000	3,000	3.1	9	300
Oil products	10,000	9,400	3.1	29	800
Non-fossil	26,000	-	-	-	-
Total	90,000	-	-	204	5,600

Source: Ukrstat, IPCC 2006, UN, Umweltbundesamt

Assumptions on energy content are crucial for option II



- Higher energy content means higher carbon content
- Estimated tax revenue depends heavily on energy content of fuels

Impact on consumer prices – Option I

Fuel	CO ₂ content per ton of primary fuel inputs	Unit	Price		CO ₂ content	CO ₂ tax	Δ Price
			UAH				
	t CO ₂ / t fuel				kg per unit	UAH per unit	%
Unleaded	3.0	per liter	28	July 2019, incl. VAT	2.3	0.1	+0.2%
Diesel			29	July 2019, incl. VAT	2.5	0.1	+0.2%
Natural gas		per 1,000 cm	8,383	1th half 2019 average households price, incl. VAT	2,100	56.7	+0.7%
			9,102	1th half 2019 average non-household price, incl. VAT	2,100	56.7	+0.6%
Coal		per ton	1,900	DETEK import Rotterdam price mid 2019	3,000	81.0	+4.3%
Heat		per Gcal	1,300	exemplary average residential heat price 2019	204	5.5	+0.4%
Electricity		per MWh	1,250	1th half 2019 average households price, incl. VAT	1,239	33.5	+2.7%
			2,240	1th half 2019 average non-household price, incl. VAT	1,239	33.5	+1.5%

Impact on consumer prices – Option II

Fuel	CO ₂ content per ton of primary fuel inputs	Unit	Price		CO ₂ content	CO ₂ tax	Δ Price
			UAH				
	t CO ₂ / t fuel				kg per unit	UAH per unit	%
Unleaded	3.1	per liter	28	July 2019, incl. VAT	2.3	0.1	+0.2%
Diesel	3.1		29	July 2019, incl. VAT	2.6	0.1	+0.2%
Natural gas	2.9	per 1,000 cm	8,383	1th half 2019 average households price, incl. VAT	2,047	55.3	+0.7%
			9,102	1th half 2019 average non-household price, incl. VAT	2,047	55.3	+0.6%
Coal	2.4	per ton	1,900	DETEK import Rotterdam price mid 2019	2,448	66.1	+3.5%
Heat	2.8	per Gcal	1,300	exemplary average residential heat price 2019	204	5.5	+0.4%
Electricity	2.4	per MWh	1,250	1th half 2019 average households price, incl. VAT	1,011	27.3	+2.2%
			2,240	1th half 2019 average non-household price, incl. VAT	1,011	27.3	+1.2%

Effects on electricity producer revenues

- With merit-order pricing, electricity price is set by the marginal power plant, i.e. the plant with highest marginal costs – mainly low-efficiency coal-fired TPPs
- CO₂ taxation increases the marginal costs of this PP and thus wholesale prices, i.e. revenues for all producers
- **CO₂ tax increases electricity expenditures by about 2%, i.e. UAH 5.2 bln at maximum**
- However, **tax revenue (UAH 1.7 bln)** is limited to the share of coal and natural gas production in electricity generation
- A potential windfall profit of UAH 3.5 bln might be generated
- But: **Electricity price caps** might prevent (coal) plants from passing through carbon cost to consumers



Comparing the options

Option I – „Uniform taxation“	Option II – “Fuel-specific taxation“
<ul style="list-style-type: none">+ Easy to implement and collect– Discriminates against coal, which is taxed overproportionally to its carbon content	<ul style="list-style-type: none">+ Fair taxation based on actual carbon content– Correct values for energy content of fuels need to be established

Conclusion

- Upstream taxation of CO₂ content of fuels is easier to monitor than CO₂ emissions in conversion processes
- Option II implies the need for accurate estimation of energy content of produced and imported fuels, while option I discriminates against coal
- Average price increase due to the proposed small tax (27 UAH/t CO₂) for consumers will be limited
- Windfall profits for low-carbon electricity producers can be substantial if (marginal) coal plants can pass through carbon cost in the form of higher prices

Annex 1: Upstream taxation

Calculation of CO₂ emission and taxation based on:

Domestic primary
energy production

Primary energy
imports

Differing between primary energy carriers:

Coal and peat

Crude oil

Oil products

Natural gas

Tax payer:

Producer of coal, natural gas
and crude oil

Importer of coal natural gas,
crude oil and oil products

Annex 2: Taxation at energy conversion

Calculation of CO₂ emission and taxation based on:

Input of fossil primary energy in energy conversion processes

Differing between secondary energy carriers:

Electricity

Heat

Transport related oil products

Tax payer:

Trader of primary & secondary energy carriers for energetic use

Annex 3: Taxation at energy conversion

Three main energy conversion processes:

