IAEE INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS

IAEE Newsletter

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Editor: *David L. Williams* **Contributing Editors**: *Paul McArdle, Tony Scanlan and Marshall Thomas*

Fourth Quarter 2000

President's Message

We have just come through the conference season with two IAEE regional conferences – the European Regional Conference in Bergen, Norway and the North American Conference in Philadelphia, PA. Both proved very successful in terms of content and attendance and allowed many members who were unable to take the long trip to Sydney in June to attend an IAEE function. The volatility of energy markets provided a stimulating backdrop to these conferences and ensured lively debate and participation. We are very appreciative of all the hard work by Einar Hope, Lars Bergman and Balbir Singh in Bergen and by Dave DeAngelo, Mary Novak and Mike Lynch in Philadelphia.

The IAEE Council met in Philadelphia. It took a number of decisions about enhancing the IAEE web site and agreed to move forward to provide the Energy Journal on line. We are now working on providing web pages or linkages to each of our international affiliates and a new web section publicising job opportunities. We hope that the a 2001 edition of the Energy Journal will be the first electronic version and that we will be able to put five years of back issues on the web also. Access to the current year's issue will be by password for IAEE member subscribers. Hard copy versions will continue to be available.

It has also been agreed that the 2003 IAEE Annual Conference will be held in Prague in the Czech Republic with Ivan Benes the conference chairman. The beauty of the city of Prague will make this a wonderfully attractive location. Meanwhile I hope that you have already pencilled in Houston for the 25-27 April 2001 International Conference and 26-29 June 2002 for Aberdeen.

Peter Davies

IAEE Website Enhancement

At the recent IAEE Council meeting in Philadelphia, the decision was made to make several enhancements to the IAEE Website. In the coming months look for the following new or enhanced services at www.iaee.org

Energy Links Page: All energy related companies/ organizations/associations, etc. are invited to visit www.iaee.org/energylinks/energylinks.asp where you can enter your own link from IAEE's website to yours. IAEE asks that you ask your ISP to build a reciprocal link from your website to IAEE's at www.iaee.org

Affiliate/Chapter Sub-pages: All IAEE Affiliates and Chapters will receive a page of their own at the IAEE site. Such information as Officer Listings, Event Listings, Affiliate/ Chapter logo placement, membership information, Newsletters and links to an Affiliate's own website (if already developed) will be offered to IAEE Affiliates/Chapters in good standing.

Employment Opportunities: Shortly, employers looking for employees will be able to post their employment opportunities directly on IAEE's website. You will be provided: Title of job, description and qualifications for job, salary information or range and contact information.

Energy Journal Hard Copy Offerings: Back copies of ***The Energy Journal*** will make the availabile for purchase.

Energy Journal Online: In a gradual effort, Council has decided to begin to place current and back issues of ***The Energy Journal*** and Special Issues available on-line in PDF format. All members and subscribers who receive the ***Energy Journal*** will be able to view, on-line, the current four issues of the ***Journal***. Issues later than one year will be available for pay-per-view.

Exciting things are happening at IAEE's website. Make sure to bookmark us at www.iaee.org If you have any suggestions on further improvements toour association's website please drop Dave Williams a note at iaee@iaee.org

Editor's Note

Reza Fathollahzadeh and Mohammad Mazraat look at the question of energy subsidies in Iran, pointing out that *(continued on page 2)*

Editor's Note *(continued from page 1)*

since there is no transparent evaluation of marginal costs in Iran, it is practically impossible to determine the amount of subsidy. However, they come up with an alternative approach that may be useful elsewhere. This issue has implications for many energy producing countries.

Paul Tempest argues for a UN mandate defining the obligations of oil producing and consuming nations to provide prompt, reliable statistics and a new international agency with full UN status to process and report the data. Under the current system, some of the statistics are fictitious and many are no more than rough estimates; and some are motivated for political and commercial advantage by key players in the market. It takes much too long for the true facts to emerge.

A group from Latvia looks at the difficulties involved in transitioning the Baltic states from existing national electricity markets to a free market encompassing the states and their immediate neighbors. Despite the difficulties, they expect a regional integrated market to start operation in 2002.

Fereidoon Sioshansi looks at the California electricity market and examines the underlying causes leading to this summer's unusually high prices. He explains what went wrong and suggests how the problems may be fixed. Blaming the market is unjustified; there is still too much regulation and not enough competition, he says.

A second article from Iran by Reza Fathollahzadeh looks at the matter of renewable energies and sustainable development in Iran. He notes that due to Iran's rich natural fossil energy resources and low subsidized costs, their rapid usage growth in the country is creating serious environmental problems. He goes on to point out that when social costs are included the costs of electric power from some renewable energy sources are less than that from some of the fossil sources.

Report from the Australian Affiliate

Members of the IAEE who attended the recent IAEE International Conference in Sydney will be interested to know that Professor Martin Green, who delivered the Invited Address at the Conference, has been recognised for his groundbreaking work in solar energy technology by another major international award.

Professor Green, Director of the University of New South Wales (UNSW) Special Research Centre for Third Generation Photovoltaics, received a gold medal from the Spanish Royal Academy, presented by Professor Antonio Luque from the Solar Energy Institute of Madrid's Polytechnic University.

Professor Luque said the award recognised Professor Green's strong contributions to the science and technology of photovoltaic engineering.

"We have good reason to be grateful to the UNSW research group, lead by Professor Green, because in Madrid we have a solar energy factory based on the research group's inventions. It employs hundreds of people and produces $30 or $40 million dollars' worth of solar cells a year. At the same time, it provides a focus for Spanish R&D into one of the fastest-growing technologies in the world," he said.

The award presentation was made at a recent international Third Generation Photovoltaics Workshop at UNSW. The workshop brought together leading international experts to share information and to plan collaborations to further develop solar energy. Participants discussed concepts that have the potential to lift the efficiency of solar cells from today's theoretical limit of about 33 per cent towards the ultimate ("Carnot") efficiency of 93 per cent.

Still with the focus on solar energy technologies, the International Solar Energy Society (ISES) will be holding its 2001 Congress in Adelaide, from 25 November to 2 December 2001. It is anticipated that around 1500 will attend. The Australian affiliate of the IAEE will be staging a number of (as yet) informal events in Sydney in the week prior to this congress. If you intend visiting Adelaide for the congress, please try and build Sydney into your plans and inform Tony Owen of your intentions. Remember, November is summer "down under"!

Tony Owen

The Jane Carter Prize

The British Institute of Energy Economics, the International Association for Energy Economics and the Association for the Conservation of Energy invite the submission of essays for the 2001 award of the Jane Carter Essay Prize. The prize will be a cash award of US $800 together with a plaque.

Essays can be on any aspect of energy efficiency and conservation or on aspects of general energy and environmental policy which are relevant to energy efficiency. The aim is to encourage new thinking on these subjects. The emphasis of the essay should, therefore, be on the policy, rather than the scientific or technical, aspects of the subject.

The competition is open to anyone under the age of thirty-five. Essays should not be more than 8,000 words long. They can be based on work done for another purpose, e.g., an academic thesis or policy report, but the results of that work should be presented in an original form. The wining essay will be considered for publication in a range of energy and environmental journals.

Essays should be submitted in English, in triplicate and typed form by 30 June 2001 to:

Mary Scanlan, Administration Secretary
British Institute of Energy Economics
37 Woodville Gardens
London W5 2LL
United Kingdom

Each essay should include a 150 word summary. The name, address and age of the author should be on a separate sheet which can be detached from the essay which will be judged anonymously. Manuscripts will not be returned.

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24th IAEE INTERNATIONAL CONFERENCE

Hosted by:

United States Association for Energy Economics and the Houston Chapter, USAEE/IAEE

2001: An Energy Odyssey?

Omni Hotel – Houston, Texas - USA
April 25-27, 2001

Conference Objective

A look ahead at the changing energy landscape and the future role of energy economics across fuels, business segments and geographies.

Session Themes and Topics

ENERGY BUSINESS METAMORPHOSIS

Redefining the energy industry, the energy business and the energy economist
Coming to terms with the New Economy
Industry consolidation: What's next?

SUSTAINING DEVELOPMENT

What is sustainable development and how should it be measured?
Market tools for sustainability
Balancing energy and environmental needs

INTERNATIONAL POLITICAL HEARING: SHOULD THE GOVERNMENT STAY OUT OF ENERGY PRICE FORMATION?

Political risk assessment in investment decisions
Techniques for price risk management
Why risk management fails

NEW POLITICS AND ENERGY

Sub-national issues: How do they play in the end game?
New paradigms – markets, regions, corporate roles, NOC roles
Energy security in dynamic markets

TECHNOLOGY TRANSFORMATIONS – EVOLUTION OR REVOLUTION?

Impacts on energy demand
Impacts on energy supply
E-commerce linkages and impacts

****** CALL FOR PROPOSALS / PAPERS ******

Deadline for Submission of Abstracts: December 4, 2000
(Please included your CV when submitting your abstract)

Anyone interested in organizing a session should propose topics, motivations and possible speakers to Program Co-Chairs:
Les Deman – 713-230-3429 / ldeman@coral-energy.com
Marianne S. Kah – 281-293-2136 / marianne.s.kah@usa.conoco.com

Abstracts (200-1500 words) for concurrent session papers and proposals for concurrent session workshops and dialogues are being accepted. The IAEE and USAEE Councils encourage conference participants to submit innovative ideas for full exploration of energy markets, business development and economic theory and application. At least one author from an accepted paper must pay the registration fees and attend the conference to present the paper.

All abstracts/proposed sessions and inquiries should be submitted to:

David Williams, Executive Director, USAEE/IAEE
28790 Chagrin Blvd., Suite 350, Cleveland, OH 44122 USA
Phone: 216-464-2785 / Fax: 216-464-2768 / E-mail: usaee@usaee.org

*Conference Chair Emeritus: John B. Boatwright * General Conference Chair: Michelle M. Foss*
*Program Co-Chair: Les Deman / Marianne S. Kah * Arrangements Chair: David L. Williams*

AGAIN THIS YEAR: USAEE Best Student Paper Award ($1000.00 cash prize plus waiver of conference registration fees).
If interested, please contact USAEE Headquarters for detailed application/guidelines.
STUDENT PARTICIPANTS: please inquire about scholarships for conference attendance!

Distortion, Illusion and Confusion: How to Improve Global Oil Market Data

*By Paul Tempest**

"The mind which has feasted on the luxurious wonders of fiction has no taste for the insipidity of truth." - Dr Samuel Johnson, 1709-1784

A Hall of Mirrors

Understanding the oil market is like walking into a hall of mirrors. From outside, all may seem in good order: the prices of transactions flash abundantly, instantaneously and reliably to and from all parts of the world. It is just another marvel of modern electronics. Yet as soon as we step inside and ask the what, and how and when and why concerning the vital information which affects those prices – details of production, sales, stocks, industry investment schedules, we see through a glass darkly, rarely face-to-face. Distortion may be often deliberate or it simply arises from the multiplicity of estimates filling the many gaps in the highly deficient statistics available to the market.

Illusions are caused by misplaced assumptions. The general public is mystified by the volatility of the market; it has difficulty in understanding how, over the past two years, the price has been allowed to swing violently between the two levels of US$10 and US$30 which the U.S. administration has defined as "dangerous" for the global economy – why it was necessary to send the U.S. Secretary of Energy on bended knee to the Saudis to beg for, first, a major cut in Saudi production and then, later, for a major expansion. Nor can the public comprehend how, within a matter of weeks, the three supermajors and other large oil companies can move from draconian cost-cutting and threatened bankruptcy to multi-billion dollar profits. If public opinion is suspicious of the motivation of the oil companies, it remains doubly suspicious of what a cartel such as OPEC is up to, even when such actions can sometimes be demonstrated to be of considerable benefit in restoring stability and harmony to the market.

The public assumes that OPEC bases its decisions regarding production quotas on the known daily facts of current production, tanker loadings, pipeline usage and market demand patterns. Nothing could be further from the truth. On a day-to-day basis much of this data is not available and is only made available after considerable delay. So OPEC and the market, for the most part, relies on estimates and guesses, almost all of which are later proved wrong and become subject to revisions on a truly massive scale.

The International Energy Agency

Among the many providers of the up-to-date assessment of oil supply, demand and the level of stocks, the International Energy Agency in Paris stands in pole position. Its professionalism and dedication are highly regarded and its estimates carry considerable weight. But these are little more than intelligent guesses based on what governments tell the IEA. And governments are slow, clumsy, inaccurate and sometimes secretive and devious. So the numbers have to be continually massaged by reference to secondary sources. Even then, in 1999, the IEA was having to revise its OPEC numbers by up to 3mbd and make other corrections of the order of 7-20%.

We do not, of course, live in a perfect statistical world. We can say that the telecommunications revolution has brought many more players and data into the public domain. Things are certainly getting better and faster. But when it is noticed that an IEA global demand or supply estimate in 1999 was so far out that a fall should have been a rise and a rise should have been a fall, then confusion reigns. Indeed the question then raised is whether the price panics of 1999 were partly caused by the IEA when the market was already moving independently on a different track.

This point requires a little explanation for those less familiar with the workings of the oil market and the practices of the industry. Most oil production and sales contracts include formula calculations linking them to movements in the Brent, West Texas Intermediate and other marker crudes as reported each day, so that they never step out of line with developments in the market. Many developing countries set their crude and product selling prices by reference to *Platts* daily prices and that obligation and practice is enshrined in law. Now when a false signal from the IEA indicates imminent shortage, the price moves up sharply. Automatically, all production, development and financing contracts are affected. The upward movement of the price feeds on itself, generating its own momentum. Deals are struck all over the world at the new price level.The IEA picks up the new signals from the market and revises its own forecasts. The process is reiterated and reiterated and the price continues to rise until new evidence comes to the market that the IEA may have been quite wrong in the first place. By this time, it is too late. Governments, companies and traders are well into well-rehearsed contingency plans to

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* Paul Tempest is Vice-President, British Institute of Energy Economics. This text is based on presentations by the author in the opening and closing sessions of a conference on World Oil Market Data – Enhancing Transparency called and addressed by the U.S. Secretary of Energy, Bill Richardson and Vice-President and Minister of the Economy Rodrigo de Rato and held in the Palace Hotel, Madrid on 14-15 July 2000. It was attended by 20 staff members of the U.S. Department of Energy, 20 senior Spanish officials, one invited representative from each of 20 countries, a number of invited speakers and a group from the International Energy Agency, Paris led by Deputy Executive Director, Ambassador William Ramsay and Head of Energy Statistics, Jean-Yves Garnier.

minimise risk and optimise opportunity and profit.

All the key market players have positions to defend and wish to exploit competitive advantage in knowing more about the market than the rest of the players, so a fundamental interest in market transparency is a low priority, particularly when the market is in turmoil. For the traders, oil price volatility means a vast increase in turnover and, whether up or down, they can reap huge profits. The last thing a trader wants is a stable, steady market.

What is the Risk ?

How much of all this shinnanikin is avoidable ?

Oil price volatility is nothing new. The history of the oil industry is one of feast and famine. At each period, it has been found necessary to impose order whether by condoning market dominance by Rockefeller or later by the Seven Sisters or, in the seventies, by OPEC. The lesson of history is that oil price volatility has to be contained. Equally history demonstrates all too clearly the danger of unfettered power concentrated in too few hands in what appears to be a free market.

We cannot afford another grotesque waste of human resources on the scale of the global economic slowdown, inflation and structural damage to the global fiancing and banking infrastructure which followed the two OPEC price-hikes of 1973-74 and 1979-80. Equally, as demonstrated in the 1990 invasion of Kuwait by Iraq, military intervention on behalf of the global consumer remains necessary whenever global supplies of oil are placed in jeopardy.

The greatest risk to the interests of every one of the four billion or so consumers of oil and natural gas (the other two billion on this planet derive nil or negligible benefit from petroleum) is complacency. Oil and natural gas are no longer at the top of geo-political problems and priorities. Yet their availability in ample and increasing volumes remains essential to underpin continuing global economic growth –at least over the next twenty to thirty years. Adequate supply of this petroleum can only be ensured by an ample flow of investment, a healthy profitable industry, the expansion of world trade and inter-dependency and an ability to surmount any obstacles, bottlenecks and pressures of a geo-political nature.

We also have to take a much longer view of mankind's chances for survival and prosperity. Only by maintaining a momentum of accelerating technological advance can we hope to absorb an increasing global population with, worldwide, an enhanced expectation of increasing affluence, mobility and diversity of activity. Even so the two billion without petroleum will quickly become three and four billion and it is these people who are deeply involved in and by the stripping of the rainforests and the desertification of marginal agriculture. Our hopes must lie in the environmentally benign transition from coal and petroleum to hydrogen power, to solar applications and to those nuclear options where concerns for safety, concern for the environment and the risks of proliferation for military purposes can be satisfied. Continuing global growth fuelled by increasing supply of petroleum is the only viable route to this transition.

In this time-scale, the bulk of incremental energy demand will be absorbed in the developing and transition economies. Consequently the leadership role of the United States, whose population currently constitutes less than 3% of the global total and which consumes one-quarter of global energy will be gradually diminished while its role as principal innovator of new technology of all kinds and as custodian of global peace and the freedom of international trade is likely to persist.

What Can be Done ?

Against these long-term prospects, the current failings of the oil-market are a flea-bite. The interests of the principal players are so entrenched that they will not easily give up their secrecy and caution in releasing statistics. In the absence of overt transparency, increasing telecommunications and media coverage, the quality of overall market intelligence will gradually improve. There is no point in shooting the messengers such as the IEA, who, within their very narrow tunnel-vision mandate, have done a good job.

Nonetheless, we are almost certainly bound to have further oil and gas supply crises in the years to come. They will concentrate the public mind on the current weaknesses and dangers of the market infrastructure. Meanwhile, it is time to put a better footing under the oil market. The rest of this presentation summarises my suggestions.

The world must have a clear factual basis of what energy is being produced and consumed day-by-day. Everyone will have their own estimate and forecast for the path forward, but at least everyone should start from the same well-informed factual base. Each global consumer has a right to this information: he or she at least deserves to know the current ingredients of the sauce they are going to be cooked in.

I, therefore, propose a UN-backed initiative to provide a set of guidelines for all countries to supply instantaneously by electronic means details of the volume of energy production, imports and exports on a weekly basis to a new UN-backed international and global agency.

This new global energy agency should be built on the foundation of the International Energy Agency, but it needs a completely new global mandate. The IEA was founded in 1974 to represent and protect industrialised country interest in the oil market then dominated by the leading OPEC producers. It has since broadened its interest but remains a sub-agency of the OECD and is thus still tied to the interests of the industrialised world. This is not an acceptable way forward for the rest of the world.

The new Agency would need ample resources to collect and collate the improved statistics and to begin to underpin the oil market with some form of agreed

California's Flawed Market
What Went Wrong and How to Fix it

By Fereidoon P. Sioshansi*

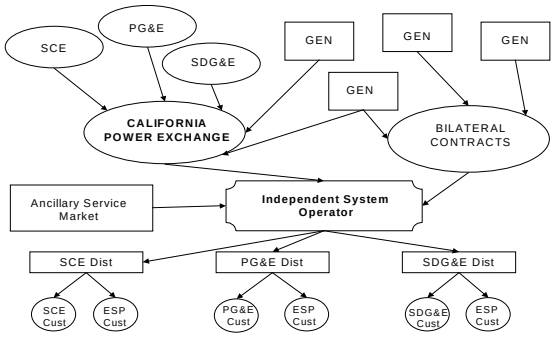
California's Grand Experiment in ESI Restructuring

California was among the first states in the United States to radically restructure its electricity supply industry (ESI) with the passage of a sweeping legislation, Assembly Bill 1890 (AB 1890) in 1996. It opened the whole market to competition at once in April 1998. The interesting features of the California market include:

- Divestiture of at least 50% of generation by incumbent utilities;
- Creation of two new and independent entities, the California Power Exchanges (PX) and the Independent System Operator (ISO);
- Fairly generous allowance for recovery of stranded costs using a competition transition charge (CTC) during a transition period not to exceed four years;
- A rate freeze until the stranded costs are fully recovered; and
- An automatic 10% bill reduction for all residential and small commercial customers.

The incumbent utilities, now called utility distribution companies (UDCs) were turned into conduits, through which customers could receive electrons from competing suppliers, called energy service providers (ESPs). UDCs were told to sell any remaining generation into the PX, and buy all the service needs of customers who choose not to switch suppliers from the PX (Figure 1). The UDCs were to re-sell power to these customers at the PX price, with no mark-up. They were also prohibited to engage in marketing – acting as silent service providers as well as provider of last resort. The policymakers envisioned a future where the UDCs would shrink over time to become passive poles and wires companies as increasing numbers of customers switched to alternative ESPs.

Figure 1
California's New Electricity Market



Generating plants sold to independent power producers (IPPs) were free to sell trough the PX, or to sell directly to customers in bilateral contracts as shown in Figure 1. There would be no regulation on how much power could be sold at the daily PX auction, unless there was evidence of price fixing or collusion. With a number of generators vigorously competing, it was felt that the wholesale market would self-regulate (Table 1). Customers who switched to ESPs would continue to receive distribution service from regulated UDCs. The two independent entities, the PX and the ISO were seen as important pillars of the new market. Everything looked set for a good start.

Table 1
Major Generators in the Golden State
Capacity of major generators with assets in California*

Company	Capacity (MW)	Market Share
Pacific Gas & Electric	7,386.46	24
Los Angeles Dept of Water & Power	4,914.50	16
AES Corporation	4,818.51	16
Reliant Energy	4,018.86	13
Southern California Edison	3,421.00	11
Duke Energy	2,763.50	9
San Diego Gas & Electric	1,216.30	4
Sacramento Municipal Utility District	828.10	3
Northern California Power Agency	644.60	2
FPL Energy	227.92	1
Others	490.12	2
Total	**30,729.86**	

** There are a number of major out-of-state generators that are active in the California market in addition to those listed here. Consequently, the market shares suggested by these figures are actually exaggerated.*
SOURCE: California Energy Commission

For the first two years of operation, things went relatively smoothly. Customers had a choice of suppliers, although the percentage of switchovers remained low among residential consumers (Table 2). Small commercial and all residential customers were getting an automatic 10% bill reduction and were not much interested to experiment with new ESPs with unfamiliar names and nothing convincing to offer. Vigorous competition ensued for the large industrial and commercial customers, resulting in a significant percentage of the load abandoning the UDCs.

Customer Switchovers in CA Compared to a Few Other Jurisdictions

Table 2
Who Is Switching Suppliers?
Customer Turnover in Selected States

	By # of Customer Accounts			By Customer Load		
State	Resid	C & I	Total	Resid	C & I	Total
California	1.4%	3.5%	1.7%	1.6%	18.8%	13.1%
Massachusetts	*	2.4%	0.3%	*	NA	11.0%
New York	1.0%	2.7%	1.3%	1.0%	10.4%	7.9%
Pennsylvania	8.3%	16.1%	9.1%	8.7%	41.7%	28.7%

** There has been virtually no switchovers in the residential market in Massachusetts thus far due to regulatory price rigidities. C&I = commercial and industrial customers.*
SOURCE: William R. Huss, Xenergy, Inc.

Both the PX and the ISO ran smoothly, with the exception of a few minor hiccups. Prices remained generally low during two mild summers in 98-99. The PX prices closely followed the generators' estimated marginal cost of generation for the great majority of the hours (Table 3). During peak demand periods, when supply approaches available capacity and reserve margins are low, PX prices exceeded estimated marginal costs, but not by an overwhelming amount. Observers generally gave

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decent marks to the competitive generation market.

Table 3
PX Prices and Estimated Marginal Cost of Generation
Not Perfect, But Tolerable
PX's market clearing price (MCP) and the estimated marginal cost of generation
June - September, 1998

Month	Period	PX MCP ($/MWh)	Marginal Cost ($/MWh)
June	Midnight - 6 am	$2.63	$2.63
June	6 am - Noon	$12.04	$12.00
June	Noon - 6 pm	$20.13	$19.30
June	6 pm - Midnight	$13.56	$13.52
July	Midnight - 6 am	$17.64	$17.46
July	6 am - Noon	$26.15	$23.21
July	Noon - 6 pm	$51.72	$28.40
July	6 pm - Midnight	$34.14	$26.36
August	Midnight - 6 am	$22.50	$22.46
August	6 am - Noon	$31.76	$26.82
August	Noon - 6 pm	$67.17	$31.97
August	6 pm - Midnight	$38.67	$29.01
September	Midnight - 6 am	$22.72	$22.68
September	6 am - Noon	$30.18	$26.57
September	Noon - 6 pm	$49.22	$30.14
September	6 pm - Midnight	$33.81	$22.70

SOURCE: Borenstein, Bushnell and Wolak, Diagnosing Market Power in California's Deregulated Wholesale Electricity Market,*University of California Energy Institute, March 99.*

Utilities were fast collecting their stranded costs through the state-endorsed competition transition charge or CTC, essentially a euphemism for a non-bypassable tax. Customers began receiving unbundled bills which showed the various elements of cost of service. Figure 2 shows one such example for a typical Pacific Gas & Electric (PG&E) residential customer, where the CTC and the other components are identified.

Figure 2
Typical Unbundled California Utility Bill
The Benefits And Complexities Of Restructuring
Sample bill for residential utility distribution company (UDC) customer receiving the legislatively mandated 10% bill reduction.

Total Charges		$78.19
Legislated 10% Reduction		7.82 -
Net Charges		$70.37
The net charges shown above include the following component(s). Please see definitions on Page 2 of the bill.		
Electric Energy Charge	$0.04446/Kwh*	$38.59
Transmission		2.90
Distribution		22.13
Public Purpose Programs		2.78
Nuclear Decommissioning		0.35
Competition Transmission Charge (CTC)		10.40 -
Trust Transfer Amount (TTA)		14.02

This rate is based on the weighted average costs for purchases through the **Power Exchange. This service is subject to competition. You may purchase electricity from another supplier. (Call 1-800-743-0040 for a supplier list.)*

SOURCE: Pacific Gas & Electric Co.

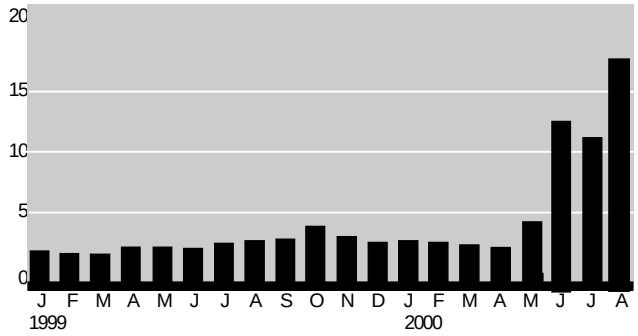
In fact, San Diego Gas & Electric (SDG&E), which did not have much to begin with, collected all its stranded costs early and was no longer subject to the mandatory rate freeze. It began boasting to its customers that they did not have to pay the CTC any more – as were the customers of the other two investor-owned utilities. It must, of course, be noted that the state's municipals and others, were not subject to the requirements of the AB 1890, and did not have to take part in any of this.

They were a few complaints, mostly from disgruntled ESPs who found the California's restructured market extremely tough to operate in. Many who entered soon left, saying that there was no way to remain viable given the rules of the market. But the lights stayed on, and small consumers were placated through the 10% bill reduction feature of AB 1890.

Summer Madness

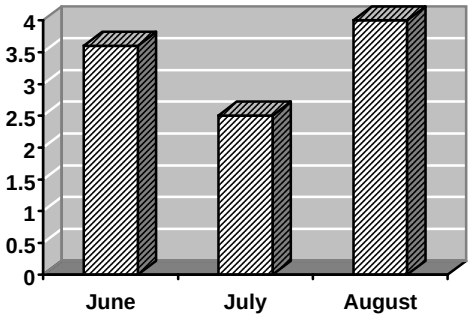
Then came the summer of 2000. Prices shot up to unusually high levels, and exhibited unprecedented (and largely unexplainable) levels of volatility (Figure 3). California paid nearly $4 billion for energy alone in the month of August, way over the previous two years (Figure 4).

Figure 3
Hot Summer's High Energy Prices
Average Monthly Wholesale Electricity Prices at the California PX, $MWh*



** These prices are pure* energy *prices and do not include the cost of reliability services which are added by the Independent System Operator.*
Source: California Power Exchange

Figure 4
Paying Dearly for Energy
Total Energy Costs in California, June, July, Aug, 2000*,$Billion



** Corresponding average monthly $/MWh prices were $167, $117, and $185*
Source: California ISO

Customers of SDG&E, who no longer had the rate freeze, saw monthly bills that were two and three times higher than normal. There were rolling brownouts in Silicon Valley. And

(continued on page 8)

California's Flawed Market *(continued from page 7)*

the ISO was paying exorbitant prices to maintain system reliability. The generators were making lots of money, without violating any laws or doing anything overtly illegal. Consumers and politicians began to say that deregulation had failed and it was time to re-regulate the industry. Other states and countries that were following California's experiment with a mixture of disbelief and awe, are now wondering if they should proceed with their own plans to restructure their own markets.

Now, with cooler temperatures and cooler heads, everybody wants to know what went wrong, and – more importantly – how to fix the problems. Many useful lessons can be drawn from this experience for other states and countries considering market liberalization. This article examines the underlying causes leading to this past summer's unusually high prices, explains what went wrong, and suggests how the problems may be fixed.

Why the California Market Behaved so Badly this Summer

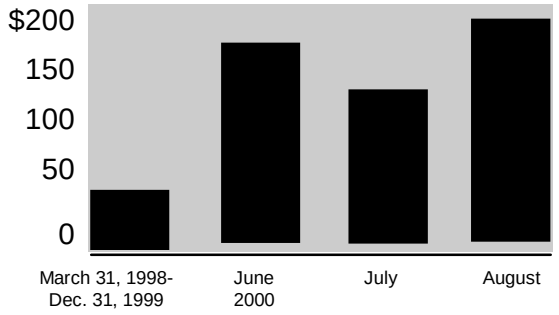
Before one can solve a problem, one must first define it. In the case of California, the problems experienced this summer are the symptoms of a flawed market. And the problems are many. Consequently no simple, single solution will do. What are the problems?

- High energy prices;
- Price volatility; and
- Lack of appropriate incentives to manage price volatility.

As shown in Figure 5, the average monthly wholesale electricity price for energy in the Golden State has been abnormally high this summer. Demand has been a little higher than last year's mild summer, but not enough to explain the difference, or so it seems.

Figure 5, however, is only part of the story. Adding the cost of reliability services (which are added on top of the PX prices by the ISO) makes the situation worse. The price tag for reliability during a 10 day period in June, for example, totaled $387 million (compared to $384 million for all of 1999). The Figure below shows what PG&E (and similar numbers for SCE) paid for power in June, July and August, compared to the average for the period covering March 1998 through December 1999. The figures for September, not final at the time of this writing, are expected to be in the same range as the previous three months. They have been running as high as $200/MWh on a few hot days in September

Figure 5
Not a Good Picture
Average Monthly Wholesale Electricity Prices Paid by PG&E, $/MWh



Source: PG&E

High prices like these add up quickly. In the month of August alone, California paid over $4 Billion for energy, exceeding previous records set in June and July (see Figure 4).

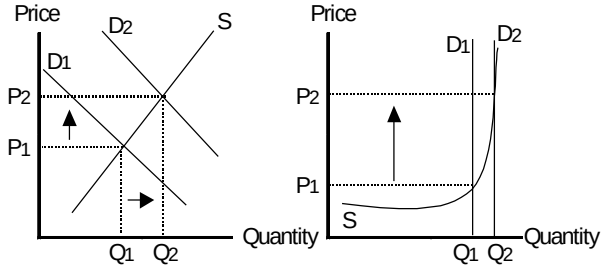
Why are the prices so high? That is the question everyone wants to know. Demand has been running a bit higher than last year, 7% higher in August of 2000 compared to 1999, for example. Is that enough to explain such steep price increases? The answer is that when demand approaches, or exceeds, available supply – which has regularly been happening in California this summer – the relationship between a rise in demand and price is no longer linear. Under such circumstances, a small increase in demand causes disproportionate increases in price.

This phenomenon is exacerbated by the artificial *inelasticity* of demand, as shown in Figure 6. The graph on the left shows a *normal* market, with normal-looking supply and demand curves. In this case, an increase in demand (represented by an upward shift in the demand curve from D1 to D2) will result in somewhat increased price (from P1 to P2), assuming a fixed supply curve, S.

Elementary Economics

When demand is inelastic and supply constrained, prices go through the roof.

Figure 6



In the graph on the right, demand is shown as *perfectly inelastic* (i.e., a vertical line), and supply with a steep upper end, representing physical limitation of generation and/or transmission. In this case, even a small increase in demand, say 7%, will result in a disproportionate price increase – and virtually no increase in supply, since the system is running at or near full capacity. The latter graph is a reasonable representation of the extremely constrained California market.

How Can it be Fixed?

There are three fundamental *solutions* to California's electricity problem – as well as a number of necessary market rule changes. The three most important fixes are:

- Increase supply by building additional generation (and transmission);
- Make demand responsive to high prices; and
- Encourage long term, fixed-price contracts outside the PX.

The need for new generation is now widely recognized – even though by itself, this is unlikely to cure the problem. According to the California Energy Commission (CEC), 2,900 MW of new capacity is under construction, with another 10,600 MW in advanced stages of design and/or licensing. Another 30 proposals are under planning. But proposing a plant and bringing one on line are two different things.

The effect of bringing demand into play has been widely underestimated, and its impact on moderating peak prices

vastly underutilized. CEC estimates that on a hot summer day, an incremental 5 degree F rise in mean temperature adds 8.5% to the peak demand – roughly 4,000 MW. Since 28% of power consumed in California during peak demand periods is consumed by the air conditioning load, equally divided among the residential and commercial sectors, the cure appears obvious. Yet the infrastructure to manage this peak load is currently very limited.

After this summer's price fiasco, the investor-owned utilities in the state are struggling to put programs into place in time for the next summer. Highly generous incentives are offered for curtailing the load when it really matters. The jury is still out as to how much of the potential may be captured.

Aside from these *physical* cures, there are *financial* options to cope with high prices and price volatility – through forward contracts and risk hedging. Although the markets for such instruments are currently immature and feeble, they can be expected to flourish in the next couple of years. The regulators should encourage such schemes. Until recently, utilities in California were effectively barred from reliance on financial instruments to manage price volatility.

Even now, the incentives to do so are poorly defined. For example, it is not clear if and how much of an insurance premium can be passed on to customers for offering long-term fixed prices by the incumbent utilities. Under these circumstances, risk-averse utility distribution companies (UDCs) cannot be expected to do much. Why should they offer fixed prices to their customers if they are unsure about passing on the risk premium?

There is also a list of what *not* to do. Price caps, rate freezes, and more regulations. Price caps, for example, have not traditionally worked in other markets such as rent or wage controls. Many of the problems affecting California's young market are because there are still too many regulations, and too many regulators. Markets have not failed, half-baked regulations have.

California Fiasco Reverberates Nationwide – Worldwide

Many policymakers in other parts of the United States, and other countries, who have been following this summer's fiasco in California, have had second thoughts. Why deregulate an industry that, despite many known shortcomings and perceived inefficiencies, appears to be working. Even if prices are not as low as they could be, at least they are stable, predictable, and *reasonably* low. Even if customers have no options to switch suppliers, there is at least one established, reliable supplier who can be relied upon to provide universal service to all.

Just in the last couple of months, a few states have expressed reservations about their own restructuring plans, and/or have announced postponements. New Mexico, for example, has decided to re-visit its 2002 start date. Oregon has devised and revised its own restructuring plans taking particular pain to avoid the mistakes of its neighbor to the South. The Oregon plan, which is scheduled to go into effect beginning October 1, 2001, will allow large industrial and commercial customers to choose an alternative supplier but will keep small residential customers under regulated rates.

The regulators have second thoughts because of serious questions about the costs and the problems associated with establishing new markets, with no guarantees that they would perform any better than the regulated ones they replace.

A number of industry observers are now of the opinion that most of the benefits of competition may be captured in the wholesale market. According to this line of argument, *retail* competition is simply not worth the bother.

The logic of this argument is simple. When considering all the costs and benefits of implementing competitive electricity markets, it is generally agreed that *most* of the benefits accrue at the wholesale level and are captured by large customers. By contrast, *most* of the costs result from extending choice to the small customers, for whom the benefits are small relative to the costs. If this is true, then why not limit customer choice to large customers (as proposed in Oregon) – and leave it at that – unless there are overwhelming reasons to extend it all the way to residential customers.

What are the costs of converting to competitive electricity markets?

- The implementation costs of new infrastructure, such as establishing competitive wholesale auctions and independent system operator (ISO) or regional transmission organizations (TSO);
- Significant costs in unbundling vertically integrated utilities and many of their internal systems;
- Costs associated with unbundling metering and billing functions and developing duplicative customer record-management systems; and
- Costs associated with monitoring market performance and compliance – in addition to maintaining the old regulatory bureaucracy to watch over the regulated monopoly functions.

A few years ago, when restructuring, deregulation, and market liberalization were in their infancy, such issues were not widely recognized. The policymakers had naïve, perhaps unreasonable, expectations. It was thought that by the strike of a pen, market discipline would take over all the functions previously performed by regulatory bureaucracies, hence the term deregulation. In reality, it is re-regulation, which often results in more regulations, not less. If the benefits are nebulous and only marginal, then the status quo may be preferable – and certainly less risky.

These are not necessarily views which this author espouses. The experiences of the past few years in California and elsewhere, however, have provided a number of sobering lessons – which any prudent policymaker must now take into account. Competitive markets have their advantages, and tend to self-regulate in the long-run if they are well-designed and well-structured. But there is no consensus, even among the experts, as to what model or market structure is the best. Nor is one solution likely to work in all cases.

Blaming the markets for what has happened in California is unjustified. The profit motive is alive and well, and powerful as ever. It must, however, be properly channeled to do some good. If anything, the main lesson for California is that there is still too much regulations, and not enough competition.

Why Customers Love Rate Stability

In the name of political expediency, the regulators in California in great haste passed a couple of measures to placate the irate customers in San Diego. The legislators sent a bill to Governor Davis to limit electricity prices to 6.5 cents/kWh

(continued on page 10)

California's Flawed Market *(continued from page 9)*

for San Diego residents. This is significantly higher than the average prices for the months of June and July in 1999, which were 2.3 and 2.8 cents/kWh respectively. But considerably lower than the corresponding prices this year, which were 12 and 10.5 cents/kWh, respectively.

The rate caps can be adjusted by the California Public utilities Commission through December 2002, when it expires. What happens after that? That is for future politicians to answer. Nor is it entirely clear if the same would apply to PG&E and SCE customers, once their rate freeze ends. The legislature has also set aside $150 million to subsidize San Diego ratepayers should power costs greatly exceed the new rate cap, but it is not clear what that would be.

Sempra Energy's Chairman, Mr. Steve Baum is not a great fan of the new price cap, and for obvious reasons. The rate cap sets a new limit to how far the prices he charges his customers can rise. But it sets no floor below which they cannot go. Consequently, SDG&E stands to under-collect a significant sum under the wrong circumstances. Nobody said regulators had to be fair, or open minded. Clearly, everyone sees the rate cap as a temporary measure, until more fundamental solutions can be implemented. But as with all regulations, once it is instituted, it will be hard to remove it.

To understand why, all you have to do is take a look at a typical California customer bill in Pacific Gas & Electric (PG&E) or Southern California Edison (SCE) service areas. During the summer, these two investor-owned utilities have been collecting negative competition transition charges or CTC. Under the California's restructuring law, when the average monthly PX prices are high, the CTC shrinks to produce the mandated 10% customer bill reduction.

Figure 7

When the PX Price is High, the CTC Goes Negative

Sample California residential bill for the month of August 2000

ACCOUNT DETAIL

Service	Service Type Bundled Service From 07/31/00 To 08/29/00	Billing Days: 32
Total Charges		$87.44
Legislated 10% Reduction		8.74-
Net Charges		$78.70

Please see definitions on Page 2 of the bill

Electric Energy Charge	$0.19360/Kwh*	$137.26
Transmission**		6.05
Distribution		26.48
Public Purpose Programs		2.21
Nuclear Decommissioning		0.32
Competition Transition Charge (CTC		101.90-
Trust Transfer Amount (TTA)		8.28

** This rate is based on the weighted average costs for purchases through the Power Exchange. This service is subject to competition. You may purchase electricity from another supplier (Call 1-800-743-0040 for a supplier list.)*

***Transmission charges on your bill now include an allocation for Reliability Services (RS) costs. These costs were previously included in CTC and do not increase your total charges. Transmission and RS costs are defined on page 2.*

Note: All customers pay a Competition Transition Charge as part of the charge above, including those who choose an electricity supplier other than PG&E.

Source: PG&E

For the month of August, for example, the average PX price for energy was 19.36 cents/kWh, the highest it has been since the California market opened to competition in March of 1998. As shown in the sample bill in Figure 7 at this price, the customer's energy bill alone would have been $137.26, without the other charges. The only way to keep the monthly bill at the level mandated by the law is to charge a *negative* $101.90 for the CTC.

Multiplied by millions of residential customers, the numbers add up quickly. PG&E, for example, reckons it has collected $2.2 billion less from its customers this summer than it paid to buy power for them from the PX. The same applies to the SCE in the South, although the numbers are not identical.

San Diego Gas & Electric (SDG&E), of course, no longer collects any CTC, and is not subject to a rate freeze, except for the one that has just been introduced (see later comment). No wonder the two incumbent utility distribution companies don't like the rate freeze. Customers, on the other hand, love them, since it provides a free subsidy – when prices are extremely high.

It wasn't supposed to be this way. As stipulated by AB 1890, the rates were frozen at a level that were believed to be high, subject to an automatic 10% bill reduction for all small residential customers. The Investor Owned Utilities (IOUs) were allowed to use the expected extra proceeds to pay off their stranded costs, at which point the rate freeze would end. This is what happened in the case of SDG&E last year – which explains why the customers had no safety net to protect them against the abnormally high PX prices this summer.

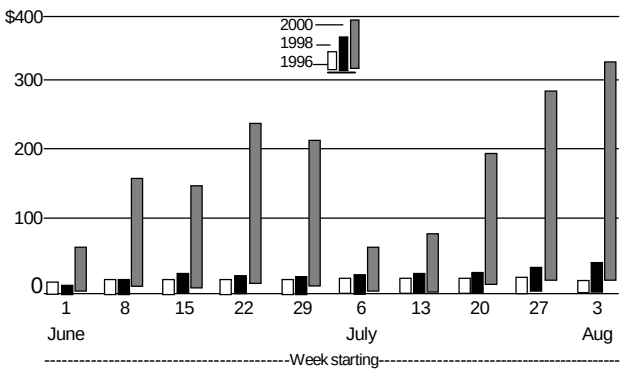
AB 1890 says that if the stranded costs are not fully collected by end of March 2002, the utilities lose out on the balance. At the time of its passage, everybody thought this was a highly unlikely scenario. The widely held view was that all three IOUs would collect all, or virtually all, of their stranded costs long before the deadline. All went well for the first couple of years. In 1998, for example, the average PX price for the period from March through December was $26/MWh. The corresponding number for 1999 was $31. PG&E was charging customers, on the average, $54/MWh – paying off its stranded costs at a rapid rate. SCE was not complaining either. Nobody knew the PX prices would shoot through the roof in 2000, forcing the CTC to go negative for months.

Now the prospects appear gloomy for PG&E and SCE. If the PX prices remain high between now and the end of the deadline, the shareholders of both companies potentially stand to lose a good chunk of change. Not surprisingly, the two companies are quietly lobbying to end the rate freeze. But at the time when irate SDG&E customers are asking for rate relief and a return to stable prices, it is hard to find much sympathy for the plea.

California's Problems Not Limited to California

The scale of the problem extends well beyond California, since eleven Western states, as well as British Columbia and Mexico, are interconnected. California, which has gotten used to buying cheap power from neighboring states, in effect sets the wholesale prices in the entire region now, regardless of whether a given state has deregulated its retail market or not. As shown in Figure 8 wholesale prices during peak demand periods in the Pacific Northwest have been hovering around $300/MWh in July and August as opposed to $30 in previous years.

Figure 8
Prices are High and not Just in California
Average Weekly Prices During Peak Demand Periods in Pacific Northwest,
June-Aug 1996, 98, and 2000; in $/MWh



Source: Northwest Power Planning Council (NPPC)

With so many inquiries under way, a lot more will be said about what happened and why. But it is tempting to ask why SDG&E did not see the storm coming, and if it did, why did it not take protective measures.

How Did SDG&E Miss the Coming Storm?

Rightly or not, the management of SDG&E has been under considerable fire for its mishandling of the crisis. They believe that the criticism is undeserved. After all, SDG&E did not create, nor benefit from the recent price hikes. SDG&E has sold off virtually all its generation assets and only holds a 20% stake in the San Onofre Nuclear plant, which is majority owned and operated by SCE. The company is a mere *price taker*, buying power on behalf of its customers from the PX, as required by the law, and reselling it at zero margin to its customers. Moreover, San Diego's relatively mild climate means that its customers do not contribute much to California's peak demand on hot summer days.

SDG&E management says the company is an innocent bystander in a flawed market gone mad. SDG&E would like its angry customers to direct their frustrations towards *others* including,

- the policymakers who should have devised better market rules to start with, or changed the rules before the recent crisis;
- the lax monitoring and enforcement agencies who should have cried foul once the PX prices began to swing out of control; and
- the greedy generators who took advantage of the tight supplies and lax market rules to make huge profits.

In fairness, there is plenty of blame to go around. But the central question remains why did SDG&E not see the storm coming, and if it did, why did it not do more to reduce the damage by protecting, or at least warning its customers. There are several reasons for this.

- First, SDG&E, like most everyone else, was caught off guard by how precarious the supply situation was going to get and how high prices were going to go.

Despite dire warnings from the California Independent System Operator nobody, it seems, was ready for the inevitable. With triple digit temperatures (in Fahrenheit, that is) in June and July, the ISO had to scramble to fill in as much as a 3,000 MW shortfall in generation capacity on a daily basis. As a result, California energy costs in the month of June alone exceeded $3.6 billion. The total energy costs for all of 1999, by comparison, were approximately $7 billion.

- Second, under California's peculiar market rules, Cal ISO is obligated, and willing, to pay any price to keep the lights on.

The independent, non-profit ISO has a highly focused duty (and desire) to maintain system reliability *at all cost.* Generators have learned that they can make a lot more money by withholding their units from the PX's day ahead *energy market* by bidding scarce reserves in the ISO's *ancillary services market* instead. With capacity in short supply in both California and in neighboring states, every day has been a struggle for the ISO to maintain minimum reserves. Under such conditions, the generators can name their price and get away with it. It is perfectly legal, as far as we can tell.

As obscene as the recent prices may appear, generators simply did what any profit maximizing firm would do, namely, maximize profits. In fact, no private generator can be expected to do otherwise. There are no indications of illegal collusion or price fixing. They may be called greedy, but greed is not illegal.

Legal or not, the consequence has been a dramatic bill for so-called *reliability services*. During a 10 day hot spell in June, ISO paid $387 million for reliability services; the comparable number for *all* of 1999 was $384 million. These costs, along with high energy costs, show up on customers' bills. The net result? Average energy prices in the 13-20 cents/kWh this summer – just for energy. Adding distribution, transmission, and other costs, makes the total exceeds 20 cents/kWh. Even for a high cost state like California, this is too high to bear.

As shown in Figure 7, for the past several months, PG&E and SCE customers have been getting bills with bloated energy charges and hugely negative CTCs. With the rate freeze and the legislatively mandated 10% bill reduction still in effect, PG&E and SCE customers' bills did not go up significantly. The cushioning effect of the negative CTC helps. But for the unfortunate SDG&E customers, there is no rate freeze, no 10% bill reduction, and no negative CTC.

- Third, mixed signals and mishandling of procedural matters led to missed opportunities to secure fixed prices.

As a regulated utility, SDG&E is not free to do what it believes is right for its customers. It must either get prior permission from the California Public Utilities Commission (CPUC), or it can second guess what the regulators may say after the fact. The latter option is risky. For example, suppose SDG&E had locked in early in the spring prices for its customers at 5.5 cents/kWh (which Enron Corp was apparently willing to offer on a long term basis). Now suppose the summer turned out to be a mild one (as in 1999) and the PX prices averaged 4 cents/kWh over the summer. Guess what the CPUC and the consumer advocates would be saying about the wisdom of SDG&E management's decision? Guess who would be eating the difference between the average PX price and the contracted price after a noisy inquiry?

(continued on page 12)

California's Flawed Market *(continued from page 11)*

With these regulatory realities in mind, earlier this year, SDG&E management sought CPUC's blessing before buying price insurance or hedging its risks by locking fixed price contracts in the PX's block forward market. For reasons that are not entirely clear, this critical procedural matter requiring the approval of the CPUC was fumbled. In hindsight, both sides deserve blame in not sorting things out before the summer's crisis hit.

This left SDG&E management in an awkward situation of not knowing whether, nor how, to seek price protection for its customers. This regulatory uncertainty, SDG&E claims, prevented them from buying price insurance prior to the recent episode. Even now, the company is unsure how much risk it can, or should, assume on behalf of its customers in hedging the risk of future price fluctuations. It is a sorry state of affairs, but that's how things currently are in the Golden State.

This illustrates one of the fundamental dilemmas of a market which is neither fully regulated nor fully competitive. The wholesale market is competitive, but once prices get too high, price caps are instituted. The retail markets are anything but competitive, which means that the incumbent utility distribution companies (UDCs) pass on the wholesale prices to customers as required by law. They obviously don't have enough of an incentive to protect their customers from price fluctuations, nor a clear authority to do so.

- Finally—and most importantly—prices, which normally regulate demand in competitive markets, currently have no opportunity to do so even when prices soar.

This means that the great majority of customers have no opportunity, nor any incentives, to curtail demand when prices are high and it is economically efficient to do so. As elementary economics predicts, when demand is fully *inelastic*, there is no response in demand even when prices soar. For the past few months, prices have been soaring, particularly prior to the reductions in the caps from $750, to $500, and subsequently to $250, with no effect on demand. Until this most fundamental flaw of the market is addressed, there is no real hope of fixing the problem, no matter what the politicians say or do.

Where Do We Go From Here?

The fundamental problems of California market are not likely to be easily solved – certainly not through mandated price caps or other artificial constraints. Late in October, the California ISO voted a new variable price cap. The Federal Energy regulatory Commission (FERC) is expected to release a major report on the subject – including a number of recommendations, in early November. This is a market that will be in turmoil for some time before solutions to the problems can be found.

In the mean time, regulators and policy makers in other parts of the world should take notice of what went wrong here, and why. If nothing else, California's mistakes can provide many useful lessons for others who are wise enough to learn from it.

Editor's Note: This paper is based on several articles which originally appeared in the September and October 2000 issues of *EEnergy Informer*.

IAEE Meeting At the Annual ASSA/AEA Conference

The International Association for Energy Economics will be having its 3rd Annual Session at the Allied Social Science Association in New Orleans, Louisiana, USA January 5 - 7, 2001. If you attend the ASSA meeting please register as a member of IAEE. With more members attending we will be able to increase the number of sessions. We hope to see you there.

Session Title:

Current Issues in Energy Economics and Energy Modeling (Q4)

Presiding: *Carol Dahl*, Colorado School of Mines

Boris Cournede, Ministry of Economy, Finance, and Industry, Paris, France—The Special Economics of Gas Deregulation on the European Continent.

Prakash Loungani, International Monetary Fund—21st Century Oil Shocks: Will They Occur? Will They Matter? Will We Be Prepared?

Prasad Rao, The Pennsylvania State University—The Choice of Crude Oil Quality in Petroleum Refining

Anne Epaulard and *Stephane Gallon*, Ecole Nationale de la Statistique et de l'Administration Economique, Malakoff, France and Ministry of Economics, Finance and Industry, Paris, France—A Model of Competition Between Nuclear and Gas-Fired Plants Using Real Options Theory to Assess Nuclear Investment Value

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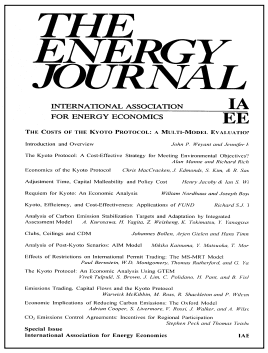
The Costs of the Kyoto Protocol: A Multi-Model Evaluation

Edited by John P. Weyant
(Energy Modeling Forum, Stanford University)

This Special Issues represents the first comprehensive report on a comparative set of modeling analyses of the economic and energy sector impacts of the Kyoto Protocol on climate change. Organized by the Stanford Energy Modeling Forum (EMF), the study identifies policy-relevant insights and analyses that are robust across a wide range of models, and provides explanations for differences in results from different models. In addition, high priority areas for future research are identified. The study produced a rich set of results. The 448-page volume consists of an introduction by John Weyant and a paper by each off the thirteen international modeling teams. More than forty authors provide richly illustrated descriptions and of what was done and concluded from the model runs that were undertaken.

Contents

ABOUT THE EDITOR: John P. Weyant is a professor of engineering-economic systems and Director of the Energy Modeling Forum (EMF) at Stanford University. His current research focuses on analysis of global climate change policy options and models for strategic planning.



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The Structure of Energy Subsidies in Iran

*By Reza Fathollahzadeh and Mohammad Mazraat**

Editor's Note: This article raises a key issue facing many major energy producing countries, namely that of energy price subsidies. This issue has implications for national budgets, national energy balances and the environment. However, as the article clearly shows, the topic is not straight forward in economic terms.

Subsidy is defined as a payment made by the government (or possibly by private individual) which forms a wedge between the price the consumer pays and the costs incurred by producers, such that price is less than marginal costs. In view of the above-mentioned definition, the calculation of energy subsidies in the context of the Iranian economy is practically impossible simply because there is no transparent evaluation of the marginal costs of energy carriers. That is mainly due to the lack of a relevant cost accounting system in the oil and gas industries. In order to overcome this barrier, some attempt has been made to tackle the issue but the problem has not been resolved yet.

Some Iranian economists are of the view that the existing wedge between nominal prices and unknown marginal costs can not be termed as a subsidy. In other words, subsidy is a policy leverage or an instrumental variable. However, in the Iranian case, the government is facing a passive situation. Those economists believe that the government does not make the wedge deliberately, while a deliberation or an authority is an essential point in the definition of explicit subsidy.

In this study, analogous to other similar works, in order to achieve a simple and specific definition of energy subsidies, a subsidy is defined as a wedge between domestic and international (or border) prices. Therefore, international prices are considered to be the opportunity costs of energy carriers. Thus the calculated subsidies are referred to as the base of this definition for an implicit subsidy.

A battery of relevant factors or the applied assumptions characterizes the estimation of the implicit energy subsidies in Iran on the basis of the above-mentioned definition. Therefore, the calculated amount of subsidies indicates a wide range, inter alia see the different works. Table 1 contains the estimation undertaken by other scholars in the Ministry of Energy of Iran.

Table 1
Range of Estimatres for Energy Subsidies
(Billions of US Dollars)

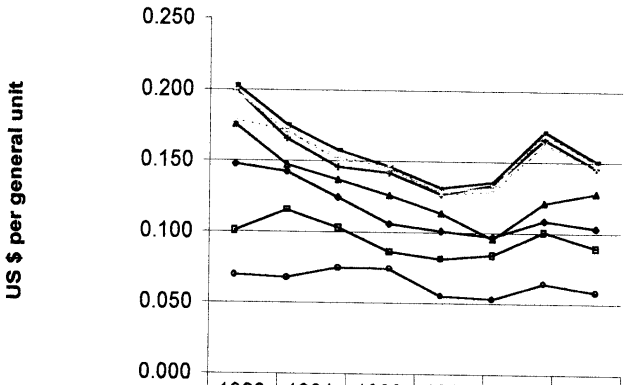
	1994			Petroleum Products		
	Total	Electricity	Natural Gas	1994	1995	1996
Lower	3.2	1.3	0.75	1.15	2.4	2.3
Upper	11.15	2.5	1.35	7.3	6.19	6.5

Source: Ministry of Energy of Iran

Here we propose an independent estimation of implicit energy subsidies for the period of 1990-1997. The total amount of energy subsidy based on market, export, and official exchange rates has been estimated at about 15.02, 13.63, and 11.64 billions of US dollars, respectively, in 1997. Supposing the market exchange rate as a realistic rate, total implicit energy subsidies in Iran have amounted to 106.2 billions of U.S. dollars within the period 1990-1997 indicating an average of 13.3 billions of U.S. dollars per year.

Figure 1 shows the trend of energy subsidies for all energy carriers. As can be seen, after the imposition of a policy to remove energy subsidies in 1990, the trend for almost all energy carriers declined up to 1995. The subsidies per common units of each carrier are affected by a number of factors such as fluctuations in exchange rates, international energy prices, and domestic energy prices. Therefore, in spite of pursuing a policy of upward adjustment in energy prices, the energy subsidy per unit increased after 1996. The subsidy paid on kerosene was 20 U.S. cents per liter in 1990, which is the highest among petroleum products. The subsidies for electricity and natural gas amounted to 7 and 10 cents per kWh and cubic meter, respectively, and the minimum amount of subsidy was for fuel oil. The implicit subsidies ranked the same among carriers in 1997 as they did in 1990, but the magnitude has decreased.

Figure 1
Trend of Energy Subsidies by Fuel



	1990	1991	1993	1994	1995	1997
Natural gas	0.101	0.115	0.086	0.081	0.084	0.089
electricity	0.070	0.068	0.074	0.055	0.053	0.058
LPG	0.199	0.165	0.142	0.126	0.133	0.146
jet fuel	0.199	0.170	0.144	0.128	0.132	0.149
gasoline	0.175	0.147	0.126	0.113	0.095	0.128
kerosene	0.203	0.176	0.146	0.131	0.136	0.150
gasoil	0.178	0.171	0.146	0.127	0.129	0.146
ls-fuel oil	0.148	0.142	0.106	0.101	0.097	0.103

Figure 2 indicates the total amount of implicit subsidies from 1990 to 1997 on the basis of market exchange rates. In spite of all attempts by government to reduce the subsidies, the total has been almost steady at around US $12 billions, and in recent years has even jumped to over US $15 billions. This was mainly due to the devaluation of Iranian Rial and the rapid growth of internal energy consumption. Figure 2 also indicates the composition of the imputed subsidies by fuels.

Figure 3 show that in 1997, electricity had the highest share of total energy subsidies, equal to 28 percent, whereas gas oil and natural gas were in second and third place. The lowest share is for jet fuel.

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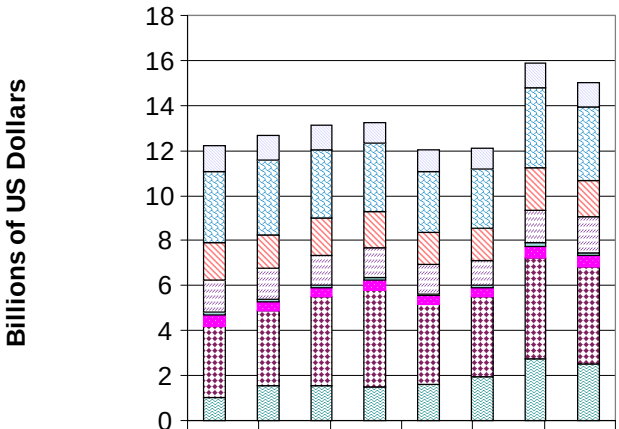
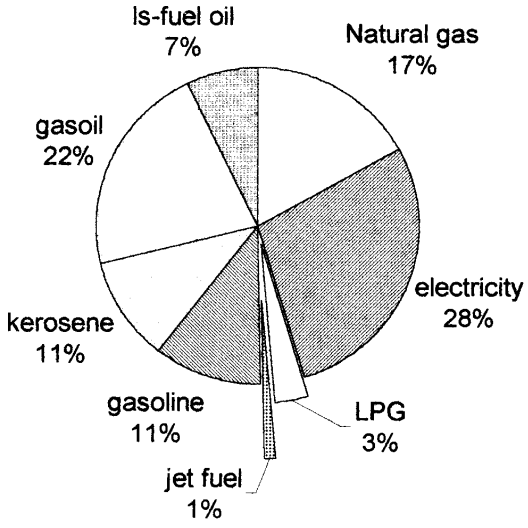
Figure 2
Total Implicit Energy Subsidies by Fuel



	1990	1991	1993	1994	1995	1997
ls-fuel oil	1.138	1.096	0.918	0.969	0.899	1.092
gasoil	3.138	3.310	3.030	2.742	2.659	3.248
kerosene	1.684	1.524	1.588	1.419	1.423	1.596
gasoline	1.451	1.324	1.348	1.293	1.092	1.620
jet fuel	0.121	0.117	0.104	0.102	0.105	0.153
LPG	0.496	0.444	0.442	0.401	0.414	0.495
electricity	3.146	3.334	4.310	3.507	3.515	4.275
Natural gas	1.032	1.520	1.480	1.626	1.967	2.541

Figure 3
Share of Implicit Subsidies by Energy Carriers (1997)



In sum, one can infer from this brief study that the structure of energy subsidies in Iran is a complicated issue. The computation of energy subsidies is not as simple as subtracting domestic prices from international prices. It is complicated by the need to establish an accurate cost accounting system for the oil and gas industries, which would provide managerial direction/control for the energy tax and/or subsidy systems by the Iranian energy authority. Also, elimination of the subsidies is not as simple as increasing domestic prices to the level of international prices. In fact, this raises the controversial issue of privatization and liberalization of the energy sector in Iran.

References

Budget and Plan Organization, 1997, Statistical Collection- Time series of Economic and Social Statistics until 1375, [in Persian], Deputy of Economic Affairs- Macroeconomic Office, Tehran: Budget and Plan Organization.

Central Bank, 1996, Iran's National Accounts (1988-1996), [in Persian], Economic Accounts Department, Tehran: Central Bank of Iran.

Energy Prices and Taxes, 1998, Quarterly Statistics, Fourth Quarter, International Energy Agency (IEA) Statistics.

Ministry of Energy, 1997, Payame-e-Energy, No. 12, 14, and 15, Vol. 2, Tehran, Iran.

Mazraati M., Bozorgzadeh et. al., 1997, The efficient ways of reduction of energy subsidies in Iran, a research scheme, [in Persian], Ministry of Energy, Tehran.

National Energy Committee of Iran (NECI), 1997, The of First National Energy Congress, Tehran, Iran.

National Energy Committee of Iran (NECI), 1999, The Second National Energy Congress, Tehran, Iran.

Oil and Energy Trends, 1999, A Monthly Publication of International energy Statistics and analysis, Blackwell energy research, Vol. 24, Issue 9, September 1999.

Pearce D.W., 1986, Macmillan Dictionary of Modern Economics, 3rd ed., The Macmillan Press Ltd.

Parra F. R., 1999, International Crude Oil and Product prices, A Biannual Review and Analysis of Oil Price Trend in World Markets, Middle East Petroleum and Economic Publications, Nicosia, Cyprus.

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From National to Regional Electricity Market in the Baltic States and Northern Europe

By V. Kreslinsh, K. Brinkis, V. Zebergs and N. Zeltinsh*

Introduction

There exist comparatively good electric links (330 kV) connecting the Baltic States – Latvia, Lithuania and Estonia, as well Russia (see Figure 1. Baltic integrated power system - IPS). The energy companies (monopolies) of these countries ensure the electricity market because Lithuania and Estonia produce more electric power than they consume whereas Latvia imports up to 40% (on the average, a year). Each of the Baltic energetic companies has a dispatcher centre dealing with electricity. In addition there is a common Baltic dispatch centre in Riga, Latvia, that ensures the flows envisaged by interstate agreements.

Figure 1
Basic Power Network of the Baltic IPS and its Interconnection with other IPSs

* V. Kreslinsh and K. Brinkis are with DC Baltija, Baltic Power Systems Control Centre Ltd. and V. Zebergs and N. Zeltinsh are with the Institute of Physical Energetics of Latvian Academy of Sciences. This paper was delivered at the annual North American Meeting of the USAEE/IAEE, September 24 to 27.

The potential of the Baltic electricity market is characterised by the extent of electric power production in the Baltic States (see Table 1).

Table 1
Trends in Electricity Production in the Baltic States

	Estonia		Latvia		Lithuania	
	GWh	%	GWh	%	GWh	%
1995	8692	100	3972	100	13882	100
1996	9102	105	3123	79	16775	121
1997	9208	106	4502	113	14848	107
1998	8518	98	5797	146	17614	127

Perspective on a Liberalised Baltic Electricity Market

At the present time a model of the perspective free Baltic electricity market is being worked out that provides for free access to the power transmission networks both for the electricity producers and its consumers (qualified consumers). Further, restructuring and privatisation of monopoly energetic companies is going on in all three Baltic States, although according to different models and rates of their realisation, which complicates the solution of the problem. The most urgent task is to develop a model of the Baltic electricity market that could be included in the European electricity market, as well, first of all by implementing the project "Baltic Ring".

At the present time technical state of 330kV network in IPS Baltic can not assure all the requirements for fully opened electricity market. The following indicates some points that do not meet the requirements for passing to a completely open electricity market and create additional restrictions in the transmission network:

- reliability criteria (n-1) can only be satisfied considering emergency control,
- on power stations in IPS Baltic and UPS Russia, there is lack of primary frequency regulators with small dead zone by frequency. These primary regulators participate in regulation only outside the limit of 50±0.2 Hz. Only secondary regulators can be used to correct frequency deviations within the limit of 50±0.2 Hz and the correcting actions may lead to overloads in 330 kV network. In case of presence of primary regulation in the network these additional overloads are less probable.
- the absence of the required amount of means to compensate excessive reactive power under minimum operational conditions of the network that leads to necessity of constrained disconnection of large number of 330 kV lines. This presents additional limitations on electrical transmission over the network.

It seems that the move to a completely open electricity market will require detailing and toughening the requirements on technical updating of the transmission network in order to eliminate a majority of the obstacles for realisation of a free electricity market.

The main problems for the development of the perspective

free Baltic electricity market are connected with:

- the creation of a market model,
- the market regulation measures,
- formation of the market tariffs,
- the operator functions of networks and the system,
- technical problems, and
- the protection of the consumers' interests.

One of the most complicated questions will be connected with the formation of electricity tariffs. The current electricity tariffs in the Baltic States are presented in Table 2.

Due to the growing competition among the producers under free electricity market conditions the electricity production costs should decrease. The consumers' electricity tariffs will depend on extra costs on electricity transmission, distribution and other services rendered to the consumers.

Table 2
The Existing Electricity Tariffs in the Baltic States (USD/kWh) (including 18% VAT).

	For population		For industry	
	1999	2000	1999	2000
Lithuania	0.0526	0.0660	0.0400	0.0500
Estonia	0.0518	0.0518	0.0505	0.0505
Latvia	0.0640	0.0640	0.0533	0.0533

The Grid Code

An important element in the formation of a liberalised Baltic electricity market is the grid code that has already been worked out in Latvia. It is a collection of documents designed to set the order for regulated management of co-ordinate operation of the electricity supply system. The purpose of the code is the application of the market mechanisms in the electricity supply system, with reliable and stable functioning of the system being considered as absolute priority.

The structure of the basic market requirements as to Latvian grid structure is the following:

- responsibilities of the market organiser,
- safety requirements,
- spot market,
- regions of the Baltic energy system,
- losses and restrictions in the networks,
- evaluation of the system adequacy,
- central dispatcher management and marketing,
- administration of spot market prices,
- extra services,
- market information,
- force majeure and shutdown of the market, and
- accounts

The use of the code in creating a joint Baltic electricity market depends on the other Baltic States – Lithuania and Estonia – as far as the principles included into the code are acceptable for them. It is important for the Baltic countries to come to an agreement on free, as low as possible, and joint price of electricity transmission avoiding any tariffs, customs on their borders, and the like.

The formation of the Baltic free electricity market is intended as a gradual process. It is envisaged to start its realisation with the market simulation during which the staff is trained and the market management is adjusted including the order of tariff calculation and financial accountancy. For the Baltic energy companies this will be a new process, different from the Western countries, considering the Baltic specifics, particularly in co-operation with the energy companies from the CIS that are hard to predict.

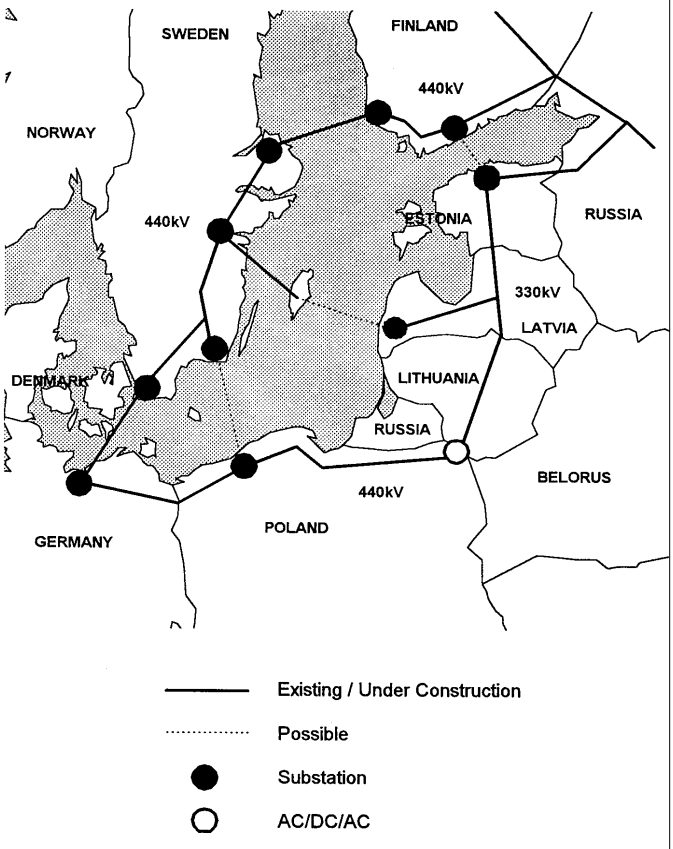
The Baltic Ring

There are several Baltic Ring variants for the creation of electric networks around the Baltic Sea forming an integrated North European power supply system in the future (see Figure 2). It concerns the connection of the Baltic power supply system by means of a deep-sea cable with Estonia and Finland, in the north, and forming an electric link with Lithuania and Poland, in the south. This variant entails great investments, and the investors should feel sure about sufficient flows of electricity through these links and their payback in quite a short time. Thus inclusion of the Baltic power supply system into the European power supply system (the NORDEL), a Scandinavian energy association in Finland, the CENTREL association in Poland under the conditions of a free European electricity market will bring severe competition for the producers of electricity in the Baltic States.

In this way the formation of the Baltic electricity market (Latvia, Lithuania and Estonia) is the first step towards further integration into the free European electricity market.

(continued on page 18)

Figure 2
Version of the "Baltic Ring" (Electricity)



Baltic Electricity Market *(continued from page 17)*

The Green Energy

Particular problems of the free Baltic and European electricity market will arise for the low-power energy producers who expand the use of renewable resources of energy (the small hydropower stations, wind generators, etc.) where the prime cost of electricity is higher than in the large electric stations with modern technology. Presently the power supply companies of the Baltic States support the producers of such "green energy" and purchase electricity at an increased price. The share of the "green energy" on the free electricity market is a special problem. A similar problem may build up around co-generation electric stations based on centralised heat supply systems widely spread in the Baltic countries. By simultaneous production of electricity and heat in co-generation electric stations a fuel economy is achieved with a correspondingly lower amount of harmful emissions into atmosphere. However the competitive power of co-generation electric stations (and of comparatively high efficiency) on the free electricity market will be limited as well.

In a number of countries there are methods developed on how to support and subsidise "green energy". To make it competitive, one of the most popular methods is that all the partners of the electricity market cover the cost difference for the production of low-power "green energy". Of course, this complicates the formation of the electricity market prices and their amount.

Conclusions

In the Baltic States transition from the existing national electricity market to the free electricity market in the Baltic region entails major and specific problems:

- the national electricity market in all the Baltic countries is at a developmental stage and proceeds according to different models and at a different rate;
- there are links with Russia and other CIS countries whose behaviour is hard to predict;
- there is no link with the European system; great investments are needed to develop it (the Baltic Ring project).

The regional integrated Baltic electricity market could start operation about the year 2002.

References

1. V. Zebergs, N. Zeltinsh, Yu. Pastors, G. Klavs un citi Energy Tariff Project - Latvia *// Edited by Niels J. Harne - Nelleman, Nilsen & Rauchenberger. Danish Energy Research Programme, 1996: 223 pp.*

2. V. Zebergs, N. Zeltinsh, A. Davis Integration of energy systems of Baltic States into the North - European system for the sustainable energy supply development // *20th Annual International Conference, Int. Ass. for Energy Economics. Vol. II, New Delhi, India, 1997: 561-570.*

3. H. Käär, J. Michna, V. Miskinis, N. Zeltinsh Actual energy efficiency problems in Baltic sea countries being in transition // *Energy Strategies in the Baltic States: From Support to Business (WEC Baltic Regional Forum, Riga, Latvia) Vol. II,1997: 59 - 64.*

4. V. Kreslinš, Yu. Pervušins, N. Zeltinš The Interconnected Baltic Power System: technical basement and development problems // *Latvian Journal of Physics and Technical Sciences, 1997, Nr.5: 17-63.*

5. V. Zebergs, N. Zeltinsh, V. Kreslinsh Latvian and East-European market: towards the EU Policy *// 21st International Conference of the IAEE "*Experimenting with Free Markets: Lessons from the Last 20 Years and Prospects for the Future" *Proceedings, Volume 1, Quebec, Canada, 1998: 233-242.*

6. K. Brinkis Development of common rules for transmission network and main power plant in the Baltic IPS under open electricity market conditions // *International seminar "Common operational rules for the Baltic power systems", Jurmala, Latvia, 2000.*

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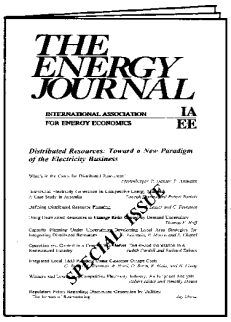

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Renewable Energies and Sustainable Development in Iran

By Reza Fathollahzadeh*

Energy is one of the main factors that must be considered in discussion of sustainable development. There are several definitions for sustainable development including "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Dincer, 1999). Sustainable development within a society demands a sustainable supply of energy resources, which in long term, is readily and sustainably available at reasonable cost and can be utilized for all required tasks without causing negative societal impacts. It also needs an effective and efficient utilization of energy resources. Negative social impacts or so-called social costs occur as a result of limitation in assimilative capacity of the environment. Therefore, planning for sustainable development needs to plan for sustainable energy supply. In this way, environmental amenity would not be sacrificed for achieving a rapid economic growth. Thus, the study of inter-linkages between economy and environment is of commanding importance for policymakers and planners alike.

It is apparent, therefore, that economics has a role to play, since much of economies is concerned with allocating resources to conflicting demands. However, it will also become clear that economic systems, primarily the market system, works very poorly in allocating environmental resources. In other words, market failure occurs. The price system is unable to solve the problem of absolute scarcity, even with a correct set of relative prices in place. Such a failure is only solvable with some limitations on resource use and on population. This makes the role of government more essential both in national and international scenes.

Energy has an essential role in the Iranian economy. It is not only a production input in the productive sectors, but also the revenue gained from energy export has been considering a prime source of finance for development purposes.

In some developing countries, governments do not pay attention to environmental issues due to the extreme limitation in investment resources and a strong appetite for rapid growth. In Iran, recently, environmental issues have become more apparent, while they were almost not a consideration in the distant past. Fossil fuels have more harmful impacts on the environment than other sources of energy, i.e., renewable energies or clean energies. In Iran, the traditional domestic pattern of energy supply and use until the early 1900s was mostly based on noncommercial and self-production energy carriers. Even after exploration of Iran oil in 1908 the pattern was unchanged. Petroleum products had limited use (only for lighting) and were imported from Russia/Azerbaijan. Since 1929, with establishment of Petroleum Product Distribution Company in Iran, the consumption of petroleum products have been increasing (Razaqi, 1988), which in turn tends to increase the share of fossil fuels in the energy basket. Since 1973, along with a rapid growth in Iranian oil export revenues, the pattern of traditional energy demand and supply has moved to a fossil based energy basket. This factor and others such as the great increase in population, energy consumption, industrial activities, etc., has accelerated the rate of environmental destruction in Iran.

Iran has rich natural energy resources including oil, gas and renewable energies. For more than a century Iran has played an important role among energy exporters in the world. Iran holds 90 billion barrels of proven oil reserves, or roughly 9% of the world's total. Iran contains an estimated 812 trillion cubic feet (Tcf) in proven natural gas reserves — the world's second largest and surpassed only by those found in Russia (EIA, 2000). Studies show that Iran also holds a capacity of 6500 MW wind electricity, 7400 MW Geothermal electricity, 42000 MW Hydroelectric powers, and 1800 kWh/m^2 solar electricity. In addition, some preliminary estimations shows that there is capacity to produce 4.6 billion cubic meters per year of bio-gas from municipal wastes and 2.3 million cubic meters methanol from the waste of the sugar industry in Iran (Ministry of Energy of Iran, 1999a).

In spite of the rich potential of renewable energies including geothermal, wind, hydro, solar, etc., the shares of these sustainable energy sources have diminished in recent decades. In 1997, the share of renewable energy (excluding large hydro) in total energy consumption was 0.0004 (Ministry of Energy Iran, 1999a). Real prices of fossil fuels in Iran are much more than nominal prices, since fossil fuels are implicitly subsidized and the social costs and negative externalities of consumption of these fuels are not taken into consideration. On the other hand, because of the relatively low prices of fossil carriers, they are inefficiently consumed, and mismanagement has occurred in almost all economic sectors. Given the exchange rate of the national currency (rial) as one dollar equal to 3000 rials (this is an official export rate), energy intensity is equal to 7.12 barrels of oil equivalent primary energy per one thousand U.S. dollars of GDP. Therefore, energy supply is neither sustainable nor effective and efficient, which as mentioned earlier, are necessary conditions for sustainable development.

Therefore, relatively cheap fossil carriers, and the availability and accessibility of them, have encouraged the limitation of renewable energies in the energy basket of Iran. This has caused some critical environmental problems in the country. Major environmental issues in Iran include air pollution, especially in urban areas, from vehicle emissions, refinery operations, and industrial effluents; deforestation; overgrazing; desertification; oil pollution in the Persian Gulf; and inadequate supplies of potable water. These problems levy a serious financial burden on Iranian government. There is no doubt that in Iran, the allocation of energy resources is inefficient. Therefore, the current pattern of energy supply/demand deters Iran from a path of sustainable development. In this regard, the close connection between renewable energy sources and sustainable development comes out.

Table 1 indicates the private and partial social cost of electricity production by different types of power plants. It is called partial social cost because it is only based on a few kinds of pollutants. Excluding social costs, fossil based power plants produce cheaper electricity. Whereas, taking social costs into consideration, renewable power plants are more economic. The social costs appear as the costs people have to pay for medical treatment as a result of diseases caused by pollution. Figure 1 ranks the power plants by the total production cost of electricity production. The social costs relating to CO_2 are

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Table 1
Private and Social Cost of Electricity Production in Different Power Plants in Iran
(U.S. cent /kWh)

Type of Generator	Private Production Costs	Social Costs		Total Cost	
		SO_x,NO_x	CO_{22}	SO_x,NO_x	+CO_2
Steam using Fuel Oil	4.0	2.9	1.9	6.8	8.8
Steam using Natural Gas	2.7	1.1	1.4	3.8	5.3
Combined Cycle	2.0	0.8	1.0	2.8	3.8
Gas turbine using Natural Gas (Base Load)	2.4	1.2	1.5	3.5	5.0
Gas turbine using Gas Oil (Base Load)	6.1	2.4	1.9	8.5	10.5
Gas turbine using Natural Gas (Peak Load)	3.3	1.2	1.5	4.5	6.0
Gas turbine using Gas Oil (Peak Load)	7.1	2.4	1.9	9.5	11.5
Small Hydro	3.6	0.0	0.0	3.6	3.6
Wind	3.4	0.0	0.0	3.4	3.4
Solar (Photo Voltaic)	64.9	0.0	0.0	64.9	64.9
Solar (Linear Parabolic)	18.2	0.0	0.0	18.2	18.2
Solar (Central Tower)	22.7	0.0	0.0	22.7	22.7
Solar (Sterling dish)	35.7	0.0	0.0	35.7	35.7
Geothermal	3.1	0.0	0.0	3.1	3.1
Biomass	8.5	0.0	0.0	8.5	8.5
Nuclear	8.9	0.0	0.0	8.9	8.9
CHP, (Elec+Heating), Steam using Natural Gas	2.9	1.2	1.5	4.0	5.6
Fuel Cell, Electricity + Heating	12.6	0.0	0.0	12.6	12.6

Source: Ministry of Energy of Iran, 1999b

not a small problem for Iran. The amount of GHG emission in Iran is not inconsiderable, when the rankings in Figure 1 includes the social costs related to CO_2 as well as SO_x/NO_x emission. Figure 2, which ranks the power plants on the basis of private costs plus SO_x/NO_x social costs, is more helpful for decision making.

To sum up, the Iranian government is well aware of the environmental problems and their harmful short/long run effects on the process of sustainable development. The main efforts to achieving sustainable development are: continuing and accelerating conservation policy; reconstructing the

(continued on page 22)

Figure 1
Total Production Cost of Electricity by Type of Power Plant

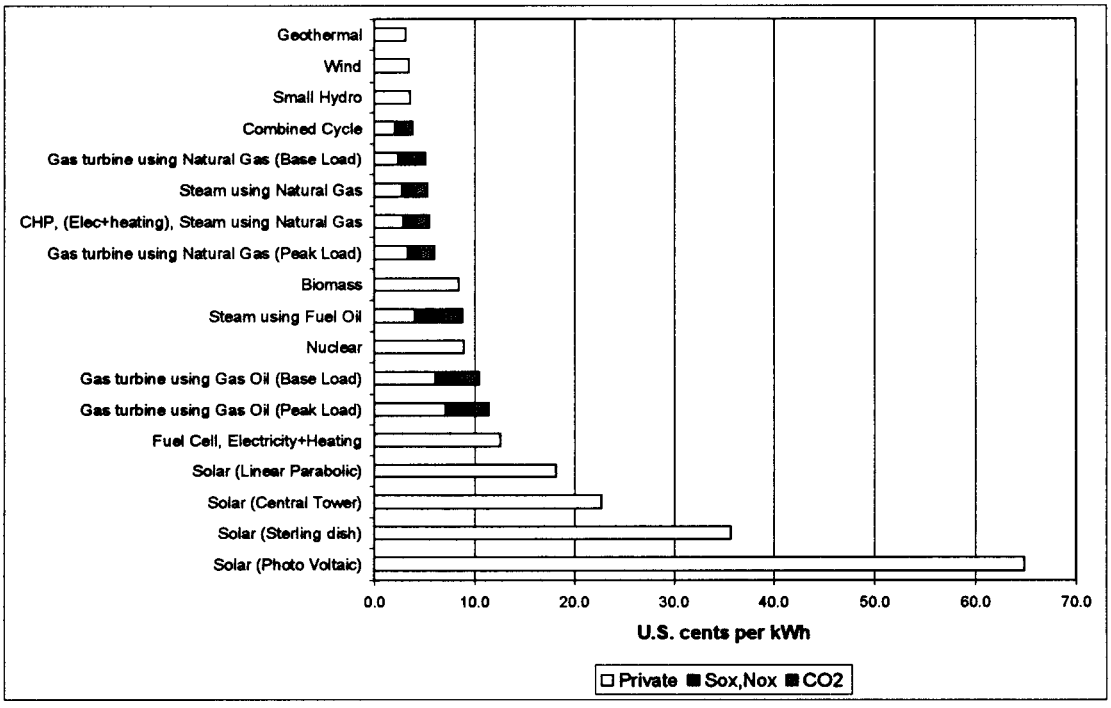
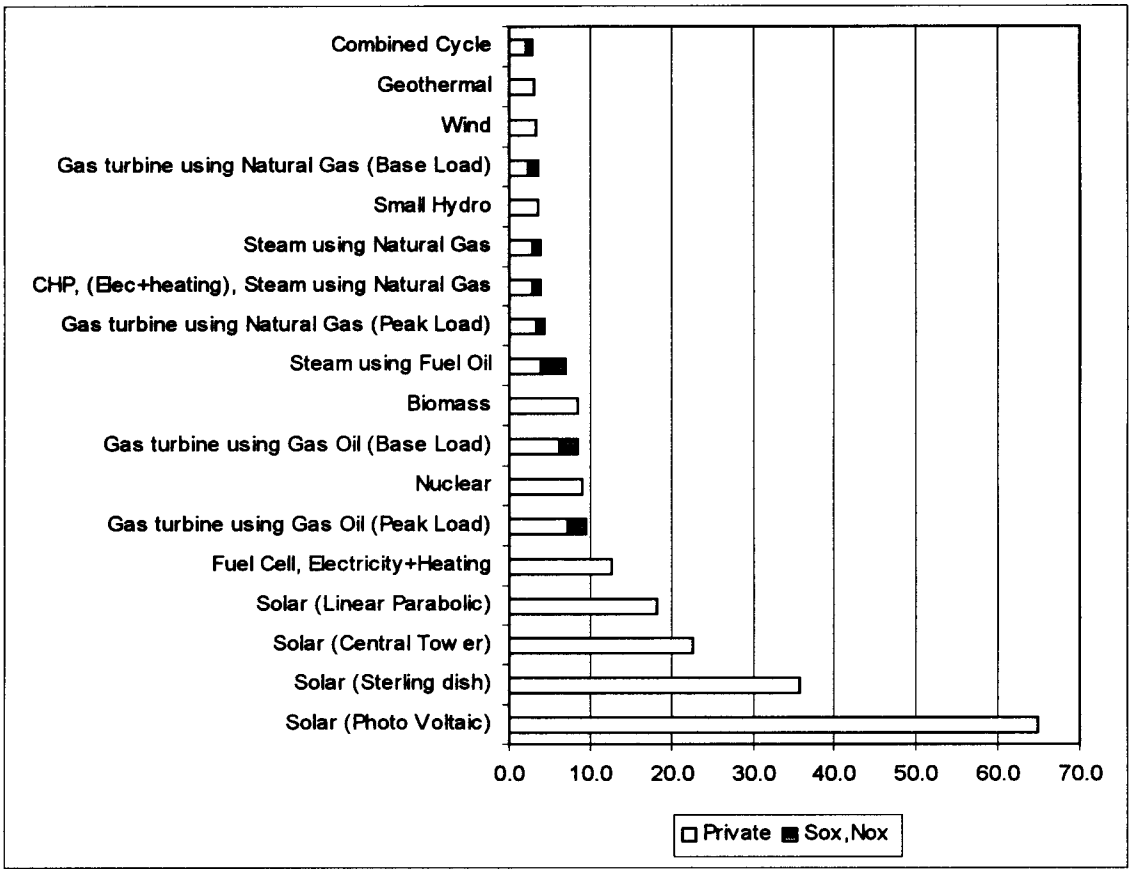


Figure 2
Production Cost of Electricity Including SO_x and NO_x



Renewable Energies *(continued from page 21)*

structure of energy pricing by promoting privatization policy and removing problems in this regard; elimination of implicit subsidies in nonproductive sectors; transforming the implicit subsidies in productive sectors that have relative advantage in international markets into explicit ones; taking social costs into consideration and internalizing the externalities via tradable tariffs, etc.; imposing carbon tax on fossil based energy supply; and stimulating private sector to invest on renewable plants.

References

Dincer I., 1999, "Environmental Impact of Energy", *Energy Policy 27,* pp. 845-854.

EIA, 2000, "Iran", Country analysis brief, Energy Information Administration. Downloaded from Internet: www.eia.doe.gov/emeu/cabs

Ministry of Energy of Iran, 1999a, [in Farsi], "Energy Balance of Iran-1997" Bureau of Energy Planning, Tehran-Iran.

Ministry of Energy of Iran, 1999b, [in Farsi], "Optimal Model of Energy Supply", Energy Planning Bureau, p 29.

Razaqi, E., 1988, [in Farsi], "Iran Economy" Nashr-e-Nei Co. Tehran-Iran, p 498.

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Volume 9, Fourth Quarter 2000

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