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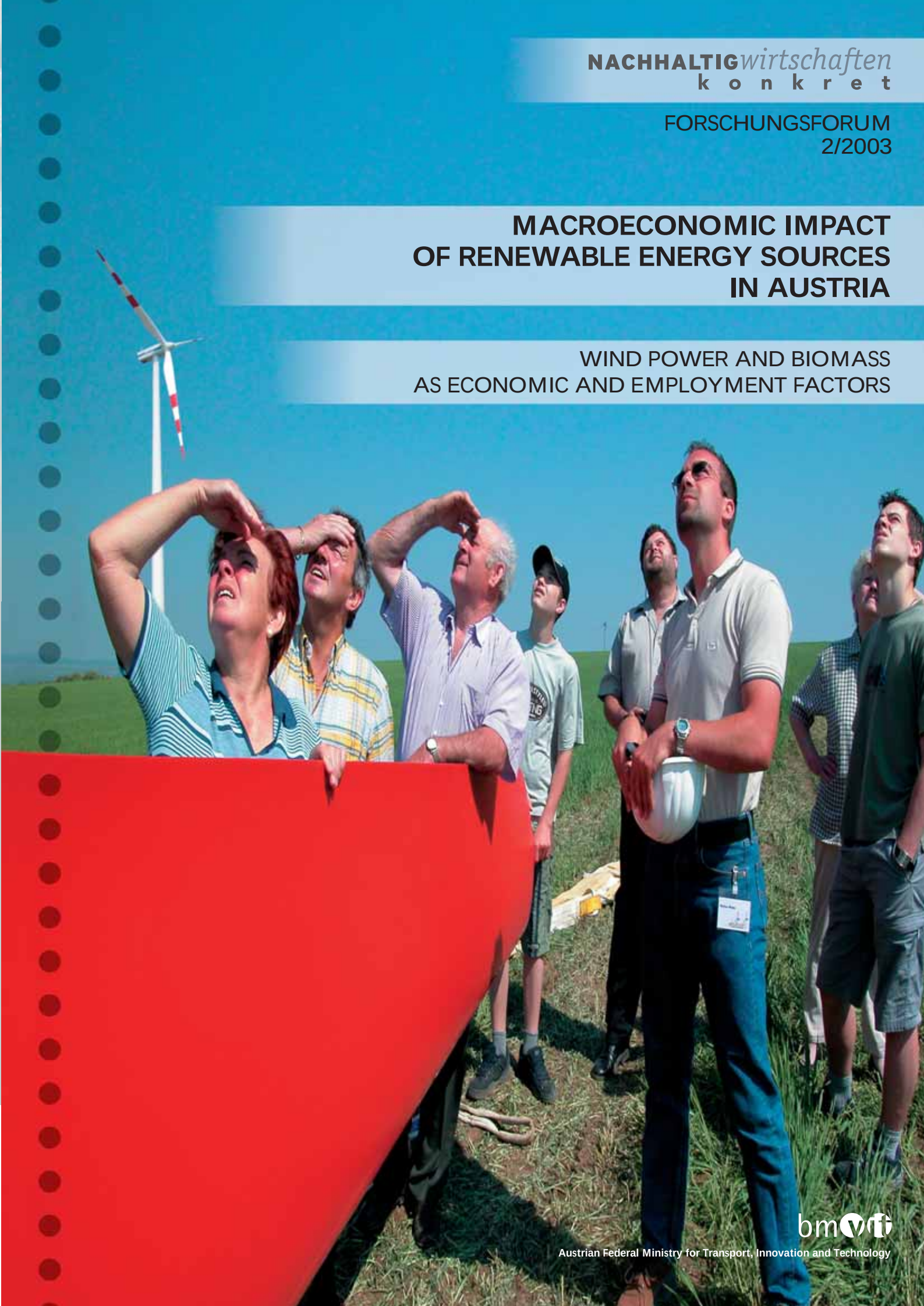
MACROECONOMIC IMPACT OF RENEWABLE ENERGY SOURCES IN AUSTRIA

WIND POWER AND BIOMASS AS ECONOMIC AND EMPLOYMENT FACTORS



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Austrian Federal Ministry for Transport, Innovation and Technology

T O P I C

THE MACROECONOMIC IMPORTANCE OF WIND POWER AND BIOMASS APPLICATIONS

Effects on Employment – Promotion Strategies – Future Scenarios

■ More intensive use of renewable sources of energy constitutes one of the important strategies towards sustainable development. The macroeconomic impact of widespread use of these energy sources is an essential aspect that has to be analyzed in detail in the development of sustainable future scenarios.

In the discussion on the possible macroeconomic effects of renewable energy sources both, opponents and advocates often use irrational arguments. This field has a great need for well-founded information and prognoses that are not biased by personal interests. A scientific analysis of the macroeconomic impact and realistic future scenarios are an indispensable basis for strategic decisions aiming at the long-term promotion of sustainable energy sources in Austria.

A systematic analysis of the macroeconomic effects of sustainable sources of energy has to take into account a great number of economic, ecological and social aspects as well as long-term strategic considerations. Prognoses should be developed for a longer period of time (e.g. until 2020) and analyze and assess various scenarios (such as low or high oil prices).

Important **macroeconomic dimensions** in this context include: (cf. Study 1)

- **Aspects at company level**
  Investment and fuel costs as well as non-monetary aspects such as comfort, user needs...
- **Ecological impact**
  Air pollutants, climate changing emissions, noise pollution, transportation, conservation of the landscape...
- **Macroeconomic criteria**
  Employment, income, balance of trade, national budget...
- **Distribution**
  Regional, social, between generations...
- **Long-term strategic measures**
  Ensuring security of supplies, price stability...

The Federal Ministry for Transport, Innovation and Technology commissioned three studies, which deal with the issues mentioned above:

1 Analyse der volkswirtschaftlichen Bedeutung der energetischen Nutzung von Biomasse für Heizzwecke

Reinhard Haas, Lukas Kranzl, Wien 2002

This study aimed to systematically analyze the many macroeconomic effects of a more intensive use of biomass for heating purposes. The study also considered aspects of regional and social distribution and long-term strategic impacts, which have been rather neglected, so far. Conclusions drawn from this analysis resulted in recommendations for the efficient promotion of biomass in Austria.

2 Wirtschaftsfaktor Windenergie in Österreich – Arbeitsplätze und Wertschöpfung

Heidi Adensam, Ökologie-Institut, Elfi Salletmaier, Bernhard Hessl, Energiewerkstatt, Stefan Hantsch, Ursula Holzinger, IG Windkraft, St. Pölten 2002

The study analyzed the importance of wind power as an economic and employment factor in Austria. For this purpose, the study established the number of jobs created through wind power and the concomitant value added and estimated the potential effects of the implementation of the targets stipulated in a federal law on power generation from renewable sources of energy.

3 Beschäftigung und erneuerbare Energieträger

Herbert Greisberger, Susanne Hasenhüttl, et.al., ÖGUT, Wien 2001

The employment effects of a more widespread use of renewables constitute the main topic of this study. It compares the results of a selection of Austrian and international studies and provides methodological guidelines for the assessment of employment effects. The goal was to improve the comparability of future studies and to provide for more transparency with a view to the methods applied.

1

PROJECT

HEATING WITH BIOMASS

The Macroeconomic Importance of Biomass as Energy Source and Efficient Promotion Strategies for Austria

A number of Austrian and international studies on the use of biomass as an energy source have been conducted, in recent years; on account of the different approaches and methods used, these studies yielded a wide range of different results. The objective of the study realized at the Vienna University of Technology (R. Haas and L. Kranzl) was to highlight the various aspects of, and approaches to, this topic by means of a systematic analysis and to develop a model for macroeconomic assessment which can meet the long-term strategic requirements of energy supply. The results of this comprehensive study are to serve as a basis for the assessment and, if necessary, optimization of promotion measures.

The study is concerned with space hating supply by means of solid biomass and also considers interdependencies with other uses of biomass (e.g. power generation in combined heat and power plants). In a first step the study documents the actual situation of biomass applications and establishes additional usable potentials and resulting costs. In 2001, approx. 136 PJ of solid and liquid biomass were used as energy source in Austria. This corresponds to some 10% of Austria's total energy consumption. The additional biomass potential that can be used energetically on a sustainable basis until 2020 comprises the components net-forest growth increment, use of thinning residues, energy forests and energy crops, straw, sawmill by-products, bark, and salvaged old wood. This results in an additional potential of solid biomass equaling some 100 PJ/yr.

METHOD

The starting point for the development of a new methodology consisted in an analysis of existing studies on this topic. The key point was to establish what methods and assumptions were responsible for the fact that these studies yielded such a variety of different results.

The investigation of the value added effects, in particular, showed a wide range of different results. The reason for this can be found in the different characteristics of the installations under study as well as in different assumptions concerning the investment and operating costs of the selected biomass and fossil reference technologies, respectively. The different methods used (e.g. input/output analysis or equilibrium model) and the establishment and assessment of emissions also accounted for variation of the results. The outcomes for employment effects, however, were of the same order of magnitude in spite of the different approaches used. It has been shown that most biomass technologies have a positive impact on employment.

The study realized at the Vienna University of Technology for the first time discussed all dimensions with a bearing on macroeconomic impacts, including effects that are difficult to quantify and were not considered in previous studies. This includes aspects concerning regional and social distribution, ecological aspects and long-term strategic aspects, such as security of supplies, independence of imports, and market chances for the export sector.

The authors of the study deduced suitable indicators for each of the dimensions and developed methods for quantification. After identifying and defining characteristic indicators, the authors selected individual biomass technologies and the corresponding fossil reference systems and identified the relevant economic parameters using a systematic approach. Subsequently, they analyzed the impact of the individual parameters (e.g. the price of fossil fuels) on these indicators.

FUTURE SCENARIOS

The different methods served as a basis for the development of various future scenarios. The purpose was to analyze the effects of an intensified promotion of biomass technologies. Influencing factors for these scenarios relate to the development of oil prices, which depend on the point of time when the oil peak will be reached. (Oil peak = a point of time, expected between 2010 and 2040, when the maximum global oil production will be achieved; demand will increase on account of low oil price levels, subsequently causing a substantial increase in oil prices).

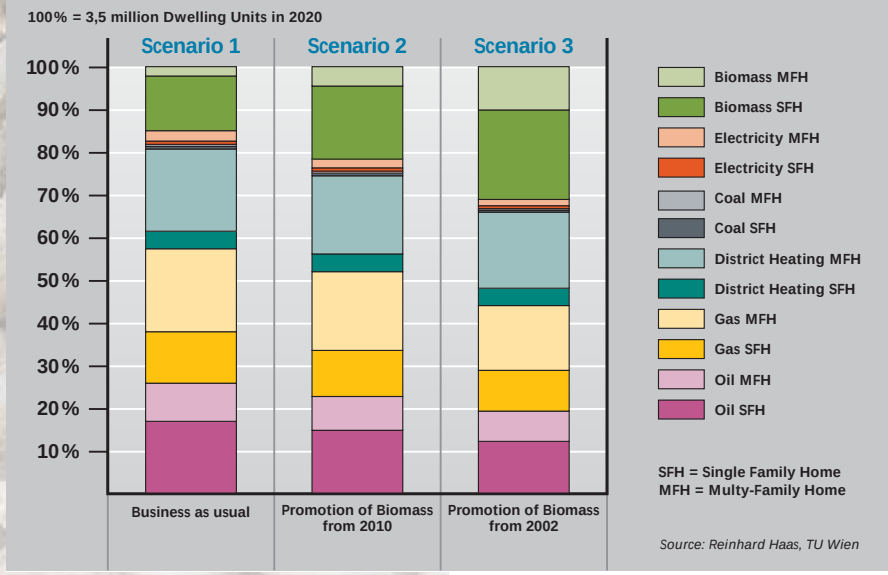
- Scenario 1
  Business as usual

This scenario assumes stable, low oil prices until 2020 (oil peak 2040), there is no incentive for operators or users to switch increasingly to biomass systems; neither do policy makers explicitly encourage biomass heating systems.

- Scenario 2
  Promotion of Biomass Applications From 2010

This scenario assumes a substantial increase in the use of biomass from 2010 onwards. This may be caused by a considerable increase of oil prices (oil peak 2010) or else by political measures with oil prices remaining at a low level (oil peak 2040). Both cases were analyzed separately.

Effects of the Promotion of Biomass in 3 Scenarios
(Prognosis for 2020)



Source: Reinhard Haas, TU Wien

- Scenario 3
  Promotion From 2002

In this scenario, the promotion of biomass starts right now thus entailing a more intensified use of biomass applications. From 2010 subsidies may be either reduced in parallel with increasing oil prices (oil peak 2010) or have to be continued (oil peak 2040). In this study, too, both cases were treated separately.

CONCLUSIONS

If the promotion biomass sets in immediately and, at the same time, thermal insulation is improved, the proportion of dwelling units with biomass based space heating could be increased to 44% by the year 2020. This would require an additional 100 PJ/yr, which corresponds to the existing sustainable potential the authors have ascertained.

As far as macroeconomic effects are concerned, the dimension "long-term strategic aspects" has the highest significance. Concerning the overall economy, the following indicators show a relatively high relevance:

- Emission of greenhouse gases can be reduced by approx. 6%
- The overall consumption of fossil fuels in Austria is reduced to a slightly lesser degree (approx. 5.4%)
- The trade balance gap could be mitigated by some 3.7% to 6%, depending on oil prices.

Being independent of fossil fuels also includes security of supplies and price stability. Concerning the three indicators, it is important to consider the fact that fossil resources are finite and one should, therefore, highlight the sustainability aspect of biomass as an energy source.

With a view to the national economy as a whole, the impacts on employment are not very important; a targeted biomass strategy could reduce unemployment by some 5%. However, in this context, the effects on the overall economy are not as important as the stimulating impetus for less favored rural areas; 4,000 new jobs could be created in these regions.

The negative impacts to be expected from the promotion of biomass systems are of little significance: dust emissions (increased by approx. 2%, relevant only in urban agglomerations) as well as the additional costs of public funding of biomass and loss of revenue from taxation of fossil energy sources. The expected effect on incomes is also relatively insignificant (0.1% increase of the GDP).

It has been shown that the positive effects on the overall economy outweigh the negative effects even if energy prices remain at low levels for a longer period of time. If, however, oil prices increase, the positive effects of a biomass strategy will be reinforced, while the burden on the budged will be reduced by some 50%.

To conclude, the study elaborated recommendations for public funding of biomass development and analyzed and assessed various subsidizing schemes and accompanying measures. An important issue, in this context, refers to the regional differentiation of promotion measures. A summary of the priorities for individual types of region can be seen in the table below:

Recommendations for Future Promotion Strategies

		Single Family Home	Micro-Networks	Short Distance District Heating	Multi-Family Homes	Long Distance District Heating
Wood Logs	Rural Areas	!!!	—	—	—	—
	Urban Areas	!	—	—	—	—
Pellets	Rural Areas	!!!	—	—	—	—
	Urban Areas	!	—	—	—	—
Wood Chips Straw	Rural Areas	—	!!!	!	!	—
	Urban Areas	—	—	!	!!!	!!!
Recovered Wood	Rural Areas	—	—	—	—	—
	Urban Areas	—	—	—	—	!!!

!!! High Significance for Subsidizing Schemes
! Low Significance for Subsidizing Schemes

Source: Reinhard Haas, TU Wien

2 PROJECT

ECONOMIC FACTOR WIND POWER

Employment and Value Added in Austria

In Europe, the utilization of wind power has become an important economic factor: Since 1990, wind power has seen annual growth rates of 40% on average. Although Austria does not have a wind power installation industry of its own, the country benefits from this international development. Many Austrian companies provide goods and services to the big wind power plant manufacturers and, on the other hand, installation and operation of plants in Austria create value added and employment.

The study "Wirtschaftsfaktor Windenergie" (Economic Factor Wind Power) aimed to establish the value added and the employment effects related to the utilization of wind power in Austria; another goal consisted in the assessment of the impact that has to be expected from the implementation of the objectives set forth in the Federal ***"Eco-Power"*** Act.

In midyear 2002, 141 wind power plants with a total output of 98 MW were in operation in Austria; their annual energy output of approx. 170 million kWh covered some 0.3% of the overall electricity consumption in the country. Assuming that half of the target stipulated in the "Eco-Power" Act is realized by means of wind power, i.e. 2% of the electricity supplied to the end user will come from wind power in 2008, yields the following scenario: Some 300 new wind power plants with a total output of approx. 500 MW have to be installed by 2008 in addition to existing plants. This will require an investment amounting to approx. € 550 million. The authors of the study analyzed this scenario with a view to economic and employment effects.

The study analyzed the potential effects of a more intensive utilization of wind power on enterprises active in this sector. The study also established the employment effects of wind power utilization through investment and long-term operation of plants in Austria. Questionnaires were used to gather information from suppliers and service companies about turnover and employment; data from operators of wind power plants provided information about investment, operating and take-down costs. The calculation of value added and employment from the wind power sector was based on an input/output analysis.

Concerning the various types of enterprise providing services for the wind power industry the service sector is, in contrast to 1996, dominating. Services comprise site assessments, planning, wind measurements, and counseling. The production sector includes infrastructure, parts and components as well as measuring technology. The data of 2001 reflect a continual increase of this industrial sector in Austria. Total turnover currently is € 72.2 million, which corresponds to an increase of more than 100% compared to 1998. In 1996, 27 enterprises (of a total of 35 included in the survey) reported 112 employees; in 2000, 295 persons worked in 31 enterprises, which constitutes an increase by a factor of more than 2.5. In addition, indirect employment through products and services supplied to the manufacturers as well as secondary employment effects were assessed by means of an input/output analysis.

Using plant operators' data on investment and operating costs (and assuming the above-mentioned scenario) the study authors worked out prognoses for the development until 2020. Macroeconomic effects were determined primarily by operating costs. Expenditure through operation will amount to € 631.7 million until 2026, in Austria, which means 10,897 employed in the industry, while investment costs in the wind power sector will be only € 193.7 million, corresponding to 3,435 jobs. Each million € spent for wind power thus creates 11.1 jobs, on average.

The study also took into account additional costs of wind power generation as compared to current market prices as well as net employment effects. All taken, wind power utilization shows a positive balance: More employment will be created, between 1997 and 2026, through investment in, and operation of, wind power plants than will be lost on account of additional costs and decreasing turnover for conventional power generation.

"Eco-Power" Act

In July 2002, the Austrian National Assembly adopted the federal "Eco-Power Act". It stipulates that the proportion of electricity from renewable energy sources (excluding hydropower) supplied to the end user shall be increased to 4% by 2008.

RENEWABLE ENERGY SOURCES AND EMPLOYMENT

There is a great number of studies that analyzed the employment effects to be expected from a more intensive use of renewable sources of energy. The task of a meta-study realized by ÖGUT (Österreichische Gesellschaft für Umwelt und Technik) was to elaborate methodological guidelines for the assessment of employment effects through renewables and to compare the empirical results of a representative sample of national and international studies. In the purpose was to improve the transparency and comparability of methodologies used and assumptions made in the studies.

While the quantitative results of the individual studies should be compared with caution (different types of installation, period of time, and region), some general statements can be made:

Most studies used the input/output analysis as economic tool. Regardless of the technology used or assumptions made, nearly all studies showed positive employment effects by a more intensive utilization of renewable energy sources. The studies did, however, not examine possible dynamic effects, such as improved competitiveness or a higher export ratio.

Technology-oriented sectors such as building construction, commerce, metal working industries, and agriculture benefit most from a more intensive utilization of renewables. Job cuts have to be expected in energy-intensive sectors, coal mining as well as in the petrol and natural gas industries. Calculations of the Austrian studies result in employment effects ranging between 300 (wind power only) and 18,000 new jobs (in case biomass technologies are subsidized and an ecological tax reform will be realized). A study commissioned by the EU results in a potential net employment effect of 62,000 new jobs in Austria until 2020 through investments in renewable sources of energy.

While many well-founded studies exist on the utilization of biomass, there are only few studies on other renewables such as photovoltaics, thermal use of solar energy, biogas, and wind power. An analysis including all important renewable energy sources has yet to be realized.

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in German and English

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FIGURES/DATA/FACTS

PROJEKTTRÄGER

1 „Analyse der volkswirtschaftlichen Bedeutung der energetischen Nutzung von Biomasse für Heizzwecke – Entwicklung von effizienten Förderstrategien für Österreich"
Reinhard Haas, Lukas Kranzl,
Wien 2002, commissioned by bmvit.

2 „Wirtschaftsfaktor Windenergie in Österreich – Arbeitsplätze und Wertschöpfung"
Heidi Adensam, Ökologie-Institut,
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Ursula Holzinger, IG Windkraft,
St. Pölten 2002, commissioned by bmvit.

3 „Beschäftigung und erneuerbare Energieträger"
Herbert Greisberger, Susanne Hasenhüttl, et.al., ÖGUT Österreichische Gesellschaft für Umwelt und Technik,
Wien 2001, commissioned by bmvit.

INFORMATIONEN PUBLIKATIONEN

The final reports on the above-mentioned studies have been published in the bmvit series "Berichte aus Energie- und Umweltforschung" ("Reports on Energy and Environment Research") by the bmvit and are available from:
www.NachhaltigWirtschaften.at

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