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Main problem with market based methods for reporting purchased electricity, e.g. environmental labelled electricity, and a proposed solution to that problem

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Abstract

In the old, physical, way of regarding the Product Electricity; as being similar to water flowing in pipes, the statement “All power mixes on the grid!” held true. However, from a market and consumer power point of view, from an economic view of the product that we purchase (i.e. the Product Electricity), that statement is false. [ ] The Product Electricity which is audited; Production vs Consumption, does not mix with any other Product Electricity. Only the Products Electricity which are not audited does mix. The anonymous agents who are the carriers of the purchased Product Electricity, i.e. the kWh:s, are mixed. The product itself (the Product Electricity) is not mixed. [ ]

This new perspective is not intuitively easy to understand, especially not for electrical engineers or anyone working in the power sector. Nevertheless, it is the correct way to understand the new situation with deregulated power markets offering different “colours” of power, i.e. Products Electricity with different environmental loads.

In this new situation the new perspective on the Product Electricity shows that there exists a possible choice of not consuming any coal power.

However, the market based methods for reporting purchased electricity do have shortcomings and this article proposes a concrete solution to the most apparent problem; that it is possible to buy only the Guarantee of Origin (GO), separate from the Product Electricity itself.

The fact that transactions like that are both allowed and correct (in theory) they do not increase the acceptance, nor the understanding of how it is actually possible to not purchase and consume any coal power. Furthermore, the ongoing important scientific discussion about consumer power on the power markets is hindered.

Introduction: The Problem

In an already one degree warmer world [, ,] people and companies are looking for different ways of reducing their emissions of carbon dioxide (CO2). Choosing to not consume any coal power is a choice many are willing to make [, ,]. However, great confusion concerning how the system with ecolabeled power (i.e. Green Power) works, is hindering active choices. [,] Reporting what electricity one has consumed, e.g. when doing environmental audits, has been made much simpler since electricity with Guarantees of Origin has become available on the different European power markets. [ ]

Ecolabeling of electricity has been criticized and is still poorly understood. In an article by Brander, Gillenwater and Ascui in Energy Policy 112 (2018) “Creative accounting: A critical perspective of market-based method for reporting purchased electricity (scope 2) emissions” they point to the problem that it actually is possible to buy electric power from e.g. a German utility and to buy Guarantees of Origin (GO) from e.g. Norway, separately. By doing so, a German company can declare their CO2-emissions from power consumption to zero (0).

Even though these transactions are fully correct, as long as an audit: Production vs Consumption, is made I argue that it should not be possible to buy the GO’s separately. The GO’s should only be able to be sold together with the actual product (i.e. the Product Electricity). This to enhance the understanding of the possibility of choosing to not consume any coal power.

For example; Norwegians do not understand that they are actually, to a large extent, consuming coal power since a large part of the GO’s from Norwegian hydro power has been sold abroad (e.g. to Germany). From the EU project RE-DISS (Reliable Disclosure Systems for Europe){ } we see that over 50 % of the Product Electricity consumed in Norway comes from fossil energy sources [Varmekraft (fossile brensler)].

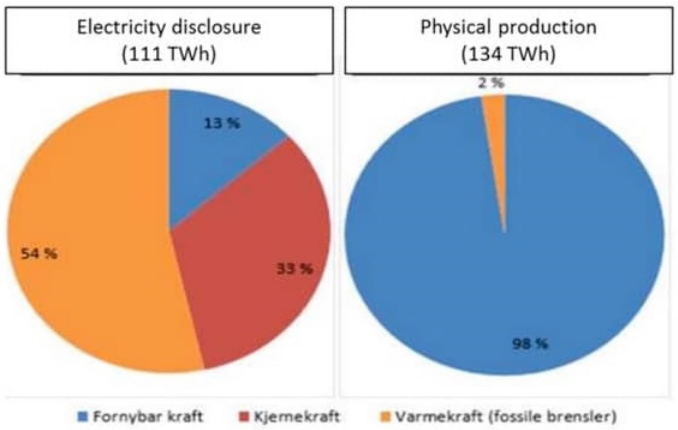

Fig. 1 The Norwegian residual mix of electricity in the RE-DISS system

2. The new perspective

The new perspective has already been explained and defined in two previous articles:

i) On the Analogy Between the Electric Grid and Our Banking System: Investigating "Consumer Power" in Deregulated Power Markets, International Journal of Earth & Environmental Sciences, August 13th 2018.

ii) Historic Perspective on the Analogy Between the Electric Grid and Our Banking System, Journal of Ecology, Pollution and Environmental science, Open Access, July 12th 2019. (Withdrawn 2020-02-24. Submitted to Journal of Nuclear Energy Science & Power Generation Technology 2020-0)

In short: we use a small, but crucial, abstraction when handling money in the “bank grid”. We accept the fact that the top-of-the-stack banknote inside an ATM is our money. If I withdraw my money before you, that top-of-the-stack banknote is my money. But if you precede me – that exact same

top-of-the-stack banknote will become your money. The same banknote can either be your money - or my money (not at the same time). The banknote is anonymous and interchangeable. This is an accepted abstraction, so very well accepted no one ever thinks twice over the banknotes in their hand there by the ATM, or the banknotes they receive from the cashier at the bank. The banknotes are anonymous and interchangeable.

Now – the parallel: you are just about to turn your electric kettle on, in your kitchen. I am just about to turn my electric kettle on, in my kitchen. If, at time: t=0, you press the contact of your electric kettle you will receive power from the electric grid (~1000 W). You will receive and consume your electricity, a product you have signed a contract with your utility to buy and consume, and your utility has promised to supply you with power [W] any time of day, all days of the year. You receive and consume your product (i.e. the Product Electricity) as according to your signed contract. You do not know from where the kWh comes. This, you have never known, wherever you have been living. But you know that from your electric outlets comes your product, your electricity. Not my electricity. Not anyone else's electricity.

If instead I, at the same time: t=0, press my contact and you wait just a second with pressing your contact, I will receive that exact same power from the electric grid (~1000 W) that otherwise you would have received. I will then consume the same kWh you would have consumed. The same kWh can be either your electricity, or mine. The anonymous agents (kWh) are anonymous and interchangeable.

For each kWh – anonymous and interchangeable – that I consume, one Guarantee of Origin (GO) is cancelled (deducted, used). The audit made, guarantees that not any more kWh's than GO's are sold. Nota Bene: if no one consumes the kWh it will not be produced – hence no GO will be awarded to the producer. One GO per produced=consumed kWh. The kWh is produced and consumed in the exact same moment.

The system is explained in a schematic sketch from the RE-DISS project here:

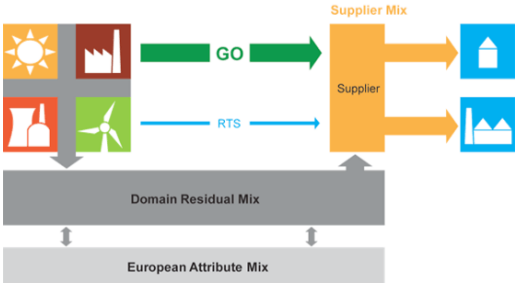

Fig. 2 The Reliable Disclosure Systems, Electricity Disclosure, schematic

3. Implications of the new perspective

3.1 The parallelism

When accepting the existing parallelism between the electric grid and the banking system as shown in this pedagogical four-square, one accepts that there is a moral choice of what power you buy. Just as there is a moral choice of what money you earn and put into your account.

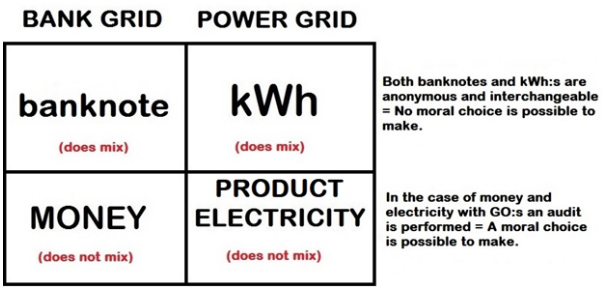

Fig. 3 The pedagogical foursquare

Now the possibility of choosing not to consume coal power is obvious. This choice is easy for people and companies looking for different ways of reducing their carbon emissions. There are many different kinds of zero or very low carbon products (electricity) to buy; wind power, hydro power, solar power, nuclear power or ecolabeled electricity. In Sweden and the Nordic countries Bra Miljöval [ ] is the most common ecolabel for electricity. In Germany all DB trains run on Ökostrom. { }

Fig. 4 Bra Miljöval Fig. 5 Ökostrom Fig. 6 EKOenergy

Internationally there is now also EKOenergy { }. All these different green products are connected in EU in that they use the same Guarantees of Origin distributed by the AIB (Association of Issuing Bodies, an EU organ) for the vital audit of produced kWh's versus sold and consumed kWh's.

3.2 The actual choice

In the above mentioned criticism of ecolabeled power the key point is that the resulting effect on the production mix is not changed. That's true. So far. But that can change. And we argue that there is a strong likelihood this will change. As the new perspective gains acceptance more and more consumers and companies, organizations and official institutions, individuals and nations, will choose to not have coal power in their outlets. All over the society the possibility of not buying coal power will most likely, due to increasing awareness of the Climate Crisis, increase the interest in, and actual choices of, choosing to not buy coal power.

Nota Bene: All that we state in this article is that it is possible to choose not to buy any coal power. We humbly propose it is likely that active consumer choices will increase, when the knowledge of the possibility of choosing not to have coal power in your home, increases.

In the new perspective of the Product Electricity the question of what effect my choice of purchased product (electricity) has on the total supply of fossil free power is not the relevant question. The (moral) questiona are:

- Do I want to have coal power in my outlets, or not? Do I want to buy coal power, or not?

These are the parallels to the question:

- What money do I want to have in my bank account?

Fig. 7 The bank in the fictitious town 'Drugsville'

The fact that it's very likely I will receive, in my hand, when I withdraw money from this bank in 'Drugsville', a banknote that has been part of a drug deal does not make my money, my salary, into drug money and it is absolutely no reason for me to start selling drugs. The argument:

"Since it's likely I will withdraw 'dirty' banknotes I might as well start selling drugs."

- is logically defect. As is the parallel:

"Since it's likely I will receive (in my electric outlets) some dirty kWh's I might as well start buying coal power."

Those arguments are illogical. And in our humble opinion, they are also immoral, given the scientific consensus in climate science regarding the risks of a "Hothouse earth" trajectory.[ ]

When choosing to buy organic bananas we don't do that, primarily, to change the world banana production but because we, personally, do not want to expose banana plantation workers for the carcinogenic pesticides used in non-organic banana production.[ ]

When choosing to buy organic coffee we don't do that, primarily, to change the world coffee production but because we, personally, do not want to expose coffee plantation workers for the toxic herbicides used in non-organic coffee production.[ ]

When choosing to buy ecolabeled power we don't do that, primarily, to change the world power production but because we, personally, do not want to expose our children for the dangers of the Climate Crisis. Our common moral choices can change the world. To quote Margaret Mead:

"Never doubt that a small group of thoughtful, committed citizens can change the world;

indeed, it's the only thing that ever has."

4. Problem and solution

As stated earlier, that it is possible to buy only the GO's separate from the Product Electricity is only making the understanding of the possibility to not buy coal power harder. The lack of understanding harms the positive effects that an active consumer power movement could have on the power market.

As a solution to this problem we suggest that the AIB must not be allowed to issue any Guarantees of Origin to be sold separately. GO's must only be allowed to be sold together with the actual product produced: a Product Electricity with Guarantees of Origin. This way Iceland will not be able to sell any GO's abroad. Norway still can – but they must sell the actual power together with the GO's. They are not to ever be sold separately from each other.

In theory this should not be needed but since the market still has not understood, now 24 full years after the deregulation of the Swedish power market, we think this concession will become a good and successful compromise. Norwegians still think they consume hydropower, when they actually consume a very dirty Product Electricity. Based on Hansla's studies we suggest that it is a very low likelihood that Norwegians knowingly would choose to consume coal power. [ ]

5. Discussion – the new picture

Actually the Product Electricity is saved, without any losses. It is 'stored' (in sorts) in Oslo, at Nordpool. It is not an energy storage. It's a digital storage for the GO's.

When a kWh is produced it is at the same time consumed. The kWh is consumed. But the Product Electricity with a Guarantee of Origin is not consumed, The GO issued for this produced/consumed kWh is stored digitally at the utility that received the GO from AIB. The GO is cancelled only when the buyer of said electricity does consume another kWh, at another time. The GO makes it possible to store the Product Electricity by storing GO's and that is done without any losses. This is ideal and purely digital. To make a schematic picture of the new perspective we suggest this picture of the route of the Product Electricity in the Nordpool power market.

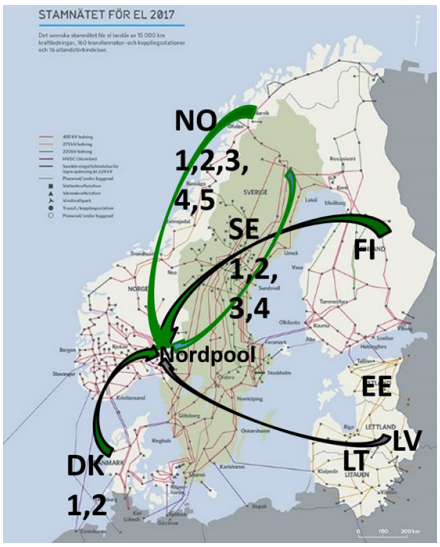

Fig. 9 The route of the Product Electricity in the Nordpool power market

Fig. 10 Energy is stored in the physical world and GO's are stored in the digital world

(HBF)2 = Hydropower dams, Batteries, Fuel cells, Hydrogen gas, Biogas, Fuels (e.g. Solar fuels)

The task of power regulation, keeping the grid stable at 50 Hz, is parallel to having all ATMs stacked full with banknotes to allow large, sudden withdrawals anywhere, any time of day, 7 days a week.
Nota Bene: kWh are mixed, banknotes are mixed. They are both anonymous and interchangeable.

Fig. 11 Power regulation is equal to stacking all ATM:s full with banknotes

6. Conclusion

We conclude by stressing that popular education in this matter is needed and that as a first step the official Nordic Ecolabel (the Swan) and the official German Ecolabel (the Blaue Engel) should adopt the criteria that all companies wanting to be a licensee to the Swan or the Blaue Engel must buy ecolabeled power. There should be no further discussion needed about such an obvious criteria once it is understood that it is possible to choose to not consume coal power. Then other eco labels should follow, e.g. the EU Ecolabel and TCO Certified

Fig. 11 the Swan

Fig. 12 Blaue Engel

Fig. 13 EU Ecolabel

Fig. 14 TCO Certified

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