Summary of Analytical Findings

The European Union's (EU) research and development programs are distinct from, and complementary to, those of the fifteen individual EU Member States. Funding for the European Union's programs comes from the General Budget of the European Communities. In observance of the legal principle of subsidiarity, the EU programs are intended to focus on research activities that are too large and/or too complex for any single country to undertake alone. This report focuses exclusively on R&D programs and activities funded and administered at the supranational, EU level. It is also important to note that this report, unlike all others in this series of country studies, contains no information on trends in private sector energy R&D. Since private sector firms operating within the territory of the European Union are necessarily based within the borders of EU Member States, private sector R&D activities are addressed in the case studies of individual countries.

The European Union's total expenditures on research and development have grown rapidly since the mid-1980s. For example, in the period between the EU's First Framework Programme for research and technological development (spanning the period 1984-1987) and the Fourth Framework Programme (1994-1998), R&D investments under the Framework Programme grew in real terms by more than 120%, from $6.4 billion to $14.5 billion.[1] The budget for the Fifth Framework Programme (1998-2002) is projected to be approximately $15 billion, covering a wide spectrum of research.

In addition to their role in promoting scientific leadership and economic competitiveness, EU-sponsored research and technology development activities play an important role in several other policy areas. For example, the Framework Programme model provides an important vehicle for European social and economic integration, encouraging the training, collaboration and exchange of researchers among EU countries, and facilitating joint research ventures among firms, universities, and research institutions throughout Europe. The Framework Programme also aims to provide leverage to existing precompetitive research and demonstration efforts in individual Member States.

There have been significant shifts over time in Framework Programme research priorities. Biotechnology and life sciences research have experienced the most consistent growth of all socioeconomic areas funded by the EU, both in real dollars and as a share of the Framework Programme budget, rising from approximately 3% to 12% of all EU-sponsored research between 1987 and 1998. In real terms, this represents a seven-fold increase, from $240 million to $1.7 billion. Funding for international scientific cooperation, training and mobility of researchers within the EU, and transportation research have emerged more recently as important areas of EU-sponsored research.

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[1] Note that prior to the Fourth Framework Programme, several major EU-sponsored research activities, such as the THERMIE energy technology demonstration program, operated independently of the Framework Programme. Thus, the major increases in Framework Programme budgets that occurred between the Third and Fourth Frameworks are, in large part, the result of a reclassification/incorporation of ongoing research activities rather than a substantial real increase in research funding and activity. Also, the expansion of the European Union to include Austria, Finland, and Sweden in 1996 also corresponded with increases in the EU research budget resulting from financial contributions from those countries.

Energy research has constituted the largest single area of investment in each of the European Union's five-year Frameworks since the earliest days of joint European Community research programs in the 1970s. The historical significance of energy as a joint European research area stems to a large degree from the impact of the first world oil shock of 1973 on Europe's economies. At that time, it became clear to Europeans that if their inefficient patterns of energy use were to persist, the economic and social foundations of an integrated Europe would be in danger of collapse. Consequently, energy research aimed at the development of new and more efficient technologies became a Community-wide priority and, in many respects, was regarded as a matter of survival. In 1978, for example, the Community spent nearly 70% of its research budget in the energy field.[i]

Since the 1970s, energy R&D has remained a mainstay of EU-sponsored research, although the urgency that originally spurred Community energy research in the crisis years of the 1970s-80s has since subsided. Today, while energy security still is a main objective of EU energy policy, economic competitiveness and environmental protection have also risen to become top energy policy priorities and energy R&D drivers. However, the overall share of the budget devoted to energy R&D has declined steadily, from nearly 50% in Framework Programme I ($1.7 billion between 1984 and 1987) to 14% in Framework Programme V ($2.1 billion between 1998 and2002).

In addition to its shrinking budget share, the energy R&D portfolio has changed significantly in its composition over the past decade. Non-nuclear energy R&D, encompassing programs focusing on fossil fuels, renewable energy, and energy efficiency, has grown over the past decade from the smallest to the largest program area of energy R&D investment, now surpassing both fission and fusion R&D. Due to the necessarily large scale and complexity of nuclear research, fission and fusion programs have always played a major role in EU-sponsored energy research, in keeping with the subsidiarity principle. The recent growth in EU-sponsored non-nuclear energy R&D reflects the rising significance of new, non-nuclear energy technologies, especially in the energy efficiency and renewables areas. The European Commission's 1995 White Paper, "An Energy Policy for the European Union," stressed the importance of these technologies to the attainment of major EU energy policy goals, including energy supply security and environmental protection.

Non-nuclear energy technologies are also viewed as important to the economic competitiveness of EU countries both for their potential to reduce European industry's energy input costs and for their export potential. In the Fourth Framework Programme, renewable energy grew to constitute the largest non-nuclear portion (14%) of the energy R&D budget, after declining sharply in the early 1990s. Energy efficiency has increased steadily over the past decade, from 3% of the total energy R&D budget in the Second Framework ($52 million) to 12% ($138 million) in the Fourth Framework.[ii]

Energy deregulation and the EU-wide integration of national energy systems are also priority policy issues that are deemed to be central to the future economic

competitiveness of the European Union. The EU hopes that energy deregulation and integration will help to reduce Europe's high energy costs, thereby helping European industry to be more competitive in global markets. The EU is working to create trans-European energy networks, linking the networked energy systems (electricity and natural gas) of all fifteen Member States.

Under the 1997 Kyoto Protocol, the European Union committed itself to an 8% reduction in greenhouse gas emissions from 1990 levels by 2008-2012. Greenhouse gas emissions reduction and climate change mitigation now occupy a central position in EU energy policy. The increase in funding for renewable energy R&D in the Fourth Framework Programme aimed to propel the growth of renewable energy in Europe and to spur European economic competitiveness by helping European firms to capture a major portion of the growing worldwide market for renewable energy technologies.

EU research, in energy as in all other socioeconomic areas, focuses on promoting the overall economic competitiveness of the EU's Member States in the world market. With this in mind, a majority of the resources the EU devotes to energy is directed toward applied R&D, technology demonstrations, and pilot projects rather than to basic research or long-term technology development programs (with the exception of nuclear fusion). Even in the renewable energy area, for instance, efforts are focusing on the improvement and commercialization of existing technologies rather than on the development of fundamentally new technologies and systems.

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[i] Luca Guzetti, *A Brief History of European Union Research Policy* (Luxembourg: Office for Official Publications of the European Communities, 1995), pp. 54-56.

[ii] Presentation by Birgit Baumann, European Commission Directorate General XII, at the International Energy Agency Workshop on Energy RTD Trends, September 19, 1997.