

Free Energy: Alternative Designs for Awareness and Choice

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Abstract

Energy is an invisible and increasingly valuable resource. However in the design of everyday environments and things, electricity and energy use is not often made explicit – wiring, electrical meters, outlets and batteries are hidden away in boxes, inside walls and in distant basements. We have been investigating design as both a means of enquiry into perceptions of energy and as a vehicle for making energy more explicit in everyday environments. In the Interactive Institute's 'Static!' project, we investigate 'energy as design material'. Taking energy as a design problem from the point of view of human and personal experience, our approach is to examine design as a means for increasing the visibility – and thus choices available – with regards to personal energy use.

'Free energy' is a project within this theme, which develops design examples based on experimental user methods to expose alternative expressions and choices with respect to energy use in everyday life. Two prototypes – the 'Energy Tap' and 'Kinetic Door' have been developed as prototypes to explore relations of design to energy perceptions and changing behaviors.

Keywords

Critical Design, Design Research, Energy, Design Methods, Sustainable Design

Introduction

If we take basic definitions such as 'material is what builds the thing; form is the way material builds the thing' [10], energy like familiar things such as textiles or plastic may be considered as a material in design. Consider, as a simple example, a lamp. Energy is one of the materials that builds the thing and is essential to how it appears in use from both functional and aesthetic perspectives, however it is not generally made explicit in the design. In objects typical of the domestic or personal sphere, such as lamps, refrigerators, mobile phones, etc., energy is often left either to the user's own devices (in the choice, for instance, of a light bulb or brand) or it is an invisible aspect of ongoing product experience that shows up in periodic electricity bills, when power runs out or is shut off.

From the perspective of product design, we might consider that: "More often than not, a product's 'life-cycle' – that is to say the cradle-to-grave trajectory taken by an object from fabrication, through marketing, consumption, use, rejection, and eventual destruction... – is defined not by its physical but social and technological durability" [2]. With regards to energy, such a perspective might shed light on the turnover of home appliances due not to wear-and-tear but succession by the next generation of more functionally superior objects. Significantly, however, such a perspective also highlights the social factors in design, raising notions of human perceptions, experiences, and choices that contribute to enduring roles of things. With regards to energy use, this enables us to think about product design in a different way, since energy is not only an aspect of product experience which extends through the entire life-cycle of things, but it is also something that may vary significantly in value.

We explore two perspectives on ‘energy as design material’ in Free Energy. First, we consider energy explicitly in the design of electrical or electronic objects, since as a material it is central to the aesthetic expression and role of an object. Thus, we re-approach energy both in terms of how such a material is treated in design and how it appears to users through design means. Second, we treat energy as an aspect of ongoing product experience. Since energy is a material which extends beyond the stage of product design into evolving social and value systems, choices and practices of people in their everyday lives, product ‘sustainability’ is to some extent subject to the interpretations and choices which people make with respect to their own energy use over time. Thus, we may enquire into design as a means of making apparent the energy choices that are available – or not – in the everyday things we use.

Related design approaches

Examining design form in relation to personal interpretations in use, the ‘do create’ products by KesselsKramer and Droog Design probes into notions of user effort to personalize rather open or generic objects [3]. By throwing it at home, the ‘do break’ vase gets an individual, aesthetic crackle pattern; the ‘do hit’ chair is a cube made of thin steel that demands laborious pounding by users to form a shape suitable for sitting on. Exploring people’s relationships to invisible electromagnetic fields, Dunne & Raby’s ‘Placebo Project’ [4] involved the design of a series of simple furniture-scale objects – for instance, a table with 25 magnetic compasses embedded that react and spin in relation to radiation generated by ordinary electronic household appliances. The designers solicited people to ‘adopt’ the objects and documented idiosyncratic interpretations and emerging practices of use that emerged over time as people lived with the objects.

These approaches explore alternative interpretations of ‘use’ in regards to participation, appropriation and choice. As conceptual or critical design examples, they work with the physical form as well as interactive/reactive behaviors of things to question and raise such issues with their audience or users – designing relates not just to the product designed but a means of enquiry into everyday life situations and evolving product experience.

Free Energy

‘Free Energy’ consists of conceptual design examples – two of which are described in this paper – exploring ways that design can treat energy by making it more apparent in the use of things and by making choices more explicit to users. As design examples, the Free Energy concepts act to stimulate reflection and reaction – rather than product designs, they use design as a method for re-thinking basic notions of ‘materials’ and ‘use’, with the intention to raise questions to designers, users and stakeholders about energy in design.

Design process

The project process has been informed by various experimental design methods probing into people’s daily lives and perceptions of energy. Such methods used in Underdogs & Superheroes [9] involved, for instance, role-play with props in participatory user workshops as a means of generating design concepts and acting them out in relation to everyday contexts and situations of use. In the workshops, concepts evolved that were related to energy, recharging, or sharing power in local or social situations, together with collaboratively generated sketches, video scenarios and simple mock-ups.



sampling of materials used and generated in participatory workshops

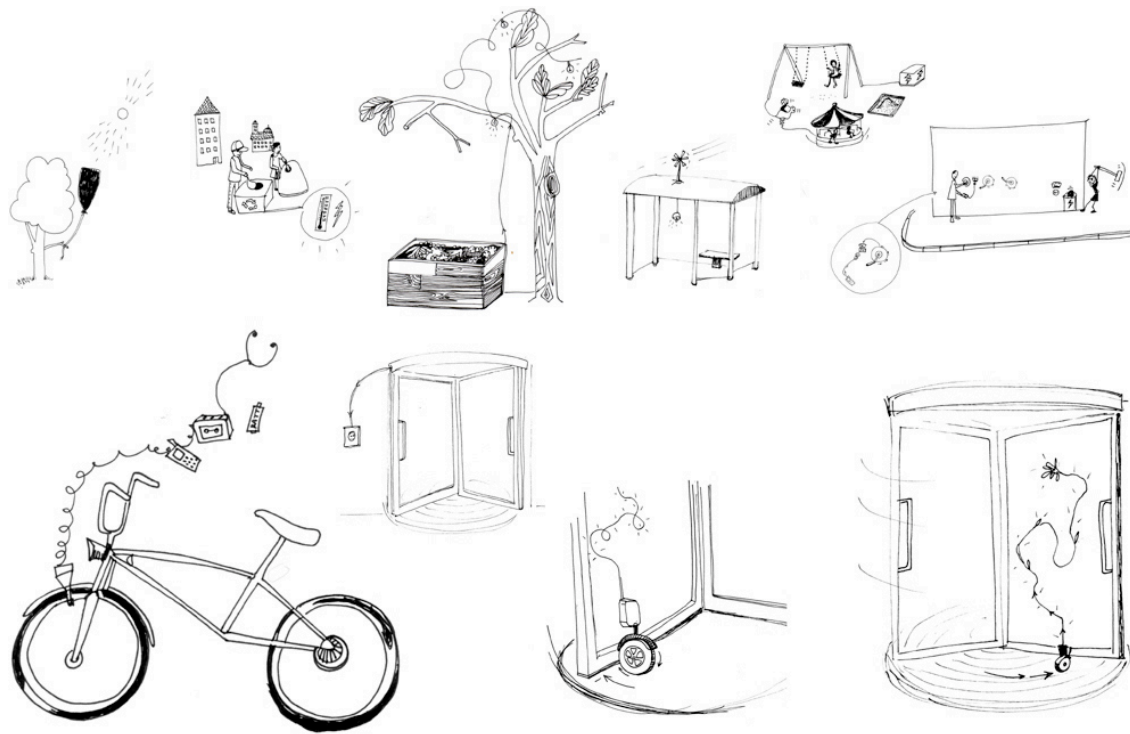
Early in the Static! project, we used the ‘cultural probe’ method [5] to enquire into people’s existing interaction with energy in mundane life. The Static! Probes were packages containing disposable cameras and logbooks – distributed to people to take into their daily and domestic lives and return in their own time by post. In relation to conventional user research methods, this method allowed people the freedom to document their own personal, emotional and cultural perceptions with respect to energy use. Information from these in the form of pictures, diary reflections and sketches were brought as inspiration materials into our design process.

One inspiration for Free Energy from the probes was people’s constant attention to certain forms of energy – particularly in relation to portable or mobile devices, energy was a constant focus of attention, throughout the day and across multiple contexts, though availability of energy sources varied widely (together with corresponding levels of awareness or stress). To explore this personal and pervasive notion of energy awareness, Free Energy concepts evolved exploring alternative energy interventions throughout the course of ones’ day.

Design for Free Energy

Free Energy strives to make energy more visible, tangible and accessible in everyday surroundings, and through this stimulate reflection and awareness about personal energy use. A series of concepts around ‘energy interventions’ into local structures or inserted into personal surroundings, ideas evolved through the design process in relation to inspiration from the user workshops and probes, exploring the placement of energy (social corners versus quiet zones of reflection), deployment (re-design, parasiting off existing structures, or the intervention of new objects), perceptions (transparency, reward systems, and emerging behaviors). At this stage in the design process, we have taken two concepts forward as prototypes, in order to explore and expose possible design directions.

The ‘Energy Tap’ is a self-sustaining energy outlet for open use – it may be inserted into any space, and cranked to generate energy to power an electric or electronic appliance to facilitate any sort of activity. The ‘Kinetic Door’ intervenes into a common energy choice in Sweden, augmenting existing revolving doors in order to reward door-pushers for making an extra energy-friendly effort. By borrowing on the design language of existing artifacts or commonly understood situations, the concepts make energy use or options explicit through means of placement, visibility, or additional choice. Our goal with these first concepts is to elicit hands-on participation through the use of simple prototypes to convey how physical interaction and everyday activity can relate to more conscious or sustainable energy behaviors.



sketch documentation from the design process

Energy Tap

The first Free Energy design example developed is the Energy Tap. The focus in this concept is how ones' personal effort might free energy for use. Placing energy taps as accessible generating outlets in the public space contradicts existing expectations of outlets which are situated indoors or connected to a building, in this way privatized or inaccessible. In this concept, activities of energy generation and utilization may be public or personal, in either case free for anyone to use for their own purposes.

In certain respects, this notion relates to notions of open or adaptable systems. For instance, Philips Design's 'Open Tools' proposes open product designs that act as 'service units' to larger systems, enabling users themselves to negotiate, locate, and pace their own interaction through the devices [1]. In a simplified way in relation to systems of energy, the Energy Tap gives interaction with energy a physical presence and tangibility for open use and local interpretation.

Situation projections

Before determining how the Energy Taps might look or what kinds of things they might be used for, an initial study was done to project into possible situations and behaviors that such designs might support or provoke. A survey was done of existing sites of interaction and animation in locales, such as meeting places, social corners and parks. Fictional stories and scenarios were created as a series of provocative images based on existing behaviors, projecting into possible em-'power'-ed visions of everyday life.



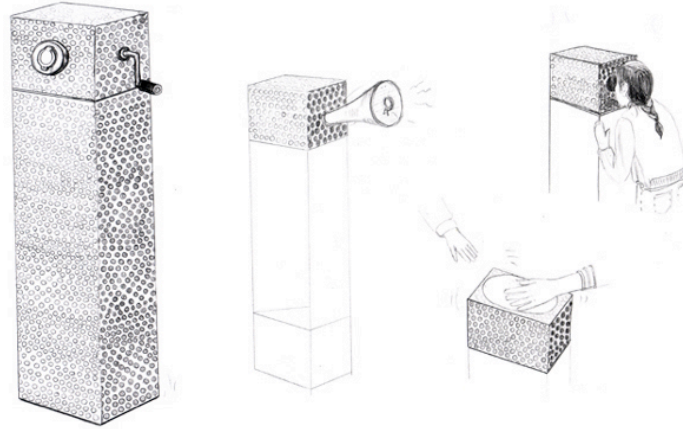
**situation projection sketches: listening to the radio by the water; free work;
tea party and waffle-making in the park.**

Prototype design

A first prototype of the Energy Tap consists of two parts: a stand and a set of modular pieces highlighting different aspects of energy. The modular pieces have been designed to act alone or to be placed upon the stand so that we could test the placement and identity of the objects. On the stand, the objects could, perhaps, draw more attention, while alone they are more portable and may blend less conspicuously into the surroundings. In this case, we can test scenarios where people serendipitously happen upon them or have a more private interaction with them. The first module is described in detail below. Other modular pieces for possible development in the future include modules for hearing energy, seeing energy and feeling energy.



patterns collected from the city as design inspirations



energy tap and modules

The first module of the prototype consists of a crank on one side, solar panels on the top and a power outlet so that energy can be locally generated. A combination of the cranking action and solar power creates enough energy to use the outlet. The amount of time the outlet works is in proportion to how much solar energy is available or has been stored as well as how much a user turns the crank.



alternative placement scenarios for the Energy Tap

The design of the object draws on the design language of electrical objects and other public structures located outdoors. The pieces are constructed as simple, understated forms covered with black mosaic tiles, a texture that plays on the vernacular of local public places. However, details are crafted in bright yellow drawing attention to the crank and the outlet. To indicate and invite interaction, the design of the crank is inspired by the notion of appliances such as meat grinders or an antique telephones. Combining traditional textures and industrial details, the objects are discrete yet decorative, familiar yet curious.



using the Energy Tap

Kinetic Door

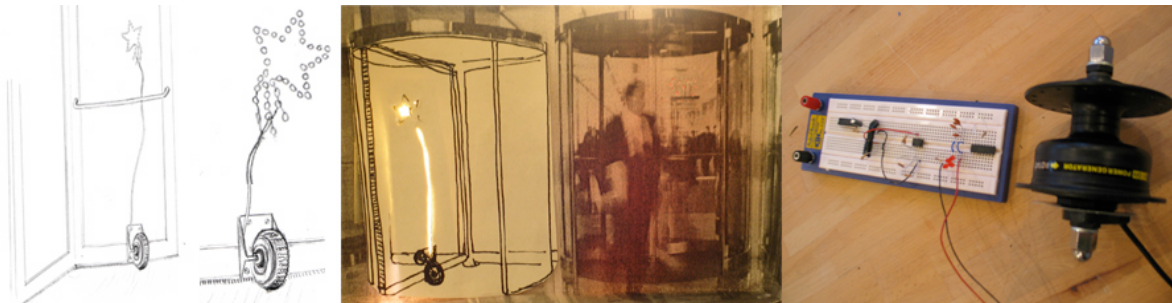
The second prototype developed is the Kinetic Door. Unlike the Energy Tap, which operates as an open object without a fixed location, the Kinetic Door is a sort of ‘redesign’ or augmentation of existing objects. The Kinetic Door acts as an extension to any revolving door, borrowing from the physical energy input by door-users to give them a reward for having chosen the environmentally-friendly way of entering or leaving a building.

This concept works with a ‘parasitic’ strategy for design, a notion that is not altogether new and has been applied in relation to television media [7] and tactical media strategies [8]. Similar to our previous work in the ‘Tejp’ project [6], the Kinetic Door works with devices that build on and parasite off existing physical or social patterns to generate new expressions or forms.

Prototype design

The Kinetic Door is a device consisting of a small wheel connected to a hacked dynamo bike light connected to a pattern of LED lights. It is compact and may be put on and removed from any revolving door – placed just inside and at the bottom of the door so that the wheel just touches the ground, the LED pattern is then placed on the surface of the glass door. When anyone pushes the door, the wheel rotates and the motor inside the dynamo draws energy that is used to power a dynamic LED lighting display. In this initial version, the LEDs are placed in an abstract aesthetic pattern, reminiscent of a good luck charm such as a falling star or something that draws your thoughts to the nature and the environment.

The concept for this device stems from a common dilemma in Sweden. In Swedish buildings, people are offered a choice either to use the revolving door, thus utilizing their own powers and energy, or to activate an electric door that holds the door open for them to pass through. These two types of doors are typically situated next to one another, symbolizing the ‘trade-off’ and choices available between design for energy-friendly or ease-of-access systems. Based in this context, our design of the Kinetic Door draws attention to this dilemma through visualization of the energy present, encouraging and rewarding a particular choice.



models and electronics for the Kinetic Door

Reflections and future directions

The two prototypes explore ‘energy as design material’ from different perspectives. Kinetic Door devices operate to make explicit the energy that is already present in a mundane physical activity, parasiting off the energy generated by the action to give visibility to a specific energy-related choice in use. The Energy Tap acts as an open interface to see what people might do if energy could be a present and tangible option anytime, anywhere. In each of these examples, energy is a focus in building the object, and interpreting and interacting with energy is central to relating to and using the object. In this way, the Free Energy prototypes become a platform for making

energy explicit in design and a means for us to enquire into alternative perceptions and behaviors that design might support in people's everyday use of energy.

In Free Energy our objective is not to offer a solution to the problem of energy over-consumption, but to explore design as a means of promoting increased awareness and to provoke reflection and discussion. Our next step is to insert the Energy Tap and Kinetic Door devices into private and public spaces, in order to examine how such objects might stimulate reflection on energy, personal energy behaviors, and possible changes or empowerment with regards to personal energy use. As design examples rather than solutions, such 'tests' will be crafted as participatory and reflective forums, as a means for people to try out and experience alternative choices in existing situations and for generating new ideas with possible users.

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