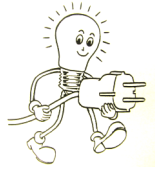


wattUknow

instant energy awareness

An E-ducation project at ETH Zurich



Goal: Building quantitative energy awareness in future decision makers.

Outline

Summary	1
Introduction	1
Principle	1
Aims	2
Impact	2
E-week	2
Budget table	4
Time-line	4
E-evaluation	4
Critical factors	4
Possible developments	5
Advisors and partners	5
Project submitters	5
References	5

Summary

We propose both an E-week and some durable actions to raise the quantitative energy awareness of the ETH students, future decision makers and leaders. The E-week is a one-week campaign where information on electricity consumption is spread at ETH, mostly through hands-on “*Erlebnisse*” and real-time information. For this purpose we use visual watt-metering displays as well as individual and group contests with non-material rewards, in order first to assess quantitative energy awareness and second to stimulate people to think creatively about their electricity consumption as well as suggest them ways to avoid wasting..

Introduction

All global energy scenarios predict for the future decades a massive growth of primary energy and fossil fuels consumption. With the “2000 watt society” vision and aiming to reduce CO₂ emissions to less than one ton per capita, Switzerland, a true pioneer, is trying to achieve a sustainable society.

However, the majority of the population struggles to *quantify* the energy employed, as opposed to the *monetary value*, of the various services and products they use. . Compared with the *financial cost awareness*, the present lack of *energy use awareness* is anachronistic in the face of increasing environmental pressure.

One reason for this situation is the lack of *real time and ubiquitous* information on energy flows with the predictable consequence that energy savings are neglected compared to the monetary ones.

Since it seems unlikely that the environmental costs of the use of energy will be added soon to the consumer energy bill, it's crucial to build a quantitative understanding of the use of energy at the level of the individuals to rein in the country's energy wasting.

Principle

Instant information works differently than *delayed* information¹.

¹ See the work of Daniel Kahneman, Nobel prize for economics 2002, on the measurement of *instant* happiness

Aims

Our aim is to promote a quantitative awareness of the use of energy among future decision makers of the swiss society, by communicating to the 10'000 students of ETH, but also to the faculty members and academic staff, the individual electricity consumption of many of the services and products they use every day.

We also expect to stimulate lively discussions on the usefulness, necessity and effectiveness of individual actions , as well as their environmental and social costs, regarding energy use. The ETH people will then be more inclined to spread their findings and convictions to other segments of the population.

In spite of the fact that in Switzerland electricity production requires only a minor fraction of the total primary energy supply, we focus on electricity for the following reasons:

- The share of primary energy for electricity production is expected to increase greatly in Switzerland²
- Electricity consumption can be measured instantly and with precision

Impact

We target ETH's population, which amounts to 15'000 individuals. We aim not only at raising their awareness, but we will also give them the opportunity to apply their newly acquired knowledge to reduce electricity waste at ETH. There is no estimate of how much electricity is wasted at ETH. However, the best guess of Dominik Brem, Environmental Officer of ETH Zurich, is that it amounts to 5-10% of the total electricity consumption. This amount is relevant and an estimated 10GWh/a of waste could be avoided³.

E-week

The core of the project is the organization of an E-week, that is a campaign where information on electricity consumption is distributed among the ETH population. Here we build on the work of Daniel Kahneman, psychologist and Nobel laureate for economics. We plan to disseminate information on energy usage of various every-day services and products at ETH.

During the E-week, the following actions and displays will be undertaken (items marked with (*) are meant to be kept throughout the year after the E-week):

E-columns *	E-columns (Fig. 1, left) are displayed at the entrance of ETH's most visited places. Three types: <ol style="list-style-type: none">1. E-information: text and pictures. Similar to Noise-Information columns in the Rämistrasse, www.laerm.zh.ch (Fig. 1, middle)2. E-display: instant watt (updated every 15 min), cumulated watt-hours over the week, and % watt hours saved by each building vs. previous consumption are displayed. Staff and students of those buildings which saved more, win a contest.3. Interactive columns: they include <u>a) a beating heart</u>⁴ <u>b) a weight</u> that can be lifted by the hand of a visitor, to provide an hands-on, effective experience of what is a joule (100 g rised by 1 meter; or also 1 heart beat) and a watt (1 J per second) ⁵.
-------------	--


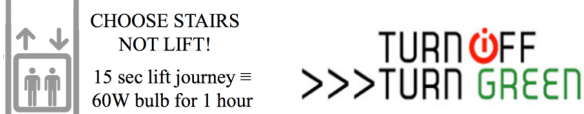
perception or of *instant* price perception (paying 10 x 10 \$ is perceived as paying more than paying 1 x 100 \$).

² "An essential element of this strategy is increasing electricity's share to about 50% of final energy demand and to about 70% of primary energy demand." Energy Strategy for ETH Zurich. ESC Energy Science center, ETH Zurich, 2008.

³ Source: personal communication with Dominik Brem

⁴ The beating heart must be realistic: with sound, motion, light, similar to a plastinated true heart. To make it, we are undertaking contacts to Damien Hirst, Gunther von Hagens and medicine students and staff in Zurich.

⁵ Based on the principle: "I hear, I forget. I see, I remember. I do, I understand"

	 <p>Figure 1: E-column (left), Noise information column of type a) (middle), Noise information column of type b) (right)</p>
E-stickers *	<p>E-stickers are placed on some electrical appliances to inform about their electricity consumption. E.g. lifts, hand-dryers, printers, projectors, coffee machines, etc.</p>  <p>Figure 2: examples of possible designs for stickers</p>
E-meters	<p>Portable, inexpensive, consumer grade power meters will be available for people to investigate the electricity consumption of their appliances such as a laptop, etc.</p>
E-displays	<p>While using electrical appliances, a display shows their instantaneous electrical consumption. E.g. while the lift is moving, the electricity used is displayed. (E-displays will be implemented if technically and economically feasible)</p>
E-quiz	<p>Multiple-choice quiz with questions on energy consumption will be proposed at ETH restaurants and bars. Correct answers are immediately rewarded with an E-coffee or beverage⁶. Some possible questions could be:</p> <ul style="list-style-type: none"> • “How much electricity is used by coffee machines in the whole of Switzerland?” • “Could you suggest three ways to reduce the electricity consumption?” <p>The duration of quiz is 2-5min.</p>
E-contest	<p>Contest between ETH buildings: those who obtain the highest reduction of electricity usage over one week/month, receive a moral reward, or a free feastful lunch organized for the whole building. People of each building can check their collective consumption on the website and on their E-column, and try to do better than those of other buildings. See e.g. online consumption comparison with neighbors in http://www.opower.com/</p>
E-show, movie, seminar	<ul style="list-style-type: none"> • Comedian to perform an E-show along with a group of creative students, e.g. during a 24h workshop, similar to “ecoworks” • Movies on energy topic in collaboration with other organisations of ETH (e.g. [project21]) • A lecture by a professor of ETH or a nobelist.
E-clownesque-coaching	<p>Professional trainer conducts clownesque energy coaching of groups (a qualified one already said yes)</p>
E-desk *	<p>An office (officer, telephone, computer) answers questions on energy saving habits/measures. A trained technician can come to your office for an E-check and to give suggestions to save electricity and energy in general. The E-desk could be part of already existing offices, such as <i>Sicherheit, Gesundheit und Umwelt</i> or <i>ETH Sustainability</i> (to investigate)</p>

⁶ Based on the idea that rewards work and are a proven way to generate motivation and remembering.

E-homepage website *	A homepage provides: - E-database with average energy cost of several services and goods - Tips for saving energy - Platform for ETH students and staff could submit online ideas for enhancing energy saving. Realized best ideas receive moral or non material, non additional rewards - Instant electricity consumption of ETH (updated every 15min). The homepage could be part of the www.umwelt.ethz.ch as agreed upon by Dominik Brem
E-tag idea promotion	We plan to catalyse the development of E-meters, which display instant electrical power use of any electrical appliance. They should be cheap, portable, light (we are already in touch with interested partners).

Budget

Here is an estimated budget for the organization of the E-week. However, the number of items and scale of our E-week are flexible and may be adapted according to the availability of funds.

Item	Estimated budget per item (in CHF)	Estimated budget total (in CHF)
E-columns	1000.-	10'000 to 15'000.-
E-stickers	0.7 to 1.-	300 to 500.-
E-displays	50.-	1500.-
E-quiz	0.75 to 1.- (cup of coffee)	2250 to 3000.-
E-contest	-	3000.-
E-show, movie, seminar	-	500.- (food and accommodation)
E-clownesque-coaching	-	500.- (food and accommodation)
E-desk	-	0-?
E-homepage website	-	0-3000.-
E-tag idea promotion	-	-
Volunteers before/during E-week	15.- (free lunch or SBB voucher)	1500
Total		19'550 to 28'500.-

The budget of our project hence amounts to approximately **20'000 to 30'000 CHF**.

Time-line

Tentative time for E-week: May 2011 (can be subject to change)

E-valuation

Measuring before and after the campaigns:

- Quantitative energy knowledge and awareness (surveys)
- Electricity consumption of ETH (whole & single buildings)

Critical factors

The realization of the **wattUknow** project relies on the following conditions:

- Approval and collaboration of ETH authorities
- Team: we will need to build a team of motivated and reliable participants who agree to spend most of their time and energy for the realization of the project. Moreover, we hope to find volunteer students with the appropriate skills needed for the project (e.g. a website programmer)
- Budget: as described in the budget section, **wattUknow** requires funds which will define the scale of the project, even though external sponsors could bear part of the costs (e.g. by supplying rewards such as public transport vouchers)
- Some of the E-week items are meant to be permanent. For the long-term maintenance, we might rely on collaborations with existing offices and permanent employees of ETH. For instance, the website could be part of and maintained by www.umwelt.ethz.ch.

Possible developments

- If E-week will be succesful at ETH, we will be able to export this initiative to other universities, companies, public administrations.
- Social entrepreneurship: e.g. founding an ETH spin-off (such as: myclimate.org, eartheffect.ch, eaternity.ch)

References

Boulouchos K, Casciaro C, Fröhlich K, Hellweg S, Leibundgut HJ, Spreng D (2008) Energy Strategy for ETH Zurich. ESC Energy Science center, ETH Zurich.

Advisors and partners

Alan AtKisson, Sustainability entrepreneur, asked, <http://www.atkisson.com/>
Jeremy Rifkin, Economist, asked, <http://www.foet.org/>
Tommaso Luzzati, Economist, asked <http://www-dse.ec.unipi.it/persona/docenti/luzzati/>
Mauro Gallegati, Economist, asked <http://www.univpm.it/>
Mathis Wackernagel, Ecologist, asked, <http://footprintnetwork.org/>
Lino Guzzella, Engineer, assured advice, http://en.wikipedia.org/wiki/Lino_Guzzella
Rüdiger Paschotta, Physicist, asked, <http://www.rp-photonics.com/paschotta.html>
Hans Koller, Engineer, asked, http://www.emuag.ch/e_sites/index_e.html
Oliviero Toscani, Communication, gave advise, <http://www.olivierotoscani.com/>
Bruno Ballardini, Communication, gave advise, http://it.wikipedia.org/wiki/Bruno_Ballardini
Elda Lanza, Communication, gave advise
Vitaliano Damioli, Communication, gave advise
Sabine Frommenwiler, Environmental communication, asked, <http://www.frokomm.ch/>
Elisa Mosler, Communication, gave advise
Max Damioli, professional coach, assured participation to the E-week www.damioli.net

Submitters



Laura Burger Chakraborty is currently pursuing a Master in Biogeochemistry and Pollutant Dynamics at ETHZ and doing a Minor in Sustainable Energy Use. She was part of the ETHZ delegation at the World Student Environmental Summit and has been involved in sustainability related activities in multiple countries.



Nandan Maheshwari received the B.Tech. and M.Tech. degrees in mechanical engineering with specialisation in Energy Technology in 2009 from the Indian Institute of Technology Madras, Chennai, India. He is currently working toward a Ph.D. degree with the Bio-Inspired Robotics Laboratory at ETHZ. His research interests include actuators design, compliant mechanisms, and legged locomotion.



Marco Morosini is an environmental analytical chemist and ecotoxicologist at the Institute of Integrative Biology (IBZ), ETHZ. His research focuses on systems of indicators of sustainable development. As scientist and citizen, he volunteers in a number of institutions in Switzerland and abroad – e.g. "Measuring the Progress of Societies", OECD, Paris; Health and Environment Department, Municipality of Zurich.



Nadine Mounir is doing a Bachelor in Economics at the University of St. Gallen. She is a member of OIKOS-St. Gallen and currently involved in one of their project called: Carbon-Neutral-Campus, with the aim to reduce the CO₂-emissions of the university. After the successful implementation of the **wattUknow** project at the ETH, her wish is to be able to carry it out at the University of St. Gallen.



Evgenia Tsianou is an Environmental Engineer and currently specializing in Atmospheric Science and Climate at ETHZ. She has been a coordinator of the local IASTE committee DUTH and a volunteer with social and environmental organizations. She has pursued two practical trainings in Tunisia and Germany.