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# The *Swiss Federal Energy Research Master Plan for the Years 2000-2003*

**Summary**

The *Swiss Federal Energy Research Master Plan* provides details within the framework set by the Swiss Parliament and the Swiss Federal Council. It maps out how publicly supported research shall be used to achieve politically decided energy goals. Information is provided on the manner in which energy education, research and technology developments will be supported during the period from 2000-2003. The *Master Plan* facilitates co-ordination among federal and cantonal decision makers as well as municipal Authorities.

Swiss energy research is dedicated to sustainable development, including the massive reduction of $CO_2$ emissions. This is also implicit in the concept of the "*2000 watts society*". A two-pronged approach strives to reduce pollution by energy systems and increase system efficiencies. Technical progress is buttressed by Socio-economic measures.

Priorities for publicly funded energy research have been set in the context of long term perspectives, harmonised with European and worldwide goals. Swiss energy research must be high calibre research and this requires adequate means being made available to assure both quality and continuity. It is important that the attractiveness and competitiveness of Switzerland as a home for science and technology be maintained, indeed strengthened.

It has been proved worldwide that energy research needs public funding. Particularly favoured is application oriented research, including pilot and demonstration projects. The basic principles, strategies and application areas of the *Swiss Federal Energy Research Master Plan* are summarised here.

**Structure of the *Swiss Federal Energy Research Master Plan***

The four main areas and their priorities for the next four years are :

- **Rational Use of Energy (RUE) :** This is to be promoted in all areas, but two principle targets are buildings and transportation. Combustion processes need to be better understood and ways should be found to use electricity more efficiently. Combined systems producing heating, cooling and electricity including the use of ambient energy need to be optimised.

- **Renewable Energy Sources (RES) :** RES already help meet a major part of Switzerland's energy demand, thanks to hydro-electric production and wood combustion. The use of renewable energy sources is to be substantially expanded in the future. However, costs need to be reduced and efficiencies increased for solar thermal systems, photovoltaic systems, biomass systems and ambient heat production. Technical support is needed for geothermal heat production, wind energy and small-head hydroelectric production. Long term development must continue for solar chemistry, including hydrogen.

- **Nuclear energy :** The two topical areas here are fission (contemporary nuclear power plants) and fusion (a long-term future option). The main research topics for fission are security and disposal of radioactive waste. International fusion research shall continue to consist of high calibre experiments using the renowned facilities located in Switzerland.

- **Energy policies & economics :** These activities primarily serve Swiss energy politics. By generating diverse scenarios, the consequences of energy measures shall be assessed with regard to their economic, ecological and societal impacts (including acceptance questions). Finally, the promotion of the transfer of new ideas across technologies into the market has to be strengthened.

**Implementation**

The Swiss Federal Office of Energy (SFOE), counselled by the Federal Energy Research Commission (CORE), is responsible for implementing this *Energy Research Master Plan* and seeing that results find practical applications. This is being pursued through

- close co-operation with private, public and institutional enterprises engaged in energy research,
- collaboration in international RD&D projects,
- consistent information strategies and
- integration in the Programme *SwissEnergy*.

This multi-faceted approach has proven effective in the past and should be further pursued. Links to the activities of the Commission for Technology and Innovation will be strengthened.

The challenge is considerable, given that annual public funded support for energy research has decreased by approximately 48 MCHF (million SFr.) since 1992 (220.6 MCHF). To put planned funding in perspective, funding sources in 2001 are presented in Figure 1. In that year public funding of energy research totalled 172.8 MCHF. This included 29.8 MCHF for pilot and demonstration projects.

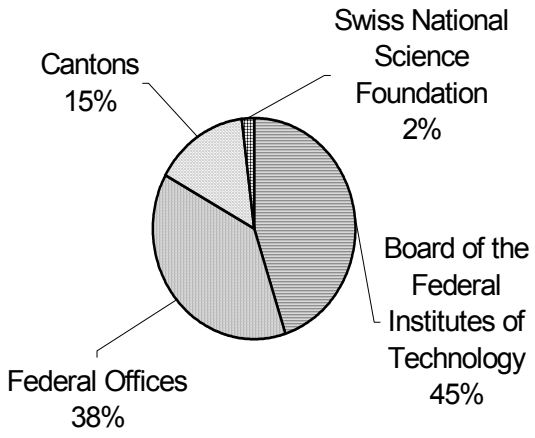


**Figure 1 : Sources of Energy Research Funding in 2001**

It is hoped that this distribution can be more or less maintained for the period from 2000 to 2003. The sources and amounts, detailed in Table 1, should, however, be increased to approximately 200 MCHF (million Swiss Francs). The loss of funding from the NEFF, which terminated all activities in 1998, should be compensated by the increased engagement of the engineering schools.

**Table 1 : Sources and Distribution of Funding for Energy Research in 1999**
(Including Pilot & Demonstration Projects)

| | | Source of Funding (MCHF) | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | | FIT-Board | SNF | OPET (CTI) | SFOE | OFES and others[)] | Cantons and Commun-ities | NEFF | |
| RESEARCH | Rational Use of Energy (RUE) | 29.09 | 0.18 | 2.78 | 14.43 | 3.33 | 5.88 | - | 55.7 |
| | Renewable Energy Sources (RES) | 27.06 | 1.01 | 0.86 | 17.28 | 2.92 | 16.81 | - | 65.9 |
| | Nuclear Energy | 31.15 | 1.32 | – | 2.35 | 11.13 | 0.05 | - | 46.0 |
| | Energy Policies & Economics | 7.79 | - | - | 3.51 | 0.05 | 0.91 | - | 12.3 |
| RESEARCH INSTITUTIONS | Swiss Federal Institute of Technology in Zürich | 22.49 | 0.24 | - | 2.21 | 1.32 | - | - | 26.3 |
| | Swiss Federal Institute of Technology in Lausanne | 28.67 | 1.76 | 0.61 | 1.73 | 7.16 | - | - | 39.9 |
| | Swiss Federal Laboratories for Materials Testing and Research | 4.92 | – | - | 0.75 | 0.03 | – | - | 5.7 |
| | Paul Scherrer Institute | 35.85 | – | 0.35 | 4.38 | 0.95 | – | - | 41.5 |
| | Other Federal Institutions | 3.17 | – | – | 3.04 | 4.24 | 0.35 | – | 10.8 |
| | Universities | – | 0.51 | 0.58 | 2.36 | 0.10 | 11.12 | - | 14.7 |
| | Engineering Colleges | – | – | 1.38 | 1.10 | 0.34 | 9.25 | - | 12.1 |
| | Other Cantonal Institutions | – | – | 0.01 | 2.55 | - | 0.95 | – | 3.5 |
| | Private Enterprises | – | – | 0.69 | 19.45 | 3.32 | 1.98 | - | 25.4 |
| | TOTALS | 95.1 | 2.5 | 3.6 | 37.6 | 17.4 | 23.6 | - | 179.9 |

**Key to abbreviations of Institutions :**

| | |
|---|---|
| FIT-Board : | Board of the Federal Institutes of Technology (and its Annex Institutions) |
| SNF : | Swiss National Science Foundation |
| OPET (CTI) : | Swiss Federal Office for Professional Education and Technology, (Commission for Technology and Innovation) |
| SFOE : | Swiss Federal Office of Energy |
| OFES and others : | Swiss Federal Office of Education and Science, and funding of other federal Offices |
| EMPA : | Swiss Federal Laboratories for Materials |
| PSI : | Paul Scherrer Institute |
| NEFF : | Formerly National Foundation for Energy Research |

## Priorities and Distribution of Resources for the Period 2000-2003

The distribution of funds for the period from 2000-2003 draws on experience dating back to the year 1999. Figure 2 contrasts 1999 funding levels and goals for 2003 by research areas.

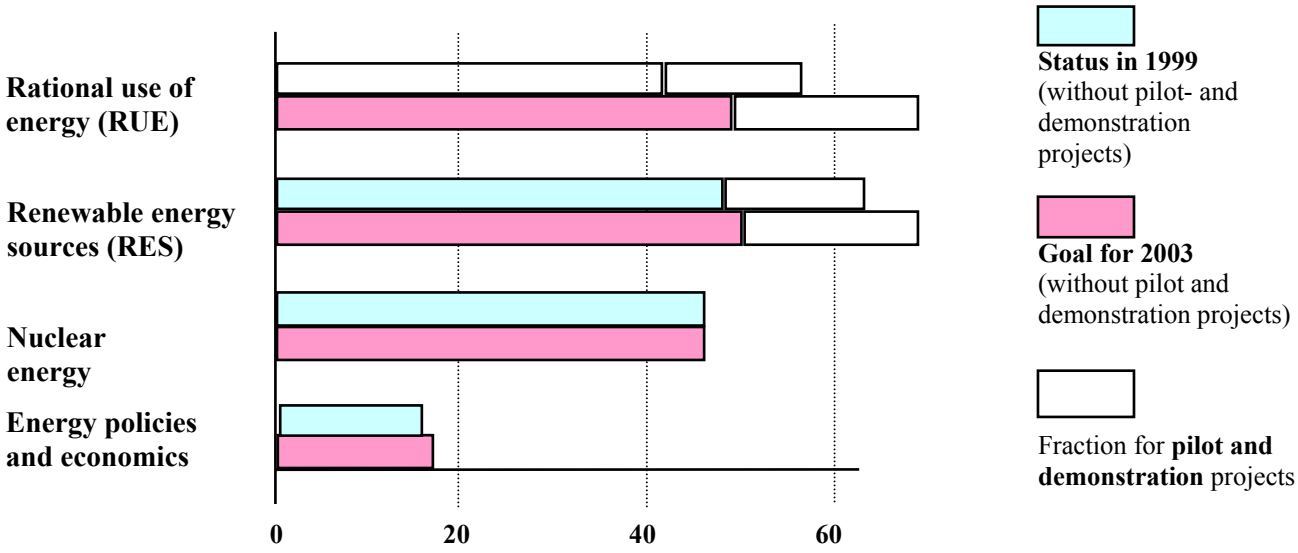


**Figure 2 : Public Support of Research Areas in 1999 and Budgeted for 2003.**

The targeted resource allocations in the year 2003 require noteworthy changes. Pilot and demonstration projects should now receive 20 percent of the total funding, a five percent increase over current levels. Within the research area, Rational Use of Energy (RUE), the subdivisions buildings and the use of ambient energy will enjoy a doubling of resources compared to current levels. This is contrasted to a large decrease in the funding for nuclear fission research, a moderate decrease for fusion research and a substantial decrease for hydro-power RD&D. As in the past, 20 percent of research funding should continue to be appropriated for basic, long term research.

Table 2 presents the recommendations and how subdivisions of research areas would be affected, should a budget reduction be unavoidable or conversely, should a budget increase occur. These increasing and decreasing scenarios do not represent the priorities of the research areas, rather they reflect their capacities to survive budget cuts. It is therefore possible that high priority research may be reduced or not receive additional funding, while lower priority research with very limited capacity may be spared reductions which might mean the complete termination of this area. The courses of action for each specific research area and subdivision are indicated as follows:

**For a budget reduction :**

- → no reductions in funding
- ↘ moderate reductions
- ↓ large reductions

**For a budget increase :**

- ↑ large increases in support
- ↗ moderate additional funding
- → no increased funding.

**Table 2 : Distribution of Public Funding for Energy RD&D (Research, Development and Demonstration)**

| Research areas and their subdivisions<br>R+D = Research & Development<br>P+D = Pilot & Demonstration | Distribution of funds | | | | Budget adjustment in the cases of : | | | |
|---|---|---|---|---|---|---|---|---|
| | 1999 MCHF | | 2003 MCHF | | reduced funding | | increased funding | |
| | R+D | P+D | R+D | P+D | R+D | P+D | R+D | P+D |
| **I RATIONAL USE OF ENERGY (RUE)** | **42,0** | **13,7** | **49** | **20** | | | | |
| **Buildings** | **8,6** | **3,0** | **10** | **5** | → | → | ↑ | ↑ |
| **Transportation** | **3,9** | **5,0** | **7** | **5** | → | → | ↗ | ↑ |
| **Electricity, storage and transportation** | **5,5** | **0,5** | **8** | **2** | ↓ | ↓ | ↗ | → |
| (including batteries and super capacitors) | (2,7) | (0,2) | (4) | (1) | ↘ | ↘ | ↗ | → |
| **Use of electricity (appliances)** | **4,4** | **0,2** | **1** | **1** | ↘ | → | → | → |
| **Combined heat and power production** | **7,8** | **2,0** | **8** | **3** | ↘ | ↘ | ↗ | ↗ |
| (including fuel cells) | (4,1) | (0,6) | (6) | (2) | → | ↘ | ↑ | ↑ |
| **Combustion** | **8,6** | **3,0** | **12** | **3** | → | ↘ | ↗ | ↑ |
| **Processes** (Industry, commerce, agriculture) | **3,3** | **0,0** | **3** | **1** | ↓ | ↓ | → | → |
| **II RENEWABLE ENERGY SOURCES (RES)** | **47,5** | **18,5** | **50** | **19** | | | | |
| **Solar energy** | **34,0** | **9,9** | **37** | **10** | | | | |
| Solar thermal (active, passive, storage) | 6,6 | 2,1 | 8 | 4 | ↘ | → | ↗ | ↗ |
| Photovoltaics (solar cells and systems) | 15,0 | 6,8 | 14 | 4 | → | ↘ | ↑ | ↗ |
| Solar chemistry (including hydrogen) | 12,3 | 0,9 | 14 | 2 | → | ↓ | ↑ | ↗ |
| **Ambient heat** (heat pumps) | **3,8** | **1,2** | **4** | **3** | → | → | ↑ | ↗ |
| **Biomass** ( wood, garbage, sludge) | **5,8** | **1,4** | **7** | **3** | ↘ | → | ↗ | ↗ |
| **Geothermal energy** | **2,0** | **0,9** | **2** | **1** | ↘ | ↘ | → | → |
| **Wind** | **0,4** | **0,6** | **-** | **1** | | ↘ | | ↗ |
| **Hydro-power** | **1,4** | **4,5** | **1** | **1** | ↓ | ↓ | ↗ | ↗ |
| **III NUCLEAR ENERGY** | **46,0** | **-** | **46** | **-** | | | | |
| **Fission** | **20,8** | **-** | **21** | **-** | ↓ | | → | |
| Safety (incl. regulatory research) | 14,1 | - | 16 | - | | | | |
| Radioactive waste | 3,6 | - | 4 | - | | | | |
| Future-oriented research (new concepts) | 3,0 | - | 1 | - | | | | |
| **Fusion** | **25,2** | **-** | **25** | **-** | ↘ | | → | |
| Plasma physics, heating methods | 20,6 | - | 20 | - | | | | |
| Fusion technology | 0,3 | - | 1 | - | | | | |
| Contribution to international commitments | 4,3 | - | 4 | - | | | | |
| **IV ENERGY POLICIES & ECONOMICS** | **11,8** | **0,5** | **17** | **1** | | | | |
| **Energy policies** (scenarios, instruments, measures) | **1,7** | **-** | **9** | **-** | → | | ↗ | |
| **Economy, society, environment** | **8,9** | **-** | **6** | **-** | → | | ↑ | |
| **Technology-transfer** | **1,1** | **0,5** | **2** | **1** | → | → | ↑ | ↑ |
| **TOTALS** | **147,3** | **32,6** | **162** | **40** | | | | |
| | **179,9** | | **202** | | | | | |

**Literature and Sources**

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