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Energy Policy 36 (2008) 1059–1073

ENERGY POLICY

www.elsevier.com/locate/enpol

The dimensions of the policy debate over transportation energy: The case of hydrogen in the United States

Gustavo Collantes[a,b,*]

[a]*Institute of Transportation Studies, University of California at Davis, One Shields Avenue, Davis, CA 95616, USA*
[b]*Kennedy School of Government, Harvard University, 79 JFK Street, Cambridge, MA 02138, USA*

Received 1 September 2007; accepted 13 November 2007
Available online 3 January 2008

Abstract

Environmental and politico-strategic concerns have driven the increase in policy activity related to energy that the United States witnessed in the last few years. The nature of the issues at stake and the level of stakeholder involvement result in a highly complex policy debate. The broad concern of this paper is the study of this energy-policy process and the identification of the main policy issues. Specifically, multivariate analysis is applied to data on a wide variety of stakeholders' policy beliefs and policy preferences to identify the policy dimensions that characterize the debate over energy policy in the United States. The focus is on the policy debate over hydrogen as a transportation fuel, although many results are applicable to the debate over transportation energy at large. The analysis uses a dataset of 502 individuals from 323 different stakeholder organizations obtained via a web-based survey specifically designed for this study.

Keywords: Policy process; Hydrogen; Transportation energy policy

1. Introduction

These are exciting times for everyone interested in energy policy. Fundamental questions related to the societal and strategic implications of the way we provide for our energy needs have installed themselves in the policy debate in a way reminiscent of the late 1980s. Thirty years ago, policy activity on transportation energy rose driven predominantly by concerns over urban ambient air quality, and resulted in such landmark statutory pieces as the 1990 Clean Air Act Amendments, California's Sher Act of 1988, and the California Low-Emission Vehicle and Clean Fuels program. The dominant issue then was essentially domestic in nature. In the 21st century, and after dramatic improvements on ambient air quality, stronger awareness about the finiteness of recoverable oil reserves, and the rise of a virtual consensus about the causal link from carbon emissions to global climate disruption, the nature of the dominant policy issues became international.

Also reminiscent of the late 1980s, much of the policy discussion on transportation energy that we witness today is directed to finding paths away from the status quo. Because most of the oil consumed in the majority of the industrialized countries (with few exceptions like Canada and Norway) comes from foreign sources—leading to a sense of energy insecurity—and because every bit of carbon in petroleum fuels eventually ends up in the atmosphere, the bottom-line question has become "What is the best trajectory toward lower reliance on oil?" Every stakeholder in the transportation-energy arena—including oil companies—is mulling over this question.

My choice of the word "trajectory" is not fortuitous. Dosi (1982) defined "*technological* trajectory" as the direction of progress within a given technological paradigm.[1] Indeed, key to finding answers to the question just posed is technological progress and innovation. However,

*Corresponding author at: Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University, 79 JFK Street, Cambridge, MA 02138, USA. Tel.: +1 617 496 6743; fax: +1 617 496 0606.
E-mail address: gustavo_collantes@ksg.harvard.edu

[1]Dosi (1982) introduced the notion of "technological paradigm", defined as "an 'outlook', a set of procedures, a definition of the 'relevant' problems and of the specific knowledge related to their solution" (p. 148)

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doi:10.1016/j.enpol.2007.11.020

whenever policy elites believe that progress within the dominant technological paradigm may be insufficient to solve the policy problem, much of the policy debate starts focusing on paradigm shifts. In the 1990s, for instance, a new paradigm was proposed in the form of battery electric vehicles (BEVs).[2] In the 2000s, the proposed new paradigm took the form of hydrogen fuel-cell vehicles (FCVs).

While important lessons were learned during the policy process over BEV and FCV (Collantes, 2006), our understanding of how radical innovations and paradigm transitions take place and the role of public policy in inducing these processes is far from complete. Kemp (1997) argued that "what is missing in the policy debate [over a transition away fossil fuels] is a framework for understanding change in complex technology systems, especially how the dynamics of technology interact with the socio-economic system from which it emerges" (p. 290). Indeed, with debates over paradigm shifts, not only technology learning takes place—policy learning occurs as well through the complex interaction of stakeholders, each of who has her/his particular set of policy preferences. This paper is concerned with identifying the issues that define such policy debates—I refer to these issues as policy dimensions. As a case study, I use the recent policy debate over hydrogen in the US, which, as I will show, yields many results that may be generalized to the broader debate of transportation energy.

Typically, scholarly studies that identify the policy dimensions of a particular policy process are also concerned with the positions that affected stakeholders take along each of the policy dimensions (e.g. Jenkins-Smith and St. Clair, 1993; Zafonte and Sabatier, 2004; Weible and Sabatier, 2005; Collantes, 2006). The study herein presented covers a wider set of specific policy aspects than typical studies. The consequent abundance of data and results justifies focusing this paper only on the policy dimensions. I expect to discuss stakeholders' policy preferences in a separate paper.

I structure this paper as follows. In Section 2, I describe the methodology, including a conceptual model of the policy process concerned with technological innovation, the data-gathering process, and methods for data analysis. In Section 3, I present and discuss my findings on the policy dimensions that characterize the policy debate. In Section 4, I discuss my results and draw general conclusions.

2. Methodology

The analysis presented in this paper is part of a larger project aimed at understanding the dynamics of the policy process when significant technology progress is involved or pursued. The project focuses on the adoption of hydrogen as a transportation fuel. To guide the study and the associated data collection, the conceptual framework outlined in Section 2.1 was developed. The data-gathering process is described in Section 2.2, while the methods of analysis are detailed in Section 2.3.

2.1. Conceptual framework

Building upon existing theories of the policy process such as the Advocacy Coalition Framework (Sabatier, 1987, 1988; Jenkins-Smith, 1988) and Multiple Streams (Kingdon, 1984; Zahariadis, 1999), theories of organization decision making such as the Garbage Can (Cohen et al., 1972; Padgett, 1980; Bendor et al., 2001; Olsen, 2001), social psychology theories such as the theory of Planned Behavior (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980), and my own studies of the policy process (e.g. Collantes, 2006; Collantes and Sperling, 2007), I developed a conceptual framework for the study of policy processes that involve technology innovation. The basic structure of the framework is shown in Fig. 1.

For the purpose of this paper, we need not dwell on the specifics of the theoretical foundations of the building blocks of the model or on how they integrate into an explanatory framework of the policy process. It suffices to explain the meaning of each of the concepts comprising the conceptual model shown in Fig. 1.

2.1.1. Policy beliefs

Policy beliefs are here understood as empirical perceptions and normative opinions about relevant policy questions and/or policy behavior. Essentially, empirical perceptions are subjective assessments of cause–effect relationships. One example would be a stakeholder's assessment of the level of abatement of anthropogenic emissions of carbon dioxide necessary to prevent severe disruptions of the global climate. Normative opinions are subjective value assessments of policy questions and/or

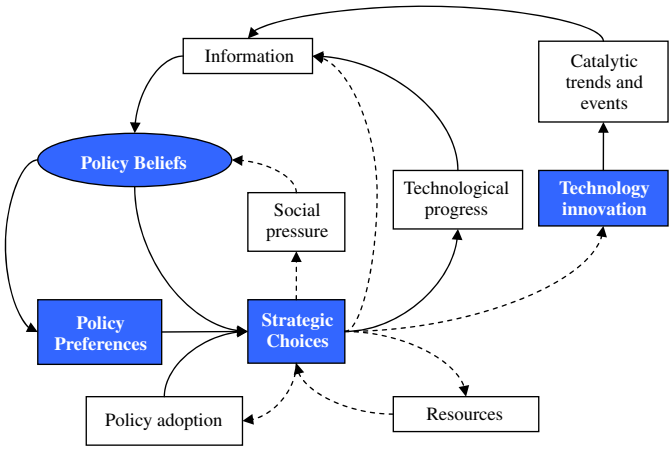

Fig. 1. Conceptual model of policy processes involving technological innovation.

(*footnote continued*)
One such technological paradigm is the petroleum-fueled internal combustion engine.

[2]The adoption of methanol as a transportation fuel also took center stage in the debates in Washington, DC, and California.