Journal of Research Practice
Volume 9, Issue 1, Article V5, 2013

ISSN: 1712-851X

Viewpoints and Discussion:

Collaborative Research in Energy: How the US-USSR Initiated a Research Project 40 Years Ago

Richard J. Ormerod
University of Warwick, UNITED KINGDOM
richard@rormerod.freeserve.co.uk

Index Terms: research collaboration; international research institutions; global issues; energy solutions; applied systems thinking; IIASA applied systems analysis

Suggested Citation: Ormerod, R. J. (2013). Collaborative research in energy: How the US-USSR initiated a research project 40 years ago. *Journal of Research Practice*, *9*(1), Article V5. Retrieved from http://jrp.icaap.org/index.php/jrp/article/view/389/314

Note. This article is a response to a Main Article published in this journal:
Thurner, T. W., & Proskuryakova, L. (2013). Collaborative research in energy efficiency and renewable energy: Evidence from 5 years of US-Russian research cooperation. *Journal of Research Practice*, *9*(1), Article M4.

I read with interest the article by Thurner and Proskuryakova (2013). It is striking that the current global energy problem they describe (drawing on OECD/IEA analysis) is almost exactly the same as that faced in the 1970s and 1980s when I was involved in such issues. The growing need for energy, the deteriorating fossil supplies, the environmental threats and the need for sustainability were all identified then. As now, the lack of technical progress was lamented and the need to develop sustainable alternatives was deemed urgent.

Thurner and Proskuryakova have analyzed recent US-Russian cooperation on energy research in terms of publications and patents, shedding some light on the collaboration involved. A related question is how such collaboration arises: what are the motivations and the support mechanisms; are such mechanisms effective? My experience as a corporate strategist in the energy field was that, in pursuing scientific questions related to the global problems of energy and climate, institutional arrangements can indeed be effective in encouraging international collaboration across political, cultural and disciplinary divisions. In the late 1970s I became involved in a US-USSR energy research

project at the International Institute for Applied Systems Analysis (IIASA). In response to Thurner and Proskuryakova's article I draw on my experience of participating (intermittently) in the IIASA project to illustrate some of the frustrations encountered and some of the project's achievements.

In 1972 IIASA came into being when a Charter was signed at the Royal Society in London by representatives of the distinguished scientific institutions from 12 countries. The idea of establishing such an institute had been conceived much earlier as a joint US-USSR initiative to bring peoples of the world together, an act of détente at a time of the Cold War. IIASA was designated to be international, without being governmental; its members were not nations but scientific institutions from each participating nation. The US and the USSR were the main financial contributors in equal measure; the other contributors each paid 15% of the amount paid by each of the larger contributors. It was thus a US-USSR collaboration involving junior partners as well. In time, additional nations joined in. The Institute adopted English as the sole official language and was located at Schloss Laxenburg near Vienna. Professor Howard Raiffa from Harvard was the first Director. By the end of its second year the Institute had established its full complement of 80 scientific staff (Häfele, 1981, pp. 835-836).

The Energy Systems Project (ESP) was initiated in 1973, the first major IIASA study to be established. Its aim was to examine strategies at global, regional, and national levels, for achieving the transition from oil- and gas-based energy systems to those based on more sustainable sources. The Director of the project was Wolf Häfele, formerly the Director of the joint West German-Belgium-Netherlands-Luxembourg Fast Breeder Project. In 1980 the ESP was also the first IIASA project to be completed with the findings published in the form of a two-volume book (Anderer, 1981; Häfele, 1981).

The project was successful in attracting the interest and participation of scientists from all over the world; some 140 scientists were involved (ranging from full-time to intermittent involvement) from over 19 countries, giving some support to the project's claim to be "a truly comprehensive analysis of the world's energy future" (Gvishiani & Levien, 1981, p. xi). The project got off to a confident start, guided by the Director, Häfele. As a passionate advocate of the nuclear Fast Breeder Reactor (FBR), his first initiative was to have a model developed to demonstrate the technical capability of an FBR programme to produce sustainable nuclear power. This model was to sit at the centre of a suite of models designed to capture the technical and scientific aspects of future energy systems.

A number of other initiatives were set away to cover other sources of energy, the impact on the environment, the requirement for material resources, the capital requirement and economic impact, and the assessment of the risks. All this involved a variety of scientists in disparate investigations, the idea being to eventually integrate the findings in one comprehensive model. The approach was also influenced by an overarching analysis that depicted primary energy sources as products globally competing for market share. An analysis of market penetration showed that over many decades, wood, water, and coal had in turn gained market share, reached saturation and then followed a path of inevitable decline. Coal's market share was (at the time of the study) declining, having peaked in

about 1920; oil was saturating; gas was still growing but would in time, according to the logic of the market penetration model, be squeezed out by the growth of the new source, nuclear (including the FBR). Thus eventually all the fossil fuels would be replaced by nuclear. Later perhaps, sustainable biomass and renewable sources, such as solar, would take over (this is a line of argument that continues to this day; see Marchetti, 2011). This general overview and the other initiatives gave rise to a number of difficult questions. How can the aspirations of non-OECD developing nations be met? Why did the public perceive a nuclear future to be unacceptably risky? Can coal make a comeback? Can large scale solar be developed? How can the environmental impact be handled? How can the transition to sustainability be achieved?

Häfele was the dominant intellectual and administrative force throughout. My involvement was intermittent but I found that most people I talked to felt that they were a bit part in a play where the outcome was already determined. Or to use a different metaphor, most felt they were up against a brick wall. There were a number of confrontations, perhaps the most dramatic being one with Amory Lovins, the American advocate of soft energy paths (Meadows, 1981); an unstoppable force met an immovable object! The ambitious model building and integration proved problematic and the project was in danger of going beyond its intended 5-year life; it was necessary to bring it to a close. I was invited to a meeting at which the final outcome of the modelling was to be presented. A large room was packed full of people. No one seemed to know what was going to be revealed. The presenters nervously scurried around and we prepared ourselves for the inevitable. The audience was stunned by what they heard. The project was to conclude that fossil fuels were required (and were available) in vast quantities to support population growth, economic aspirations, and the transition to sustainability over the coming decades. The explanation was simple. The so-called fast breeder nuclear reactors, even on the most optimistic assumptions, could not in fact breed fast enough to displace the additional demands for fossil fuels; the label *fast* refers to the use made of fast neutrons; a breeder reactor programme could indeed breed, but only very slowly. In the quantities required, other sustainable sources such as solar would make huge demands for metals and materials. As a result, despite the environmental and human impact, fossil energy (coal and increasingly marginal sources of oil and gas) was the only source of energy that could be utilized over the coming decades to provide the huge investment required to achieve a sustainable energy future in the long term. The project leader had been forced to come to terms with the logic of the research when it was made transparent by the model.

The next mystery was how all this would be presented in a book? How to square the circle given the interests and the sensitivities? To my surprise, after much consultation, it was well done, with all the limitations and assumptions clearly stated in the foreword to the summary volume, which was jointly authored by the Chairman of the IIASA Council, Jermen Gvishiani and the Director of IIASA, Robert Levien:

> Although analysis strives to be objective, it cannot avoid completely the imprint of personality or the influence of individual and group experience. Consequently this study, like all others, reflects the character and

> background of its authors. Good analysis, however, tries to make these influences and assumptions explicit, so that the user of the analysis can be aware of and compensate for them. Professor Häfele and his team have taken special care in this report to state carefully the assumptions they have made and to distinguish their "visions" from their calculations. . . . But the findings and conclusions of the study are those of the Energy Systems Program under the leadership of Professor Wolf Häfele and should not necessarily be ascribed to the Institute, its Council, or its National Member Organizations. (Gvishiani & Levien, 1981, pp. xi-xii).

Quite so; it seems that wise heads prevailed. In the preface Häfele *inter alia* makes the following comment:

> Our aim throughout the study has been to be objective. However, in summing up, we recognized the need to take a position and to express the views we actually hold. Thus, the assessments and implications of our study for energy policy cannot be defended merely on an objective scientific basis: They are either evident or not. (W. Häfele in the Preface to Anderer, 1981, pp. xiii-xiv).

Today IIASA is funded by 21 national member organizations (52%) and additional contracts, grants, and donations (46%). The annual income in 2011 was a little under EUR17 million. Research is focused on three global problem areas: (i) energy and climate change, (ii) food and water, and (iii) poverty and equity. These problem areas are supported by research into the drivers of the transformations taking place in our world—population, technology, and economic growth. The research is geared toward provision of robust solutions to the challenges of international, regional, and national policy and governance. The methodology used is *advanced systems analysis*.

It is something of an achievement that the Institute has survived the various political upheavals in member governments. Despite the problems encountered, the initial research projects established that multidisciplinary collaboration was possible across ideological divides; so long as the organizational relationships supported scientific inquiry aimed at a common goal, independent of governmental control, the scientific process of analysis, publication, and critique could be made to work. IIASA (2013a) is able to claim: "This approach has been widely imitated, for example, in the Intergovernmental Panel on Climate Change (IPCC) and the International Geosphere-Biosphere Programme." Today IIASA (2013b) can also claim a significant contribution to the 5th Assessment Report of the IPCC, the first portion of which was released on September 27, 2013. IIASA research focuses on what to do about climate change, a major global problem.

At the same time as being involved in the IIASA project, I was also involved in the World Coal Study run by MIT, funded by various companies, foundations, the US Department of Energy, and MIT itself (Wilson, 1980). I was also involved in bilateral collaboration between the company I worked for at the time (the British Coal Corporation) and other commercial enterprises (for instance, General Electric of USA,

Ruhrkohle of Germany) and in international institutions such as the International Energy Agency (IEA). These had commercial and political as well as scientific aims. It is my observation that properly constituted, well-funded institutions involving those sharing a common interest, such as IIASA and the IEA, stand the best chance of surviving and contributing in the long term. The crucial role of global institutions (such as the UN and the OECD/IEA) in confronting the problems of energy use and climate change is obvious. Less obvious, but equally important, is collaboration aimed at developing sustainable options on the supply side. It would be interesting to know if Thurner and Proskuryakova's research indicated the nature of the institutional arrangements that gave rise to the collaboration they identified.

Perhaps, in the light of the importance of the climate change debate, I should end with a word of caution. Making any long-term projection is very difficult. Making long-term projections about a systems as complex as the world's climate is almost impossible. 30-years on, the 1980 IIASA projections of energy demand, the statement of the problem, do not look too bad. It was their supply side solutions that have not (not yet, at least) come about. Perhaps something similar could be said for today's climate change predictions: the statement of the problem is getting better but we are not much closer to a solution that necessarily involves political agreement. To attempt to influence political decision-making by conducting scientific research based on international collaboration is inevitably fraught with difficulty; but it would seem to be better to try to anticipate consequences and to act accordingly than to leave the energy-environment system to make its mind up for us.

References

Anderer, J. (with McDonald, A., & Nakicenovic, N.). (1981). *Energy in a finite world: Paths to a sustainable future*. Cambridge, MA: Ballinger. Retrieved October 2, 2013, from http://webarchive.iiasa.ac.at/Admin/PUB/Documents/XB-81-202.pdf

Gvishiani, J., & Levien, R. E. (1981). Foreword. In J. Anderer, *Energy in a finite world: Paths to a sustainable future* (p. xi). Cambridge, MA: Ballinger.

Häfele, W. (1981). *Energy in a finite world: A global systems analysis*. Cambridge, MA: Ballinger. Retrieved October 2, 2013, from http://webarchive.iiasa.ac.at/Admin/PUB/Documents/XB-81-203.pdf

IIASA. (2013a). *History of IIASA*. Retrieved September 28, 2013, from http://www.iiasa.ac.at/web/home/about/whatisiiasa/history/history_of_iiasa.html

IIASA. (2013b). *IIASA research provides answers on climate change*. Retrieved September 28, 2013, from http://www.iiasa.ac.at/web/home/about/news/IIASA_research_and_the_IPCC_AR5_report_.en.html

Marchetti, C. (2011). On energy systems historically and in the next centuries. *Human Evolution: An International Journal*, *26*(3-4), 181-194.

Meadows, D. (1981). A critique of the IIASA energy models. *The Energy Journal*, *2*(3), 17-28.

Thurner, T. W., & Proskuryakova, L. (2013). Collaborative research in energy efficiency and renewable energy: Evidence from 5 years of US-Russian research cooperation. *Journal of Research Practice*, *9*(1), Article M4. Retrieved from http://jrp.icaap.org/index.php/jrp/article/view/366/306

Wilson, C. L. (1980). *Coal—Bridge to the future: Report of the world coal study*. Cambridge, MA: Ballinger.

Published 2 October 2013