

Summary of Analytical Findings

Germany's total national funding for R&D stood at \$42 billion in 1997. The private sector accounted for nearly 62% (\$24 billion) of the total, while the public sector accounted for approximately 38%. Since the late 1970s, when the public and private sectors each funded roughly half of Germany's R&D, the private sector has steadily assumed a larger and larger role as the dominant supporter of R&D activity, while overall government funding has remained essentially flat for much of the past two decades.

Overall public R&D expenditures in Germany declined by 4% in real terms between 1991 and 1997, to approximately \$15 billion. The reduction in R&D investments in the public sector can be attributed in large part to the financial challenges associated with German reunification and related shifts in social priorities (e.g., high unemployment and basic infrastructure needs in the eastern states). R&D expenditures have also declined as a percentage of the total public budget, from a peak of 3.4% in 1985 to 2.7% in 1996.

Private R&D investments grew by 5% between 1995 and 1997. Prior to 1995 private sector R&D expenditures had declined throughout the 1990s attributable in part to weak economic growth in Germany and from relatively unfavorable international terms of trade. Germany's private sector R&D is concentrated in industries that generate a major portion of their revenues through exports and that are particularly vulnerable to exchange rate fluctuations; the high foreign value of the Deutschmark has put downward pressure on foreign sales and further intensified the competitive pressures on industry's R&D projects.

Energy R&D has been the hardest hit of all major socioeconomic areas of R&D expenditure funded by the German government. Between 1981 and 1997, public energy R&D fell from approximately \$1.6 billion to \$400 million--a 75% real decline. The \$850 million reduction in Germany's fission R&D budget (which constituted two-thirds of government R&D investment in 1985) explains some 90% of the funding decline. Negative public perceptions regarding the safety and environmental impacts of nuclear energy, especially following the 1987 Chernobyl crisis, reduced nuclear power's viability as a long-term energy option for Germany.

Government-sponsored fossil energy programs have declined sharply--by 95%--from \$316 million in 1981 to \$20 million in 1997. Government support for fossil energy R&D now focuses primarily on the development of advanced energy systems such as fuel cells, advanced combustion research, and the development of vehicles powered by natural gas, methanol and other alternative fuels. Germany relies increasingly on natural gas, for environmental and economic reasons, and no longer funds large clean coal or other fossil energy programs.

Germany's public energy R&D investment portfolio has intensified its focus in the areas of renewable energy and energy efficiency. R&D in these areas, which accounted for 14% of the energy budget in 1981, now account for approximately 36% of public energy R&D (approximately \$140 million in 1998).

More so than in most other industrialized countries, global climate change has become a major factor in German energy policy. Under the Kyoto Protocol and the European Union's Community Strategy on Climate Change, Germany has committed itself to a 21% reduction in

greenhouse gas emissions from 1990 levels by 2008-2012. The reduction of greenhouse gas emissions and the transition to low- and no-carbon energy technologies is now a major stated policy goal. This major shift in policy goals highlights a dislocation between Germany's current energy policy and its related R&D expenditures, since public support for energy R&D has declined throughout the 1990s.

Shortly after taking office in October 1998, Germany's Social Democratic-Green Party coalition government announced controversial plans to phase out all nuclear power plants in Germany and to raise taxes further on electricity and fossil fuels. Since nuclear power currently generates more than 30% of the country's electricity, attempts to achieve this goal rapidly will intensify the challenge of reducing carbon emissions, which the government has also listed among its policy priorities.

The development and export of new low-carbon or no-carbon energy technologies to mitigate climate change and other environmental impacts of energy use have become important dimensions of Germany's economic and trade policy. The German government and industry are working together to set the international standards for new energy and environmental technologies, a strategy that, if effective, could help position Germany to dominate key technology markets in the future.