



Original research article

Competition, carbon, and conservation: Assessing the energy savings potential of energy efficiency competitions

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ABSTRACT

Competition has become an increasingly popular strategy to engage individuals in energy and resource conservation; however, there has not been an objective, independent review of existing competition programs focusing on the reduction of energy use. This paper attempts to address this shortcoming.

This paper reviews a representative selection of completed and ongoing energy reduction competitions in the United States and uses the lessons learned to provide best practice guidance on the design, implementation, and evaluation of future programs. Four key research questions are addressed in this study:

- How effective have competitions been at changing behavior and reducing energy?
- How long do energy savings persist after the end of competitions?
- Under what circumstances are competitions more or less effective?
- What are common best practices for the design, implementation and evaluation of energy and resource conservation competitions?

The primary target audiences for this paper are electric and natural gas utilities seeking to broaden their portfolio of behavior-based interventions, as well as potential designers, implementers and evaluators of energy reduction competitions. Our intention is to improve the effectiveness of competitions and to suggest when competition may or may not be an effective strategy to save energy over the long term.

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1. Introduction

Competition is found in all societies, and it is found in many areas of society: for example, biology, ecology, economics and business, politics, sports, education, and lotteries. Not surprisingly, competition is being investigated by policymakers and program managers as a strategy to engage individuals in energy and resource conservation; however, there has not been an objective, independent review of existing competition programs focusing on the reduction of energy use. This paper attempts to address this shortcoming.

1.1. Research study motivation and goals

This paper reviews a representative selection of completed and ongoing energy reduction competitions in the United States and uses the lessons learned to provide best practice guidance on the design, implementation, and evaluation of future programs. Four key research questions are addressed in this study:

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based interventions, as well as potential designers, implementers and evaluators of energy reduction competitions. Our intention is to improve the effectiveness of competitions and to suggest when competition may or may not be an effective strategy to save energy over the long term. Many of the lessons from this paper should also be relevant to students, practitioners and policymakers seeking to engage individuals and groups in energy and resource conservation.

As noted above, this research focuses on programs in the United States. While programs outside the United States were investigated (e.g., Germany and Sweden – see [16]; and Australia, Europe, Sweden, and the United Kingdom – see [47]), programs that had measured results and good documentation (two of the criteria used in the selection of programs, as noted below) were lacking. As countries outside the United States continue to experiment with competition, the lessons learned from this study should be of value for their investigations. Of course, one needs to be careful in adapting a program from one country to another—one needs to keep in mind the cultural context and the advanced state of behavior and energy programs in the United States before applying these programs to one's own country.

As noted below, competitions incorporate multiple behavior change strategies that have been studied by social scientists over the years, including one that was identified by Sovacool [51] as one of the key research questions deserving of further exploration: communication scholarship – in particular, what types of information and feedback are most effective at influencing energy users? Communication of energy savings results is critical in competitions – in both content (text and visual) as well as in process (who is doing the communication and to whom). As Stern [53] noted: “People respond to information not only based on its availability and completeness, but also with how it is presented, their trust in its source, how they interact with the medium (such as television or website), and how it confirms or conflicts with information coming from friends and associates.”

1.2. Steering committee guidance

A steering committee of ten industry professionals, academics and utilities was formed to provide guidance on project goals, case study selection, refining interview questions, and review of a final draft report. The committee members were senior-level policymakers and program managers from California's investor-owned utilities and regulatory agencies (California Air Resources Control Board, California Energy Commission, and California Public Utilities Commission), had expertise in the social sciences, and were knowledgeable about stakeholder needs regarding behavioral programs. The other committee members from California, Oregon and Canada were nationally recognized experts (professors and consultants) in the social sciences, and several had participated in the design, implementation and evaluation of energy efficiency behavior programs. The committee was convened by email, and individuals were contacted periodically for their input on specific aspects of the project. A final report was prepared [55], which forms the basis for this paper; detailed case studies and the survey instrument are contained in the final report.

2. Context

A review of the literature on energy reduction competitions was conducted and found to be incomplete. Individual programs were primarily documented in the grey literature (program websites, conferences, program evaluation reports, etc.), and only a few papers on these programs were published in the academic literature. A few studies included competitions in meta-analyses of behavior programs (e.g., [1,20]), and a few recent studies have

been published on competition on college and university campuses [46,9,30] and on gamification [28]. There have been very few experimental treatments of pro-environmental behavior published in the literature [43]. Energy competitions are included in some behavior change programs, for which documentation exists on the design, implementation and evaluation of these programs. And in some cases, program implementers and evaluators provided us previously unpublished documentation of programs including evaluation results, program materials and other relevant information.

In this section, key aspects of energy reduction competitions, behavior change strategies, and the design of competitions are highlighted; more details can be found in Vine and Jones [55].

2.1. Energy reduction competitions

At their core, competitions provide a set of rules, mechanisms to track results, and public acknowledgement (recognition) to participants for their progress in achieving a specified objective. In energy reduction competitions,¹ the objectives may be reducing energy below a benchmark, earning points for taking energy conservation strategies (such as investing in an energy-efficient appliance or changing an air conditioner's thermostat setting), achieving the most energy upgrades, or other quantifiable activities that either directly or indirectly (e.g., via education) reduce energy use.

As noted in our interviews with implementers and evaluators of competition projects, competition may be thought of as both a type of program and an intervention strategy. Programs that refer to themselves as competitions typically organize resources, activities and evaluation metrics around the objectives of the competition, while in other behavior change programs, competition may be an intervention strategy of a larger program. Engagement is key: while there are typically winners and losers in competitions, most competitions try to publicly engage all participants and reward them with recognition and/or tangible incentives (e.g., prize money for a community project).

Competitions build on the growing evidence of the power of social influence in general, and peer pressure in particular, in promoting cooperative behavior [35]. Competitions are typically conducted in a social, publicly visible setting where group dynamics are important and where goals are set, commitments are made, information and feedback are provided, and prompts are issued to keep participants informed and to make it easy for them to participate.

While reductions in energy use are typically the principal focus of competitions, another goal is to increase awareness, understanding and knowledge of the connection between behavior change and energy use, and often attempting to increase the competencies, capabilities and self-efficacy of individuals to create change.

In summary, competitions must be structured to achieve four related goals in order to stimulate change in thought and behavior that result in short and long-term reductions in energy use [45]:

1. Engage (catch attention and involve the target audience)
2. Educate (communicate information on what, why and how behavior should change)
3. Motivate (enhance desire to change behavior), and
4. Empower (increase perception and reality of self-efficacy and suggest concrete and actionable behavior)

¹ In this paper, the term “energy reduction” is used to encompass both energy conservation actions (focusing on behavior change) and energy efficiency actions (focusing on installing energy efficiency measures).

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