

The Challenges and Opportunities Facing the ISES Family of Societies: The Hubbert Peak of Petroleum Production and Global Warming

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Abstract. *There are two serious challenges for ISES and its National Sections at present: global warming and the world Hubbert peak of petroleum production. Global warming is caused by carbon dioxide injected into the atmosphere by burning fossil fuels. The carbon dioxide absorbs some of the infrared radiation with which the earth sends its solar heating back into space, so the earth has to become hotter to have the necessary heat losses. The petroleum Hubbert peak involves the maximum petroleum production we will ever get, which is something to be expected for a finite resource produced with solar energy and carbon dioxide many million years ago. We already passed this Hubbert peak. We will face an ever decreasing petroleum supply, and we will have to use less in petroleum liquids, for they will become much more expensive. It is however clear that wind power, photovoltaics, and solar thermal power will be able to keep electric power costs low. The Hubbert peak is the beginning of the end of our very short petroleum era, and humanity must start an energy transition to establish its permanent age of solar energy. Global warming makes this energy transition critical, for humanity must reduce all of its fossil fuel combustion to pass on a livable world to future generations. ISES should start to address the needs of humanity in this urgent energy transition.*

Key Words: World Petroleum Hubbert Peak, Global Warming, Energy Transition, Solar Energy, ISES

1. INTRODUCTION

For many decades petroleum-liquids have been the most important energy sources and raw materials for almost everything we do. They are classified as conventional and non-conventional petroleum-liquids. Conventional petroleum is the petroleum from the traditional oil fields found on land. If one drills a well into such an oil field, much of the oil comes out by itself under great pressure, just as it has done recently out of the off-shore British Petroleum well in the Gulf of Mexico. All one has to do is to hook up a pipeline to take the oil to the refinery, and after some time one also needs a pump. Non-conventional petroleum-liquids include tar sands petroleum, heavy oil petroleum, natural gas liquids, deep water petroleum (like that which has been coming out of the British Petroleum well into the Gulf of Mexico), polar regions petroleum, bio-liquids, and other such very different and much more difficult and/or expensive and/or dirty liquids. Some of these non-conventional types of petroleum, like tar sands and heavy oil, may be very plentiful, but they cannot be produced anywhere near as rapidly and cleanly and cheaply as conventional petroleum.

According to The Oil and Gas Journal, the most prestigious magazine in the petroleum industry, Dr. Colin John Campbell is the most widely respected expert in the world on the topic of oil depletion. Dr. Campbell has a massive computerized database on oil fields all over the world, with information on field size, past and present production, depletion rates, etc. He has been compiling this database for several decades, and it includes information from the literature, and solicited and unsolicited contributions from many sources. The Hubbert peak is not a hypothetical concern that we may have to worry about at some time in the future, for we almost certainly have already passed this world Hubbert peak. According to Dr. Campbell the world's Hubbert peak in conventional petroleum already passed in the year 2004, and in all petroleum liquids it passed in the year 2007 or 2008. Many other very highly respected retired petroleum geologists or financiers such as Mr. Leskay Magoon of the USGS, Dr. Walter Youngquist of the Univ. of Oregon at Eugene, Mr. Jean Laherrère (former chief of exploration) of the French Total company, the late Mr. Matthew Simmons of the Simmons & Company International investment group of Houston, and others, agree with Dr. Campbell on these dates. The information can be most conveniently obtained from the website of ASPO-USA, the Association for the Study of Peak Oil in the USA (Anon, 2010a), but there are also many other

informative websites (Anon, 2010b). A graph of the oil and gas production made by Dr. Campbell in 2008 (as shown at the ASPO websites) is shown in Figure 1. Dr. Campbell can generate such an updated graph at any time based on his computerized database.

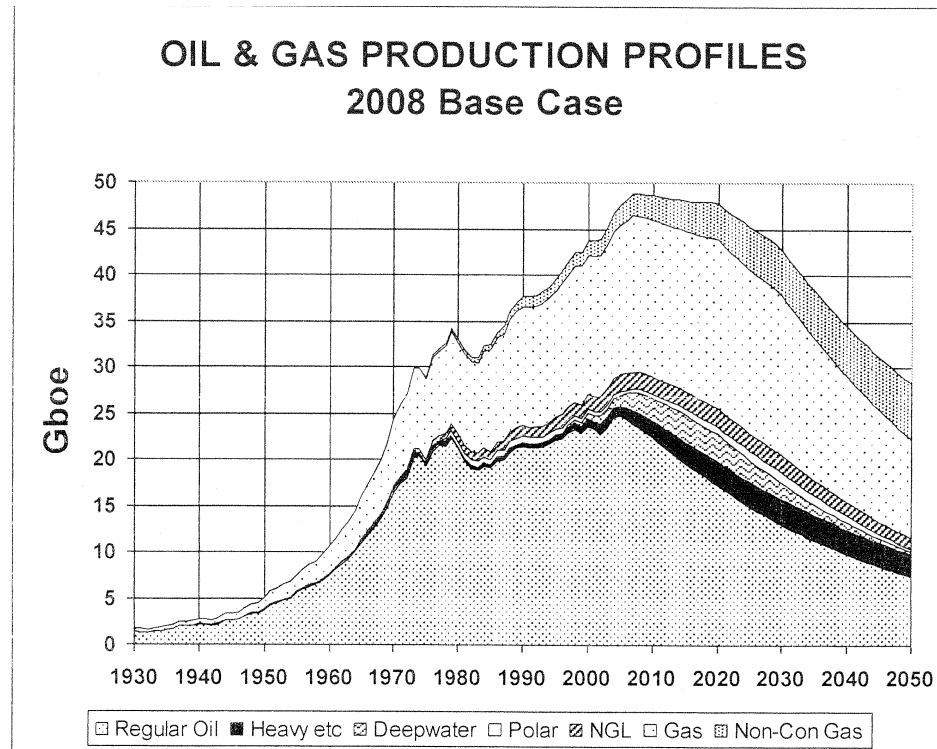


Figure 1. Petroleum Liquids and Natural Gas Production in the Past, Present, and Future, In Billions of Barrels of Petroleum-Equivalent Energy Content Per Year

At first sight the future looks quite ominous in Figure 1, with the total supply declining at a compound rate of perhaps a few percent. The reality is however likely to be much worse, for what is important is not the total supply available to humanity, but the total supply available on the world market, after the producing nations have satisfied their own internal needs. Those internal needs can be highly subsidized, as in Venezuela, where automobile fuel is almost free, and the needs are growing rapidly. In WW 2 Japan invaded Indonesia because it had so much petroleum. After WW 2 Indonesia became part of OPEC, but recently the depletion of the resources and the growth of consumption made Indonesia a petroleum importer rather than an exporter. Mexico may stop becoming an exporter in the near future, and other exporters are sure to follow. In the near future the developed countries may be the only ones able to buy significant amounts of petroleum, and the developing countries may be left largely without any. Some optimists expect airline travel to continue growing at 5% per year. It may well instead shrink significantly because of the cost of fuel, to become as much of a luxury as it was 60 or more years ago.

The established petroleum experts are more trustworthy than industry or oil ministry spokesmen. At present, everybody knows that many of the most brilliant young people end up in Silicon Valley, but 30 or 40 years ago Silicon Valley did not exist. For nearly a century before then, many of the most brilliant young people ended up in petroleum geology, in which there were great fortunes and good careers to be made. The best retired petroleum experts are the only ones who should be trusted, for they are the top people in the field, and they can no longer be told what to say by the management of a company or a government agency. They have been involved in the petroleum industry their whole life, they have the details on the important (and not-so-important) oil fields and oil provinces, and most importantly they know many if not most of the high level technical people in the field. They can nearly always get the real numbers, even though the oil company managers or the oil ministry officials may not want the real numbers to be released.

Global warming constitutes an absolutely terrifying threat. Since the first study on global warming (Arrhenius, 1896) there have never been serious doubts about the global warming effects of adding carbon dioxide to the earth atmosphere. At present it has already become possible to make very specific predictions on what global warming will do to the climate in different parts of the world (Appenzeller et al, 2004). The evidence that global warming has started and is accelerating has become quite undeniable, and there are reports on actions we could take to keep global warming to a minimum (Kutscher, 2007). We should however recognize that for humanity a response to global warming is totally optional, for society is totally free to commit suicide by letting the whole world overheat, by letting an enormous number of species go extinct, by letting many ocean side cities and other areas flood, by letting local climates change beyond recognition, by abandoning much of the infrastructure because it no longer works in the new climates or when submerged by the seas, by letting a major part of the world's population starve, by inviting total chaos as major population groups try to reach parts of the world where they can perhaps survive, etc. After all, many individual societies have already essentially committed suicide in the past, like the Maya, the people who lived on Easter Island, and others, as documented in the book "Collapse" (Diamond, 2005). There is no God and no technology that can protect us from ourselves, but ISES can certainly help to provide some rationality.

The world Hubbert peak of petroleum production however does not offer any options to humanity. Society will have to adjust, with an oil depletion schedule that we can do almost nothing about but that is defined by geology and nature. The only option open to humanity is whether the adjustment will be intelligent and peaceful, or stupid and violent. In Hubbert's very first paper (Hubbert, 1949), he already recognized that the world's oil Hubbert peak would be the first time in history that all of humanity would have to face the same problem, and that this could lead to events of enormous stupidity and violence. We have already seen some of that stupidity and violence in the US oil war in Iraq: an adventure as illegal, and as stupid, and as destructive, and as wasteful as the US George W. Bush Administration, in its almost total lack of respect for the facts, the truth, the law, and the US Constitution, could be expected to make it, as described in the book "Fiasco" (Ricks, 2006). The seriousness of global warming has been recognized more recently, but global warming is an equally critical problem. The main question for the members of the ISES family of societies to address on the world Hubbert peak of petroleum production and on global warming seems to be: "Which NGO is most likely to be able to ensure that the energy transition from fossil fuels to sustainable energy sources will be peaceful and orderly, instead of stupid and violent?" The answer is obvious and simple: ISES, if ISES can accept that challenge. The time has come to recognize this, and to accept that challenge.

2. THE DETAILS ON THESE CHALLENGES AND OPPORTUNITIES

Global warming and peak oil will affect everybody. Many people who have studied these problems have concluded that solving or addressing these problems properly will have to involve almost everybody, once humanity recognizes and understands the situations involved. That is the challenge for ISES, for the history of ISES can make ISES the most credible NGO involved for helping humanity on these problems. There may be an enormous enthusiasm on the part of the public, once people recognize that they are members of the few generations entrusted by fate to change humanity to sustainable energy sources. Such enthusiasm has been seen before. In WW 2 the US public became very committed to defeating Nazi Germany and the aggressive Japanese empire. There were two books written about this, entitled: "The Greatest Generation" (Brokaw, 1992 and 1999) to record the public enthusiasm involved. The challenge for ISES is to lead such an enthusiastic movement all around the world, and if ISES does that properly, the membership of ISES and its National Sections could become not a few thousands or tens of thousands, but literally in the millions. An ISES family of societies with 7 million members would still have only one member for every thousand people on earth. The membership could even be much higher.

These numbers are not just guesses, for a huge environmental movement has already started, (Hawken, 2007). This movement is still quite fragmented, but the American Solar Energy Society (ASES) is already fully involved. Its annual National Solar Tour attracts well over 160,000 people, its magazine Solar Today is printed in over 20,000 copies, its conferences attract an attendance of 5,000 and have a budget of about US\$2 million, and its annual budget is over US\$4 million and expected to reach US\$6 million next year. ASES hopes to have a total number of members and magazine readers of about 600,000 in a year or two, but I think the number will be even larger. The ISES family of

societies has the chance to become the most important leader in this movement, or it can simply do little or nothing, and look at the world as it moves by and leaves ISES behind. As Shakespeare wrote in Julius Caesar (Act 4, Scene 3): “There is a tide in the affairs of men, which taken at the flood, leads on to fortune. Omitted, all the voyage of their life is bound in shallows and in miseries. On such a full sea are we now afloat. And we must take the current when it serves, or lose our ventures” (Anon, 2010c).

The energy transition will take many decades, and must be started as soon as possible. It is harmful to wait until everybody has become convinced that the oil Hubbert peak has already passed, but we no longer have any other choice. When Denis Hayes was the Director of the US Solar Energy Research Institute (SERI, now NREL) under US President Carter, he commissioned a report (SERI, 1981) that described the needed effort, and predicted that it could create jobs and prosperity, instead of chaos. Carter would almost certainly have tried to start the energy transition. Unfortunately, new oil provinces in Prudhoe Bay, Mexico, and the North Atlantic Ocean then created an “oil glut” that served to distract humanity, and Ronald Reagan won the election to become US President instead of Carter. Reagan did everything he could to destroy the solar energy programs, and even refused to allow the SERI report (SERI, 1981) to be printed by the US government. It had to be published privately. About 25 years later the same thing happened again. A new study was done on the necessary energy transition process for the US DOE, the US DOE refused to publish it, and the report had to be posted on the internet (Hirsch et al, 2005).

It is well known how petroleum was originally created, where one might be able to find oil fields, and where it is pointless to look for them (Magoon and Dow, 1994). For well over a century the most capable petroleum geologists have had almost unlimited funds to look for oil fields, and there are very few parts of the world that have not been carefully explored. All the large oil fields and “oil provinces” were discovered long ago. We are now only filling in the gaps, with most of the new oil fields so small that they can only satisfy the world’s “needs” (i.e. the world’s almost insatiable thirst for oil) for a short period. The BP Macondo field that has produced such a disaster in the Gulf of Mexico has been estimated to contain 50 million barrels of recoverable oil, whereas the world currently uses about 86 million barrels per day. The Macondo field could hence have satisfied the world’s current oil thirst for 58% of a day: about 14 hours! The Macondo oil field would have required many years to produce these 50 million barrels if nothing had gone wrong. It will probably require many decades for nature and humanity to clean up the Macondo mess, but the oil industry is insisting that it is essential for humanity to continue developing as many insignificant offshore oil fields as possible, no matter what this does to global warming, to the environment, or to humanity’s future. Solar energy can provide a better solution, and ISES must (or at least should try to) make the world aware of this.

In 1994 I met Dr. Campbell in France, and visited the Geneva office of Petroconsultants, at the time the most important data center in the world on petroleum reserves and resources around the world, in conjunction with Mr. Laherrère. Since then I have met and been in fairly frequent contact with the people mentioned above, and already in 1996 I was concerned about the misinformation being widely published on petroleum (de Winter, 1996). Soon after meeting with Campbell, I arranged for Campbell to write 3 articles in the ISES SunWorld magazine (Campbell, 1994 and 1995). Campbell followed this up with articles in several prominent magazines (Campbell, 1998a and 1998b), and with several books. He later founded ASPO, the Association for the Study of Peak Oil (Anon, 2010a).

There are many questionable numbers and predictions being published. To any careless R&D think-tank, the most attractive “R&D Contract” is one in which a client comes in and says: “Here is X million US dollars. I want you to produce a beautiful report, in which the conclusion is that the world Hubbert peak of petroleum-liquids production will only happen 35 years from now, if ever, and that until then we will be swimming in very affordable petroleum. I do not care how you spend the money, and if you want to you can take most of it out in profits.” This happens. In a 2005 paper I co-authored with Ronald Swenson it was documented that Exxon-Mobil had already spent 8 million US dollars on “studies” leading to the “conclusion” that global warming was a myth (Swenson and de Winter, 2005). Exxon-Mobil and other groups continue funding such studies.

Another type of questionable “study report” can be one that is sponsored internally in a think tank, but then only sold to people willing to pay for example US\$30,000 or more per copy of the report. Few can afford to buy this report to confirm that the widely publicized “conclusions” are in fact totally nonsensical, but an oil company can easily buy (and then destroy) 50 copies for US\$1,500,000

to compensate the “think tank” for having reached these conclusions, with such “publication sales” being secret. This also happens.

These types of misinformation efforts have been going on for long. In a 1985 paper (de Winter, 1985) I mentioned that OPEC leaders were making sure to keep the price of petroleum low enough so that solar energy could not compete, and were telling the world that petroleum would be cheap and plentiful for long, so that humanity would limit its energy R&D, and so that petroleum could keep its market. In my paper I however warned that the world petroleum Hubbert peak and petroleum scarcity could be expected in no more than a generation. That was fairly accurate, for the Hubbert peak has now already arrived.

There are a number of groups that have been putting out excessively optimistic numbers on the petroleum reserves and on the future petroleum production. They include OPEC, the IEA, the US DOE EIA, the USGS, CERA (Cambridge Energy Research Associates), many oil companies and countries, and a number of free lance consultants. Many of the optimists involve economists, of whom Dr. Marion King Hubbert used to say: “Some economists can find twice as much oil on paper as a petroleum geologist can find in the ground.” Many are paid or ordered to publish only good news. The oil industry, the politicians, and the public may all like good news, but the solar energy establishment does not need to believe it.

In our 2005 paper (Swenson and de Winter, 2005) it was documented that Dr. Farrington Daniels, the founder of ISES, was already involved with Dr. Marion King Hubbert at the very beginning of the Hubbert work in 1948. At that time, at a prominent AAAS technical conference session, Hubbert presented a paper on the future of petroleum (Hubbert, 1949), Daniels presented a paper on the future of solar energy (Daniels, 1949), and Eugene Wigner (winner of the Nobel Physics Prize of 1963) presented a paper on the future of nuclear power (Wigner, 1948). Later they co-authored a paper, with Daniels as senior author (Daniels, Hubbert and Wigner, 1949). Later Hubbert had several publications (Hubbert, 1956 and Hubbert, 1971) which included his predictions for when the Hubbert peak would be in the USA and in the whole world. Daniels knew about Hubbert’s predictions, for in his 1964 book (Daniels, 1964) Daniels mentioned that the US Hubbert peak would come around 1970, and that the world Hubbert peak of petroleum would happen around now.

Daniels was a very prominent chemist, who wrote several chemistry texts widely used in universities. One of these was still being printed and used for years after Daniels died in the early 1970s at the age of 83. Daniels was the Director of the whole Chicago operation (called the “Metallurgical Laboratory” or “Metlab” to hide the reality) of the Manhattan Project that developed the atom bomb and the nuclear power technology (Enrico Fermi and Eugene Wigner both worked for him at the time), and in 1947 he conceived the pebble bed or gas-cooled reactor, also called the “Daniels Pile,” now being put into production around the world. After the war he worked on limiting the nuclear arms race, he apparently had more faith in solar energy than in nuclear power, and he founded ISES to prepare humanity for the Hubbert Peak.

There are many people now studying peak oil as members of ASPO (the Association for the Study of Peak Oil). There is not only the international ASPO group (Anon, 2010a)), but there are many ASPO National Sections (Anon, 2010d), just like ISES has National Sections. The ASPO members are as interested in peak oil as Dr. Daniels (the ISES founder) was over 60 years ago in the late 1940s.

OPEC has always claimed to have a significant spare production capacity. Recently the price of oil went to US\$147 per barrel, and it became clear that this spare capacity did not exist. The price later dropped to US\$30 per barrel because the world economy collapsed and the oil demand dropped just a bit. The price had almost exploded because of a shortage of a few percent, and then it almost collapsed because of a surplus of a few percent. This was to be expected. We were already at the wiggly plateau that one can expect at the world Hubbert peak of petroleum production, but things happened so fast that the public did not notice. An ever increasing number of people are however becoming familiar with the Hubbert peak concept. When the economy recovers and an increased oil demand shows again that the spare capacity does not exist the world is likely to reach the “tipping point” (Gladwell, 2000), with the public becoming widely aware that the Hubbert peak has passed. ISES must be ready to respond to the needs of humanity.

I have continued writing papers and articles about the Hubbert peak (de Winter and Swenson, 2006 and 2009) because it will give an enormous boost to solar energy. It can also give an enormous boost to the ISES family of societies, but only if they accept the challenge. If ISES and its National Sections ignore the enormous opportunities that the Hubbert petroleum peak and global warming offers to them, they will simply become insignificant relics of the past.

3. CONCLUSIONS AND RECOMMENDATIONS

For the rest of our lives, and for the rest of this century, it is almost certain that the most important objective for humanity will be to achieve a sustainable lifestyle in a livable world. The ISES family of societies can have a major role in the necessary energy transition, and can grow from small groups into massive societies. This will however happen only if we accept the challenges and opportunities involved. Let us do so.

4. REFERENCES

- Anon, 2010a: ASPO is at: <http://www.peakoil.net> , its US Section at: <http://www.aspo-usa.org> .
- Anon, 2010b: More information on the Hubbert peak and on global warming can be found at: <http://www.hubbertpeak.com> , <http://www.oilcrisis.com> , <http://www.dieoff.org> , <http://www.lifeaftertheoilcrash.net> , <http://www.realclimate.org> , <http://www.theoil drum.com> , <http://www.postcarbon.org> , and <http://www.apolloalliance.org> .
- Anon, 2010c: One can see the famous actor Sir John Gielgud delivering this Shakespeare quotation at: <http://www.youtube.com/watch?v=mwoTxa-M4NM> .
- Anon, 2010d. There are many ASPO National Sections, including Argentina, Australia, Belgium, Canada, China, France, Germany, Hong Kong, Ireland, Israel, Italy, Korea, Kuwait, Mexico, The Netherlands, New Zealand, Portugal, South Africa, Spain, Sweden, Switzerland, UK, and USA. See <http://www.peakoil.net> for details.
- Appenzeller, T., et al, 2004: Articles on Global Warming, National Geographic, Sept. 2004, pp 2-75.
- Arrhenius, S., 1896: "On the Influence of Carbonic Acid in the Air Upon the Temperature of the Ground," Philosophical Magazine and Journal of Science (London, Edinburgh, and Dublin), Fifth Series. Vol. 41, pp 237–276, April 1896.
- Brokaw, T., 1992: "The Greatest Generation," Random House, NY, 1992.
- Brokaw, T., 1999: "The Greatest Generation Speaks – Letters and Reflections," Random House, NY, 1999.
- Campbell, C. J., 1994 and 1995: "The Imminent End of Cheap Oil-Based Energy," ISES SunWorld, V 18, N 4, Dec. 1994, pp 17-19. See also: "Taking Stock," in V 19, N 1, March 1995, pp 16-19, and: "The Coming Crisis," in V 19, N 2, June 1995, pp 16-19.
- Campbell, C. J. and Laherrère, J., 1998: "The End of Cheap Oil," Scientific American, March 1998, pp 78-83.
- Campbell, C. J., 1998: "Running Out of Gas - This Time the Wolf is Coming," The National Interest, Number 51, Spring 1998, pp 47-55.
- Daniels, F., 1949: "Solar Energy," Science, Vol. 109, 1949, pp 51-57.
- Daniels, F.; Hubbert, M. K.; and Wigner, E. P., 1949: "Our Energy Resources," Physics Today, April 1949, pp 18-22.
- Daniels, F., 1964 (the founder of ISES): "Direct Use of the Sun's Energy," Ballantine Books, NY, 1964 (the discussion of peak petroleum production and of petroleum scarcity is on page 3 or page 4, depending on the edition).
- de Winter, F., 1985: "Economic and Policy Aspects of Solar Energy," Proc. of the Ninth Biennial Congress of ISES, Intersol 85, Montreal, Canada, June 23-29, 1985, Pergamon Press, NY, 1986, Vol. 4, pp. 2207-2218.
- de Winter, F., 1996: Already in 1996 I posted a discussion on the internet about the misinformation efforts on petroleum resources and reserves, as well as on other topics, and this can be found at: <http://www.oilcrisis.com/editorials/19960711.htm> .
- de Winter, F. and R. B. Swenson, R. B., 2006: "A Wake-Up Call," Solar Today, March/April 2006, pp 15-19. This is the first of four articles in this issue, all of which can be downloaded at: <http://www.ecotopia.com/ases/SolarToday/DawnofTheSolarEra.pdf> .
- de Winter, F. and Swenson, R. B., 2009: "The Hubbert Peak of World Oil Production, and its Likely Impacts on Population, Lifestyles, Conflicts, Globalization, the Environment, and ISES," Proc. of the 2009 Solar World Congress of ISES, Johannesburg, S.A., Oct. 11-14, 2009, pp 13-18.

- Diamond, 2005: "Collapse: How Societies Choose to Fail or Succeed," Viking, NY, 2005.
- Gladwell, M., 2000: "The Tipping Point - How Little Things Can Make a Big Difference," Little, Brown & Co., NY, 2000.
- Hawken, P., 2007: "Blessed Unrest – How the Largest Movement in the World Came into Being and Why No One Saw it Coming," Viking, NY, 2007.
- Hirsch, R. L.; Bezdek, R. H.; and Wendling, R. M., 2005: "Peaking of Oil Production: Impacts, Mitigation, and Risk Management," Science Applications Inc. and Management Information Services Inc. Report to the National Energy Techn. Lab. of the US DOE, Wash., DC, Feb. 2005. The US DOE refused to publish this report, just like it refused to publish the SERI report (SERI, 1981), and it had to be posted on the internet at: http://www.mnforsustain.org/oil_peaking_of_world_oil_production_study_hirsch.htm
- Hubbert, M. K., 1949: "Energy from Fossil Fuels," Science (a journal of the American Association for the Advancement of Science - the AAAS), Vol. 109, 1949, pp 103-109.
- Hubbert, M. K., 1956: "Nuclear Energy and the Fossil Fuels," Pub. No. 95, Shell Dev. Co. Expl. & Prod. Res. Div., Houston, TX, June 1956.
- Hubbert, M. K., 1971: "The Energy Resources of the Earth," Energy and Power, A Sci. American Book, Freeman & Co., San Francisco, 1971, pp. 31-40.
- Kutscher, C. F., Ed., 2007: "Tackling Climate Change in the U.S.," American Solar Energy Society, ASES, Boulder, Colorado, USA, January 2007. This report can be downloaded at: http://www.ases.org/images/stories/file/ASES/climate_change.pdf .
- Magoon, L. B. and Dow, W. G., Eds., 2004: "The Petroleum System – From Source to Trap," The Am. Assoc. of Petroleum Geologists, Tulsa, OK, 1994.
- Ricks, T. E., 2006: "Fiasco – The American Adventure in Iraq," Penguin, NY, 2006.
- SERI, 1981: "A New Prosperity – Building a Sustainable Energy Future," Published outside of the US Government by Brickhouse Publ., Andover, MA, 1981.
- Swenson, R. B. and de Winter, F., 2005: "The Production Peaks in Petroleum and Natural Gas: Information, Misinformation, Awareness, and Implications," Proc. of the 2005 Solar World Congress of ISES, Orlando, Florida, USA, August 6-12, 2005. This paper can be downloaded at: <http://www.ecotopia.com/ises/2005/OilGasProduction.pdf> .
- Wigner, E. P., 1948: "Atomic Energy," Science, Vol. 108, 1948, pp 517-521.