

Incorporating sustainable development considerations into energy sector decision-making: Malmö Flintränen district heating facility case study

Pepukaye Bardouille^{a,*}, Jan Koubsky^b

^aInternational Institute for Industrial Environmental Economics, Lund University, P O Box 196, 22100, Lund, Sweden

^bDelnickà 2, Kalovy Vary 360 05, Czech Republic

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Abstract

The paper introduces an on-going doctoral research study aimed at facilitating the operationalisation of sustainable energy systems. The study focuses upon the analysis of existing and development of new methods for the incorporation of socio-environmental considerations into large-scale investment decision-making in the energy sector. The final output of the research study, to be completed by the end of 2001, will be a *Framework for Sustainable Energy Sector Investment Analysis and Decision Support*. The *Framework* will be designed for application by energy companies in decision-making processes concerning the selection of new power generation alternatives. In order to broadly identify decision-making parameters applied in energy sector decision processes, primary data collection for the study involves the retrospective analysis of decision cases. The results of one portion of information gathering undertaken as part of the aforementioned data collection are presented in the paper. A retrospective case study analysis was carried out on an investment decision-making process concerning the Flintränen biomass-based district heating plant in southern Sweden. To analyse the case study data, an *analytical module* was developed. Examination of the Flintränen case using the *analytical module* revealed several weaknesses in the decision-making methods applied to the planning of the facility, originating primarily from the incorporation of only a limited number of decision parameters or considerations into investment calculations. Furthermore, analysis showed that, had appropriate socio-environmental decision-support methods been incorporated into the decision process, considerable financial and internal environmental costs associated with the facility could have been avoided, and environmental risk linked to its operation decreased. Lessons learned from the Flintränen case will be utilised as input into the ongoing identification and development of parameters considered as important for inclusion in the *Framework for Sustainable Energy Sector Investment Analysis and Decision Support*. © 2000 Elsevier Science Ltd. All rights reserved.

Keywords: Sustainable development; Energy sector; Investment decision-making; Environmental decision-support tools

1. Aim of the paper

The objective of the present paper is two-fold:

1. Firstly, the paper introduces an on-going Ph.D. research study (doctorate in engineering) and presents an overview of work completed within the first year (1998–1999) of the three-year (1998–2001) project. Within the larger goal of facilitating the operationalisation of sustainable energy systems, the study

focuses upon the analysis of existing and development of new methods for the incorporation of socio-environmental considerations into large-scale investment decision-making in the energy sector. The final output of the doctoral project, to be completed by the end of 2001, will be a *Framework for Sustainable Energy Sector Investment Analysis and Decision Support*, which can be applied by energy companies to broaden the considerations used in decision-making processes concerning the selection of new power generation alternatives.

2. Secondly, the paper presents the results of one portion of primary data collection undertaken as part of the aforementioned research. Through a retrospective case study analysis, the researchers sought to

* Corresponding author. Tel.: + 46-46-222 0212; fax: + 46-46-222-0210.

E-mail addresses: pep.bardouille@iiee.lu.se (P. Bardouille), jan.koubsky@envirostrategie.cz (J. Koubsky).

determine the extent to which environmental- and social-considerations were incorporated in a past investment decision process concerning a district heating facility in southern Sweden. Based upon the results of the case study investigation and analysis, areas for improvement in current energy sector investment decision-making processes are highlighted, and areas for further research are recommended.

2. Towards sustainable energy development

2.1. Energy within the sustainability debate

The term *sustainable development* was conceptualised and first came into documented use during the preparation of the then World Wildlife Fund (now the International Union for the Conservation of Nature and Natural Resources) *World Conservation Strategy*, in 1980 (IUCN, 1980). With the 1987 publication of the World Commission on Environment and Development Report, *Our Common Future*, the concept began to gain considerable attention in international circles (WCED, 1987). However, it was following the 1992 United Nations Conference on Environment and Development, and the subsequent emergence of *Agenda 21* and the *Rio Declaration*, that global *sustainable development* became one of the most widely used and seemingly unavoidable catchphrases of the 1990s.

The incompatibility of present development patterns and, thus, the need for a *sustainable method of development* to achieve the goal of a '*positive and lasting development of our planet's resources and population*' (WCED, 1987) has become strikingly apparent, notably over the last two decades: justifiably, with rapid population growth; pollution of soil, air and water; biodiversity loss and myriad other environmental problems related to, amongst others, industrialisation and resource mismanagement, the need to act is ever clearer.

Although the inseparability of energy from global development has been advocated over the past several decades, it has markedly been since the 1972 United Nations Conference on the Human Environment held in Stockholm that energy-related environmental concerns, and their links to human health issues, have begun to find their way into the mainstream — becoming the focus of, or addressed in, several subsequent international conferences and countless publications. Since then, a host of connected events, beginning with the *Earth Summit*, have sought to address the complex inter-related issues concerning energy, environment and (sustainable) development patterns; these include the Energy Charter Protocol signed in Lisbon in December 1994, and the 1997 United Nations Framework Convention on Climate Change (UNFCCC) Kyoto Protocol.

Spurred by the global warming debate and international efforts to curtail the greenhouse effect, scientists, decision-makers, researchers, politicians, special interest groups and the general public have begun to more carefully question current energy production and consumption patterns, and to consider their impacts on the present global development path. Hence, with time, a move towards more *sustainable energy systems* has, increasingly, become recognised as crucial — given energy's undeniable linkages to almost all major development issues — within the overall sustainability discussion.

The environmental issues associated with energy systems — from primary extraction to the processing of fuels, and from energy conversion to electricity distribution and use — are extremely complex. Perhaps due to this very fact, there has, in the past, been a tendency for both government and industry (perhaps in an effort to minimise complicated decision-making and the hard-to-resolve issues stemming therefrom) to more or less push them aside. Recently, however, with the arrival of what could be called a 'sustainable energy movement' to the international arena, things are beginning to change. Promisingly, in addition to increasing national efforts to address energy-related issues, a number of important industrial corporations, including some of the world's largest energy companies — as demonstrated by the forming and activities of the *E7 Group*¹ — have also begun to recognise that the environmental impacts of their activities can no longer be viewed simply as 'external' to their businesses; it is almost inevitable that, at some point in the future, such impacts will begin to affect corporate profitability. A case in point is the proposed sinking of the Royal Dutch Shell *Brent Spar* oil platform, and the negative attention, as well as ensuing corporate financial losses, which resulted.

That said, companies, such as those represented by E7, have also expressed a need for management systems designed to reflect their commitment to a sustainable development path which encompass both economic and environmental issues; such systems are necessary for the *operationalisation* of corporate environmental policies and sustainable energy development strategies. Furthermore, E7 members have, in their policy statements, strongly advocated and promoted the addressing of environmental issues, highlighting their organisational belief that improving the environment is not only good social policy but, in addition, makes good *business sense* for energy companies (E7, 1995).

¹ E7 comprises eight of the world's largest energy companies: Electricité de France, ENEL S.p.A (Italy), Hydro Québec (Canada), Kansai Electric Power Company (Japan), Ontario Hydro (Canada), RWE AG (Germany), Southern California Edison (USA), and Tokyo Electric Power Company (Japan).

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