A DAILY ENERGY ECONOMICS DOZEN

TWELVE (12) EASY ENERGY ECONOMICS EXERCISES BY

Ferdinand E Banks

NUCLEAR, MACROECONOMICS, OIL, RUSSIA, COAL, JAPAN, WIND, GAS, AND ELECTRIC DEREGULATION

PROFILE of Professor Banks

Ferdinand E. Banks (Uppsala University, Sweden), performed his undergraduate studies at Illinois Institute of Technology (electrical engineering) and Roosevelt University (Chicago), graduating with honors in economics. He also attended the University of Maryland and UCLA. He has the MSc from Stockholm University and the PhD from Uppsala University. He has been visiting professor at 5 universities in Australia, The Czech University (Prague), Stockholm University (?), Nanyang Technical University in Singapore, and has held energy economics (guest) professorships in France (Grenoble), Hongkong, and the Asian Institute of Technology (Bangkok). The main portion of his military service was in Japan (infantry) and Germany (artillery), and he was employed for one year in the engineering department of the U.S. Navy at the Great Lakes Naval Training Station (Illinois). He has also been a lecturer in mathematical and development economics in Dakar (Senegal) for 15 months, and macroeconomics at the University of Technology in Lisbon (Portugal) for one term. He was an econometrician for UNCTAD (United Nations Commission on Trade and Development) in Geneva (Switzerland) for 3 years, and fellow of the Reserve Bank of Australia when visiting professor of mathematical economics at the University of New South Wales (Sydney) for one academic year, and later taught at Sydney University of Technology for 2 months under the auspices of the University of New England. He was a consultant for the Hudson Institute in Paris, and a systems analyst and applied mathematician for a consulting firm in Chicago. He has published internationally 12 books, to include 2 energy economics textbooks and an international finance textbook, and 200+ articles of various lengths. His new (13th) book ENERGY AND ECONOMIC THEORY has just been published by *World Scientific* (Singapore, London and New York) and he is finishing an elementary book on energy economics called ENERGY ECONOMICS: A MODERN FIRST COURSE. As for these exercises, they are actually readings, but I prefer to label them exercises because that is what they were called at Forts Jackson and Orr, and Camp Majestic (Japan) and Hardt Kaserne (Germany).

1. A NUCLEAR ENERGY UPDATE

AN IMPORTANT INTRODUCTION: UNCOMMON KNOWLEDGE

Try thinking about and never forgetting the following. France and Sweden may still have the largest nuclear inventory per voter in the world, and they also once enjoyed the lowest electricity prices in Europe, and perhaps the world. Their nuclear reactors also have an admirable safety record, despite the 'advanced age' of some of this equipment. Something else that you should find of interest, and which deserves close attention, is that according to the CIA 'Fact Book', Japan is one of the most nuclear intensive countries in the world, but at the same time, on the average, its residents have the longest life expectancy in the world for residents of a major industrial power. The life expectancy in non-nuclear Denmark (and non-nuclear Norway) is below that of nuclear intensive Sweden and *very* nuclear intensive Japan. The CIA 'fact book' has Monaco at the top of life expectancies, but tiny (and rich) Monaco is 'surrounded' by nuclear intensive France. According to the Japanese government there were no casualties at Fukushima that can be attributed to nuclear failure, and according to the U.S. government, none at all at Three-Mile Island. As for Chernobyl, the casualty count provided by the Russian government is not something that I repeat because it sounds too low. There are more than 400 reactors in operation today, many are being constructed at the present time, and even more are in the planning stage. Given this situation, I find it very easy to accept that there will be well over 500 in a decade, and you should accept it too instead of pretending that nuclear is a lost cause. Some of those reactors might be breeders, and according to Professor Jeffrey Sachs (of Columbia University and the Earth Institute) nuclear is the only sensible way to deal with the climate disruption problem.

THE MAIN ORDER OF BUSINESS

The above introduction should get readers into the rhythm of the present short exposition. But please take my advice and do not expect this service from *The International Handbook on the Economics of Energy* (2009), which is more than 800 pages, and contains many articles. It ignores nuclear energy however, which strikes me and should strike you as odd, but maybe that doesn't matter. On the basis of a brief perusal, I believe that like most publications that ignore nuclear where the real as compared to the fictional energy future is concerned, it deserves to be considered pedagogically worthless.

Thus I begin this contribution with the following important message: the nuclear facility at Fukushima was constructed about 40 years ago from blueprints prepared 5 or 10 years earlier. Suddenly it was a victim of one of the most powerful earthquakes ever experienced in Japan in the last 200 years, and also in the path of a destructive tsunami that featured waves up to 40 meters high along portions of a 100 kilometer stretch of the Eastern Japanese coastline. To some extent the survival of the Fukushima nuclear facility could be described as a structural miracle, and as indicated by the testimony of the Swedish diplomat and nuclear expert Hans Blix, its survival demonstrated what we

have the right to expect from future generations of (technologically superior) nuclear equipment.

The bottom line here is that exuberant claims about the utility of nuclear energy should not only be tolerated, but promoted, and where the teaching of nuclear economics is concerned, as much emphasis should be put on history as on economics, because history is where the truth about nuclear is to be found.

Sweden is the perfect country in which to study both disciplines. About 45 percent of the electric production *capacity* in Sweden (in e.g. Megawatts) is accounted for by nuclear, although annually – at various times in the past – nuclear probably provided at fifty percent of the *electric energy* (in Megawatt-hours) produced in Sweden. Initially, nuclear and hydro gave Sweden some of the lowest cost and price of electricity in the world (and the same is true of the output of carbon dioxide). The pointless deregulation of electricity put an end to that very favourable price arrangement.

More significant, the Swedish nuclear inventory of 12 reactors was installed in slightly less than 14 years, which was a feat of technological brilliance that in some respects was analogous to the expansion of the United States Navy and Air Force in the years immediately after the attack on Pearl Harbor. (At least eight of these Swedish reactors were produced by ASEA, which was a Swedish firm that inexplicably was moved from Sweden to Switzerland in 1988, becoming the A in ABB, or Asea Brown-Boveri.)

Something I never fail to stress in my formal lectures or informal harangues is the importance of moderately priced electricity for an industrial economy, and on that score Sweden was once in the forefront of world economies.

Unfortunately, that lovely situation turned out to be unacceptable to the local anti-nuclear booster clubs, who together with self-appointed energy experts from Sweden and elsewhere unleashed a torrent of lies and misunderstandings about nuclear energy that eventually resulted in the bad news for consumers of electricity that sometimes characterizes the Swedish electric market. During the last few years, the price of electricity to households in Sweden has occasionally been extremely high, although – wisely – electricity may still be sold to Swedish industries at a lower price.

If we take a careful look at the time series of global macroeconomic growth from the end of the second world war (WW2) to the present, we can distinguish two distinct segments. The first is comparatively smooth, and stretches from the end of WW2 until the middle of the l970s, or shortly after energy prices began to rise in an unexpected manner. Unexpected in the sense that the countries comprising OPEC decided to take control of the energy resources within their borders.

The second segment, from the middle l970s to the present, which I discuss in my forthcoming energy economics textbook (2015), featured an irregular growth that doubtlessly resulted from the occasional drastic increases in all energy prices that began with the first oil price shock, and whose impact effect was a reduction in the rate of the productivity growth in almost every industrial country.

This was a kind of 'sneak preview' of the macroeconomic meltdown that would begin in the latter half of 2008. Another consequence of the energy price rise – i.e. oil primarily, but also other energy resources – was *stagflation*, or the simultaneous occurrence of inflation and increased unemployment.

Unless national energy structures are 'adjusted', these miseries might accelerate if the prices of the main fossil fuels begin to escalate again, which is a misfortune that I consider likely, though perhaps not in the short run, and which I prefer not to discuss here. I will suggest however that t*his judgement particularly applies to oil and natural gas, and initially will likely be due to geopolitical rather than geological causes*.

In case a possible 'adjustment' for *countries like Sweden* is necessary, I would like to suggest reinforcing hydro, if hydro is present, with an optimal collection of renewables and alternatives, as well as maintaining the presence of nuclear, increasing its efficiency, and eventually adopting the next generation of reactors and its variants in both present and smaller sizes. I also think it 'politic' to assume that nuclear will be an indispensable *complement to* (and not *substitute for*) any conceivable mix of renewables and alternatives, and also to accept that a fraction of these renewables and alternatives would be an optimal political but suboptimal economic concession to voters and politicians who are unable to understand the exterior (or historical) logic of science and engineering in or for that matter outside their countries, and to a certain extent are offended by that logic, which happens to be the situation in Sweden.

As Sigmar Gabriel, Germany's economy and energy minister, made clear, "we have reached the limit of what we can ask of our economy." What he meant – but obviously could not say – was the limit of what could be asked if the proposed liquidation of nuclear energy in his country becomes a reality. Notice the word "if", because a *genuine* as opposed to a *synthetic* dumping of nuclear will *never* take place in Germany or Japan. Gabriel also said that "Germany had been financing the learning curve on renewable energy for other European countries", which might be the reason that he has called what he regards as the Swedish portion of that 'debt' due.

To be specific, Gabriel understands as well as I do that wind and solar can NEVER replace nuclear in Germany, nor any other civilized country, nor was that the intention of his government, even if it sounded good to persons who consider it elegant to believe lies and misunderstandings. The replacement for nuclear in Germany is – and will

remain for a while – imported electricity and coal, and so he contacted the Swedish prime minister (Mr Lõfven) and humbly requested that the Swedish firm Vattenfall should not abandon its coal mining activities in Germany, which may or may not have been about to happen, even though the lies that the directors of Vattenfall once spread across the world about their CCS (or 'carbon capture and sequestration') activities in that country probably set a new record where contempt for the intelligence of Swedish and German politicians and journalists are concerned, and also some of the employees of their firm.

Another thing that is easily understandable, according to Jochen Eberhard – senior executive at the Fraunhofer Institute – is that "too much attention has been placed on costly renewables, and far too little on energy flexibility and flexibility of energy demand". I'm sure that he is correct, and especially correct when he says that "this led to a *rather* high electricity price (except for those companies who got an exemption from the government from the eco-tax and the surcharge of the renewables' cost)."

Hearing this tells me – as it should tell you – that other countries should not make the mistake of trying to assist the German Chancellor (= President) Angela Merkel and her friends, because what they are trying to do is to make the impossible possible by manipulating subsidies of one sort or another. Instead, the governments of countries that export electricity to Germany should attempt to reintroduce German voters to reality rather than helping to prolong the fantasy of their counter-productive *Energiwende*, and one way to do this is to reduce electricity exports to Germany, *which will keep electricity prices from rising in their own countries*. Thanks for nothing, Germany, is the proper farewell here, and an unmistakeable gesture of disrespect should also be tendered politicians in every state or city who deem it correct to increase the price of electricity in their countries in order to make a success of the attack on local living standards that will be experienced if the E*nergiwende achieves its goals*!

REFERENCES

Banks, Ferdinand E. (2015). *Energy and Economic Theory*. London, New York and Singapore: World Scientific.

_____. (2007). *The Political Economy of World Energy: An Introductory Textbook.* Singapore and New York: World Scientific'

2.THE OIL PRICE AND MACROECONOMICS

In the silence of my lonely room, and sometimes in crowded seminars, I enjoy thinking about my forthcoming books and lectures, which will almost certainly lead to my describing Professor James Hamilton as the leading academic oil economist in the United States (U.S.). I want to make it clear though that I don't know that scholar, nor

do I want to know him, because although we share the same outlook on the past and future of oil, he has never mentioned me in his publications, despite my citing and alluding to his work whenever I get the opportunity.

Hamilton (2012) has carefully examined the relationship between increases in the oil price and the negative effect they have on the U.S. economy , beginning at the end of the second world war (WW2), until the early years of the last decade of the 20th century. His results are similar to those of Professor Andrew Oswald of Warwick University and later myself, but much more thorough than mine, and covering a longer period. The thing that my future energy economics students will kindly be asked to remember is Hamilton's claim that "*all but one of the recessions in the United States since WW2 were preceded – typically by about 9 months – by a dramatic increase in the price of oil*."

This is an important macroeconomic observation, and you should make every attempt to remember it and to repeat it to friends and neighbors if you get the opportunity. It is the kind of contention that you can take to the bank and draw interest on, although in later articles and conference papers, and of course on the blogosphere, his research likely goes as far as the present day. I might as well confess however, that for the period 1991 to the present, my own work on oil economics ranks with any that has been done anywhere in the world, and as a result I will use this opportunity to give readers my version of exactly what happened on the global oil market in the early years of this century .

From the formation of OPEC in 1961, until at least the beginning of the twenty-first century, it was the intention of that organization to manage not only the oil in their countries, but also to exert a decisive influence on the global oil price. In order to do this efficiently, complete (or nearly complete) unanimity among the directors of that cartel was required, and as far as I can tell they did not obtain sufficient like-mindedness to achieve their goal until the price of oil fell below ten dollar a barrel (= $10/b), and the amateur energy experts – or 'know-nothings' and charlatans as I usually call them – in the oil importing world, began talking foolishness about it reaching $5/b. That was when even the 'independent thinkers' in the OPEC executive suite in Vienna saw the light, and fell into line with OPEC's main men.

Econometrics is a familiar item in advanced academic economics, and I taught it for a few years in Stockholm and Uppsala. It was also one of the reasons why I was given the opportunity to spend 3 years in Geneva (Switzerland), but eventually concluded that playing econometric games was too rich for my blood. However some simple calculations that I made about 2005 indicated that the oil price had started to accelerate upwards, and a 'slow motion' oil price escalation was probably underway.

A few years later, while I was giving a long talk on oil at the Ecole Normale Superieure (Paris), that price was on its way into orbit, and eventually it reached $147/b, which provided OPEC with the income they had been dreaming of since the formation of that organization. Something else that you might find interesting is that a few of the leading oil experts in the world thought that the price would climb as least as high as two hundred dollars a barrel. Fortunately, a high degree of intelligence and rationality prevailed in the OPEC executive suite, and so there was no attempt to over-exploit a good thing.

Unfortunately however, according to myself and Professor Hamilton, the macroeconomic damage had been done. As much as I hate to say it, the machinations of speculators, and the clumsiness of bank directors and politicians had very little to do with the bad economic news that began in 2008, which is best described as the most serious economic downturn since the great depression (that began in l929).

Future students of mine will have to demonstrate a perfect understanding of the above if they prefer a passing to a failing grade. They will have to recognize the power of an organization like OPEC, by which I mean the present as well as the past power. The recession triggered by the oil price escalation that culminated in 2008 cut the ground out from under the global macro-economy, and as a result the demand for oil fell in such a way that the oil price bottomed out at about $32/b. OPEC reacted to this situation by simply reducing production by a small amount, and the oil price quickly climbed to $72/b. *This is the most important thing for you to remember should you find yourself in a conversation on oil with persons who think that they know more than you do!* Shortly after – with the global macroeconomic apparatus still in disarray – the oil price kept moving up, until finally the aggregate oil price exceeded $100/b and touched $147/b, although the demand for oil was not increasing rapidly. Later it settled for a long period in the vicinity of $100/b.

In case you haven't heard, with that price ($100/b) OPEC's income was a trillion dollars a year. Not bad for a syndicate that Nobel Laureate Milton Friedman and some of his colleagues at the University of Chicago pictured as a losing proposition.

It is also useful to cite what happened when the war in Libya began – a war, incidentally, that was about oil and not protecting civilians, as the ignorant NATO president claimed. Oil production in Libya almost ceased, which meant that about 1.7% of the global oil output disappeared. That loss was enough to cause the oil price to increase by approximately 17%, as you have might have been informed by me on many occasions.

Even students at the store-front university in Chicago from which I obtained my economics degree should be able to calculate and interpret the short-run elasticity of the

oil price from those numbers, and if they are hooked on nonsense about speculation, also realize that OPEC receives all the help it needs from large oil producers who, surprisingly, prefer high to low oil prices, and in concert with OPEC understand how to make the moves that are necessary to obtain them. PLEASE REMEMBER THIS TOO!

Much more will be said about oil in my forthcoming textbooks (2015), but right now I want to mention some thoughts of the billionaire Canadian investor Stephen Jarislowsky, which are especially appropriate when dealing with energy economics.

"We're living in just about the most dishonest time in the history of mankind. It's theft from A to Z". Well Steve, it's also lies and misunderstandings, where by the latter I constantly refer to President Obama's belief about natural gas, and where the former is concerned the persons who have provided the commander-in-chief with his counter-productive opinions about energy, since I am certain that a few of them know almost as much about that issue as my good self. Actually, they should know a great deal more, because in theory they are in the lovely position of being able to obtain all the information they want or need, at any hour of the day or night, from world-class economists, managers and scientists.

REFERENCES

Banks, Ferdinand E. (2015). *Energy and Economic Theory*. Singapore, London and New York: World Scientific.

____. *(2015). Energy Economics: A Modern First Course.* (In Process)

Hamilton, James (2012). 'World oil production is not going to increase forever'. Working paper, University of California (San Diego).

3. AN UPDATE ON THE ECONOMICS OF THE GREAT COAL GAME

Several years ago I politely asked every student in my course on oil and gas economics at the Asian Institute of Technology (AIT) in Bangkok to master some important materials dealing with the availability of oil. By "master" I meant learn perfectly, assuming they preferred a passing to a failing grade. In the future I plan to practice the same approach with nuclear and natural gas.

On the other hand, I have not dealt with thermal (or steam) coal for many years, and although there are chapters on coal in my new textbooks (2015), I am actually a bit vague as to how I should approach this subject in the classroom, where it is possible to encounter environmental issues that that I might feel comfortable avoiding. One thing though is certain, which is that regardless of what people think about coal, they are going to continue to use it, and probably more than ever. They are already doing this in Germany, although cleverly concealing this fact with a symphony of lies and promises

that apparently are necessary to keep the Energiwende (= Energy Transition) on the rails.

In a book I wrote on coal many years ago (1985), I predicted that under no circumstances was it likely that the price of coal would be greater than fifty dollars a metric ton (= $50/t). That is slightly under the global average price at the present time, although it has happened that the price of coal has at least touched $100/t, and now I must admit that it may do that again in the future. The explanation for the latter price, as is almost certainly well known, is an explosion in the demand for coal by China and – to a lesser extent – India over the past few decades.

Now for the term 'game'. If you study economics for more than a year, it is almost certain that you will encounter that expression: to be precise, '*Game as in game the*ory'. I have taught various amounts of 'game theory' in many countries, and eventually came to the conclusion that most of it is sophisticated bunkum and a waste of time, even though I occasionally like impressing my students with my ability to use and teach the algebra and elementary calculus in books on that subject. The principal thing that it has in its favor is its association with John von Neumann, often described by his peers as the 'best brain of the 20th century' and sometimes credited with being the founder of game theory, which may or may not be true.

In any case, together with Oscar Morgenstern he wrote *Economics and the Theory of Ga*mes, which is a book read by very few, but mentioned by many. I have neither read nor wanted to read more than a few pages of that book, because I happen to know that the biggest mistake made by students of economics, and unfortunately energy economics, is their incorrect choice of reading materials, and the same is true of some of the goofy choices of their teachers where teaching tactics and strategies are concerned.

In any event, during a war-time taxi ride in London, von Neumann explained to his colleague Jacob Bronowski – as is recounted by William Poundstone (1992) – that real life game theory is not the sort of thing that you see splattered on black and white boards at Harvard and Oxford universities, but "bluffing, little tactics of deception, and asking yourself what is the other man going to think I mean to do." I suggest that you adjust this to 'the other man or woman', and add to this roster *the flamboyant dissemination of lies and the promotion of misunderstandings.*

The position I am approaching in this discussion is that much more of the commodity coal is going to be burned than commonly believed, and to help make this happen a game will have to be played in which there are frequent assurances by well-meaning (or slightly confused) decision makers that much of this coal will be cleaned – or for that matter will not be cleaned, but it doesn't matter because the resort to coal is

a temporary measure before there is an all-out and glorious resort to renewables. I am thinking of course of Germany, and perhaps of China.

The basic arguments here can be found in the articles of Victor and Cullenward (2007) and Victor and Rai (2009), but I do not need their arguments or those of anybody else. I know that a game is in progress, featuring the lies and deceptions mentioned by von Neumann, and also strategic considerations such as bluffing, disinformation and the systematic exploitation of options provided by prevailing attitudes and politics.

Let me extend that remark. Pollution-wise, the great coal game features a play now-pay later format, distinguished by the barely concealed hope of dominant players (and/or their advisers and supporters) that the water will not begin to rise on Canal Street (in Amsterdam) or the Reeperbahn (in Hamburg) before the music starts at the 'end-of-century' parties on December 31st, 2099. Of course, that date is more than a lifetime away for many voters, although I do not think I am exaggerating if I say that for most of the ladies and gentlemen in the game whose role is passive until it is time to cast a vote, it wouldn't make any difference when the bad news arrived, as long as they are not forced to think about the downsides of an excessive consumption of coal in the near future. Unless I am mistaken, this outcome is being made possible today in Germany by a manipulation of subsidies.

Joe Hung (2010) said that coal is the most rapidly growing fuel source in the world. He also pointed out that it is broadly distributed and most important, the energy in it exceeds that of all other fossil fuels combined. If you want to prove this, I suggest using the techniques alluded to in the first chapter of my book *ENERGY ECONOMICS: A MODERN FIRST COURSE*. By the same token, if you are deeply interested in the longevity of actual and hypothetical energy reserves, then you should examine what you should be able to obtain from uranium and thorium reserves burned in the next generation (Gen 4) of nuclear reactors.

Johanna Rose (2010) once claimed that China opens a new coal-based electricity generating plant every week, although I suspect that this claim is slightly in error. Regardless, the Chinese, Indian, and U.S. consumption of coal, reinforced by a few other heavy consumers, will ensure that carbon dioxide (CO_2) emissions into the atmosphere overwhelm any countermeasure, where one of these countermeasures is the cap-and-trade foolishness that we heard so many positive things about in the learned literature a few years ago.

What about technological countermeasures. Some of those were mentioned by colleagues at Nanyang Technological University in Singapore, and when I returned to Sweden I heard about them from Jeffrey Michel, who is a graduate of MIT and one of the most important energy commentators in Germany. The technique he focused on was

'carbon capture and sequestration' (CSS), which he referred to as a "thermodynamic travesty", although 'economic travesty' will suffice, because adoption of this procedure will greatly increase the cost of a power plant burning coal.

Two things have interested me about CCS. The first was the so-called CCS activities of the Swedish firm Vattenfall in Germany, which was surrounded by a swarm of lies, the most grotesque of which was the so-called zero-emission operation at *Schwarze Pumpe* in eastern Germany, which is supposed to be a pilot operation. I prefer to think of it as a publicity stunt exploiting the naiveté of half-educated academics and journalists rather than a serious attempt to solve a weighty problem. I can also mention the explicit recognition – though not elaboration – of CCS by the editor of the site *OilPrice.Com*, which made it clear to me that my departure from that site should have come much earlier, because the example he cited and was impressed by involved the U.S., where CCS is generally recognized as a scam, though not on the scale of Vattenfall's German operations, which ostensibly called for CO_2 being transported about 300 kilometers, and then pumped into caverns below the surface of the earth or the Baltic Sea.

Exactly what is the point here? The point is that the games that John von Neumann was thinking of that involved lies and deceptions are the real deal, and often function magnificently, at least for a while. One of the best example thus far in the 21st century is the *Energiwende* in Germany, which with its increased resort to the mining and consumption of (low quality) coal is more than a scandal that will be eventually exposed. In the context of the Energiwende it is also scientifically absurd, although it will likely escape recognition as such.

REFERENCES

Banks, Ferdinand E. (2015). *Energy and Economic Theory*: Singapore, London and New York: World Scientific.

_____, (2015). *Energy Economics: A Modern First Course*. (In Process).

_____. (1985).*The Political Economy of Coal*: Boston: Lexington Books.

Harlinger, Hildegard (1975). 'Neue modelle für die zukunft der menshheit' IFO Institut für Wirtschaftsforschung (Munich).

Hung, Joe (2010). 'Coal: the contrarian investment'. *321 Energy* (April 10).

Poundstone, William (1993). *Prisoners Dilemma*. Oxford: Oxford University Press.

Rose, Johanna (2010). 'Drömmen om rentkol'. *Forskning & Framsteg* (March).

Victor, David G. and Danny Cullenward (2007). 'Making carbon markets work'.*Scientific American* (March 15)

_____. and Varun Rai (2009). **'Dirty coal is winning'**. *Newsweek*. (October 30)-

4.SEIZING THE ENERGY DAY

Edward Lucas is called a 'Senior Vice President at the Center for European Policy Analysis', and Senior Editor of *The Economist*. I am an academic energy economist, and especially enjoy making the claim that I am a brilliant lecturer.

During the 5 or 6 years I taught international financial economics at Uppsala University, I made it quite clear that the *The Economist* was not to be discussed or even enthusiastically mentioned in my presence. When, at the parties to which my students invited me , if I were asked about that policy, I said that I regarded *The Economist* as a "compendium of London wine bar gossip", and not only were students never to mention it to me, but if some of the Japanese 'Thought Police' who were often referred to in the Chicago of my youth were still alive and were 'free-lancing', I would try to get them invited to those wonderful gatherings in order to scrutinize the brain waves of my students in case some of those young ladies and gentlemen possessed a sensual fascination for *The Economist.*

In an op-ed piece in *Svenska Dagbladet* a month or so ago, Mr Lucas claimed that Russia is exporting "corruption and influence" along with its natural gas. If he visited Sweden I would ask him to come to my university to explain this interest of his in a complicated subject like natural gas, and regardless of his reply, I would profess to be honored if he and/or one or more of his colleagues would visit my classroom to present a lesson on that or similar subjects to me and my students. What I would NOT tell him however is that anyone appearing in *my* classroom to give *me* a lesson on any energy topic would be made to feel so inferior that they would never want to hear words like 'natural gas' again.

Apparently Lucas was able to gain access to the op-ed page of a Swedish newspaper because of the alarm that many readers feel about what has happened on the Eastern border of the Ukraine, and the appearance of some Russian aircraft close to Swedish air space. Frankly, I also cannot understand those events, they strike me as irrational, and because of them I wonder if Mr Putin is not imbibing too heavily in some of the liquids that certain foreign visitors of my acquaintance were invited to sample at Russian breakfast tables.

But you see, I know some things that Mr Lucas and his associates do not know. When the North Korean army invaded South Korea, if the U.S. government and/or military had been thinking clearly and not dealing in fantasies like those supported by Mr Lucas and his Economist foot soldiers, they would have immediately sent every tank and combat aircraft in the U.S. to Korea. Instead this equipment and some other assets were kept in the U.S. (and Europe) to fight a war that was NEVER going to take place, given the huge superiority at that time of the U.S. nuclear arsenal. I lost some of my best friends in that war, and so you see I am supremely unimpressed by the ignorant beliefs that Lucas & Co have about a country (Russia) that I claim will one day be the richest in Europe, and maybe in the world.

Now for this 'seizing' business. I encountered it in a recent edition of the *Economist* (2015) that was on a shelf in the library in the Economics building at Uppsala University, and of course the word energy forced me to open that publication. How is this for nonsense: "A carbon tax is a much better way to reduce emissions of greenhouse gases than subsidies for windmills and nuclear plants." Or for that matter the talk about "exploiting the oil and gas in the shale beneath the feet of Europeans", and as icing on a smelly cake the ban on energy exports by the U.S. is termed a "*boondoggle*" for American refiners and petrochemical firms. Actually, the continued ban on energy exports in the U.S. is one of the few things that makes sense about the Obama government.

***I also want to take this opportunity to claim that the only thing better than subsidies for nuclear plants is governments and private enterprises working together to develop and utilize the nuclear technologies that will become available during this or the next decade, and doing so immediately*. As for the shale beneath the feet of Europeans, the CEO of none other than Exxon Mobil pointed out that shale clays in Europe do not make the cut, although this might change in the future. What will not change is the exceptional *natural depletion* of shale deposits, which is a condition that OPEC clearly understands, and probably underlies their new-found fondness for 'market pricing', nor the stupidity of Americans putting (or thinking about putting) their precious energy resources on the block. Yes, better a *boondoggle* for American firms – especially petrochemical producers and their suppliers – than supplying foreigners with the energy means to compete more successfully with Americans.**

REFERENCES

Banks, Ferdinand E. (2015). '*Energy and Economics theory'*. Singapore, London and New York: World Scientific.

_____. (2015). *Energy Economics: A Modern First Course*. (In Process)

The Economist (2015*). Seize The Day*. (January 17)

5.A SETTING SUN FOR OIL?

A recent week was a bad week for fossil fuels in Sweden. The well-known Professor Jeffrey Sachs, boss of the influential Earth Institute and professor of economics at Columbia University, was in Stockholm, and he apparently declared that not only oil but also the other fossil fuels will soon be on their way out. Finished! Kaput! Luckily, unlike many of his admirers in Stockholm and New York, he did not add nuclear to that list, because if he had he might have been compelled to accept a string of highly paid speaking engagements and simultaneous guest professorships in this country before being allowed to tender his final farewells.

Compelled how? Compelled by a threat to remove his name from the Nobel short list if it happens to be there.

Unfortunately, his hosts did not bother to solicit his opinion about the strange behaviour of the richer countries in OPEC, who together with the unenthusiastic cooperation of several of their less fortunate colleagues recently informed the oil importing countries that in the future they will turn the setting of the oil price over to the market.

That sounds beautiful to some ears – perhaps like something you could have heard in economics 101 lectures at the University of Chicago when Professor Milton Friedman was strutting his stuff, where his stuff included a crank claim that OPEC was a lost cause, and the oil price was on its way to five dollars a barrel. Accordingly, this is the place to declare that the movers and shakers in OPEC have no intention of allowing the market to determine anything important about the oil in their countries, and eventually this might also be true about natural gas. Why should they? Would you if you were in their place?

When the oil price touched $147/b in 2008, OPEC knowingly supported the myth that it was speculation (i.e. gambling) and not fundamentals (i.e. supply and demand) that was the villain. That absurd allegation suited the fancy of a finance professional named Michael Masters, who appeared before a sub-committee of the United States Congress, and assured those ladies and gentlemen that it was speculation and not buying and selling on the *physical* oil market that was ruining the lives of American motorists. The Fox News star, Mr Bill O'Reilly, also took a part in this discussion, informing admirers that it was 'little guys in or of the Las Vegas genre' who created the problem.

If you don't believe anything else in this exercise, please believe that neither Mr O'Reilly nor Mr Masters nor the persons they broke bread with during that dramatic period had any accurate knowledge about the functioning of the world oil market. The aforementioned price – $147/b – was due to the demand for physical oil 'outrunning' the supply, and was sufficient to initiate the most severe economic and financial meltdown since the great depression. Moreover, while it was not clear to many observers, it was clear to me that if the oil price villains had been in the financial district of New York, President Bush could have taken the morning train or a Greyhound Bus to Wall Street, and using the very great powers of his office, put things right before lunch was served.

Instead he climbed into Air Force One and flew to Saudi Arabia, where he asked the Saudi King to produce more oil, and preferably sooner rather than later. That 'hat-in-hand' episode was concluded very shortly after the delivery of the president's

request, with King Abdullah thanking him for his concern, and wishing him a safe trip home.

The oil price soon began to decline, but unfortunately this failed to restore the health of the international macro-economy. Some non-thinkers and self-appointed experts said that it was headed for five or ten dollars a barrel, but in reality it was headed for $32/b, at which point OPEC calmly stepped in with a substantial reduction in output, and the oil price began to climb again. It paused at just over $70/b and then proceeded to around $100/b, which was sufficient to provide OPEC with an income of almost a trillion dollars a year. IT WAS THIS BEHAVIOR THAT SHOWED THE POWER OF OPEC, and that power still exists. It exists and for that reason the decision to commence the export of (light) American oil – although the U.S. is still an importer of oil and natural gas – does not make the slightest economic sense.

Earlier, output in the U.S. peaked at the end of l970 at the level of about 9.5 mb/d – which is approximately the present output of Saudi Arabia and Russia (and the U.S.). When that peaking took place there was still an enormous amount of oil in the United States, or directly offshore, but even so production dropped to 7.5 mb/d! When the giant Prudhoe Bay field in Alaska came on line, the total output in the U.S. turned up, but unfortunately the previous peak was not attained, and eventually production began to decline again. Fortunately though, shale oil entered the picture, and now U.S. oil production is in the same category as that of Saudi Arabia and Russia.

The question then becomes what will happen to the U.S. oil production in the future, and to answer this a few words about the price of oil might be useful? As I enjoyed telling my macroeconomics students, although genuinely rich people tend to be annoyed by a decline in their income, the key thing for intelligent ladies and gentlemen in that category is that their 'capital' remains intact. The oil producers in the Gulf are more than genuinely rich, and a very large portion of their capital consists of oil in the ground. Regardless of the message given his hosts in Stockholm by Professor Sachs, if he or they had asked me I would have assured them that the value of those reserves will increase over time.

They will increase because the consumption of oil is going to continue increasing, both in the vehicle intensive U.S. and elsewhere, regardless of what the good Professor Sachs thinks should happen.. After examining the statistics for reserves, reading and thinking about the rapid depreciation/decline of shale deposits, observing and hearing about the 'flattening' of some shale production curves, constantly hearing about persons calling the shale 'revolution' a scam, I have decided to believe that the U.S. shale 'boom/revolution' is in danger of running out of steam, but not the appetite for travel or

motion or pleasure in that country or any other country: this is something that has no limit. Where the latter is concerned, to quote Marlene Dietrich (who very definitely was in a position to know), "the pursuit of pleasure has become a veritable sickness". Had she attended my lectures, I would have made a point of explaining to her and her colleagues that a feature of this obsession is a rising discount rate on future as compared to present 'utility'.

A CLOSING STATEMENT

As alluded to in the first paragraph of this note, Professor Sachs did not provide his hosts with a nuclear-friendly message before leaving Sweden (although there might be one when or if he makes an appearance at the forthcoming climate talkathon in Paris later this year.) But an explicit message just now is unnecessary, because GOOGLE will tell you he believes that nuclear is the only way that the (alleged) climate menace can be efficiently dealt with. This is an important observation, but I am not certain that it is completely correct.

I have also informed friends and neighbours that nuclear is necessary, but made it clear that an important change in attitude is necessary on the part of the decision makers if we are to have these assets by the time they are needed. This is a change that is unlikely to take place because of the confusion created by the adverse developments on the income distribution front, and the increase in the global population of about 750 million persons per decade.

Adverse developments on the income distribution front and the increase in the global population of about 750 million persons per decade. If you take the trouble to put those two things together and give them a few minutes of serious thought, then you – like me – cannot avoid concluding that Professor Sachs may not be correct if he believes that fossil fuels can or will be dismissed during the time frame he considered during his visit to lovely Stockholm.

REFERENCES

Banks, Ferdinand E. (2015). ***Energy Economics: A Modern First Course*****. (In process.)**

_____. (2015). ***Energy and Economic Theory*****. London and Singapore: World Scientific**

.

6.A RUSSIAN ENERGY REALITY

Russia is not some Zimbabwe-to-be. It's sitting on a surplus of foreign assets and very healthy foreign exchange reserves of around $375 billion. Moreover, it has a strong debt-to-GDP ratio of just 13% and a large (and steadily growing) stockpile of gold. This is why Russia will arrest the ruble's slide and keep pumping oil.

-Marin Katusa (Chief investment strategist for Casey Energy Investment (2014).)

You got that right Dr Katusa, and I hope that our friends and neighbors control their rage when they read it, because it is just what many of our finest citizens do not want to hear. 'As right as the rain' – as it says in the opening line of the song from the brilliant American musical *Bloomer Girl* (1944) – although the former scholar from the Stockholm School of Economics, Professor Anders Åslund, tells us to think of Russia as though Joseph Stalin (aka Bob Steele to some of the disco crowd during my post-grad days in Stockholm) was still giving the orders, and the Russian economy was still grossly mismanaged and would soon disappear down the tube, which is sheer nonsense.

But I want to go further than Dr Katusa, because he touched on the key point in his short and important article. "*Putin always thinks decades ahead*!" was the way he put it. I consider it a good idea if readers of this contribution understand the meaning and value of this behavior.

In my book *Scarcity, Energy and Economic Progress* (1977), I say early on that population growth is going to be a major issue in the not too distant future, and the time to do something about it was NOW (meaning THEN). Understandably, that contention didn't go over so good, and so I only mentioned it *en-passant* in my later books and lectures. You see, in every society there are a number of inveterate gamblers and dreamers, and some of those players believe that huge populations will be good for their bank accounts and/or their 'intimate lives'.

To my great surprise and disgust, I was made aware of those predilections the second day I was in Sweden. More alarming, various ladies and gentlemen cherishing that silly belief succeeded in bequeathing it to later Swedish voters and governments, and the same is true in many other countries. As a result our decision makers have lost or are losing control of the population situation. They are losing control and they know it, and so when that topic is introduced they inevitably react with lies and misunderstandings instead of intelligence.

Although I haven't made it clear yet to the colleagues and students, I intend to continue believing that simple jealousy is one of the reasons for the anti-Russian nonsense that we have to put up with now, some of which (as with natural gas) is obviously counterproductive. Jealousy because Russia will not have to deal with the curse of limited natural resources and excessive populations in the foreseeable future. In the book mentioned above, and especially my book on oil (1980), I claimed that Russia is the richest country in the world, by which I meant that they have everything to work with if they get and keep their economic act together, and as icing on the cake they in the unique position of being able to ignore the demographic headwinds.

Thirty years ago I had the same belief about Canada until I attended a lecture in Australia in which a Canadian bureaucrat assured her audience that everything possible was being done to increase the immigration into her country. But maybe, like Russia and Australia, the numbers are still in Canada's favor…for a while at least. I certainly hope so, because they aren't in the favor of the United States of America.

"Everything to work with if they can get their act together", which is now happening. Consider this example. Russia has comprehensive military service, but there tend to be exclusions for young men in schools and important professions. Therefore, according to many of the military people in that country with the large hats but small brains, the wrong people are being drafted. Their claim is that the army is getting the heavy drinkers and drug users, while the good boys sit in front of computers and study math.

There was a small but enthusiastic collection of heavy drinkers and drug users in the infantry battalion I served with in Kobe (Japan) shortly before the Korean war. The army succeeded in reducing the taste of many of my colleagues for illicit pleasures, and although it is not widely known, this is one of the purposes of conscription (or national service) in Russia. It's not to fight a war near the shores of the Baltic, or on the eastern border of the Ukraine. It's purpose is to help improve Russian human capital, although this is not widely advertised!

The talk these days is about Russian oil. Russia has more than enough oil, and as I pointed out in my oil book, both theory and evidence indicates that oil in the ground is like money in a bank: it has a greater value with every passing year. Moreover, together with the American firm Exxon Mobil, a huge oil deposit was recently discovered in Arctic waters relatively close to Russia.

For some ignorant reason Exxon has been forbidden to work with Russians again, but Mr Putin doesn't care. Why should he? As he and his friends point out, that kind of prohibition generally makes Russia stronger, because it means that in the future they will have to learn how to do without foreign help, and the oil they are certain to find will not have to be shared with anyone. You might also have heard that China and Russia boast the largest shale resources in the world, and sooner or later their optimal exploitation will be possible. Unlike China, Russia has no need to hurry.

Incidentally, I don't concern myself with Russian oil any longer. For me the Russian agricultural sector is the item to watch, and I must unfortunately report to Professor Åslund and his colleagues at the Peterson Institute that prospects for that sector couldn't be better, thanks to the cooperation that has taken place with North American and other foreign technicians and experts, and will eventually be expanded. I should also note that the expression 'food insecurity', which at the present time may

apply to a sixth of American residents (according to a recent article in *National Geographic*). will soon be history in Russia. On the other hand it is unfortunate that those Russians who want to ski (and party) at wonderful Courchevel (in France) or Åre (in Sweden) will have to demonstrate their skill on domestic slopes, but remembering the magnificent panoramas served up for the 2014 winter Olympics in Sochi, that can't be too much of a disappointment.

One more point. In my oil book I criticize the CIA for believing that Russia would soon be an importer rather than an exporter of oil. I don't believe that they make mistakes of that nature any longer, and so I am sure that they not only know that the arguments above are accurate, but know it better than I do.

REFERENCES

Banks, Ferdinand E. (2015). *Energy and Economic Theory*. London, New York and Singapore: World Scientific. (Forthcoming)

_____. (2008).'The sum of many hopes and fears about the energy resources of the Middle East'. Lecture given at the Ecole Normale Superieure (Paris), May 20.

_____. (1980). *The Political Economy of Oil*. Lexington (Massachusetts) and Toronto: D.C. Heath and Company.

Katusha, Marin (2014), 'Why Russia will halt the ruble's slide and keep pumping oil.' *321 Energy* (December 20th).

Åslund, Anders (2014). 'Ryssland sviktar under tunga slag'. *Svenska Dagbladet'* (21 December)

7.JAPAN AND POPULATION

In the early chapters of my forthcoming energy economics textbook (2015), I inform my readers what I want them to know by the time they reach the long last chapter. To be specific, I want them to be ready to impress friends and neighbors, and especially friends and neighbors who are in the habit of making mistakes about important topics. There are occasional remarks about population in those early chapters, but these do not suffice, and because this is an extremely important topic, I have chosen to add a few things.

I can start by saying once again that I know Japan, though not as well as I should. I gave several greatly appreciated lectures on energy economics in that country, while much earlier I delivered hundreds of brilliant but unfortunately unappreciated lectures/harangues to American infantry soldiers, mostly in Camp Majestic (near Gifu), but also in wonderful Kobe, and at the live firing ranges close to the base of Mount Fuji.

I don't believe however that I spent a day in that country without wondering why those good people decided to challenge the United States of America, even after my company commander, Lieutenant Smith, explained it to me in one simple sentence. According to him, as a veteran of the war in the Pacific, "The key was the F-word", by

which he meant fanaticism. Further elucidation was provided by my very intelligent platoon leader, Lieutenant Garza, who one day stated that a Japanese corporal in smelly underwear was the equivalent of a foreign soldier with a Marlon Brando sneer on his lips, and a collection of medals on his breast, assuming that he had the right kind of equipment in his hands, and also at his back.

For individuals like my good self, fanaticism has often turned out to be a beautiful thing, especially if it is accompanied by generosity and a sense of humour. After being expelled from engineering school and being pronounced hopeless by the Dean of Engineering as a result of my poor scholarship, it was a simple matter for me to figure out the qualities I needed to emphasize in order to do the things that have offended so many of the Swedish academic elite. But that doesn't explain why I am prepared to assure the academic rank and file in all countries that Japan will eventually move at a faster pace, and will reclaim or solidify their place in the winner's club.

The most important thing working in Japan's favour at the present time is the structure of their population. According to a recent *Bloomberg Business Week*, Japan is growing older too fast. There is a diagram in the same publication which shows India, Egypt, Columbia and Mexico as the four countries with the smallest fraction of their population over 65 years of age, and in the (Bloomberg) 'jumbo' position the diagram shows Japan, Germany, Italy and France (where the latter was tied with Spain). In other words, implicitly, because of what somebody has interpreted as a shortage of nimble brains and hands, the last four are supposed to be in serious decline. I might be able to accept this misconception from students, but never from strangers.

An extended misunderstanding is found in my book ENERGY ECONOMICS: A MODERN FIRST COURSE, but to quote the Bloomberg expert responsible for this 'contribution', "to offset labor shortages, Japan has begun easing immigration requirements for highly skilled workers. So far however the program has fallen short of its modest target: under a quarter of the 2000 professionals it sought have come to work in Japan".

The correct reaction to this information is polite disbelief. *The Japanese educational system can produce all the "professionals" needed by that country!* Moreover, the truth is that an overwhelming majority of the Japanese do not want foreign 'workers' in their country, highly skilled or not. What they want is for their political masters to reproduce the economic miracles that I repeatedly told my international finance students about before I decided to concentrate on energy economics – miracles that I mention briefly in my new book. Nor does a cursory statistical analysis indicate that foreign workers are needed.

The economy of Japan is the third largest in the world on the basis of its nominal GDP. Japan is the world's third largest automobile manufacturing country, and has the largest electronics goods industry in the world. The Japanese firm Toyota has decided that fuel-cells are the most viable zero-emissions technology, and will focus on manufacturing cars that run on hydrogen fuel cells, even though at the present time that firm is the world's largest manufacturer of gas-electric hybrids. (In case you don't remember, the fuel cell converts the energy in hydrogen or liquid fuels directly into electricity, and ostensibly has twice the energy efficiency of the internal combustion engine.) Many persons are so preoccupied with assessing the amazing achievements of China over the past 25 years that they forget about Japan. Japan may well have lessons to teach the rest of the world.

For instance, Japan is also a country in which individuals can feel safe in their homes or on the streets at virtually any hour of the day or night, which is an advantage enjoyed by its residents that will be of increasing value in this century. You should also know that where international educational scores are concerned, Japan is Number 4 or 5 for primary or secondary education, and probably occupied one of those positions every year for a number of years. *That by itself tells me where Japan is going in the future, and it should tell you!*

In a short but brilliant lecture that I attended a few weeks after starting my three year 'tour' at the Palais des Nations (in Geneva, Switzerland), my colleagues and myself were informed that Japan's development plans were generally regarded by economists in that noble structure as a role model for industrialisation and economic progress. They still are, and this means – as emphasized above and below – that three cheers for nuclear are appropriate. An important article on Japan has been authored by Joni Jupesta and Aki Suwa (2011), and among other things it reinforces my belief that Japan will never abandon nuclear energy. Of course, I don't need an article to tell me about Japan and nuclear. Apparently only about 40% of the Japanese want nuclear, but that is certain to increase, and increase in the near rather than distant future. As a matter of fact it will have to increase for one of my favourite and most widely disseminated predictions to come true: by the middle of this century Japan and Germany will be the most nuclear intensive countries in the world!

You should also try to appreciate that when the New Year's Eve parties begin on December 31, 2049, there will be thousands – or tens of thousands – of brainy engineers roaming the streets of India, Egypt, Columbia and Mexico begging for work before their valuable analytical skills are dissipated by idleness. Instead, imagine being a qualified engineer or technician who, after e.g. arriving at Kobe's airport, proceeds to an apartment on or near one of the sensual hills in that exotic city, before embarking on a

spell of hi-tech employment. That sort of experience is in the same class as marching down a main thoroughfare of Kobe in the direction of the exotic 'Motimachi' (sic) in 1949, with the First Field Sergeant shouting out the 'Jody Cadence', returning from a long day of training for the next American war.

REFERENCES

Banks, Ferdinand E. (2014). *Energy and Economic Theory*. London, New York and Singapore: World Scientific. (Forthcoming)

Jupesta, Joni and Aki Suwa (2011). Sustainable energy policy in Japan, post Fukushima. *IAEE Energy Forum* (4th quarter)

8. SOME MYTH AND MEANING IN THE GREAT WORLD OF OIL ECONOMICS

"To act in accord with a myth is the distinctive characteristic of all living things".
—Nicolas Georgescu-Roegen

INTRODUCTION

This exercise is an upgrading of some observations in my new book ENERGY AND ECONOMIC THEORY (2015), and earlier in a talk at the Australian National University. The topic of oil is fully surveyed in that book, but I have a desperate urge to say more.

However before beginning, I want to mention the late Professor Georgescu-Roegen, who provided the quotation just under the title of this contribution. If the economics section of the Nobel committee were composed of serious and knowledgeable scholars, Nicholas Georgescu-Roegen would have been certain to receive a prize (and the same is true for many other world class economists). Occasionally described as "one of the most remarkable and profound thinkers in economics", his profundity – like that of many other potential recipients of a 'Nobel' – was almost certainly an affront to the gentlemen who select the economics laureates.

I am also willing to believe that present day committee members are so badly educated, so completely ignorant of who has done what, that they neither know nor care who Professor Georgescu-Roegen was. Among other reasons, this might have been why the physics superstar Murray Gell-Mann once said that winners of the economics 'Nobel' should not be allowed to sit with the other laureates at the awards ceremony, although I will leave it to readers to propose where new economics laureates should be seated before receiving their accolades from the hand of His Majesty, the Swedish king..

A SERIOUS THEORETICAL MYTH

Many years ago I gave a very short course in energy economics at Griffith University (Brisbane, Australia), during which I had a rather remarkable experience. I put a fairly complicated mathematical expression on the blackboard, performed some operations, and obtained a well known result. Then I put a fairly simple relationship on the board, and easily derived the same equation. The problem was that while pausing for a few seconds before formulating some sarcastic remark about these two outcomes, I unexpectedly found myself thinking that the theoretical background of academic energy economics (at that time) was seriously overvalued, and the same could be said about some of the things I had taught my students on several occasions during the previous decade or so.

Fortunately, my students at Griffith had some acquaintance with the conventional literature, and so it was possible for me to discuss various meaningless analytical results at some length without drawing any protests. As some of you may have guessed, when it comes to meaningless results the first name in my mouth is usually that of Harold Hotelling, a brilliant American economist, who as far as I am concerned went off the rails with his theory of how the price of exhaustible resources was determined.

That must have been about 20 years ago, maybe longer, but the astonishing thing is that on at least a half dozen occasions in 2014, I opened some sort of publication to find myself once again staring at Professor Hotelling's famous equation, which suggests that the price of oil cannot rise until the same thing happens with the rate of interest. Simply mentioning this state of affairs causes me to think once more of a useful adage from the American navy: "On every ship there is someone who doesn't get the message", only in this war the persons who haven't gotten the message are on the bridge, directing operations and editing 'scientific' publications, and some of them are doing everything they can to make sure that the good ship 'energy economics' is not on a voyage of discovery.

The situation is worse than not getting a message. I gave a talk on oil in the Danish parliament about 15 years ago, and during a coffee break had a conversation with an energy economist whose work I had mentioned in my book on natural gas. I told him that I was going to return to mathematical economics or finance because I had become completely and totally dissatisfied with a large part of the theoretical literature of energy economics, and it had become almost painful for me to teach that subject. He replied by saying that if he didn't teach his students the conventional wisdom, by which he explicitly meant the conventional nonsense, then it might turn out to be even more painful for him, because unfortunately there was nothing else available to give them.

I'm pleased to report that much of the irrationality in the exhaustible resources literature has disappeared, though far from all of it, and in any case it has become possible for teachers like myself to enter a class or seminar room with a smile on my face, knowing that I will not be asked to explain extremely relevant concepts with equations that belong in a comic book or a movie magazine. On the other hand, we still have to confront some elephantine myths about virtually every topic in energy economics.

MY FAVORITE PEDAGOGICAL COMMITMENT

The document containing this exercise is called A DAILY ENERGY ECONOMICS DOZEN, which means that it is intended to be read on trains, buses, or in chartered aircraft until you understand it perfectly. You might also find it nice to read in an Uppsala University student club on Friday or Saturday night, just before the music begins, and that includes the following diagram. In my classroom presentations on oil and the oil markets to beginning students, it is crucial, and I have made it clear to my students in every university where I have taught energy economics or finance that they must ALWAYS be able to reproduce and explain its logic, and they must be able to do this on EVERY examination. I also insist that they must appreciate how simple it is, despite its resemblance to diagrams in your favourite electrical engineering book.

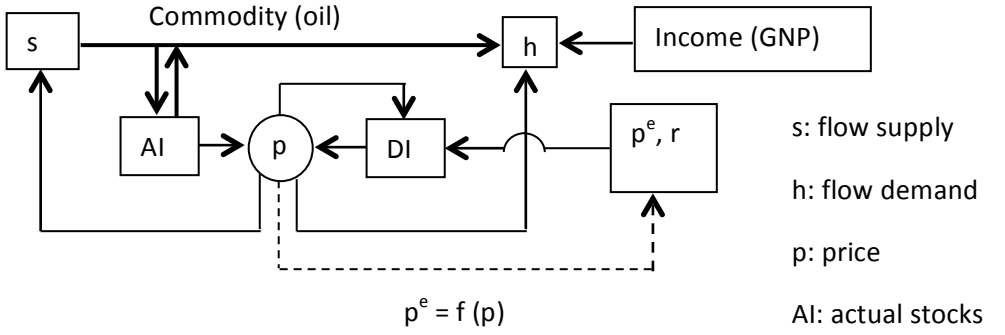

Figure 1

In case you haven't figured it out, p^e is expected price, and r is the rate of interest. You might also note that in this model expected price (p^e) is a function of the present price, although clearly it might be a function of the present price and the rate of change of the present price, as was the case in 2008. In any event, we can start our analysis by asking what part of this diagram belongs to Economics 101. The answer is (flow) supply, (flow) demand, price, and perhaps income. As indicated supply and demand are 'flow' variables, such as barrels per day, and so the model involving those items is a '*flow' model*. These are sometimes discussed in your in your morning newspaper and always in

your Economics 101 classes. As for income, movements in income shift the demand curve. You were told that by your Econ 101 teacher, but you knew this anyway when you started shopping for a private jet aircraft or private train.

Then what about AI and DI, which you probably were not introduced to in Economics 101? These are 'stock' items, which in the non-academic world are usually called inventories, and the units for these is not of oil per day, but simply barrels.

You probably have heard something about AI (actual stocks/inventories) because this item occasionally pops up in the press or technical journals in discussions about oil and also natural gas, and also non-fuel minerals. Looking at Figure 1 we see that the product (e.g. oil) moves in and out of inventory, while price in this model – which is a stock-flow model instead of just a flow model – *is determined by the relation of actual to desired inventories rather than flow supply to flow demand.* Desired inventories are conceivably a function of expected price, as indicated in the diagram, and again the best example that I know of was the oil price escalation in 2008, when expectations were that the price of oil might not stop increasing until it reached or exceeded two hundred dollars a barrel.

The rate of interest (r) might also have a place in this scheme, because almost always there is a cost to be considered when holding inventories. 'r' might say something about borrowing money for that purpose, as was the case almost ten years ago. A more complicated but comprehensive approach can be found in the book on operations research by Sasieni, Yaspan and Friedman (1959)

Now we can ask where the above model came from. The diagram and some of the explanation came from Professor Banks, while the rest of the explanation came from the brilliant MIT Econometrician Professor Franklin Fisher and Professor Robert W. Clower of Northwestern University, though they were discussing non-fuel minerals.

The issue now is what do I ask beginning (first year) students to tell me about this model. I expect them to tell me that (*ceteris paribus*) when DI is greater than AI, price will increase, or it will likely increase, or if DI is much greater than AI then price always or almost always increases. It increases in order to raise flow production above flow consumption, with the difference going into an increase in inventories.

Assuming that the model in Figure 1 is valid, some simple algebra might be useful. Rather than formulating a differential equation on this occasion, I merely ask students to comprehend a simple relationship for explaining short-run price movements. This is $dP/dt (\approx \Delta P/\Delta t) = f(DI - AI)$: the rate of change of price with respect to time is a function of the difference between desired stocks (or inventories) DI and actual stocks, AI. I can also mention, without elaborating, that there is a 'feedback circuit' shown in the diagram, at the center of which is p-DI. In case you remember your servomechanism

theory, this is where we derive a large part of the price instability often associated with the oil market, and which made traders of physical and paper (e.g. *futures*) oil so happy.

Readers would be doing themselves a great favour if they stared at this diagram and asked their teacher about that relationship until it is perfectly clear. A detailed explanation can also be found in my book ENERGY AND ECONOMIC THEORY (2015). As is pointed out there equilibrium is not when (flow) supply is equal to (flow) demand, but when AI = DI.

CONCLUSION

A final question concerns what is this short exercise was about? It is about myths that some people are happy to listen to, believe and circulate, though not on this occasion myths about the advantages to be gained from the export of oil from the U.S. When we look at the mistaken pronouncements about the amount of oil in that country made by people who should know better, it seems clear that somebody – or a lot of somebodies – do not get the message. Nor do they often get the message about a diagram like Figure 1, which looks difficult but which is actually easy. Please excuse me if I say that I will continue to insist that my students master that diagram and perhaps also a large dose of the mathematics that it suggests.

REFERENCES

Banks, Ferdinand E. (2015). *Energy Economics: A Modern First Course*. (In process.)
_____. (2015). *Energy and Economic Theory*. London and Singapore: World Scientific
_____ . (2007). *The Political Economy of World Energy: An Introductory Textbook.* London and Singapore: World Scientific.
Cooke, Ronald R. (2009). 'The clean energy act is not going anywhere'. *321 Energy* (July).
Huber, Peter W. (2009). 'Bound to burn'. *City' Journal* (Spring).
Hutzler, Mary J. (2009). 'The Pickens plan: is it the answer to our needs?' *IAEE Energy Forum*.
Lounsbury, John (2009). 'Natural gas: another great thing from a lobby near you.'*Seeking Alpha* (August 02).
Moller, Jorgen Orstrom (2008). 'The return of Malthus: scarcity and international Order'. *The American Interest* (July/August).
Sasieni, Maurice, Yaspan, Arthur and Lawrence Friedman (1959). *Operations Research: Methods and Problems.* New York and London: John Wiley.

9. STATEMENTS ABOUT NUCLEAR LIES AND TRUTH

A few years ago the Swedish energy minister and the head of a Swedish labour union were brought together in a short television debate about nuclear energy. Almost every

sentence that Madame Energy Minister uttered contained the expression *renewables*, and caused me to think of something that the great American president Franklin D. Roosevelt once said: "repetition of a lie does not transform it into the truth". Of course, in her case it was not a lie but a misunderstanding. A serious misunderstanding based on a comprehensive ignorance about energy and energy economics.

Furthermore, as the gentleman from the labour union – who is now the Swedish Prime Minister – pointed out, he grew up in Northern Sweden, and though winter temperatures in that part of the country sometimes reached *minus* twenty-five degrees (or even lower) centigrade, he had no memory of air currents of such strength that they would guarantee the sustained motion of wind turbines. I often skied in northern Sweden many years ago, and my son did a part of his military service in that region, but neither of us can recollect a wind strength and consistency that would justify abandoning nuclear energy in favour of wind turbines that, on the average, provide *rated* (or *nameplate*) power less than twenty five percent of the time. (In other words, their *capacity factors* are on average less than 0.25, and sometimes much less.)

There is another item that everyone should be aware of. I do not know of any country, in any part of the world, where decision makers, rank and file politicians, academics with access to the corridors and restaurants of power, break dancers, rappers, moonwalkers or anybody else have talked as much about a major expansion in the use of renewable energy as in Sweden, and in addition have tried to give foreigners the impression that much has been done and even more will be done with renewables in the near future. In reality – with the exception of hydro (waterpower) – hardly anything is being or has been done, because suggestions for greatly modifying the present Swedish energy profile to provide for more renewables, in conjunction with less nuclear energy, are scientifically absurd.

I perhaps should mention that Madame Energy Minister was not a representative of the political party that I would vote for if I voted in Sweden. Of course, maybe that doesn't make a difference, because the last Social Democratic prime minister in Sweden, a sometimes intelligent man named Göran Persson, went so far as to call nuclear energy "obsolete". This kind of mistake is natural or typical, and not just where the vote-getting process is concerned, because in a democracy everyone is encouraged to express their opinion on all sorts of topics, even though in this case the prime minister's opinion overlooked the likelihood that the nuclear reactor may someday be judged the most important invention of the 20th century.

Here I can point out that when Mr Person's curiously eccentric and inaccurate statement about obsolescence was made, the cost and price of Swedish electricity was among the lowest in the world, while the cost and price of electricity in the promised

land of wind energy, which as you probably know is Denmark, was (and still is) among the highest. Thanks to Germany's preposterous *Energiwende* (= Energy Transition), Denmark and Germany have the highest electricity prices in Europe.

If necessary, I might still be able to read a small amount of German, however I would never pick up a newspaper or journal in order to find out what is going on in the heads of the German Chancellor and her foot soldiers, which includes closing Germany's nuclear facilities. I sometimes tell myself though that the one time student of physical science, Angela Merkel, *must* have at least an inkling of the economic fiasco that would result from dumping nuclear, and trying to replace it with renewables and/or imported electric power. But votes are votes, and if she prefers chilling out in the Reichstag to watching (on her wide-screen TV) her political rivals staring across the table at charmers like Sarkozy and Berlusconi, she evidently feels that she has no choice but to accept what the great American songwriter Irving Berlin called 'Doing What Comes Naturally', which in this context means initiating an energy program that makes no technical or economic sense whatsoever.

I like to think that at the present time most countries are filled with people who are intelligent and sensible enough to realize how misguided Chancellor Merkel's plans happen to be, although you can never be certain. What everyone reading this should remember is that where energy economics is concerned, even highly educated men and women can lose their way, and not just with nuclear energy. In my lecture on oil at the National University of Singapore, I informed my audience that the war in Libya was about oil, and not protecting what the ignorant Secretary General of NATO called civilians, but I am afraid that my powers of persuasion failed me on that occasion.

Recently a French Prime Minister, Monsieur Fillon, reaffirmed that "France's goal is first of all to ensure its energy independence". The opinion here is that ensuring the energy independence of countries like France, Germany and Japan can only be done by at least retaining their nuclear inventory, *assuming that independence is to be accompanied by continued prosperity*. Moreover, you can be as certain as I am that no industrial country on the face of the earth can afford to abandon nuclear. I don't feel a need to argue this however, because French and Japanese energy specialists are smarter and more sophisticated where their domestic energy matters are concerned than I could ever be. I have also heard that regardless of what French politicians say or think before the cognac starts going around the table, French nuclear kingpins expect to profit handsomely from the foolishness being launched by Ms Merkel and her energy experts.

I engage in many polemics about energy in my articles, lectures and especially my books. I also have long conversations with myself on the subject, usually in the silence of my lonely room, This might be why I once received a number of strange mails from a

Catalan engineer (who says that he is a PhD from the Massachusetts Institute of Technology) informing me that a large team of experts at MIT (which may have included the present U.S. Secretary of Energy) have produced research on the cost and desirability of nuclear energy that – in his opinion – casts some scepticism on my humble work on these subjects.

Their research casts no scepticism on my work, because I doubt whether persons like Energy Secretary Moniz are capable of understanding my work. The calculations made at MIT or IIT (Illinois Institute of Technology) or CIT (California Institute of Technology) or the storefront university that gave me my economics degree may or may not be correct for the short run, but as for the long term – where the issue is mainly economics – they are probably as wrong as the Dean of Engineering at Illinois Institute of Technology thought that I was when he expelled me from his school for failing physics and mathematics (both twice), and told me to never come back.

Wrong because there are no electricity generating assets on the horizon that are as flexible as nuclear reactors when it comes to providing large amounts of reliable electric power. Flexible in what way? How can someone look at a nuclear facility and talk about flexibility? The answer is that flexibility in this context means the ability to greatly improve the technology and economics of future generations of reactors, although admittedly improvements might also be made where wind and solar equipment is concerned, especially if 'energy storage' (with nuclear supplying the energy to be stored) actually makes the progress that many observers have started talking about, or even if renewables can operate in harmony with future generations of nuclear.

But there is another factor that needs to be absorbed. In the courses in electrical engineering that I busied myself with after being readmitted to IIT, I studied a number of fascinating topics, but there is no law or hypothesis that is more applicable to the real world than what might be regarded as the first law of neo-classical economics, *which is that given a 'package' of things that a person likes, almost everyone would prefer more to less*. That law will ensure that a nuclear retreat by e.g. Germany will eventually collapse, and will someday be transformed into a nuclear advance that includes the adoption of the breeder reactor. I think that I should mention, however, that a Japanese gentleman once eagerly explained to me that that approach could eventually involve a lot of plutonium, while on the other hand, a number of physicists have assured me that this is NOT certain. In any event, I sincerely hope that the breeder Mr. Bill Gates is financing (and should be available by the end of the present decade) is managed in a way that it does not interfere with that gentleman's income and bank accounts.

Some observers believe that a commercial breeder will never be developed. I once heard this from the particle physicist Michael Dittmar, whose interesting paper is listed

in the references. What he means is that he hopes it will never be developed, although the truth is that their appearance is a certainty, and there will be plenty of them in Russia and China before the middle of this century. Readers with an interest in microeconomic theory should examine a paper by Fabien A. Roques et al (2006), which considers nuclear a hedge against uncertain fossil fuel prices, and also suggests that it might be fruitful to view energy as a 'public good' (like e.g. streetlights and defence). I certainly can accept that, since it is clear to me that where energy is concerned, governments and private manufacturing firms should cooperate in the same way they did in the U.S. during the last world war.

I make a point of claiming that with nuclear installations located domestically, you know almost exactly what access you will have to e.g. electricity over very long time frames, while with other energy resources there can be large uncertainties, especially about prices. This is why Finland, with Norwegian gas on one side of that country, and Russian gas and coal on the other side, decided to buy the largest reactor in the world from Areva of France. Apparently Finland will also purchase one more large reactor, and perhaps two. If you want to know why, although Finland's experience with Areva was not commendable, consider the following: *Finland has one of the best educated populations in the world, and they are capable of understanding that rejecting nuclear is equivalent to playing the energy fool?*

Many people are afraid of nuclear energy, which I regard as a reason for being positive to that resource. If they were not afraid, dismissed caution, and instead wanted a reactor on every street corner, I would have a problem exposing myself to the silly warnings, empirical blunders, and the kind of shocked expressions I provoked at the *Ecole Normale Superieure* (Paris) when, at the end of my lecture on oil, I put in a cheerful good word for nuclear. In nuclear intensive Sweden and France, the record shows everyone with a desire to avoid lies and make-believe that nuclear can deliver the goods, although if decision makers become careless, like putting reactors in the wrong place (as in Fukushima) it could someday destabilize *portions* of the global economy (as is possible in Europe now) by causing the abandonment of verifiably safe reactors.

REFERENCES

Banks, Ferdinand E. (2015). *Energy and Economic Theory*. London, New York and Singapore: World Scientific.

_____. (2007). *The Political Economy of World Energy: An Introductory Textbook.* Singapore and New York: World Scientific'

Constanty, H. (1995). 'Nucleaire: le grand trouble'. *L'Expansion* (68-73).

Dittmar, Michael (2011). The future of nuclear energy: facts and fiction. The Institute of Particle Physics, Zurich. (Conference paper, Jan 21, 2011).

Léveque, Francois, Jean-Michel Glachant, Julian Barquin, Christian von Hirschehausen, Franziska Holz and William J. Nuttal (2010). *Security of Supply in Europe: Natural gas, nuclear and hydrogen.* London: Edward Elgar

Patel, Tara (2011). 'France won't build nuclear reactors to make up for shutdowns in Germany.' *Bloomberg* (Bloomberg Economic News).,

Roques, Fabien A., William J. Nuttall, David M. Newberry, Richard de Neufville, Steven Connors (2006). 'Nuclear power: a hedge against uncertain gas and carbon prices.' *The Energy Journal*, (Volume 27, No 4).

Zaleski, C. Pierre (2005). 'The future of nuclear power in France, the EU and the world for the next quarter-century'. Conference paper, University of Paris – Dauphine).

10.WINDPOWER: MORE BAD NEWS BLOWS IN FROM DENMARK

It's absolutely unbelievable what's going on. We're living in just about the most dishonest time in the history of man.
-Steven Jarislowsky

As noted earlier, I once gave a short course on energy economics at Griffith University (Brisbane, Australia), and to the disgust of my students I insisted that only amateurs believed that wind-power would play a significant role on the world energy stage in the near future, although when or where it could deliver the goods, it should be employed.

As it happened, I was not completely correct, because although I did not know it, shortly before I gave that course, a manager at one of the largest and most prestigious scientific establishments in the United States, NASA (National Aeronautics and Space Administration), said that "If the Danes could get 200,000 kilowatts from the wind back in 1908, we should be able to satisfy our present needs".

My memory is not as good as it once was where nonsense is concerned, but apparently the excellent scientists and managers of NASA were thinking in terms of wind supplying about one-half of the electricity requirements of the United States. The problem here of course was that cost did not receive the attention that it deserved. My students in Brisbane suffered from a similar imperfection, because my suggestion that cost should always play some sort of role in dealing with the provision of electricity by alternative technologies, was greeted by the first gutter language that I heard in a university classroom, although of course it did not match in richness or volume the kind I heard in the ranks of the U.S. infantry. For a good insight into wind, turn to GOOGLE and look for John Droz Jr!

In any event, the Danes are apparently talented where wind is concerned, because throughout the civilized world (and elsewhere) their achievements are constantly noted. I regard this adulation as foolish, but unfortunately my personality deficiencies have prevented my messages on that topic from reaching the broad masses. For instance, despite my pedagogical talents, I have never been able to get those ladies and gentlemen to understand that the very high cost of electricity in Denmark would be even higher – and maybe intolerable – if the Danes were not able to hook into the grids of Sweden and Norway, and at one time Germany. In case you have not been told, wind only supplies

about 26% of the electricity consumed in Denmark, and the price of electricity in Denmark is the highest in Europe, and one of the highest in the world. Something else you might remember is that the price of electricity in Germany is the second highest in Europe, and the problems of the German economy can in part be traced to that price.

And not just (as mentioned above) the broad masses, because some of the smartest and highest paid 'masters of the universe' seem to have fallen out of love with nuclear. I first noticed this in an issue of *Business Week* (10 July, 2006), where it was stated that "smart money is placing multi-billion dollar bets on ethanol, wind power, and solar. It's not throwing buckets of cash at nukes." I have heard this sort of thing about "smart money" many times in recent years, although *ceteris paribus*, these young 'masters of the universe' should be perfectly equipped to comprehend the advantages of nuclear, as specified in this book. As I have gotten into the habit of claiming, without adequate nuclear, the ethanol, wind and solar in their ideal energy portfolios will underperform – i.e. will be sub-optimal – if those portfolios are held for a substantial period of time, because in a "substantial period of time" anyone with any sort of intelligence at all will get the message!

I failed to emphasize this in my earlier textbooks and articles, but I hope that everyone who reads my new books gives this claim some thought. I am also curious as to why this very simple hypothesis does not receive a great deal of attention from teachers and students of energy economics at very large universities where energy economics is taught. As Thoreau remarked, "any truth is better than make believe", although an axiom of this nature may not carry much weight when serious money is involved, and that money becomes available for popular forecasters to spread lies and/or nonsense.

Jeffrey Michel once informed me that the average *capacity factor* in Germany is about 21%. In other words, if 1000 kilowatt hours of electricity is theoretically available during a year from a windwill, the average (or better the *expected*) amount accessed during the same time period would only be 210 kilowatt hours. A year or so ago one of the leading energy/environmental bureaucrats in Sweden calculated that with a capacity factor of 25%, four (4) windmills with a (nameplate) capacity of e.g. 1000 kilowatts each could replace a nuclear installation of 1000 kilowatts with a capacity factor of 100%, and as a result, with existing (construction and variable) costs, the windmills were a better economic prospect.

Bizarre calculations of this nature were probably responsible for making (and keeping) Sweden one of the poorest countries in Europe until the Second World War. However without going too deeply into that subject, resorting to wind (and solar) will increase total energy costs. In addition to the wind installations, 'back-up' must be provided.

Returning to Denmark, it appears that one of the largest windmill producers in the world, Vestas (of Denmark), has run into difficulties. What I would like to believe is that the economics of wind power are on the way to being understood by concerned persons in Denmark and the rest of Scandinavia. They seem to be understood in Finland, where despite the large cost overrun with its new Generation 3 reactor, two more reactors may be purchased. But not in Sweden, where the dream of a complete massacre of the remaining nuclear reactors seems to be stronger than ever, given the ability of the environmental party to remain a part of the Government.

Unlike the situation in Finland, myths having to do with wind and solar are more attractive to voters in Denmark and perhaps even in Sweden than lowering energy costs, and therefore expanding and/or improving the foundation for increased employment and welfare. (Where welfare is concerned I am primarily thinking about hospitals and the education of children.) This is not true in Norway, but then Norway is one of the richest countries in the world, and had they not foolishly accepted electric deregulation, they would be even better situated.

Before presenting a conclusion, let me note that Exxon – perhaps the most successful energy firm in history – has predicted that in 30 years time wind will only account for 7% of total global energy, and solar just 2%. Hmm…2% doesn't sound right to this teacher of energy economics, but there it is. The same source says that oil and gas combined will produce 60% of global energy and compared to 55% today. Hmm again, but the fact of the matter is that we must have predictions, and on the basis of some of the things the CEO of Exxon has said about shale gas, I think that the numbers given just above are a good place to begin our investigations of the future energy supply.

11. THINKING AHEAD: A HANDOUT FOR A LECTURE ON NATURAL GAS

At the present time. as has been the case for the last few years, natural gas appears to be one of the most important topics in energy economics, and to a certain extent the most dynamic. As a result, I hope to begin the next academic year with a very long lecture that will provide my students with a comprehensive but elementary introduction to a topic that has achieved 'star quality' in many newspapers and business periodicals. However in case any of those ladies and gentlemen are not in the mood for comprehensive introductions, both they and passers-by will be offered this friendly 'handout', which they can examine before, during or after my lecture, and perhaps circulate to friends and neighbors.

Natural gas has been a useful energy resource for many decades, but lately it has achieved a kind of celebrity in the United States (= U.S.) due to the intensified exploitation of an activity called *hydraulic fracturing* (or 'fracking'), which involves producing natural gas from underground shale formations by pumping water, sand and chemicals into a 'well' at high pressure. There are chapters on natural gas in my textbooks (2000, 2007, 2015), and once I published a book on natural gas economics (1987), but until recently I was unable to muster a genuine interest in this subject. That changed when I examined an issue of the *Energy Journal* dedicated to natural gas, and saw that of the 14 papers it contained, only a few would have received passing grades in a remedial course at Boston Public.

That not unexpected surprise also made it clear to yours truly that he should upgrade and expand his previous work on this increasingly important subject. As a first step in doing this, I would like to suggest that everyone interested in shale resources should be on the alert for gross and most likely intentional misinterpretations of the economics of this resource. Rather than provide a string of examples in this short 'handout', I present a few friendly comments that serious students of energy issues should scrutinize very carefully, and if possible always have available in case they are on the receiving end of the lies and misunderstandings about natural gas and other energy topics that are in circulation in every corner of the world at the present time, and liable to turn up anywhere, at any time of the day or night.

1. **EUROPEAN AND RUSSIAN GAS. The story here is eventually going to be the same as with Russian oil. The end result of all the wishful thinking about putting the Russians (and OPEC) in their place where energy resources are concerned will come to nothing. Basically it is an absurd departure. Russian oil exports to China have increased by a huge amount since 2010. and mostly through the newly constructed Siberia-Pacific Ocean pipeline. Eventually large pipelines will transport natural gas toward Japan and South Korea over a similar route. Directing Russian energy resources to Asian markets makes unambiguous economic sense for both exporters and importers, and the loser is Europe.**
2. **China has the world's largest shale gas reserves, estimated today at a little over 36 trillion square meters (= $36Tm^3$). The announced intention in that country is to produce 6.5 billion cubic meters of shale gas annually by 2015, but since the average Chinese shale gas well consumes an average of 16,000 m^3 of water, some very careful and imaginative management and regulation will be necessary in order to avoid serious water shortages, as well as other environmental problems. This might be one of the reasons for the extensive Chinese interest in energy resources outside of their country. Among other things, they need time to figure out how they are going to deal with this issue. Put more 'scientifically', the possession of these resources is equivalent to a *financial call-option*, and rather than exercise that option at the present time (by producing gas), the decision makers in China may have decided to wait for new information that might e.g. increase the productivity of the investment.**

3. **It would be simply wonderful if the teaching of energy economics could be improved at the present time. I say this because as a result of its mediocrity, a surprising number of quasi-influential observers without training in engineering or economics have appointed themselves experts, and feel that they have the right to pontificate on the oil and gas future. Even the chief economic commentator of the (London) *Financial Times*, Mr Wolf, thinks that he qualifies for a ride on the shale gravy train, even though he doesn't know the difference between gas and a hole in the ground. What we have with gentlemen in his position is the implication that the production and management of items like shale gas is such a simple matter that its comprehension does not require any specialized training, and thus newspapers can take the place of textbooks.**
4. **Just as grotesque, but equally relevant, many teachers of energy economics are totally unaware that lectures on academic economics, like mathematical demonstrations, require a suitable starting point. In mathematics these are *axioms*, or an accepted body of fact so unquestioned that they can serve as a foundation for proofs of more controversial claims. We are more fortunate in economics, because economic history often provides a logical beginning. As a trivial example, in the last 8 years, oil and gas firms have nearly doubled their ranking on *Fortune Magazine's* Top 500 list, and these enterprises now constitute a third of the top 50. *This says something about the increasing importance of energy that cannot be said with the algebra in the bogus economic models of which many scholars are so fond!* I can add that Royal Dutch Shell is now the largest firm in the world, with posted revenues of $489 billion in 2012.**
5. **Oil in the 'lower-48' of the U.S. peaked in 1970, as predicted by M. King Hubbert. But not long after the giant Prudhoe oil strike took place, and with the total U.S. production increasing once more there was talk about output in the U.S. surpassing the previous peak. That story is not as familiar as it should be, especially the part about *the former peak never being reached again*! Natural gas in the U.S. had not peaked when the so-called shale revolution appeared, but there had been talk about forthcoming shortages, and the need for increased natural gas imports. The theory being offered now is that the sky is the limit for the U.S. gas and oil sectors, but in my humble opinion some of the arguments offered to promote this contention are to a certain extent crank. Please allow me to suggest that it might be a good idea for decision makers to mull over the history of oil production in the last 40 years ago if they are serious about obtaining an insight into how an essential extraction industry functions.**
6. **6. A PhD student at the University of Chicago once published a paper saying that an OPEC type approach for natural gas - a GAS-PEC - could not take place. As far as I am concerned, that prediction is not correct. and it would have been lovely if his teachers at that noble institution of higher learning had provided him with some additional tutoring on this subject, because I am sure that he – as compared to many of his teachers – is sufficiently intelligent to receive and appreciate instruction on energy economics if it were provided by the right person. *By the right person I mean somebody like myself*! At the present time the *Gas Exporting Countries Forum* undoubtedly has ambitions to eventually function like OPEC, or a quasi OPEC. Professor Alberto Clo of Bologna University has corrected some loose terminology on my part, and made it clear that OGEC (Organization of gas exporting countries) is the name likely to be**

chosen *if* - or most likely *when* - this gas forum transmutes into a formal cartel. Among the present members of the Forum, and likely members of OGEC, are Algeria, Qatar, Venezuela, Libya, Iran, Nigeria, Russia, The United Arab Emirates, and Trinidad-Tobago. These countries controlled well over 66 per-cent of natural gas reserves the last time I gave a lecture on this topic, and when I can muster enough energy to examine the latest gas statistics, I expect to find that members or potential members of that forum now control more.

7. **According to Jeffrey H. Michel, a leading energy economist in Germany, the real estate laws in Germany are such that e.g. shale gas extracted in Hamburg – and probably many other places in Germany -- could in theory be transported to Russia in a pipeline, and from there it might end up in Asia where the price is higher than in Europe (2013). It is a long way from Germany to Asia, but not too long when billions of dollars are on the table. Of course, just because investors are willing to finance an extremely long pipeline, it is not certain that it will go where it should go. The once widely celebrated *Nabucco Pipeline* that was supposed to end up in Austria so that it could add to the gas supply in central Europe, is now scheduled to have its terminus in Italy, although that country is faced with an oversupply of gas from North Africa. Of course, nobody really knows if that pipeline will ever be constructed.**
8. **A MISUNDERSTANDING OF THE YEAR. The manager of *Oil Price Com*, James Stafford, apparently believes that he knows more about energy economics than I do, because when I criticized one of his 'experts' for claiming that the U.S. is swimming in exploitable oil, he referred to my work as garbage, though hopefully not like some of the garbage I had to collect and put on garbage trucks for a month or so after being expelled from the infantry leadership school at Fort Ord (California). Stafford also seems to believe that carbon capture in the United States – or more correctly 'carbon capture and storage (CCS)' – a winning gamble. However, on the basis of what I know about the one-time intentions of the large Swedish utility *Vattenfall,* CCS might be a candidate for the scam of the century. A good candidate for 'truth of the century' (thus far) is what is taking place in Germany with solar energy. The giant corporation Siemens may shut down its solar power division after heavy losses over the past two years. It has also been announced in that country that solar subsidies will end by 2018. The opinion here is that there are countries in which solar subsidies are justified - *but not countries as far north as Germany*!**
9. **As reported by *Financial Times* journalists Ajay Makan and Ed Crooks, shale oil companies in the U.S. are burning off enough gas to power all the homes in Chicago and Washington DC combined. What this waste of resources and possible damage to the environment tells me is that instead of the present American president shouting to the high heavens about 100 years of natural gas, which is a goofy estimate, he should use his remaining years in office to convince voters that if possible they should elect a president without energy economics pretentions, and he or she should attempt to safeguard the invaluable resources of their country. One way to do this is to forbid or tax the export of crucial energy resources. For instance, Sweden should tax the electricity it exports.**

In my forthcoming lectures, l will make it clear that much of what I hear or read about natural gas is bunkum. Shale natural gas is a valuable resource, but on the basis

of evidence as opposed to dreams, not as valuable has often depicted. The history up to now of gas production in the U.S. and elsewhere (e.g. Poland and Argentina) are very different, and not favourable for gas, but the idle chatter about engineers and managers in the U.S. mastering the technology while engineers and managers elsewhere are mystified is sheer foolishness.

The CEO of the giant (and successful) firm Exxon has stated flatly that fracking has failed to perform in a satisfactory manner in China and Europe, and Mr Tillerson has also said that some shale formations in the U.S. have also proved difficult to exploit by fracking. *This is one of the reasons for the hesitation in adopting natural gas as the main fuel for factories and vehicles.* That adoption (investment) does not make economic sense until managers and engineers have the same confidence in the long-run availability of shale gas as propagandists who are being paid to make fools of the voters.

A year ago I attended a boring and pretentious meeting on natural gas at the Stockholm School of Economics. I thought that the emphasis would be on shale gas, but that turned out to be only a digression, and I ended up listening to half-baked lectures and comments by self-appointed experts that were received by many members of the audience as if they were holy writ. As to be expected, when the Q & A began, I attempted to set everybody straight on the past, present and likely future of shale gas, supplying both answers as well as questions, but I am afraid that my efforts were not accorded the admiration they deserved by the sponsors of that tiresome spectacle.

Before completing this handout, I would like to congratulate myself for my present approach to this subject. Congratulations Fred! You've done some great work this academic year, but that is nothing as compared to what you can achieve in the future if I am given the opportunity. Many years ago, at a conference or workshop in Vienna, an American business executive called me a fool for the belief I had in shale, and which I expressed in my book '*The Political Economy of Oil*' (1980), as well as the brilliant lecture on oil that I gave earlier that day. His argument was that there was not enough water in his part of the U.S. to exploit shale the way that Professor Banks erroneously/stupidly believed. I have heard this argument many times, and it deserves consideration.

When the shale gas circus began in the U.S. a few years ago, I immediately turned to the subject *game theory* in order to augment my knowledge of the extractive industries, remembering at the same time that John von Neumann - often called 'the best brain in the world' - was the founder of modern game theory. More important, in a discussion held in London during WW2, von Neumann told Jacob Bronowski that game theory was not the impractical and sometimes silly mathematics that we often put or see on whiteboards and blackboards in courses dealing with that subject, but was about lies,

deception and bluffing. Well, try to keep in mind that lies, deception and bluffing is what a considerable part of the shale revolution is probably - though not certainly - about *so far*, although I would like to confess that it would really be lovely if it morphed into something that would enhance the common good instead of making billionaires of a few dissatisfied and/or frustrated millionaires.

REFERENCES

Angelier, Jean-Pierre (1994). *Le Gaz Naturel*. Paris: Economica.
Banks, Ferdinand E. (2015). *Energy and Economic Theory*. Singapore, London and New York: World Scientific. (Forthcoming).
_____. *The Political Economy of World Energy: An Introductory Textbook'*. (2007). Singapore, London and New York: World Scientific.
_____ .(2004). 'An introduction to the economics of natural gas'. *The OPEC Review* 24-38. (March).
_____. (2000). *Energy Economics: A Modern Introduction*. Dordrecht: Kluwer Academic Publishers.
_____ .(1987) *The Political Economy of Natural Gas*. London and Sydney: Croom Helm.
_____ (1980). *The Political Economy of Oil.* D.C. Heath & Co. Lexington and Toronto: Lexington Books.
_____. (1977). Scarcity, *Energy and Economic Progress*. D.C. Heath & Co. Lexington and Toronto: Lexington Books.
Clarren, Rebecca (2013). 'Fracking is a feminist issue'. MS (Spring).
Cobb, Kurt (2011). 'Can we believe everything we've heard about shale gas? *OilPrice.Com.*
Crooks, Ed, (2013). 'Gas export opponents ignite US shale debate'. *Financial Times* (March 26).
Hughes, J. David (2013). *Drill Baby Drill.* Post Carbon Institute (February).
Mazur, Karol (2012). 'Economics of shale gas'. EnergyPulse (3 October).
Michel, Jeffrey H. (2013). 'Fracking und die EuropÃ¤ische Energieversorgung.' *Stencil*. Ing. BÃ¼ro fÃ¼r Energieforschung.
Neumann, John von and Oscar Morganstern (1944). *The Theory of Games and Economic Behavior.* Princeton: Princeton University Press.
Stevens, Paul (2010). The Shale Gas Revolution: Hype and Reality. A Chatham House Report (September).

12. ANOTHER LOOK AT SOME ASPECTS OF ELECTRIC DEREGULATION

***In the* summer of 2001, a few months before the 9-11 attacks on the Trade Towers and Pentagon, I was invited to Hong Kong as a visiting professor and university fellow for the purpose of lecturing on electric regulation and deregulation. What this ended up as was a handful of lectures, taking place over several months, which left me with plenty of time to read, visit athletic facilities located in the apartment complex where my wife and I lived, and to give some thought to the delusional theories accompanying deregulation.**

My visit was apparently sponsored by one of the foremost (electric) power companies in Hong Kong, and what they wanted me to do was to inform university teachers, journalists, students, break dancers, moonwalkers and anybody else I came

into contact with that electric deregulation (or 'restructuring' as it is also called) was a crazy and unworkable concept that would bring misery into the lives of many consumers of electricity. I have recently been invited elsewhere for the same purpose.

I'm glad to confess that nothing could have pleased me more, because the bottom line where this important topic is concerned is refreshingly simple and I repeat it every chance that I get: electric deregulation has failed, is failing, and probably will fail almost everywhere, and increasing numbers of observers are now prepared to admit that it cannot succeed in the real world, despite its occasional success in seminar rooms and conferences. For instance, in case you didn't know, in Southern California electric deregulation at the turn of the century led to the *wholesale* electric price increasing by a huge amount in about 8 months. This was not good, because in 2000 California had a population of almost 35 million, and its Gross State Economy made it the fifth largest in the world at that time according to Faruqui et al (2001).

The question that immediately arises is what happened to the *retail* price in California – that is, the price charged final consumers of electricity by utilities. The answer is nothing or not much, because to avoid the risk of a recession, and perhaps a rebellion by these consumers, the California state government paid billions of dollars to firms generating electricity, with some of these firms called "out-of-the-state criminals" by California governor Gray Davis, because they gamed the system by pretending that for various technical and/or economic reasons they could not supply more electricity.

It may be true that something similar was experienced in Sweden on several occasions a few years ago. What many people do not realize is that in Sweden, where nuclear and hydro are the main generating assets, the cost of generating electricity was once among the lowest in the world. But as a result of deregulation, the price paid by Swedish households occasionally spiked to one of the highest in Europe.

In my more mellow moments, I often describe deregulation as an unsuccessful attempt to rescind the laws of mainstream economics. A justification for continuing the criticism of deregulation is the large body of evidence at variance with surviving fantasies about expected deregulation results, where by fantasies I mean academic and journalistic bunkum promising large amounts of reliable and inexpensive electricity if deregulation (i.e. *restructuring* or *liberalization*) were allowed to proceed without the meddling of politicians or bureaucrats.

Almost 15 years have passed since my tour of duty in Hong Kong, and in that period electric deregulation has also failed in Alberta and Ontario Canada. It failed in South Australia. It failed in many states in the United States of America where it was attempted, and in my former home state, Illinois, a state official – Kimery Vories – reported that deregulation resulted in the price of electricity increasing by forty percent,

all at once. It failed here in Sweden, and as I told colleagues and students in Bangkok a few years ago, electric deregulation in Sweden seems to mean that the largest power company in Scandinavia has been awarded a gold-plated license to make fools of the consumers of electricity.

I mentioned Canada above, and so I'll take this opportunity to repeat what the chairman of the independent Electricity System Operator of Ontario had to say about her experiences with what is sometimes called the 'deregulation experiment'.

"Now before you ask whether I am still asleep or dreaming or had something extra in my coffee this morning," she told a small audience several years ago, "let me qualify my remarks by noting that I have not given a timetable to arrive at this destination", where by "this destination" she specifically meant a "reliable, efficient, easily understandable, transparent, accountable, and sustained supply of inexpensive deregulated electricity." That's putting it mildly, because on the date when the contents of Madame Chairman's morning coffee came into question, Ontario had less generating capacity than it possessed a decade earlier, and according to the president of the Association of Major Power Consumers of Ontario, a bungled deregulation agenda resulted in that province losing a valuable competitive advantage.

I remember giving one of my sermons against deregulation in Lima (Peru), and fortunately I got out of that country just in time, because when they initiated that goofy experiment I heard of some shots were fired, as was also the case in the Dominican Republic.

Deregulation failed in Brazil, and a notable aspect of that particular burlesque consisted of Lutz Trevesso, CEO of a large power company in Brazil, saying that deregulation would create more problems than it solved.

You've heard what I think of deregulation, so now let's turn to some other opinions. The elderly U.S. Senator Ernest Hollings brusquely abandoned the deregulation sinners who had seduced him into the ways of 'liberalization'. and began to call himself a "born-again regulator". Another U.S. Senator, Byron Dorgan, was more explicit. He put it this way: "I'VE HAD A BELLY FULL OF BEING RESTRUCTURED AND DEREGULATED, ONLY TO FIND OUT THAT EVERYBODY ELSE GETS RICH AND THE REST OF THE PEOPLE LOSE THEIR SHIRTS!" (*Financial Times*, April 22, 2003). A headline in the *New York Times* (15 July, 1998) read as follows: "Deregulation fosters turmoil in power markets!"

Personally I'm very fond of Governor Gray Davis' judgement: "At the mercy of forces that show no mercy." Governor Gary Locke of Washington (State) offered an important thought on the bad news resulting from the deregulation travesty, concluding that since the government caused the suffering, it was up to them to cure it. And last but

not least, U.S. Congressman Peter de Fazio put it this way: "Why do we need to go through such a radical, risk taking experiment"? Fortunately, I don't have to repeat my favorite Wall Street mantra, which is 'It's not the money, Ingrid – it's *only* the money' – because Congressman de Fazio answered his own question by saying "it's because there are people who are going to make millions or billions!"

There are still two items in this humble discussion that deserve a short comment. The first has to do with why a large power company wanted me to come to Hong Kong and ridicule electric deregulation. In a sense, I've already provided the answer to that. The directors of that company knew that electric deregulation was a lost cause, a waste, a scam, a lose-lose proposition, or to quote Jean-Paul Sartre "a fire without a tomorrow". In California though, or for that matter here in Sweden, it wouldn't have made any difference to the directors of the power companies what it was, because although they know the difference between right and wrong, what they were mainly concerned with was – as they say on Wall Street – putting themselves in a position where they could take the money and run. Furthermore, for Sweden, deregulation made it possible for a large power company to shift a part of its attention to Germany, where it specializes in making grossly unscientific claims about their program for a "green" future. A green future in which the large-scale mining of low-quality coal is included.

But things are different in China. A deregulation failure in Hong Kong could mean something very different from a failure in California or Sweden. In California – and especially in Sweden – there might be a short article in a newspaper or business magazine, but the poor consumers would be left to gnash their teeth and curse, and that would be the end of it. On the other hand, in Hong Kong somebody important might confront the executives responsible for the misfortune, demand an explanation, talk to them in a manner that sergeants in the American Army once talked to recruits, and perhaps ask to examine some bookkeeping and other paper work. I don't think that it is necessary to tell you how this could turn out, because the Chinese government does not make a practice of applauding incompetence.

And finally, when I began to study regulation and deregulation, the leading scholar in the field was Professor Alfred Kahn. Once the electric deregulation failures began, he made the following statement; "I am worried about the uniqueness of electricity markets. I've always been uncertain about eliminating vertical integration. It may be one industry in which it works reasonably well. "

I'm not worried at all ladies and gentlemen, because the main issue being discussed on this occasion is not vertical integration. It is the supreme importance of electricity as compared to, for example, natural gas, which is a topic that I once studied in some detail. There may be passable substitutes for natural gas, but – everything considered –

there are no substitutes for a large supply of inexpensive and reliable electricity, especially if we are considering modern and civilized countries whose citizens and/or voters are concerned about their futures and the futures of their descendants.

REFERENCE

Banks, Ferdinand E. (2015). *Energy and Economic Theory*. Singapore London and New York: World Scientific.

Faruqui, Ahmad, Hung-po Chauo, Vic Nemeyer, Jeremy Platt, and Karl Stahlkopf (2001). 'Analyzing California's Power Crisis'. *The Energy Journal.*