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# Institutionalized knowledge conflict in assessing the possible contributions of H<sub>2</sub> to a sustainable energy system for the Netherlands

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## ABSTRACT

This paper reports on a stakeholder dialogue project on the possible contribution of hydrogen to the Dutch energy transition. Dialogue methodology aims at articulating and exploring competing perspectives, including views that are in the margin of the energy policy subsystem. Three dialogue groups explored trajectories labeled Hydrogen for Transport, Hydrogen for the Built Environment and Hydrogen in the existing natural gas grid. The groups identified barriers and opportunities for the trajectories through back casting and assessed its pros and cons as compared to a non-hydrogen alternative. Referees from abroad contributed to a confrontation workshop, where the groups exchanged and discussed their first findings. The dialogue reveals that stakeholders are strongly divided with respect to small-scale domestic as well as the concept of a flexible natural gas infrastructure. We find a conflict between knowledge claims that either support or challenge the status quo. This is referred to as institutionalized knowledge conflict.

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## 1. Introduction

This paper explores the institutional factors that foster or inhibit the adoption of energy innovations, hydrogen technologies in particular. The adoption of technological breakthroughs are, to a large extent, determined by institutional factors, as has been aptly shown by numerous studies into innovation systems [1] and system innovation and transition processes [2–6]. On the one hand, institutional settings varying from country to country, have a ‘preference’ for specific technological pathways. On the other hand, specific technological pathways are dependent on a ‘friendly’ institutional context [7].

As a concept, ‘institution’ refers to the formal and informal rules that enable and constrain the behavior of actors

involved in a specific policy subsystem [8]. A typical example is the structure and the functioning of markets. Market access for innovations is to a large extent determined by national laws and regulations and the availability of infrastructures. With respect to the informal character of institutions, we may think of policy theories or frames shared by policy-science networks, such as large scale versus small-scale orientation of the system. Notions with respect to power are also important. Small organizations and companies, so-called niche players, base their demands and strategies in part of what they expect the position of ‘regime’ parties will be. Hence, in assessing the institutional potential for hydrogen applications in a future energy system, the relevance of taken for granted assumptions on ‘how the system works’ cannot be underestimated. In assessing institutional factors we also include organizations,

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which are decisive in developing, implementing or enforcing rules, regulations etc.<sup>1</sup> Regime players involved in exploitation and distribution of the Dutch natural gas stock, including Shell and the Dutch state are critical factors within the ‘landscape’ in which the transition is supposed to unfold.

In order to articulate both the state of the art knowledge with respect to hydrogen technologies and stakeholders’ ‘tacit knowledge’ on ‘how the energy system works’, a dialogue can be considered highly appropriate. A dialogue encourages stakeholders to discuss different views and perspectives. Conceptually, stakeholder dialogue is a methodology for problem structuring, i.e. the articulation, confrontation and where possible integration of different perspectives and views [9–12]. It is the approach needed in case a problem is unstructured, i.e. characterized by large uncertainty or disagreement with respect to the relevant knowledge and values that are at stake.

The project reported here engaged about 60 stakeholders in a four years dialogue project (2004–2008), called the H<sub>2</sub> Dialogue. The major questions addressed in the dialogue were: To what extent can hydrogen contribute to a future sustainable energy system in the Netherlands? What are the driving forces that move our energy system towards sustainability including an extended share for H<sub>2</sub>? What are the obstacles? To what extent does technological change require institutional change and vice versa?

This paper reports on the findings from the dialogue and, in retrospect, on the lessons learnt with respect to institutional factors. Inevitably, we thereby touch upon aspects related to substance (including technological options), methodology (process), and energy politics. Linking these aspects will draw attention to a phenomenon, which we refer to as institutionalized knowledge conflict, i.e. a conflict that cannot be resolved unless something changes in the institutional context. Section 2 discusses dialogue methodology. Section 3, 4 and 5, the substance part, present the findings with respect to three H<sub>2</sub> trajectories and the issues they raised among dialogue participants. Section 6 analyzes the institutional implications. Section 7 wraps up with conclusions and lessons from the dialogue and the dialogue approach.

## 2. Dialogue approach and process

The H<sub>2</sub> Dialogue used an approach labeled *Constructive Conflict Methodology* (CCM) [12]. Taking argument with approaches that aim at consensus building, CCM focuses on articulating and confronting rival options and conflicting lines of argument [10,13]. The main arguments in support of this focus are

<sup>1</sup> According to the narrow definition, important actors such as companies, government agencies and the like, are not considered institutions. In transition theory, major actors are referred to as ‘regime players’. However, since the concept of ‘regime’ in the social science literature is defined in a similar fashion as ‘institutions’, i.e. as formal and informal rules that enable and constrain actors’ behavior, the distinction between ‘rules’ and ‘actors’ is somewhat artificial in this respect.

fourfold. First, at psychological level, people in a group setting have an inclination to seek for consensus even if consensus is artificial [10]. Under the common umbrella of a ‘Hydrogen Economy’ divergent perspectives can be identified. Some have high expectations of H<sub>2</sub> options in the far-away future, whereas others see opportunities on a relatively short term already. Some refer to an integrated Hydrogen Economy, whereas others consider the benefits of hydrogen energy for transport only. This implies that any dialogue has to go through a stage in which participants become aware of perspectives different from their own. Second, as regards complex issues with a bearing on the (very) long term - the potential contribution of hydrogen energy to sustainability being a typical example - stakeholders often lack a clear idea with respect to the socio-political contradictions at stake and their own preferences and interests in the eventual process of change. This implies that in the course of a dialogue parties also learn with respect to what they want for themselves along with the articulation and clarification of different views. Third, energy institutions restrict the range of options that are perceived to be ‘realistic’ and marginalize others. Institutions maintain a sense of order that is beneficial in that it enables people to play their part. Institutions offer guidance with respect to what is ‘normal’ behavior and ‘taken-for-granted’ knowledge. The downside of this is that people have difficulties in ‘out-of-the-box’ thinking and exploring scenarios that a large majority would consider irrelevant or even ‘insane’. As Lindblom [14] has put it, institutions generate ‘cognitive impairment’: people are ‘programmed’ in a way that they become resistant to change. In consequence, dialogue methodology should encourage ‘out-of-the-box’ thinking’. Fourth, and, from the standpoint of innovation most importantly, knowledge claims frequently mentioned, those on which there is substantial consensus, have less probative value than claims in the margin of a knowledge system, because marginal perspectives challenge mainstream knowledge through initiating the articulation of rival hypotheses [15 p. 426]. This implies that policy-making will benefit from an approach that highlights a range of competing perspectives.

From these arguments it follows that CCM, through specific interventions, will disturb ‘normal’ discourse as to create an equal opportunity for rival perspectives [12]. Thereby, a dialogue takes on features of a social experiment [11]. CCM takes four steps that were all applied in the H<sub>2</sub> Dialogue.

- 1) Stakeholder identification & selection: this is the most difficult step, as it must lead to the inclusion of a broad range of participants from different networks approaching the problem from divergent, even contrasting perspectives,
- 2) Articulation of divergent perspectives: here it is important that participants must have the opportunity to express their genuine viewpoints and share knowledge;
- 3) Confrontation of views and knowledge claims: this requires an open atmosphere in which participants are willing to explore different lines of argument and to learn as to whether they (dis)agree,
- 4) Synthesis: this requires a way of reporting that does justice to the different claims and arguments and also highlights elements from the discussion that can be considered new.

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