

*Installations of production and storage of energy: what social acceptability? Is hydrogen a special case?*

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**A. Introduction**

The work that I will describe in this paper was carried out with Nicolas Dupuis, who is here today, and a few other colleagues of the TVES laboratory of the University of the Littoral Côte d'Opale. It concerns the GRHYD programme, with financial support from ADEME, and involving several partners, including the Urban Community of Dunkirk, under the guidance of the Engie group. GRHYD's objective is to store electricity surpluses produced at certain times by wind turbines and other poorly scalable technologies in the form of dihydrogen, for subsequent use of this gas as fuel for urban buses and to provide energy for housing and other buildings. In both cases, it is not pure dihydrogen that would be used, but a mixture containing a maximum rate of 20%, while natural gas would account for a minimum of 80%.

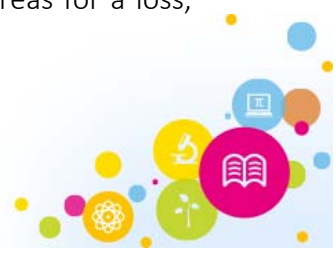
For the time being, the programme is still in a pre-operational phase, and the surveys that we have carried out with bus users and future residents of the urban development provide information about their a priori acceptance.

Before discussing the issue of the acceptance of this GRHYD programme by the Dunkirk residents, we will explore at length the issue of how new energy production and storage technologies are perceived by society. First, because we think that all these new technologies raise a certain number of fairly similar questions about acceptance, and secondly because it will enable us to see the specific features of hydrogen, particularly compared to wind power or biomethane production.

**B. The installation of a new device in an area is never insignificant**

It is always important to consider how the device will be accepted. This is particularly so as in general the local inhabitants have not asked for anything, and it is the result of a private initiative and a decision taken by the public authorities, who, even if they are elected representatives, have usually not carried out any prior consultation process regarding the project.

The residents of a district or town generally prefer the status quo; a change may lead to a gain or a loss, but we know from the work of Tversky and Kahneman that the expectations of gains and losses are not symmetrical (as postulated in the Expected Utility Theory). Most individuals have an aversion for loss. Thus, experiments in psychology have shown that while people generally prefer to have one chance in a hundred of winning €1,000 rather than obtaining €5 with certainty, they generally prefer the certainty of losing €5 than of having one chance in a hundred of losing €1,000. For a gain, one is prepared to take a risk (of possibly not winning in order to obtain a large win), whereas for a loss,



one is much more cautious (preferring a definite small loss to a large loss, even if the probability is very low).

Applied to our problem, in other words the installation of a new technology or a new energy production or storage site, that means that if the inhabitants think there is a likelihood, however small, that it will cause significant damage, they will want to avert the risk, even if this means that they are certain to “lose” a little – the time and energy spent fighting the project. In some way, it is as if the residents said: “we know what we’ve got, we know our present environment, it suits us, so even if the new installation has only a slight chance of harming it, it’s better not to take that risk and oppose it”.

### C. This raises the question of the acceptance of the new technology and the device.

Many sociologists and other researchers in the social sciences reject the term “NIMBY” to describe the local residents’ refusal of the new device, considering it to be pejorative. They also often reject the term “acceptance”, on the grounds that it is taken from the discourse of the project developer. It thus betrays their objective, namely to find ways of making the inhabitants accept what they spontaneously refuse, which in some way is not acceptable to them. There is even the idea among researchers that treating this resistance as NIMBYism is to claim that the inhabitants have an irrational view of the issue. However, this rejection of the expressions “social acceptance” and “NIMBYism” does not seem to me to be justified.

We will look first at the question of the rationality of the nimbyists’ arguments. We cannot say that nimbyist inhabitants are irrational. First of all, some at least of the risks and disturbances that they highlight well and truly exist: wind turbines, either onshore or offshore, have an impact on the landscape that can be considered negative; hydrogen is an explosive gas, which has already caused fatal accidents; biogas installations can be smelly and noisy, etc. Moreover, the people who oppose new installations remember episodes when the technologies that had been declared safe and inoffensive eventually proved to be harmful, if not downright dangerous. A prime example is that of asbestos, that “miracle” substance that turned out to cause many health hazards. Finally, even if some dangers highlighted by the opponents are imaginary, they are nonetheless perceived (wrongly) as such and must be taken into account. For those who believe it, an objectively non-existent danger constitutes a good reason (Boudon) for opposition. The nocebo effect exists; even if it is a figment of the imagination, its effects are real.

Turning now to the question of legitimacy, linked to that of rationality. For the social sciences researchers mentioned above, saying that opponents to a project are motivated by nimbyism is a total denial of the legitimacy of their position. On the contrary, it is perfectly legitimate for inhabitants to defend their immediate environment, which is directly perceptible to their five senses. Nobody wants to see a threat to a place where they feel safe, to put up with a new negative visual, olfactory or other nuisance in an environment where these probably already existed but were generally well accepted.

The conflicts arising from projects to install or develop technologies whose aim is to produce or use less carbon-intensive sources of energy thus often lead to a clash between two legitimate authorities. First, the public authorities, who, because that is their role, implement or promote the

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development of these technologies, even if it means upsetting the equilibrium in certain areas, and secondly the local residents, who, for the reasons described above, defend their living environment.

It is thus one argument against another. For the project developers, it is the overall interest of the country, or even of the whole planet, that is at stake; for the local residents, it is their right to live in a pleasant environment, and not to see the destruction of the environment in which they chose, in the more or less distant past, to settle. Moreover, in addition to the disturbances and new threats to their environment, for residents who own their property (main residence or holiday home) there is the issue of the effect on the value of their property.

People who are not directly involved may consider that it is selfish to defend one's own turf, well-being and personal capital against the general well-being and future of the planet, but the residents respond that the issue is so huge that the local project won't make the slightest difference. Its impact will be tiny, and they never suggested that the project shouldn't be developed elsewhere, for example close to the homes of those who accuse them of being selfish! The NIMBY syndrome does not thus involve on the one hand those who have a completely legitimate claim, and on the other, those who have none.

Two legitimate authorities, at different scales, clash, and if the political authorities (essentially national, those who signed international climate change agreements, e.g. COP 21) decide to impose something that displeases the local residents, they can do so without denying the legitimacy of their interests. The general interest simply imposes that some people are losers.

#### D. The factors influencing social/local acceptance

When comparing the resistance to different technologies and installations of energy production and use, we can observe that they are not all rejected to the same extent. The most hostile reactions are to wind turbines and methanation installations. A simple search on the Internet shows that the organisations opposed to wind turbines and then those opposed to methanation installations are the most numerous, particularly in France. Hydrogen technologies, admittedly still rare, are generally better accepted.

To understand these differences, we need to return to an issue raised at the beginning of this paper, namely how the installation of this new device is perceived locally, and in what way and to what extent it changes the living environment and lifestyle of the residents.

The best way is through the concept of social representation (Moscovici). The inhabitants of an area have a representation of what it is, of its main features. This representation is constructed on the basis of their everyday life in the area, what they see, hear and feel, and their relationships with the other inhabitants. Discussions occur, which confirm or modify each person's spontaneous impressions. The greater the (negative) discrepancy between the new installation or technology and this more-or-less convergent representation, the greater the probability that it will be rejected or simply contested. The opponents to on-shore or offshore wind farms make no mistake when they use photomontages on their web-sites or in their tracts, which aim to show that the pylons and blades dominate the familiar landscape by their height.

If the literature on the subject is to be believed, there are several ways of making the new installation less outlandish. Studies show that a consultation process carried out well in advance of the project can enhance the social acceptability of the project. However, this is difficult to prove, as

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it would require comparing projects that are exactly identical in all aspects (size of the installation or experiment, type of landscape, population, economic or social context, etc.), and that the consultation processes occurred at a similar moment. Which is, of course, impossible. Making the residents participate in the project is a way of familiarising them with it, so that they find it less disturbing for their environment, less intrusive.

Another way of working on the effects of the intrusion into the everyday world of residents is to allow them to participate in the financial plan, and hence in the future profits. Otherwise, the residents have the feeling that the project developer – who is moreover easily suspected of being motivated only by financial interest – is the only one to gain. The risks and negative impacts are for us, the profit for the others. Demonstrating that the environment and the planet as a whole will benefit is not enough to convince them, as mentioned above. But here again, it is difficult to say what concrete effects an economic participatory venture will have on acceptance, for the same reasons as for the consultation process. Belgium obliges wind farm project developers to open up their capital to local authorities and local residents in order to involve them more and make them more receptive, but the results of this statutory innovation are still unclear.

Regarding the disquieting character of the installation, what is important is not that the threat is real, but that it is perceived as such. It is not the reality that counts, but the residents' perception of it. The way of communicating can have a negative impact on acceptance, for example, if the style is domineering, if the terms used are too technical, if the project is presented as being too far advanced, without any margin for negotiation, etc.

#### **E. Acceptance of hydrogen and more specifically the GRHYD project**

First of all, as mentioned above, we are still in a pre-operational stage of the two components of the project: urban buses and the urban development including social housing, private housing and a hospital.

The fuel that would be used in the buses would be a mixture of 80% natural gas and 20% hydrogen. The mixture for housing and the hospital would have a lower proportion of hydrogen, initially about 5 to 6%.

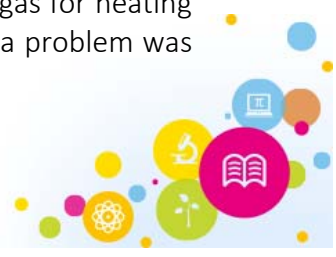
The field survey carried out among 600 urban bus passengers indicates that they know little about hydrogen, but show good acceptance of the use of a mixture of natural gas and dihydrogen as a fuel. Only 11% could remember an accident linked to the use of hydrogen, and amongst those, a good third (27 out of 74) mentioned the Hindenburg airship disaster (New Jersey, 1937).

With regard to the urban development, things are somewhat different. We asked the bus users what they thought about living in a house supplied with a mixture of natural gas and dihydrogen, and while only 9% declared that they would not spontaneously get into a bus using this mixture, 35% said that they would refuse to live in a house with the same supply (19% expressed no opinion). There is a difference between encountering a worrying element during a bus journey and allowing it into one's home. The home is a sanctuary, and safety is one of its essential qualities.

Furthermore, future residents of the urban development and people living nearby were questioned, this time using semi-structure interviews. This time, we observed good acceptance of the natural gas/dihydrogen mixture, the greatest reticence being by people who had never used gas for heating and were in general reticent about its use, whatever its composition. What did pose a problem was

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where the dihydrogen would be made, stored or injected into the network. Here, we found the same situation, albeit to a lesser degree, as for wind turbine or methanation installations: the residents were worried about its location in the immediate vicinity of their homes. Full safety guarantees should be made, and the project developers should provide evidence to that effect. Moreover, the installation should not be too visible, nor look like an industrial plant, which is out of place in a residential area. Above all, it should not be too close to houses, in order to comply better with the two previous conditions.

In a much milder form, we can see the NIMBY effect, but in a reduced form, because “backyard” is here taken almost literally: “I am maybe ready to accept an installation of hydrogen in my district, but not too near my home, not in my garden or my backyard.”

Let us end by adding that hydrogen is a little known element and what plays against it is the term “gas”, which is rather stressful. And for the GRHYD project, the expression “gas mixture” is certainly even more stressful (cf. the expression “explosive mixture”).

