

1 - What would be the realities of implementing the 2,000 Watt society in our communities?

**TEST LABORATORY FOR SUSTAINABILITY RESEARCH
A SWISS UNIVERSITY PROGRAMME AS A PUBLIC PRIVATE PARTNERSHIP**

1 THE INTELLIGENT PERSPECTIVE

The global reservoir of fossil energies, in particular petroleum, is declining at an increasing pace. Soon deposits that are difficult to exploit will become the focus of attention. Exhaustion of these reserves will lead to actual or presumed shortages which will, in turn, result in economic or even military conflicts. It is obvious that we are living at the expense of coming generations. This also applies to the CO₂ problem. In the last 125 years the concentration of carbon dioxide in the atmosphere has increased by 35%. A reorientation is urgently necessary.

Today a person needs 17,500 kilowatt-hours a year on a global average. This corresponds to a continuous power of 2000 watts. In western Europe this figure today is three times higher, just under 6000 watts per capita. People in some Asian and African countries require only fractions of that on average. The vision of the 2000-watt society enables a balance between industrialized and developing countries and thus a good standard of living for all people.

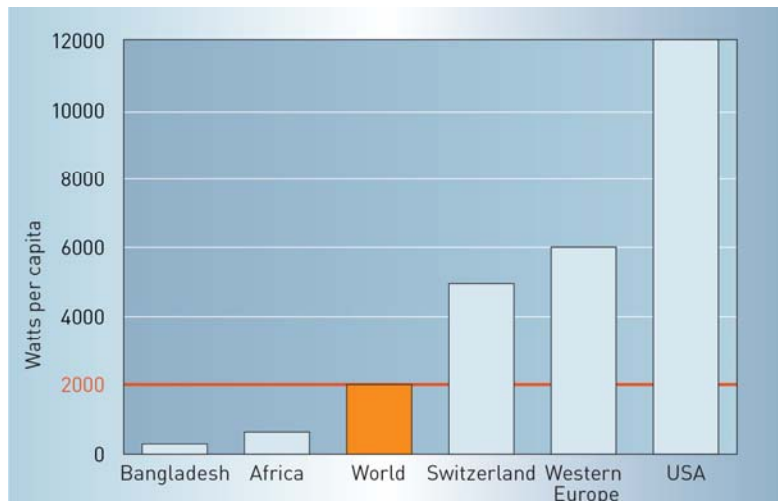


Fig. 1 2000 watts – this is the power needed by a person on a worldwide average. The differences between countries are exorbitant, however. The figure is a few hundred watts in non-industrialized countries, in others it is 20 times higher.

The vision of the 2000-watt society, which came into being as an idea at Swiss Federal Institute of Technology (ETH) in Zurich at the end of the 1990s, is feasible. This was demonstrated by researchers in the ETH domain and other institutes in the project “White Book of the 2000-Watt Society”¹. It projects the extensively unexploited efficiency and substitution potential onto the entire infrastructure in Switzerland taking precise account of the renewal intervals. This results in a long time horizon of 50 to over 100 years, within which the vision will become practised reality. A prerequisite for achieving the goals is rigorous adaptation of buildings and equipment, vehicles and facilities. Without greater material and energy efficiency and without selective use of resources the 2000-watt society will remain a mere declaration of intent².

¹ Jochem, E. (Ed.), *Steps towards a sustainable development: A White Book for R&D of energy-efficient technologies. A Novatlantis Project. Dübendorf, March, 2004*

² The brochure ‘Smarter living: Generating a new understanding for natural resources as the key to sustainable development – the 2000-watt society’ (Dübendorf, 2005) can be downloaded at www.novatlantis.ch or ordered as a printed version through info@novatlantis.ch.

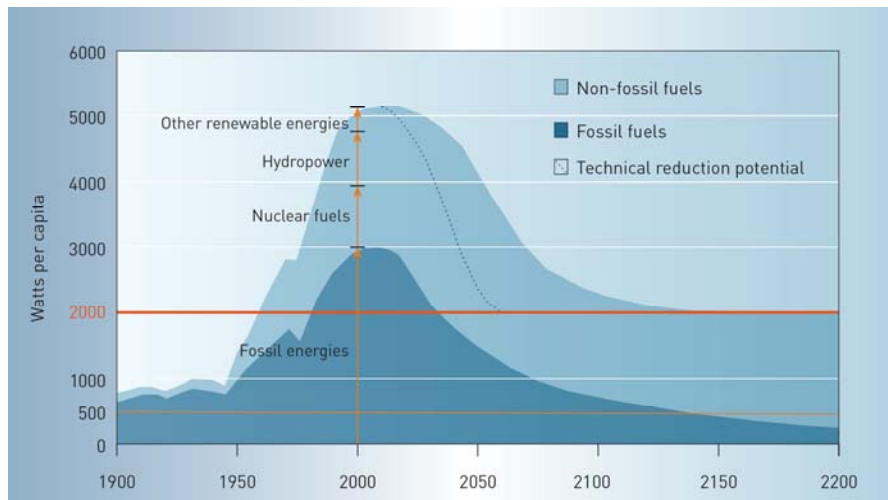


Fig. 2 Primary energy consumption in Switzerland today (excluding grey energy) amounts to 5000 watts per capita. The graph depicts a possible development to the 2000-watt society.

2 A NETWORK FOR SUSTAINABLE DEVELOPMENT

Novatlantis is a programme of the ETH Council and research institutes in the ETH domain – Paul Scherrer Institut, Empa, Eawag, WSL – for the implementation of research findings into the practice of sustainable urban development. Through forward-looking projects Novatlantis shows jointly with its partners, i.e. investors, planners, industrial and commercial enterprises, how the vision can become reality step by step. At the same time the research institutes, ETH Zurich and EPF in Lausanne, universities and universities of applied sciences jointly define projects that make the research results usable for society.

Novatlantis has been pursuing the path towards the 2000-watt society together with the Canton of Basel-Stadt for over four years. The region of Basel including the two Swiss cantons (states) of Basel Stadt, mainly consisting of the city of Basel itself, and Basel Land, consisting of the surrounding metropolitan area including a number of smaller cities, is an interesting test field for sustainable development and the application of new technologies. First of all, the region is characterized by a very high awareness concerning environment and sustainability, reflected in public votes on related issues, where the region of Basel often sticks out compared with many other cantons in Switzerland. Second, it is home to the headquarters of several strong global corporations like the leading pharmaceutical corporations Novartis and Roche, and has a strong local economy. Third, it is directly located in the heart of Europe at the borders of Switzerland with France and Germany, positioning Basel as an educational, cultural, and trade center with a strong influence on this international three-country-site.

In the 'Pilot Region Basel' the Hochbau- und Planungsamt (Building and Planning Department) as well as the Department for Environment and Energy, the University of Basel and the University of Applied Sciences of the two cantons of Basel work together with Novatlantis and the research institutes in the ETH domain in interdisciplinary teams. They support know-how transfer from applied urban development and mobility research to practice and empirical gains from practice flow back into research.

However, the ETH domain not only enters into partnerships with authorities and private entities in Basel. In November 2005 the city of Zurich made a decision to continue to attach great importance to sustainability in planning and building in the future. For this reason the Building Department enters into a partnership with Novatlantis in order to find practice-oriented solutions jointly. The focus here is on specific projects that produce noticeable results in the fields of construction, real estate management, urban planning, energy supply, mobility and tourism. Both sides will be able to profit extensively from the close cooperation between research and practice.

3 CUTTING EDGE TECHNOLOGIES FOR THE CONSTRUCTION SECTOR

Novatlantis Bauforum offers a platform for exchanging experience to decision-makers in the construction sector and sensitizes the target groups to a sustainable society. The Novatlantis Bauforum conferences, held twice a year, provide an overview of the latest highly interesting developments at universities and in practice. They are specially tailored to the concerns and interests of those responsible for real estate portfolios of private and institutional investors, pension funds and project developers and have thus become an integral part of the agendas of many renowned investors.

On 14 July 2005 an event entitled 'Investments in real estate: maximum and long-term returns for investors?' took place in Zurich. Many interesting lecturers were won over on the subject of the benefits of decision-making criteria for more sustainability. In addition to the event with its focus on economic issues, the third Technology Conference was held on 1 December 2005, this time on the topic of 'Building for the future: glass, cooling, IT and urban development'. An energy-related assessment of the trend towards full glazing and the current state of research on cooling, the challenge of the future, were the subject of discussion as well as the highly regarded publication of 'ETH Studios Basel – Institut Stadt der Gegenwart' 'Die Schweiz - ein städtebauliches Projekt'³.

4 PIONEERING STRUCTURES OF SUSTAINABILITY

However, communication and dialogue alone are not enough to change the building stock in Switzerland on a sustainable basis. Novatlantis is setting up pilot and demonstration projects jointly with business partners and authorities to test sustainability technologies in the building sector and optimize them for broad application on the market. These projects make it possible to determine research and development needs and disseminate information on sustainability technologies in the building sector. Universities and investors mutually profit from each other in this way. The forward-looking buildings combine innovative concepts and get by with a fraction of the energy of conventional buildings.

In the new building of the Empa und Eawag research institutes in Dübendorf (Forum Chriesbach⁴) the orientation, volumetric analysis, building shell, storage material and solar protection are designed in such a way that the heat requirements can be met through the heat already generated in the building, on the one hand, and through the use of waste heat sources, geothermal heat and passive solar energy, on the other hand. The ambitious 'zero energy house' with its innovative energy concept additionally has virtually natural free space and a diverse range of spatial elements with flexibly usable rooms, freely networkable workstations and communication zones. Water, a key medium, is integrated into the project as a technical and artistic element. Science City, the extension of ETH Zürich Hönggerberg, shall also be created under the banner of sustainability.

5 SUSTAINABLE URBAN DISTRICTS AND CITIES

Novatlantis not only operates in the building sector. The energy service that will be available to every person in future in accordance with the 2000-watt society must also be utilized for other areas of daily life. The scope of the considerations must by all means be extended beyond individual buildings: urban districts and cities constitute ideal prerequisites for comprehensive specification of the issue of sustainable development.

The project 'Sustainable Urban District Development', which has been running since 2003, is funded by the Swiss Federal Departments for Energy (BFE), for Regional Development (ARE) and for Housing (BWO). The existing situations were analyzed on the basis of four different urban districts in Basel, Lausanne, Lucerne and Zurich as examples and specific measures were planned for

³ R. Diener, J. Herzog, M.Meili, P. de Meuron, C. Schmid, Die Schweiz – ein städtebauliches Portrait (Switzerland – an urban development portrait). ETH Studio Basel – Institut Stadt der Gegenwart, Birkhäuser Verlag, Basel 2005

⁴ General planning: Bob Gysin+Partner BGP Architekten, www.bgp.ch

sustainable development. Besides energy-related restoration work on the stock of buildings, such diverse fields as upgrading of existing outdoor areas, 'gentle' mobility and social aspects of changing tenants were examined.

In Basel architecture competitions have led to large-scale projects on the former freight station grounds of Deutsche Bahn (Erlenmatt) and along the large construction site for the underground highway (northern expressway) through the St. Johann district that have provided new impetus for reshaping urban development.

The Basel northern expressway has been the largest road construction site in Switzerland for several years and runs straight through existing residential areas. After its completion in 2008 construction of attractive housing and complementary utilities shall be started. The areas available for construction are part of national road property or in the possession of private parties and will be managed by the Canton of Basel-Stadt and passed on to investors who are willing builders. An architect-investor team combining project quality with an appropriate purchase price offer was looked for through a two-stage competitive procedure. The innovative approach of employing a competitive procedure with the simultaneous participation of architects and investors met with great interest among experts. While the entire development is to be carried out according to the Minergie standard, one part shall meet more extensive energy-related requirements of the 2000-watt society. The project will substantially support sustainable urban development, particularly through its unconventional and varied range of housing.

6 EXPERIMENTAL SPACE MOBILITY

As part of the Basel pilot region, the 'Experimental Space Mobility' project is aimed at making innovations for more sustainable mobility known in society and directly experienceable.

One focus within the 'Experimental Space Mobility' is smoothing the impact of car traffic. At present, there are almost 200'000 passenger cars in the region of Basel. For a high-income region, the canton of Basel Stadt has an unusually large number of households, about 44%, which do not own a car and rely either on public transport or on car-sharing organizations. This underlines the fact that there is a high local awareness for problems related to car traffic. However, the rest of the households do own one or more cars and show annual mileages of about 12'000 km, comparable to the Swiss average annual mileage. In the larger metropolitan area of Basel, mainly the canton Basel Land, both car ownership and usage generally reflect the Swiss average. In summary, while acceptance of public transport and awareness for alternative solutions is already high in the region of Basel, the remaining car fleet is important for commuters in the agglomeration and for leisure traffic in the whole region.

Another focus is on environmentally friendly vehicles run with natural gas and biogas as short-term and medium-term options and on mobility with hydrogen fuel as a long-term vision.

The use of natural gas and biogas as fuels is especially attractive as a means of making internal combustion engines more environmentally sound. Both local air-polluting emissions and the global climate-damaging output of CO₂ can be reduced in this way. Test vehicles with elements of the very environmentally friendly Clean Engine Vehicle (CEV) technology, developed by Empa and ETH Zurich, on the basis of the VW Touran are employed in the Basel pilot region.

Innovations developed by Paul Scherrer Institut and the ETH domain together with industrial partners in connection with particularly efficient fuel cell vehicles are presented in the field of hydrogen mobility. They point out long-term ways of achieving extremely efficient and locally emission-free mobility.

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