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An assessment of experiences in the U.S.A. with power and emissions disclosure information for energy consumers

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Abstract:
A new Norwegian electricity directive that will take effect in 2007 will mandate the compliance of Norwegian electricity utilities with the European Unions EL Directive (2003/54/EC, par 6). The EU Directive states that all electricity suppliers will be required to provide their customers with 'power disclosure' information on the fuel mix and emissions resulting from energy generation. The USA has a decade of experience with the implementation of power disclosure information. The experiences in the USA form a valuable source of insights and information on the pros and cons of various forms for power disclosure. These insights serve as a source for further testing in Norway and as a resource on which Norwegian authorities and energy suppliers can draw in their further development of guidelines and compliance schemes. In this report, the US experiences with power and emissions disclosure are reviewed and their relevance for Norway discussed. Emphasis is given to the ways that information has been provided to customers, such as whether information should be provided on the energy bill or as a billing insert; whether a graphical or tabular presentation of the information should be used; whether and how to provide a basis of comparison of a given suppliers power mix with that of others. Recommendations are made as to how Norwegian suppliers can best achieve an effective and consumer friendly format for power disclosure information.

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1 Introduction

A new Norwegian electricity directive that will take effect in 2007 will mandate the compliance of Norwegian electricity utilities with the European Unions EL Directive (2003/54/EC, par 6). The EU Directive states that all electricity suppliers will be required to provide their customers with information on the fuel mix and emissions resulting from energy generation. The purpose is to make fuel mix and fuel source pollution more visible. The theory is that this will increase consumer awareness and motivate some consumers to switch to renewable or less polluting energy sources; further, it might lead consumers to take steps to reduce their electricity consumption. It is anticipated that power disclosure labels will also have an effect on suppliers, some of which may be interested in 'greening' their profile by increasing their mix of renewables and decreasing fossil fuel or nuclear generated power.

The EU Directive contains some minimum standards for the ways that the power disclosure and emissions information is to be provided, but also allows for some flexibility. For instance, the Directive stipulates that at a minimum the information must be up to date (based on last year), must be provided at least once a year and must be controlled by a government regulator. Beyond that, the form for presentation is left up to suppliers. In Norway, minimal guidelines have been announced to steer the ways that energy suppliers implement power disclosure. These allow considerable leeway in adaptation. For example, important issues such as the information's placement (on bill or as insert), design, layout and some content issues, such as whether or not a comparative 'average' power mix for Norway is provided, are all left up to energy suppliers.

Left unanswered are a number of questions regarding customer response. Some of these were addressed in a pre-study for the EU Commission (Boardman and Palmer 2003) – these will be discussed in section 6. However, only one EU country (Austria) has thus far fully complied with the disclosure directive and no comprehensive post-implementation assessments have been carried out. Thus there have as yet been no post-implementation evaluations in Europe. The USA, on the other hand, has a decade of experience with the implementation of power disclosure information. A first wave of States implemented power disclosure in the late 1990s. By 2005, more than 40% (21) of the US states had implemented power disclosure and an estimated 60% of the US population received power disclosure information (Delmas et al. 2006). The experiences in the USA form a valuable source of insights and information on the pros and cons of various forms for power disclosure. These insights serve as a source for further testing in Norway and as a resource on which Norwegian authorities and energy suppliers can draw in their further development of guidelines and compliance schemes.

In this report, the US experiences with power and emissions disclosure are reviewed and their relevance for Norway discussed. The report is based on interviews with key persons and institutions in California in August 2006, as well as a review of journal articles, reports and web-based information provided by researchers, public authorities, power regulators and energy utilities in the United States. Two questions have directed the research:

- What insights can be gleaned on the strengths and weaknesses of different U. S. programs and information designs?
- What general lessons can be drawn from the US experience on how Norway might go forward to implement disclosure information, accounting for the perspectives of US public authorities, energy suppliers and consumers?

Emphasis will be given to the ways that information has been provided to customers, such as whether information should be provided on the energy bill or as a billing insert; whether a graphical or tabular presentation of the information should be used; whether and how to provide a basis of comparison of a given suppliers power mix with that of others, for example providing the average mix of all Norwegian suppliers. The report will also touch on the issues of tracing power sources and insuring the reliability of the information.

2 Background on power disclosure and restructuring in the USA

The idea of power disclosure information grew up in the 1990s in conjunction with the wave of interest across the United States in deregulating (restructuring) the electricity industry. Similar to the rationale a decade later in Europe, it was thought that with the introduction of choice of supplier, the provision of information on power mix and emissions would raise awareness and provide a basis for those motivated by environmental concerns to choose suppliers with a greater proportion of renewables in their production portfolio. By making power mix transparent, consumers would be given a basis to make more informed choices about their electricity supplier. It would also raise awareness about the contributions of environmentally problematic fossil fuels and nuclear power.

There is lots of evidence that awareness of energy supply sources was quite low in the USA at the time of the re-structuring wave in the USA in the late 1990s. One of the first groups to conduct research on customer awareness and potential response to power disclosure was Resource Solutions in California. Its Director, Jan Hamlin (interview) conducted focus groups in California. The results revealed extremely low awareness among participants concerning the sources of their electricity. When asked where their power comes from, many participants pointed to "Hoover Dam" in Nevada. In actual fact, power from Hoover Dam made up less than 20% of the respondents' energy mix (the rest being composed mainly of fossil fuels and nuclear-generated electricity). Given the general low level of knowledge in California and elsewhere, it was believed that power disclosure, if done in a way comprehensible to the average consumer, had a huge potential for raising awareness about power mix and its environmental consequences.

Public authorities were also interested in pressing energy suppliers to increase their renewable generation and decrease the use of polluting fuels. It was hoped that power and emissions disclosure would provide an incentive, opening a new avenue for energy companies to distinguish themselves in the market through increasing their green profile. As the California Energy Commission formulated it (2004:3), "the power content label allows retail providers of electricity to distinguish their products from other electricity products in the market on the basis of relative mix of fuel source." As we will see, the theory has been validated in many of the US States that have restructured their energy markets. An interesting point that will be developed below is that power disclosure has also had some of the same desired effects in so-called captive markets. In several of the States which have not deregulated, there is evidence that power disclosure has lead to increased interest in green power programs.

California is an example of a state where the original motive for power disclosure was related to its plans for deregulation. Electricity markets in California were deregulated in 1997 and a retail power pool created. After significant problems with the pool and with rapidly fluctuating retail prices, California decided to return to public regulated energy distribution a few years later, re-establishing regional monopolies and repealing the option for consumers to choose their energy suppliers. Nonetheless, power disclosure was retained as a mandatory

piece of information.[1] It seems that within only a few years, power disclosure had come to be taken for granted as essential consumer information. This rapid embracement by bptj consumers and public authorities was likely exacerbated by the long consumer tradition in the USA with product disclosure and the "right to know" the composition of consumer products. Another factor was that many energy suppliers began to take advantage of the marketing potential that power disclosure provided. According to Sedano (2002), energy suppliers in both free and regulated markets began to use a "green" profile – made visible by power disclosure - in their marketing. To summarise this point, power disclosure is increasingly being seen as a normal piece of billing information in the USA, both in States with monopoly and restructured energy markets.

3 Choice of fuel mix categories

The first important question concerning the power disclosure information is which categories of fuel to display for consumers. In most States, this is mandated by public authorities. In only two States, Vermont and Virginia, are electricity suppliers allowed choose which production categories to highlight. First and foremost, the categories chosen should separate non-renewable from renewable energy sources. Table 1 lists categories used in the 21 US states that had mandated power disclosure by 2005.

Coal, Gas, Oil and Nuclear are all fairly standard non-renewable categories. Looking at renewable energy, solar, wind and biomass are standard categories for most States. Geothermal energy is listed separately by a few States. Hydro power is dealt with differently from State to State. This is because some States have decided that consumers should be made aware of the differences between large hydro, seen as having negative environmental consequences, and small hydro, which has lesser effects on the local environment. California is one of the States that mandates that energy suppliers highlight the distinction between large and small hydropower. According to interview respondents, many of the large California energy suppliers have not been pleased with this requirement. A few have still not complied, while others have done so only after NGO pressure and public attention. As a result of these debates about hydro, the Low Impact Hydro Institute (LIHI) was established to certify whether a hydropower plant could be certified as renewable or not.[2] LIHI has thus far certified a few plants in California.

[1] The post re-regulation strategy in California is to promote renewables through the use of targets and regulations. California Renewables Portfolio Standard (RPS) was established by Senate Bill 1078 (SB 1078, Chapter 516, Statutes of 2002, Sher) in 2002, and calls for the state's investor-owned utilities (IOUs), energy service providers (ESPs), and community choice aggregators (CCAs) to meet 20 percent of their electricity load with eligible sources of renewable energy by 2017. To reach this target, each obligated load-serving entity must increase by at least 1 percent annually the percentage of its load served by renewable energy. In 2005, the governor of California has declared that the State will achieve 20% renewables in power consumption by 2010 and has initiated a number of programs and incentives to encourage this.

[2] In order to be certified by the Institute, a hydropower facility must meet criteria in the following eight areas: (1) river flows; (2) water quality; (3) fish passage and protection; (4) watershed protection; (5) threatened and endangered species protection; (6) cultural resource protection; (7) recreation, and (8) facilities recommended for removal.

LIHI writes on their website (http://www.lowimpacthydro.org/) the following "The criteria standards are typically based on the most recent, and most stringent, mitigation measures recommended for the dam by expert state and federal resource agencies, even if those measures aren't a requirement for operating. A hydropower facility meeting all eight certification criteria will be certified as a Low Impact Hydropower Facility, and will be able to use this certification when marketing power to consumers."

Table 1. Categories of power mix displayed by U. S. State[3]

	Coal	Gas	Oil	Nuclear	Hydro	Large hydro	Small hydro	Solar	Wind	Bio-mass	Geo-Thermal	Imports	System average
Arizona	*			*				*					
California	*	*		*		*	*	*	*		*		*
Colorado	*	*	*	*	*			*	*		*	*	
Connecticut	*	*	*	*			*	*	*	*		*	*
Delaware	*	*	*	*	*				*		*		
Illinois	*	*	*	*	*			*	*	*	*		*
Iowa	*	*	*	*	*			*	*	*		*	*
Maine	*	*	*	*	*			*	*	*	*		
Maryland	*	*	*	*	*			*	*	*		*	
Michigan	*	*	*	*	*				*	*	*		
Minnesota	*	*	*	*	*			*	*	*			
Montana	*	*		*			*	*	*	*			*
Nevada	*	*	*	*	*			*	*	*	*		*
New Jersey	*	*	*	*		*	*	*	*	*			
New York	*	*	*	*	*			*	*	*			
Ohio	*	*	*	*	*			*	*		*	*	
Oregon	*	*		*	*				*			*	
Texas	*	*		*	*			*	*	*			*
Vermont[4]	-	-	-	-	*			*	*	*			
Virginia[5]	-	-	-	-	-			-	-	-	-	-	
Washington	*	*	*	*	*			*	*	*	*	*	

4 Systems for estimating and reporting the sources of power

Once the categories of power sources to be displayed for consumers is established, a procedure must be developed for reliably tracing, or tracking the power from source to point of consumption. This movement of power from source to consumption is complex. It can either be traced by following the flow of transactions in electricity markets or through tracing the flow of environmental attributes associated with the various power sources. Since the emphasis in this report is on the content and display of the information for consumers, I will not give a detailed analysis of the ways these flows are tracked. I will rather highlight two general approaches taken in the USA.

[3] Note: The table was put together using information on the web site: http://www.dsireusa.org/summarytables/reg1.cfm?&CurrentPageID=7&EE=0&RE=1

[4] Vermont does not specify categories for conventional (non-renewable) power.

[5] Virginia does not specify which fuel sources should be listed, but fuel mix should be broken down "to the extent feasible", as stated in the Virgina State Code on power disclosure (VA code 56§592).

US States use either tracking or tagging as a basis for power disclosure. Tracking follows the actual physical exchange of power between energy producers and suppliers. Tagging uses a system of tagging environmental attributes, which are traded separately from power.[6] Each system has its advantages and disadvantages. Tracking the physical exchange of power is technically complex and expensive. Tagging environmental attributes requires thorough control mechanisms. Tagging is more difficult for consumers to grasp and is more likely to lead to doubt about the trustworthiness of reporting (Sedano 2002).

4.1 Tracking power exchanges

The Regulatory Assistance Project (RAP 1996:4) uses the metaphor of adding and taking water from a lake to capture the idea behind tracking:

> The electricity delivery system can be visualized as a lake to which suppliers add water (electrons) at many different points, and consumers take water (electrons) out at many other points. In a competitive market, customers will take power from the grid and pay specific suppliers who either have delivered the power or have had others deliver it. What is known with certainty is which suppliers are paid and what power plants they use to add to the lake of electrons.

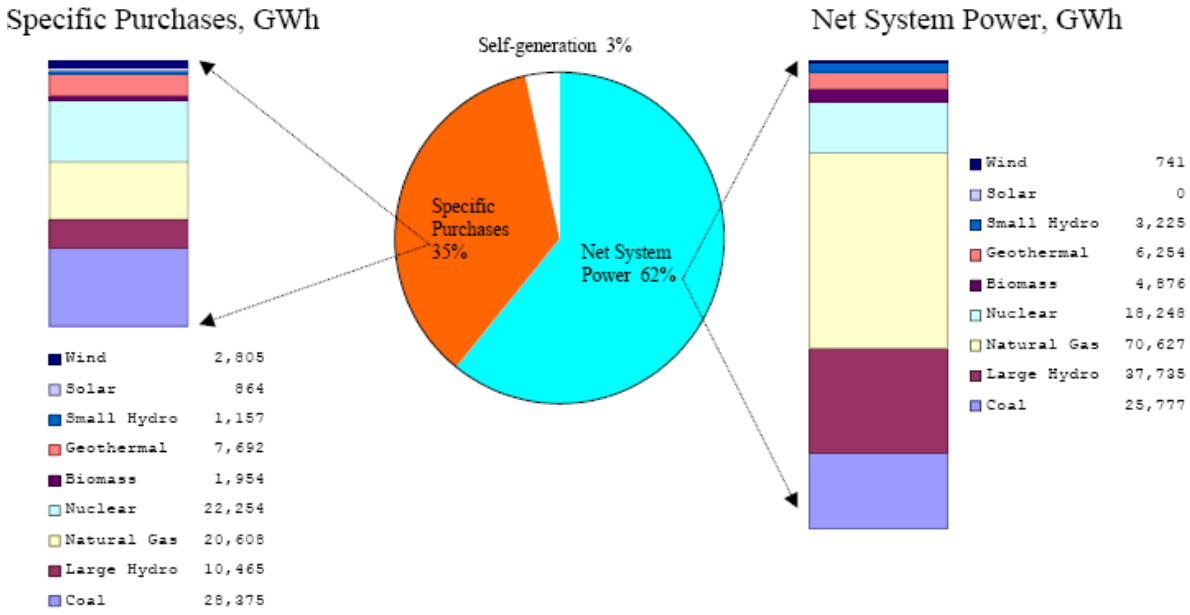
In New York, there is an elaborate tracking system in which the Public Services Commission (PSC) plays a significant role. By using information on contracts between producers and distributors, as well as through records of transactions in the power market, the PSC makes all the basic disclosure calculations and provides energy suppliers with the label they are to use.

In California, the Public Utilities Commission (PUC) provides energy suppliers with the "average power mix" (the list of fuel types in the generic, undifferentiated power available for sale in California). The power sold to a customer is deemed to be in line with this average mix unless the retailer makes verifiable claims that it has made specific purchases from wholesale generators of identified fuel types. These specific purchases then allow the retailer to claim that the power it offers for sale to its customers is different from the net system power. Those who claim specific purchases of renewables are supposed to submit their claims for audit and evaluation to the California Energy Commission (according to interview informants this is not done systematically). Figure 1 is an example produced by the CEC. It shows how a given energy supplier can come up with its unique power disclosure profile through differentiating between its purchases from the power pool, its specific contracted purchases outside the pool and its self-generated power.

On the Power Content Label provided by the supplier, net system power is called "California Power Mix." Imports of out-of-state generation are included in net system power by fuel type, but both self-generation and specific purchases are excluded from net system power.

[6] See Sedano 2000: 23-25 for a detailed description of 'tagging' and 'tracking' systems for energy transactions.

Figure 1
Details of 2002 Gross System Power



Source: California Energy Commission, report CEC 300-03-002

4.2 Tagging green attributes

In a tagging system, described comprehensively in Sedano (2002), the fuel and environmental attributes are separated from the energy. The attributes are recorded on a certificate and the trading of certificates then forms a basis for coming up with power mix. The six New England States use a tagging system as a basis for power disclosure. An organisation called NEPOOL, a membership organization of market participants including end users, administers the information. What they call 'The Generation Information System' uses tradable renewable credits to tag renewable power. It provides the energy suppliers with a statement of the renewable credits based on what they purchased or were assigned during the previous quarter, and this information is then incorporated into the energy supplier's label.

4.3 Control and evaluation

From the point of view of the consumer, whether energy is tagged or traced is not important. What consumers are interested in is reliability, accuracy and comprehension. Many States address the question of reliability by having the retailer submit all information supporting the label to regulators. As discussed above, in New York, the regulating authority actually gathers the information and puts the data together for retailers. The tagging system in New England is also controlled by a publicly appointed administrator. However, most States give energy suppliers both the responsibility for gathering information and for presenting it to consumers. The public authorities are supposed to periodically check and inspect the information. According to Sedano (2002), who reviewed evaluation systems in 2002, this prospect of inspection, coupled with a form for punishment should errors be found, is

important to assuring that the information is rigorously handled and reported. Golove (interview) claims that in California the evaluations have not been "systematic" and that this has opened for faulty reporting.

Resource Solutions in San Francisco, the convener of the Green-e certification program has developed an auditing system for its Green-e certified energy suppliers. In fact, a condition for Green-e certification is that the participant energy supplier agrees to full disclosure of the supplier's power mix and for both verification and audit. The companies that participate must submit to an audit by a CPA. Resource Solutions maintains a list of CPAs with experience in power disclosure accounting.

5 Presentation of information

This section will address issues concerning the design, layout and presentation of the power disclosure and emissions information.

5.1 Design

Based on my interviews and the fledgling literature on consumer reaction to power disclosure information, it seems that very little was done in the US prior to implementation of disclosure in the way of testing consumer preferences for information design. In the only extensive tests of design I came across, customers in focus groups in New England, California and Washington were presented with different forms for presentation of both power mix and emissions, including text, tables, graphs and pie charts. The overwhelming conclusion from these studies was that a pie chart was the preferred form for presentation of the power mix and that a bar graph was preferred as the form for presenting emissions (Teisl et al. 1997:3). All of the consumer groups indicated that technical language such as "system power" should be avoided and that an effort be made to use non-technical language.

These results are interesting in light of actual practices in the U. S. States. Of the 16 States that had mandated disclosure information in 2002, only 4 used pie charts. The remaining 12 used a table format. From what I can discern from interviews, the suppliers have chosen to use tables mainly because they are technically easier to prepare. Another reason given is that in a pie chart, power sources with zero contribution disappear from the chart, whereas in a tabular form, all of the categories continue to be listed (even though they may have a zero entry). Based on the author's own research with disaggregation of household energy use (Wilhite et al 1999), consumers like the simplicity and clarity that pie charts provide.

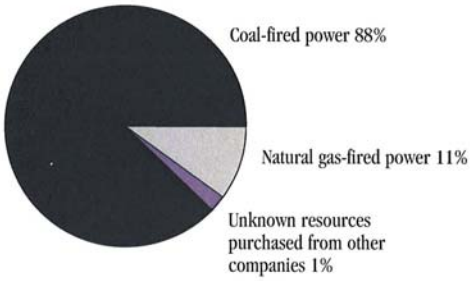
Illinois is one of the four states requiring a pie chart. An example of the disclosure information provided by Alliant Energy is shown in figure 2.

Note that the information combines a pie chart with a table, increasing the amount of space and information, but providing the consumer with both a readable and comprehensive presentation. Two examples of the tabular design for power disclosure are those that the States of Michigan and Texas, respectively have recommended for its energy suppliers (see Figure 3.

ENVIRONMENTAL DISCLOSURE

Alliant Energy – Interstate Power and Light – Illinois

Sources of electricity supplied for the 12 months ended 9/30/05



Sources of electricity supplied for the 12 months ended 9/30/05	Percentage of total
Biomass power	0%
Coal-fired power	88%
Hydro power	0%
Natural gas-fired power	11%
Nuclear power	0%
Oil-fired power	0%
Solar power	0%
Wind power	0%
Other resources	0%
Unknown resources purchased from other companies	1%
Total	100%

AVERAGE AMOUNTS OF EMISSIONS and AMOUNT OF NUCLEAR WASTE per 1000 kilowatt-hours(kWh) PRODUCED from KNOWN[1] Sources for the 12 months ended 9/30/05

Carbon dioxide	2,041.09 lbs.
Nitrogen oxides	3.40 lbs.
Sulfur dioxide	6.42 lbs.
High-level nuclear waste	0 lbs.
Low-level nuclear waste	0 cubic feet

FOOTNOTE

(1) 1% of the total electricity supplied was purchased from other suppliers and the amounts of emissions and amount of nuclear waste attributable to producing this electricity is not known and is not included in this table.

Additional information on companies selling electrical power in Illinois may be found at the Illinois Commerce Commission's World Wide Web site (www.icc.state.il.us).

The disclosure of this information is required under Section 16-127 of the Electric Service Customer Choice and Rate Relief Law of 1997 and the rules of the Illinois Commerce Commission, 83 Ill. Adm. Code 421.

ALLIANT ENERGY

ILL 111118 1/06 15M JS

Figure 2. Alliant Energy, Illinois' power disclosure label.

Fuel Sources	Percentage of fuel types used to produce [supplier's name] electricity.	Percentage of fuel type used to produce electricity in Michigan, Illinois, Indiana, Ohio, and Wisconsin.
Coal	**45.4**	**71.3**
Nuclear	**30.9**	**22.7**
Gas	**5.2**	**3.8**
Oil	**1.1**	**0.8**
Hydroelectric	**13.9**	**0.5**
Total Renewable Fuel	**3.5**	**0.9**
Biomass	**1.6**	**0.1**
Biofuel		**--**
Solid Waste Incineration		**0.2**
Wind	**1.6**	**--**
Wood		**0.5**
Other		**--**

Note: (1) Biomass above excludes wood; solid waste incineration includes landfill gas, and (2)" -- " indicates not applicable or negligible, less then 0.1%.

Airborne Emissions and High-Level Nuclear Waste Comparison [supplier's name] vs. regional average for the 12-month period ended [month/day/year].

Type of emission/waste	[supplier's name] average lbs/MWh	A regional average of all generation in Michigan, Illinois, Indiana, Ohio, and Wisconsin
Sulfur Dioxide	**5**	**19.9**
Carbon Dioxide	**1,963**	**2,117**
Oxides of Nitrogen	**4.8**	**7.9**
High-level nuclear waste	**0.0054**	**0.0074**

Figure 3. The Michigan power disclosure guidelines for energy suppliers[7]

[7] Prepared by: the Staff of the Michigan Public Service Commission, Executive Secretary Division, Statistical Analysis Section, January 23, 2002.

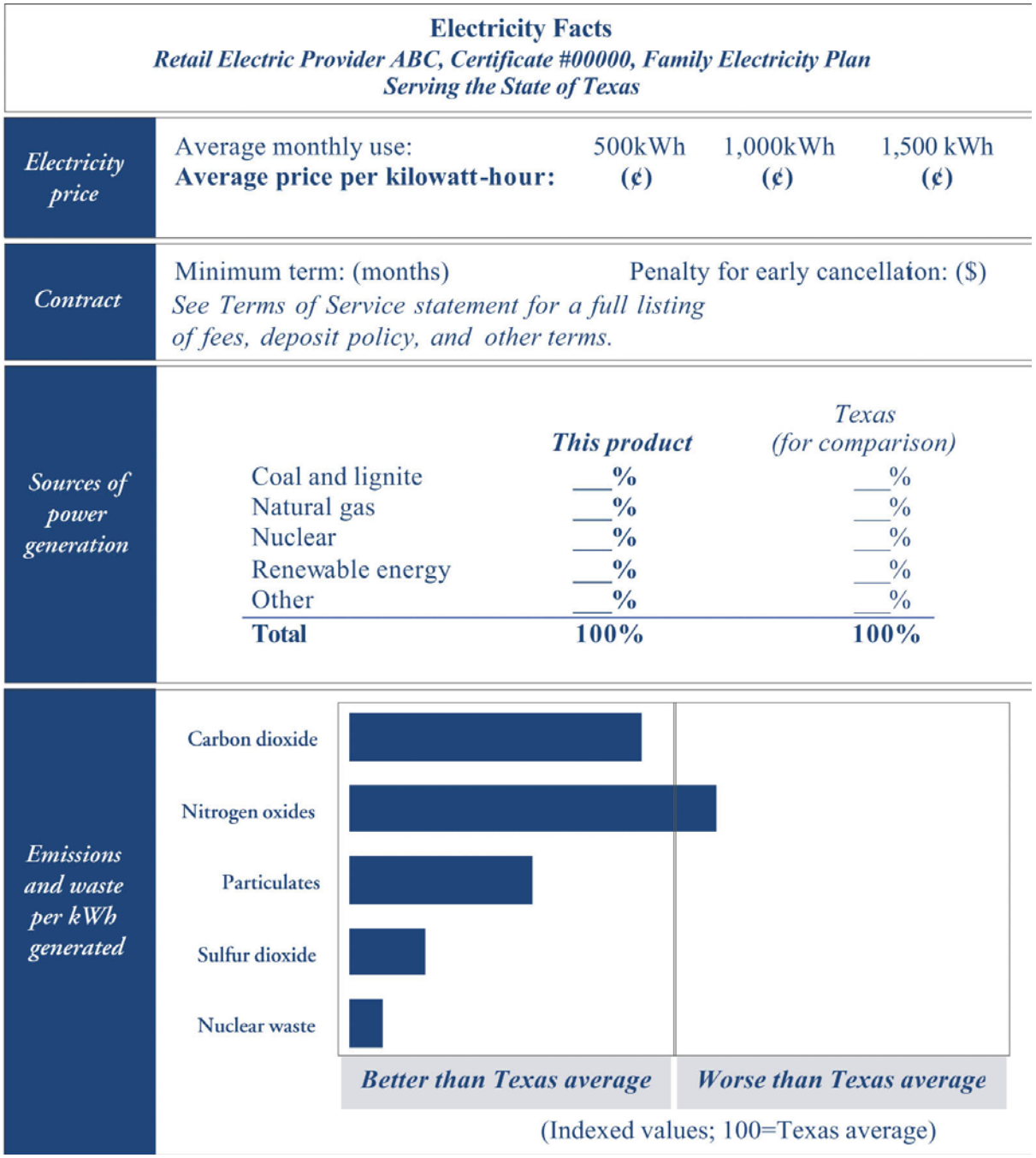


Figure 4: The Texas guidelines for its energy suppliers on power disclosure.[8]

Concerning emissions disclosure, note that Texas uses a bar graph to illustrate emissions information. Based on earlier studies in Norway and in the USA, bar graphs are preferred over text for presenting amounts (Wilhite and Ling 1995).

[8] see http://www.powertochoose.org/publications/factslabel.pdf

A pie chart would not be appropriate because the chart displays amounts rather than percentage contributions that add up to 100%, as in the case of power disclosure.

5.2 Provision of a reference (average) for comparison

Providing either a breakdown of power sources or emissions is meaningless for the average household consumer without framing the data in relation to the breakdown and emissions of the alternatives, i. e. other energy suppliers. This data is essential in giving the consumer a basis for evaluating whether their energy supplier relies more or less than the average amount of renewable energy and whether it produces more or less of the listed pollutants.

Where this average is placed and how it is presented is dealt with in different ways in the U. S. Looking at the illustrations above, we see that Texas and Michigan are examples of two States that provide the averages together with the fuel mix. This provides the reader with a context for comparison. The Illinois supplier (figure 2), does not give any comparative information on the power disclosure label, but rather refers the reader to a web site. This has the advantage of giving access to more comprehensive information, such as access to all of the given States power labels, but has the significant disadvantage of demanding an additional action by the reader in order to make sense of the disclosure information.

Concerning the emissions information, a reference to an average is also essential. The Texas graphic is a good example of a clear and simple transposition of the average onto the bar graph. The text “better than average” and “worse than average” eliminates any confusion about how the given emissions compare with the average.

5.3 Placement of the label

The placement of the information can be decisive in determining whether or not consumers give it their attention; yet, this is another issue which seems not to have been analyzed or tested by US authorities prior to implementing information disclosure. There have evidently neither been any post-implementation tests of customer response to placement of power disclosure information

Most of the energy suppliers in the USA provide the disclosure information in a billing supplement. A separate page is inserted into the billing envelop. Research in Norway shows that billing inserts get little attention from recipients (Wilhite and Ribeiro 1988). When the presentation of historical comparative consumption was tested in Oslo, it was determined that a placement on the front of the billing statement drew most attention, followed by the reverse side of the bill and lastly by an insert (Wilhite and Ling 1995).

A glance at the layouts for USA power disclosure exemplified in the figures above shows that there is not enough space on the front side of the bill for the pie chart, tables and text. The reverse side of the bill is perhaps the next best alternative. Placement is an issue that deserves careful attention and will be revisited in section 7.

5.4 Frequency

The majority of US States require reporting of power disclosure only once a year. A few report the information semi-annually or quarterly. Given that “average system power” is only calculated once a year in most states, and that this is an important ingredient in calculating power mix, reporting the power mix information more often than once a year would simply mean that the same information would be repeated. While frequent provision of information is important from the point of view of consciousness-raising, repeating the same message over and over again could have the opposite effect of boring the recipients and resulting in a

loss of interest. Given this, I agree with Hamrin's (interview) assessment based on her California focus groups that reporting fuel mix information once a year is sufficient.

6 Consumer response to power disclosure

Power disclosure is only one of many new efforts in the United States, both market-based and regulatory, the purpose of which, either directly or indirectly, is to increase the proportion of energy production from renewable energy. Because of this multiplicity of efforts, it is a difficult task to sort out what kinds of changes can be attributable to the power disclosure alone. Nonetheless, from my interviews in the USA there was a widely shared impression that disclosure has been responsible for

1) Greater awareness about energy sources
2) Changes in choice of supplier (in States with deregulated electricity markets)
3) Greater interest in green pricing programs

In a study of 145 major investor-owned energy utilities, Delmas et al. (2006:23) found "a surprisingly large impact of information disclosure programs". This impact was greatest among residential customers. Comparing those receiving power disclosure information with those who do not, Delmas et al. found that for those who received it there were statistically significant decreases in the amounts of fossil fuels and nuclear power in the fuel mixes and significant increases in the amounts of renewables.

There are two ways in which customers can change their fuel mix. In states with restructured markets, they can change to a supplier with for example a higher mix of renewables or a lower mix of fossil-based energy. In states such as California in which choice of energy supplier is fixed, the increase awareness can manifest itself in an increasing interest in green pricing programs, as well as in Green-e certification and other kinds of programs premiering renewable energy. According to Bird et al. (2004), the number of customers participating in green pricing programs in the USA increased nearly five-fold between 1999 and 2003. These programs vary in their design and conditions, but the principle is that in return for a guaranteed renewable portfolio, the consumer either pays a higher kWh price or agrees to a long term contract.[9] The Austin Energy Utility's program - the company offers a guaranteed renewable portfolio in return for the signing of a 10 year, fixed price contract - is so popular that it is fully subscribed and has been turning away customers for the past year. In the meantime the utility has been working on obtaining access to more renewable-based energy, thus underlining that the power disclosure has realised its ultimate aim.

One of the fastest growing and best known of the programs to encourage renewables is the Green-e program, initiated in 1997 and administered by Resource Solutions in San Francisco. Green-e helps local communities around the country to establish chapters which certify products for the Green-e label. For manufacturers and retailers, the label signifies that a product uses a certain amount of green energy in the manufacturing process or that the company invests a certain amount in renewable energy. An energy supplier can buy Green-e certificates and then resell them to their customers as green power. As described above, local Green-e organizations audit the power disclosure information of energy suppliers which have qualified for the label.

To sum up this section, demand for renewable energy is growing in the USA and there is evidence that power and emission disclosure is a part of the reason for this change. Given the

[9] An example of the former is offered by Sacrimento Municipal Utility in California and an example of the latter is Austin Energy in Texas.

many other renewable initiatives, including governmental, informational and market-based, it would be impossible to make a claim for a specific amount of change in energy demand related to power and emission disclosure. Nonetheless, based on the results of previous studies, there is reason to claim that making electricity delivery more transparent - revealing where it comes from, where it goes in the home and giving a basis for tracing changes - is an important pre-requisite to making other informational and motivational programs interesting and effective.

7 Conclusions and implications for Norwegian adaptation

The EU directive sets the general guidelines for Norwegian implementation of power and emissions disclosure. The guidelines are broad, providing for considerable flexibility on the ways in which individual countries choose to provide the information. To recapitulate, there are four explicit requirements:

(1) The overall fuel mix over the preceding year must be provided in or with energy bills and in promotion materials to customers.

(2) Emissions of CO2 and radioactive waste associated with energy production must be at a minimum referenced on bills or in inserts and information provided on, for example, a web site.

(3) Concerning electricity obtained by way of an electricity exchange or imported from an undertaking situated outside the country, "aggregate figures provided by the exchange or the undertaking in question over the preceding year may be used."

(4) A system must be established to control quality and reliability of the information.

In the following, I summarise findings from the USA and draw on the scoping study for European adoption (Boardman and Palmer 2003) to point to issues of relevance for Norwegian adaptation. I limit this summary to a discussion of points (1) and (2), having to do with the interface with consumers. Concerning tracking and control, points (3) and (4), I leave it to the experts on the Norwegian power delivery system to make judgements on optimal Norwegian adaptation.

7.1 Consumer motivation

As pointed out above, no comprehensive pre-studies of consumer interest in power disclosure were done in the USA prior to its implementation. However, in those few studies where consumer interest was tested, it was consistently high. The scoping study for Europe by Boardman and Palmer did focus groups and telephone surveys in 7 European countries, including Sweden. 80% of households stated that they would find it useful to have their electricity mix and environmental impact of their electricity shown on a label.

As far as emissions disclosure is concerned, it was not tested in focus groups in the US. In the European study, there was a lower interest in emissions disclosure (compared to power disclosure), mainly because participants in focus groups found the information difficult to understand and interpret (Boardman and Palmer 2003).

As for the potential of the information to lead to changes in behaviour, there is evidence in the US that the information is related to an increased interest in renewable energy and in energy suppliers that offer a higher renewable mix. Delmos et al. (2006) found that increase in green pricing programs increased by a factor of 5 in States with power disclosure. A study in New York by Sedano (2002) showed that emissions disclosure had substantially increased consumer interest in the New York Power Authority (NPA), whose member utilities have a

low amount of CO2 emissions relative to the other energy suppliers in the region. The NPA CO2 emissions rate is about 40% of the state average. Other energy suppliers in New York have been "left in the difficult position of trying to explain to their customers why their emissions are so much greater than the state average (Sedano 2002:35)."

In Norway, predicting consumer response is complex because of the predominance of hydropower in electricity production and a lack of a clear distinction in people's minds as to its placement on a scale from environmentally problematic to friendly. Will people be comforted by the large amount of their energy consumption supplied by hydro-generation and thus not be motivated to change (either behaviour or supplier)? Or will the revealing of the relatively small but increasing amounts of imported energy, much of it based on non-renewable energy, motivate change? And would this change be towards companies that use a greater mix of hydropower, or to other renewable sources such as wind and biomass? These are important questions that deserve close observation and further testing.

7.2 Design and layout of the information

Choice of categories of energy supply. The specific categories to be displayed for the customer are not delineated in the EU directive. Looking at the USA experience, in the conventional (non-renewable) energy production categories, Coal, Gas, Oil and Nuclear are fairly standard. In the renewable category, solar, wind and biomass are standard categories for most States. The category hydropower has an ambiguous status, with some states treating large and small hydropower as separate categories and specifying both in their disclosure information. Whether or not hydropower is a single category, there is good reason to believe that making the large contribution of hydro transparent will be positive for Norwegian energy suppliers interested in selling to the European market. The Boardman and Palmer (2002) study found that European customers say they are willing to pay up to 5% more for renewable energy.

For the Norwegian domestic market, where differences in the power source profiles among utilities are small, power disclosure will draw attention to non-hydro based renewables and may contribute to increased interest in suppliers with a greater proportion of solar, wind and biomass. In this market, the differentiation between small and large hydro might make a difference to consumers. This is a question that ought to be raised in further consumer testing.

Presentation of information. Focus groups in the USA preferred pie charts over tables as the most understandable presentation form for power mix. Nonetheless, only a few states recommend that energy suppliers use pie charts. An exception is the state of Illinois, which has mandated the pie chart supplemented by a table (figure 2). The design was recently selected as the best USA power disclosure label by The U. S. Department of Energy and the Union of Concerned Scientists. In the European scoping study, respondents also indicated a strong preference for pie charts supplemented with a table. In Norway, tests of presentations of energy information – in this case, where energy goes in the home – showed that customers overwhelmingly preferred pie diagrams. Thus there is good reason to believe that pie diagrams would be the most effective and comprehensible way to present information.

As discussed above, providing power mix and emissions is fairly meaningless without giving the recipient a basis to compare the profiles of their energy supplier with those of other suppliers. In the focus groups conducted in Sweden (in the Boardman and Palmer study), respondents indicated that they wanted not only an average, but in addition a booklet giving the fuel mixes of all of the Swedish energy suppliers. Such a booklet has now been prepared by the Swedish consumer agency. For Norway, at a minimum the average fuel mix and average emissions should be a part of power disclosure information. Norwegian authorities

should consider supplementing this average with more detailed information on the power mix and emissions of all Norwegian electricity suppliers.

Placement of information. The EU Directive specifies that the fuel mix information be provided on the electricity bill or in a bill insert. The emissions information need not be presented on the bill, but rather can in the form of a reference to a web site or other existing reference sources. The USA experience reveals that this issue of placement has not been tested or evaluated with US consumers. In the Boardman and Palmer study in Europe, respondents indicated a strong preference to having the information on or with the bill. Wilhite's early studies (1988, 1995, 1999) on placement of billing information concluded decisively that information on bills is much more effective than information provided on bill supplements. Given the space needed to lay out the information, it may not be possible to fit the disclosure information on the front side of the billing statement. In this case, the reverse side of the bill is the next best choice. The effectiveness of information placement should be tested in the next phase of the project.

7.3 Concluding remarks

Power disclosure has been a popular and successful information strategy in the United States. Consumers like it because it makes transparent something previously invisible to them: the relative amounts of polluting and non-polluting fuels contributing to their electricity demand. Experience from the USA confirms that this transparency raises awareness. For those who are environmentally motivated, there is evidence that disclosure is related to two kinds of responses: one being an interest in finding a supplier with a more environmentally friendly energy mix; the other an interest in enrolling in a green pricing program, i. e. a program in which the energy supplier guarantees a certain percentage of renewable energy in the power mix (in return for a higher price).

The ways that the information is presented is important to comprehension, interest and motivation to seek green energy. Clean presentations and the use of pie charts and simple graphics get the best results in the USA. To get optimal consumer response in Norway, variations of these presentation forms should be tested here, something that is planned for the next phase of this project.

A clear result from analyzing the USA power disclosure experience that the transparency provided by disclosure has not be supplemented by other information on what people can or should do in order to reduce the environmental impacts of their own consumption, whether it be to change supplier, subscribe to a green pricing program or to reduce their energy consumption. The type of information represents an untried potential that is worthy of testing in conjunction with disclosure information in Norway and elsewhere in Europe.

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