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### Joint Session of Trade and Environment Experts

## THE ENVIRONMENTAL EFFECTS OF LIBERALISING TRADE-DISTORTING MEASURES IN THE ENERGY SECTOR

6-7 May 1998

*At its meeting in November 1997, the Joint Session welcomed the proposal by the Norwegian Experts to study the "win-win" potential of reforming distortions affecting trade in the energy sector, but sought a more carefully defined scope. This note presents a revised proposal that modifies the scope accordingly.*

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## **THE ENVIRONMENTAL EFFECTS OF LIBERALISING TRADE-DISTORTING MEASURES IN THE ENERGY SECTOR**

### **I. Introduction**

1. Energy markets are strongly affected by various government interventions. These interventions are often aspects of national policy to address various objectives. However, it has been recognised that government interventions can reduce economic efficiency and may also result in environmental degradation as well. The main purpose of this study is to clarify the extent to which there is a potential for «win-win» policy reforms, which both increase economic efficiency and reduce environmental problems.

2. This win-win potential may be particularly promising in the energy sector, as tax structures, subsidies and other policies often support relatively more polluting energy sources as compared to cleaner energy sources. These policies also affect trade in energy.

#### ***Proposed Structure of Study***

3. The proposed study consists of three principal segments. These are:

- a brief overview of trade flows of the three primary energy flows and their intrinsic environmental composition based on carbon, sulphur and particulates
- a classification of the principal trade distortions and restrictions affecting the primary energy sector and overview of the prevalence and magnitude of these policies in major producing and consuming countries
- an analysis of selected cases (OECD, developing countries and economies in transition). The analysis will focus on implications of changes in domestic energy consumption and trade from removing the barriers and distortions. The case study analysis will be supplemented by a model simulation to provide a perspective on the overall changes in global trade

### **II. Environmental implications of current trade flows in primary energy**

#### **Trade Flows**

4. Within the global context, the study would provide an overview of the trade flows of the three primary energy sources: petroleum, natural gas and coal<sup>1</sup>. This selection is based on the observations that these three sources are the overwhelming components in both energy trade and energy-related emissions.

**Table 1. Magnitude of primary energy sources**

energy source	% of global primary energy consumption	% of global emissions	% of global energy trade
petroleum			
natural gas			
coal			

### Environmental Implications

5. The study would concentrate on the carbon effects of changes in the primary energy trade rather than the local environmental effects -- although the case studies would be used to provide indications of local environmental effects. The focus on carbon emissions allows for a direct measure of the environmental effects among the three energy sources. Further, the local environmental impact is dependent more on domestic environmental regulation and technology than on energy consumed and thus very difficult to measure for changes in fuel quality<sup>2</sup>.

6. By using average energy, carbon, sulphur and particulate levels the following information would be developed:

**Table 2. Global Trade**

Energy Source	current trade	environmental content in international trade		
		carbon	sulphur	particulates
petroleum				
natural gas				
coal				

### III. Policy measures affecting trade and environment in the energy sector

#### *Classification of trade-distorting measures<sup>3</sup>*

7. This section will review different types of government intervention in domestic energy markets, their potential trade effects, and how widespread such distortions are. The analysis of these distortionary policies would be limited to the large stationary sources -- i.e. the power and large industrial and, if applicable, large central heating sectors. Relevant domestic policies that distort trade fall into three basic categories:

#### **Market Price Support**

8. Market price support policies have the effect of raising the domestic price above the border price. These may be direct trade policies which are designed expressly to limit imports or exports, or may take the form of required domestic purchases.

9. Trade policies in the energy sector have an obvious impact on trade flows and, therefore, on environmental conditions. While generally in decline, *tariff and non-tariff trade barriers* still exist. The effect of removing trade barriers, either tariffs or import (export) restrictions, is to increase total energy flows and change the energy mix traded, while consumption of the domestically produced energy source increases (decreases). The change in the energy mix also depends on cross-price elasticities. These changes together determine the net impact on trade and environment. However, the environmental impact depends on the change in the energy mix traded and/or on the quality of the energy product being replaced. Environmental benefits arise only if the protected energy source is replaced with an environmentally more benign one or is substituted by the same energy source but of higher quality.

10. *Purchase requirements* to buy from domestic energy producers include any obligation imposed by the government to some sector of the economy to purchase a certain energy source or at least some quantity of it (often both are state-owned.) This leads to the consumption of energy sources at prices that are usually higher than world market level. The removal of such distortions leads to a decrease in the consumption of the domestic energy source in question. The net impact on the environment will depend on the quality of imports and substitution to other energy forms.

#### ***Other, mainly budgetary, forms of assistance***

11. Other forms of assistance are designed to assist the domestic industry via direct transfers to the domestic industry. The implications of changes in these policies are often difficult to quantify, especially regarding their environmental impacts. Depending on the case, removal of distortions could change both volumes and energy mix traded and be either beneficial, neutral or harmful to environmental conditions. While variations of these policies are manifest, it is suggested to limit the study to the more widespread and important of these practices. Often governments use a combination of these measures to achieve policy targets, indeed often the policies must be combined in order to be effective.

12. *Support related to inputs* These are policies that reduce the costs of inputs and complements. They may take the form of direct budgetary support to material and energy input. Or they may be investment subsidies such as favourable loan terms, debt write-off or provision of infrastructure below long run marginal cost.

13. *Direct payments to producers and consumers.* At the production level, these include, deficiency payments (grants to cover losses) and operating subsidies. This form of assistance is generally more common than price support. At the consumption level, energy price rebates are sometimes paid to consumers of energy to reduce the price they pay. By distorting the domestic consumption and/or production pattern, such transfers have a direct impact on primary energy traded and environmental considerations

#### ***Tax policies***

14. These include preferential treatment under the general tax code or in local rates and fees. Statistical data on energy taxation of industry would be gathered: actual tax rates on energy for the end uses studied (the large stationary sources -- i.e. power, large industrial central heating sectors but not transport or households) would be compared with the normal rates in each country studied. In addition, excise taxes and VAT on the three energy sources would be gathered for the countries studied.

*Overview matrix of trade-distorting measures*

15. Based on the above typology, a matrix would be developed of the trade-distorting measures in the countries studied. This matrix would identify the major distortions by location, types of energy and a proxy for their importance in international trade. Table 3 summarises the selected indicators and Table 4 the separate calculations on taxation.

**Table 3. Scope and magnitude of trade-distortionary measures**

Country	Energy source	Type of distortions	Measure of distortion (1)	export and import volumes	trade volumes as a share of domestic consumption (2)
	oil natural gas coal	<u>Market price support</u> Tariffs barriers  Non-tariff barriers  Purchase requirements	as % of intern. price  as % of dom. consumption  as % of dom. consumption		
		<u>Other, budgetary aid</u> Support to input use  Direct payments	as % of intern. price  as % of intern. price		

1 *Measure of distortion* will quantify the value of the distortionary policy in terms of price or quantity of the energy source. The international price should be used as a benchmark.

2 *Share of the distorted energy source in international trade* will evaluate the importance of the domestic policy distortion on international trade flows. As such, the overview will distinguish those distortions that represent a relatively large fraction of international trade flows from those representing small ones .

**Table 4. Taxation**

Country (1)	Energy source (2)	Price exclusive of taxes (3)	Excise Tax (4)	VAT (5)
	oil		as % of (3)	
	natural gas		as % of market-based price	
	coal			

To determine whether prices include some degree of distortion, cross country comparisons could be made on the basis of market-based prices. Information gathered on taxes would be calculated as a share of price exclusive of taxes and then also as a share of market-based prices (excluding taxes). This would provide a uniform basis of comparison among countries.

#### **IV. Analysis of the environmental effects of removing trade-distorting measures**

16. The analysis of changes in trade-distortionary policies involves both case studies and a model simulation. The case studies provide the basis for the analysis in that they can more effectively incorporate the different types and effects of the distortions. The model simulation provides a global context for viewing the case study results.

##### ***Case Studies***

17. On the basis of the overview provided (section III above), case studies would be developed and analysed. The case studies will be chosen according to the nature of the trade-distortionary policy, the extent of the distortion and its relative importance. As relatively few countries account for the majority of the non-OECD energy market, the number of case studies need not be too large. It is recommended that these cover OECD members and 4-6 developing and transition economies, representing about 60-65 percent of non-OECD energy consumption.

For each case study, the following information would be collected and analysis done:

- a more in-depth analysis of the existing distortions and their interrelationship with each other
- identification of the degree to which these distortions affect consumption, affect trade volumes and mix, and the environment;
- analysis of how removal of the distortions affect consumption, trade volumes and mix, and the environment;
- determine the environmental impact of removing distortions.

18. In analysing the effect of removing distortions, the analysis would be restricted to the static effects. Even so, both price elasticities and price cross-elasticities among fuels will be needed. For developing and transition countries, such elasticities are difficult to develop. It is suggested to use existing studies (and models) to determine appropriate country (or regional) elasticities.

##### ***Model simulation***

19. A model simulation would be included in the study, but play only a subsidiary role in this study. Energy trade models tend to be based on debatable and uncertain assumptions about market power in the oil and coal market and in regional gas markets. The likely effects on global emissions will be very sensitive to assumptions about these issues. Given the work on the scope of distortions, the case studies and the review of the model literature, an approximation can be built in that traces the effects by the following parameters: type of distortion; change in energy trade volumes; change in energy mix; potential environmental impacts.

20. It should be stressed that this result will be a composite of cases, models, and qualitative assumptions; and thus not provide a specific forecast. However such an estimate of magnitude allows a more useful measure of relating trade and environmental effects to specific changes in policies.

**V. Resources and timing**

21. Co-ordination is foreseen with the horizontal OECD-family wide work on the second of the four specific, concrete projects on sustainable development involving a horizontal review of the environmental impact of economic subsidies [see C/MIN(98)23 and C(98)46]; this larger picture would therefore determine the precise parameters and resources available. This project is of interest to the environment/subsidies work programme under EPOC GEEPI, who have expressed support for a continuation of the work, as did the Environment Ministers in early April. The OECD Council of Ministers will also have the same document before them: *Improving the environment through reducing subsidies*, C/MIN(98)14. Co-operation with the IEA would be in the form of peer review. It is envisaged at this stage, however, that financing would be needed in the form of grants from Member countries. It is hoped that in the interim, it would be possible to begin with the first two sections of the study (sections II and III above).

## NOTES

1. This study excludes international electricity trade for the following reasons:
  - as a derivative energy source, the trade and environmental impacts are partially captured by the trade in primary sources (which are used in electricity generation);
  - electricity trade is regionally based and, to date, confined primarily to certain OECD countries; it thereby lacks a global market;
  - the growth in inter-country electricity trade has so far been related to liberalisation of electricity markets rather than removal of subsidies.

In addition to these theoretical factors, it should be noted that the IEA work programme contains substantial work on electricity and that the OECD country reviews of regulatory reform will be examining the electricity sector.
  
2. It is important to recognise that while the environmental content of the energy sources can be measured, the domestic environmental impacts need not be directly correlated; among emission types, carbon is the most closely related to trade. The local emissions of sulphur, particulates and other non-combustibles are dependent on the efficiency of the equipment, and more importantly, on environmental regulation. Environmental policy can effectively determine the fuel quality and the emissions of non-combustibles. Further, environmental technologies exist and are in widespread use that substantially reduce the emissions of non-combustibles. The result is that the level of emissions, except for carbon and NO<sub>x</sub>, can be largely independent of both the type and quality of the fuel consumed. Thus changes in the level and composition of international energy trade is not necessarily a valid proxy of non-combustible emissions. For these reasons, it is suggested the study focuses on the carbon content of the fuels traded as the primary proxy for trade-related environmental effects.
  
3. This preliminary classification of trade-distorting measures has been adapted from the recent work in the Environment Directorate, "Improving the environment through reducing subsidies" [C/MIN(98)14, plus Annexes 1 and 2] and *Reforming energy and transport subsidies: environmental and economic implications*, OECD 1997.