The Flow of WELGAS.

Innehåll

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Abstract

In the wake of the current climate change, biodiversity loss and economic recession debate, ideas of in-depth socio environmental transition away from the dominant industrial modern practice of extractivism flourish. It is not the first time in recent history the claim for changing the modern society's energy, food and transport chains has been made. Inhabitants in Sweden, for example, voted already in the 1980 for a re-orientation of the entire energy system in line with today's ideas of transition. One of the most intriguing and greeted projects of transition at that time are investigated; how a project called WaterELectricityGAS with three energy transformation technologies; wind turbine, reversible fuel cell and hydrogen combustion engine was set up, enacted as well as intra-acted with discourses of Swedish energy- and environmental politics in the 1980s. The analysis is based on publically available reports, journal articles, petitions, and uncategorized archive material including minutes, contracts, personal letters, notes, information materials, reports and so forth from an archive.

This article re-creates the history of WELGAS by enacting a special focus on the *quasi-objects* water and wind and discusses a combination of actor-network theory and discourse theory. The important insights and the vocabulary of becoming in ANT are kept and merged with the insights of history and conflict from DT. Antonyms to the classic ANT concepts are proposed in forms of *Problematization-Perversion*; *Intressement-Estrangement*; *Enrolment-Rejection*; *Mobilize-Paralyze* creating a heterogeneous material~semiotic analysis with attention to conflict, power, and marginality.

Keywords

Renewable energy, Wind power, Quasi-objects, ANT, Discourse Theory, Transition, Posthumanities

The Beginning of the End

Today the need to shift energy and transport systems towards low greenhouse emission societies is thoroughly discussed in current environmental policy debate, even though the dominant discourses are mostly occupied with creating a conservative ecomodern utopia (Anshelm and Hultman, 2014). With the emissions created from extractive industries and peak oil on the agenda, there are no shortcuts available if we are to take care of ourselves and our world. Research papers and reports cite many examples of transitional projects, both concrete and hypothetical, as possible ways forward. Ideas and practical examples of decentralized, renewable energy systems, closed-loop biogas systems, ecovillages, and localized food chains are offered (Hédren and Bradley, 2014)

Sweden had the chance to be early with transitioning from an extractive based industrial modern society to a renewable small-scale. Already with the results from the 1980 referendum on nuclear power, inhabitants in Sweden voted to reorient the entire energy system in line with current ideas of transition. The emphasis on large-scale, centralized organization of the industrial modern discourse sort fell out of favor due to social movements exposing natural resource concerns, health risks, and pollution. A totally different energy system was envisioned for Sweden around this time with an ecological discourse gaining influence in which energy demand would be met through distributed renewable energy resources and local production of food (Hultman & Yaras, 2012).

The WELGAS project, which was part of this ecological discourse, sought to construct a small-scale energy system based on renewable, decentralized technologies. In this article heterogeneous collective and discourse is used as concepts when following the quasi-objects water and wind. It was not created by some obscure innovator on the political margins. WELGAS was actually hailed by leading environmentalists such as Rolf Edberg (Social Democrat and internationally acknowledged environmental pioneer) who for example published letters to the editor in *Arbetet* urging "progressive politicians" to consider WELGAS for clues as to how to save human civilization from destruction. WELGAS was similarly portrayed as a prototype for the future in Centre Party and Green Party petitions as well as by influential politicians. WELGAS also attracted international interest in the form of journal articles from Germany.[1]

Some words about WELGAS

1980 Olof Tegström was an experienced innovator, entrepreneur, and environmentalist. Together with his partner Inga they both joined the Green Party at its formation in 1981. Inga was later on elected as a representative for Green Party, a party that changed the political landscape in Sweden (Vedung, 1991)

[1] This case study of WELGAS is based on three types of materials: first, publicly available reports, journal articles, mass media texts, and petitions collected via database searches; second, an abundance of uncategorized archival material, including minutes, contracts, personal letters, personal notes, information materials, and reports, preserved by the community housing company of Härnösand; and, third, one interview with WELGAS initiators Olof and Inga Tegström complemented with written materials from their personal archives. A detailed and complete analysis including references to all empirical material can be found in the book *Den inställda omställningen. Svensk energy- och miljöpolitik i möjligheternas tid 1980-1991* published 2015 at Gidlunds förlag.

When Tegströms were told via their political connections that there were opportunities to propose projects for the city of Härnösand's 400th anniversary celebration Olof submitted his proposal for WELGAS, which included three energy transformations that would be made possible using four key technologies. First, a wind turbine collected kinetic energy and transformed it into electrical energy. Second, the electrical energy was then transformed into hydrogen using a reversible fuel cell that also functioned as an electrolyzer. Third, the hydrogen was then converted by combustion into kinetic energy in a car and heat by an owen in a house. Härnösand's anniversary committee supported the proposal, giving the project needed legitimacy in 1983. A feasibility group was later formed to realize the project.

Some words about Posthumanities

Posthumanities is a concept to shape an ontological position making supra-disciplinary analysis transcending historically settled disciplinary borders possible. It´s origin may be described as coming from six different intra-acting global changes in power/ knowledge transformations that is De-colonialization, Quantum physics, Microbiology, Anti-humanism, Ecology and Science and Technology Studies (Chen, MacLeod, Neimanis, 2013; Braidotti, 2013; Coole & Frost, 2010; Hekman, &. Alaimo, 2008; Bennett, 2009).The power/knowledge transformation De-colonialization has a history since the Bandung conference trying to re-create and re-historizise the oppressed Indigenous Peoples away from colonialization thereby shifting "[…] the geography of reasoning […]" from a Bacon-Newton-Descartes enactment of nature as dead/mechanic separated from culture towards a entangled and lively matter (Tiostanova & Mignolo, 2012:10 e.g 174; Smith, 1999). The appreciation of Quantum Physics ideas of vibrating strings as the smallest and unpredictable parts of universe has inspired posthumanities thinkers such as Karen Barad and Timothy Morton suggesting that things are only understandable as part of relations (Barad, 2003; Morton, 2013). Feminist materialists such as Stacy Alaimo and Susan Heckman insist that with the latest medical understanding of our bodies we need "[…] a way to talk about the materiality of the body as itself and active, sometimes recalcitrant, force" (Hekman & Alaimo, 2008). This is an understanding long proposed by eco-feminists thereby making possible reconceptualise Nature away from the mechanics and dead matter as it was presented by men at the Renaissance (Merchant, 1980; Bennet, 2009). Anti-humanism as of the

´death of man´ exclaimed by Foucault is another stream from where the river of posthumanities is created. It is thus important not to confuse this with cynical and nihilistic misanthropy in the form of climate denialism or fascism. As Braidotti explain, this anti-humanism is not enough, we need to look […] more affirmatively towards new alternative" […] and "[…] create alternative ways of conceptualizing the human subject" (Braidotti, 2013:37). It is important to recognise what Bennet writes that […] where subjectivity begins and ends is too often bound up with fantasies of a human uniqueness in the eyes of God, of escape from materiality, or of mastery of nature […]"(2009: ix). Last, but not least, we have the arguments coming from in-depth case studies from the field of Science and Technology studies in which materiality has been conceptualised as always already part of values, ideas, politics and so forth making the modern claim about separation between Nature and Culture obsolete (e.g. Haraway, 1988; Latour 1993, 2004). From above I will draw out the core ontological ideas of posthumanities.

The main theoretical tenets and empirical findings of the posthumanities river are twofold: that objects and subjects are heterogeneous and become what they are in relation to others. Let us provincially call them *quasi-objects*. Quasi-objects cannot pre-exist as such, but neither is its existence purely ideological or socially constructed (Serres, 2007). This position moves toward a conception of knowledge-making as a negotiation among human and non-human assemblages. Reality is as a contingent and antagonistic field filled by heterogeneous quasi-objects which are structured by hegemonic processes. The identity of each element is constitutively split and when an element such as water is part of a chain of equivalence other possibilities are cancelled. The excluded outside levels all difference within the network. This means that the meaning of quasi-objects is established in a network of relations, not given by the mere referential materiality but are, rather, assemblages (Latour 1993, 2004); or as I call them in this text, heterogeneous collectives inspired, but also developing, the concept of heterogeneous collectif (Callon & Law, 1995). Unpredictability is neither completely unpredictable, nor completely predictable, but rests on a combination of stability and contingency as vibrant matter (Bennet, 2009). As we will see later on, water and wind were becoming differently together with different heterogeneous collectives in a similar way as Karen Barad take the third possibility, the quantum physic statement for real and say that light is both particle and wave at the same time, depending on its intra-action with other elements in different arrangements (Barad, 2003). Neither discursive practices nor material phenomena are ontologically or epistemologically prior. Neither can be explained in the terms of the other only together.

Some words about concepts of Actor-Network-Discourse

As a concretization of posthumanities I will in this article use Actor-Network-Discourse.[2] In late 1970's and the beginning of 1980's Bruno Latour and Michael Callon at the École des Mines in Paris concluded their first empirical studies with the aim of explaining scientific research settings (Latour & Wolgar 1979, Callon 1980, 1986, Latour & Callon 1981). Initially the focus was on ethnographic studies of laboratory settings and inspired by Gilles Deleuze, Felix Guattari, Michel Serres and Michel Foucault they conducted detailed ethnographic studies in line with a material~semiotic appraisal of the ordering of humans and things which they later on called actor-network theory. Since its formulation, use and popularity in a variety of scientific fields as one of the most important posthumanities theories, ANT has also been met by critical and constructive remarks from a variety of perspectives. From the debate in books as *Science as practice and Culture* over *Actor-network theory and after* to *Modernity and technology*, as well as in the numerous hours at workshops, conferences and seminars. In this article I suggest that some of the constructive/critical remarks about ANT call for theoretical concepts that strengthen the approach, or even actually transform it, what John Law calls for 'blindness', that ANT sometimes create must be dealt with (Law 2002:92). One is of network building as the (re)making of discourses. One is of the process of network building as both inclusion and exclusion, or what Law call presence and absence (Law 2003:7). There is a need in ANT for [1] historicizing the actor-network and to scrutinize the restrictions that permeate every actor-network building. The concept of a material~semiotic discourse is here suggested. It is important to note that many before have tried to find flaws in ANT and add concepts to it, not least combining it with different types of foucauldian discourse analyses(Fox 2000; Edwards, 2003; Asdal, 2003; Kärrholm, 2004). ANT-scholars have already from the beginning made their tribute to Foucault, but at the same time made clear that there was a necessity to develop ANT for making his work symmetric and materialistic relevant (Law, 1992; Latour, 1996; Callon, 1999). Instead of going back to Foucault again, I suggest that ANT can be combined with a certain development of foucauldian analysis, that is Discourse Theory (DT) with its clear idea of discourse as material, sometimes also

[2] A much more elaborated and in-depth description of the combination Actor-Network-Discourse is to be found in the book *Den inställda omställningen. Svensk energy- och miljöpolitik I möjligheternas tid 1980-1991*. Gidlunds förlag published 2015. I am very grateful and could not enough acknowledge Francis Lee for all the hours we have discussed this combination as well as his contribution as the main source for presenting antonyms to the Callon concepts used later on in this article (Galis & Lee, 2014).

referred to as the “Essex school in discourse theory” (Townshend 2003). The basics of DT is that a discourse is always a part of a discursive order, in which different discourses are in opposition to each other (Laclau & Mouffe 1985, 87; Laclau 89, 96, 2000 and Torfing 1999). It denotes that “elements do not pre-exist the relational complex but are constituted through it” (Laclau, 2005: 68). The reality according to DT may be described in terms of a hegemonic field in which different elements are transformed into moments and connected to each other as nodal points forming a discourse (Laclau & Mouffe 1985). One given is that when a human kicks a spherical object it is combined differently if it is done on a football ground or in the street (Laclau & Mouffe 1987:82).

These two theories share the ontological status of humans and more than humans as well as the political ambition of a parliament of things. They are combined as of the need in ANT for more explicit show struggles and give DT concepts displaying the fine grained construction of discourse . I suggest keeping the important insights and the vocabulary of becoming in ANT and merge this with the insights of history and conflict from DT. A heterogeneous material~semiotic analysis can thereby be done with attention to conflict, power, and marginality (Hultman, 2005; Hultman & Lee, 2006. Hultman, 2008)

Antonyms to the classic ANT concepts are therefore proposed in forms of *Problematization-Perversion*; *Intressement-Estrangement*; *Enrolment-Rejection*; *Mobilize-Paralyze*. For every articulation there is a simultaneous exclusion. By winning a problematisation/perversion struggle a local resolution of a valid agenda is enacted. Where an actor manages an intressement, an alignment of trajectories, there is also an estrangement of other assemblages’ goals, and other trajectories. For every enrolment there is also a rejection of other possible enrolments. Powerful actors, fact-builders of their interest, with significant influence on the development manage to enrol and control other actors and arguments, which mobilize their authority and status. At the same time, this constitutes a paralysation for the invisible actors, a process that could be perceived as a denial of the excluded identities (Hultman, 2005; Hultman & Lee, 2006; Galis & Lee, 2014).

• Säljaren och köparen av Sveriges första vätgashus: Nils-Erik Helsing, VD i AB Härnösands hus, önskar Olof Tegström, hustru Inga och barnen Katarina och Mattias lycka till med sitt nya hem.

Large scale nuclear vs. small scale wind

When given the go-ahead by the Härnösand municipality in 1983, the WELGAS project initiators tried to spread the word about the project as well as recruit new supporters. The engineering consultancy K-Konsult was assigned to lead the group, and Swedish experts in the field as well as potential sponsors were contacted. This expanded the feasibility study group but also created a schism within the newly composed heterogeneous collective. Engineer Björn Örtenheim was appointed coordinator of the new organization and was responsible for issues such as the technical/economic evaluation, generator development, and creating a new system for the WELGAS house. Kjell Pernestål from the Swedish nuclear energy research institute Studsvik was employed by state-owned energy company Vattenfall as an expert. Parallel to this development, Tegström created his own WELGAS exhibition in an old school building in Vålanger, which also served as his family's residence.

In Pernestål's view an energy system of the future had to be constructed on a different scale from Tegströms initial ideas about WELGAS. Örtenheim and Pernestål together proposed a different system, which did not include wind power at all. Instead, they proposed the electrolyzer preferably use power from the main power system and charge the car directly. Perneståhl and Örtenheim, for their part, wanted WELGAS to become part of official Swedish hydrogen research connected to the dominant energy and environmental policy. For every intressement, which "imposes and stabilizes the other actors the other actors it defines through its problematization" (Callon, 1999:71), there is what I call an estrangement that destabilizes and confound other actors. Where an actor manages an intressement, an alignment of trajectories there is also an estrangement of other assemblages' goals, and other trajectories. During this process the agenda of the defeated actors are downplayed and loses awareness. Intressement means to estrange and disassociate other nodes – to create a chain of differences (Callon, 1986). This industrial modern research was dominated by Studsvik, which envisioned a large-scale nuclear system using hydrogen as the energy carrier. If driven by Studsvik, the project would only entail testing distinct hydrogen technologies (e.g., electrolyzers, hydride tanks, and hydrogen engines) separately from each other. For every enrolment there is also a rejection. This type of descriptions, based on an almost ridicule of the renewable and small-scale technology, was at this time common in Sweden, not least the debate in parliament where biomass by Liberals and Conservatives was compared with sticks and wind power with weathervanes (Kall, 2011).

Tegström later on wrote a personal letter to the CEO of Härnösandshus AB in which he expressed his disappointment alleged that the WELGAS project had been turned in the wrong direction (Tegström, 1984). The second group, with Tegström as the central figure, wanted WELGAS to show how infrastructure could be changed to be based on renewable sources of energy in small-scale, decentralized heterogeneous collectives. The wind as quasi-objects was a central part in the negotiations between the industrial modern and ecological discourse. Both wanted it on their side making possible to define the heterogeneous collective in relation to a suitable discourse; to get it on its side, as an ally either in the form of absent or present. In every case that there is a problematisation enacted by a specific network, this entails a perversion of the situation. By winning a problematisation/perversion struggle a local resolution of a valid agenda is enacted. It is important to note that this logic does not necessarily mean that there are only two sides to a conflict – it is important to note that the process perversion can have effects on multiple heterogeneous collectives, and on multiple struggles for hegemony.

Tegström's vision of creating WELGAS as an overall concept was mobilized in favor of Pernestål and Örtenheim's enactments when the feasibility report was written since visable in such a way that the industrial modern discourse was put as appendix in the long-term project plan presented 1984. For the time being the small-scale renewable energy heterogeneous collectives and its proponents succeeded in keeping their project with the ecological discourse intact, temporarily deflecting the challenge from the advocates of a nationally centralized, large-scale nuclear-powered society acting with a industrial modern discourse. Through the process of exclusion the rejected actors are made invisible in this particular case Pernestål and Örtenheim was put in the appendix and later on excluded from the heterogeneous collective As Callon notes in his seminal article hegemony occurs only when the spokesmen are considered to be beyond question which is achieved only after a series of negotiations (Callon, 1986).

The summer came and went without any significant new developments, but in mid-October 1984 the final decision was made by the City of Härnösand and AB Härnösandshus to help set up WELGAS. Härnösands shared leadership in form of the two mayors Svante Adelhult (Centre Party) and Tord Oscarsson (Social Democratic Party), called a press conference to announce and promote the project. Many journalists attended, and they described the scheme as revolutionary and unique as a bold attempt to achieve the world's first zero-energy family.

The wind within

During a couple of months in 1984 Tegström, along with the wind, were perverted. Through an estrangement, rejection and paralyzation the original shape of WELGAS as a small scale renewable energy system was put aside and the technologies separated to be re-connected into the dominating industrial modern energy system. Pernestål others rejected the original WELGAS idea and said that hydrogen technology could instead be examined as part of the current energy system. They re-used the industrialized modern discourse, with which the wind had somewhat difficult role as unreliable and inadequate. For them the wind avoids the human capacity to catch it according to the industrial modern logic. Wind turbines were described by moderate industrial modernists in parliament as an ancient technique that did not work with the modern lifestyle.

But Tegström had other plans. Party representatives of the Centre Party and the Left who spoke with the ecological discourse pointed instead to the large energy supply that existed in the winds, its naturalness, small risk and the proven experience of them. For Tegström this was the key to show the place wind had within the heterogeneous collective. The wind became interested and recruited by Tegström to the heterogeneous community by wind measurements, analysis of a wind turbine in Tågarp outside Falkenberg and contacts with turbine resellers. The element wind was enlisted in a model calculation of wind availability at Geresta, in which two not yet merged models were assembled by hand by SMHI. The input data used was for Skagsudde, a place located 80 km northeast of Härnösand. In SMHI report the location of WELGAS-house based on wind simulations, was described as a "wind-poor" position compared to the places studied at different wind power projects.

Discourse theory is based on the understanding of the object is never finished or complete, but the players are constantly trying to fill objects with different discourses. The potential variability is crucial in the discourse theoretical thought; an element can always be constructed as a part of another discourse. The moments cannot be understood without its historical and spatial contexts, the discourses it is always already part of. Wind as power was in the mid-1980s, primarily associated with

small-scale, decentralized and alternative energy and created as a moment of conversion within the ecological discourse. Instead of solely relying on models of the wind and instead making possible enrollment of the wind to the project a trip was made by Olof Tegström to Falkenberg where he and colleagues performed measurements of a windmill and discussed with the owner Roland Bengtson about how his wind turbines of type Vestas HVK15 worked. The visit was later re-used arguing that the turbine could stand less than 50 m from the WELGAS-house and that the turbine was reliable because the windmill in Tågarp was still just four days every year. In order to make it credible that a similar wind turbine would work in Härnösand, the wind was calculated by numbers and transferred to the WELGAS-house. The quasi-object wind was singled out first as an important element by the trip to and report from Tågarp. Then it was interested and later on enrolled so that it became an moment within the heterogeneous collective. Elements can be moved between discourse and the discursive field. But they have always a historicity that sets limits and forms an impact on the meaning the element get in the discourse which it is currently fixed with. The elements thus has a history, not in the linear historiography significance, but the possibility depends on the discourses that it was previously included in as moments. The wind and the windmill made concrete marks on the family's life. Since it was standing only 50 meters from the house in the middle of a residential area, the noise, shape and shadows coming from the power plant was always present. The shadows made it feels like being part of a disco all the time, according to Inga Tegström. The wind as electricity was forced to be part of a technology harnessed with the outcome of visible movements, not in trees, not in flags but in circular movements.

I was quite interested to be part of WELGAS already from the beginning. For me the possibility to whirl around and stir up some energy is quite fun, especially when there is only three blades on a hill to have a relationship with. They tried to discipline me into figures first, but I was more interested to test the possibilities in practice. Tegström had to find me in southern part of Sweden where I was making it easy for a co-operative to live within the boundaries of our earth. I was captured on a couple of pictures and translated into a report. Quite a few people did not like me, even persons within WELGAS who I thought to be friendly. I could never understand what they were doing there, I was part of Tegströms plans already from the beginning, why could they not just stay away and let me do my thing. In the end I was. I was doing my thing, helping out as much I could. There was no time to rest. After a while the family got a bit tired of me, I was making some noise during the nights and also creating a fast moving shadow. Anyhow, I was there and I left, as I always do. Being of a flowing sort I created lines of flight together with my friends.

The project is on its way

The vision of a decentralized society powered by renewable energy, which was an important starting point for the WELGAS project, emerged from the ecological discourse which were gaining ground in Sweden during 1980's (Hultman and Yaras, 2012). In the mid- 1980s, the ecological discourse was approaching the point where it could actually challenge the dominant modern industrial discourse a juncture that has been recognized in previous research into educational material, attested by opinion polls, mass media coverage, protests against large-scale industrial projects and the rise of the Green Party (Hultman, 2014). In this formative period, a window of opportunity for transition actors had the potential to shift the society in the direction of ecological sustainability.

By the mid-1980s, the WELGAS project was under way. The municipality supported it and the list of sponsors was substantial. With only six months to the opening of the house, Tegström was firmly in

charge of setting up the hydrogen system. In summer 1985, WELGAS was ready to be presented. All the essential elements had been assembled and were ready to impress the public. During the Swedish royal couple's "Eriksgata," when they travel the country after being crowned, WELGAS was presented as a concrete illustration of how to build the energy system of the future. The hydrogen-powered car idled during a presentation. A large crowd that had gathered outside WELGAS house watched as the Swedish king, Carl Gustaf XVI, hesitated to drink the condensed exhaust from the car; to convince the King and the spectators Olof Tegström, as seen on the pictures from the family's personal album, drank the water from the car's tailpipe.

The water within

How do we make possible to think with the water making up 65%of our bodies, not of, against or about it? How do we create the "[…] collaborative relationship with the aqueous, actively questioning the habitual instrumentalisations of water?"(Chen, MacLeod and Neimaris, 2013:3f).Thinking the political with water might help understand issues often separated, to decolonialize is to recognize the political hegemonies within. It is much needed to co-create ourselves as waters that literarily "[…] flows within and between and within bodies, across space and trough time, in a planetary circulating system that challenges pretentions do discrete individuality" (Chen, MacLeod and Neimaris, 2013:12). Is it as Chandler and Neimaris claim that "[…] water makes ethics possible"(Chandler & Neimaris, 2013:62)? What ethic was made possible in the case of WELGAS?

I got to hear about the WELGAS project when I was traveling in the body of Roger E. Billings inside his house in Provo. I was quite comfortable in Billings' veins, but I always thought that he did not go the whole way. Tegström saw me on television when he was on work travel in Mexico, he even came and visited me. Yes, I was able to be part of Billings's whole system from being split into hydrogen and oxygen, burned in a combustion engine and then coming back together as exhaust from the pipe of the car. The reversible fuel cell that split me was thus powered with coal and I never got my head around how this resource circle could be presented as environmental friendly when based on coal

from the extractive industries. Tegströms vision seemed more appealing to me, creating electricity from the wind, borrowing some of its unlimited power, and use that instead when splitting me to hydrogen and oxygen! So I set myself free from the vicious circle of Billings, and endorsed myself in the Atlantic Ocean. It took me awhile to get to Sweden and Härnösand where Tegström was setting up his project, I even had to take the route through the clouds and appear as snow for a while. I was not used to that, it was cold up there, but beautiful since I was becoming in unique ways with a couple of friends in a snowflake. Lastly I arrived through the pipes to Tegströms house. I went through the splitting process again and one part of me hooked up with the titan/iron sponge in the car. This sponge was called the key to the ecologically sustainable society. I was a bit critical of that though as new technologies tend to become hooked into a boomerang effect. I was not expecting that, being intertwined with metals was not my type of life; I tried to escape all the time but was not allowed to do it until it was hot as a sauna, and even then I had a hard time to be released. Finally of I went, creating kinetic energy on my way out through the pipe. I would have loved to be part of a Kings blood for some time, look closer on the myth if these people really have blue blood or not? But he refused to take me into his system and back into Tegström I was, making a full circle again.

The quasi-object within the heterogeneous collective which often played a major role in the mobilizations was the ordinary water. With the help of water, which forms a central part of humanity, the new and somewhat unfamiliar technology was inked to the everyday life, the youngest son of Tegström family was even cited that ”we may then drink exhaust” of the hydrogen-powered car. One of the clearest linkages made with water was when the Olof Tegström drank the water from the car right in front of King Carl Gustav and the assembled crowd. That the king smelled the water and then dared not drink indicates that he was not willing to contribute fully to the heterogeneous collective with his body. He dismissed the construction of water as harmless. The Expressen reporter Christer Gerlach also drank the exhaust water from the car thereby using himself to prove the credibility of harmlessness. The connection between the absence of pollutants in the exhaust emissions and the environmental friendliness of the entire process was constructed which allowed water to stand as the symbol of an entire life cycle in the WELGAS project.

The middle

In late 1985, the various elements were in their places. Tegström wrote in a Christmas message to the heterogeneous collective that the last piece was put in place in November, which was the hydrogen car. Tegström felt confident about the progress of the project and was looking forward to the following year. The hydrogen car was an especially valuable display piece: reporters often asked about it in interviews and, when running, it attracted admiration and prompted glowing descriptions. In line with increasing discussion of the environment as fragile and worth protecting—not only for its own sake but for humanity’s survival—the notion of a hydrogen society based on renewable energy was described as a realistic option within the ecological discourse gaining ground in Sweden by mid-1980s.

When the WELGAS project was in full operation, Prime Minister Ingvar Carlsson appointed Birgitta Dahl as minister of both Energy and the Environment. The historically and internationally unique composition of her portfolio including both energy and environment indicates the influence of ecological ideas at the time, promoted by Social Democratic special interest groups and the political parties Centre Party, Left Party and Green Party. Dahls visit to WELGAS and her encouragement of the project in its promotional video can be understood as part of an ongoing shift in energy and

environmental policy. In addition, people from the Green Party, Rotary Club, People's Campaign against Nuclear Power, Centre Party, and Swedish Society for Nature Conservation also signed the visitors' log book at WELGAS. With explicit reference to the project, the representatives of Centre and Left Party as well as Green Party members stressed the potential of hydrogen, making positive references to WELGAS in various petitions and legislative bills.

Miljöprisade av partiet i går blev från vänster Olle och Inga Tegström av Lotta Rodebrand, Grön ungdom, besökande språkröret Lotta Nilsson Hedström samt Eva Goës.

FOTO: MATS BERGLUND

KLAS LEFFLER

The End of the Beginning

After a successful period in which WELGAS was promoted as an energy system option, the project was halted in March 1987. The car was sent to Gothenburg, where it was acquired by Professor Jan Stefensson of Chalmers University of Technology. The fuel cell was returned to Vattenfall. The wind turbine went back to the Danish company Vestas, although it stood for a few years beside the house previously known as the WELGAS house as a monument of the past.

Halting the project

What had happened? From the beginning, WELGAS was a contested project hailed by its proponents and condemned by its critics. Local politicians in the city of Härnösand discussed extending the project, but would grant additional funding only if an evaluation was conducted. This evaluation became fundamental to the ongoing development and legacy of WELGAS. The State Energy Board and Studsvik, where the familiar Perneståhl worked, had been skeptical about the WELGAS project from the outset, and now outsourced the evaluation to the Energy Committee (EFN). WELGAS was evaluated by Professor Gunnar Wettermark, who was an enthusiastic proponent of nuclear power, and engineer Carina Johansson. Johansson wrote the report and possibly added to the evaluation findings of Bengt Finnström and Gunnar Wettemark. Finnström was invited to become involved in WELGAS early on and was a longstanding acquaintance of Perneståhl. At the time of the evaluation, he was research director of EFN's Department of Hydrogen and Fuel Cell Research, which focused mainly on nuclear power. At a meeting with the WELGAS feasibility study group in summer 1983, he explained that EFN had already invested in hydride storage with Studsvik and did not see the research potential of the project.

The EFN evaluation criticized the spirit of WELGAS in the same way as Vattenfall, the State Energy Board, and Perneståhl had early on. The evaluators said that the decentralized organization of the energy system was the biggest fallacy of the WELGAS project. They announced that in most

situations in which hydrogen technologies have been discussed the energy system had been connected to large-scale units as a prerequisite to achieve reasonable economic performance. Wettermark and Johansson were not gracious in their criticism of the project, saying that the project from an energy system point of view should be described as a Potemkin facade. This assessment made a huge impact. If politicians in Härnösand had been unsure whether to extend the project and if WELGAS was still locally thought of as an amazing achievement as of spring 1987, the EFN evaluation changed all that. Actors becoming with the industrial modern discourse got the opportunity to pervert the project and could thereby paralyze it. If WELGAS as heterogeneous collective had been dominated by an ecological discourse for most of the time, by winning a problematisation/perversion struggle a local resolution of a valid agenda was enacted. But there is also an estrangement of other assemblages' goals, and other trajectories which with the evaluations made by Finnström, Wettermark and Johansson made obvious when the flipped the project around.

A few years after the evaluation, WELGAS was not discussed in the same positive manner; Olof Tegström was no longer interviewed in the most influential papers *Dagens Nyheter*, *Expressen*, or *Aftonbladet*, nor was he described as a visionary who could point out the necessary path of societal transition. The small-scale, renewable hydrogen society that had been proposed as an option in the mid- 1980s was dismissed a few years later and shunted to the periphery of energy and environmental policy.

The ecological discourse was also marginalized in the late 1980s and early 1990s. The priorities of Dahl's integrated energy and environmental portfolio met very stiff resistance from both the Employers Association (a business and industry interest group) and United Labor Unions. Both organizations forcefully advocated an increased supply of cheap energy, particularly electricity from nuclear power (Linderström, 2001). Even more drama followed when labor unions, large-scale industry, and power producers joined forces with the bourgeois politicians in a campaign for nuclear power. This coincided with Dahl's deposition as energy and environment minister in 1990 due to a power struggle between her and above mentioned opponents (Anshelm, 2000). Progress towards a decentralized, renewable energy network stopped and the momentum was lost in the early 1990s. The influence the ecological discourse had gained over the century was now a situation of the past (Hultman, 2010). WELGAS as well as the ecological discourse lost power and instead the ecomodern discourse came to dominate energy and environmental politics for the days up until today.

What did the wind and water do?

Enacting with water and wind in the project of WELGAS give us another possibility of understanding the process of becoming heterogeneous collectives. Taken as starting points in a analysis, the wind and the water make possible a fine grained analysis of in what relations WELGAS became. Maybe it in a more obvious way makes clear the differences and similarities that make up heterogeneous collectives. The question, maybe, is not about what the wind and water did in WELGAS, the question is more about what and how do we understand WELGAS when quasi-objects such as wind and water are taken into account not as something dead out there but something alive in here?

The Flow of WELGAS turned into large scale windfarms

The WELGAS project presented a practical and visionary example of what a decentralized energy system based on renewable energy sources might be like. It demonstrated the possibilities of creating an alternative, more networked type of society in which electric power transformations were more decentralized. In Sweden, the mid to late 1980s was a time of reassessment in the

political elite regarding energy and environmental policy. The strength of this reassessment can be seen in how the Social Democratic Party was forced to alter how it conducted energy and environmental politics. Before and after the mid-1980s, the Social Democratic government's policies regarding energy and the environment characteristically deemphasized nature conservation relative to (or in exceptional cases, balanced it against) economic growth and employment. The losses to the Green Party in the 1985 and 1988 elections prompted extensive self-criticism. Influential people in the largest, and at the time ruling, Social Democratic party tried to pursue the idea that energy and environmental policies would in the future be subordinated to the limits set by nature: economic growth could not be the sole goal of political policy. In that light, WELGAS was both visited and supported by several Social Democrats as well as leaders from the Green Party. In these years, Tegström was not regarded as an eccentric who suggested far-flung solutions. Instead, WELGAS was regarded as a realistic vision of a future energy system, which was decentralized and based on renewable energy sources. Local supporters were proud of being in the frontline of technological development, a course of development that followed national recommendations. WELGAS was both supported by, and cited as an example of, the opportunities offered by ecological discourse.

However, the WELGAS project was never allowed to become a longstanding prototype and vision for the future. At the time when WELGAS was most publicized and discussed, its supporter's encountered stiff resistances from actors directly related to the project and were affected by the shift in the national discourse hegemony. The early critics from powerful institutions took the opportunity to evaluate the project. They framed WELGAS as insufficient and incongruent with how successful energy technology worked, a criticism they had already formulated at the start of the project. In the case of WELGAS, it is possible to understand how energy and environmental policies in the late 1980s hung in the balance between the possibilities of shifting towards small-scale, renewable energy or continuing with a large-scale nuclear/fossil-fuel system. The strong presence of environmental problems on the agenda forced heterogeneous collectives part of totally different discourses to formulate and construct the future. In the end, the conservative actors who described prototype as WELGAS as a mistake got the upper hand and transition was delayed, a development congruent with the shift in energy and environmental politics towards the hegemony of an ecomodern discourse in which marketization and technofixes of the environmental issue dominated.

Today, Sweden is a country with one of the fastest growing installed and planned capacity of wind power due to a transformed regulation in favor of large scale wind farms as well as an ecomodern belief in technological fixes. But, instead of being part of a transformation towards ecologically sound societies this installation of wind power in forms of huge industrialized zones create neo industrial colonialized spaces. The wind is thus now part of very different heterogeneous collectives than it was with WELGAS. Wind farms are today a continuation of industrial modern way of transforming energy, part of creating a conservative ecomodern utopia in which the power structures and resource depletion continue under the green wash of renewable energy.

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