

WAIT FOR THE DROP: DESIGNING A GRAVITY POWERED TURNTABLE OF THE FUTURE



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Abstract

This project presents a bespoke vertical turntable that plays music for 10 minutes on power generated by a small gravity battery. Blending speculative and practical design, the gravity turntable is designed and built according to the constraints of a near future storyworld in which radial grid electricity does not exist, and energy must be produced and consumed by exploiting local terrain, knowledge, and materials. The conceptual basis of this project draws inspiration in part from Borgmann's "device paradigm", seeking to go "behind the wall" to design a holistic product that demonstrates a harmonious relationship with its energy source and the surrounding environment.

Keywords

Speculative Design
Design Fiction
Renewable Energy
Gravity Battery
Critical futures

1. INTRODUCTION

Energy is essential to modern living. Our inseparability from energy is not just a matter of electricity consumption and use, but includes our inseparability from infrastructures of generation, transmission, and storage. But while our lives are energy rich, our relationship with energy is poor; electricity is abstract and distant, a number on a meter. Most of us have little understanding of how energy works. As technology advances it also becomes increasingly hidden, lost in complex systems, controlled by invisible algorithms. This has the effect of dislocating ends and means. The present tendency is for designers and consumers alike to focus on the end—the object of desire—while ignoring the means, the complex infrastructures and systems that allow the device to work. Nothing illustrates this dislocation more clearly than our attitude towards energy. Electricity, as a form of energy, powers our lives. It magically appears in sockets on the wall that deliver a seemingly endless supply. Behind the wall, however, energy resides in massive, alien infrastructures.

Drawing inspiration from Albert Borgmann's "device paradigm", this project transforms a grid-dependent "device"—a record player—into a situated "thing". As an instrumental product, our record player no longer exists as an isolated element dislocated from its infrastructure; instead, it has become an integral part of the local ecosystem.

2. BACKGROUND: REDESIGNING MADEIRA

The artefact we present is part of ongoing research sited at the innovative island edge of Madeira. In our project, "Redesigning Madeira", the island's vertiginous topography and numerous microclimates provide an ideal venue for the conception and testing of multi-scale energy experiments. We aim to provide solutions—some practical, others (for now) fictional—that return control of energy generation and consumption to communities while challenging historical constraints of infrastructure.

Our overall approach blends speculative and practical design in much the way that design fiction does. Design fiction is commonly defined as the "design of diegetic prototypes to suspend disbelief about change" (Bleecker 2009). In our

case, we have imagined and conceptualised a fictional storyworld to manipulate the constraints that influence our design approach to energy. Essentially, Madeira in this storyworld has no radial model of central energy generation, so that communities must find innovative ways to use remoteness and peripherality to their advantage. This allows for the imaginary reconstruction of society and human behaviour—from how energy is generated, to the rethinking of products that no longer have wall sockets ready to provide them with always available power. In our recent work, we have focused on helping communities to reclaim ownership of energy generation and storage by employing local knowledge and materials to develop gravity batteries. The gravity battery is a storage device designed to be used with a variety of renewable energy generation methods. In our case, energy provided by the abundant Madeiran sunshine is captured by solar photovoltaics. This energy powers a motor, and with the help of a home-made gearbox is used to lift a fixed weight into the air. When it is needed the energy is released by dropping the weight, which in turn rotates the motor—now a generator—to produce electrical energy. The power available is determined by the size of the dropping mass, the speed at which it drops, the gearbox ratio, and the drop distance. To communicate the concept of the prototype we recorded a short video that shows how the energy generated powers an out-of-the-box record player (Fig. 1).

Fig. 1

Gravity battery powering an out-of-the-box record player: <https://vimeo.com/202043363>.



The next iteration, to be shown at xCoAx, builds on our gravity-based energy generation methods and applies them to the domestic environment of product design. Our bespoke gravity turntable is a product that exists in a near future storyworld where living rooms have no wall sockets, but still provide a space to gather with friends and enjoy music together.

3. THE GRAVITY TURNTABLE

In the simplest terms we are proposing to “remove the wall” that makes energy abstract and intangible. The wall and socket facilitate generic and problematic approaches to both the design of electrical products and the way they are used. The metaphorical removal of the wall reveals local contexts and highlights local terrains, materials, and skills. We reify this metaphor by building a wall-less, gravity powered turntable from recycled materials following an open-source approach.

3.1. Conceptual Context

In *Autonomous Technology*, Langdon Winner describes how “abstract general ends” such as “health, safety, comfort, nutrition, shelter, mobility, happiness, and so forth” have become highly instrument specific: “The desire to move about becomes the desire to possess an automobile; the need to communicate becomes the necessity of having a telephone service; the need to eat becomes the need for a refrigerator, stove, and convenient supermarket” (Winner 1978). Borgmann took this idea a step further in *Technology and the Character of Contemporary Life* with his description of the “device paradigm”, which differentiates between things and devices. Things are inseparable from their context: we engage and interact with them in their worlds; means and ends exist in an unbroken continuum. Devices, on the other hand, conceal their contexts. In his study Borgmann examines the human need of warmth, detailing the shift from the stove as thing — “a focus, a hearth, a place that gathered the work and leisure of a family and gave the house a centre” — to the device, the central heating plant that “procures mere warmth and disburdens us of all the other elements” (Borgmann 1984). Our energy infrastructure, developed and implemented a century ago, similarly “disburdens us of all the other elements”. Electricity, the mysterious entity that is essential in powering modern life, appears to be as unproblematic and ubiquitous as the air we breathe. The always-on availability of energy manifests clearly in the design of domestic products—design that stops at the wall where infrastructure begins. A shift to alternative modes of product design that are aware of the local environment, people, and materials at hand does not mean reverting to a nostalgic or pre-industrial past. Rather, it means promoting the *thing*-ness of the product, which supports an ecosystem of practices derived from its use.

The gravity turntable is a “thing” rather than a “device” because of the shift it causes in the practice and attitude of listening to music. The gravity turntable is wall-less: the gravity-based mechanism for energy generation is an integral design feature. Hence, its energy infrastructure and its functionality are components of equal aesthetic relevance. The experience of listening to music on the gravity turntable is highly influenced by its design. Its maximum playback time—10 minutes—and the slight effort it imposes on its user encourages active rather than passive listening, and quality over quantity. After all, a record is not an mp3 file, so why should their modes of enjoyment be the same?

3.2. Implementation

As mentioned earlier our last iteration used gravity as an energy storage and generation solution. For our next iteration, the gravity turntable, we are implementing a small scale version of the gravity battery in a domestic product. The gravity turntable plays a record for an uninterrupted 10 minutes. It does so without the need for any external energy supply, by using gravity as the energy source for its functions. This is one of the main design constraints we have adopted in our process. The other design constraint is intimacy. The gravity turntable provides an active listening experience in exchange for a minor athletic effort on the part of the listener. After placing the record and adjusting the position of the needle, a weight must be pulled up until it reaches a height of 2 meters. The listener adjusts the headphones provided and releases the weight. Music begins to play, and lasts until the weight reaches the floor.

The energy demands of the gravity turntable require that the record is oriented vertically, rather than horizontally as is typically the case. While the weight falls, the spin produced in the transmission gear is used directly to spin the record at 33 rpm. Also during the time the weight falls, another gear is connected to a small motor that works as a generator, providing enough energy for signal treatment (i.e. filtering) and amplification. Finally, the signal is driven through a jack port into which headphones (or speakers) are connected.

Fig. 2
Detail of the gravity
battery mechanism
and weight.



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