

Games for Grownups: The Role of Gamification in Climate Change and Sustainability

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About the Author(s)

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Abstract

Gamification, and the related concept of 'serious' games, refer to the use of games and game mechanics that are designed to influence real-world behavior. This is a concept that has been getting increased attention in the climate change and sustainability world in recent years. Games are a potentially powerful tool to use fun to reach a broad audience. Most behavior-change programs touch a small set of people who are motivated by information. Using games (and other social-science inspired strategies) gives us a greater ability to reach everyone else. Ambitious carbon reduction goals, for example, require high participation rates. Games provide people who may not otherwise be inclined to care about climate change or carbon reduction with the motivation to get involved.

Executive Summary

Gamification is the process whereby program designers incorporate game mechanics into everyday activities to provide added motivation for behavior change. Gamified programs take the features of games that keep players' attention, like points, badges, leaderboards and challenges, and apply them to real-world situations that might otherwise seem mundane or boring. The incorporation of game mechanics heightens the experience and/or performance of everyday, real-world activities. Essentially, gamification is "approaching problems from the perspective of a game designer to tap into the psychology of motivation." A related concept is serious games, which are complete games that do not require real-world activities to complete, but are intended to inspire behavior change through education and provoking thoughts and emotions.

The concept of gamification has gained a lot of traction in recent years among implementers of programs aimed at climate change mitigation strategies such as carbon and waste reduction, as well as energy conservation. There have been diverse pilots, which achieved positive results at small scales. However, the real promise of gamification lies in its theoretical ability to harness the attention of large numbers of people in order to change everyday behaviors in the home, office, at the store, or on the streets. Games can reach millions if not billions of people in theory. The enormous power this scale implies, and the ability to harness it for positive change, is what has made gamification such a hot topic.

However, in recent years, observers have leveled a number of criticisms at gamification, in particular the idea that it the concept is all hype and no substance. Because of negative connotations that have accrued to the term gamification, in this paper we are recommending that designers of programs consider shifting their perspective towards one of *gameful* design and its focus on positive interactions and outcomes.

We looked at 40 games and challenges meant to influence behavior around energy efficiency and sustainability. We organized those games into categories based on the role of the publisher (utility, market, government-sponsored) and the setting intended for engagement (residential, commercial, campus). Each of these categories receives in-depth treatment of a case study, a game representing the type, whether they are utility-affiliated, Green Button enabled, and have any reliable savings.

This paper also organizes games according to various types by feature, as well as looking at how players fall into types according to what motivates them to play. It is worth stressing that it is important to understand what games can and cannot do, and therefore carefully select a specific kind of game to achieve a pre-identified outcome.

While data across categories is hard to come by, there have been positive results at smaller scales. We assemble several specific recommendations for the program designer who is considering implementing a game in the near future, including to consider the relatively short lifespan of many games and game-design teams, before committing major resources to their deployment. One suggestion is to include a life-stage analysis component to your

program's overall logic model, and consider games a short-term and tactical aspect of changing behavior.

Despite the theoretical potential for sustainability-related games to be enormously successful, there is still a great deal of uncertainty surrounding gamification. Because the idea is relatively new, many program designers, administrators, and evaluators are unfamiliar with their performance. Furthermore, skepticism exists as to whether gamification is anything more than hype. There is also a set of developers and evaluators new to game conventions and mechanics, and for whom many myths persist with respect to who games and why.

Our goal for this paper is to make the concept of gamification useful for a wide variety of program design needs. We saw a need for an examination of the features a game or gamified program needs to be successful, and through this we hope to prevent the waste of money, time, and attention. In order to do this we need to evaluate games for their effectiveness. Luckily, games are uniquely oriented towards tracking outcomes, with this type of measurement 'baked in' to certain forms, such as digital or video games.

This paper expands upon the taxonomy of games published in the 2013 ACEEE Field Guide to Utility-run Behavior Programs (Mazur-Stommen, Farley 2013) by going into detail regarding the concept of gamification – whereby game mechanics are incorporated into everyday activities to provide added motivation for behavior change. This includes an in-depth description of game mechanics, features such as leaderboards and points, which are important in both gamification and traditional games. In this paper, we use several games examples for the types of games most commonly encountered in this space. We also discuss best practices behind successful game design more generally.

We also discuss the rise of 'altruistic gaming' which background provides context for explaining the sudden rise of interest in games and gamification across the energy efficiency industry. We conclude that designers of programs in the energy efficiency and sustainability arenas consider shifting their perspective towards one of *gameful* design and its focus on positive interactions and outcomes instead of mindless repetition. Gamification has the potential to attract large numbers of people and have a proportionately large impact on energy consumption, but in order to achieve these results, designers of games need to provide an engaging experience first, and consider them as a platform for behavior change second.

Introduction

In recent years, there has been a great deal of interest in using game mechanics to influence people to change their behavior in “fun” ways. This paper examines the recent history of both games and gamification with a specific focus on their deployment in sustainability efforts in the United States and Canada. Educational games have a long history, but gamification, serious games, and games for social good are concepts that began to appear much more recently. The relationship between games, gamification, and energy efficiency is very new, and until now has not been explored in a systematic manner. In this paper, we discuss the history of the term gamification, and its relationship to a newer way of thinking about games called gamefulness.

There have been several energy efficiency games who have achieved positive results in small scale pilot projects. However, there are not yet any guidelines or benchmarks for the qualities and features an energy program incorporating game mechanics must have in order to be successful. We look at some games from the energy efficiency and sustainability community, and derive some best practices for program implementers interested in adding a game to their behavior portfolio. In this paper, we evaluate games for their effectiveness and identify successful (or unsuccessful) elements to begin to create a benchmark. By providing this benchmark, we hope to prevent the waste of money, time, and attention. This paper is for utility program developers who want to know more about using games in their energy efficiency programs. Whether they have never tried a game, but are considering one, have used games before but want to learn more, or even just want to see what is going on in the industry, this paper delivers information that can help future decision-making.

Games

POPULARITY

The rise in popularity of games and gamification shines a spotlight on the many myths that persist about games, including who plays them, who they are aimed at, and what they can achieve. One of the first hurdles to overcome for anyone considering using a game in their program portfolio is the lack of understanding about what audience exists for games.

There is a perception that games are exclusively the territory of teenage boys. At a recent conference, an attendee told a developer of a game “Only kids play games.” In reality, according to 2013 figures put out by the Entertainment Software Association, 58% of all Americans play video games. There are actually more female gamers over 18 (31% of the total number of players) than male gamers under 17 (19%). The average age of gamer is 30, with one third of gamers under the age of 18, one third between 18 and 35 years of age, and the remainder aged 36 and up. The gender divide among gamers is also less stark than is popularly imagined, with 55% of all gamers being male, and 45% female. As Georgia Tech Professor Ian Bogost, a game designer and theorist, put it: “[People ask] ‘why would I want to do that, be involved in that prurient, adolescent, game?’ Overcoming those preconceptions (about games) – the Michael Bay version of games –and turning to the potential that hasn’t been realized, the Errol Morris version of games.”

Anyone who believes that ‘only kids play games’ is missing a huge opportunity to connect with an audience that consists of a majority of U.S. households; 58% of which own at least one game console. We know that games can reach millions if not billions of people. Angry Birds, which is free to play, is the number one downloaded app of all time and has over 2 billion downloads and hundreds of millions of active players at the time of this writing. *Grand Theft Auto V*, the best-selling game of 2013, sold over 30 million copies worldwide across all game platforms. Games also reach people wherever they are, as people play on the go (36% play on their smartphones and another 25% on other mobile devices). People also play together (77% report at least one hour in the past week playing with others) which makes games vehicles for messaging around social norms.

We put out an informal poll¹ asking people about their gaming experiences. Poll questions are available in the appendix. From our poll, 63% of our respondents, all adults, had played a game (any kind) within the past week. 54% of respondents said they had played a ‘video’ or ‘digital’ game within the past week. The top two categories for games were casual games (e.g., Angry Birds, Candy Crush) with 63% of respondents, followed by social games (e.g., Words with Friends, Farmville) played by 35% of respondents. In terms of age, 27% of respondents were over 50. Our gender split was 63% female, 36% male, and 1% other, with no teenaged boys.

This explosion of interest in games is the result of a convergence of several trends in technology that have simultaneously affected our social lives, behavior, and energy usage. At the most basic level, with the advent of smartphones, and their high penetration of the market, people are now able to access games any time or place. Smartphones now occupy 66.8% of the mobile market share, up from a mere 4% in 2007 (ComScore 2014, Dreyer 2014). People have the computing power of a previous generation’s desktop hard-drive now in a palm-sized device. Over the past decade, with the rise in smartphones and mobile optimized websites, consumers have become increasingly adept at handling large amounts of information on the go. There exists a positive feedback loop wherein consumers can process more information, and therefore demand on-going access to more information. The delivery on 24 household energy information, enabled by smart grid investment, and shaped by big data initiatives, fits neatly into this relationship (Kamal 2012).

Another trend has been the rise of mobile, casual, gaming. Games such as Angry Birds, Farmville, Words with Friends, and Bejeweled, have become ubiquitous as both entertainment activities and as cultural touchstones. Angry Birds, which is free to play, is the number one downloaded app of all time and has over 2 billion downloads and hundreds of millions of active players at the time of this writing. In response to the rise of such relatively mindless, grinding-type, games on social networking sites like Facebook,

¹ We put out a SurveyMonkey link on Friday 4/11/14 via several social media channels. We had no sampling strategy or controls.

Georgia Tech Professor Ian Bogost, a game designer and theorist, infamously designed the game *Cow Clicker*, which showed that through the application proper game mechanics, people could be incentivized to do even the most extraordinarily mundane activities obsessively². It should be noted that much of the perspective offered in this paper applies to the digital side of gaming, because digital games are omnipresent online, on desktop machines, and are also available for mobile applications such as smartphones and tablets. However, we also examine the popularity and effects of analog games, including physical challenges in real life as well as card-based games.

THE BUSINESS CASE FOR GAMES

It would be useful to establish a return on investment (ROI) when it comes to games. This ROI would look at the costs associated with developing and deploying games across a set of players, and then establish the cost-effectiveness of games as a measure through the relationship of costs with energy savings achieved through associated behavior change. Unfortunately, data on the costs, behaviors changed as a result of engaging with a game, and actual energy savings are hard to come by due to several barriers detailed later in the paper.

That does not mean there is no role for games in an energy efficiency program portfolio – games are ideal for driving participation, and harnessing motivations for people to care about energy efficiency. Aggressive energy savings goals require high participation rates. Most efficiency programs touch a small set of people who are motivated by information. Using games gives us a greater ability to reach everyone else. Games provide people who may not otherwise be inclined to care about energy efficiency with the motivation to get involved.

CLASSIC DEFINITIONS OF GAMES

Our research for this project broadened the scope of the kinds of activities we were looking at, beyond utilities and into market-based and education games, which took many forms including card-games (Cool Choices), videogames (Ludwig), and games for mobile devices such as smartphones (Ringorang). We are also looking at *gamification*, such as that used in the Opower/Facebook application, whereby the incorporation of game mechanics heightens the experience and/or performance of everyday, real-world activities.

All of us have played games in one form or another, but it is more complicated to define what specific qualities a game must have. We reviewed classic definitions of games from

² “Bogost’s breakout hit – the game that has made him a celebrity within his industry, attracted tens of thousands of players, and even earned him a bit of money – is a cynical trifle he whipped up in a matter of days. It’s a Facebook game called *Cow Clicker*, and it’s unlike anything Bogost ever made before, a borderline-evil piece of work that was intended to embody the worst aspects of the modern gaming industry. He meant *Cow Clicker* to be a satire with a short shelf life. Instead, it enslaved him and many of its players for much of the past 18 months. Even Bogost can’t decide whether it represents his greatest success – or his most colossal failure” (Tanz 2011).

social sciences such as anthropology and sociology, and then used this research to infer some common features among those definitions. Huizinga, in *Homo Ludens* (1949) considers play to be “first and foremost” a *voluntary* activity³. Other key elements he stipulates include that games are *temporary* (i.e., have a beginning and an end), have *spatial limits*, have *rules*, and have some kind of self-contained *goal*. These are useful characteristics for identifying if you are involved in a game – as opposed to work – though the line between work and play is often fuzzier than commonly conceived, and this fuzziness has led to the coining of the term ‘playbor’⁴. Gredler (2004) suggests that the deep structure of games includes (a) competition among the players, (b) reinforcement in the form of advancement in the game for right answers, and (c) actions governed by rules that may be imaginative. For example, the rules may specify the point values of different clues that can assist the player to find a hidden pot of gold.

There are many other definitions for what constitutes a ‘game’ but in aggregate, most of them agree that certain characteristics or features are required to establish whether or not a game is present (in bold). There needs to be a minimum of one **player**, who **voluntarily** enters into an environment where their **choices** are **constrained** by an **artificially** imposed set of **rules**. Within this environment, the player must receive **feedback** about their progress towards a set of **goals** as determined by their **decision-making**. Games must ultimately provide a **quantifiable outcome** for the player such as points. Games that engage more than one player set up a form of conflict, and it becomes a ‘competition’ (whereas a challenge is a player against their own previously established baseline, more on this later).

Drivers of play

Previous research we have done includes the *ACEEE Field Guide to Utility-run Behavior Programs*, where we looked at nearly 300 different programs that had run in the past several years. We sorted these programs into a *taxonomy* using contrasting sets of features to organize our categories. These categories were in turn, based upon earlier *typologies* of drivers of behaviors. In this section we are going to talk a little about the kinds of drivers of behavior one finds in games, before discussing how we are refining the taxonomy in the *ACEEE Field Guide* to more precisely reflect the breadth of game types available to program designers.

These programs included about nine game based programs run by utilities scattered across the country in the time period under examination. In the Field Guide, one section focused specifically on these game-based programs, which we described as being, “generally dependent on both social interaction and reward mechanisms to be engaging.” That part of

³ Note: some educational and training games may not be strictly voluntary.

⁴ Bogost interview

the taxonomy divided games into competitions, challenges, and lotteries, strung along a continuum from “most socially rewarding” to “most economically rewarding.”

What this means is that games without monetary compensation allow players to enhance their social status (or receive another intrinsic reward) by demonstrating more skill, deeper knowledge, or greater cultural competence than their opponents do. On the other hand, many people are motivated to engage in lotteries and other competitions solely by the possibility of winning a prize (or other reward with extrinsic value). On that scale, the most intrinsically rewarding tend to be challenges, which are usually team-based and involve social interaction. Meanwhile, the act of scratching off a lottery ticket may not be intrinsically fun; the potential reward is the primary motivator.

When designing games intended to change attitudes or behavior around energy consumption, we think that attention should also focus on some of the reasons why people play, and what satisfaction they get out of games and game-like activities. At the most basic level people might say that they play for ‘fun’ but this simple answer conceals more than it reveals. Part of the appeal of games lies in the combination of different reward *types* such as the behavioral drivers “Status,” “Access,” “Power” and “Stuff” as identified by gaming theorist Gabe Zicherman. While extrinsic rewards, such as free products (Stuff), can be short-term motivators, Zichermann thinks that intrinsic rewards, such as community recognition (Status), are superior mechanisms for fostering engagement and loyalty (Kamal 2012). Rewards and their appeal may differ because player motivations vary. Bartle (1996) identified four main *types of players* in online multiplayer games:

- Achievers: players who work hard to achieve game-related goals, like accumulating treasure or completing specific challenges
- Socializers: Players who want to converse and interact with other players
- Explorers: players who are interested in learning as much as they can about the game world – both the story lore and the limits of the game engine
- Killers: Players who impose themselves on others (griefers), or who work hard to win at the expense of others

In our poll, 51% of our poll respondents ranked ‘Facing challenges and overcoming them’ as the number one reason they played games, making them ‘Achievers’ according to Bartle’s schema. Meanwhile, ‘Being able to socialize with friends’ came in second with 22% of respondents ranking it as the number one reason they played. These players would be ‘Socializers.’ Third were ‘Explorers’ who want to engage and learn through content and experiences. Fourth in our poll was a category Bartle did not identify (though 1996 pre-dates some of the technology that makes it viable); those who like to customize their online avatar or habitat, or ‘Customizers’ for short.

We had no self-reported 'Killers' also often termed *griefers*⁵. In his work, Bartle argues that a 'multi-player' game must have a player base balanced between these player types. We would argue that *any* games that seek to have widespread appeal need to have elements that satisfy at least four of the five of (our) identified player types. It could be argued that a role should exist for griefers, since they often push the boundaries of systems and content capability to express meaning; therefore, the presence of griefers in the gaming eco-system is actually a sign of a healthy, open system with generous amounts of plasticity and autonomy.

Other researchers of games developed a typology for the *types of satisfaction* that players derive from games (Hunicke et al 2004). In some ways, Hunicke's taxonomy is more encompassing than Bartle's, help us understand why particular people find particular games "fun" by breaking the experience of gaming into finer sub-categories.

⁵ For more on the phenomenon of grieving, see <http://journals.tdl.org/jvwr/index.php/jvwr/article/view/348>

Sensation Game as sense-pleasure	Fellowship Game as social framework
Fantasy Game as make-believe	Discovery Game as uncharted territory
Narrative Game as drama	Expression Game as self-discovery
Challenge Game as obstacle course	Submission Game as pastime

There is a deep social connection between games and emotion, and we play games to feel things like pride, or social connection, or immersion in an imaginative world. In order for a game to be fun – and thus attract players – games must inspire genuine emotions of some kind in players. Many successful games, like *Cool Choices*, use emotions like loyalty to a team and friendly rivalry as a major driver for engagement.

Another major driver for game engagement – and one we believe is often overlooked during the development of games for social and behavioral change – is varying levels of challenge of intensity and complexity. Many games put out by designers who want to change behavior with respect to energy seem to be relatively easy and routine when compared with games for recreation. Take for example, [Climate Defense](#), which is a ‘tower defense’ style app. Climate Defense uses pollution as the ‘enemy’ represented by black clouds emitting from exhaust pipes. The player attempts to stop the enemy by planting various kinds of buds, flowers, and fruit, in order to increase exhaust efficiency, or cut overall emissions. The player has an allotted amount of resources to use to build one of the defenses, which each have varying costs and levels of effectiveness. The pollution that reaches the atmosphere increases the carbon parts per million (ppm) and temperature, and for each threshold of ppm past, a “fact,” appears on the screen. These ‘fun facts’ were complicated and jargon filled such as “Cereal yields in temperate regions increase slightly but the Atlantic thermohaline circulation starts to weaken.”

There are two modes to play Climate Defense, “fun” and “realistic.” Neither version has levels, there are few upgrades, and hardly any variation in gameplay making for an ultimately mundane experience since the enemy never changes and you automatically ‘win.’ The “fun” mode is so easy that it makes the topic seem trivial. In Climate Defense’s ‘realistic’ mode, the player is doomed to lose from the beginning. Studies on climate change communications have shown that fear inducing tactics are not effective and can be even

counterproductive, especially if they do not provide a means of mitigating the issue (O'Neill, Nicholson-Cole, 2009 & Hulme, 2007).

We asked Ian Bogost his thoughts on the subject.

Q: Why do so many 'social good' games seem to lack challenge for players?

IB: If you want to make a game about a real-world challenge, and you depict it as simple then you have failed. Why does it happen? People get involved and they don't want to allow people to do terrible things or scary things and so you end up with infantilizing games.



There is a fine line to be walked between constructing games that illustrate no-win or doom-and-gloom situations, and games that fail to engage on anything more than a superficial level. However, as long as there is a means to achieve success within the parameters of a game, it seems most players are up to a challenge!

Features of games

In this section, we are going to talk about the various types of games we encountered, the platforms, how one engages with them. These are called the 'features' of the domain, 'games'. We organized these features into categories including: **medium** (e.g., digital vs. analog), **platform** (e.g., desktop vs. mobile), **function** (e.g., educational vs. entertainment), **location** (e.g., campus vs. home), **intensity** (e.g., casual vs. hardcore), **format** (challenge or competition), and **position** along the continuum of our definition of games (e.g. complete games to gamified activity).

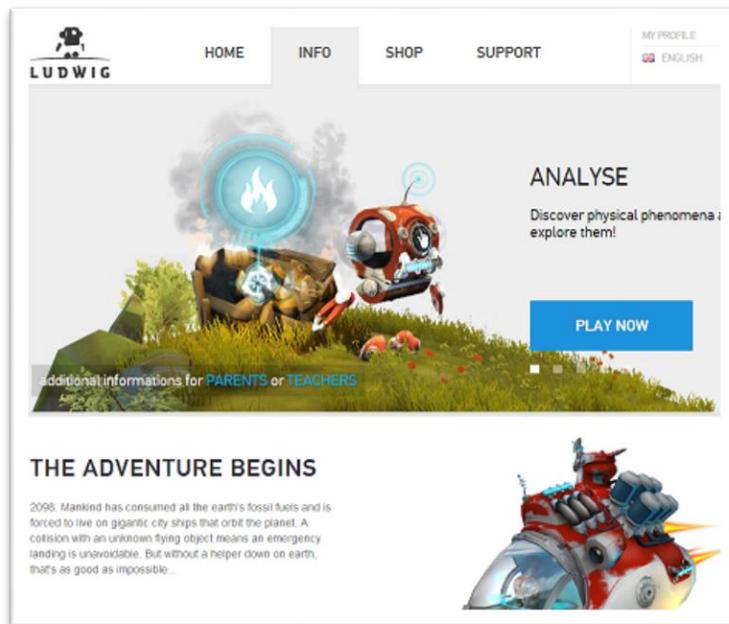
MEDIUM

Analog

Games with energy as a topic have existed for a long time, at least since the 1970s. The earliest games are analog in nature, as opposed to digital. That means that they have physical presence, with boards, cards, dice, and other pieces composing the set.

BOARD

Board games with energy as a topic (e.g., [Power Grid](#)) have been around for some time ([Energy Quest](#) dates from 1977), however most of these are not explicitly aiming to induce behavior changes on the part of the player with respect to their energy consumption, or any other resources. One departure from this is a board game developed by students and staff from Clarkson and St. Lawrence Universities. The game is used to introduce the concepts of energy use in daily life and the impact that personal choices have on energy consumption, energy bills, and fuel supply.



CARD

Cool Choices began as a card-based game designed to encourage players to save energy, with separate versions designed to be implemented at schools or at workplaces. Players receive a deck of cards printed with various energy- or water-saving actions. Different cards have different point values based on the degree of difficulty and the impact of the action. We discuss this game more in the case study appendix.

Digital

Most games we looked at had a digital component, at a minimum a website. Much of the perspective offered in this paper applies to the digital side of gaming, thanks to the technological developments we outlined earlier. Digital games and gamified activities can be found online, for the desktop, and for mobile applications such as smartphones and tablets. Digital games on all of these platforms can theoretically be either 'casual' or 'hardcore' (Martin D 2013) though due to screen sizes and processor speeds, most 'hardcore' games are still associated with desktop PCs (Alexander 2012).

PLATFORM

Desktop

Only two or three of the energy efficiency/sustainability games that we looked at were designed for the PC specifically. One of those is Ludwig, an educational game about physics and energy that comes out of Austria (but is playable in English):

Join ([Ludwig](#)) on an exciting journey through the world of physics. Find out how energy is created from fire, water, wind, and sun and use them cleverly to protect the Robotronics on Unitron against the impending energy collapse!

In order to download and run Ludwig, the system requirements include a PC running Windows XP (SP3)/Vista/7, 2 GB of RAM, 600 MB of space on the hard disk, and a 3D Accelerator Card (such as an nVidia Geforce 8400 GS). Ludwig was also one of the few games that had a purchase price. Games like this are going to offer an immersive environment, be very fast in terms of both gameplay and graphical processing, and likely offer a complex learning environment.

Mobile

Seven games either were designed solely as mobile apps or had a mobile app component in addition to other interfaces. Two additional games used Facebook, which has a mobile app, but did not have standalone app components. These were all from 2011 or later, thus they are the newest entrants to the field.

INTENSITY

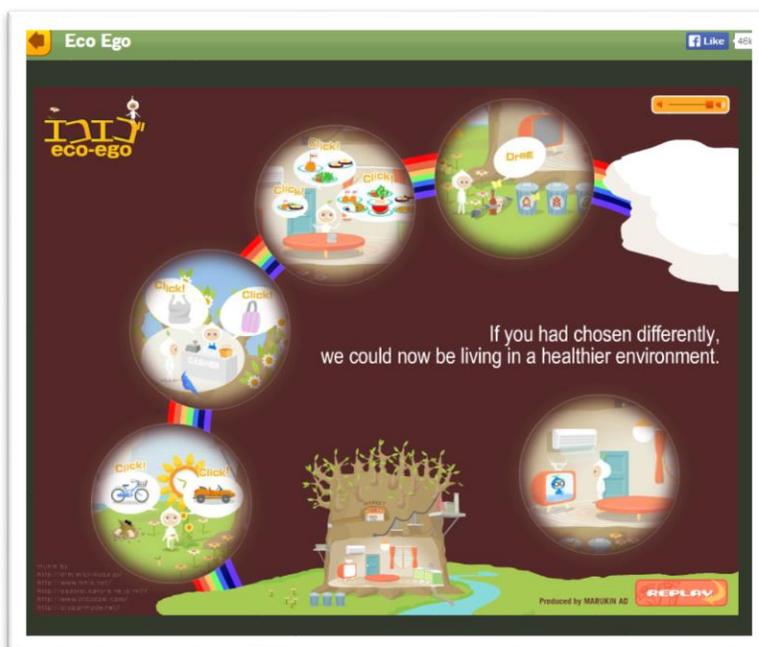
One can further divide digital games into “casual” and “hardcore.” It is interesting to note that these labels are rarely applied to analog games. Games can also be categorized by the time commitment and skill level required to play at a specific level. Within the gaming community, these labels are subjective to a certain degree, and often connected to status and authority. For example, someone who plays World of Warcraft for ten hours per week might seem “hardcore” to some, but to a player who logs upwards of 30 hours per week to beat the most difficult monsters, they might be denigrated as “just a casual player.” The differentiation between casual and hardcore gamers contributes to the myths surrounding gamer demographics discussed earlier. The games that are most popular with women and older players, like simulation games, puzzles, and social games, are usually considered to be, “casual” and therefore less legitimate by the mostly-male audience of “hardcore” gamers.

Casual

These games do not require a hefty commitment, and are usually easy to learn and play. Examples from the entertainment world include Farmville, Angry Birds, and Solitaire. Often these games are web- or mobile-based. About one third of all computer games *sold* in 2012 were “casual” according to the Entertainment Software Association, but this does not count

the many free games that are available, therefore it is safe to say that the vast majority of games today are casual in nature.

A good example of a casual game that encourages making energy conservation-based lifestyle choices was [Eco-Ego](#) by Marukin Ad in Japan. In this time-limited (six minutes) game, you can manipulate the environment a little humanoid creature inhabits, turning the air conditioning up or down, lights on or off, choosing to bike or drive, etc. The ‘externalities’ of these choices are reflected in a smokestack puffing black smoke, or the number of bird roosting in the trees above the creature’s house. Eco-Ego is charming,



and easy to engage with, with little to no set-up required. It is also more challenging than might be expected from such a simple game, since there are no guidelines provided about what some of the rules mean – you learn by doing. This challenge is a plus, drawing the player deeper into the world of Eco-Ego, and reinforcing the positive **outcome** of the **decisions** made by the player through **feedback**.

Hardcore

These games require a larger time commitment from the player, and often have a steeper learning curve. These games also often require a console or a computer with high-end graphic capability. This category includes the entertainment-oriented games Madden NFL, Call of Duty, Skyrim. In terms of energy-related games, SimCity.Edu, an educational ‘port’ of the popular SimCity franchise, would be closest, as it required (like Ludwig) hefty capacity on the part of the computer, a relatively lengthy download, and a rather steep learning curve (in comparison with casual games). Again, like Ludwig, it comes with a price tag, though free single-use licenses were available for demoing.

LOCATION-BASED

Out in the ‘real-world’ people often play games in person. These games take place in a variety of settings, including schools, universities, workplaces, and as communities. Each of these settings may bring something unique to the way a game ‘plays’ out.

FORMAT

The final set of features in our taxonomy of EE games is that of format; whether a game takes the form of a challenge or a competition. As we wrote in the Field Guide, “even solitary games are played socially against the player's past self or against others who play remotely.” So all games have a social component, but it makes a difference whether one is playing alone, against an opponent, or as part of a team.

Challenges

In the Field Guide we wrote that, “challenges typically involve an individual, household, or community trying to improve over its own baseline, as opposed to outperforming another group.” In researching games more deeply we came across the concept that challenges *do* involve, “an active agent against whom you compete,” and even that you may possibly interfere with that agent’s performance of the tasks of the game (Crawford, 2003). This makes sense in light of what happens in many campus-based challenges, such as the Kukui Cup, where students may actively attempt to (lightheartedly) sabotage other teams through such actions as showering in the other team’s dorm. At the same time, we think our original definition stands, because a player can challenge themselves to do better, achieve more, or score higher, but one ultimately needs another agent to compete against.

Competitions

In our research for the Field Guide we found that, “competitions may be interpersonal, communal, intra-communal, or campus-based.” Since folks in the fields of energy efficiency and sustainability have used the terms ‘competition’ and ‘challenge’ somewhat

interchangeably, , we would like to suggest that, going forward competitions refer to designs where one or more players play against one or more players; and that the term challenge be reserved for ‘baseline/improvement’ scenarios.

GAME MECHANICS

Think about games that people describe as “addictive.” It could be a casual iPhone game like Candy Crush or Angry Birds, a massively multiplayer online game like World of Warcraft, or even an activity affected by real-world events and statistics like fantasy football. How do these games keep players’ attention for many hours, even after the initial novelty wears off? Elements of *game mechanics* like leaderboards, achievements, and leveling up provide motivation for players to continue playing.

- A **leaderboard** is a list of players who have the most points or best times in a particular game. Leaderboards can be a useful tool for inspiring competition. **Leveling up** allows players to gain additional privileges or abilities after reaching a certain point in the game. In a classic fantasy game, leveling up allows players access to more health points or more powerful spells. In other situations, leveling up might allow players to gain access to new parts of the game, or more chances to complete a task before failing.
- **Points, or virtual currency**, are means of measuring progress within a game. They are awarded for participating in the game and completing various tasks. Sometimes points or virtual currency can be spent on rewards, either virtual (like enhancements to an avatar) or real-life, tangible goods.

- **Quests** are specific goals or tasks for users to complete, often in exchange for some kind of reward, like additional points. The fitness website Fitocracy, for example, includes quests such as running 5k in one workout or deadlifting one's own bodyweight. Energy efficiency quests might include programming a thermostat or taking public transit to work instead of driving.
- An **achievement** is a reward for completing a certain set of tasks within a game. Players might be awarded achievements for anything from logging in every day for a week, to completing a task within a certain time limit, or convincing a friend to sign up for the game. Achievements and quests often work hand-in-hand, with achievements being awarded for completing a specific combination of quests, or reaching a particularly significant milestone.
- **Badges** are visual signifiers of a user's rank or status within a game, often awarded for completing an achievement. Badges are usually publicly visible on the user's profile page, avatar, or next to their name when posting in online forums hosted by the game.
- **Narrative** is a somewhat less popular strategy for gamification, but can be a tool to enable users to immerse themselves in the activity. In a gamified program that uses narrative, users can progress in a story by participating.

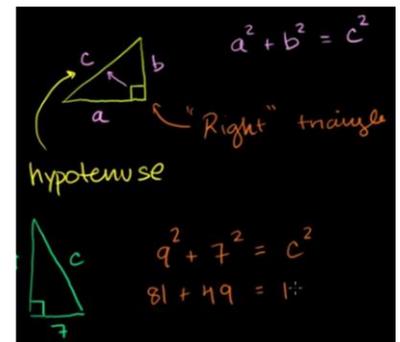
Gamification

GAMES' POTENTIAL TO CHANGE BEHAVIOR

The use of games and game mechanics has gained a lot of traction in recent years among implementers of energy efficiency programs. The fact that we could find over 40 games in this area created within the past three years speaks to this level of interest in this delivery system. The promise many people see in games and gamification lies in the ability to harness the attention of large numbers of people in order to change



Khan Academy hosts educational videos, with an emphasis on STEM (Science, Technology, Engineering, Mathematics) topics. The videos generally feature a black background with colorful writing that appears in real time as a teacher (often Sal Khan, Khan Academy's founder) delivers a tutorial.



Screenshot from a Khan Academy video about the Pythagorean Theorem

The website awards a system of "badges" for completing various tasks. Some, called Meteorite Badges, are easy to achieve – users get a badge after watching their first video or signing in for a number of consecutive days. Other ranks of badges – Moon, Earth, Sun, Black Hole, and Challenge – represent increasing levels of difficulty and commitment. The website encourages discussion about the videos by awarding badges for asking or answering questions on the discussion forums.

everyday behaviors in the home, office, at the store, or on the streets. Games have the power to reach millions if not billions of people, going far beyond the limited demographics that most people think of when they consider “gamers” as a group. The enormous power this scale implies, and the ability to harness it for positive change, have made gaming and gamification such a hot topic in sustainability, energy efficiency, and environmentalist circles. Designers of games intended to promote behavior change are working off the assumption that it is possible to take something essentially human about how we engage in both work and play, and then use it in a way to change our behavior.

Do Games Change Behavior?

So far, the evidence suggests that it certainly is possible for games to encourage positive behavior change. Several studies of individual game mechanics have demonstrated that individual game mechanics can significantly influence behavior. Anderson et al (2013) were able to develop a model for how badges can influence behavior that accurately predicted user behavior on the question-and-answer website Stack Overflow. They found that badges can act as a powerful motivational tool, and users are willing to put in a significant amount of work to attain them. Another study found that introducing points and a meaningful framework to a simple task of annotating images motivated participants to create a greater number of higher-quality annotations (Meckler et al. 2013).

WHAT IS GAMIFICATION?

Gamification is a term of art. If you are reading this, then you have probably encountered it sometime recently. You may be intrigued, or you may think it is just a bunch of hype. Our goal for this paper is to make the concept of gamification useful for sustainability program design, as opposed to mere hype. Gamification seems to mean different things to different people. Does it really encompass multiple concepts, or is there something that requires disentangling? Our goal is to unpack the various meanings ascribed to gamification.

Gamification has been with us for a long time, in the form of such things as frequent flier miles, Girl Scout badges, leaderboards for salespeople, thermometers for school fundraisers. The earliest example of what might be termed gamification we could find was from 1896, when Sperry & Hutchinson began offering stamps to retailers back in 1896 (The Straight Dope 2001). Consumers who acquired enough stamps were able to redeem them for items from a catalog. Regardless of how venerable the concept is, the term “gamification” was only coined in 2002 by British computer programmer and game designer Nick Pelling. Here he is in his own words describing what he intended (Pelling 2001):

So at some point during late 2002, I put all these pieces together...and began to wonder whether the kind of games user-interface I had been developing for so long could be used to turbo-charge all manner of transactions and activities on commercial electronic devices – in-flight video, ATM machines, vending machines, mobile phones, etc. Unsurprisingly, this was the point when I coined the deliberately

ugly word “gamification”, by which I meant *applying game-like accelerated user interface design to make electronic transactions both enjoyable and fast*⁶.

We define gamification as the process whereby program designers incorporate game mechanics into everyday activities to provide added motivation for behavior change. Gamified programs take the features of games that keep players’ attention, like points, badges, leaderboards and challenges, and apply them to real-world situations that might otherwise seem mundane or boring. The incorporation of game mechanics heightens the experience and/or performance of everyday, real-world activities. Essentially, gamification is “approaching problems from the perspective of a game designer to tap into the psychology of motivation.”

It is important to note the difference between a ‘gamified system’ and a complete game. Complete games are self-contained. Educational or activist games are designed to influence the way people think after completing the game, but it is not always necessary to perform tasks outside of direct gameplay in order to complete the game. Gamified systems directly interact with real-world actions, like exercise or environmental actions. Additionally, gamified systems are not necessarily voluntary, which violates one of the key elements of games that we identified above when reviewing classic definitions of games. The social energy ‘app’ from the combined forces of Facebook, NRDC, and Opower is an example of a gamified system rather than a game. If we refer back to Pelling’s definition of a ‘game-like accelerated user interface design intended to make electronic transactions enjoyable and fast,’ we can see they intended for consumers of energy to have a simple, attractive, one-stop shop where they could receive feedback about their usage on an on-going basis.

CRITICISMS OF GAMIFICATION

The concept of gamification has gathered more than its share of critics. The arguments against gamification tend to fall into three camps: semantic, functional, and ethical. The first argument hinges on the neologism, *gamification*, itself (“I hate that word!”), and that it is merely a new label for an older set of business practices. Some see the relabeling of these business practices as an attempt to make them seem ‘hipper’ and more attractive⁷. Although it is true that basic gamification is nothing new, the proliferation of social media and smartphones along with the cultural adoption of gaming has increased both the scope and sophistication of gamification.

The past ten years have been a wild ride, technologically speaking. 2004 was the year the iPod really took off, and the year Facebook was founded. YouTube followed in 2005, Twitter in 2006, the first iPhone in 2007. The era we are in currently is framed by the technologies we are using, and our ability to collect, distribute, display, and respond to data on an

⁶ Emphasis ours.

⁷ Bogost interview

unprecedented scale and with astonishing rapidity. Real-time feedback for behavior is now possible particularly when gamification is integrated into 'wearable' technologies such as the FitBit (see sidebar). Interestingly, this line of attack does not address the effectiveness of gamification, merely the re-branding effort.

The second argument brought to bear is that gamification is mere 'hype.' Because games have erupted so suddenly in the energy efficiency arena, many program designers, administrators, and evaluators are unfamiliar with their performance, and skepticism exists whether gamification is anything more than hype. The implicit accusation is that gamification, whatever it is, simply does not work. Research, however, suggests otherwise. In a recent review of "24 peer-reviewed, empirical research papers" on gamification, Hamari, Koivisto, and Sarsa (2014) write that, "According to a majority of the reviewed studies, gamification does produce positive effects and benefits." Several gamified systems oriented toward health and fitness, including *Fitocracy* and *Superbetter*, have demonstrated that such games can successfully influence people to change their behavior to improve their health; energy-related game designers seek to do the same thing to promote pro-environmental behavior.

The third, and most serious, argument against gamification is that corporations and governments are using the addictive qualities of game mechanics in order to trick people into performing activities they would otherwise refuse. These can include work-related tasks, such as managing safety in industrial contexts (Levy 2012), or incentivizing people to pay their taxes (Mak 2012). The crux of the argument is that game mechanics possess an inherent quality of coercion, and when deployed via institutions with a great deal of power over the individual, people see gamification as something that is both deceptive and oppressive. Clearly, organizations and institutions can choose to engage people in repetitive activities via games on their smartphone, but what is the actual goal?

GAMING FOR SOCIAL GOOD AND GAMEFULNESS

The rise in popularity of gamification has been accompanied by a rise of interest in 'gaming for social good,' also sometimes called 'altruistic gaming.' Gaming for social good



Fitbit is a manufacturer of personal tracking devices. Their core product is a pedometer that is capable of uploading step data to an online platform; more advanced units are capable of tracking additional information like number of stairs climbed or sleep patterns. The devices themselves are either worn like a wristwatch or clipped to a waistband or undergarments.



Fitbit Zip™, Fitbit's entry-level pedometer

Fitbit data syncs automatically with an online "dashboard," which provides a wealth of information to the user. In addition to statistical information about distance walked and calories burned, Fitbit shows how the user's own data stacks up against data from users in similar demographics. Users can also add other Fitbit users as friends, which Fitbit ranks based on factors like average number of daily steps. Additionally, users can earn badges for reaching certain milestones, like walking a particular number of steps in a single day.

is a movement that seeks to use medium of games for transformative change. While there is ample evidence that some form of behavior change can be effected through the use of game mechanics, in order to truly harness the power of games to change the world, designers need to look beyond simple stimulation and response and towards the deeper possibilities of engaging players through positive content and context. One factor in the rise of gaming for social good was influential game designer Jane McGonigal's widely-viewed TED talk from 2010 on how games can 'save the world'. In it, McGonigal, currently Director of Games Research & Development at the Institute for the Future, begins by saying:

Right now we spend three billion hours a week playing online games. Some of you might be thinking, "That's a lot of time to spend playing games. Maybe too much time, considering how many urgent problems we have to solve in the real world." But actually, according to my research at The Institute For The Future, it's actually the opposite is true. Three billion hours a week is not nearly enough game play to solve the world's most urgent problems (McGonigal 2010).

If you have not experienced this video, and are seriously interested in games and gamification, then we encourage you to watch. It is almost impossible to understand why so many people are excited about the potential of games for solving real world problems without having listened to McGonigal's vision. Her research focuses on how games can increase the resilience and well-being of people in areas such as health and the environment.

MOVING FROM GAMIFICATION TO GAMEFUL

There is clearly a continuum with one pole being games intended to entertain and make a profit, while at the other end of the spectrum lie games that enlighten as well as entertain. As one example, game designer Ian Bogost has been at the forefront of designing games with a flair for empathy:

By immersing players in a foreign experience, games can help them understand the challenges and choices that others face, whether it is cash-strapped diabetics trying to be healthy or agriculture-supply-chain managers. Bogost's games may not hew to traditional definitions of fun, but hey, neither does life (Tanz 2011).

At the same time, many games mimic real world activities, to the point where 'the grind' is part of the gameplay (as in World of Warcraft). Anthropologist Thomas Malaby (2009) hypothesized that there are two sides to the 'coin' of gaming, one where there are things called games (which have the mechanics outlined above) and the other side, where we sometimes make 'games' out of experiences (for instance driving a car or cleaning the house). This two-sided nature of games means that they can be used for a variety of purposes, and that they sometimes show up where least expected.

In a talk given at the Game Developer's Conference in 2011, Jane McGonigal encouraged a transition away from gamification and towards a more meaningful engagement with the challenges of our world. In her address, she characterized the concept of gameful design as intended to, "Create platforms and experiences that empower players to have the spirit of

the gamer in real life” (McGonigal 2011). She outlines a way of evaluating whether or not a game or gamified activity is actually *gameful*:

- Are these games increasing the happiness, the health, the well-being of the people who play them?
- Are these games enhancing positive social relationships with friends, family, colleagues, and neighbors?
- Do these games connect players to something bigger than themselves, purpose, mission, or a collective endeavor?
- Do these games give people opportunities people to wake up and do something that matters? To achieve something in their daily lives?

Jane McGonigal’s schema derives from psychologist Martin Seligman’s five-sided ‘PERMA’ model for happiness, as outlined in his 2011 book, *Flourish: A New Understanding of Happiness and Well-Being - and How To Achieve Them*. This model consists of the following five categories:

- Positive emotions – feeling good
- Engagement – being completely absorbed in activities
- Relationships – being authentically connected to others
- Meaning – purposeful existence
- Achievement – a sense of accomplishment and success

Our examination of the world of games and behavior change leads us to assert that, while it is possible to ‘condition’ people to behave differently through the application of game mechanics and rewards, at a minimum such attempts may be construed as cynical and manipulative, and unlikely to produce real, lasting, change. Recall the definition of a complete game we offered earlier, and that one of the characteristics is that games are played voluntarily. Pure gamification, particularly when deployed in the workplace, violates that first principle of composing games. This then undermines the effectiveness for changing how people interact with energy and the environment, which was sought in games in the first place. In our interview with him, game designer and theorist Ian Bogost told us something similar:

When you have complex systems you want to communicate about, games are kind of purpose-built for those kinds of areas. Our argument is that, while there is ample evidence that some form of behavior change can be effected through the use of game mechanics, in order to truly harness the power of games to change the world, designers need to look beyond simple stimulation and response and towards the deeper possibilities of engaging players through positive content and context. Big

problems, health, energy, sustainability, it helps to look at the inter-connected pieces. We need to depict them honestly – this is one way of approaching the problem.⁸

Our argument is that, while there is ample evidence that some form of behavior change can be effected through the use of game mechanics, in order to truly harness the power of games to change the world, designers need to look beyond simple stimulation and response and towards the deeper possibilities of engaging players through positive content and context. Because of negative connotations that have accrued to the term gamification, in this paper we are recommending that designers of programs in the energy efficiency and sustainability arenas consider shifting their perspective towards one of *gameful* design and its focus on positive interactions and outcomes instead of mindless repetition.

Energy Efficiency Games

Games and gamification have definitely arrived with respect to energy efficiency and other ‘green’ goals (Kamal, 2012). We examined over 40 games and challenges meant to influence behavior around energy efficiency and sustainability and organized them into a database. The 40 plus games we collected all incorporate an energy efficiency component, sometimes as the primary focus of the game, and sometimes as one among a suite of topics. These games teach users concepts about energy, help them manage their household consumption of energy, or change the way they think about, and use, energy across a variety of activities. These games all emerged within the past seven years, with three quarters of them dating from after 2010. This means that there has been a game launch in this space about every six weeks! The relationship between games, gamification, and sustainability is very new, and until now has not been explored in a systematic manner.

METHODOLOGY OF THIS STUDY

For this study, we collected information on 40 games and challenges meant to influence behavior around energy efficiency and sustainability. In addition to secondary research, we interviewed Raj Shukla of Cool Choices, Nicholas Lange of Vermontivate, and Ian Bogost, professor of games at Georgia Institute of Technology, and author of the book *Persuasive Games: The Expressive Power of Videogames*. These interviews were all half an hour long, and took place over the telephone. We spoke with Raj and Nick about their roles as game designers and implementers, going into the history behind their games’ creation, and how they came to decide that a game made sense for achieving their goals of energy saving. Our conversation with Professor Bogost focused on larger questions about the rhetorical nature of games, why game-mechanics work, and what games do that other forms of media cannot.

Barriers to data collection

A major barrier to data collection and analysis lies in the fact that many of the entrants to this field are not familiar with the utility domain. Unaware of the fact that utilities in some

⁸ Telephone interview, April 22, 2014

states can use behavior-based energy efficiency as a resource, nor what regulatory requirements constrain this ability, market-based providers of games do not often provide the means for establishing whether or not behavior change has taken place.

Out of the 40 games we collected, 16 were market-based, 13 were utility-based, and the remainder were published by a mix of universities, government agencies or non-governmental organizations (NGOs) such as Natural Resources Defense Council (NRDC). From this list, besides the utility-run games, only one other game, NYSEERDA's Reduce the Use in District 39, had engaged a utility partner. The rest are simply releasing games 'into the wild' and hoping for the best. Games from these publishers may have good (proprietary) player data, but they do not have associated energy use data.

In addition to the limited amounts available, on the rare occasions data is released in large enough sets to be statistically meaningful, it is also generally aggregated, often across all users of a platform. This may consist of the customers of multiple utilities (Simple Energy) or the employees of a group of commercial enterprises (Wespire). This means that there is no sampling strategy, nor might most of the players have anything identifiable in common other than their role as consumers or employees.

'ZOMBIE' GAMES

Without exception, all of the games maintain some type of web presence, even if the challenge takes place IRL – in the real world. This presence can make assessing the status of a game's viability difficult, as many games continue to have half-lives online. One good example of this 'zombie' presence is Leaffully, a game offered via website and smartphone application that uses the Green Button platform to connect you directly with your household energy via data acquired from your provider. It won a DOE 'apps for energy' contest in May of 2012, and a year later announced on Facebook that the app 'was now connected' to Southern California Edison's Green Button data. However, the last update to the iPhone application was around the same time, the last post to Facebook took place in October 2013. Signing up for Leaffully *appears* to work, with a message telling you, "We are in the process of downloading your energy usage data. This can take a little while, so we'll send you an email when it is ready." However, this message never changes, and no one responded to our attempts to contact them via email. This was true for other games we found, such as *Eskom Energy Planner* from designer Formula D Interactive, which looked intriguing, was online, but would not load for us. As with Leaffully, we also could not get anyone from Formula D Interactive to reply to our queries.

RANGE OF GAMES IN OUR DATASET

The games we looked at ranged from in-person campus challenges to card games, web-based applications, and mobile games that ‘ping’ the player throughout the day via their smartphone. Our games were individually oriented as well as communal, and their various designers intended them for a diverse set of audiences including K-12 students, college students, workers, and utility customers. Seven games either were designed solely as mobile apps or had a mobile app component in addition to other interfaces. Two additional games used Facebook, which has a mobile app, but did not have standalone app components. These were all from 2011 or later, thus they are the newest entrants to the field.

Most of the games we found were free to play, at least to individual users. JouleBug has a model whereby municipalities, universities, and other institutions can license the application for internal use, but the download was otherwise free. SimCityEdu was similar, in that it is for use by schools and other educational environments, and there was a licensing fee. However, single-use players could request and receive a free version, as we did.

For our main case studies, we selected seven games and gamified activities that we felt comprised a representative sample of program types. These seven representatives were also the set with the greatest amount of information available, either through formal evaluations or presentations. They are also still ‘live’ at the time of writing and readers can access them for further investigation.

EVALUATION OF ENERGY EFFICIENCY GAMES

In order to evaluate games we did the hard work and had to play them for you! All jokes aside, there are objective and subjective components to what makes a ‘good’ game or what make a game ‘successful’ or even fun. As we shall see, establishing even what the parameters for ‘good’ ‘success’ and ‘fun’ are more difficult than may appear. Each of these may have their own particular joys, challenges, and frustrations.

There are two key measures of success. The first is simply, are the games fun? In other words, are people really going to play them? The participation of people in games meant to excite and inspire around topics related to energy, water, and waste (carbon) is *the* most salient measure. If a particular game does not convince on its own merits, than people will not play it. Without an adequate number of players, the goals of the game program, such as kWh saved, are unachievable and the game is ultimately a waste of resources. Without players, there is nothing to measure.

If the first goal of a game is to acquire players, the second goal is to change behaviors or awareness with respect to energy efficiency and sustainability. This can be difficult to measure in games that are designed to be primarily illustrative or educational, such as *Climate Defense*. But with games and gamified programs where real-world measures of behavior change are integral to the program, like *JouleBug* or *Cool Choices*, it can be quite easy to obtain robust data.

However, as with many other newly emergent behavior-based programs, reliable energy savings figures remain scant, and those that do have reasonably rigorous EM&V are mostly the smaller-scale pilots. At the opposite end of the spectrum, several for-profit enterprises have fielded large rollouts of their products, but specifics may be difficult to obtain due to their proprietary nature. Some energy efficiency oriented game pilot projects have achieved positive results at small scales⁹. One example comes from the summer of 2011, when San Diego Gas & Electric (SDG&E) joined with Simple Energy to provide energy consumers a game experience (Burke, 2013):

Participants who used Simple Energy’s social gaming app saved an average of 20% of their energy use over the three-month period, compared with 9% savings for those who used only in-home energy-saving devices. The winning customer reduced her family’s energy use by nearly 50%.

The figure of 50% savings by the winner is remarkably similar to the 49% savings by the winner of Reduce the Use in District 39 from NYSERDA, discussed below.

TAXONOMY OF GAMES

The *ACEEE Field Guide to Utility-run Behavior Programs* divided games into the broad categories of competitions, challenges, and lotteries. These range from “most socially rewarding” to “most economically rewarding” and help games also fit into the model of three families we established: cognitive, calculus, and social. Looking more closely, we can further divide-up those categories depending upon who is publishing and/or promoting the game, as well as what is the intended audience. If we do so, we find 15 new sub-categories, in alphabetical order:

⁹ For example, the SDG&E pilot only had 200 players.

Government/Community
Market/Commercial
Market/educational
Market/individual
Market/Residential
NGO/Campus
NGO/Commercial
NGO/Community
NGO/education
NGO/Workplace
University/Campus
University/residential
Utility/challenge
Utility/community
Utility/Residential

Notably, very few games in this sector employ a ‘lottery’ approach, which is sensible, since the connection between action and reward becomes attenuated when the reward is mostly dependent upon luck.

Government/Community:

There is only one game in this category, NYSERDA’s **Reduce the Use in District 39**, which consisted of 161 household entrants (out of which it appears 40 were active)¹⁰. This program, which ran for a year from August 2010 to August 2011, was spearheaded the office of New York City Councilman Brad Lander. This program, managed by Cameron Bard and Scott Kessler of NYSERDA, was a great example of a ‘stacked’ program, such as we recommended in the *ACEEE Field-guide to Utility-run Behavior Programs*. It used regular and salient communications, social norming of household energy consumption, and a competition to get households to reduce their energy. Average savings across all participants ranged from 4-6%, but the “Biggest Reduction” winner reduced usage by 49%:

The “Biggest Reduction” winner was Katherine Degn who reduced her household’s energy use by 49 percent compared to the previous year. **“The competition and its monthly updates made me constantly aware of my energy consumption, more so**

¹⁰ <http://web.stanford.edu/group/peec/cgi-bin/docs/events/2011/becc/presentations/1%20NYSERDAs%20competition.pdf>

than my monthly electric bills," she said. "**And I liked seeing my usage relative to Councilmember Brad Lander's**, so that gave me some sort of comparison."¹¹

We reached out to program designer Scott Kessler for cost data, but both he and Cameron Bard have since left NYSERDA and are not authorized to comment on the program details.

Market/Commercial

Wespire (formerly Practically Green) was the sole exemplar for the category of market-based commercial solutions, founded in 2011. We spoke with a Wespire representative about their platform¹² and they told us:

WeSpire is a cloud-based, gamified platform that allows companies to engage their employees in positive impact projects and initiatives. Each WeSpire customer has a customized version of the platform that enables them to track and measure participation within their employee populations. WeSpire's platform runs hundreds of engagement projects across 30 customers and since July 2013, these customers have collectively saved over \$1M while reducing their environmental impact in the following ways: Over 4,000,000 pounds of CO2 avoided; 3,200,000 Kwh saved; 165,000 gallons of fuel saved; over 215,000 pounds of waste diverted, and 3,600,000 gallons of water use avoided.

Wespire emphasizes that the figures above represent data from across all of their customers, which amounts to hundreds of gamified projects. Cost data from Wespire was not available.

Market/educational

There were only a couple of market-based games about energy designed specifically for the K-12 educational space. We discussed Ludwig in some detail in our section on game features above. The other was **SimCity Edu: Pollution Challenge!** Launched in November of 2013, with the goal to teach children about energy, this is an educational game that uses the same game engine as Sim City's most recent edition, but with highly limited functionality. SimCity is a popular simulation game in which the player takes on the role of mayor of an imaginary city. The player is responsible for planning everything from street layout to electric and water utility coverage to zoning. It's not the sort of game that one can "win," but building up a city from a crossroads in the middle of nowhere to a thriving metropolis requires a delicate balancing act of generating enough income via taxes and city ordinances and maintaining the infrastructure and social services needed to keep Sim citizens happy.

¹¹ <http://www.nyserda.ny.gov/About/Newsroom/2011-Announcements/2011-11-21-Competition-to-Reduce-Energy-Use-Results-In-Savings-for-Six-Brooklyn-Neighborhoods.aspx> (emphasis ours)

¹² Lauren Mason, email 9/12/14

The game is designed to be played in a classroom setting by middle school students—the Sim City Edu website prominently lists the Common Core standards that the game is intended to cover. It uses a license-model, and is not free to play. At the time of publication, publisher GlassLab had signed up over 100 classroom subscribers, with over 3,000 individual players.

The game itself is made up of six “missions” or scenarios that focus on environmental themes. Each of these missions presents the player with an already-constructed city that faces some kind of problem; the player must use Sim City’s tools to solve the problem.

The main problem with Sim City Edu is simply that it lacks the level of challenge we suggested earlier might be a critical component for player satisfaction. As an example, one mission that was focused on public transportation required the player to click on the map to build bus stops. We found it possible to complete the mission objective by clicking indiscriminately on the map to build bus stops without any particular method or strategy. The game is designed to be played by middle-schoolers, who are usually between 10 and 14 years old. Many kids that age are experts at video and computer games, and taking away any semblance of challenge comes across as patronizing.

Additionally, many of the most interesting features that contribute to a fun experience in Sim City are removed from Sim City Edu. In each mission, nearly all of the game features are disabled, leaving only the bare minimum required to complete the mission objectives. None of the creative aspects of the game are enabled; players can’t really build new roads or re-zone land outside of narrow parameters. This entirely eliminates the balancing-act aspect of the game, which is arguably one of the most important educational aspects of the full Sim City game. In general, SimCity Edu has a lot of potential, since it uses a game that has already established itself as popular and fun as its base. However, to really be engaging and thought provoking, it needs to offer greater challenge (at least as an optional setting) and some of the creative elements that make SimCity fun in the first place.

Sim City Edu is not affiliated with any utilities, does not collect data on energy savings, is not primarily focused on efficiency, and is not Green Button enabled.

Market/individual

13 out of 40 games belonged in this category, and as discussed above the publishers of these games are generally unaware of the needs of utilities and state regulators with respect to measuring energy savings. The games in this category are mostly designed as apps for mobile platforms, and aim to engage individuals in making new choices across a wide variety of sustainable actions.

Joulebug is a sleek smartphone app with a hip, modern sensibility. The basic idea of the app is to reward users with points for logging pro-energy activities, which include everything from replacing incandescent lightbulbs with CFLs to carpooling to work. The activities, called “pins,” are organized into broad categories which include many of the usual suspects like water, waste, transportation, and energy. Since simply logging each activity can get

tedious, Joulebug has users press a button to “buzz” whenever one of the activities listed in a pin is completed and get points. Each pin is given up to four dollar-sign symbols, or “wallet bonus” points, to indicate how much money the user can save by completing the activity, and up to four planet-Earth symbols, or “Earth bonus” points, to represent how beneficial the activity is for the environment. (The vast majority of pins do not get more than one wallet bonus and one Earth bonus point each.) An “advanced” section includes pins that require a bit more technical know-how, or time commitment, such as purchasing Energy Star appliances or reading a suggested book about sustainability.

The app introduces a social element by allowing users to log in with Facebook, so that each buzz posts to the user’s Facebook Timeline. It also integrates with Twitter so that each buzz automatically creates a tweet. There are also leaderboards, both worldwide and for the user’s social media friends, listing the people who have racked up the greatest number of points over the past thirty days. One of the more clever aspects of this app (which is sadly hidden in a menu under the Profile tab) are trophies that can be earned for buzzing thematically-related pins. For instance, the “Now That’s Hot” trophy, which incorporates actions related to winter temperature comfort, includes pins encouraging users to dress warmly, insulate windows with plastic sheeting, close curtains, and open south-facing shades during the day.

Unfortunately, the game’s hipster sensibility is also a weakness. Quite a bit of energy seems to have been spent on pins that are fun but geared toward a specific type of young, urban lifestyle – at least two different pins are concerned with the environmental impacts of locally-brewed beer! Additionally, people of color are absolutely nowhere to be seen in any of the imagery included with the app or in the two-minute introductory video on JouleBug’s website. This imagery limits the appeal of Joulebug, gently excluding non-Caucasians and poorer people. Finally, one of Joulebug’s features is that it can link to user utility bills, making it possible to see how energy efficient behaviors might be contributing to lower energy bills.

JouleBug is Green Button enabled and energy efficiency-oriented. Peak loads may be affected through actions taken in the game. It is not affiliated with any specific utility. Cost and resultant (or estimated) energy savings were not provided, though we reached out repeatedly to the game designer.

Market/Residential

There were two market-based gamified platforms aimed specifically at the residential sector: MyEnergy, since acquired by Nest; and an application co-released by Facebook/Opower and NRDC. Both launched in 2012.

The Opower web-based app was free to play, and the goal is saving energy through social competition and benchmarking. It initially requires being signed up with a participating utility in order to play, or else customers needed to manually enter their bill data. At the time of this writing, it has a feature for uploading Green Button data from your utility but acquiring this data in the first place was not easy or intuitive – it required three email

conversations over several days with the utility to get it to work. Further, the download is not automatic thereafter; it requires monthly visits to download the data to see progress. The upload to the app itself is easy, but it is hard to see how any but the most determined data-geek would be interested in participating.

The site is relatively static, there are tips for saving energy, but they are unchanging and seem to have no connection to the specific data one is asked to input in order to set up the comparison. Out of 12 friends invited, only two signed up, and one of those was a co-author of this report. Neither of those input their data.

The Opower app is Green Button enabled and affiliated with about two dozen utilities. It is efficiency oriented, but has no noticeable features that would impact peak loads specifically. Cost and energy savings data was not available. Possibly moribund.

NGO/Campus

There was only one program in this category, Campus Conservation Nationals, launched in 2010 and sponsored by a coalition of USGBC Students, the National Wildlife Foundation, and the Alliance to Save Energy¹³. In set up and implementation similar to the Kukui Cup, which we discuss in detail below, Campus Conservation Nationals (CCN) claims an impressive 240,000 as their peak number of players.

We do not have cost or energy savings figures for CCN, but there are many challenges to establishing accurate numbers for on-campus challenges, including their short duration (often consisting of only a few weeks), the transitory nature of students, who cycle on and off campus with regularity, and the wide variability between housing units, even on the same campus. Further, the campus environment encourages extreme acts that would not contribute to life-long attitude or behavior changes. These include playful subversion to hamper challengers, such as showering in opposing team dorms.

CCN is not affiliated with a specific utility, and as it is a real-world challenge, it is not Green Button enabled. There does not seem to be a peak load component, though there may be a peak load effect, through actions taken by students.

NGO/Commercial

There was only one game in this category, Carbon 4 Square from the Northwest Energy-efficiency Alliance (NEEA). This is a real-world, physical challenge set by NEEA for commercial buildings in Portland. Begun in 2010, and still running, the goal of this competition is to catalyze area building teams to benchmark environmental performance,

¹³ Alliance to Save Energy also has another non-gamified campus program, PowerSave Campus, at all California State University sites. We covered this program in-depth in the ACEEE Field Guide.

analyze data, develop action plans, and implement strategies that lead to greater efficiencies and reduced operating expenses.

NGO/Community

There were three examples of NGO's organizing community-oriented games: Kansas TakeCharge Challenge from 2011, Green Bean Recycle, also from 2011, and Vermontivate, the most venerable, dating to 2010. Vermontivate is a web-based game with an emphasis on community sustainability. Players can sign up to join a team associated with a town or school in Vermont. It is not necessary to actually live in the state to play, however – as the Vermontivate official rules put it, “Vermont is not just a state, it’s a state of mind.” The “Vermont state of mind” is also reflected in the site’s web design, with old-timey typefaces, friendly-sounding language, and many, many cows. We spoke with game designer Nicholas Lange, from the publisher VEIC, and he reported a peak number of 700 players (as of 2013).

The challenges alternate by topic every week with six core themes: team-building, food, energy, capital, transportation, future action. Points can also be attained when a user logs into the forum, inviting people to play and having them join, commenting on someone else’s post about a challenge, attending public events and writing about your experiences, and having “play of the week” or being the “player of the week.”

The game is played over a period of several weeks. Each week, a series of challenges are issued by five characters representing the game’s “Game Masters”: Jersey Jill the cow, Ramblin’ Mags the dog, Scratchy Dave the rooster, Young Stanley the lamb, and Madame Phoebe the goat. Each of the different characters is supposed to offer challenges with a different perspective. For instance, Phoebe’s challenges focus on creativity, while Stanley’s focus on building community. Each week has a different theme, including food, energy, and transportation. The town and school that get the most points win an ice cream party sponsored by Ben and Jerry’s.

Vermontivate requires a little more time and introspection compared to the other games we have reviewed. Participating in a challenge is not simply a matter of checking off a box or clicking on a button; it encourages participants to write a “moment of play,” or MOP, a paragraph or two resembling a blog post reflecting on the action taken. The overall effect is that it allows engaged, motivated players to dig deeper into the game, facilitating the creation of a sense of community. Such a game works well in Vermont, where people tend to be much more environmentally-aware than the average American. This type of game would probably be more difficult to implement in a community that is skeptical of environmental issues or pressed for time and reluctant to engage in anything that takes more than a minute or two.

Vermontivate takes place in the real-world, so to speak, and therefore is not Green Button-enabled. It is not affiliated with any specific utility, does not affect peak loads, and has efficiency as a partial component to the game.

NGO/education

Dropoly was the sole example of an NGO offering a game platform for education in the energy efficiency arena. While it is apparently still live, no one from Dropoly responded to our requests for information or data. It appears to function primarily as a gamified fundraising tool, using energy tips as a rationale rather than driving behavior change per se. Further we found at least one ‘tip’, to buy a single cup coffee maker, distressing in terms of environmental impact. Dropoly works through schools, not utilities, and is neither Green Button enabled, nor explicitly concerned with peak load impact.

NGO/Workplace

There was only one example of an NGO producing a workplace-oriented game. Launched in 2011, Cool Choices began as a card-based game designed to encourage players to reduce greenhouse gas emissions and save energy, with separate versions for schools and workplaces. Over 3,000 individuals have played the game to date; they have experienced a peak number of players in one game of 959.

Players receive a deck of cards printed with various energy- or water-saving actions. Different cards have different point values based on the degree of difficulty and the impact of the action—choosing to take the stairs instead of the elevator for a day might be worth 2 points, while changing home furnace fan settings to “auto” from “continuous” is worth 100 points. Generally, the game is played in teams, and the team with the greatest number of points at the end of a set time-period wins.

While researching this report, we spoke with Raj Shukla, one of the designers of Cool Choices. He told us that one of the primary goals of this game was that it be *easy*, so that people who play the game associate energy efficiency with ease and fun rather than with complicated calculations. In our estimation, the game succeeds in being easy. Point values



Figure 1 Example of Cool Choices card

provide a relatively intuitive means of judging the relative environmental impact of a particular action. The game also does not require a large time commitment—aside from completing the actions, actually playing the cards in order to get credit only takes a minute or two.

In general, the available actions in this game are more suitable for people living in a suburban or rural environment. This is much more noticeable in the digital version of the game, because the physical card game simply has more cards and therefore more possible actions that can earn points.

However, those of us who do not own cars, live in apartments rather than houses, or rent our homes had a more difficult time finding cards that we were eligible to play. This reflects the fact that the card game was developed in Wisconsin rather than in a dense coastal city.

Fortunately, the card-based nature of the game makes it relatively easy to simply add cards that are more appropriate for city dwellers. We can even imagine future versions of the game having separate urban and suburban/rural editions, so that schools and workplaces that wish to run a game of Cool Choices can provide cards with a wide variety of appropriate actions.

The Cool Choices game has demonstrable results. So far, impact evaluations have been performed for seven Cool Choices sites – both schools and workplaces. The results have been impressive:

Water saved: 2,296,000 gallons
 Gasoline saved: 71,000 gallons
 Electricity saved: 1,163 MWh
 Natural Gas saved: 27,800 therms
 CO2 Avoided: 4.3 million pounds
 Financial Savings: \$404,000 annually

Implemented as employee engagement game – the cost varies by employer. Cool Choices is not Green Button enabled, nor affiliated with any utility. It does have a focus on energy efficiency within the game, and peak load may be affected by actions taken.

University/Campus

There were two university-run and campus-oriented challenges in our dataset: the Kukui Cup from the University of Hawaii (launched 2011), and Michigan State University’s Green League (launched 2012) which “encourages MSU students to follow “best practices” identified by campus sustainability office.” Both are free to play, neither gave us cost or energy savings.

The Kukui Cup is a gamified energy efficiency program based in Hawaii. It was originally designed for first-year students living on campus at the University of Hawaii at Mānoa, but it has since grown to include other schools and universities in Hawaii. We were not able to review this game by participating in it ourselves (as, sadly, none of the reviewers are located in Hawaii!) but we were able to review materials and information about the game. It has had a peak number of 400 players.

In the introductory videos to the Kukui Cup, the game designers do an excellent job at invoking Hawaii’s isolated location as a reason for taking the time and effort to change energy behaviors. Because Hawaii is an island, the concept of energy independence becomes much more clear and immediate. Energy crises in the continental United States might seem abstract to some, but as the “Introduction to the Kukui Cup” YouTube video mentions, all it would take would be a missed oil tanker shipment for Hawaii to see negative consequences.

The Kukui Cup is played by teams of students representing their dormitory buildings. To play, students log into an online interface that uses the Makahiki game engine, which was

specifically created for the Kukui Cup. The online interface lets players see in real-time how much energy their dorm is using. It also allows them to complete challenges to earn points and view informational videos and other content. The Kukui Cup has an impressively high participation rate. According to Kukuicup.org, 40% of over 1000 first-year students participated in Kukui Cup's launch year in 2011. When the program expanded to cover the entire university, 35% of all students participated. The high participation rate suggests that there is something fun and engaging about the game that is inspiring students to sign up and remain involved. In a paper written after running the Kukui Cup author Philip Johnson writes that their analysis looked closely at the methods employed to produce outcome data for energy competitions, which caused them to question the accuracy of results from campus-based competitions¹⁴.

The Kukui cup was affiliated with the Hawaii Electric Company. It was a 'real-world' challenge, so not Green Button-enabled. It did not focus explicitly on energy efficiency, and does not seem to have aimed to change peak load behaviors.

University/residential

There was only one game developed by a university yet intended for off-campus residential behavior change. PowerHouse, from Stanford, was debuted at BECC in 2009, and was one of the first games we thought of when conceiving this paper. Unfortunately, it required a Pacific Gas and Electric (PG&E) account to play, so none of the paper authors were able to access it. PowerHouse has a neat feature, which we were eager to explore, whereby the game house mimics the player's energy use in their 'real' home (Phelps, 2013). This came out of a Stanford initiative regarding 'Serious Games and Energy Behavior' established in 2008. We have not seen cost figures, which would not be market-rate, as this work was under-written by an ARPA-E grant. Nor have we seen energy savings figures published to date. As mentioned, this game is affiliated with PG&E, and we expect (but are not sure) that it is therefore Green Button enabled.

Utility/challenge

One exception to the rule that market-based actors are unaware of the utility arena's specific constraints is Simple Energy, a Boulder, Colorado-based company that works in tandem with utilities to offer their gamified platform as a 'private label' solution. Consumers who are using Simple Energy's online platform have demonstrated an average result of 6.7% verified energy savings. That is 2-3 times the results of other behavioral energy efficiency programs.

Simple Energy offers a web-based platform that syncs with actual participant utility bill data. This allows customers to get feedback about how they are using energy in their households and how behavioral changes actually might be influencing energy use. The

¹⁴ For more detail on how the structure of games can affect the collection of data, see the team's paper (Johnson, et al, 2012).

software learns what messages are most motivating to each user based on their usage data and A/B message testing. By targeting users with messages that speak to them, they learn about other programs. This leads to an increase in energy saving actions. In addition to simply providing information, Simple Energy uses a host of game mechanics to promote behavior change. This includes points, leaderboards, integration with social media, and team challenges.

Simple Energy works with a number of utilities, though for the purposes of this review we focus on Simple Energy's partnership with San Diego Gas and Electric (SDG&E), the San Diego Energy Challenge. This campaign was concluded before we got a chance to participate for ourselves; instead, our review focuses on the program's mechanics and materials. A new version of this program, called Manage-Act-Save, is running through 2015. Simple Energy's platform is also set up to allow users to compete for real-world prizes. For the San Diego Energy Challenge, SDG&E offered iPads, gift cards to local restaurants, and laptop computers as rewards. 200 selected participants shared their energy usage on daily basis via a social gaming application developed by Simple Energy. Homes were equipped with energy management devices which would allow them to see and show their real time energy usages.

The winner of the San Diego Energy Challenge achieved 46.5% energy savings over a three-month period. The average participant in the challenge that used Simple Energy's gamified platform saved about 20%. Other key results were greater than 10% reduction in demand on peak load days. This is driven through day-of digital messaging and increased reward points awarded for energy savings during peak events. Further, 27% of Simple Energy users sign-up in complementary energy efficiency programs offered by their utility. These results speak to the power of digital customer engagement, as well as to how making saving energy fun, social, and rewarding can drive real results. Energy efficiency does not have to be just boring charts and graphs!

Simple Energy's platform is Green Button-enabled, utility affiliated, efficiency-oriented, and also focuses on peak loads with certain activities. Cost data for Simple Energy platform implementation is not available.

Utility/community

We found three games published by utilities that encouraged customers to team up and save energy on a community-wide basis. Those three were: *SMECO Hometown Spirit Energy Savings Challenge* from Southern Maryland Electric Cooperative; *What Would You Do With An Hour in the Dark*, from FortisBC; and *Save Energy. Save Money. Win Prizes!* From New Jersey Natural Gas.

SMECO Hometown Spirit Energy Savings Challenge ran most recently, and was a Facebook-situated game that asked customers to, "Help your county team achieve the greatest cumulative and aggregate average per person energy savings compared to team members' 2012-2013 baseline." The goal of the game was to compete against other team

members to achieve the greatest percent reduction compared to your 2012-2013 baseline. The prize was a \$200 Visa gift card (4 total).

SMECO is an Opower client, and used their home energy reports to help residents acquire and understand their energy consumption. Out of a potential 136,160 customers, only 22 played. However, despite the small number of players, 16,864 kWh was saved - excluding customers who used more energy compared to their 2012-2013 baseline; 2,056 kWh saved - including customers who used more energy compared to their 2012-2013 baseline.

Utility/Residential

Unsurprisingly, one of the larger categories. We found five games from utilities for residential (not counting possible multiple iterations of Simple Energy as a private label game). These were: the 20/20 energy challenge from FortisBC; Energy Wise Home Diagnostic from Hydro-Québec, Conserve to Preserve Community Rewards from New Jersey Natural Gas; Facebook "PNM Super Energy Saver" Challenge from PNM; and finally, the Energy Savings Challenge from SMECO. One thing that jumps out is that utilities who commit to a game tend to commit to more than one game, which seems to be a sensible strategy given what we discussed above with respect to different game functions and player types. It also suggests that utilities have found some form of positive return on 'going long' on games.

Recommendations

For anyone considering developing or adopting a game or gamified activity for their energy efficiency/sustainability program portfolio, the following recommendations are things we think should be at the forefront of the design process. In addition to the specific game-related recommendations supplied here, we encourage the use of logic models in program design, to connect the role of the game with the intended behavior change and a measurable outcome.

AUDIENCE

Define at the outset who the audience for the game is. We have shown in this paper that the range of ages and genders who play games is wider than the stereotypical ‘teenaged boy’ -- however, the kinds of games people play still tend to be stratified by age and gender. If the typical bill-paying, household decision-maker is a woman in her 30s, then it is likely that a casual game for the smartphone delivered via an app will see more activity than will something requiring a greater time commitment and learning curve.

PLAYER TYPE

What is the anticipated motivation for the person playing your game? Which among the five player types do you think will be engaging with your game? The five types we identified include:

- **Achievers:** players who work hard to achieve game-related goals, like accumulating treasure or completing specific challenges
- **Socializers:** Players who want to converse and interact with other players
- **Explorers:** players who are interested in learning as much as they can about the game world – both the story lore and the limits of the game engine
- **Customizers** : those who like to customize their online avatar or habitat
- **Killers:** Players who impose themselves on others (griefers), or who work hard to win at the expense of others

Not many games can successfully be all things to all people. For program designers with limited budgets, it is likely best to seek to satisfy the first two categories of players, the achievers, and socializers. These were the primary reasons our poll respondents provided for participating in the games they had recently played.

PURPOSE OF GAME

What kind of experience do you want your player to have through your game? A game is not generally a means to an end, or even an end in itself. People play games that satisfy particular types of ‘fun-seeking,’ whether that is a need for dramatic expression (e.g. role-playing games), vehicle for learning, or simply passing the time at the bus stop. The purpose of the game should not be to change behavior. Rather, behavior change should be a natural by-product of playing the game. The purpose of the game is to provide players with a ‘fun’ experience, and the role of the designer is to define which type of experience makes the most sense within the constraints of time, budget, and program goals.

FEATURES OF GAME

Recall that we organized common features into categories including: **medium** (e.g., digital vs. analog), **platform** (e.g., desktop vs. mobile), **function** (e.g., educational vs. entertainment), **location** (e.g., campus vs. home), **intensity** (e.g., casual vs. hardcore), **format** (challenge or competition), and **position** along the continuum of our definition of games (e.g. complete games to gamified activity). Decisions made about the audience you are seeking to connect with will affect the features you might choose to deploy. So too, the features of your game will attract (or repel) specific kinds of players.

PLATFORM

The different platforms all have their pros and cons. For example, mobile apps for behavior change can take advantage of specific smartphone features such as vibrating ([Ringorang](#)) to let someone know about an opportunity or challenger, or swiping to move quickly among ‘cards’ one can play ([JouleBug](#)). However, with mobile technology comes the danger of using features ‘because they are there’ as opposed to their serving a purpose or fulfilling one of the gaming needs outlined earlier. Ringorang used the ability to ‘buzz’ people to keep them engaged in the game throughout the day, but the questions they served up seemed both simplistic and removed from the actual day-to-day interests of consumers, “Which of these types of bulbs is energy efficient?” The authors of this paper found such questions unlikely to hold the interest of members of the public.

LEVEL OF INTENSITY

Regardless of the type of game you chose to provide to players, the research suggests that people are generally up for more of a challenge than energy efficiency and sustainability games have provided to date. In order to attract and maintain players, your game should not be insurmountably difficult, nor should it be trivially easy. The medium and platform that deliver your game will suggest some possibilities for design, but do not let these limit you unnecessarily. A challenging and fun game need not require a dedicated game console or PC – we are seeing that smartphones are ramping up to be able to support even serious, ‘hardcore’ games. Further, in the arena of games for entertainment we see that even a ‘casual’ game like Candy Crush Saga builds up to high levels of difficulty. We strongly recommend not underestimating players’ interest in complexity and challenge.

MODE OF PLAY

Will people be playing alone, or with other people? Are they joining teams or competing against another individual? These factors will affect both the structure of the gameplay in terms of design, but also the emotional content of the experience. For instance, a game that uses teams will land further towards one end of the continuum from “most socially rewarding” to “most economically rewarding.” This will also aid the program developer who is attempting to construct a ‘stack’ of program types, as outlined in detail in the *ACEEE Field Guide*.

DURATION

Due to the relative ease of developing apps for smartphones, and the enormous popularity of gaming and gamification, it is likely that many teams pitching energy games do not possess the resources for long-term support. We encourage program implementers interested in adding a game or gamified activity to their portfolio to consider the relatively short lifespan of many games and game-design teams, before committing major resources to their deployment. One suggestion is to include a life-stage analysis component to your program's overall logic model, and consider games a short-term and tactical aspect of changing behavior.

In Conclusion

Gamification has the potential to attract large numbers of people and have a proportionately large impact on energy consumption, but in order to achieve these results, games must be thoughtfully designed to provide an engaging experience first, and operate as a platform for behavior change secondarily. Designers of programs in the energy efficiency and sustainability arenas should consider shifting their perspective towards one of *gameful* design and its focus on positive interactions and outcomes instead of mindless repetition. In order to truly harness the power of games to change the world, designers need to look beyond simple stimulation and response and towards the deeper possibilities of engaging players through positive content and context.

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Appendix A:

POLL QUESTIONS

1. When was the last time you played a game?

(Any kind of game: chess, cards, video)

2. What kind of game was it?

3. What was it called?

4. When was the last time you played a digital or video game?

(Yes, iPhone and Facebook games like Candy Crush or Bejeweled count!)

5. What was it?

6. Do you own a game console?

(e.g., XBox, PS3/4, Wii)

7. Do you have a Steam account?

8. What kinds of games do you like to play? Select all that apply.

- Casual games (Angry Birds, Candy Crush)
- Social games (Words with Friends, Farmville)
- Sports games (Madden NFL, FIFA Soccer)
- Shooter games (Halo, Call of Duty)
- Racing Games (Mario Kart, NASCAR)
- Puzzle Games (Portal, Sudoku)
- Strategy games (Civilization, Age of Empires)
- Simulation games (The Sims, Sim City)
- Adventure or Role playing games (Skyrim, Dragon Age)
- Massively Multiplayer Online Role Playing Games (World of Warcraft, Eve Online)
- Physical or Exercise Games (Wii Fit, Just Dance)
- Other

9. What gets you most excited about playing digital or video games?

- Being able to socialize with my friends
- Facing challenges and overcoming them
- Exploring new maps/worlds/content
- Winning, getting the highest score
- Customizing my page or avatar?