United States Association for Energy Economics

USAEE Dialogue

PRESIDENT'S MESSAGE

The Albuquerque North American conference is approaching fast. Planning has gone into high gear. We think we have a terrific line-up. Mark your calendars now for October 18th-21st. You won't be disappointed!

The theme of this year's conference is "Technology's Critical Role in Energy and Environmental Markets." Everyone is talking about technology in both the energy and environmental industries. This conference will look at technology in depth in most of the energy and environmental markets. New Mexico is a great place to discuss technology. It is the home of two of DOE's national labs – Sandia and Los Alamos. We will be taking advantage of having these labs nearby by having you visit The National Solar Thermal Test Facility at Sandia on Sunday before the conference starts, at no additional cost. This is a great way to be exposed to the latest solar technologies and catch up on what is happening in the exciting, emerging renewable energy market.

Our keynoter opening the conference will be Sandia's president, Paul Robinson, discussing how technology can make a difference for future energy and environmental issues. Our luncheon speaker will be Ben Montoya, the President and CEO of Public Service of New Mexico, who will focus on technology's impact on a utility in transition. For our dinner keynote speaker we have invited Senator Jeff Bingaman, a senior member of the Senate Energy Committee, who will provide a Congressional perspective on the technology issues of energy and environment.

Our plenary sessions continue the theme of technology. The first set of dual plenary sessions will examine the use of information technology (IT) in the energy market with experts from EDS, a specialist in IT. Along side that session will one focusing on technological change and government policy relying on the experience from the U. S. Gulf of Mexico.

In our next set of dual plenary sessions, one continues with the technology theme through a discussion of the role of technology in energy modeling. This should be an interesting discussion drawing on the experience of government and the energy modeling forum. Opposite this session will be a plenary focusing on the 25th anniversary of the oil embargo, which took place in October 1973. The theme of this session is whether the oil market needs to be managed, with speakers on both sides of the issue.

The remainder of our dual plenary sessions are a mixture of technology issues, especially in climate change, public lands issues, electricity restructuring, and hemispheric energy and technology needs.

These sessions, along with the 100 concurrent papers elaborating on the technology issues, should make for an exciting, thoughtful, and productive conference.

Of course, we are not only in Albuquerque to work. All work and no play makes for a very dull person. We have scheduled a reception at the Indian Pueblo Cultural Center. This will be an opportunity to see demonstrations by Indian crafts makers and to witness Native American dancing. The extensive gift shop will remain open for us and discounts will be available for the excellent collection of Indian pots, sculptures, rugs, and other craft items. Your evening will be free afterwards to explore Albuquerque's old town and enjoy fantastic southwestern cooking. For those who can spare an extra day or two, Santa Fe is only an hour away. Santa Fe is home to more art galleries than any other city of its size. It is renown for a new mélange of American cooking –

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Editor's Corner

This issue of *Dialogue* brings you an excellent article by Stephen P.A. Brown of the Federal Reserve Bank of Dallas and Hillard G. Huntington of the Energy Modeling Forum on "Implications of Increased Cooperation in World Oil Conservation" (which originally appeared in the Second Quarter 1998 issue of *Economic Review*, published by the Federal Reserve Bank of Dallas). This assessment of the impacts of oil conservation should be of great interest whether or not we accept the premise that we can impact global climate change.

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President's Message *(continued from page 1)*

Santa Fe style – that is tasty, piquant, and innovative. For art lovers, the new Georgia O'Keefe museum is a must, as are the museums dedicated to the American Indian art. Los Alamos is about one and one half hours away – home to the Bradbury Museum of Science, one of the best interactive science museums in the world. Bandalier National Monument also is not far away, with ancient Indian cliff dwellings for you to explore. Closer to the conference site, ride the tram to the top of the Sandia mountains for an exquisite view of Albuquerque and the surrounding area.

All in all, the 19th Annual North American Conference will be a winner. Slip on your jeans and boots and join us for three days of stimulating discussion and outstanding ambience. I look forward to greeting all of you in Albuquerque!!

Len Coburn

Student Scholarships: A Call for Support
USAEE/IAEE Annual North American Conference

Started in 1997 at the San Francisco North American Conference, the USAEE is proud to continue its student scholarship fund. Funds are used to cover the cost of registration fees for students attending the annual conference of the USAEE/IAEE. Students must submit a written application and letter from their student advisor requesting that funds be granted. At the San Francisco Conference, sixteen students qualified to have their conference registration fees waived in an effort to share our conference experience, the field of energy economics and networking opportunities with other students. Further, inviting student participation at our conferences is one of the best mechanisms for recruiting new members to the USAEE.

The student scholarship fund has been generously provided by the support of the following organizations:

American Petroleum Institute
Amoco Corporation
Atlantic Richfield Company
Conoco, Inc.
Exxon Corporation
Shell Oil Company

Recognizing the need for interested and qualified graduates, many funding organizations view the program as supporting education as well as recruitment. The USAEE has started its campaign for scholarship funds for the 1998 North American meeting in Albuquerque, New Mexico, October 18-21. Scholarships range from $500 to $2500. If you would like to receive information on how your company can become a supporter of this program, please contact Shirley Neff, USAEE Council Member and Vice President, Chapter Relations at (p) 202-466-1400, (f) 202-466-1498, or sjneff@clark.net

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This issue also includes a fine article by Dr. Gürcan Gülen of the Energy Institute at the University of Houston addressing changes in the energy industry in Turkey. Dramatic changes in both socio-economic policies and facilities will be needed to meet Turkey's rapidly growing energy needs.

Please join me in thanking the authors for their contributions to our newsletter.

Please send new articles (or suggestions for articles) and notices for publication in *Dialogue*. Include news of chapter events and appropriate press releases. Items can be sent via E-mail (paul-roberts@hlp.com), by Fax (713-207-9962), or by regular mail (Houston Lighting & Power Company, P.O. Box 1700, Houston TX 77251-1700). If you have questions, comments, or suggestions, I can be reached by phone at 713-207-5059.

Paul Roberts

USAEE Nominations Announced

Dr. Hillard G. Huntington, Past President of USAEE and Chair of the 1999 Nominations Committee is pleased to announce the following slate of nominees for USAEE Officer and Board positions:

1999 Elections

For President Elect	David J. DeAngelo
Vice President – Conferences	Arnold B. Baker
Vice President – Chapters	Adam E. Sieminski
Secretary-Treasurer	Mine K. Yucel
Council Member	Wilfrid L. Kohl
Council Member	N. Foster Mellen

Other USAEE Officer and Board members for the 1999 calendar year will include Michael C. Lynch, Leonard L. Coburn, Fereidoon "Perry" Sioshansi, and Stephen R. Warwick.

!!! MARK YOUR CALENDARS — PLAN TO ATTEND !!!

Technology'sCriticalRoleinEnergy&EnvironmentalMarkets

19th USAEE/IAEE Annual North American Conference - October 18-21, 1998
Albuquerque, New Mexico, USA - Hyatt Regency Hotel
Sponsored by: USAEE/IAEE

If you're concerned about the future of the energy industry and profession, this is one meeting you surely don't want to miss. The 19th USAEE/IAEE Annual North American Conference will detail current developments within the energy field so that you come away with a better sense of energy supply, demand and price. Some of the major conference themes and topics are as follows:

Critical Energy and Environmental Issues in the Next Century: Where Can Technology Make A Difference?
A Competitive Advantage in the New Millennium: Use of IT in the Energy Market
Technological Change and Government Policy: Experience in the U.S. Gulf of Mexico
25 Years After the First Oil Shock: Are Oil Markets Managed and Will They Need to Be?
Technology in Energy Modeling: Key Insights and Future Directions
Energy Resource Development and Public Lands Policy
Debate: Federal/State Jurisdictions for Electricity Restructuring
Innovations in Risk Management
The Role of Technology in Climate Change Policy

In the opening session C. Paul Robinson, President, Sandia National Laboratories, will focus on critical energy and environmental issues in the next century. In particular, issues of where can technology make a difference will be addressed. Luncheon speaker Senator Jeff Bingaman (invited) will share with us his views on critical energy issues and congressional initiatives.

At this time, other confirmed and/or invited speakers include the following:

Herman Franssen, Petroleum Economics Limited
Jay E. Hakes, Energy Information Administration
Joe Roemm, US Department of Energy
Jennifer Salisbury, State of New Mexico
Robert C. Marlay, U.S. Department of Energy
Edward L. Morse, Energy Intelligence Group
Anthony J. Finizza, Atlantic Richfield Company
Mark K. Jaccard, Simon Fraser University
Benjamin F. Montoya, Public Service Co. of New Mexico
Tom Fry (invited), Bureau of Lane Management
Dennis J. O'Brien, Sarkeys Energy Center
Richard Newell, Resources for the Future

In addition, 25 concurrent sessions are planned to address timely topics that affect all of us specializing in the field of energy economics.

Companies today are investing and trading in intensively competitive international energy markets. How these market conditions develop and what kinds of opportunities they create depend very much on the policies governments adopt, not only for promoting competition but also for meeting certain societal goals such as environmental protection. Since markets transcend national boundaries, policies adopted in one country or region may affect competition elsewhere as well as domestically.

The 19th USAEE/IAEE Annual North American Conference provides a unique opportunity for leading experts from business, government, universities, and research institutions to discuss and debate the future of energy markets in this era of commodization, decentralization, and internationalization.

You can be sure that prominent speakers who are on the cutting-edge of energy economic issues will once again address this annual meeting.

Albuquerque, New Mexico is a wonderful and scenic place to meet. Single nights at the Hyatt Regency Hotel are $119.00 (contact the Hyatt Hotel at 505-842-1234, to make your reservations). Conference registration fees are $400.00 for USAEE/IAEE members and $475.00 for non-members. Special airfares have been arranged through Conventions in America (5-10% off the lowest applicable fares, call Conventions in America at - 619-453-3686). These prices make it affordable for you to attend a conference that will keep you abreast of the issues that are now being addressed on the energy frontier.

There are many ways you and your organization may become involved with this important conference. You may wish to attend for your own professional benefit or your company may wish to become a sponsor or exhibitor at the meeting whereby it would receive broad recognition. For further information on these opportunities, please fill out the form below and return to USAEE/IAEE Headquarters.

Technology's Critical Role in Energy & Environmental Markets

19th Annual North American Conference of the USAEE/IAEE

Please send me further information on the subject checked below regarding the October 18-21, 1998 USAEE/IAEE Conference.

Registration Information _____ Sponsorship Information _____ Exhibit Information

Name: _____

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USAEE/IAEE Conference Headquarters
28790 Chagrin Blvd., Suite 350
Cleveland, OH 44122 USA
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Some Implications of Increased Cooperation in World Oil Conservation

*By Stephen P.A. Brown and Hillard G. Huntington**

The classic problem of free riding arises when nations act to curtail emissions of carbon dioxide (CO_2) and other potential greenhouse gases. When damages from emissions are global rather than local, countries that do not participate in policies directed at reducing global climate change receive the benefits of other countries' actions without incurring the costs.

Past research and game-theoretic analyses have emphasized the gains from eliciting the cooperation of developing countries in an effort to limit global CO_2 emissions (Bohm 1993; Brown and Huntington 1994b; Eyckmans, Proost, and Schokkaert 1993; Hoel 1991b and 1994; Manne and Rutherford 1994; and Welsch 1995). Broader participation reduces the costs of achieving any given target of emissions reductions among those nations engaged in the coordinated policies. In essence, the cost curve for countries reducing their emissions shifts downward as participation expands to include more countries.

Recent estimates of possible climate-change damages allow us to examine the impact of cooperation on the optimal strategy for reducing CO_2 emissions. Because increased participation lowers the costs of coordinated policies to reduce emissions, it is likely to increase the amount of conservation that the participants would see as cost-effective for any given set of estimates of the benefits of reducing emissions and avoiding environmental damage. Whether increased cooperation yields too little or too great a reduction in emissions from a world perspective depends critically upon the level of damage estimates – an empirical issue that at the moment is highly uncertain.

Reduced usage of fossil fuels, through higher-efficiency equipment and changing economic structures and lifestyles, is the principal vehicle for CO_2 emissions abatement. Policies that discourage the use of coal, oil, and to a lesser extent, natural gas contribute to reduced emissions of greenhouse gases and hence lower the potential damages from climate change. Abatement policies affecting the oil market are particularly complex to analyze because actions taken by one country or group of countries are likely to influence oil consumption in other parts of the world through their effect on the world oil price.

In this article, we evaluate the extent to which increasing cooperation beyond the Organization of Economic Cooperation and Development (OECD) to limit CO_2 emissions through oil conservation is desirable from a world perspective. To accomplish this task, we derive cost and benefit curves from recent studies of world oil markets and the nascent literature on the damages arising from changes in the world climate. Our analysis shows that the desirability of extending cooperation in global energy conservation policies is essentially an empirical issue rather than a conceptual one. In addition, the current evidence suggests that over the next two decades, the OECD will have an incentive to reduce its oil consumption by more than is optimal from a world perspective – even when its actions are evaluated on a precautionary approach to reducing CO_2 emissions.[1]

2. Estimating the Cost of Oil Conservation

As in several previous studies, we use a welfare-theoretic framework built on top of a simulation model of the world oil market to compute cost curves for oil conservation under alternative assumptions about which countries are participating in the policy. The curves indicate how participants' costs change as the level of conservation increases. The cost curves include the direct resource costs associated with shifting inputs from other sectors into energy conservation activities, the wealth transfers associated with changes in the oil price, and the effects of increased oil consumption in nonparticipating countries.

2.1 The World Oil Market

Our analysis divides the world into four regions: the industrialized OECD countries; China, Eastern Europe and the former Soviet Union, (C/EE/FSU); OPEC members; and other less developed countries (other LDCs). The simulation model is calibrated to reproduce the oil price, production, and consumption data shown in Table 1. The data in the table represent one of many possible oil-market outlooks for the year 2010. It is based on the midprice case in the U.S. Energy Information Administration's (EIA) *1993 International Energy Outlook*.[2]

The projected oil demand conditions depend on a variety of assumptions about economic growth, prices of competing fuels, and the extent of oil-saving technological change in the absence of price changes. The supply conditions outside of OPEC member countries incorporate assumptions about the resource base, engineering constraints on developing resources, and producer-

* Stephen P.A. Brown is Senior Economist and Assistant Vice President, Federal Reserve Bank of Dallas. Hillard G. Huntington is Executive Director, Energy Modeling Forum, Stanford University. A full copy of this article is available from the Federal Reserve Bank of Dallas website at www.dallasfed.org

[1] See notes at end of text.

country taxes and policies. In these projections, OPEC members satisfy the excess demand, but adjust the next period's price in response to market tightness.

Table 1
Baseline World Oil Market Conditions, 2010

	Quantity (10^6 Bbl /day)[a]	Price Elasticity[b]
Consumption		
OECD	45.6	-0.47
C/EE/FSU[c]	15.3	-0.15
OPEC	7.1	-0.30
Other LDCs	17.9	-0.30
Total	85.9	
Production		
OECD	15.4	0.43
C/EE/FSUc	15.3	0.30
OPEC	42.7	*
Other LDCs	12.2	0.40
Discrepancy[d]	0.3	na
Total	85.9	

a Mid-price case from EIA's *1993 International Energy Outlook.* Price is $29.30 per barrel (1991$).
b Percent change in quantity for each one percent change in price. Based on Energy Modeling Forum (1991), except for C/EE/FSU which are base on the authors' judgment.
c China, Eastern Europe and the former Soviet Union.
d Includes net stock withdrawals.
* OPEC responds to hold a constant market share. See text.

Table 1 also summarizes representative estimates of the long-run supply and demand responses to price for the major regional areas in the analysis. They represent mean estimates derived from an Energy Modeling Forum study (1991), which compared ten major world oil market models, and are similar to those used by the EIA in developing the projections shown in the first column. The estimates in the table were used in construction of the simulation model.[3]

The responses for the C/EE/FSU region are judgmental. Their production and consumption decisions are likely to be influenced greatly by the forces of economic transition, resulting in smaller responses to changes in world oil prices than found in other regions. In fact, if the supply and demand responses for the C/EE/FSU were made comparable to responses for other country groups, the conservation scenarios considered here would push world oil prices sufficiently low that we would estimate these economies would import significant quantities of oil. We consider this result untenable and therefore assumed a smaller response to price than for other countries. To the extent that these countries yield a greater response to price, the estimated costs of achieving various world conservation targets without cooperation from these countries would be larger than reported here.

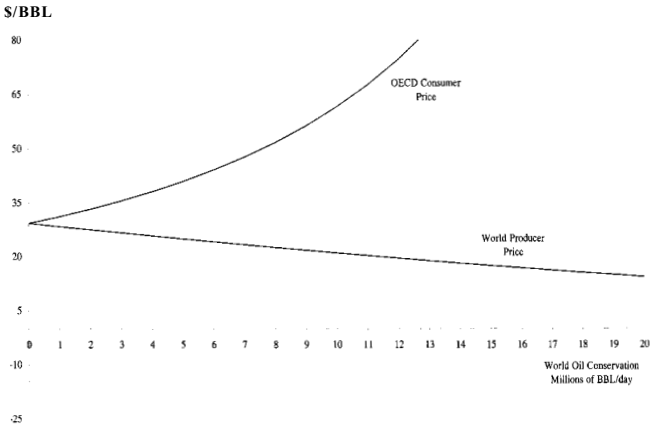
The response of oil producers within OPEC is highly uncertain. To date, formal modeling of OPEC decisions has been far from reliable. OPEC appears to operate like an imperfect cartel during some times, but not at others.[4] The OPEC countries appear to be about as uncomfortable with a rapidly increasing market share (as accompanied the relatively low prices in the 1960s) as they are with a rapidly decreasing market share (as occurred in the aftermath of the price hikes of the late 1970s and early 1980s). The analysis presented here assumes that OPEC acts to maintain a constant market share.[5]

2.2 The Cost of Conservation

We examine conservation policies by reducing oil consumption in participating countries below the levels shown in Table 1 and allowing the world oil price to adjust to restore a balance between oil supply and demand conditions. Analytically, we use a tax to reduce oil consumption in the participating groups of countries. The tax approach assumes that conservation measures are applied across all end uses.

As shown in Figure 1, an oil conservation tax applied in the OECD acts to depress the world oil price while it boosts the oil price faced by consumers in the OECD. A reduced world oil price has two important effects. It yields transfers from oil exporting countries to oil importing countries that operate to offset some of the costs that OECD incurs by imposing conservation policies. It also stimulates oil consumption in countries not participating in the conservation efforts.

Figure 1
Oil Price Under an OECD Conservation Tax



Using values from the simulations, we construct cost curves. The methodology follows a welfare-theoretic approach previously employed by Brown and Huntington (1994a) and Felder and Rutherford (1993). The resulting cost curves take into account the direct welfare

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costs of a country's conservation efforts, transfers of wealth from oil exporting to oil importing countries, and the effect that lower world oil prices will have in stimulating oil consumption in nonparticipating countries. The cost curves also take into account the economic cost of OPEC cartelization.[6]

Construction of the cost curves depends critically on the assumptions used. In particular, assumptions that world oil production or OECD oil consumption is more responsive to price, would tend to work against the conclusions presented below. Nonetheless, sensitivity analysis using a range of plausible assumptions about the outlook for 2010 and the responsiveness of consumption and production to changes in price yielded overall conclusions similar results to those reported below.

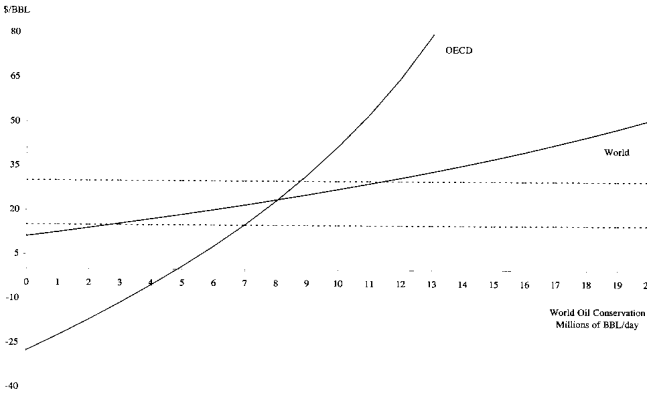
To maintain the emphasis on the substantial difference in market response to the inclusion of additional countries, our analysis abstracts from a number of important considerations that would be incorporated in a more refined analysis. These considerations include alternative policies for distributing conservation goals across countries (Whalley and Wigle 1991, and Brown and Huntington 1994b); the design of taxes and redistributive mechanisms (Hoel 1991b); and an explicit accounting for different types of goods (Felder and Rutherford 1993, and Pezzey 1992). We also abstract from the effects of pre-existing energy taxes and other taxes. Pre-existing taxes could be reduced to offset some of the costs of a new conservation policy (Hoel 1991b), or be left in place which would affect the estimated costs of imposing a new conservation policy (Newberry 1992).

Similarly, for some LDCs, removing subsidies to the energy sector could reduce energy use and improve economic efficiency, which contrasts to our assumption that conservation is achieved through taxes that impose costs on the economy. Alternatively, some LDCs may have supply-constrained energy consumption, and the costs of their conservation efforts would be higher than we estimate here.

3. Differing Incentives for Oil Conservation

In Figure 2, the cost curve labeled "World" shows how much each additional barrel of world oil conservation costs all nations collectively. The construction of this curve assumes that conservation is first adopted wherever it is cheapest. The curve incorporates the efficiency losses resulting from the OPEC cartel restricting output below free-market levels, as well as the direct costs associated with shifting resources toward oil conservation. The world curve does not incorporate any transfers because any the oil-importing nations obtain through the lower oil prices induced by conservation are exactly offset by transfers away from oil producers. The curve starts above zero to incorporate the economic efficiency losses associated with OPEC restricting its output.

Figure 2
Marginal Cost of World Oil Conservation



The cost curve labeled "OECD" shows how much each additional barrel of world conservation costs the OECD countries if only they act to conserve oil. As such, this curve is constructed to reflect the increase in non-OECD consumption that will result from lower world oil prices induced by unilateral OECD action to conserve oil. At lower levels of oil conservation, the cost to OECD is negative because lower prices fostered by its conservation efforts transfers wealth from oil exporting nations to the OECD. At about 5 million barrels per day of world oil conservation, the marginal cost reaches zero and is positive thereafter.

Although the OECD cost curve lies below the world cost curve at lower levels of conservation, it rises more sharply with conservation for two reasons. The wealth transfer to the OECD becomes smaller as greater conservation reduces imports. In addition, the direct costs increase more sharply for the OECD curve than for the world curve because conservation projects can be selected from only OECD countries rather than worldwide. As a consequence, for conservation levels of about 8 million barrels per day and higher, the OECD cost curve lies above the world cost curve.

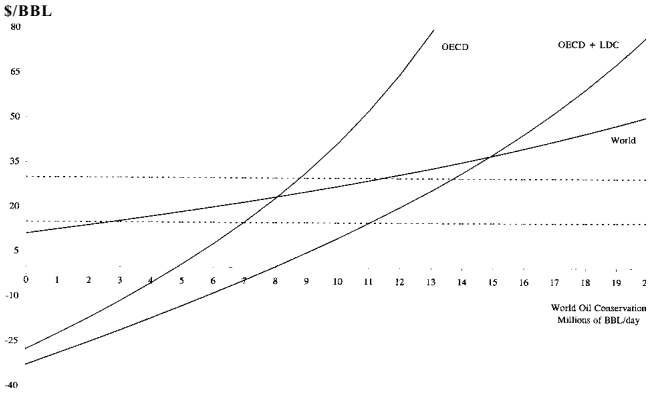
The OECD and world cost curves illustrate that the oil-importing OECD countries, acting as a group, have an incentive to select a level of oil conservation that is not optimal from a world perspective. Whether unilateral OECD action that is unmatched by other countries leads to too much or too little emissions reduction, however, cannot be determined by the cost information alone. This issue can be resolved only by knowing the estimated benefits of (or damages avoided by) oil conservation.

Previous analysis suggests a flat marginal damage curve. Summarizing the previous literature, Peck and Teisberg (1992) explain that marginal damage costs are essentially unaffected by the emissions levels in any given decade. This conclusion rests on the finding that temperature change depends upon gas concentration, which is not greatly affected by the emission levels in any given decade. We adopt this characterization by assuming horizontal damage curves that depict a constant level of benefits for any level of oil conservation.

Figure 2 also illustrates the situation for two hypothetical marginal benefit curves – one at $15 per barrel and one at $30 per barrel. When the marginal benefits of oil conservation are below about $24 per barrel, the OECD has an incentive to pursue more conservation than is optimal from the world perspective, as is illustrated along the $15 marginal benefit curve. In this range, the $15 curve intersects the OECD marginal cost curve to the right of its intersection with the world marginal cost curve. Unilateral OECD action could result in too much oil conservation from the world perspective.

Moreover, at benefit levels below about $24 per barrel, cooperation from the group of oil-importing countries previously identified as "other LDCs " will exacerbate the discrepancy between what is optimal from a world perspective and what participants would have the incentive to choose. As shown in Figure 3, cooperation between the OECD and the other LDCs shifts the participant's cost curve for world oil conservation from the one labeled "OECD" to the one labeled "OECD + other LDCs."[7] At benefit levels below about $24 per barrel, the equilibrium amount of oil conservation selected by the participating countries will be even greater--producing even more abatement of CO_2 emissions than would be optimal from the world's perspective.

Figure 3
Marginal Cost of World Oil Conservation



When the benefits are above about $24 per barrel, the OECD has an incentive to pursue less oil conservation than is optimal from a world perspective, as is illustrated along the $30 benefit curve. Under these conditions, the marginal benefit line intersects the OECD's marginal cost curve to the left of its intersection with the world's marginal cost curve. Unilateral OECD action could result in too little oil conservation. Some limited cooperation from developing countries could help ameliorate this problem by shifting the cost curve outward, but full cooperation from all developing countries would shift the curve far to the right, and the participants would seek more conservation than would be optimal from a world perspective unless the benefits of oil conservation were more than about $37 per barrel.

4. The Benefits of Reducing CO_2 Emissions

Damage estimates for CO_2 are in their infancy. Economic evaluations attempt to monetize both market and nonmarket impacts of greenhouse gas concentrations, and the resulting estimates vary considerably. Key uncertainties include the dynamics of the carbon cycle governing the effect of emissions on concentrations, the effect of concentrations on temperature change, and the consequences of temperature change on market and nonmarket damages. Differences in discount rates for evaluating potential impacts over horizons of 100 years or more account for a significant part of the differences in damage estimates. Finally, estimates vary depending upon the decade for which they are computed; estimated damages increase for later decades.

Table 2
Estimated Damages from CO_2 Emissions for 2001-10

Study	$/tC*	$/Bbl/**
Nordhaus (1991 a.b)	7.3	.89
Nordhaus (1992	6.8	.85
Peck-Teisberg (1993 a,b)	12-14	1.46-1.71
Fankhauser (1994)		
Mean	22.8	2.78
5th percentile	7.4	0.90
95th percentile	52.9	6.45

* Adapted from Fankhauser (1994).
** Authors' estimates based upon a conversion factor of $8/tC equals $1/Bbl.

Table 2 reports estimates from several prominent studies providing monetized estimates of the marginal damages arising from CO_2 emissions in the decade 2001-10. Researchers usually report their estimates in U.S. dollars per ton carbon (tC), as shown in the first column. We convert these estimates to U.S. dollars per barrel of oil in the second column. In oil-equivalent terms, the mean damage estimates range from about $1 to 3 dollars per barrel across different studies. Emphasizing the dramatic uncertainty in these estimates, the

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Fankhauser study (1994) provides a range from less than $1 per barrel to almost $6.50 per barrel, depending upon key parameter assumptions.

Hope and Maul (1996) use two economic-environmental assessment models – Intera and PAGE – to provide similar estimates to the range shown by Fankhauser without specifying the decade for their analysis. Using the PAGE model and what they identify as "the inner uncertainty range" of the Intera model, they find that damages from marginal CO_2 emissions range from $12 to $45 tC for the PAGE model and from $3 to $50 tC for the Intera model. The outer uncertainty range found with the Intera model – which should be accorded a very low probability because it combines many events, each of which is accorded only a 5 percent probability by experts – is $0 to $270 tC. Hope and Maul suggest that policymakers who take the threat of global warming seriously should use a precautionary principle and penalize sources of CO_2 with the high estimates found with the PAGE model or the inner uncertainty range of the Intera model, which would amount to $5.63 (PAGE) or $6.50 (Intera) per barrel of oil.

Even for those taking a precautionary approach to reducing CO_2 emissions, the available damage estimates fall well below $24 per barrel of oil. Combined with the cost curves of oil conservation presented above, these damage estimates suggest that unilateral action by the OECD will lead to excessive oil conservation and that adding oil-importing LDCs would exacerbate the problem.[8] At $0 to $33.75 per barrel, the outer uncertainty range found with the Intera model emphasizes the possibility (but low probability) of higher damage estimates and thus indicates the need for further study of the benefits of reducing CO_2 emissions.

5. Conclusion: The Costs of Extending Cooperation

The preliminary evidence suggests that during the next two decades, OECD action to conserve oil to reduce CO_2 emissions is likely to result in more oil conservation than is optimal from a world perspective. For the OECD, cooperative oil conservation would reduce world oil prices and yield wealth transfers from oil-exporting countries to the oil-importing countries undertaking oil conservation policies. These wealth transfers are sizable and positive for the OECD nations, which collectively are heavily dependent upon oil imports. For relatively small oil-conservation strategies, as are suggested by the nascent literature on the damages from CO_2 emissions, these wealth transfers will dominate the direct costs of conservation and lead to excessive conservation from a world perspective. This result contrasts sharply with the standard perspective that unilateral OECD action is likely to lead to insufficient oil conservation.

Under these conditions, extending cooperation to the oil-importing developing countries will exacerbate the problem. Participants' costs will be reduced, leading to even larger discrepancies between emissions levels chosen by the self-interested participants and those seen as optimal from a world perspective.

These seemingly anomalous results are obtained precisely because the nations most likely to cooperate in conserving oil are likely to exclude the oil-exporting nations and thus ignore the costs that conservation imposes on the latter group. From a world perspective, transfers to energy-importing countries are exactly offset by transfers from net-energy-exporting countries. From the more limited perspective of the oil-importing countries participating in a coordinated energy conservation policy, these wealth transfers are not offset but operate as an incentive to conserve energy and reduce emissions. Because CO_2 damages are currently unpriced in the market, these additional incentives to conserve oil may be a good thing. Nonetheless, the current estimates of the costs of CO_2 damages are not sufficiently high to justify concern that OECD countries do not have sufficient incentive to act unilaterally to reduce emissions.

These preliminary conclusions depend very critically upon the size of estimated damages from CO_2 emissions. If future estimates of damages should prove to be higher by a factor of 5 – a possibility suggested by the outer uncertainty range of the Intera estimates – the analysis could be reversed. In such a case, our cost estimates would suggest that OECD countries would not have sufficient incentives to conserve oil and eliciting cooperation from oil-importing LDCs could improve the outcome from a world perspective. In this respect, one implication of our analysis is that the desirability of extending cooperation in global energy conservation policies is essentially an empirical issue, rather than a conceptual one.

In addition, our conclusions pertain only to CO_2 emissions with a global impact. The local and regional benefits from reducing energy use (the damages avoided from local pollution) may well be more important than the benefits derived from global strategies to reduce worldwide environmental threats (See Hall 1990 and 1992).

References

Bohm, Peter (1993), "Incomplete International Cooperation to Reduce CO_2 Emissions: Alternative Policies," *Journal of Environmental Economics and Management* 24(3): 258-71.

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Notes

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(continued on page 10)

Implications of Increased Cooperation *(continued from page 9)*

End Notes

[1] The current analysis is limited to oil conservation, and does not consider interfuel substitution. Substantial interfuel substitution could alter the analysis.

[2] Although the EIA's 1993 outlook is dated, particularly in the $29.30 per barrel price forecasted for 2010, sensitivity analysis using a range of plausible assumptions about the outlook for 2010 yielded overall conclusions similar to the results reported below.

[3] The estimates are taken from Huntington (1992, 1993).

[4] Griffin (1985) and Dahl and Yücel (1991) provide empirical estimates of OPEC behavior that are broadly consistent with this view.

[5] A sensitivity analysis using alternative assumptions that allow modest adjustments in OPEC's market share confirm our general findings. In the extreme, OPEC could maintain a given price and accept a substantial loss in market share in the face of reduced demand. Under these conditions, the OECD would not obtain wealth gains from lower oil prices with which to offset the direct costs of unilateral oil conservation policies.

[6] To obtain the full cost of world conservation to the world in the presence of OPEC cartelization, we add marginal loss in producer surplus that results from OPEC restricting its output. That is the share of world oil coming from OPEC multiplied by difference between the world price of oil and OPEC's full production costs including user costs.

[7] The cost curve is constructed to reflect the gains in nonparticipant oil consumption that will result from lower world oil prices induced by the cooperative action to conserve oil. As such, it reflects participant costs of world oil conservation.

[8] Sensitivity testing, through the use of parameters to replicate the behavior of several of the prominent energy models that participated in a recent Energy Modeling Forum study (1991), yielded qualitatively similar results.

Highlights From the 3rd Annual Washington Energy Policy Conference

Possible Trajectories to the U.S. Kyoto Targets

The National Capital Area Chapter of the U.S. Association for Energy Economics, in cooperation with The Johns Hopkins School of Advanced International Studies (SAIS), presented its third annual Energy Policy Seminar on May 28th. Streamlined this year into a three-speaker program, the extended-luncheon seminar aimed at exploring the Kyoto Protocol and addressing a specific question, "Can the U.S. meet the greenhouse gas emissions reduction target?"

Not surprisingly, this involved key sub-questions: Will the cost of U.S. compliance be reduced by the flexible alternative approaches proposed, such as joint implementation, a Clean Development Mechanism, and emissions trading? Are targets likely to be achieved, given the economic costs estimated and the current political climate? Realistically, what path must the U.S. follow to meet its obligations?

Moderating the seminar were David South of Energy Resources International and Professor Wilfrid Kohl of SAIS. The speakers who addressed the issues from different perspectives were Jonathan Pershing (U.S. Department of State), who outlined Administration views; Christopher Whaley (British Embassy), who discussed a European outlook; and David Montgomery (Charles River Associates), who focused on analyzing economic assumptions.

Mr. Pershing opened the session by stating flatly that the protocol's reduction targets for U.S. greenhouse gas emission reductions are achievable. He said the analysis done so far indicates this is possible, although there will be costs to the U.S. economy. The flexible mechanisms are capable of bringing costs down substantially, he added, and the Administration recognizes a clear need to involve the developing countries (those not listed in Annex 1). Without them, the agreement will not accomplish its long-term goal of reducing greenhouse gas concentrations.

Mr. Pershing hailed the flexible mechanisms as an important international innovation — the first to be included in an agreement of this type. Still, he said that much remains to be determined — including the rules for the mechanisms, the compliance methods, and guidelines for handling non-compliance. The U.S. and the other developed countries that comprise Annex 1 must make meaningful reductions first, however, or developing countries such as China and India will not undertake the needed reductions. In Mr. Pershing's view, such balance is needed because the U.S. has 5% of the world's

population but produces one-fourth of its emissions.

Due to the timing of the obligation (2008-2012), Mr. Pershing concluded that systems must be put into place within the next few years in order to meet the schedule. He saw progress in the fact that the international community is focused now on cost aspects of dealing with the climate change problem (rather than on whether or not it even warrants collective action), but cautioned that, "If the Kyoto Protocol is the wrong approach, we will have to re-invent a multilateral system that looks much like it . . . and in which costs are of primary importance." Mr. Pershing doubted that such an alternative could emerge in only a year or so.

Mr. Whaley described the European situation regarding the Kyoto Protocol as quite different from that of the United States. The European Union is now in the difficult process of determining how to divide up a combined target and how to allocate the 6 covered gases internally among the 15 sovereign nations. The EU will need a coordinated policy that includes all the measures to be used by all the countries. In the case of the United Kingdom, he said it would meet its emissions reduction target through even higher gasoline taxes, tougher efficiency standards, and further use of public transportation.

Mr. Whaley added his opinion that the U.S., like Europe, could achieve the reduction targets to which it had agreed. The flexible mechanisms, he said, would bring costs down while technological savings could offset some of those costs. He considers U.S. ratification of the agreement essential to the success of the protocol, but he commented that the U.S. may be too optimistic about getting the developing countries to reduce emissions. Nevertheless, unless the U.S. and the other developed countries make meaningful changes, the developing countries will not do so.

Contrary to the U.S. position, the EU believes that reductions should come mainly from domestic measures rather than from international trading or sharing of projects. In March, the group agreed that there should be a firm ceiling on the use of flexible mechanisms, since the protocol provides that they should be only supplemental to domestic measures; and he said both Europe and the developing countries are waiting to see how the United States undertakes the latter.

As to prospects for the Buenos Aires Conference of the Parties in November, Mr. Whaley suggested that a realistic approach might be not to address all of the technical issues at once, but to concentrate on further resolving at least one of the flexible mechanisms (such as emissions trading). Unless rules are brought out in the open so that issues can be addressed one at a time, he fears negotiators might risk failing to make significant progress on any.

David Montgomery agreed also that the targets could be met, but he was less optimistic that they would be unless the most meaningful elements of the protocol were first clarified and disagreements about them resolved — both domestically and internationally. He cited such critical issues as the details of the flexible mechanisms, the rules and their enforcement, and the measurement of emissions. He displayed variations of as much as 1,000 percent among estimates of how much the agreed-upon reductions might cost, chiefly because of explicable differences in underlying assumptions; but he noted that the U.S. Senate (which must ratify the U.S. agreement) now clearly views the costs as too high. His explanation of legislative fears is that a shift in energy-intensive industries out of Annex 1 countries might easily take place if emissions trading were limited and developing countries built a sharp comparative advantage in energy costs. But he also saw the task of getting developing countries involved as very difficult.

Comparing various economic modeling scenarios, Mr. Montgomery found trading to be a crucial element in reducing compliance costs — with the U.S. buying more than 85 percent of its obligation if it is to hold those costs to the lower end of the estimated range. Russia, however, appears to be the only possible trading partner for the U.S. at this point, which puts that country in a monopoly position for pricing the emissions credits it has to offer. Mr. Montgomery envisioned achieving the desired reduction of greenhouse-gas concentrations in the relevant future at "least cost" by extending the Kyoto timetable (introducing both "where and when" flexibility). He suggested that relying on even more advanced technologies than those listed in the recent "5-lab study" by DOE would prove more affordable for both developed and developing countries . . . but cautioned that, "There is no substitute for money to get the process started," in research and development. Mr. Montgomery recommended more partnerships between government and industry such as the one created for a new generation of vehicles in this country, but he favored emphasizing policy stability (such as a global carbon tax of $10 per ton rising gradually to $100 per ton by 2100) rather than the uncertainties he sees now. His own evaluation was that tax incentives for premature commercialization could actually waste money, because the technologies needed to accomplish the necessary scale of reductions were not yet on the horizon.

The Turkish Power Market

By S. Gürcan Gülen, Ph.D.

Despite political instability and lack of a consistent economic policy, the Turkish economy has been growing significantly since 1980 at about 5% a year on average. More strikingly, the industrial sector continued to grow faster at slightly more than 6%, increasing its share in Turkey's GDP to 35% in 1995 from 26% in 1970. The strong performance of the industrial sector is expected to continue.

The Turkish economy has traditionally been heavily dependent on State Economic Enterprises (SEEs). However, following the trend of globalization and accompanying transformation towards freer markets, a privatization program was started in the early 1980s. Resistance from certain sections of Turkish society and the interference by the Constitutional Court and the Supreme Administrative Court (Danistay) slowed down the privatization process. Revenues from the sale of SEEs have totaled $3.25 billion between 1986 and 1996 while remaining SEEs are valued at about $60 billion.

So far, the privatization program has not had a significant impact on the energy sector despite some of the major SEEs of this sector having been on the privatization block for several years. Turkish Petroleum Company (TPAO) produces more than 70% of domestic crude oil. In order to meet the increasing need for fossil fuels, TPAO is also becoming more active outside Turkey, especially in Central Asia and North Africa. Turkish Refineries (TUPRAS) is responsible for 86% of 713,000 b/d total refining capacity of Turkey (1% of world total), and Petrol Ofisi has a 56% share in total petroleum products sales. Turkish Pipeline Company (BOTAS) has a monopoly status in import, distribution, price determination and sale of natural gas in Turkey. Turkish Electricity Generation, Transmission Company (TEAS) generates more than 90% of the electricity in Turkey, almost all of which is transmitted and distributed by TEAS and Turkish Electricity Distribution Company (TEDAS).

Turkey has long been a major importer of fossil fuels, especially oil, and increasingly natural gas (Table 1). The share of imported oil in total consumption increased from 52% in 1970 to 87% in 1995. Turkey currently consumes about 285 bcf of natural gas a year, almost all of which is imported. Partly because of environmental concerns and partly because of the need for fuel diversification, Turkey appears to have chosen natural gas as the fuel of the future. Currently, more than half of natural gas is used in the electricity sector and about 25% is used for residential and commercial purposes. The share of natural gas in power generation is expected to increase from 14% in 1996 to almost 30% by 2010. Combined with the enormous need for expanding generation capacity, the demand for gas in power generation will be immense (Table 2). Urban pollution in Istanbul, Bursa, Izmit and other cities of Turkey where industry is concentrated will cause residential and commercial use of natural gas to increase as well. Turkey is a significant producer of coal (mostly lignite) and 31% of electricity generated in Turkey comes from coal-fired plants. However, because of environmental concerns, domestic lignite may be replaced gradually with imported hard coal.

Table 1
Fossil Fuel Reserves, Production and Consumption in Turkey, 1996

	Reserves	Production	Consumption
Oil	260 mb.	71,200 b/d	600,000 b/d
Natural Gas	312 bcf	7.1 bcf/year	285 bcf/year
Coal	8200 m. short tons	59.7 m. short tons	67.2 m short tons

Source: Energy Information Administration Country Report, May 1997.

Table 2
Turkish Gas Imports (bcf per year)

Source	1996	2000	2005	2010	2015	2020
Russia	194	353-565	353-565	918	918	918
Turkministan	-	-	282	282	282	494
Iran	-	106	353	353	353	353
Iraq	-	353	353	353	353	353
Egypt (LNG/Pipeline)	-	353	353	353	353	353
Algeria (LNG)	85	141	141	141	141	141
Qatar (LNG)	-	-	95	95	95	95
Nigeria (LNG)	-	-	43	43	43	43
Yeman (LNG)	-	141	141	141	141	141
Total	282	1447-1659	2114-2326	2679	2679	2891

Sources: BOTAS Anual Report, 1995; *World Gas Intelligence*, various Issues.

It is clear that the Turkish economy is heavily dependent on imported energy. Although upstream activity in Turkey (especially offshore) is surging, current reserve estimates are at best sketchy. Even if commercial quantities of oil/gas are found, it will take years before production can start. Without a doubt, these efforts of domestic development should continue. However, increased domestic production can only reduce reliance on imports and cannot eliminate it.

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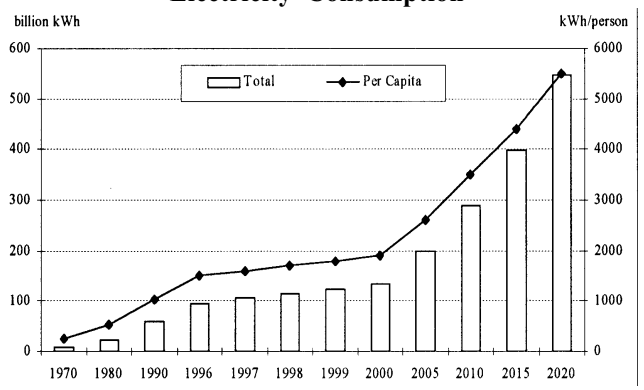
* S. Gürcan Gülen is Research Associate, *Energy Institute,* University of Houston College of Business Administration. For more details, please see "Power Marketization in Turkey," an Energy Institute white paper. Another version was published in the Proceedings for the 21st Annual International Conference of the IAEE.

Chart 1
Electricity Consumption



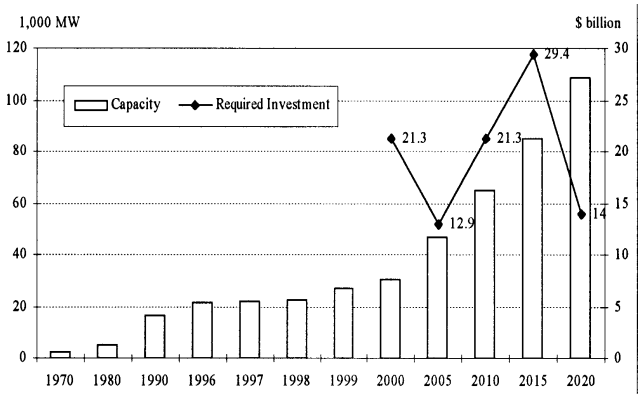
Source: TEAS as reported in Isveren (Monthly Bulletin of TISK), April 1997.

Electricity in Turkey

In September 1993, the Turkish Government issued Decree No. 93/4789 that divided the Turkish Electric Authority (TEK) into two public companies: TEAS and TEDAS. Although all shares of both companies are currently held by the state, these companies are not SEEs but joint stock companies. The two companies were created in order to speed up the privatization of electricity operations. According to the Constitution of Turkey, generation, transmission, and distribution of electricity are public services that need to be delivered by an SEE to guarantee uninterrupted, universal service to consumers. The activities of both TEAS and TEDAS, however, are excluded from the scope of public service. Currently, TEAS owns and operates 15 thermal and 30 hydroelectric power plants (HEPPs) which generated 91% of electricity. The private sector now accounts for 2.5% of the total generation while autoproduction (cogeneration) in industrial plants accounts for the remaining 6.5%. TEAS has 6,875 miles of 380 KV and over 14,375 miles of 154 KV transmission lines. TEDAS has over 343,750 miles of distribution lines ranging from 0.4 to 34.5 KV.

Consumption & Capacity: Electricity consumption has increased more than four-fold since 1980 (Chart 1). Turkey is the seventh fastest growing country in the world in terms of electricity consumption at more than 8% a year since 1980. Yet, per capita consumption of electricity in Turkey was 1,520 kWh in 1996 as compared to about 11,500 kWh in the U.S. The OECD average is seven times and the world average is twice as large. Domestic capacity expansion in Turkey kept pace during the 1970s and 1980s, but, between 1990 and 1996, electricity consumption increased at 8.7% a year while capacity expansion lagged far behind at 4.4% a year (Chart 2). As a result, officials started to talk about blackouts and/or brownouts and arrangements were made for imports from Bulgaria and Azerbaijan. Electricity consumption is expected to increase 8-9% a year well into the next century. In order to keep up with demand expansion, 2,000 to 2,500 MW of new generation capacity needs to be established every year. This new capacity will require outlays of up to $100 billion by 2020. To meet the power needs of Turkey, several options are being exercised including privatization and restructuring of state assets in order to improve productivity and efficiency. Several governments introduced and/or promoted incentive models that would induce private companies, both domestic and foreign, to invest in the power sector.

Chart 2
Generation Capacity – Historical and Needed



Source: TEAS as reported in Isveren (Monthly Bulletin of TISK), April 1997.

Build-Operate-Transfer (BOT) Model.[1] Law No. 3096 of 1984 was the first Turkish BOT law and covered three major types of private sector involvement in the power sector.

- *Assignment for the generation, transmission and distribution*. Private companies are allowed to carry all activities and sell electricity directly to consumers in certain "assignment regions" as defined in Regulation No. 85/9800 of 1985. This assignment requires a decree by the Council of Ministers. The companies that receive the permit to operate in these regions are called "assigned companies." An assigned company is obligated to meet the energy needs in its region. Short as well as long-term investment plans of the company should be in line with the national energy policy of the Undersecretary of State Planning (USP) and the Ministry of Energy and Natural Resources (MENR). The MENR sets rules of operation for all activities and supervises compliance with those rules. At the end of the assignment period (usually 20 years), all facilities and immovable assets related to the subject of the assignment need to be handed over to the state at no cost.

[1] See note at end of text. *(Continued on page 14)*

The Turkish Power Market *(continued from page 13)*

- *Construction and operation of power plants, including cogeneration plants*. Companies operating under this option are not allowed to sell electricity directly to consumers. Instead, they have to sell their power to TEAS or assigned companies with the right to T&D operations in that particular region. T&D companies will charge a fee for transportation of electricity. For cogeneration plants, the sale price of surplus electricity is determined by MENR not to exceed 70% of the net average sale price to end-users nationwide. At the end of the contract term, all facilities and immovable assets related to the subject of the assignment must be handed over to the state at no cost.
- *Transfer of operational rights of existing power plants, and T&D facilities owned by the state*. This option is limited to assignment regions and requires a decree by the Council of Ministers. Like the first two options, 99 years is the maximum term, but contracts signed are usually for 20 years with an option to extend a year prior to termination. Again, all facilities need to be given back to the state at no cost.

MENR has the right to terminate contracts before their expiration if the private party becomes insolvent or violates terms and conditions of the contract. A governmental entity, the Electrical Energy Fund (EEF), was created to help with BOT projects. EEF reports to MENR that is in charge of EEF's financial resources. Main responsibilities of EEF include ensuring nationwide stability of electricity rates, paying the buyout price to the project company if such buyout becomes necessary, and extending cash or non-cash credit to companies on terms and conditions approved by MENR.

As of early 1997, out of a pool of BOT projects worth $18.8 billion, only $3.1 billion worth of projects were under construction. Projects during the agreement stage were valued at $4.7 billion with another set of projects worth $2.7 billion being negotiated. The rest of the projects were in preliminary stages of the process. There are five HEPPs with a total capacity of 74 MW and a gas-fired plant with 253 MW capacity that are completed and commissioned under the BOT model since 1984. Currently, there are two 480 MW gas-fired plants that are being built at Marmara Ereglisi, near Turkey's only LNG terminal. The deal for a 672 MW HEPP was finally concluded in 1997 after eight years of negotiation and review. In late 1997, Danistay was still reviewing several BOT projects and several others were under development.

During 1996, MENR also indicated that 55 to 60 HEPP projects with about 7,300 MW total capacity were to be offered to the private sector on a BOT basis. Also in 1996, MENR announced a major tender for operational rights of 12 existing thermal power plants and associated coal mines for ten coal-fired plants. In October 1997, the MENR identified the winning bids for these ten plants (4,253 MW total capacity). However, in February 1998, Ankara First Administrative Court annulled this privatization effort after evaluating the complaint of Maden-Is (Turkey's Mining Labor Union) and the Chamber of Electric Engineers. The court decided that the awarding of the leases violated existing laws and that it is actually up to the Council of Ministers and not the MENR to authorize and announce the winners. The MENR is now trying to work out a solution with the Council of Ministers.

Plans for transferring operational rights for 18 hydroelectric power plants were also underway. As of early 1998, a total of 10,700 MW capacity has been tendered. As a result, the private sector now operates a plant of 30 MW and Danistay is reviewing agreements for plants with 2,064 MW total capacity. The rest is either under negotiation or waiting to be re-tendered. The transfer of operational rights of distribution facilities has also been considered. For this purpose, the MENR has divided the country into 29 regions regarding the level of industrialization and demand for electricity as well as the location and status of distribution facilities in preparation for this potential offer. Four of these 29 local distribution networks are already awarded and currently operated as private concessions. Twenty more have recently been awarded and the remaining five regions will be re-tendered.

Finally, cogeneration is being pushed forward by MENR. Large consumers such as textile, cement, steel, petrochemical and automotive industries are well developed in Turkey. However, they pay the highest electricity rate in OECD. According to *Energy Prices and Taxes*, an OECD report, the purchasing power parity based industrial rate in Turkey was 15.4 cents per kWh in 1995 as compared to 5.7 cents per kWh OECD average or 4.7 cents per kWh in the U.S. Furthermore, while most OECD countries do not tax electricity use by their industry, Turkey charges the second highest tax rate at about 14%. Therefore, cogeneration provides an excellent opportunity for the Turkish industry to establish a cheap and reliable source of electricity. Currently, 19 plants with 390 MW capacity generate 3 billion kWh of electricity a year. Execution contracts for 31 projects with 741 MW capacity are completed, and applications for 49 projects with 1,522 MW capacity are under MENR review. Cogeneration seems to be the most beneficial use of imported natural gas as cogeneration

units operate at 82-85% efficiency compared to 52-55% in conventional power plants.

The Constitution of Turkey defines power generation, transmission and distribution as public services, and considers any private party involvement as concessions that are subject to review and approval of Danistay. As such, any disputes that may arise out of these concession contracts should be settled at Turkish administrative courts and not through commercial arbitration. Not surprisingly, the BOT Law and Law No. 3996 of 1994, which identified certain arrangements that would be subject to private law and of a non-concessionary nature, were challenged by the Constitutional Court. In March 1996, the Constitutional Court canceled certain parts of Law No. 3996. Danistay originally did not interfere with the development of BOT projects that were already underway before the cancellation decision by the Constitutional Court. However, it responded when the Chamber of Electrical Engineers filed a lawsuit against MENR and TEAS for the cancellation of several projects claiming that they were concessions cloaked by the administration as projects governed by the private law. Enron's Marmara Ereglisi project was able to keep its private status because of the 60-day statute of limitations. Other projects, however, were ruled as concessions and subject to administrative courts in case of disputes.

Build-Operate (BO) Model. MENR introduced the BO model that promotes the licensing system as an alternative. MENR expected that this model would not receive as much opposition from high courts as BOT projects. In June 1996, the Council of Ministers issued Decree No. 96/8269 concerning power plant construction and operation according to the BO model, which differs from the BOT model in several ways. Most significantly, developers retain ownership of the plant at the end of the contract period and, when selling their electricity, they are not restricted to TEAS or assigned companies and can sell directly to end-users.

At first stage, 13 priority sites with designated generation capacity (10,700 MW) were identified. The total value of these projects were estimated at about $10 billion. Most of these plants were intended to be gas-fired. Companies were asked to negotiate with BOTAS issues such as natural gas procurement, LNG issues and others as part of their bid. MENR originally issued tenders for six projects with a total capacity of 5,200 MW. Partly because of the bitter BOT experience and expectations of intervention from high courts, partly because of less-than-ideal conditions of the BO model, the response to MENR's original tender was disappointing. In late 1996, MENR announced revised terms and conditions for the six BO projects. New terms were more likely to receive international financing and reflected a fairer sharing of risk among the parties involved. One of the most crucial changes was the provision of dispute resolution under UN Commission on International Trade Law (UNCITRAL) arbitration rules rather than Turkish administrative court rules. UNCITRAL would apply to both power purchase and natural gas supply agreements. Other significant changes included 100% Treasury guarantee during the contract period for TEAS purchases instead of a gradually declining guarantee. Previously, new or prototype technologies were not acceptable, but new terms removed this restriction as well. The only requirement now is that the technology is proven sound from an engineering point of view.

However, before the result of these improved terms could be seen, Danistay suspended the BO Decree claiming that the BOT Law was the main legislation regulating private sector involvement in power sector and that any alternative model should be expressed in the form of a law rather than a decree by the Council of Ministers. In response, the Turkish legislature passed Law No. 4283 (the BO Law) in July 1997. This law regulates the licensing of private sector for the construction and operation of thermal power plants. The BO Law does not allow for T&D operations and excludes hydro, nuclear and geothermal plants. Other characteristics of the BO Law are similar to those of the BO Decree discussed earlier.

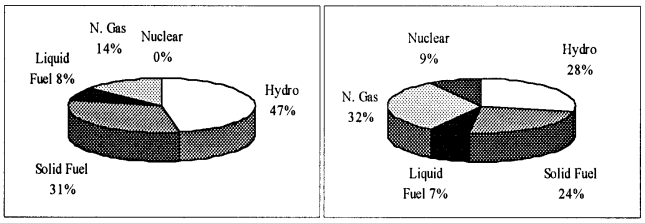
Clearly, the consideration of generation of electricity as a public service restricts the forward progress of power privatization in Turkey. Currently, the Constitution of Turkey (Article 155) gives high courts the right to monitor and, if necessary, to interrupt the development of power projects under BOT or BO models. So far, governments employed ministerial decrees and such to get around Danistay interference but these temporary solutions do not address the fundamental problem. In fact, the conflict between legislative and judicial branches of the state creates an uncertain investment environment that discourages foreign companies. The most straightforward solution to resolving the conflict in Turkey seems to be amending or changing Article 155 of the Constitution. Unfortunately, the current political stalemate at the parliament renders this option very unlikely. Nevertheless, in order to attract much needed private sector capital and know-how, the conflict between governments and high courts need to be resolved as quickly as possible.

Fuel Considerations: Almost half of electricity (47%) was generated by HEPPs in 1996 (Chart 3). The next most significant fuel was coal with 31% of

(continued on page 16)

The Turkish Power Market *(continued from page 15)*

Chart 3
Power Generation by Fuel, 1996 vs. 2020



Source: Behçet Yücel, Isveren, April 1997, pp 22-24.

However, environmental concerns may cause lignite consumption to decline. Close proximity of large suppliers and its clean-burning qualities render natural gas a good substitute. However, the initial investment necessary to build pipelines and/or LNG terminals is significant. Also, the country's concern about increasing dependence on imported fuels such as oil and natural gas may slow down the process of substituting these fuels for lignite. Under these circumstances, nuclear fission deserves serious consideration as an alternative form of power generation. According to official predictions, the share of HEPPs is expected to fall to 28% by 2020 while that of coal is expected to decline to 24%. Natural gas and nuclear fission will be substituted instead. Natural gas will account for 32% and the nuclear fission for 9% of the total generation by 2020.

Guidelines for Energy Policy and Reform in Turkey

The energy policy of Turkey has to consider the following.

- Diversification of types and sources of imported fuels.
- Increasing the global competitiveness of the Turkish economy.
- Protection of the environment.

The optimal policy that would satisfy all these criteria, at least to a certain extent, would have to:

- Reduce interference by high courts in private sector involvement in energy projects;
- Induce the private sector to invest in the energy sector by establishing an environment where the price of energy is determined according to the market rules and the government intervention is not uncertain;
- Establish an independent regulatory agency to oversee the competitiveness and efficiency of the new marketplace;
- Encourage autoproduction;
- Include nuclear fission in the fuel mix for power generation;
- Maintain and perhaps increase the share of coal in the fuel mix;
- Explore opportunities to develop domestic resources;
- Increase efficiency and productivity in existing power plants and T&D network;
- Encourage energy conservation and efficiency;
- Increase the use of renewable technologies where it is viable.

Turkey is at a critical junction. Decisions to be made at the close of this century will have a long-term impact not only on the energy sector but also on the whole economy. The world economy is rapidly becoming integrated and much more competitive at the same time. This trend of economic integration appears to go hand in hand with the trend towards freer markets. The ongoing crisis in Asia shows that seemingly unstoppable growth of Asian Tigers was halted by their own governments' excessive interference with the marketplace. Even Japan does not seem to be immune to these ills. Elsewhere in the world, ex-communist and ex-socialist economies are reaping the benefits of marketization. These growing economies are looking for ever-increasing amounts of fossil fuels to continue on their growth path. As this trend continues, competition for fuels will become fiercer. In this environment, Turkey has no other choice but follow the rules of the game and marketize its economy beginning with the power sector.

End Note

[1] For details, see *Financing Projects in Turkey, Turkey's Power Sector: The Latest Legislation and Its Impact on Independent Power Projects*, October 1997, a report prepared by Birsel Law Offices, Izmir, Turkey.

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