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Distributed Generation in Electricity Networks

Benchmarking Models and Revenue Caps

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Last but not least, this work would not have been completed without the contribution of our friends and family, to whom we are most grateful.

Abstract

The main focus of this thesis is the Norwegian Water Resources and Energy Directorate's regulation model for the grid companies in Norway. We have taken a special interest in distributed generation and how the model compensates the companies for including this kind of production. We analyze in depth how one distributed generation project affects the revenue cap of a few companies, as well as the effect of future potential changes to the industry and model. We found that the project is very lucrative, but that the underlying assumptions are sensitive to changes in the industry. We also looked at a possible future regulation model, in which the project is even more lucrative, and where the data are less sensitive to changes in the industry. We also analyze the effect of changing some of the model parameters (e.g. rho) and illustrate the effects of charging investment contribution.

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Preface

This master thesis is written as a part of the Master of Science in Economics and Business Administration at the Norwegian School of Economics and Business Administration (NHH). The thesis is written on the basis of data provided by NVE and the reference group we have been working with. The research has been supervised by Associate Professor Dr. Endre Bjørndal at the Department of Accounting, Auditing and Law at NHH.

The chosen topic, benchmarking of grid companies, is a part of the curriculum of the course BUS439, Benchmarking for regulation and performance improvement. Taking this course in spring 2009 was when we, the authors, started exploring this topic and our interest was piqued. When looking for a topic for our master thesis, we decided to dig deeper into the subject suggested to us by Dr. Endre Bjørndal and Vice Rector and Professor Dr. Mette Bjørndal.

Working on this thesis has been a valuable experience in both academic and practical terms and we have gained valuable insight into electricity economics.

In conclusion, we would like to thank everyone that has contributed to this master thesis for their valuable insight, time and dedication.

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Part 1 –

Introduction

1 Introduction

There are two major issues in energy politics. One is the security of supply of electricity and the other is CO_2 emissions. Both these issues will only be more important in the future, and this is why Norwegian politics and the Norwegian Water Resources and Energy Directorate (NVE) now want to increase the amount of distributed generation in Norway, because distributed generation is an important factor in tackling both of these issues. In order to ensure that these goals are met it is important to give the right incentives to both new producers and grid companies. Facilitating easy entry for the producers also requires one to consider the grid companies they will be connected to. Distributed generation should be placed where it is most economically and environmentally sound, rather than where it is more lucrative due to unintended incentive effects in the regulation model. Several new laws and regulations have been put in place to usher the industry in the right direction.

Our research questions were as follows:

How does adding distributed generation change the revenue caps of the grid companies? How sensitive are these revenues to changes in the model and the industry? One of our main goals is to present a general intuition for the grid companies to understand how distributed generation works in the model, and how their business is affected by it.

In Part 2 we illustrate the transportation of electricity in Norway, and why the transmission and distribution companies need to be regulated. We also look at relevant theory to the regulation model.

In Part 3 we describe in detail how the Norwegian regulation model benchmarks each grid company and creates a revenue cap. We describe the project and how to add it to the model.

In Part 4 we analyze how changes to the model affect the grid companies, and we answer our research questions. This is followed by a concluding summary of our findings and suggestions for further research in Part 5.

Part 2 –
Theory

2 The Electricity Supply Chain

Although electricity is vital to today's standard of living, most people do not think much about how electricity actually arrives at their houses and how a reliable electricity supply is guaranteed. This thesis will not attempt to explain how the physical side of it works. In order to understand the issues of the electricity industry, it is important, though, to understand how electricity is produced, transported, traded and consumed.

The most important and challenging issue in electricity production is the balance between electricity production and consumption (Energi Norge, 2007). Electricity has to be used at the same time as it is produced, else it is lost. The perfect balance can be reached by an optimal interaction between the four main factors of the electricity flow: generation, transportation, trade and consumption. Figure 2-1 illustrates the electricity flow.

Figure 2-1 Electricity Flow

A short description of each factor is presented in the following sub-chapters.

2.1 Generation

Before electricity can be consumed, it has to be produced – or generated. The energy for electricity production can originate from various sources like fossil fuels and nuclear power or renewable energy sources like solar or wind power.

In 2008, 98.5 percent of the electricity in Norway originated from both large and small scale hydropower generation facilities. The remaining 1.5 percent of electricity production was either from thermal or wind power (NVE, 2009).

There are 174 generation companies in Norway, of which Statkraft is the largest. The Norwegian state owns 37% of generation capacity through its ownership in Statkraft. Municipalities and county municipalities own another 50% of electricity production. The remaining 13% of electricity generation is carried out by privately owned companies (Energi Norge, 2007). 21 of the 174 generators are generating companies only (OED, Regjeringen - Faktaheftet, 2008). The ten biggest producers account for approximately 70% of generation capacity (Energi Norge, 2007).

The generation of electricity is not regulated and anyone can start a new generation plant as long as they get a concession from the state. As will be pointed out in more detail in chapter 6.1, the Norwegian state has the goal to decrease Norwegian CO_2 emissions by focusing on an increase in electricity production from renewable resources. Several laws that have come into effect in the beginning of 2010 are meant to incentivize the set-up of new CO_2-free distributed generation plants. While 76% of the Norwegian grid companies have distributed generation plants in their area today, 82% of the Norwegian grid owners expect to have new distributed generation plants coming up in the years to come. (Svartsund, 2008)

The produced electricity must then be transported to the consumers. The next step in the chain is to transport the electricity through the electricity grid.

2.2 Transportation

A very important step in the flow of electricity – and the focus of this paper – is the secure transportation of electricity. After generation, the electricity has to be transported from the generators to the end users. Generators send the electricity to the transmission grid from where it is transported via the regional and distributional grid to the consumers. The total Norwegian electricity grid amounts to 300.000 km. In addition to this, there are several connections to other countries' electricity grids to enable electricity exchange between Norway and other countries (Energi Norge, 2007).

The transportation of electricity is quite difficult not only due to physical limitations. Physical limitations of transporting electricity are that energy gets lost when it is transported. It is therefore important for the network companies to keep their networks at a high standard, to keep power losses as low, and line outages as few as possible.

There are in total 159 grid companies that own grids on one or more levels. (OED, Regjeringen - Faktaheftet, 2008) The grids in Norway are divided into three different levels (Grønli, 2003):

- transmission grid (>132 kV)
- regional grids (60-132 kV)
- distribution grids (22-60 kV).

Of all grid companies in Norway, 42 are pure grid companies, while others own parts of generation or trade companies as well. The biggest grid-only company is Statnett, which owns approximately 87 percent of the transmission grid. There are a total of 117 vertically integrated companies that operate both a competitive business (generation and/or trade) and a regulated business (grid owner) (OED, Regjeringen - Faktaheftet, 2008).

The transportation of electricity is a natural monopoly, since it is economically infeasible to have more than one transmission line per region (Rud, 2009). Therefore it is extremely likely that grid companies will be regulated by the state. However, the major goal of regulation should not be limited to keeping prices low. It is equally important to ensure a suitable expansion of the transmission grid through the construction of new lines or the upgrade of existing grids, as this increases both the amount of power that can be traded securely and the number of generators and consumers that can take part in the electricity market, which in turn increases the competitiveness of the market (Kirschen & Strbac, 2004).

In Norway, these goals are pursued by the usage of an elaborated revenue cap regulation model, which will be described in more detail in later chapters. Through benchmarking, the network companies are assessed according to efficiency, which results in the determination of a revenue cap that in turn sets the tariffs the network company can ask for. This also influences the electricity prices for the end-users to a great extent. Legislation on how exactly companies have to report their costs and on what costs they can cover help maintain the regulation. They will be further explained in chapter 6.3.

2.3 Trade

One prerequisite for maintaining a balance between generation and consumption is a well working electricity market or trade of electricity. This market has been developed and was a major institutional precondition for the Norwegian reform of the electricity market in 1991 (Houmöller, 2000).

In a well working market the price of electricity serves as a pricing signal that increases and decreases according to demand (Energi Norge, 2007). The price of electricity in Norway and the other Nordic countries is determined by the Nordic Power exchange Nord Pool, which today includes all Nordic countries (Finland, Sweden, Denmark, and Norway) and Estonia, and which is the place where – amongst other things - sellers and buyers trade electricity on a day-to-day basis (Nord Pool ASA, 2009).

In an electricity market like Norway, which is highly dependent on hydropower, the electricity price has for a long time been determined by factors like filling height of the water storages. With the establishment of a common Nordic electricity market and the opening up to continental Europe, this effect has been lowered and the price is more dependent on other factors like oil and gas prices or prices of CO_2-emission certificates. Further, factors that influence production and psychological factors like expectations influence the price of electricity. Examples would be precipitation or extension of production capacity, for example the building of new distributed generation plants.

2.4 Consumption

The consumers are the end users of the electricity produced. Electricity consumers can either be big production facilities (business customers) or the 4.5 million inhabitants of Norway wanting to switch on lights, computers, televisions or use electricity elsewhere.

Total electricity consumed in Norway was 111,471 GWh in 2008. Of this, industry and mining consumed a share of approximately 44.6% (49,721 GWh), while the private households consumed a share of approximately 30 % (34,512 GWh). The rest is consumed by private and public service providers, and other sectors like fishing and agriculture (Statistisk sentralbyrå, 2010). These end users are at the end of the distribution grid and are provided with electricity by their distribution company. The electricity bill for end-users is divided into three different parts (BKK, 2010) (NVE, 2008):

1. Fixed part, paid to the local energy company (hook-up fee)
2. Variable part, based on the amount of electricity used, paid to the distribution company (transmission fee)
3. Variable fee per kWh consumed, paid to the company the user chooses to buy electricity from (this company can be located anywhere in Norway) (consumption fee)

The fact that consumers can choose where to buy their electricity is a big step towards market liberalization. Consumers are also entitled to buy electricity from Nord Pool on a contract provided by energy retailers.

3 Natural monopolies in Electricity Transmission

“A natural monopoly is a firm that can produce the entire output of the market at a cost that is lower than what it would be if there were several firms” (Rubinfeld & Pindyck, 2009). Public utilities are examples of, and are usually considered to be, natural monopolies. Natural monopolies also tend to be associated with industries where there is a high ratio of fixed to variable costs. This is also the case with electricity transmission where there are significant barriers to entry in the form of large investment costs. It would not be economically feasible for a competitor to establish itself in a market because the already established company has already made the investment and has a very low marginal cost for adding another customer. Due to the risk of pricing wars a new competitor would find it very difficult to make the investment pay off. Also, the presumed efficiency gained from exposing the monopolist to competition would be more than offset by the enormous cost of establishing a secondary overlapping grid. “If a firm is a natural monopoly it is more efficient to let it serve the entire market rather than have several firms compete” (Rubinfeld & Pindyck, 2009). Therefore, it is in the public interest to have one distribution grid. This poses a problem however, because monopolies are notoriously inefficient, and the monopoly price is not necessarily the same as the utility maximizing price.

It is uncertain what the economies of scale are in the distribution business, but there is likely an optimal size for a grid company where it is neither so large it loses efficiency in bureaucracy nor so small it wastes economies of scale. There are, however, few recent studies on what this optimal size might be. Wangensteen refers to a study done in the 1980s which found that there were cost advantages of increasing the size to about 10,000 customers (Wangensteen, 2007). He also notes however that “things have probably changed since then […] but other investigations support the findings that there is an upper limit on economical size for a distribution utility” (Wangensteen, 2007). It follows that the optimal solution is probably an unknown number of distribution companies, each serving a region as a natural monopoly.

3.1 Regulating the monopoly

There are two main areas that need to be regulated in a natural monopoly of a necessary good. “Monopolies will typically try to set the price so that the marginal revenue equals the marginal costs" (Rubinfeld & Pindyck, 2009) in order to take out as much profit from the market as possible. This is not the price that gives the maximum social benefit. In addition they will not have clear incentives to keep costs down, as costs can be transferred to the customer. These two inefficiencies are defined as market inefficiency and x-inefficiency (Wangensteen, 2007). The main goal of the regulation regime should be to reduce these two inefficiencies for the electricity transmissions market.

3.1.1 Market inefficiency

"A natural monopoly is characterized by a decrease in average total cost (ATC) with increasing quantity. That means that marginal cost (MC) is lower than ATC over the interval we consider" (Wangensteen, 2007). Therefore, setting the price at MC will not cover the total cost of the company. "At that level however the price would not cover average cost and the firm could go out of business" (Rubinfeld & Pindyck, 2009). One solution would be to offer government subsidy to make up for the loss, however then there would be the problem of determining exactly how much this subsidy should be. "The best alternative is therefore to set the price at P_2 (Figure 3-1) where average cost and [demand] intersect. In that case, the firm earns no monopoly profit, while output remains as large as possible without driving the firm out of business" (Rubinfeld & Pindyck, 2009).

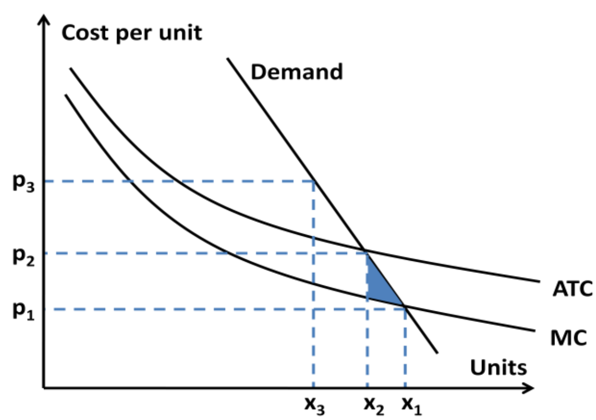

Figure 3-1 Market Inefficiency

The loss of social surplus is in part determined by the price elasticity of the good, i.e. the slope of the demand curve. Electricity is known to be an inelastic good so the loss in social surplus is not assumed to be the largest inefficiency of the two.

3.1.2 X-Inefficiency

X-inefficiency is caused by several factors (Wangensteen, 2007):

- Scale inefficiency – i.e. the company can be too small or too large compared to the optimal size
- Technical inefficiency - i.e. using larger quantities of production factors than necessary
- Cost-inefficiency - i.e. uneconomical composition of production factors.

X-inefficiency is illustrated in Figure 3-2 by two ATC curves. ATC is the cost that the monopolist could be producing at if it was producing efficiently. Should the company increase the efficiency of production the ATC* curve would shift downwards.

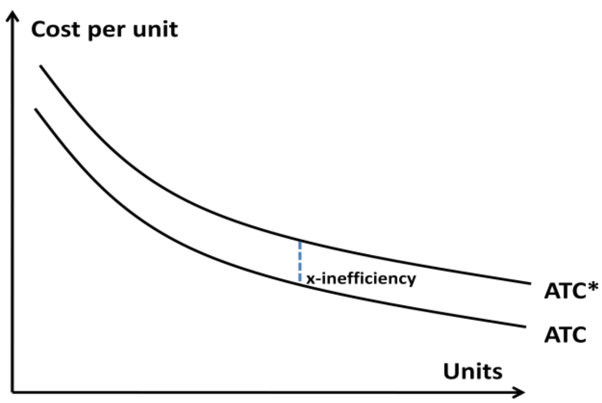

Figure 3-2 X-inefficiency

In an unregulated market the monopolist would just transfer its full costs on to the consumer because there is no real incentive to reduce cost. This is x-inefficiency and can have a significant impact on social surplus, and the incentive to reduce cost is one of the most important points that NVE addresses with its regulation model.

In Figure 3-3 below Wangensteen (2007) illustrates the effect of x-inefficiency and market inefficiency.

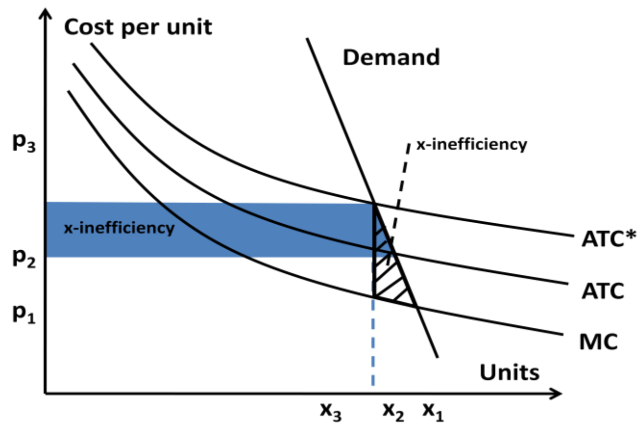

Figure 3-3 X-Inefficiency & Market-inefficiency

From the figure it would appear that the potential gain from reducing X-inefficiency is much larger than reducing the market inefficiency. A regulation scheme however should seek to address both issues.

3.2 The Norwegian Regulation Model

NVE's regulation model attempts to tackle both types of inefficiency. In some ways it is a return on investment regulation. "In this practice the regulatory agency determines an allowed price, so that its rate of return is in some sense competitive or fair [and] the maximum price allowed is based on the expected rate of return that the firm will earn" (Rubinfeld & Pindyck, 2009). This type of control by itself however is not enough, because it does not give good incentives to keep costs low. In fact, Return on Investment regulation can lead to the exact opposite; i.e. gold plating. Therefore the NVE model also has an element of regulation via benchmarking. All grid companies in Norway are compared to each other via a model that attempts to classify their efficiency via a DEA benchmarking model. This efficiency score is intended to reveal a cost norm that is the correct cost for the grid companies (refer to the lower ATC curve in Figure 3-3). The right mechanism is not tied to what the cost is, but what it should be. A company that is rated 100% efficient will be allowed to cover all its costs and in addition earn a specified rate of return equal to the regulated rate of return, which is determined by NVE. Companies that are not efficient, e.g. rated at 80% efficiency will not be allowed to charge their customers for all of the 20% of their inefficiency costs, and will have to reduce costs and thereby increase efficiency to see a profit.

4 Data Envelopment Analysis – Overview of the Theoretical Model

Data Envelopment Analysis (DEA) is one way to distinguish between decision making units (DMU) in terms of efficiency scores. In brief, the tool creates a frontier along the most efficient DMUs and compares less efficient units to these frontier defining units. In this section we shall give a brief overview of the DEA model and a few of its most relevant modifications.

In any production scenario using inputs and outputs, there is a feasible production set. We can imagine Figure 4-1 (Bjørndal, Bjørndal, & Fange, Forthcoming) where all possible inputs are mapped against all possible corresponding outputs.

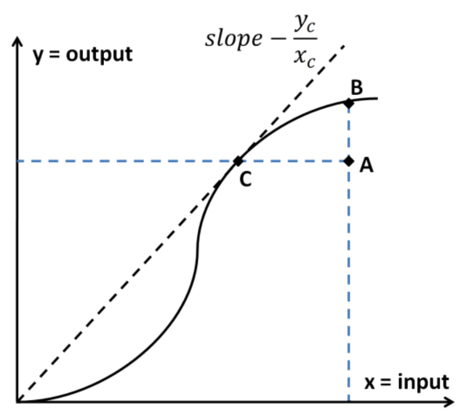

Figure 4-1 Feasible Production Sets

All points to the right of the graph are possible points of production. The graph itself is the efficient frontier, or one could say the points where one cannot increase output any further without increasing input. Point A is within the feasible production set, however compared to B it could be producing more output with the same amount of inputs and compared to C it could be producing the same amount of output with a lower use of inputs. C and B are both on the efficient frontier. We say however that C is scale efficient because it cannot produce more output per input than it already does. B produces as much output as is possible for its size, but some efficiency is lost because it is on a point on the efficient frontier where the marginal productivity is decreasing.

In an efficiency analysis therefore it would be interesting to plot the individual DMUs in a figure like Figure 4-1 and rate their efficiency based on how far they are from the efficient frontier. The problem is that “the efficient frontier is not known” (Bjørndal, Bjørndal, & Fange, Forthcoming). One way to estimate such a frontier is using Data Envelopment Analysis (DEA).

Both Coelli et al. (2005) and Cooper et al. (2004) introduce the DEA model by first illustrating the ratio form, then the multiplier form, and finally the dual of the multiplier form which forms the DEA model. This development will be summarized in the following paragraphs.

In the ratio form we measure each company according to a ratio, say by dividing all outputs over all inputs. This ratio is calculated for each firm, and says something about the relative efficiency of each firm. Our goal then is to maximize the relative efficiency h_0 by variables u and v:

$$\max h_o\,(u,v) = \frac{\sum_r u_r\, y_{ro}}{\sum_i v_i x_{io}} = \frac{u \times multiple\ outputs\ (y_r)}{v \times multiple\ inputs\ (x_i)}$$

The weights u and v help us to determine the most efficient firm. Further we have *i* number of inputs *x*, and *r* number of outputs *y*. We now also constrain the efficiency measure so that it is equal to or less than one, and also that the input and output weights are non-negative.

$$\max h\,(u,v) = \frac{\sum_r u_r\, y_r}{\sum_i v_i x_i}$$

$$Subject\ to:$$

$$\frac{\sum_r u_r\, y_{rj}}{\sum_i v_i x_{ij}} \leq 1\ for\ j = 1, \dots, n$$

$$u_r, v_i \geq 0\ for\ all\ r\ and\ i$$

This construction has one problem however; it is unbounded. For any correct solution (u^*, v^*) the solution $(\alpha u^*, \alpha v^*)$ is also correct. We solve this problem by adding another constraint $\sum_{i=1}^{m} v_i x_i = 1$, “which yields the equivalent linear programming (LP) problem in which we change the variables from (u, v) to (μ, v)” (Cooper, Seiford, Zhu, & Banker, 2004).

$$\max z = \sum_{r=1}^{s} \mu_r \, y_{r0}$$

$$Subject\ to:$$

$$\sum_{r=1}^{s} \mu_r \, y_{rj} - \sum_{i=1}^{m} v_i \, x_{ij} \geq 0$$

$$\sum_{i=1}^{m} v_i \, x_{i0} = 1$$

$$\mu_r \, , v_i \ \geq 0$$

Using the dual of the LP problem, we can derive an "equivalent envelopment form of this problem" (Coelli, Rao, O'Donnell, & Battese, An Introduction to Efficiency and Productivity Analysis, 1998). We use the dual of the LP problem because it has fewer restrictions and is therefore easier to solve.

$$\theta^* = \min \theta$$

$$Subject\ to:$$

$$\sum_{j=1}^{n} x_{ij} \, \lambda_j \leq \theta x_{i0} \quad i = 1, \dots, m$$

$$\sum_{j=1}^{n} y_{rj} \, \lambda_j \geq y_{r0} \qquad r = 1, \dots, s$$

$$\lambda_j \geq 0 \qquad\qquad j = 1, \dots, n$$

Here θ is the efficiency of the i-th firm. We run the minimization once for every firm. The λ is a weight that assists us in forming an efficient virtual-firm for every firm. Firms where $\theta = 1$ are technically efficient and define the efficient frontier to which all other companies are compared. The constraints have their own intuitive meanings (Figure 4-2). These constraints ensure that the projected point cannot lie outside the feasible production set.

$\sum_{j=1}^{n} x_{ij}\, \lambda_j \leq \theta x_{i0}$	- Firm *i* should use at least as many inputs as its reference.
$\sum_{j=1}^{n} y_{rj}\, \lambda_j \geq y_{r0}$	- Firm i should produce at least as many outputs as its reference.
$\lambda_j \geq 0$	- Decision variables to define reference firms.

Figure 4-2 Meanings of the constraints (Bjørndal, Bjørndal, & Fange, Forthcoming)

We illustrate the input-oriented CRS model with a simple numerical example from (Coelli, Rao, O'Donnell, & Battese, 1998). They set up five firms that produce one output (y) with two inputs (x1, x2). The data are as follows:

firm	y	x1	x2	x1/y	x2/y
1	1	2	5	2	5
2	2	2	4	1	2
3	3	6	6	2	2
4	1	3	2	3	2
5	2	6	2	3	1

Table 4-1 Example Data for CRS DEA Example

The minimization is run once per firm and resulting values are found in Table 4-2. The problem, solved for firm 3 would appear as follows:

$$\theta^* = \min \theta$$

$$Subject\ to:$$

$$y_3 \leq (y_1\lambda_1 + y_2\lambda_2 + y_3\lambda_3 + y_4\lambda_4 + y_5\lambda_5)$$

$$\theta x_{13} \geq (x_{11}\lambda_1 + x_{12}\lambda_2 + x_{13}\lambda_3 + x_{14}\lambda_4 + x_{15}\lambda_5)$$

$$\theta x_{23} \geq (x_{21}\lambda_1 + x_{22}\lambda_2 + x_{23}\lambda_3 + x_{24}\lambda_4 + x_{25}\lambda_5)$$

$$\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5 \ \geq 0$$

Table 4-2 shows the value for the five solutions, with the λ and θ that provide the minimum value for θ. The λ values are linear weights that in combination give a projected point on the efficient frontier where an efficient firm 3' is thought to be. We see in Table 4-2 as well as Figure 4-3 that the reference firms for firm 3 are firm 2 and 5.

firm	θ	λ1	λ2	λ3	λ4	λ5
1	0.50	-	0.50	-	-	-
2	1.00	-	1.00	-	-	-
3	0.83	-	1.00	-	-	0.50
4	0.71	-	0.21	-	-	0.29
5	1.00	-	-	-	-	1.00

Table 4-2 CRS Input-Oriented DEA Example (Coelli et.al., 2005)

The reference firms can be distinguished from the others in two ways. One is by seeing which companies have $\theta = 1$. These are the efficient firms that define the efficient frontier. One can also tell that these are reference firms because they are fully weighted on themselves, i.e. when running the LP problem for Firm 2, then $\lambda_2 = 1$ and similarly when running the LP problem for Firm 5, $\lambda_5 = 1$.

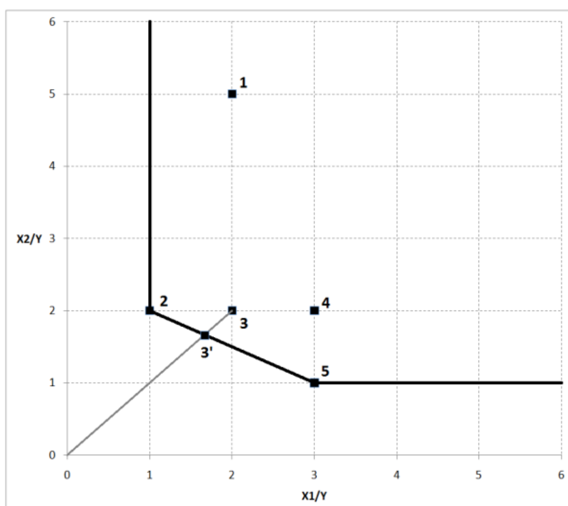

Figure 4-3 CRS Input Oriented DEA Example (Coelli et.al., 2005)

To visualize how the efficiency score is determined, one can draw a line that starts at the origin and ends where Firm 3 is placed in Figure 4-3. The point where this line crosses the efficient frontier (on the line between point 2 and point 5) is the virtual efficient version of Firm 3. If one were to divide the length of the line from the origin to point 3' by the length of the line from the origin to point 3 one would get the efficiency score – 0,83 – as it appears in Table 4-2.

4.1 Constant Returns to Scale or Variable Returns to Scale?

Thus far we have only dealt with the assumption that we have constant returns to scale (CRS). However, there are many reasons why firms would not operate at optimal scale, and it is possible to modify the model to allow for variable returns to scale (VRS). This is done by adding the constraint:

$$\sum_{j=1}^{m} \lambda_j = 1$$

"This approach forms a convex hull of intersecting facets that envelope the data points more tightly than the CRS conical hull and thus provides technical efficiency scores that are greater than or equal to those obtained using the CRS model" (Coelli, Rao, O'Donnell, & Battese, 1998). This constraint makes sure that companies are only compared to reference companies that are of similar size.

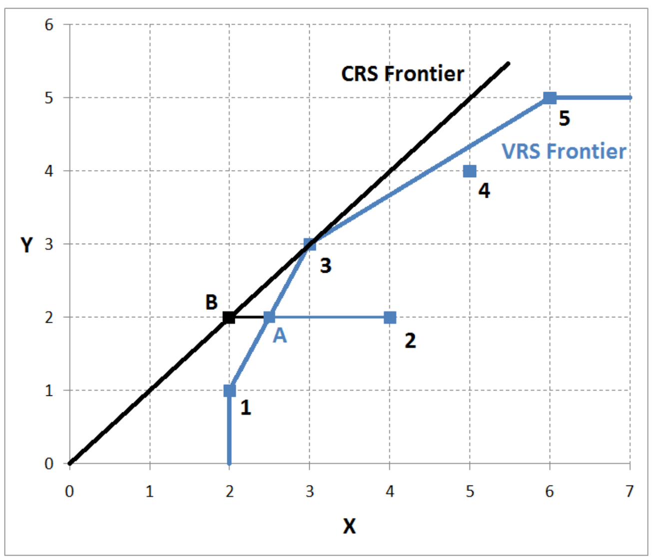

Figure 4-4 VRS vs. CRS (Coelli et.al., 2005)

If the CRS and VRS values differ from each other, and we believe VRS frontier is correct, this implies that the firm suffers from scale inefficiency. In a VRS model with one input and one output like in Figure 4-4 the firm in point C would be technically efficient in point A, and scale efficient in point B.

4.2 Input vs. output oriented models

The model we have defined thus far has only rated DMUs by how efficiently they use inputs while they keep the outputs fixed. This is interesting for firms where it is the inputs that are controllable. In some other scenarios we can imagine that firms have a fixed budget and seek to maximize the output. In this case an output oriented model would be more appropriate. Input and output models are identical under CRS, whereas under VRS a slight modification allows us to maximize according to fixed inputs and variable outputs. Even with an adapted model the two values are usually very similar (Coelli, Rao, O'Donnell, & Battese, 1998).

4.3 Super efficiency

In some cases it is interesting to discriminate between the companies that are part of the efficient frontier; these are in the regular model all rated at $\theta = 1$. One way to do this is to allow efficiency scores that are greater than one. This can be accommodated by restricting the model from using a firm as a reference to itself. It follows that an efficient firm would not be part of the data set when the firm itself is being evaluated. It would however still be an efficient frontier defining firm when the other firms are being evaluated, so the DEA model does not change for any other firms than the efficient firms when allowing for super-efficiency.

5 Adjusting for the environment

An issue that has been much discussed because it is vital to efficiency analysis is the effect of environmental factors on the efficiency score. Environmental factors are defined as all factors that could influence the efficiency of a firm and that are not controllable by the manager (Coelli, Rao, O'Donnell, & Battese, 2005). In other publications, environmental factors are named socio-economic factors, geography variables, fixed inputs or outputs, non-discretionary variables or non-controllable factors, but essentially they all mean the same. Examples for environmental factors are population sizes, mild or hard competition or extreme weather conditions; depending on the industry assessed.

The following paragraphs present some of the suggestions that have been made for handling environmental factors.

5.1 Categorization

Charnes, Cooper and Rhodes were the ones to introduce the method of DEA in the first place. They also considered environmental variables and came up with a first solution to taking into account environmental factors.

Their suggestion was a very easy one, though it brings about some problems, especially when it comes to sample size. This approach is especially useful, when the environmental variable does not have a natural ordering (e.g. public versus private ownership). "Charnes, Cooper and Rhodes suggested a model that can be divided into three stages (Coelli, Rao, O'Donnell, & Battese, 2005):

1. Divide the sample into public and private sub-samples and solve DEAs for each sub-sample;
2. Project all observed data points onto their respective frontiers; and
3. Solve a single DEA using the projected points and assess any difference in the mean efficiency of the two sub-samples."

As mentioned before, one problem with this method is the possible reduction of the comparison set, "resulting in many firms being found to be efficient and thus reducing the discriminating power of the analysis" (Coelli, Rao, O'Donnell, & Battese, 2005). Another problem is that with this approach only one environmental factor can be taken into account, as we can only have one category to group the DMUs. A more flexible approach to categorical variables was suggested by Banker and Morey in 1986, as the next sub-chapter will show.

5.2 Categorical Variables

In 1986 Banker and Morey suggested that the original DEA model had to be extended “in order to estimate the extent to which the controllable or discretionary inputs can be reduced by the DMU manager while keeping the exogenously fixed inputs at their current level” (Banker & Morey, 1986a).

The necessary extension of the DEA model is to change the set-up so that it determines whether, and to what extent, a discretionary input or output can be reduced or increased, given that the level of the other input or output will remain fixed at its current value (Banker & Morey, 1986a). Figure 5-1 illustrates this approach by looking at discretionary and fixed inputs.

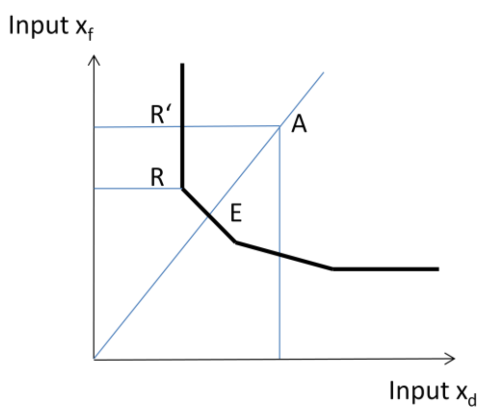

Figure 5-1 Discretionary versus Fixed inputs

As explained in chapter 4, the traditional DEA approach determines the efficiency of A by comparing it with point E on the efficient frontier. Because x_f is exogenously fixed, the information about a possible reduction in x_f (in this case | x_f A- x_f E|) is not valuable to the manager of DMU A. In case of environmental variables, it is more meaningful to compare A to point R’ on the efficient frontier. DMU R’ consumes the same quantity of the fixed input x_f but less of the discretionary input x_d and the new amount of reduction possible in x_d can be estimated at the distance |x_dA-x_dR’| (Banker & Morey, 1986a).

In this illustration we make sure that DMU A is compared to a DMU with the same quantity of the fixed input. Banker and Morey developed a DEA model where the requirement is that the composite reference group shall use no more of the uncontrollable resource than the unit under evaluation, but not necessarily the same amount. This procedure has the advantage of enriching the comparison set immensely. (Banker & Morey, 1986a)

This work paved the way for the suggestion of a new DEA model including categorical variables, presented in a later paper in 1986 by Banker and Morey.

The idea behind using categorical variables in DEA presented by Banker and Morey in 1986 (Banker & Morey, 1986b) is to group the DMUs into categories so that they are only compared to units that face the same non-controllable or environmental factors.

This approach is meant to ensure that companies are only compared to companies that face the same issues. Imagine as an example network companies operating in an area with a lot of average snow fall in winter. They will face different issues about electricity transmission and distribution – e.g. regarding maintenance needs - than network companies operating in an area with low average snowfall (Banker & Morey, 1986b). Assume network companies are categorized into three snowfall categories 'mild', 'medium' or 'heavy' snowfall. A network company in the 'heavy snowfall' category will then only be compared to other companies in the same category. Network companies in the 'mild snowfall' category on the other hand would have its peer group composed of network companies in all three categories, if any of these companies outperformed the assessed company despite of their more difficult situation. (Banker & Morey, 1986b)

This approach ensures fair assessment of each company by taking into account the non-controllable environmental factors that each company faces. However, as easy as this approach sounds, it can only be used if the values of the environmental variable can be ordered from the least to the most detrimental effect upon efficiency (Coelli, Rao, O'Donnell, & Battese, 2005). Furthermore, we assume that it needs a large enough sample, if we want to divide the DMUs into categories.

In their article, Banker and Morey suggest modifications to the mathematical formulation of the LP problem. They also include a comparison of the normal DEA and the one that includes categorical variables and find that, at least for their example, “very little discriminating power is lost, while greatly increasing the credibility of the findings” (Banker & Morey, 1986b).

5.3 Two-stage method

A very popular procedure for adjusting for environmental factors is the two-stage method (Barnum & Gleason, 2008). With this method, in the first stage a DEA is conducted with endogenous factors only. The resulting efficiency scores are regressed on the chosen exogenous variables in a second stage (Ray, 1991) (Coelli, Rao, O'Donnell, & Battese, 2005) (Barnum & Gleason, 2008).

The two-stage method helps to identify statistical significant environmental factors and with this to adjust the efficiency scores such that it represents the pure managerial efficiency (Ray, 1991) (Barnum & Gleason, 2008) (Coelli, Rao, O'Donnell, & Battese, 2005).

In more detail, the signs of the coefficients the regression delivers indicate the directions of the influences of the environmental variables. These can then be used to adjust all efficiency scores so that they are better comparable, i.e. that they correspond to a common level of environment. (Coelli, Rao, O'Donnell, & Battese, 2005)

Advantages of the two-stage method are that it can be used for both continuous and categorical variables. The two-stage method also does not make prior assumptions regarding the direction of the influence of the environmental factor and this can thus be assessed unprejudiced. (Coelli, Rao, O'Donnell, & Battese, 2005).

A considerable disadvantage of the two-stage method is the potential for biased estimates due to correlation of the endogenous variables of the first stage (DEA) and the exogenous factors of the second stage regression. (Barnum & Gleason, 2008) (Coelli, Rao, O'Donnell, & Battese, 2005) Concerning this disadvantage, Barnum and Gleason (2008) suggest an alternative two-stage method, where the order of the stages is reversed. This means that inputs are adjusted for environmental factors in a first stage by regressing each output on endogenous and exogenous inputs and adjusting the outputs accordingly by removing the estimated effect of the exogenous factor. In a second stage the adjusted variables are then used to calculate the efficiency score with a conventional DEA method (Barnum & Gleason, 2008).

This reverse two-stage method has the advantage of removing the correlation that causes the biased results in the conventional model. However, Barnum and Gleason (2008) point out that the method has neither been extensively tested empirically, nor has the methodology been proven analytically yet. Once this is done, this reverse two-stage method might become a good alternative to the conventional two-stage method.

Part 3 –

Regulation of Distribution Companies in Norway

6 The Norwegian Regulation Authority and Energy Politics

6.1 Goals of energy politics

Norway is very abundant in renewable energy sources. It is therefore understandable that politics in Norway see the major goal of Norwegian energy policy to have Norway develop a leading role in developing a climate-friendly community by setting an example in reducing its own emissions significantly. (Regjeringen.no, 2010)

For achieving this goal, the following prerequisites will need to be met (Regjeringen.no, 2010):

- to supply electricity in an economically rational way
- to use less energy by using energy more efficiently
- to increase the percentage of renewable energy sources for electricity production
- to maintain and create good market solutions to pursue the goal

While aiming at this overall goal, energy policy shall ensure high security of energy supply by focusing both on the national and international development of the industry.

The energy demand is expected to increase until 2050 (Regjeringen.no, 2010). This increased demand can be covered both by increase in production and a reinforcement of the grid in order to be able to transport the energy.

The objective to increase the amount of distributed generation has been well received and a further extension of distributed generation plants in Norway is to be expected. Geographically these resources are located in Northern and Western Norway and in coastal areas, as the distributed generation majorly consists of wind power and small-scale hydropower generators.

The challenges to be met in distributed generation are (Regjeringen.no, 2010):

- The need to strengthen the grid to be able to integrate wind power and small-scale generation as well as to guarantee for the market to function

- Avoiding bottlenecks in the grid
- Secure grid capacity to and from Europe and the Nordic countries
- Grid planning needs to take into account both production and consumption
- Strengthen the interaction between production and the grid

The increased focus on climate measures, conversion and new distributed generation means that the development of the grid will play a vital role in meeting these goals.

6.2 The Norwegian Water Resources and Energy Directorate

The Norwegian Water Resources and Energy Directorate (NVE), a directorate under the Ministry of Petroleum and Energy, is the authority responsible for the regulation of the network companies in Norway. Their areas of responsibility range from management of the country's water resources to the promotion of efficient energy markets and cost-effective energy systems. Their overall goal is to achieve a more efficient use of energy (NVE, 2009).

The Energy Act of 1990 delegates the power for regulation of the transmission network companies to NVE (Edvardsen, Førsund, Hansen, Kittelsen, & Neurauter, 2006). Besides regulation and controlling grid activities, NVE is empowered as a licensing authority for investment grants for large distribution grids (22-60 kV) and geographical area licenses (Magnus, 2000).

Since the very beginning of the deregulation in Norway, NVE has put great focus on cost efficiency in the transmission networks by introducing an incentive regulation regime (Edvardsen, Førsund, Hansen, Kittelsen, & Neurauter, 2006). After a few years of a rate of return regulation with the principle of cost reimbursement (Andersen, 2007), the regulation model has been changed to a revenue-cap regulation, which enables higher rates of return in utilities which are able to reduce short- and long-term slack (Bråten & Magnus, 2000).

From theory we know that ideally, the regulator should motivate the network companies to price their services efficiently, to ensure that product quality is satisfactory, incentivize the right investments in a timely fashion both in the short and long run, and to contribute to increased cost-efficiency of the grid companies. In addition, the regime should minimize the administrative costs incurred through regulation. According to Magnus (2000) experience in Norway and elsewhere has shown that these goals might be conflicting objectives.

Since the start of the deregulation, NVE has been working on creating a benchmarking model that is both stable and fair, where by stable we mean that the model does not overreact to changes and has low variability and by fair we mean that it does not over or under compensate companies for being special in one way or the other. In the course of the last two decades, a benchmarking model has been developed in cooperation between NVE, the grid companies and Energi Norge. This model is constantly being developed and improved to make the regulation more fair and transparent.

6.3 Laws and Regulations

6.3.1 The Market Reform in 1990 and laws that followed it

The process of reform was initiated by a conservative government that envisaged both a privatization of the major state production and transmission company, Statkraft, as well as an increase in competition. Due to a change in government, the privatization was postponed. The deregulation of the power market, however, was implemented and while Statkraft was split up into production and transmission companies, the market was opened up for competition (McGowan, 1993). There have been two major laws that set the ground rules for the deregulation and regulation of the industry. These will be presented in the following sub-chapters.

6.3.2 On the Energy Act of 1990

The Energy Act first came into force January 1, 1991. It provides a framework for the organization of power supply. The Energy Act liberalized the power supply in Norway by introducing unbundling of accounts between production, trade, distribution and transmission of electricity, and sets the legal framework for the monopoly control of the distribution and transmission activities (Edvardsen, Førsund, Hansen, Kittelsen, & Neurauter, 2006). The basic objectives of the Energy Act are to ensure an economically rational use of the power resources, to facilitate a secure electricity supply and to even out the prices to consumers. The law has since been modified repeatedly (EnergiLink, 2008).

Since 2006, the Energy Act is being re-evaluated by the government with the help of the whole political environment, industry organizations and interest groups that have been asked to help re-evaluate the Energy Act and conduct studies related to four key issues in Norway's energy policy:

- The conditions for new electricity generation
- The allocation of water reservoirs
- The conditions for the development of the heating sector, and
- The energy efficiency on the consumer side (OED, 2006).

One current result of this research group has been the amendments made to paragraph 3-4 of the Energy Act.

§ 3-4 of the Energy Act: Connection Responsibility

The law about connection duty has been changed with effect from January 1, 2010. Earlier network companies could choose whether or not to give access to the grid to new generators. Now they are required to connect any generator that wishes so to the grid. This means that from now on network companies will have the requirement to assess, apply for concession and invest in needed extensions of the grid, if the undertaking is economically rational. This change in the law is meant to incentivize economically rational grid investments in connection with new economically rational generation plant projects. While this law requires the grid companies to give access to the grid to everyone, the 'regulation on economic and technical reporting, revenue caps for network companies and tariffs' regulates which party will have to pay for the necessary investments.

6.3.3 On 'The Regulation on Financial and Technical Reporting, Revenue Caps for Network Companies and Tariffs'[1]

Another law that has been passed with the beginning of the deregulation of the electricity sector is the 'Regulation on financial and technical reporting, revenue caps for network companies and tariffs'.

This regulation covers all necessary topics that both the network companies and the regulator need to know about for their operations. One could say that it serves as a kind of guideline for market participants. Amongst other things, the regulation sets rules for how the network companies'

[1] In Norwegian: Forskrift om økonomisk og teknisk rapportering, inntektsramme for nettvirksomheten og tariffer

accounting practices should look, how to deal with excess income, in what cases companies can be compensated for extra costs and how to set tariffs.

One special paragraph in the law has recently been changed and is likely to affect most network companies, also due to the newly established connection requirement. This paragraph, § 17-5 of the regulation, regulates the sharing of the investment costs for grid investments caused by a new generation plant.

§ 17-5 of the Regulation: Investment Contribution

This paragraph on investment contribution[2] regulates to what extent grid companies have the right to charge customers the construction cost of new grid connections or costs in connection with reinforcements of the grid. This reimbursement is called investment contribution and can only be taken, when the customer, i.e. the production company, causes demand for increased capacity or quality that triggers the need for grid expansion. The regulation requires that a fixed amount is calculated for the investment contribution that covers the costs for the connection of the client to the grid minus possible future investments to be made by the grid company (e.g. reinforcement of old infrastructure) (Lovdata, 2010).

The investment contribution has to be determined independently of the client's expected energy output and can be set to the maximum fixed cost for the new grid minus the connection fee. The project costs are equal to the necessary costs of the improvement or extension, including man-hours for personnel, machinery, and equipment.

Network companies have the possibility to distribute the investment contribution amount amongst the facilities and customers that are being connected to the grid within a period of ten years after completion of the grid. This distribution of costs may either be decided upon in the beginning of the period, i.e. assuming the company knows how many and what kind of customers need to be connected to the grid in the next ten years, or it may be calculated when new customers actually get connected to the grid. This may involve some redistribution of money to the first-comers. The major difference here lies in who takes on the investment risk.

[2] Investment Contribution = Anleggsbidrag

The regulation further emphasizes the importance of the transparency of the process. The customers (end users or generators) must always be notified in advance about the collection of, and the basis for calculating the investment contribution.

Exceptions for when the investment contribution cannot be used are for investments in meshed grids. In this case the investment contribution can only be taken in extraordinary cases. Also for reinforcements of the radial grid, only a proportionate share of these costs can be included in the investment contribution amount.

The above being a summary of the law text, we point out that this text was originally written with regard to end users who want to be connected to the grid and having to pay an investment contribution for possible grid expansions. Since the change in the Energy Act in the beginning of 2010 where connection duty was expanded to generation plants as well, § 17-5 also applies for generation plants that want to be connected to the grid. (NVE, 2009a)

While approving of the general legislation, NVE suggests that the investment contribution is maintained and that it is expanded to meshed grids as well. We expect § 17-5 to be expanded according to the suggestions of NVE in the near future.

6.3.4 Summary

With effect from January 1, 2010, the connection duty has been introduced and from now on, every distributed generation plant has the right to be connected to the grid. In relation to this, the paragraph on investment contribution gets a new meaning added to the old one. It is now also valid for generation plants.

In practice, this means that each distributed generation plant that wants access to the grid will have to pay the investment contribution to the corresponding grid company. The amount of the investment contribution then depends on the amount of investment needed, i.e. length of new lines needed or amount of reinforcement needed. It has to be taken into account that, if the one asking for the extension of the grid does not accept to pay the investment contribution the grid companies are not required to connect them. We furthermore point out that the investment contribution is a good tool to make the actual costs of the investment visible and ensures that the increased costs due to new connections of new distributed generation plants are not passed on to the end users.

A study conducted by Energi Norge in 2010 found that 76% of the respondents had distributed generation in their area and that 100% of the respondents used the possibility of imposing an investment contribution on the distributed generators when they could. (Svartsund.pdf XX)

7 Explaining Efficiency Scores and Revenue Caps

In the following we shall give an overview of how to calculate the revenue cap for each company. The first step is to calculate the cost base to be used as the input in the DEA analysis, as well as to gather data for each company's outputs. In the second step we run the DEA analysis and retrieve DEA efficiency scores for each company. Then we run a Generalized Least Squares (GLS) regression to correct these scores for certain environmental factors. After calibrating the efficiency scores we have an efficiency rating for each grid company that is used to calculate the revenue cap. We will only be looking at the distribution grid efficiencies in this thesis, however there is also an efficiency calculation for the regional grid that is weighted together with the distributional efficiency score.

When the individual efficiency scores are calculated we calculate a cost base to be used in the revenue cap, and then finally the revenue cap. Then there are two corrections before the final revenue cap is determined. In the following we shall give a detailed overview of each step in this process.

7.1 Calculating the Efficiency Scores

7.1.1 Cost Base for DEA Inputs

The DEA analysis uses only one input: the cost base. This is the representative cost that each grid company uses to provide their amount of outputs. The costs included in this cost base are:

- Operations & maintenance costs
- Capital costs (including capital financed by investment contribution)
- Depreciation
- Value of lost load (VOLL)[3]
- Network losses in regional & distributional grids

In the DEA model, all the grid companies are compared to each other based on this cost relative to their respective outputs.

[3] Value of Lost Load (VOLL) = Kostnad av ikke levert energi (KILE)

7.1.2 Calculating the DEA efficiency

The DEA model is the first step in determining the efficiency scores. The only input is the cost base as detailed in the previous sub-chapter. The current NVE model includes eleven outputs, three of which are included in the second stage of the efficiency analysis in chapter 7.1.3. The output variables are chosen so that they together reflect the amount of output each company has, but should also reflect cost increasing environments that cannot be controlled by the grid companies' management. Part of the purpose of the regulation is to measure the efficiency of the companies based on what they can 'change'. Several of the output variables are geography variables and are intended to compensate for the added challenge of operating in different regions, i.e. regions with different environmental factors such as forest, snow, population density etc. The outputs included in the DEA analysis are:

- Subscriptions without vacation homes
- Subscriptions for vacation homes
- Delivered Energy
- High Voltage Lines
- Network stations
- Forest
- Snow
- Wind

We run the DEA analysis allowing for super efficiency, in a CRS model. Because the model is volatile NVE has decided that only companies that are super-efficient (over 100% efficient) on average over the last four years shall be allowed to keep their super efficient score. This means we have to run two separate DEA analyses. Once with 2008 data and a second time with averaged data for 2004-2007. Companies that were over 100% efficient in 2008, but were not super efficient in the 2004-2007 period will be capped at a 100%. Companies that were super efficient in the 2004-2007 period and in 2008 will be allowed to keep the super efficient score from the 2004-2007 analysis. These scores are then carried on to the second stage where they will be corrected for the last three environmental factors.

7.1.3 Stage 2 – Correction for Environmental Factors

The second stage is designed to correct the DEA efficiency scores according to inefficiencies caused by the environmental factors Interfaces, Islands and Distributed Generation (DG). This is done by calculating coefficients for each variable with the help of a panel data model. These coefficients are then used to calculate a value for an environmental factor correction (EFC) for each company.

The GLS regression[4] model we use to determine the coefficients is specified as follows:

$$\ln(DEAres) = \alpha + \beta Z + u \Rightarrow DEAres = e^{(\alpha+\beta Z+u)},$$

where α is a constant term, Z is a vector of the different environmental factors, β is a vector of estimates for the coefficients for each environmental factor and u is an error term.

The DEA efficiency scores from the years 2004 to 2008 without super efficiency are used as the dependent variable, which is described by the three independent variables: Interfaces, Islands and DG. The use of panel data in the second stage makes sure that variations are kept as low as possible.

The dependent variable is size independent, which is why we need to make the independent variables size independent as well before adding them to the regression. This is done by dividing them by a grid value that is calculated for each company.[5]

After running the regression analysis specified above, we have coefficients for each of the independent variables. These coefficients can then be used to calculate an EFC score for each company:

$$EFC = e^{\hat{\alpha}} e^{\hat{\beta} Z} - e^{\hat{\alpha}} = e^{\hat{\alpha}+\hat{\beta} Z} - e^{\hat{\alpha}},$$

where $\hat{\alpha}$ is the estimated constant term and the different $\hat{\beta}$'s are the estimated coefficients for each independent variable. EFC is a number that describes how much of a disadvantage (in units of efficiency score) each grid company suffers for its amount of Islands, Interfaces and DG.

We use the coefficients of 2010 to illustrate what the EFC calculation looks like:

$$EFC = e^{\hat{\alpha} + \hat{\beta}_1 * \left(\frac{Interfaces}{Grid\ Value}\right) + \hat{\beta}_2 * \left(\frac{Islands}{Grid\ Value}\right) + \hat{\beta}_3 * \left(\frac{DG}{Grid\ Value}\right)} - e^{\hat{\alpha}}$$

$$= e^{4.45901 - 0.00473536 * \left(\frac{Interfaces}{Grid\ Value}\right) - 1.26697 * \left(\frac{Islands}{Grid\ Value}\right) - 0.726778 * \left(\frac{DG}{Grid\ Value}\right)} - e^{4.45901}$$

To determine the corrected total efficiency score for each company, we subtract EFC from the DEA efficiency scores:

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[4] We run the GLS regression with random effects and robust t-values

[5] Calculation of the net value for each company: 419,000 NOK * High voltage lines (km) + 147,000 NOK * number of network stations + 12,000 NOK * total amount of customers

$$DEA_{EFC} = DEA_{res} - EFC$$

Because EFC is a negative number, this will result in an increased total efficiency for all companies with Islands, Interfaces or DG. The next step then is to calibrate the efficiency score.

7.1.4 Calibrating the Efficiency Score

Due to the way the model is formulated, only a handful of companies will be efficient. This is because the DEA model is a best practice model, and ranks all companies by the most efficient companies. This means that if we do not calibrate the efficiency scores, most companies will not be reimbursed for all their costs. Therefore, NVE calibrates the results to make the average company 100% efficient, which also means that on average, the companies will be able to cover their costs. This calibration is done by dividing each cost base by the total cost base for the industry determining a weight (ω_i).

$$\omega_i = \frac{Cost\ base_i}{Industry\ cost\ base}$$

Each weight is then multiplied with its respective efficiency score and the sum of these values is the average calculated efficiency of the industry.

$$Industry\ Average\ Efficiency = \sum_{i=1}^{n} \omega_i \times Efficiency_i$$

To calibrate the efficiency scores the difference between 100% and the average efficiency score is added to each individual efficiency score.

$$Calibrated\ Efficiency_i = Efficiency_i + (1 - Industry\ Average\ Efficiency)$$

The average should now be roughly 100% for the industry. We say roughly because the efficiency scores are rounded to two decimal places resulting in an average that is slightly incorrect. This will however be taken care of in the calibration correction when we calculate the revenue cap.

7.1.5 Combining Distribution Grid with Regional Grid Results

The efficiency scores calculated thus far have been for the distribution grid. A similar process is used to calculate efficiency scores for the regional grid. The two scores are merged to one total efficiency score for each company. The weight is determined by how large a share of the company's costs is caused by either the regional (R) or the distribution (D) grid.

$$Revenue\ Cap\ Efficiency = Efficiency_D \times \frac{Cost\ base_D}{Cost\ base_{R+D}} + Efficiency_R \times \frac{Cost\ base_R}{Cost\ base_{R+D}}$$

The resulting number, finally, is the efficiency score used to calculate each company's revenue cap.

7.2 Calculating the Revenue Cap

The revenue cap is the maximum revenue a grid company is allowed to take during year t. The basis for calculating the revenue cap is the cost base. Unfortunately, this is an estimated number, as the actual costs of each grid company will typically not be known until two years after the revenue cap has been set. Similarly, the revenue cap is not necessarily known exactly to the grid companies during the year, though usually they are given a preliminary number. The result is that the grid companies may charge their customers too much or little. They are however required to make up for this difference in following years. Over the long term the revenue cap and total revenue for the grid companies must match each other.

7.2.1 Calculating the Cost Base for the Revenue Cap

After calculating the efficiency score for each grid company, it is possible to calculate the revenue cap. The first step is to calculate the cost base to be used to determine the revenue cap. This cost base is slightly different from the one used as the DEA input. The cost base used in calculating the revenue cap is an estimated cost for year t, which is the real cost for year t-2, where some of the costs have been adjusted for inflation:

- Operations & maintenance costs, adjusted for two years of inflation
- Capital Costs (Not including capital financed by investment contribution)
- Depreciation
- Value of Lost Load (VOLL), adjusted for two years of inflation
- Network Losses in Regional and Distributional grids

Note that the capital base used to calculate capital costs no longer includes the capital paid for by investment contribution.

7.2.2 Calculating the Cost Norm

The cost norm is the cost that the model estimates for a 100% efficient company, i.e. what the cost base should be. Companies that are inefficient will have a cost base that is above their cost norm and will not be allowed to charge their customers for the full difference between the two. The intended incentive is that the grid company will cut costs to reduce inefficiency and by doing so increase their profits while keeping the price low for its customers. The cost norm is calculated as the cost base, minus the network loss in the regional grid and required planning costs[6] multiplied with their efficiency score.

$$Cost\ Norm_i = (Cost\ Base_i - Network\ \&\ Study\ Costs_i) * Efficiency_i + Network\ \&\ Study\ Costs_i$$

After multiplying, the network loss and required study costs are then added at full cost and the result is the cost norm. This cost norm is then calibrated in two stages before it becomes part of the revenue cap for the company.

7.2.3 Rho – Weight of Norm vs. Actual Costs

The model NVE uses cannot be seen as a perfect evaluator of efficiency because clearly there are differences between the grid companies that the model does not take into account. It is not known what exactly drives the costs and similarly what the cost should be for an efficient company; there will always be errors. Some may be due to measurement errors in the outputs, or the input may be calculated differently between companies. Other errors might be due to factors that are outside management's control, but are not reflected in the model. As an example distributed generation has not been included in the model before 2010. To lessen the impact of these errors in measuring the efficiency NVE has added a multiplier that defines how much of the revenue cap should be based on the model's cost norm and how much should be based on the grid company's actual cost.

$$Revenue\ Cap = Cost\ norm \times\ \rho + Cost\ base\ \times (1 - \rho)$$

This multiplier rho (ρ) is currently set equal to 0.6. This means that the revenue cap is the sum of 60% of the cost norm and 40% of the cost base. Recall that the cost norm is the estimated cost of a fully efficient company of the same size, as defined by NVE's benchmarking model. The cost base is the budgeted cost for year t.

[6] Required Planning Costs = Utredningsansvar

7.2.4 Calibration Correction

The calibration correction is related to discrepancies between the total Revenue Cap_1 and the total cost for the industry. This discrepancy was initially caused in the calibration in chapter 7.1.4, where the efficiency scores have rounding errors when they were rounded to two decimal points. However, the model is intended to cover the total industry costs, and therefore a difference between the industry total revenue cap and industry total cost base must be accounted for. This is done by calculating how much of an impact this has relative to the total return base of the industry.

$$Cost\ Norm_2 = Cost\ Norm_1 - \frac{\left(Return\ base \times \frac{Industry\ Revenue\ Cap_1 - Industry\ Cost\ base}{Industry\ Return\ base}\right)}{\rho}$$

In other words, the industry total cost base is subtracted from the total industry Revenue Cap_1 and divided by the industry total return base; the resulting number is a fraction of how much the discrepancy is compared to the total return base. This fraction is then multiplied with the individual return base and the result is the amount by which the grid company has been under- or over-compensated by the model. This is then divided by rho and subtracted from the cost norm. We divide by rho because the cost norm will later be multiplied with rho again, and we want the full effect of the correction to be carried into the revenue cap. The new Revenue Cap_2 is determined by:

$$Revenue\ cap_2 = Cost\ Norm_2 \times\ \rho + Cost\ base\ \times (1-\rho)$$

The total effect of this calibration is relatively small and only reduces the revenue cap for the entire industry in 2010 by 38 MNOK, or about a quarter of a percent of the total costs of the industry.

7.2.5 Deviation Correction

In the previous calibration the model attempts to match the total industry revenue cap to the total industry cost. This correction step addresses another problem in a similar way. The cost base we use for the current year is an estimation of costs for year t based on the costs of year t-2 adjusted for two years of inflation. Naturally, the actual costs of year t will be different from those estimated. Typically the actual costs for the grid companies are not known before the financial statements are available, one or two years later. This correction step reimburses the grid companies for the deviation in the estimated cost base used in the set revenue cap for year t-2 and the actual costs base of year t-2.

We subtract the actual cost base of year t-2 from the cost base used to set the revenue cap for year t-2. The resulting amount is the amount by which the industry has been over- or under-compensated in year t-2. We add two years of lost interest and then divide by the industry total return base. The resulting fraction shows by how many percent the estimated cost base was off from the actual one, compared to the industry total return base. We have termed this the Variation Factor.

$$Variation\ Factor = \frac{(\text{Industry Cost base in Revenue cap}_{t-2} - \text{Actual Industry cost}_{t-2}) \times (1 + \text{i}_{t-2}) \times (1 + \text{i}_{t-1})}{\text{Industry Return base}}$$

The grid companies will be compensated for the same fraction, plus the fraction in the calibration correction step, on their own return base, divided by ρ. We divide by rho for the same reason as in the calibration correction: we want the full effect of the correction to be added to the revenue cap. The cost norm will later be multiplied with rho and we preemptively divide by rho now, so that the full amount is added to the revenue cap.

$$Cost\ Norm_3 = Cost\ Norm_1 - \frac{Return\ base\ \times (Variation\ Factor_{t-2} + Calibration\ Correction\ Fraction)}{\rho}$$

In summation, the grid companies receive the fraction by which the estimation was off in year t-2 on their own return base, added two years of interest plus the calibration correction fraction. This is then divided by rho and subtracted from the cost norm. Again, the actual effect this has on the revenue cap is determined in the yardstick formula:

$$Revenue\ Cap_3 = Cost\ Norm_3 \times\ \rho + Cost\ base\ \times (1 - \rho)$$

7.3 Addition for Investments

In earlier years the revenue cap has had an addition for investments. This was added because the grid companies would make investments, but the costs of these investments would not make it into the model before two years later. NVE has issued a statement that this will no longer be in use from January 2011 (NVE, 2010). We therefore consider this step irrelevant to the analysis later in this paper, and have decided to drop this step entirely.

Part 4 –

Analysis

8 Project Presentation

8.1 Project Facts

The project that will be used in the analyses has been presented to us by SKS Produksjon, located in the Beiarn region south of Bodø.

We investigate the costs for the extension of the grid to eight new distributed generation facilities that want to get access to the grid. These companies will increase the generation capacity the grid needs to transport by 25 MW. In case all planned generation is put into place, the grid will be overloaded which in turn will lead to an increased network loss and voltage. Thus, the grid as it is cannot be used when the new generation is introduced and action must be taken, i.e. the grid needs reinforcement.

The expected yearly production of the new generators amounts to 91 GWh (assuming 40% usage of the distributed generation) and the generation facilities are meant to be connected to the already existing high voltage lines (>22kV).

As a baseline, SKS uses the alternative of leaving the grid as it is. We call this the reference alternative – alternative R - where we assume that the 22kV grid from Beiarn to Beiardalen remains as it is now and no distributed generation enters the scene. The other alternative – alternative 1 – assumes that distributed generation will be connected and the grid is optimized both technically and economically.

Considering the above mentioned conditions, adding the project will result in the following costs:

- Today's value of the future reinvestments alternative 1: 13.013 MNOK
- Today's value of the future reinvestments alternative R: 3.933 MNOK
- This results in a difference of 9.080 MNOK, which can be charged as investment contribution from the distributed generators

To require a fair share of the investment contribution from each distributed generator, an amount payable per megawatt is calculated and results in 0.364 MNOK / MW, which with the assumption of a 40% usage rate (i.e. 91 GWh) results in 10 Øre / kWh.

For the analyses we will assume that grid companies always take 100% of the investment contribution and thus make the distributed generators pay. In chapter 12, we will however also analyze if this is always the right decision profit wise.

The dataset we use is the data provided by NVE for 2010. (NVE, 2009b)

8.2 How the Project is Added to the Model

For the reader to be able to follow our analysis more closely, this chapter points out the details of how we added the project to the model.

In a first step we adapt the input and output variables for the respective company for the efficiency analysis. The only variables that are affected by the project are the DEA input costs and the distributed generation variable in the second stage regression. The DEA input cost is increased by adding the total investment cost (13.013 MNOK) of the project to the book value as well as to the depreciation cost. For depreciation we assume a linear depreciation over a period of 30 years. The distributed generation variable in the second step is increased by the full new amount of distributed generation, i.e. in this case 25 MW.

We do not change any of the other outputs, because the project strengthens the existing architecture and thus does not increase the length of lines or the number of network stations. This results in the project being added in the least beneficial manner, which will result in the worst case scenario possible for this project. The reason that we add no outputs is that we do not know a specific number of outputs, so we do not want to overly optimistic about the project.

When running the DEA analysis, we change the cost input for those companies that we add the project to. As described earlier, the full project costs are accounted for in the DEA input that thus increases by 1,288,070 NOK[7].

The resulting DEA efficiency scores are then transferred to the second step, where we run the regression with the new dependent variables (natural logarithms of DEA efficiency scores) and the adapted DG variable (additional 25 MW divided by the net value of the respective companies) for the companies the project is added to. The new coefficients are used to calculate the EFC for each company.

After calibration and combination of regional and distribution grid efficiency scores, the new revenue cap efficiency scores are used to calculate the new revenue caps. Again, we have to adapt the input cost for the revenue calculation. It is important to note that the cost base is calculated differently to the DEA input cost. Also, the change in the cost base for the revenue calculation depends on if the grid companies demand investment contribution or not. Because it is common practice to take the full amount of investment contribution, we run most analyses assuming that investment contribution is taken to the full extent. A separate analysis on the effects of investment contribution is done in chapter 12.

In the likely case that the company demands investment contribution, only the costs the company actually had from the project, i.e. total investment costs (13.013 MNOK) minus investment contribution (9.080 MNOK), are added to the cost base. The respective amount is also added to the depreciation costs assuming linear depreciation over a period of 30 years, which then results in an increase of the revenue cap cost base of 389,301 NOK[8].

These adaptations to the inputs and outputs then yield new revenue caps that show the effect of adding the project.

[7] Total project cost: 13,013,000 NOK; 1% working capital; NVE regulated rate of return 2010: 6.5%; Linear depreciation over 30 years; 13,013,000*1.01*0.065+13,013,000/30 = 1,288,070 NOK

[8] Project costs paid by the grid company: 3,933,000 NOK; % working capital; NVE regulated rate of return 2010: 6.5%; Linear depreciation over 30 years; 3,933,000*1.01*0.065+3,933,000/30 = 389,301 NOK

9 Effects of Adding the Project to Different Companies

9.1 Introduction

In this chapter we analyze the effects of adding the project to different companies. Although the project has been researched for the Beiarn area south of Bodø, we add the project to different companies along the west coast of Norway, because this is the only well researched project available.

We are adding the project to three different companies separately first, and then to all three companies at the same time. For each single analysis, we will both look at the effects the project has on the company and the industry as a whole with respect to changes in revenue cap.

The companies we chose for our analysis are:

- BE Nett AS
- Dalane Energi IKS
- Lyse Nett AS

The reason we chose these three companies is that all three of them are represented in the reference group we have been working with and that provided us with the project numbers. Also, the companies are good examples for companies that deal with a considerable amount of distributed generation and may deal with even more of it in the future. Table 9-1 shows the major characteristics of the three companies and illustrates major differences between the companies.

ID	Company	DEA Efficiency	calibrated efficiency	Distribution grid	Regional grid	Revenue Cap	Distributed Generation in MWh*	Energy Delivered (ED) in MWh	% of DG in ED	Cost base for Revenue Cap (Distribution + Regional)
5112008	Lyse Nett AS	99.27%	111.50%	x	x	kr 714,948,990	135,983	3,735,746	4%	kr 603,244,276
2572008	Dalane Energi IKB	69.01%	92.27%	x		kr 81,300,197	97,306	362,808	27%	kr 74,989,357
7262008	BE Nett AS	93.35%	109.71%	x		kr 133,003,310	76,874	841,421	9%	kr 113,648,992

*assuming DG being operated at 40%

Table 9-1 Company characterisitics

From Table 9-1, we see that Lyse Nett is a very large company and therefore interesting to consider. Their DEA efficiency score is with 99.27% close to fully efficient, which adds another characteristic that is valuable to have in our analysis. Dalane Energi on the other hand represents a much smaller company, both with respect to their revenue cap and the amount of energy delivered. Their DEA efficiency score is only 69.01%, a score ranging amongst the lowest DEA efficiency scores in the industry. With these two example companies, we have very different characteristics in our analysis. BE Nett is the third company being analyzed. There are two major reasons for including it into the analysis. On the one hand, the data we have available has been researched for BE Nett. Thus, it is evident that we include BE Nett into our analysis. Also, it is an interesting medium-sized company that is close to efficient with a DEA efficiency score of 93.35%.

The project we are adding has been described in detail in chapter 8. We add the same project to each company. Due to the differences of the companies with respect to size, adding the project will have different effects on the companies, both because of the different relations of input to project costs and the relations of already available to newly added DG capacity. It is also important to note that because none of the companies are frontier efficient in the DEA analysis, they do not change the efficient frontier, thus the DEA efficiency scores of all other companies remain the same, with one exception that does not have an effect on the later correction and calibration values.[9] The efficiency scores will however change when we adjust for environmental factors in the second stage and be further increased in the calibration step. The purpose of this analysis is to find out how the project affects the companies themselves as well as how other companies are affected, when one or more companies make an investment into DG.

9.2 Effects of the project on the company that adds the project

9.2.1 Effects on BE Nett AS

Adding the project to BE Nett results in an increase of the company's total revenue cap of 0.88 MNOK in the first year, amounting to approximately 22.5% of the additional investment paid for by BE Nett. This chapter will show how adding the project changes both efficiency scores and revenue caps of BE Nett.

[9] When adding the project to Lyse Nett AS, the efficiency score of Klepp Energi AS increases by 0.27%-points. Because Klepp Energi AS is a superefficient company in 2008 and has not been superefficient before, the efficiency score to be considered is set to 100% either way; thus the further calibration is not affected by this and does not have an effect on Klepp Energi AS or any other company.

BE Nett AS	w/o project	w/ project	Δ DEA efficiency
DEA Efficiency	93.35%	92.31%	-1.04%
EFC efficiency	96.67%	97.06%	0.39%
Calibrated Efficiency	109.71%	110.16%	0.45%

Table 9-2 Change in efficiency scores when adding the project to BE Nett AS

Table 9-2 shows how the efficiency scores differ comparing BE Nett without the project and with the project for the year 2010 (base year 2008). As can be seen from the table, the DEA efficiency decreases by 1.04%-points when adding the project. This is due to the project costs increasing the DEA input, while they are not being matched with an increase in any of the outputs. Correcting for environmental factors in the second stage compensates BE Nett for adding DG. As a result the efficiency increases to 97.06% (compared to 96.67% before adding the project). After the calibration of the efficiency scores, BE Nett observes a total increase in efficiency of 0.45%-points. Thus, BE Nett is rewarded with an increase in efficiency by 0.45%-points for adding the project, which results in an increase in revenue cap of 0.88 MNOK after calibration and deviation correction.

BE Nett AS	w/o project	w/ project	Δ
DEA Efficiency	kr 109,114	kr 108,777	-kr 338
Environmental Factor Correction	kr 2,264	kr 3,251	kr 987
Calibration of efficiency	kr 8,892	kr 8,963	kr 71
Calibration correction	-kr 296	-kr 302	-kr 6
Deviation correction	kr 13,029	kr 13,197	kr 168
Sum / Total Revenue Cap	kr 133,003	kr 133,885	kr 882

Table 9-3 Decomposition of the effects of the project on the revenue cap (values in thousand NOK)

Table 9-3 shows a decomposition of the effects of each step of determining the revenue cap both with and without the project. The sum of all steps determines the total revenue cap. It shows very clearly that the biggest part of the revenue cap is determined by the DEA efficiency. The EFC and the calibration of the efficiency score have a lesser, but not unimportant impact on the revenue cap. Further, the deviation correction also adds a considerable amount to the revenue cap. It is however important to note once more that this value can vary considerably amongst years, in fact, it can even be negative. This problem is approached in connection with the investment contribution analysis in chapter 12.

To show the effects of adding the project, the last column in Table 9-3 compares the composition of the effects for BE Nett with and without the project. This is also illustrated in Figure 9-1. Due to the initial decrease in efficiency, it is evident that the revenue cap decreases when looking at the DEA efficiency in the first step.

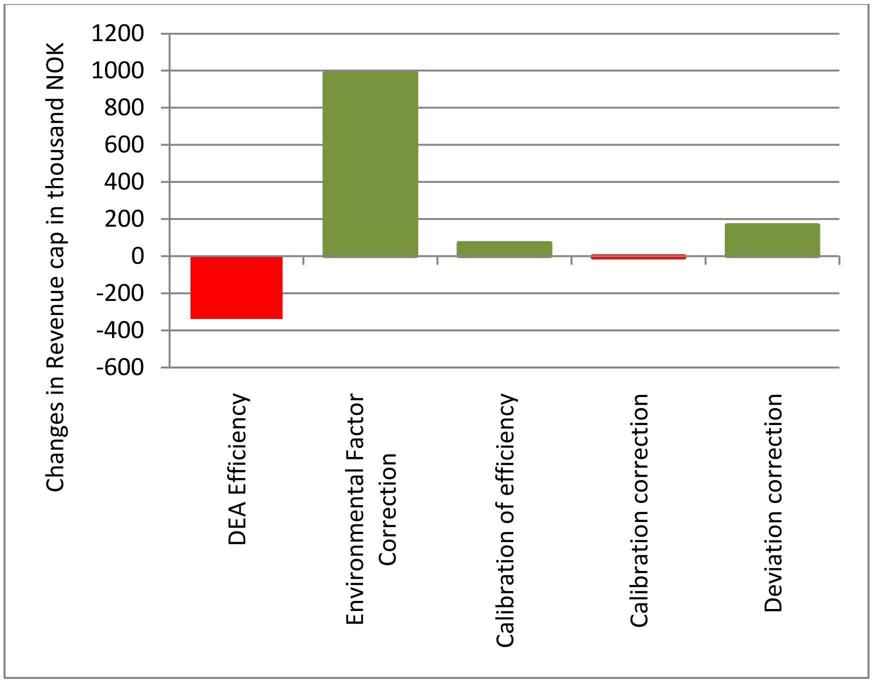


Figure 9-1 Changes in revenue cap in each step

The second step, the environmental factor correction (EFC), adds a considerable amount to the revenue cap when adding the project. This is exactly what we expect from the second step, since it compensates the company for adding more DG. Because we are adding a DG project and the second stage corrects for environmental factors including DG, this implies that the model works according to its intentions. Taking a closer look at the coefficients and the second stage, however, shows that although the company adding the DG project gets compensated for it, it would get compensated even more if the model was less volatile and the coefficients did not change.

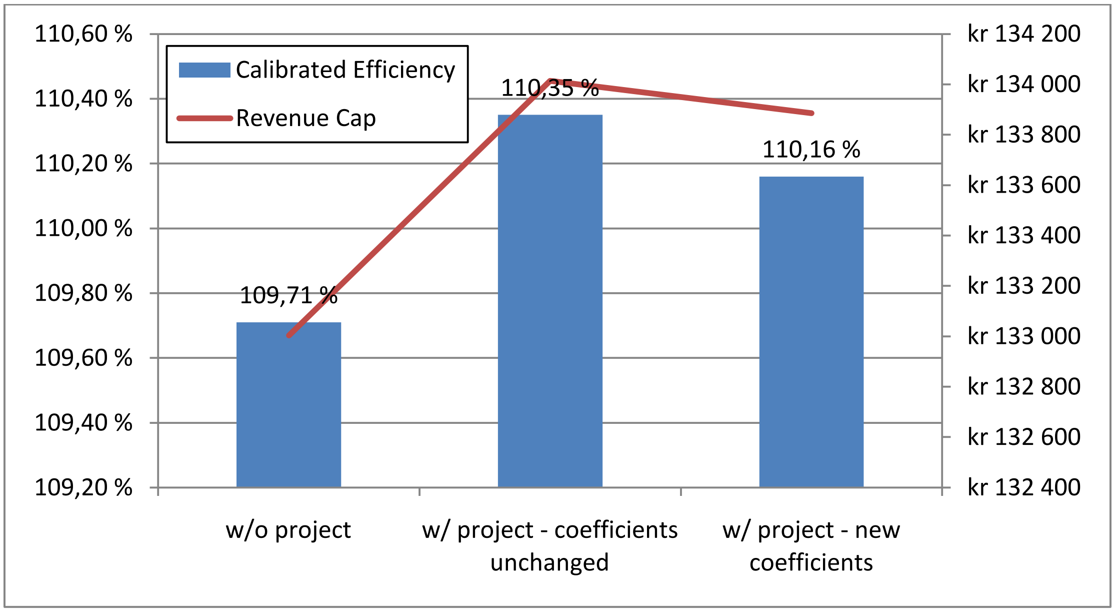


Figure 9-2 Efficiencies and revenue caps of BE Nett AS in three different scenarios (revenue cap in thousand NOK)

We would expect that no companies experience a change in EFC unless they increase one of the three independent variables (DG, Islands or Interfaces). In the case of BE Nett, this means that their EFC would remain stable at 3.32% with no changes. It would increase by 1.62%-points to 4.94% when adding DG, assuming the coefficients are stable. Thus, if the coefficients did not change, this would result in an additional increase in efficiency and an additional increase in revenue cap by 129,000 NOK to 134 MNOK. Because this is not the case and the second stage regression is volatile, the coefficients decrease with more DG in the industry and the EFC increases to only 4.75%. Thus, BE Nett looses 0.19%-points in efficiency increase due to the changes in the coefficients. The total effects are shown in Figure 9-2. As will be shown in chapter 10, the payback period for the project is expected to be very good, however uncertain due to possible future changes in the coefficients. The decrease in coefficients and the resulting decrease in compensation for DG in general thus only have an effect on the industry as a whole and usually an insignificant negative effect on the company adding the project. The effects of the project on the industry will be looked at more closely in chapter 9.3.

The third step in Figure 9-1, the difference in the revenue cap caused by calibrated efficiency, results from the minor decrease of the average efficiency of the industry (decrease of 0.06%-points) due to BE Nett adding the project and the resulting increased calibration value (by 0.06%-points).

We recall from chapter 7 that the next step corrects for rounding errors made in the calibration of the efficiency score. This step has a small but negative impact on the revenue cap both with and without the project.

Further the correction for discrepancy amongst the regulated and actual values of year t-2 are adjusted for in the last step. As noted before, this value can vary considerably amongst the years and we therefore point out that changes in this step are not important for this analysis.

The same analysis has been done for Dalane Energi and Lyse Nett, with similar results. A comparison of the results follows in the following sub-chapter.

9.2.2 Comparing the effects adding the project has on the three sample companies

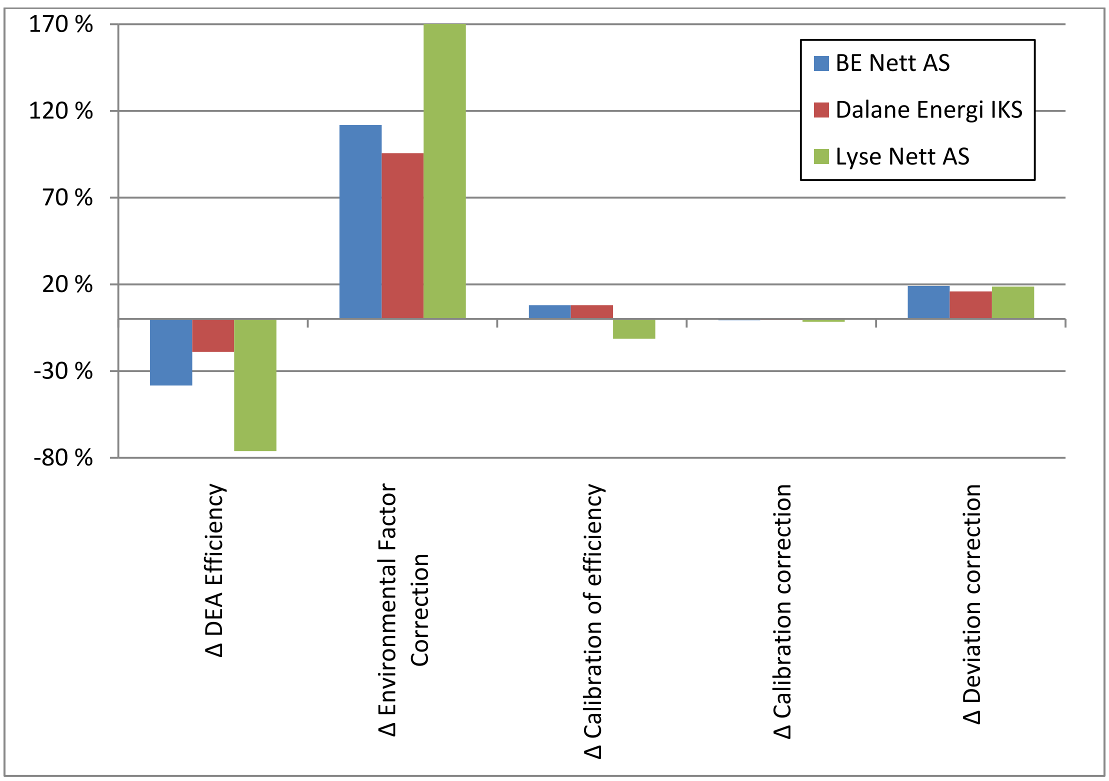


Figure 9-3 Fractional effect of each step on changes in revenue cap in percentage of total change in revenue cap for each company

Figure 9-3 compares the effects of each step for all three companies in percentage of the total change in revenue cap of each company. This comparison shows that adding the project has similar effects on the companies, despite their different characteristics. The larger differences of Lyse Nett to BE Nett and Dalane Energi stem from the regional grid, which is reflected here as well. This also causes the negative change in the revenue cap of the calibrated efficiency for Lyse Nett. As mentioned in chapter 7, the regional network losses and the required planning costs are taken out of the cost base for the part of the revenue cap that is determined by the efficiency score and thus remain stable and do not increase the revenue cap with increased efficiency scores.

9.2.3 Summary of Results

From the three examples we analyzed, we reason that the model as it is today compensates for DG projects to a good extent. We conclude this, because the biggest change in Total Revenue Cap results from changes in EFC and the biggest change in EFC results from extra compensation for added DG capacity. The model does what we expect, i.e. compensates the company that adds the project for extra DG, but it decreases the coefficient for DG capacity as well, which results in the project having an impact on the whole industry. This is an effect that is not desirable and which weakens the assumption that adding the second stage makes the efficiency outcomes less volatile. In order to find out, how much less volatile the two-stage method is, we would need to compare the current model to a one-stage DEA analysis with all eleven outputs. The scope of this thesis does however not allow for this and we leave this question to be answered. The following chapter looks at the industry effects that occur when adding the project.

9.3 Effects of the Project on the Industry

9.3.1 Effects on the Industry when Adding the Project to the Companies Separately

Adding the project to any company increases the total industry revenue cap by the amount the cost base for the companies adding the project is increased. For the DG project we are analyzing, this means that the total industry revenue cap after calibration correction and before deviation correction (RC2) increases by 389,000 NOK[10]. This implies that adding the project to one company in the industry has an effect on the total industry besides changes in coefficients and thus efficiency. All three companies we added the project to had a larger effect of adding the project than the increase in total industry revenue cap. This implies a distributional effect on the revenue caps of all companies

[10] Increase in cost base due to project: 3,933,000*1.01*0.065+3,933,000/30 = 389,000 NOK

To eliminate the uncertainty of the deviation correction, we are analyzing Revenue Cap 2 for this anaylsis. In Revenue Cap 2, the increase in total industry revenue cap amounts to 389,000 NOK. We also see a small average increase of 3,000 NOK for the whole industry. Nevertheless, there are a number of companies that suffer losses of up to 207,000 NOK. The five largest losses and gains of BE Nett, Lyse Nett and Dalane Energi adding the project are shown in Table 9-4 Changes in Revenue Cap 2 when BE Nett AS adds the project (numbers in thousand NOK). Details for all companies can be found in Appendix 20.

Adding project to BE Nett AS		Adding project to Lyse Nett AS		Adding project to Dalane Energi IKS	
Company	Δ RC2	Company	Δ RC2	Company	Δ RC2
SFE Nett AS	-207	SFE Nett AS	-55	SFE Nett AS	-107
Tussa Nett AS	-187	Tussa Nett AS	-44	Tussa Nett AS	-93
Sunnfjord Energi AS	-171	Sunnfjord Energi AS	-37	Sunnfjord Energi AS	-85
Stranda Energiverk AS	-82	BKK Nett AS	-20	Agder Energi Nett AS	-68
x	x	x	x	x	x
x	x	x	x	x	x
Fortum Distribution AS	78	Trondheim Energiverk Nett AS	8	Trondheim Energiverk Nett AS	21
Skagerak Nett AS	116	Fortum Distribution AS	14	Fortum Distribution AS	33
Hafslund Nett AS	438	Hafslund Nett AS	53	Hafslund Nett AS	135
BE Nett AS	714	Lyse Nett AS	785	Dalane Energi IKS	881
Average	3	Average	3	Average	3

Table 9-4 Changes in Revenue Cap 2 when BE Nett AS adds the project (numbers in thousand NOK)

We see very clearly that the company that adds the project experiences the largest positive effect. When BE Nett adds the project, its Revenue Cap 2 increases by 714,000 NOK. Besides BE Nett, a few other companies gain large amounts by the changes caused by BE Nett. All of these winning companies are companies with very small amounts of Islands and DG, the two coefficients that change the most, and thus only experience small changes in their efficiency scores and resulting revenue caps. The companies that suffer a large decrease of their revenue cap are those companies with the largest amounts of DG; except for BE Nett which adds 25 MW in DG capacity, all DG abundant companies lose both in efficiency and resulting revenue cap. The same reasoning applies to the industry effects of Lyse Nett and Dalane Energi when they add the project.

We see a very similar result when looking at the percentage effects adding the project has on other companies. The largest increases and decreases are shown in Table 9-5. Results for all companies are shown in Appendices 21-23.

BE Nett AS Company	Δ RC 2	Dalane Energi IKS Company	Δ RC 2	Lyse Nett AS Company	Δ RC 2
BE Nett AS	0.60%	Dalane Energi IKS	1.24%	Lyse Nett AS	0.12%
Løvenskiold Fossum Kraft	0.05%	next 15 companies	0.02%	Yara Norge AS	0.02%
next 14 companies	0.04%	next 24 companies	0.01%	next 12 companies	0.01%
x	x	x	x	x	x
x	x	x	x	x	x
Kvinnherad Energi AS	-0.23%	Kvinnherad Energi AS	-0.11%	Modalen Kraftlag BA	-0.05%
Modalen Kraftlag BA	-0.24%	Modalen Kraftlag BA	-0.12%	Kvinnherad Energi AS	-0.05%
Norddal Elverk AS	-0.27%	Norddal Elverk AS	-0.13%	Norddal Elverk AS	-0.06%
Stranda Energiverk AS	-0.32%	Stranda Energiverk AS	-0.16%	Stranda Energiverk AS	-0.07%
Average	-0.019%	Average	-0.005%	Average	-0.006%

Table 9-5 Effects on Revenue Cap when adding the project to the companies separately

Note that the average change for the industry is very small and slightly positive in all three cases, which was to be expected from the revenue cap example in Table 9-4. The comparison of percentage changes shows even better that the company adding the project experiences the biggest change in revenue cap. The large negative effects occur for the same few companies in every analysis and can be explained by the large amount of DG these companies have. The coefficient for DG decreases when a company adds DG, and as a result the companies are compensated less for each unit of DG. Thus, companies with DG are compensated less and receive a lower revenue cap.

The changes for the whole industry are illustrated in Figure 9-4, where all companies' percentage changes in the revenue cap are mapped out. This shows graphically that most companies will only experience a very minor change in revenue cap, when one company adds a project, with the exception of those companies with a comparatively large amount of DG. The results for all companies can be found in Appendices 21-23.

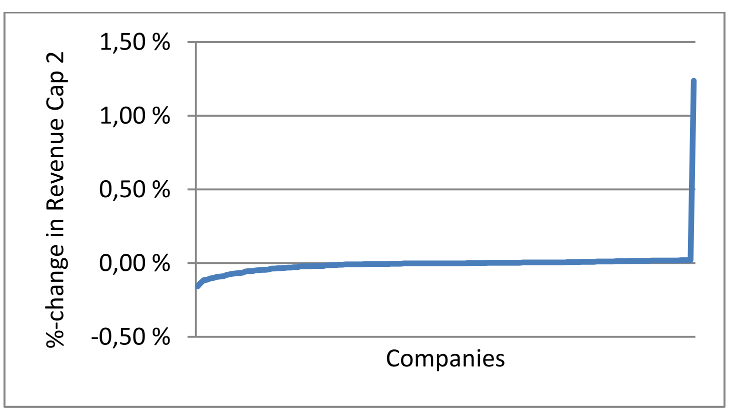


Figure 9-4 Industry Revenue Cap 2 changes (in %) when adding project to Dalane Energi IKS

When adding the project to companies separately, we thus only experience a minor change for the majority of companies. This outcome justifies the statement that the model is not very much influenced by changes of just one company, as is intended.

In the following sub-chapter we will add the project to three companies simultaneously and take another look at the volatility.

9.3.2 Effects on the Industry when Adding the Project to Three Companies Simultaneously

Because it is very probable that more than one company will start a project in a year and to move the analysis closer to reality, we add the project to all three companies simultaneously. We used the same project and added it to all three of our test companies. The results can be seen in Table 9-6**.**

Company	%Δ RC 2	Company	Δ RC 2
Dalane Energi IKS	1.06%	Dalane Energi IKS	755
BE Nett AS	0.54%	Hafslund Nett AS	714
Lyse Nett AS	0.11%	Lyse Nett AS	691
x	x	BE Nett AS	652
x	x	x	x
Modalen Kraftlag BA	-0.40%	Sunnfjord Energi AS	-287
Norddal Elverk AS	-0.45%	Tussa Nett AS	-316
Stranda Energiverk AS	-0.54%	SFE Nett AS	-351
Average	-0.029%	Average	8

Table 9-6 Percentage changes in Revenue Cap when adding the project to three companies simultaneously (values in thousand NOK)

Again, as expected, companies that add the project have the highest positive changes in revenue cap in percent. Hafslund Nett gains 714,000 NOK in revenue cap without adding the project. While this is more in total numbers than Lyse Nett and BE Nett gain from adding the project, the percentage increase for Hafslund is only 0.03%, thus the only reason for Hafslund gaining this much is its size. Again, the same companies as before experience a negative change in their revenue cap.

It is interesting to note that adding the project to different companies simultaneously, we observe larger volatility in changes, although the average is still very close to zero; and again the slight negativity of the average originates in the extreme values of that handful of companies. Figure 9-5 illustrates the percentage changes in the industry by mapping all companies' changes in Revenue Cap 3. It becomes visible that more companies have a slightly negative change in revenue cap.

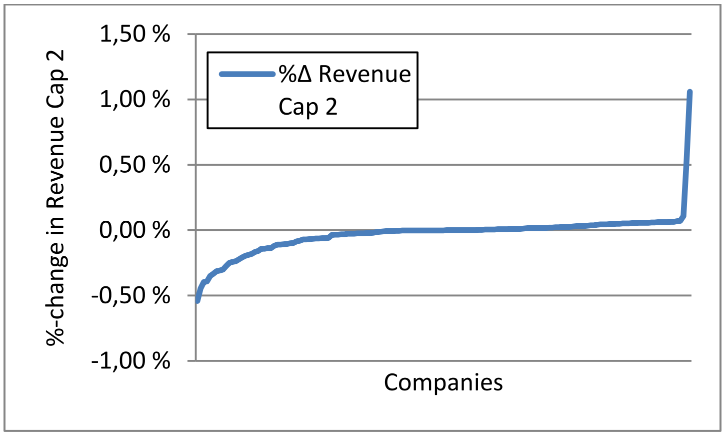


Figure 9-5 Industry revenue cap changes (in%) when adding the project to three companies

The reason for this is the more extreme change of the coefficients when adding the project to more companies. The total amount of DG is increased for the industry by more than when just adding one project; thus the coefficients decrease by more than before. Table 9-7 shows the changes of the coefficients in comparison to the original coefficients, when adding the project to the three companies separately and simultaneously. Although the other coefficients change as well, the biggest changes occur in the DG coefficient, with a considerable larger decrease when adding more than one project at a time.

	Interfaces	Δ to original	Islands	Δ to original	DG	Δ to original
original	-0.00474		-1.26697		-0.72678	
Adding project to BE Nett AS	-0.00475	0.00001	-1.26282	-0.00415	-0.68330	-0.04348
Adding project to Dalane Energi IKS	-0.00474	0.00000	-1.26549	-0.00148	-0.70537	-0.02141
Adding project to Lyse Nett AS	-0.00474	0.00001	-1.26631	-0.00066	-0.71748	-0.00929
Adding project to all three companies	-0.00476	0.00002	-1.26081	-0.00616	-0.65445	-0.07233

Table 9-7 Change in coefficients when adding the project

9.3.3 Summary of Results

When adding projects, the biggest changes in revenue caps in both total numbers and percentages occur in the company that added the project, while the industry average change remains close to zero. Even though adding the project to one or three companies does have an effect on some companies – in this case those companies with a large amount of DG capacity -, the change can with less than 0.5% in all cases still be considered to be small enough to not overly affect each single company. So far, the model seems to incentivize companies to invest in DG projects, as companies will get a higher revenue cap for investing in it. We point to chapter 10 for a short profitability analysis. It might also be good to know for managers that their decisions will not overly benefit or penalize other companies.

10 Profitability of the Project

10.1 Introduction

To get an idea about the profitability of our project, we measure the profitability by a simple payback analysis, a present value calculation and the internal rate of return at the example of BE Nett. Recall that the grid companies are obliged to connect any producer to the grid and the question of whether or not to invest in a project is not up to the grid company. Despite this, it is interesting to see how profitable the project is. The project costs amount to 13.013 MNOK, of which the grid company must invest 3.93 MNOK, while the remaining 9.08 MNOK are paid for by the producers as an investment contribution. This is, if we assume that the grid company asks for 100% investment contribution. Thus, the increase in revenue cap, i.e. the extra amount of money the grid company is allowed to make in order to cover their costs, has to be compared to the 3.93 MNOK.

For our project analysis, we use BE Nett as an example and make the questionable assumption that the rest of the industry will not change over time. This assumption is questionable because it is very unlikely that the industry will not change over the next 30 years. We run an analysis for 30 years, where we change both cost base[11] and depreciation costs of the project continuously. This causes a continuous decrease in the cost base both for the DEA analysis and the revenue cap analysis, with a result of increasing DEA efficiency scores, changing coefficients for the EFC calculation and a slight increase in the final revenue cap.

We use Revenue Cap 1, i.e. before calibration correction and deviation correction for this analysis in order to eliminate correction errors and uncertainties of how these corrections will change over the next 30 years. This is supposed to make our vague assumptions a little bit less unpredictable.

The above mentioned assumptions then lead to the following changes in depreciation costs and cost bases each year. Assuming a linear depreciation over 30 years, this means that the value added to the depreciation is the same every year. For the DEA input costs this is 434,000 NOK[12] and for the

[11] Cost base = Avkastningsgrunnlag
[12] Depreciation: 13,013,000/30 = 434,000 NOK

revenue cap this is 131,000 NOK[13]. The cost bases decrease by the depreciated value each year. This can be calculated with the following formula:

$$Cost\ base_t = Total\ project\ cost - (Depreciation * (t - 1))$$

This is the same calculation for both DEA inputs and revenue cap cost base, only the project costs are different (13,013,000 NOK for the DEA, 3,933,000 NOK for the revenue cap calculations). The sum of depreciation and change in cost base in year t are then added to the total cost of BE Nett. The resulting changes can be seen in Appendix 25, an excerpt of the changes is shown in Table 10-1.

BE Nett (RC1 w/o project 120,270)			
year	Revenue Cap Efficiency	RC 1	Revenue from project
1	110.16%	120,990	720
2	110.18%	120,995	724
3	110.21%	121,006	736
4	110.23%	121,011	740
5	110.25%	121,015	745
6	110.27%	121,020	750
7	110.30%	121,031	761
8	110.32%	121,036	765
9	110.34%	121,040	770
10	110.36%	121,045	774
x	x	x	x
20	110.59%	121,110	840
x	x	x	x
30	110.81%	121,169	899
after depreciation	111.17%	121,541	1,271

Table 10-1 Project revenue over 30 years

The following sub-chapters use these numbers to calculate payback, net present value and internal rate of return.

[13] Depreciation: 3,933,000/30 = 131,000 NOK

10.2 Payback Analysis

With an investment of 3.93 MNOK and a continuous increase of the revenue cap as shown in Table 10-1, a simple calculated payback period for the investment amounts to 5.5 years to cover the project costs.

This makes the project very profitable, especially accounting for the expected lifetime of the grid of 30 years. This calculation does, however, not take into account any costs for operation and maintenance, which will probably decrease profitability by a bit. Also, we use Revenue Cap 1 to calculate the payback. Revenue Cap 1 is considerably smaller than the potential final Revenue Cap 3, but more stable and reliable. This means that there is a potential of an even larger increase in profitability or a slight decrease, depending on the calibrations.

10.3 Net Present Value Analysis

A Net Present Value (NPV) calculation with the values of Table 10-1 yields a similar result: a positive present value is reached in year 7, when assuming a rate of return of 6.5%, which is the NVE's regulated rate of return for 2010.

$$NPV = \sum_t \frac{R_t}{(1+i)^t}$$

$$= -\frac{3.933}{(1+0.065)^0} + \frac{0.720}{(1+0.065)^1} + \frac{0.724}{(1+0.065)^2} + \frac{0.736}{(1+0.065)^3} + \frac{0.740}{(1+0.065)^4} + \frac{0.745}{(1+0.065)^5} + \frac{0.750}{(1+0.065)^6} + \frac{0.761}{(1+0.065)^7} = 0.113$$

This is a very good result as well. Again, no operation and maintenance costs are taken into account.

10.4 Internal Rate of Return Analysis

The NVE regulation model is in part a return on investment calculation, thus we also use an internal rate of return calculation. For this, we find the rate of return for which the Net Present Value is zero, assuming a lifetime of the project of 30 years. The internal rate of return is given by r in:

$$NPV = \sum_{t=0}^{T} \frac{R_t}{(1+r)^t} = 0, with\ T = 30$$

With the values in Table 10-1, the internal rate of return would amount to 19.03%. This is a very high return on investment for the regulated industry, especially when compared to the NVE's regulated rate of return of 6.5% in 2010.

10.5 Summary of Results

We conclude that the project is profitable to BE Nett, especially, if NVE manages to increase regulation stability and therefore to decrease the risk of large changes in the revenue cap and earnings for the grid companies. There are, however, many uncertainties to these calculations. The model is very volatile and even though the company who adds the project may not change its inputs or outputs, and thus perform on par with earlier years, it is possible that the revenue cap will decrease and the payback period for the project will be prolonged. Besides the volatility, it is also unclear if changes in the model will benefit companies as much as the current model does. One possible scenario of a changed model is examined in chapter 16, in which the project becomes even more profitable to the grid company.

11Effects of Changing Rho

11.1 Introduction

In the following we illustrate the effect of changing rho. Recall first the function of rho, which is to reduce the weight of the model. A low value for rho should put the revenue cap closer to the cost base, whereas a high value for rho puts the revenue cap closer to the cost norm:

$$Revenue\ Cap = Cost\ Norm \times\ \rho + Cost\ base\ \times (1-\rho)$$

Rho then sets a relation between the cost norm and the cost base. Recall also that the initial difference between the cost base and the cost norm is that the cost norm is the cost for an efficient version of the same company. Therefore we can assume that changes in rho will somehow be related to efficiency scores.

11.2 Illustration of Effects of Changing Rho

The first step in our analysis is to set up a table over the revenue caps at different steps of correction for both values of rho. The data is sorted by ascending efficiency and we include only the bottom and top three efficient companies. The sums at the bottom are from the full table, which can be found in Appendix 26.

Company	Revenue Cap Efficiency	ρ = 0.6 RC1	ρ = 0.6 RC2	ρ = 0.6 RC3	ρ = 0.5 RC1	ρ = 0.5 RC2	ρ = 0.5 RC3	Δ RC1	Δ RC2	Δ RC3
Åbjørakraft Kolsvik Kraftverk	46.77%	830	825	1,039	895	891	1,105	7.82%	7.97%	6.33%
Løvenskiold Fossum Kraft	54.47%	2,425	2,415	2,877	2,577	2,569	3,030	6.26%	6.36%	5.34%
Vinstra Kraftselskap DA	61.87%	441	441	462	463	463	484	4.94%	4.97%	4.74%
×	×	×	×	×	×	×	×	×	×	×
×	×	×	×	×	×	×	×	×	×	×
Yara Norge AS	134.50%	17,285	17,270	17,896	16,791	16,779	17,404	-2.86%	-2.85%	-2.75%
Sira-Kvina Kraftselskap	146.77%	7,410	7,395	8,046	7,139	7,126	7,778	-3.65%	-3.63%	-3.33%
Ringeriks-Kraft Produksjon AS	245.07%	1,030	1,025	1,207	965	962	1,143	-6.25%	-6.21%	-5.28%
		15,085,168	15,046,730	16,726,819	15,078,762	15,046,730	16,726,819	-0.04%	0	0

Table 11-1 Summary of Effects of Changing Rho (values in thousand NOKs)

Table 11-1 confirms our idea that the changes in the revenue cap are related to the efficiency of the company. All the companies that are over 100% efficient have their revenue cap decreased, while the lower efficiency companies have their revenue cap increased. This is because super efficient companies have cost norms that are larger than their cost base, and for inefficient companies the opposite is true. Considering that the revenue cap is a fraction of each of these costs, it makes sense for each company to want the rho to put weight on whichever cost base or cost norm is higher for them. For super efficient companies, the larger cost is the cost norm (i.e. they prefer a high value of rho), for inefficient companies this is the cost base (i.e. they prefer a low value of rho).

Company	Revenue Cap 3	RC Efficiency	ΔRevenue Cap 3 for changes in ρ:								
			ρ = 0.4		ρ = 0.5		ρ = 0.6	ρ = 0.7		ρ = 0.8	
Åbjørakraft Kolsvik Kraftverk	1,039	46.77%	131	12.61%	66	6.35%	-	-66	-6.35%	-131	-12.61%
Løvenskiold Fossum Kraft	2,866	54.47%	307	10.71%	154	5.37%	-	-154	-5.37%	-307	-10.71%
Vinstra Kraftselskap DA	462	61.87%	43	9.31%	22	4.76%	-	-22	-4.76%	-44	-9.53%
×	×	×	×	×	×	×	×	×	×	×	×
Yara Norge AS	17,724	134.50%	-983	-5.55%	-492	-2.78%	-	492	2.78%	984	5.55%
Sira-Kvina Kraftselskap	8,047	146.77%	-536	-6.66%	-268	-3.33%	-	269	3.34%	537	6.67%
Ringeriks-Kraft Produksjon AS	1,207	245.07%	-128	-10.61%	-64	-5.30%	-	63	5.22%	127	10.53%

Table 11-2 – Changes in Revenue Cap for Changing Rho (numbers in thousand NOKs)

Table 11-2 shows the change in Revenue Cap 3 for the same three companies as before when rho changes from the base case of 0.6. For Yara Norge the change in rho has a very significant impact on their revenue cap. By increasing or decreasing the rho by 0.1 their revenue cap changes by as much as 500,000 NOK (2.78%). Since this is a super efficient company, increasing rho will increase their income. On the other hand, for Vinstra Kraftselskap increasing rho from 0.6 decreases the revenue cap by 21,700 NOK (4.76%), and vice versa for decreasing rho. Because the table shows the most and least efficient companies, these are likely the companies that will show the most extreme changes in revenue caps.

From Table 11-1 we also see that the aggregate effect before calibration correction and deviation correction is almost zero. The industry revenue cap before calibration correction (RC1) changes by 0.04% and after the first stage of calibration correction (RC2) the total effect of changing rho is zero. Recall that the calibration correction matches the industry revenue cap to the industry cost base, so changing rho cannot affect earnings of the industry as a whole. In other words, the only effect of rho is a distributional effect; it will take from some companies and give to others.

When changing rho, it appears that the change in revenue cap is entirely linked to the efficiency rating of the companies. If that were true, we could conclude that the less efficient the company is rated, the more interested they would be in a decreased value of rho. However, if we study the table below we see there is another factor we have to consider to understand how rho affects the revenue cap. Table 11-3 shows the cost base and change in revenue cap after corrections (RC3), but also shows two new costs: Network Losses in Regional Grid[14] and Required Planning Costs[15].

Company	Cost Base	Network Losses in R-Grid	Required Planning costs	Revenue Cap Efficiency	ΔRC3	Extra Cost/ Cost Base
Forsand Elverk KF	8,695	0	0	73.39 %	2.87 %	0.00 %
Sandøy Energi AS	7,544	0	0	73.58 %	2.89 %	0.00 %
Opplandskraft DA	10,643	5,596	0	73.61 %	1.28 %	52.58 %
Malvik Everk	26,535	0	0	75.11 %	2.68 %	0.00 %
Aurland Energiverk AS	16,197	0	0	75.75 %	2.59 %	0.00 %

Table 11-3 – Effect of Regional Grid and Required Planning Costs (numbers in thousand NOKs)

These are all inefficient companies sorted according to efficiency rating. The ΔRC3 column shows how large a fraction their revenue caps increase due to reducing the value of rho from 0.6 to 0.5. Because they are inefficient their revenue caps will increase. We see that as efficiency goes down, the fractional change in RC3 goes up. In our example, Opplandskraft has a much lower increase in revenue cap than its closest neighbors. One would expect the company to have a revenue cap increase of more than 2.68% but less than 2.89% as these are the values for the companies just above and below it in efficiency. The reason for Opplandskraft being much less affected by the change in rho is because more than half of its costs are related to network losses in the regional grid. When calculating the cost norm, the costs related to required planning and network losses in the regional grid are not multiplied with the efficiency score, but added in full after the multiplication.

$$Cost\ Norm_i = (Cost\ Base_i - Network\ Loss_R\ \&\ Planning\ Costs_i) * Efficiency_i + Network\ Loss_R\ \&\ Planning\ Costs_i$$

In terms of these specific costs then, the cost norm and the cost base are the same; they are exempt from regulation. Therefore rho, being a weight to determine shares of the cost norm and cost base cannot change the cost norm or revenue cap for these costs; they are added in full either way.

In summary, companies that have costs related to required planning costs and network losses in the regional grid, will not have this part of their revenue cap changed by different values of rho.

[14] Losses Regional Grid Costs = Nettap i Regional Nett
[15] Required Planning Costs = Kostnader knyttet til utredningsansvar

11.3 How is the Project Affected by Rho?

As we have demonstrated, the effect of rho depends on the difference between the cost norm and the cost base. In the case where these two are similar, rho does almost nothing. The primary driver for the difference between the cost base and cost norm is the efficiency rating of the company. In addition to this we also have to consider the company's amount of costs in required planning and regional network losses.

The way we have formulated the project, it increases the cost base in the first year by 389,000 NOK[16], which includes depreciation and capital costs. Naturally, this also affects the cost norm, depending on the efficiency score and finally the revenue cap depending on the value of rho. We have found that adding the project has a significant effect on the efficiency score for the companies we have selected. We therefore illustrate the effects of changing rho in the three companies we added the project to and compare the cases with and without the project for several values of rho. Because the project has an effect on the efficiency score of the company, and this ties in with the company's cost norm we cannot separate the earnings for the project from the rest of the revenue cap because it changes the revenue cap for the whole company.

Table 11-4, Table 11-5 and Table 11-6 show the change in revenue cap for the base case, where the project is not added, and compare it to the changes in revenue cap when the project is added; all for four different values of rho, compared to the 0.6 value.

BE Nett AS				
ρ	Base RC3	Project RC3	ΔRC3	Project Earnings
0.4	-2 108	-2 217	-108	774
0.5	-1 054	-1 108	-54	828
0.6	x	x	x	882
0.7	1 054	1 108	54	936
0.8	2 108	2 217	108	990

Table 11-4 Effect of Rho on Project Earnings for BE Nett (Numbers in thousand NOKs)

We see in Table 11-4 that when reducing rho to 0.5 BE Nett's Revenue Cap 3 goes down to 1,054,000 NOK when the project is not added, and 1,108,000 NOK when it is. The difference 54,000 NOK is the changed profitability of the project when decreasing rho. In other words, reducing rho to

[16] Depreciation + Capital Cost = 3,933,000/30 + 3,933,000*1.01*0.065 = 389,000 NOK

0.5 will also reduce the project earnings from 880,000 NOK down to 828,000 NOK. Since both BE Nett and Lyse Nett are rated as super efficient companies after calibration and corrections they will both earn less money when reducing rho.

Lyse Nett AS				
ρ	Base RC3	Project RC3	ΔRC3	Project Earnings
0.4	-12,533	-12,665	-132	832
0.5	-6,266	-6,332	-66	898
0.6	x	x	x	964
0.7	6,266	6,332	66	1,030
0.8	12,533	12,665	132	1,096

Table 11-5 Effect of Rho on Project Earnings for Lyse Nett (numbers in thousand NOKs)

Similar to BE Nett, Lyse Nett has its revenue cap increased by 66 000 NOK per 0.1 increase in rho due to the project. Size in this case does not seem to play a big role in how rho changes the profitability of the project.

Dalane Energi IKS				
ρ	Base RC3	Project RC3	ΔRC3	Project Earnings
0.4	1,235	1,071	-164	884
0.5	618	536	-82	966
0.6	x	x	x	1048
0.7	-618	-536	82	1,130
0.8	-1,235	-1,071	164	1,212

Table 11-6 Effect of Rho on Project Earnings for Dalane Energi (numbers in thousand NOKs)

Dalane Energi is a smaller company that is not rated super efficient and therefore will receive a larger revenue cap when rho decreases. For each 0.1 decrease in rho, Dalane Energi receives roughly 80,000 NOK extra revenue cap with the project.

11.4 Conclusion

The purpose of this illustration has been to see what effect changing rho has on the project. As one might have guessed, it has practically the same effect on the project earnings as it does on the revenue cap itself. The original observation holds, and we see that super-efficient companies will earn more with a higher rho, while inefficient companies will earn less.

The effect of lowering rho is to bring the revenue cap closer to the cost base. In other words, the discriminating effect of the regulation model is lowered. The effect of changing rho is mainly distributional, and companies with low efficiency ratings will be punished less for their inefficiency, while high efficiency companies will be rewarded less for their high efficiency when rho is lowered. We have also shown however that this effect is lowered for companies with high costs in regional network losses and required planning. In the preliminary revenue cap calculations for 2010 we found that about 80 grid companies would have their revenue caps increased, while 73 would see a decrease, although for 76 of the companies the change in revenue cap would be less than 1%. For most companies changing rho to 0.5 has a small effect, although for a handful of grid companies the change in revenue cap can be very significant.

A final reason for the grid companies to want a lower value of rho would be to guard against the volatility in the model. The model is not perfect and NVE may very well change the model in the near future, potentially resulting in large changes in efficiency for the individual grid company. Also changes in inputs and outputs for other companies, mainly frontier companies, may have a large impact on how other companies are rated in efficiency. Lowering rho will reduce the volatility risk for all companies.

12 Effects of Investment Contribution

12.1 Introduction

How does the use of investment contribution[17] change the profitability? We have already illustrated what happens to the revenue cap when we add the project to our three selected companies. How does the question of charging investment contribution change this profitability, and could grid companies sometimes earn money by paying for larger parts of the projects themselves? The following aims to illustrate how investment contribution affects the revenue cap in unison with adding the project.

In the following analysis we first explain the difference between demanding and not demanding investment contribution and look closer at what happens to the revenue cap as we increase the return base[18] by the amount of the investment contribution. We will also briefly show how much the investment contribution adds to the revenue caps of both a super-efficient and an inefficient company.

12.2 The Difference between Accepting and Not Accepting Investment Contribution

Adding a project to a grid company in the model is different for the case where you use investment contribution versus the case where the grid company finances it themselves. There are two main differences in how the revenue cap changes according to the investment contribution question. The first is how the cost base is calculated; the second is by how much the company receives in the correction steps of the revenue cap calculation.

The first difference concerns how the investment contribution cost base is calculated compared to the non-investment contribution cost base. In both scenarios the input for the DEA analysis is the same because all costs are included in this cost base. The cost base that is used in the revenue cap

[17] Investment Contribution = Anleggsbidrag
[18] Return Base = Avkastningsgrunnlag

however differs in the two scenarios. When the grid company finances the project themselves all costs are included in their revenue cap cost base. If the grid company decides to use investment contribution to finance the project the depreciation and capital costs are not added to the cost base, but added to another account that is not included in the calculation of the revenue cap. This decision cannot change the efficiency rating of the company as the investment contribution account is included in the DEA analysis. When the company pays for the project themselves the depreciation and capital cost are added to their revenue cap cost base. What effect would we assume this to have? We know that a company that is 100% efficient should be able to cover all their costs plus the regulated rate of return on their invested capital. Therefore companies rated as super efficient should be able to cover more than the costs of the project plus the regulated rate of return. Roughly speaking a company rated at 110% for example should be able to add the project and cover all the project's costs and an additional profit of 10% on the added costs. The opposite should be true for companies that are less than 100% efficient. It would seem then that companies above 100% efficiency would not want to charge investment contribution, while companies below 100% efficiency would require the investment contribution to add the project.

The second difference is how the companies are compensated in the correction steps of the revenue cap. We have already looked at the effect adding the project to the firm has in terms of increasing total calibrated efficiency, and that the grid companies are required by law to add any projects as long as the producer pays the investment contribution. This leaves the question to the grid company on whether or not to demand investment contribution. By not demanding investment contribution the company is increasing its return base, and both corrections in the revenue cap are added as a fraction to the return base. So by increasing the return base, the grid company could also increase the amount it gains in the two correction steps. This could change the profitability to a point where the grid company may want to invest in the project themselves rather than require investment contribution. The amount gained in these correction steps may vary between years, and will only be a positive amount as long as the total industry cost in year t-2 was above the estimated cost in the revenue cap of year t-2. This means that the correction amount could even be a negative, and the increase in return base could mean losses instead of gains. The difference in the correction steps will be the main focus of our analysis.

12.3 Calibration & Deviation Correction for Investment Contribution

In the following we look at what effect the decision to not take investment contribution has on the cost norm of the company in the correction steps, and look at what effect this decision has on the revenue cap of the company. Both the calibration correction and the deviation correction change the cost norms of each company by a fraction of their cost base. A company could then affect the amount of compensation they receive from these steps by increasing their return base. For the project as we have specified it, the investment contribution is 9,080,000 NOK, and allowing for 1% of working capital it is 9,170,800 NOK. It follows that a company that adds this project, but does not demand investment contribution, increases its return base by almost 9.2 MNOK.

The calculations in the following show how the cost norm, and indirectly the revenue cap, will change for any company adding the project without accepting investment contribution. The first correction to the cost is the calibration correction:

$$\Delta Cost\ Norm = -\frac{\left(\Delta Return\ base \times \frac{Industry\ Revenue\ Cap - Industry\ Cost\ base}{Industry\ Return\ base}\right)}{\rho}$$

If we then use numbers from 2010 the equation will look as follows:

$$\Delta Cost\ Norm = -\frac{\left(9{,}171 \times \frac{15{,}085{,}168 - 15{,}046{,}730}{40{,}008{,}811}\right)}{0.6} = -14{,}685$$

The amount by which the cost norm changes here is as expected relatively small. The investment contribution investment deducts 14,685 NOK from the cost norm in this correction step. Note that this is will change by a very small amount depending on which company we do this for. This is because the industry total revenue cap changes when we add costs, and how much of these costs are transferred to the cost norm depends on the efficiency of the company.

The second stage calibration however is interesting because it increases the industry revenue cap by the amount the cost base was off in year t-2 with two years of NVE's regulated rate of return added. This can be a very significant amount of money; in 2010 it is almost as much as 1,700 MNOK.

$$Variation\ factor = \frac{(\text{Industry Cost base in Revenue cap}_{t-2} - \text{Actual Industry cost}_{t-2}) \times (1 + \text{i}_{t-2}) \times (1 + \text{i}_{t-1})}{\text{Industry Return base}}$$

In 2008, the cost base used in the revenue cap was 1 472 731 000 NOK below the actual industry cost. This difference is the amount of total compensation to be given back to the industry. It is multiplied with the rate of return for each of the two years the industry had to wait to be reimbursed this money; the rates of return for these years as determined by the NVE were 7.44% and 6.18%:

$$Variation\ factor = \frac{-1{,}472{,}731\ \times 1.0744\ \times 1.0618}{40{,}008{,}811} = -0.041993$$

This Variation Factor is added to the calibration correction fraction, which in 2010 is 0.0951%, then divided by rho and multiplied with the return base.

$$\Delta Cost\ Norm = -\frac{\Delta Return\ base\ \times (Variation\ Factor + \frac{Industry\ Revenue\ Cap - Industry\ Cost\ base}{Industry\ Return\ base})}{\rho}$$

We then add the numbers from the 2010 case to see how the cost norm changes for the project's increase in return base:

$$\Delta Cost\ Norm = -9{,}171 \times \frac{(-0.041993 +\ 0.000951)}{0.6} = 627{,}327$$

For the deviation correction the amount added to the cost norm is 627,327 NOK. To see the total change in revenue cap we have to use this number in the yardstick formula:

$$\Delta Revenue\ Cap = \Delta Cost\ norm \times\ \rho + \Delta Cost\ base\ \times (1 - \rho)$$

The correction steps adjust the cost norm, and therefore the cost base is naturally unaffected. The cost base does increase based on whether or not the grid company receives investment contribution, however this cost is also added to the cost norm based on the company's efficiency score. To get a rough idea how this might affect the revenue cap, we multiply with rho:

$$\Delta Revenue\ Cap = 627{,}327 \times\ 0{,}6 = 376{,}396$$

This change in revenue cap is related to the extra compensation in the correction steps only. We have not included the changes in cost base and cost norm due to increased depreciation and capital costs, but will do so in the next sub-chapter.

In summation for the correction steps, the grid companies can by deciding to invest the 9,080,000 NOK in the project increase their revenue caps by about 376,396 NOK in the two correction steps alone. Remember though that this is only for the year 2010, so if the deviation from the estimated industry cost base in the future is not 1,400 MNOK as it was in 2008-2010 the numbers would be quite different. In fact, the number for 2007-2009 is with 934 MNOK only about 65% of this (NVE, 2010). Still, it serves to point out that the corrections have a significant impact on the revenue cap, and the effect of increasing the return base should not be ignored when deciding on the degree of required investment contribution for the project.

12.4 Total Effect of the Investment Contribution Decision on the Revenue Cap

In the following we look at the total effect of the choice of whether or not to demand investment contribution for a super-efficient and an inefficient company.

We have already demonstrated that when a company adds the project there is a change in the efficiency score. This section does not address this effect, but seeks rather to illustrate the revenue cap differences of financing the project with investment contribution or not. We do this by comparing two companies to themselves and see what would be different if they had 9,080,000 NOK moved from their investment contribution account to their return base account. This increases the cost base, the cost norm and the amount by which they are compensated in the correction steps. The cost base increases by 898,769 NOK[19], and the cost norm increases depending on efficiency by a similar amount.

[19] The annual cost of the investment contribution for the first year is the depreciation of the 9,080,000 NOK (9,080,000 / 30 = 302,667 NOK plus the capital costs 9,080,000*1,01*0,065 = 596,102 NOK, the sum of which is 898,769 NOK.

For the super efficient company we chose BE Nett. Table 12-1 below shows the change in BE Nett's cost base and Revenue Caps 1 and 3 with and without the 9,080,000 NOK investment contribution (IC).

BE Nett AS (RC Efficiency 108,97%)	Cost Base	RC 1	RC 3
BE Nett with Investment Contribution	113,649	119,766	132,497
BE Nett w/o Investment Contribution	114,548	120,713	133,813
Difference between IC choices	899	947	1,316
Profit for Financing Without IC		48	369
Sum Project Profits Without IC			417

Table 12-1 BE Nett's Profit without Investment Contribution (numbers in thousand NOKs)

On the third row is the difference in cost base, Revenue Cap_1 and Revenue Cap_3 for the company when financing with investment contribution and without investment contribution. We see in the first cell that the annual extra cost of the project without investment contribution is 899,000 NOK. The uncorrected revenue cap (RC1) increases by 947,000 NOK which is 48,000 NOK more than the annual costs. The 48,000 NOK is the annual extra profit BE Nett makes when foregoing investment contribution because it is super efficient. BE Nett is rated at 108.97% efficiency, it will therefore increase the revenue cap by 8.97% more than the costs it adds to its cost base:

$$Cost\ Base\ \times\ 8{,}97\% \times\ \rho = 899 \times 8{,}97\% \times 0{,}6 = 48$$

The increase gained from the deviation correction stage is 369,000 NOK. This is the correction amount BE Nett gains in the correction stages described in chapter 7.2.5.

For the comparison company we selected a random company that is 81.69% efficient, Nore Energi AS. The increase in cost base for Nore Energi is the same as for BE Nett.

Nore Energi AS (RC Efficiency 81,69%)	Cost Base	RC 1	RC 3
Nore Energi with Investment Contribution	13,561	12,071	13,392
Nore Energi w/o Investment Contribution	14,460	12,871	14,564
Difference between IC choices	899	800	1,172
Profit for Financing Without IC		-99	372
Sum Project Profits Without IC			274

Table 12-2 Nore Energi's Profit without Investment Contribution (numbers in thousand NOKs)

We see however that the uncorrected Revenue Cap 1 goes down by 99,000 NOK. This is because Nore Energi is not efficient and this is the revenue penalty it receives on this project:

$$Cost\ Base\ \times (0{,}8169 - 1) \times\ \rho = 899 \times -0{,}1831 \times 0{,}6 = -99$$

Nore Energi however gains this loss back in the correction steps which here amounts to approximately 372,000 NOK. Due to the correction steps the project is still profitable for Nore Energi this year. The costs increase by 899,000 NOK but the final revenue cap increases by 1,172,000 NOK, which would be 274,000 NOK of extra profit this year.

BE Nett makes 143,000 NOK more than Nore Energi if it decides to forego investment contribution. Both companies receive about the same amount in the correction steps due to increasing their return bases. The small differences in these numbers are related to how their efficiency rating transfers the increased cost base to the industry revenue cap; the super efficient firm will increase the industry revenue cap by more than the cost, and the inefficient company by less than the increased cost base. The difference will not be much larger than the one we see here.

Company	Efficiency Profit	Correction Profit	Sum Profit
Nore Energi AS	-99	372	274
BE Nett AS	48	369	417

Table 12-3 Profit Difference between Nore Energi and BE Nett (numbers in thousand NOKs)

The main difference for the two companies stems from the different amounts they make on the increased cost base. BE Nett receives 48,000 NOK on top of the annual cost increase because they are rated super efficient, they will continue to receive extra profit every year they are super-efficient and as long as NVE rewards the super efficient companies like it does. The 370,000 NOK revenue increase is due to how NVE corrects the revenue caps. This is a strange incentive effect, and it is possible NVE will change this in the future; however, it is a good reason for the grid companies to manage their return base as well as their costs.

12.5 Conclusion

We have demonstrated in this chapter that demanding investment contribution for a project is not necessarily always the most profitable decision. The super efficient companies will gain the cost of the project plus a fraction extra as profit, depending on how much over 100% efficienct they are. The opposite is true for companies that are not efficient as they will not be able to cover the entire cost of the project without the extra amount in the correction steps.

In addition to this, we have demonstrated that the amount of compensation the companies gain in the correction steps by increasing their return base can be quite significant. This value is however highly dependent on how costs develop for the industry in the future. A negative correction could happen, but only if the total industry costs are below those of two years ago when they have been adjusted for two years of inflation. In fact, if the regulation model had the intended effect, one would assume that annual industry costs would decrease.

Another risk is that of the volatility in the model. The companies know that the model will be modified within the next few years, and they do not know how much their efficiency scores will change. Therefore any project profitability calculations are made a little more difficult, because so much of the income is decided by the efficiency rating. The safest choice is to just demand investment contribution even though this is clearly not always the most profitable choice. For the super efficient companies, it would seem a wise choice to try to attract projects like this, and if the risk seems too great, share the project costs with the producers and demand a rate of investment contribution, e.g. 50% of total project costs rather than the full potential investment contribution.

13 Adding Distributed Generation to BE Nett – Sensitivity of Coefficients

13.1 Introduction

We found in chapter 9 that by adding the distributed generation project to grid companies, the coefficients in the EFC change. The distributed generation coefficient decreased, which means that adding the project reduces the amount of compensation per share of distributed generation[20] for all companies. This is a little surprising, as one would have hoped that this part of the model would be stable enough as to not significantly reduce the revenue cap of other companies when another company adds a relatively small amount of distributed generation. We found that some companies, primarily the ones with significant amounts of distributed generation capacity suffered losses in EFC and therefore their revenue caps when BE Nett added the project. In comparison, when adding the project in the DEA analysis, the only company to experience an efficiency change was BE Nett.

We will in this chapter look at what happens in the EFC calculations for all companies as BE Nett adds distributed generation. We do this to see how the coefficients might change according to the size of the project.

13.2 How We Add the Project

In this chapter we want to look at how different sizes of the project will affect the EFC calculation of all the companies in the industry. To do this, we split the 25 MW project we have already described earlier into smaller 5 MW projects. We then calculate the coefficients for each 5 MW increment of DG up to a 100 MW project. If BE Nett added 100 MW of DG in one year it would be the largest DG grid company in the country, therefore this is probably an unrealistically large project. It should however give us a good idea of how the coefficients change with the size of a project.

[20] In the EFC Calculation ($EFC = e^{\hat{\alpha} + \hat{\beta}_1 * Interfaces + \hat{\beta}_2 * Islands + \hat{\beta}_3 * DG} - e^{\hat{\alpha}}$), the coefficient ($\hat{\beta}_3$), which is analyzed in this chapter, is multiplied with a grid company's share of DG = $\frac{DG(MW)}{Grid\ value}$. This is a company's share of DG and it is this multiple that yields the final value of environmental correction for distributed generation.

We present the original coefficients, and the coefficients for every addition of 5 MW to BE Nett in Appendix 27.

13.3 Changes in EFC and Compensation

The coefficient is a measure of how much compensation the grid companies get per share of distributed generation. To get a full understanding of how the coefficients change, we would have had to do this analysis on several companies. This is because the coefficients will change differently according to which company we do this analysis on. We are also interested in seeing how the coefficients change when we add DG to large parts of the industry, and we will do so in chapter 14. Due to time constraints, this thesis will be limited to these two sensitivity analyses of DG.

Our main interest here is to see how sensitive the coefficients are according to the size of the DG project that is added. Will the coefficients change differently according to the size of the project being added? Figure 13-1 shows how the DG coefficient changes. Recall that the higher a negative value the coefficient has, the larger the efficiency compensation in the environmental factor correction stage will be.

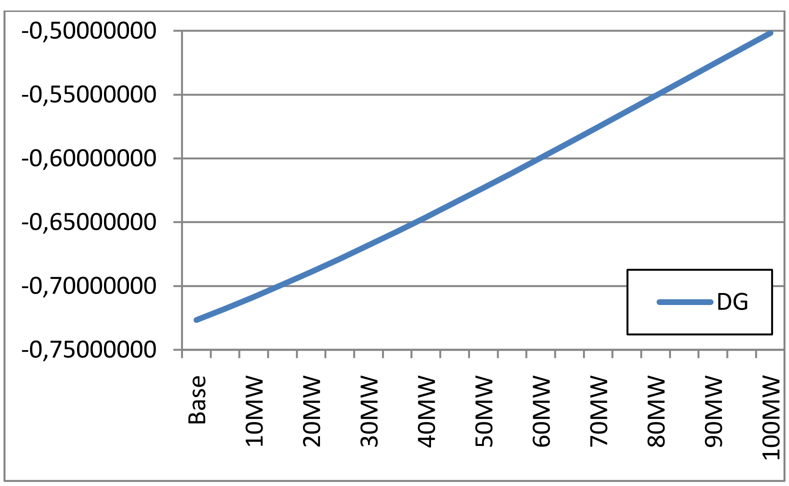


Figure 13-1 The Distributed Generation Coefficient

We see that as the project increases in size the DG coefficient moves toward zero. If BE Nett were to have added 100MW of DG, the coefficient changes from roughly -0.75 to -0.5. This means that each share of DG will change the EFC by about two thirds of what it previously did. The monetary value of this change is entirely company specific and will not translate as two thirds of the original amount.

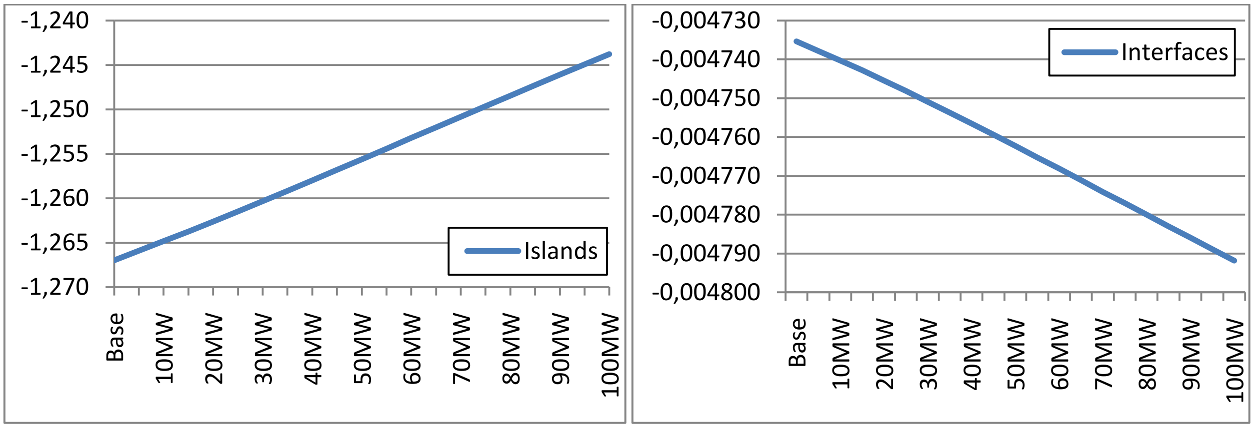
Although it is hard to tell from the figure, the graph is slightly convex so the marginal change in coefficient increases as the added amount of DG increases. On average each 5 MW increment decreases the absolute value of the DG coefficient by 0.011. Although this is a very small amount, this coefficient change can mean a lot for the companies with a large share of DG. Appendix 28 shows the new EFC values for all companies when BE Nett adds DG. Where BE Nett in its original state has an EFC of 3.32%, a 0.011 decrease in the coefficient would bring it down to 3.31%. This decrease of 0.01%-points does not seem a lot, but it adds up quickly. With the 25 MW added coefficient the EFC would be down to 3.23%. The effect is larger for companies whom already have significant amounts of distributed generation. Table 13-1 shows the decrease in EFC and corresponding Revenue Cap 3 (RC3) for a few companies with high amounts of DG.

Company	EFC with BE Nett adding: 0MW	25MW	Δ EFC	Δ RC3	Δ% RC3
Kvinnherad Energi AS	-10.06 %	-9.55 %	0.52 %	-103	-0.26 %
Modalen Kraftlag BA	-8.65 %	-8.11 %	0.55 %	-9	-0.26 %
Norddal Elverk AS	-9.26 %	-8.71 %	0.54 %	-36	-0.30 %
Stranda Energiverk AS	-13.20 %	-12.44 %	0.76 %	-97	-0.36 %
Suldal Elverk	-13.62 %	-13.22 %	0.39 %	-66	-0.20 %

Table 13-1 The Effect of BE Nett adding DG on Other Companies' EFC (numbers in thousand NOKs)

For every 25 MW DG project BE Nett adds, the companies in the Table 13-1 lose around half a percentage-point on their efficiency scores. For Kvinnherad Energi this means that just because BE Nett adds DG capacity, their efficiency score decreases by 0.5%-points, which amounts to over 100,000 NOK in decreased revenue cap.

The change in the DG coefficient means something to the industry then. This is without factoring in any of the changes that occur in the Islands and Interface coefficients. The other coefficients do change, but much less than the DG coefficient does. Where the DG coefficient decreases by over 30% for the 100 MW project the other two coefficients remain within 2% of their original values. The Islands coefficient changes in the same direction as the DG coefficient. For every 5 MW increase in DG in BE Nett each company in the industry is compensated slightly less for each of their island connections.



The interfaces coefficient changes in the opposite direction of the other two coefficients. This means that companies that proportionately have very high values for interfaces will be slightly better compensated for their share of Interfaces. The changes in the other coefficients are small enough so that one can easily be ignored. Increasing DG capacity in the BE Nett will at least not affect the compensation companies get from Islands or Interfaces in any significant way.

What do the total changes in EFC look like for the different levels of EFC? Figure 13-2 illustrates EFC changes for four different amounts of added DG in BE Nett. Note that as we add DG the EFC in Figure 13-2 moves upwards, toward 0%, which means the effect of the EFC is decreasing. The closer the EFC comes to zero (up in the graph), the less the grid company is reimbursed for the three environmental variables.

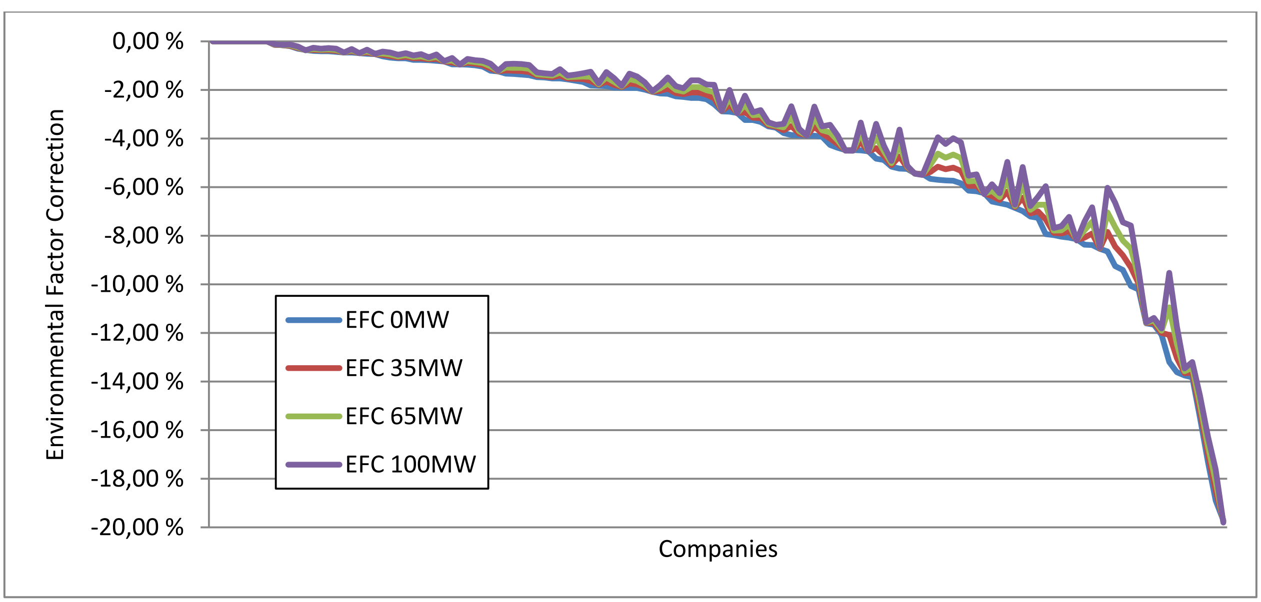


Figure 13-2 Environmental Factor Correction for DG Increments

It is clear that some companies experience close to no change, while others experience a much larger change in their EFC. The companies with large changes in EFC are the ones with a large share of DG. The full table of figures for changes in EFC can be found in Appendix 28.

How much does EFC compensation change compared to the old values? If we reformulate the data in the figure above, and now instead show by how many percent the EFC changes compared to the old values, and sort the companies according to how large a percentage change in EFC the companies get, we get Figure 13-3.

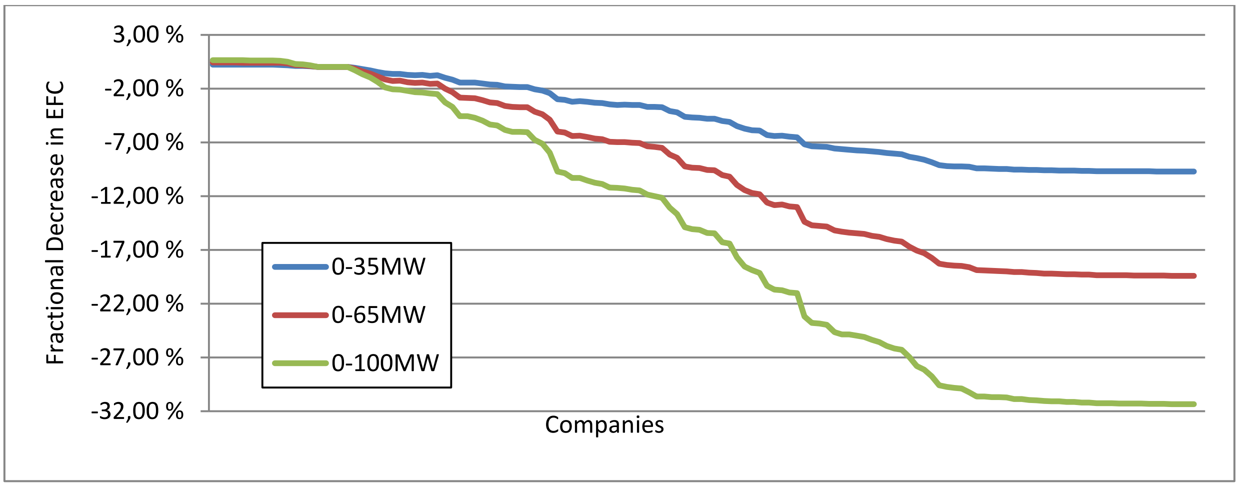


Figure 13-3 Fractional Difference in Environmental Factor Correction

We see that when BE Nett add 35 MW to their total distributed generation, a large share of the companies have their EFC reduced 7% less than it was before. In other words, the compensation these companies get from the EFC stage will be reduced by 7%. While this may not result in a dramatic drop in revenue caps it shows that the model is quite sensitive to the actions of individual companies.

13.4 Conclusion Sensitivity BE Nett

According to our findings so far the changes in the coefficients are mostly linear. Even when we add enough DG in one year to make BE Nett the largest DG company in the country, each increment of 5 MW change in DG changes the coefficients in much the same manner. While it may not be what one would hope for, it at least seems predictable.

14 Adding Distributed Generation to the Industry - Sensitivity of DG

14.1 Introduction

In the previous chapter, we looked at what happens to the EFC coefficients as we add DG to one company. We saw that as one company adds DG, the DG coefficient becomes smaller. We did this only for BE Nett, but it is clear that the coefficients are volatile enough to change as one company acts. It would seem that a further study of the sensitivity of the DG coefficient is merited. How does the coefficient change when more companies add DG, will the coefficient still decrease in a linear manner? In this chapter we add the project to a large part of the industry, and then try to see what happens to the coefficients and efficiency scores of these companies when doing so.

14.2 How the Project is Added to the Industry

In this chapter, we will try to see what happens to the DG coefficient as all DG companies add distributed generation capacity to their grids. NVE defines distributed generation as small generation plants that have a production capacity of 1 to 10 MW; facilities with capacity below this are defined as micro generation plants. We will then be adding DG to all companies in the industry who already have 1 MW of installed DG capacity. This means we will add the project to all the companies in the DEA/Regression analysis, but for 32.

We add the project to each company by dividing the annual cost of the project by the DG capacity. This means that we increase the DEA input costs of the DG companies by 51,522 NOK per MW added in distributed generation. This is the annual cost of the project for BE Nett (1,288,070 NOK[21]) divided by the installed capacity of 25 MW. Our assumption throughout this paper is that the costs for the project will be the same for all companies. Another assumption is that the project is a marginal project, i.e. it is a strengthening of existing infrastructure. This means we will only be

[21] The annual cost of 1,288,070 NOK is the sum of capital costs and depreciation. The capital costs are the total project costs with 1% working capital multiplied by the NVE reference rent. The depreciation is the project costs divided by 30 years. E.g. 1,288,070=13,013*1.01*0.065 + 13,013/30

adding DG capacity and costs in the input of the DEA model. Clearly after a while this assumption becomes a little problematic. Sooner or later the project will no longer be marginal and new infrastructure will be added. Increasing outputs on so many companies will further cloud the results we find in the next sub chapter, when we look at what happens to the DEA Efficiency as we add the project to the DG industry.

14.3 Changes in the DEA Analysis

When we add the project in 5 MW increments, we get the DEA Efficiency scores as in Appendix 31 and 32. Figure 14-1 shows the changes in DEA efficiency scores for each 5 MW increment of added distributed generation. We see that how each company's efficiency score is affected varies greatly from company to company.

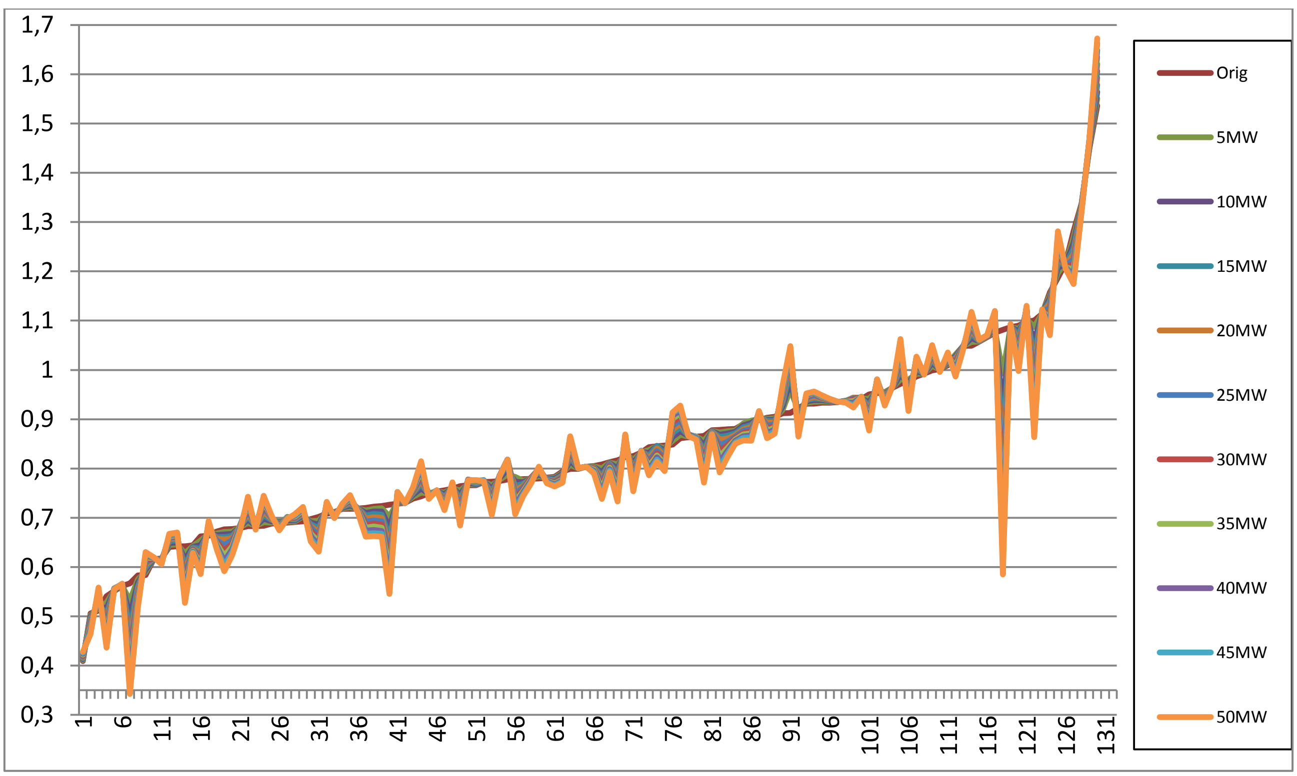


Figure 14-1 DEA Efficiency for all Companies

It would appear that the changes in efficiency are random. Some companies will suffer reduced efficiency, while others will have increased their efficiency. If we isolate the companies that have added the project, we get Figure 14-2.

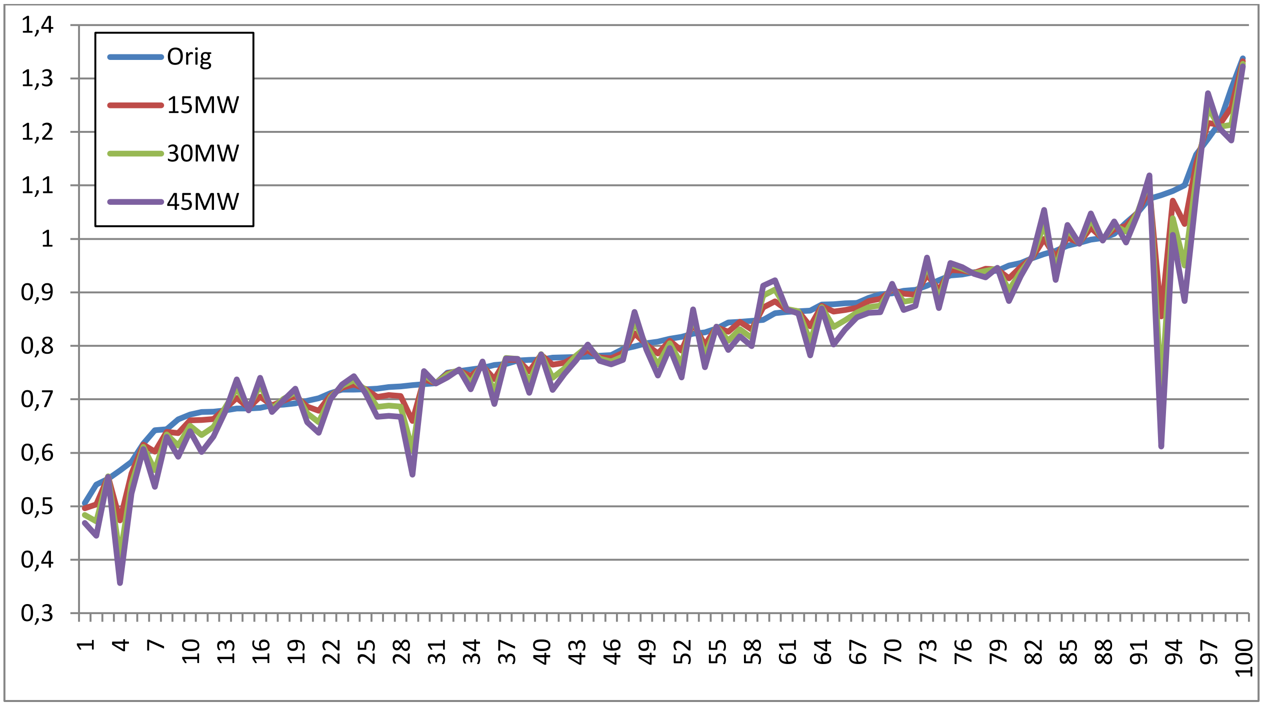


Figure 14-2 DEA Efficiency - DG companies only

We notice that one company in particular seems to suffer a very significant drop in efficiency, the 93rd company on the x-axis Modalen Kraftlag BA. Although the company is a frontier company in the original data, it drops off the front with the first 5MW addition, and continues to drop sharply in efficiency. This means that another company has now taken Modalen Kraftlag's place as a frontier defining company, and this will likely change the efficiency scores of a number of companies. This could be because Modalen Kraftlag is a very small grid company, and the project in relation to the grid company is relatively large. From the figure we also see that although most of the companies lose efficiency some also gain efficiency – even though they are adding costs and no new outputs in the DEA analysis. This is because frontier companies are also adding the project hence changing the frontier and how a number of companies are rated.

When we put all the companies that do not add the project in one graph, we get Figure 14-3. None of these companies lose efficiency. This was to be expected because their costs remain the same while the rest of the industry is increasing costs without adding outputs.

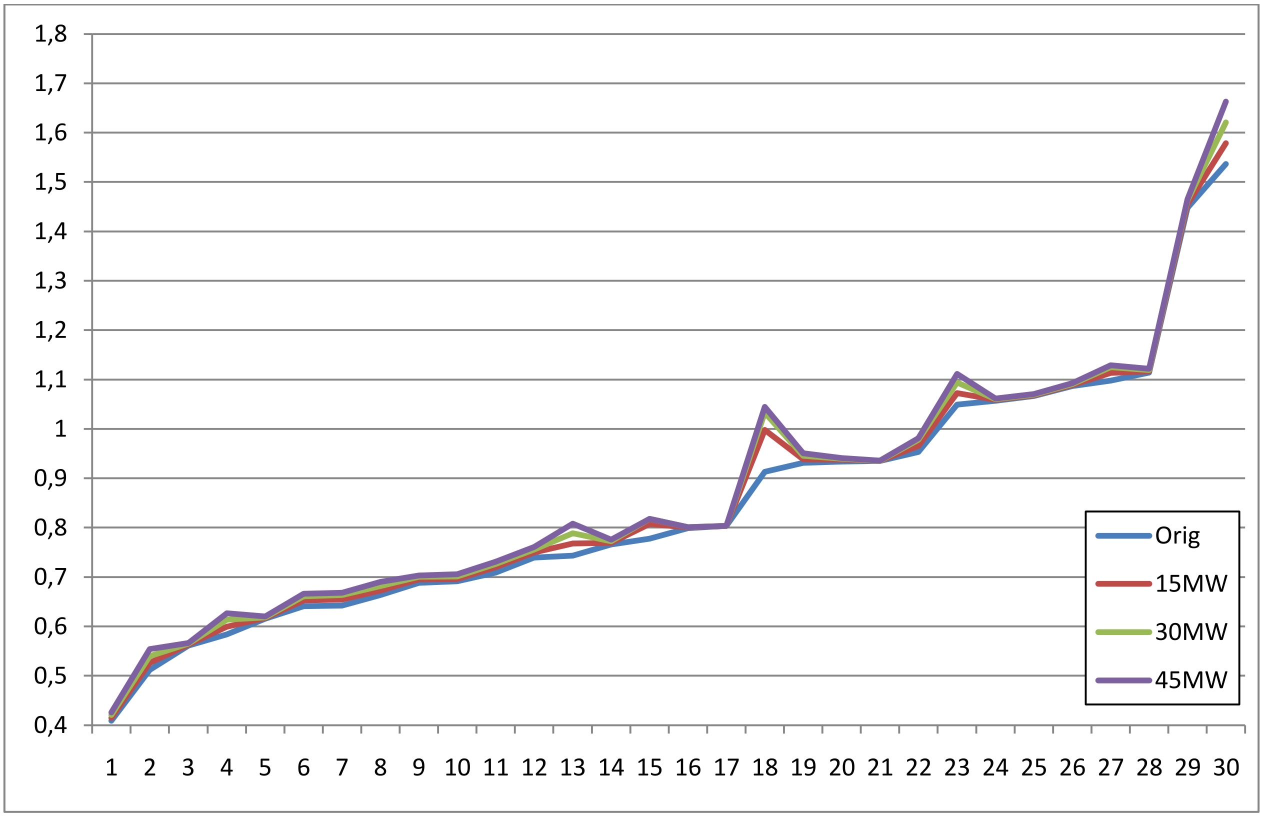


Figure 14-3 DEA Efficiency - Non-DG Companies Only

There is also much less variation in the efficiency scores of the companies that do not add the project. Also here we note that one company in particular gains more efficiency rating than the others. Rauland Kraftforsyningslag, company 18 on the x-axis is not a reference company initially but increases steadily in efficiency, and after 20 MW becomes a frontier company. A number of the reference companies in the DEA analysis are also DG companies to which we add extra capacity. If this were not so it is likely the DG companies' efficiency scores decrease more distinctly in the DEA analysis than they do here. When a reference company adds costs and no outputs the efficient frontier moves so that the referenced companies will not have their efficiency scores reduced as much.

We see in the data so far, that there is a lot of variation in the efficiency scores of the DG companies, while the non-DG companies either do not change much, or increase in efficiency. It will be interesting then to see how the EFC will compensate the DG companies for this loss in efficiency. After all, the function of the EFC is to compensate for losses that are not accounted for in the DEA – in the current model this would be Islands, Interfaces and Distributed Generation.

We are then interested in seeing how much of a decrease in efficiency the grid companies suffer from adding the project. We put the average DEA scores of all the grid companies in Table 14-1, both for the original case and for the case where the DG companies add 25 MW of DG.

The average efficiency of the DG companies goes down by 1.34%-points, while the average efficiency of the non-DG companies goes up 1.88%-points.

Average DEA Efficiency:		
DG Companies	83.40%	-1.34%
DG Companies (25 MW project)	82.06%	
Non-DG companies	84.89%	1.88%
Non-DG companies (25 MW project)	86.77%	

Table 14-1 Average DEA Efficiencies

We see in Table 14-1 that the average efficiency of the DG companies was already lower than their competitors before the projects were added at all. This could be one indication that distributed generation adds inefficiency to the grid companies in the model. It will be interesting to see if the EFC compensates the DG companies for this efficiency loss, and also if the average efficiencies will be more comparable. Also, a major change for some companies when adding distributed generation may be that they fall off the efficient frontier, as we see at least once in our trials. This means that adding DG can potentially affect many companies' efficiency scores in an unpredictable manner as the efficient frontier changes in favor of non-DG companies. In the following section we look at how the EFC changes for the industry as we add the DG project.

14.4 Changes in the Environmental Factor Correction

After having looked at how the DEA scores change, we add the additional DG capacity to the companies in the second stage. Here we are interested in seeing how the coefficients in the EFC change as the industry increases their DG capacity, and how this changes the overall efficiency of the industry and the DG adding companies. We saw that in the DEA analysis, the DG companies decreased in DEA efficiency, and the non-DG companies increased in efficiency, we would then expect the EFC value to compensate for this difference.

Our first step is mapping out the changes in the coefficients. We run the regression analysis with the new DEA efficiencies and DG / Grid Value for each 5 MW increment of DG, the full table for the new coefficients can be found in appendix 35. The first coefficient we look at is the one for distributed generation.

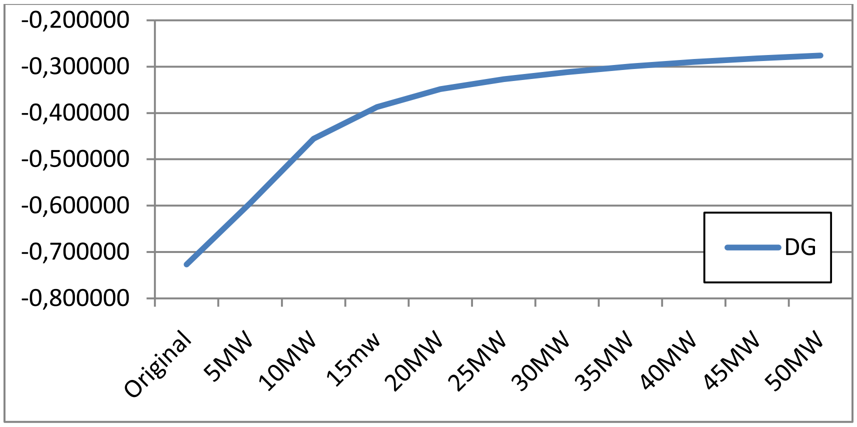


Figure 14-4 Distributed Generation Coefficient

We see from Figure 14-4 that the coefficient drops sharply as the industry adds its first 5 MW. It continues to drop sharply until the addition of about 20-25 MW where the drop levels off. The coefficient changes from -0.73 to -0.6 with the first 5 MW added which means the industry compensation for distributed generation will be reduced by almost 18%. This change is much higher than when we added the DG to only one company, the curve of the change in the DG coefficient is also clearly concave and therefore each increment of DG affects the coefficients less than the previous ones. We might have expected this outcome as we are making the DG companies in the industry increasingly similar to each other. The more DG we add uniformly to each company, the more similar they are and the less discriminatory power the regression analysis will have.

As for the other coefficients, the change is much less dramatic than the change in the DG coefficient. The Islands coefficient increases with the 5MW added and then decreases, and the total change in coefficient between the original case and the 50 MW case is 4%.

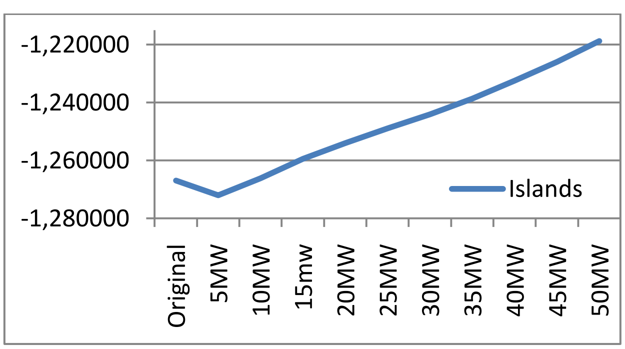


Figure 14-5 Island Coefficient

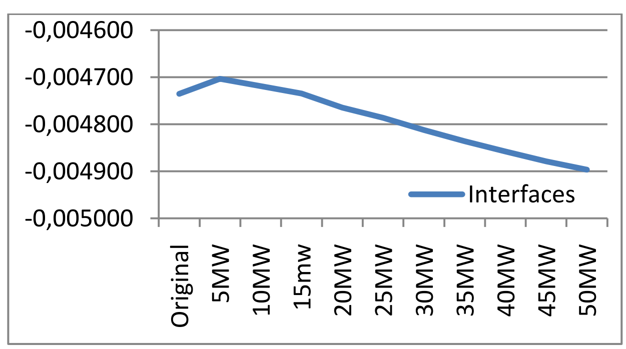


Figure 14-6 Interfaces Coefficient

The interfaces coefficient also changes direction after the first 5 MW increment and changes relatively little. The total change between the base case and the 50 MW increment is 2%. In the 5 MW increment case, a much more realistic number, the change in Islands and Interfaces coefficients is 0.4% and 0.6% respectively. This is negligible in comparison to the 18% change in the DG coefficient for the same interval.

The new coefficients change the EFC values for some companies dramatically. The full table of the new EFC values can be found in Appendix 29 and 30. Figure 14-7 and Figure 14-8 show the EFC compensation for the original case and the industry incremental DG scenarios.

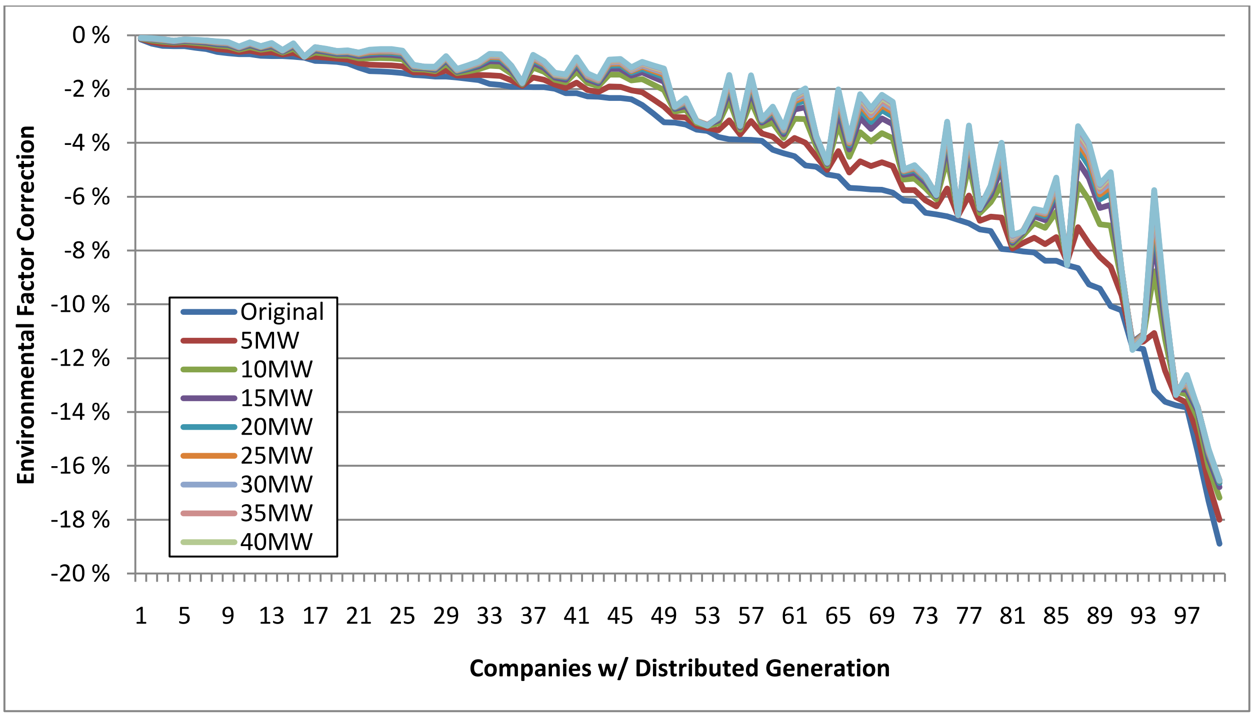


Figure 14-7 Environmental Factor Correction for DG Companies

The graph confirms what we already know. The EFC effect for each company is reduced for every increment of distributed generation and the impact of each increment lessens substantially after the 20-25 MW range is reached. We also see that the impact of adding the first 5 MW is quite severe. Moving upwards in the graph reduces company EFC compensation and therefore reduces the companies' revenue caps.

For the companies without distributed generation the results are quite different. Figure 14-8 shows that there are almost no changes for these companies. In fact the graphs mostly overlap for all the different DG addition scenarios.

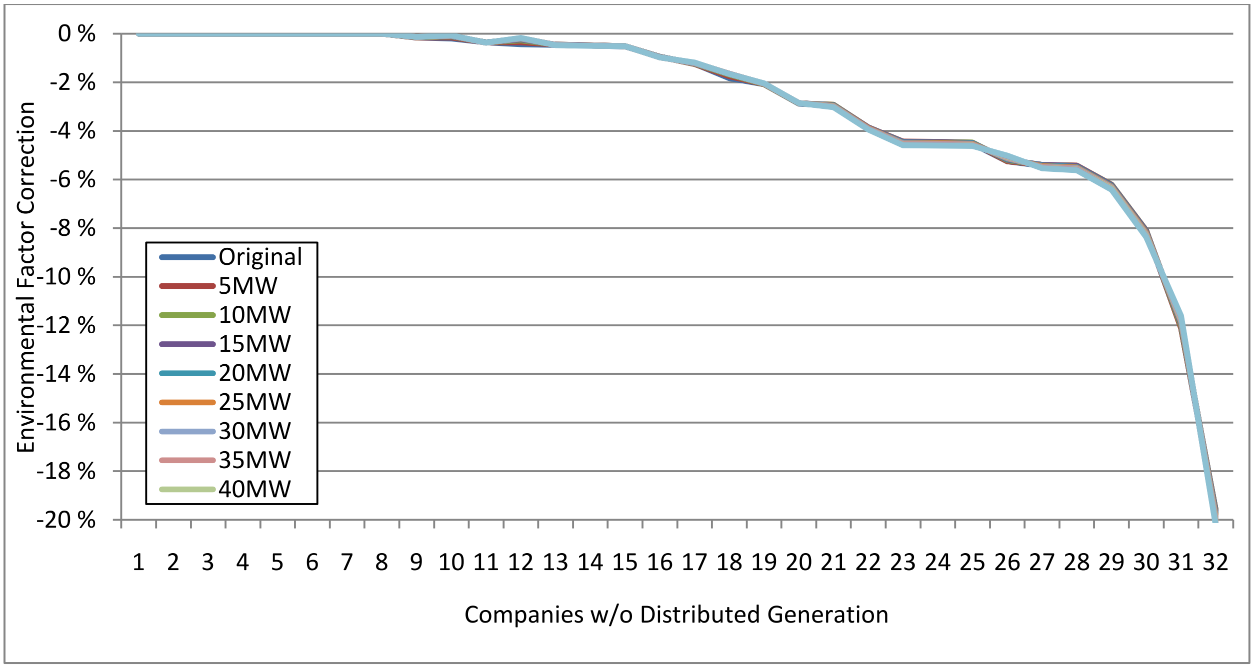


Figure 14-8 EFC for Non-DG Companies

The small change that some of these companies experience is due to the change in the coefficients for Islands and Interfaces. As mentioned earlier and made visible here, this effect is almost negligible.

To further illustrate the effect of the drop in the DG coefficient for the industry 5 MW scenario, we calculate the compensation loss for the same companies as before, with the addition of BE Nett. Note that for this particular table we are not actually changing the inputs or outputs of the DG companies, we are only using the new coefficients. We are doing this to be able to compare Table 14-2 and Table 13-1. By changing only the coefficients we see how much of an impact the coefficient change would have on the base case.

Company	EFC when Industry adds: 0 MW	5 MW	ΔEFC	ΔRC3
Kvinnherad Energi AS	-10.06 %	-8.61 %	1.45 %	-287
Modalen Kraftlag BA	-8.65 %	-7.13 %	1.52 %	-25
Norddal Elverk AS	-9.26 %	-7.73 %	1.53 %	-101
Stranda Energiverk AS	-13.20 %	-11.06 %	2.14 %	-272
Suldal Elverk	-13.62 %	-12.46 %	1.16 %	-196
BE Nett	-3.32 %	-3.06 %	0.26 %	-176

Table 14-2 Effect of Industry 5 MW scenario coefficients on selected companies (numbers in thousand NOKs)

For the companies with large amounts of distributed generation, the change in EFC is about 1.5%-points. Kvinnherad Energi's revenue cap decreases by almost 300,000 NOK. BE Nett, while only losing 0.26%-points efficiency also loses a significant amount of revenue, about 180,000 NOK. This is all due to the efficiency lost because the EFC now compensates much less for distributed generation.

Table 14-3 compares the changes in RC3 from Table 13-1 and Table 14-2.

	BE Nett 25 MW		Industry 5 MW	
Company	ΔRC3	Δ%RC3	ΔRC3	Δ%RC3
Kvinnherad Energi AS	-103	-0.26 %	-287	-0.72 %
Modalen Kraftlag BA	-9	-0.26 %	-25	-0.72 %
Norddal Elverk AS	-36	-0.30 %	-101	-0.84 %
Stranda Energiverk AS	-97	-0.36 %	-272	-1.02 %
Suldal Elverk	-66	-0.20 %	-196	-0.61 %

Table 14-3 Comparison on effects on RC 3

We see that the change in coefficients has a quite significant impact on the revenue caps of the companies. Where companies with a high share of DG before would lose 0.2-0.36% on their revenue caps, the industry 5 MW scenario coefficients reduces the RC3s even further, here the same companies lose 0.61-0.84% of their revenue caps. By increasing the amount of DG on all DG companies the DG coefficient changes significantly and revenue caps of companies with high shares of DG suffer.

14.5 Total Efficiency Score

We have shown that the DEA efficiencies of the DG companies are reduced. In addition to this, we see that by adding large amounts of DG to the industry the DG coefficient is significantly reduced as well as the EFC. We will now present the total efficiency changes.

The total efficiency scores can be found in Appendix 31 and 32. How do the DEA efficiency changes and the environmental factor correction changes look together? We look at DG companies and Non-DG companies separately. Figure 14-9 shows the total efficiency changes for all the DG companies.

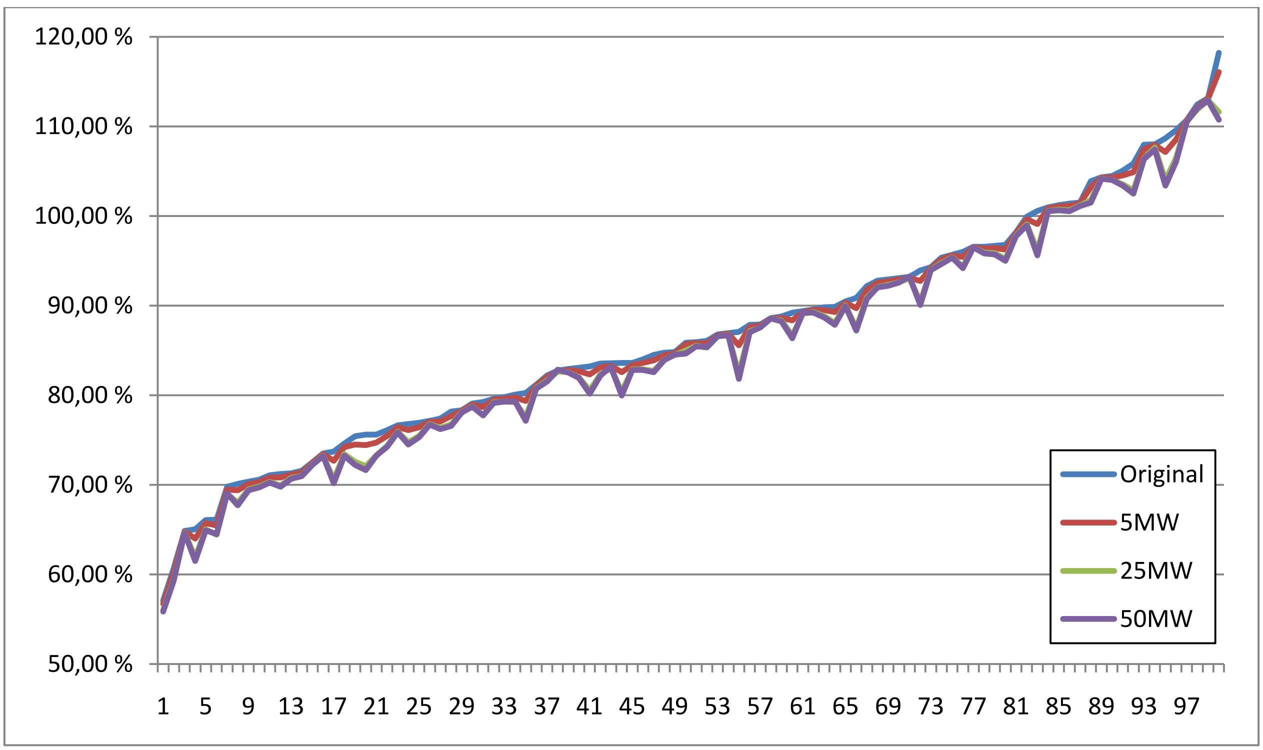


Figure 14-9 Total Efficiency for DG Companies

We see that many of these DG companies lose efficiency as distributed generation is added to the industry. Comparing to Figure 14-10 below, we see that the non-DG companies are much less affected by the change in industry DG capacity.

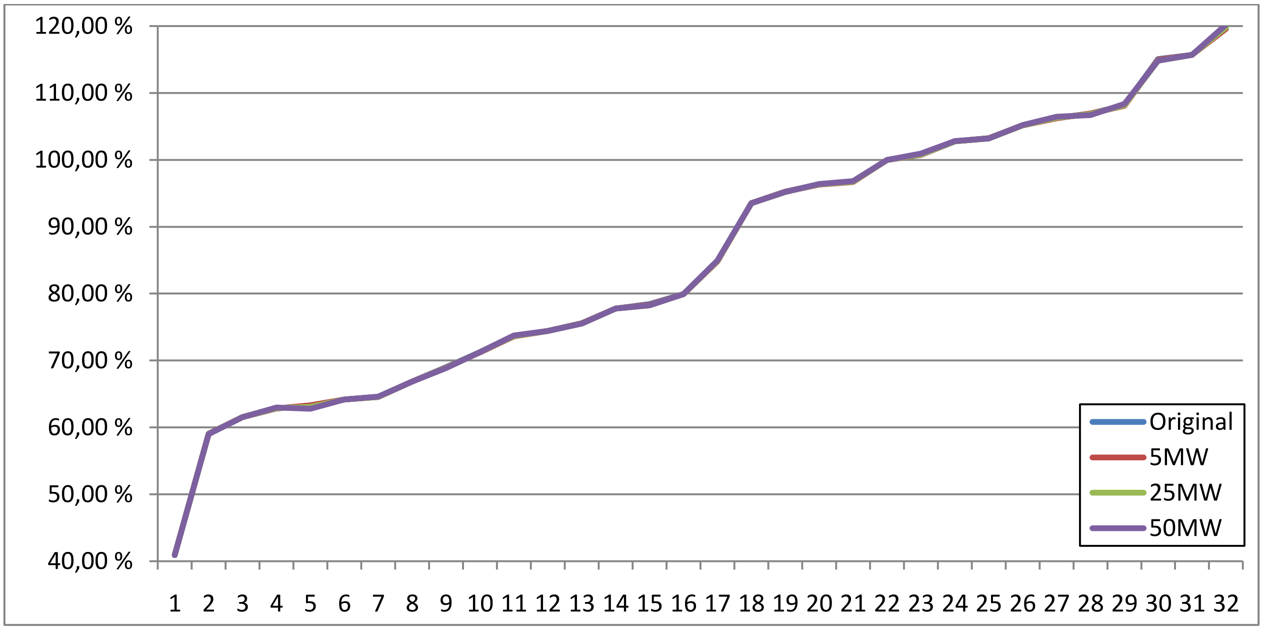


Figure 14-10 Total Efficiency Change for Non-DG Companies

Non-DG companies suffer almost no reduction in efficiency. If we look at the averages, the difference becomes even clearer. Note that the DEA averages used here are different from the averages used in Table 14-4 because these are all DEA results for correction and are either capped at 100% or are averages from the last years.

	Averages			Δ
	DEA	EFC	RC Efficiency	RC Efficiency
DG Companies	82.13 %	-4.59 %	86.72 %	-0.42 %
DG Companies after 5MW	82.12 %	-4.18 %	86.30 %	
Non-DG Companies	82.48 %	-2.95 %	85.43 %	-0.02 %
Non-DG Companies after 5MW	82.48 %	-2.93 %	85.41 %	

Table 14-4 Total Efficiency Before Calibration

We see from the averages that before the EFC the DG companies are slightly less efficient than the non-DG companies. After the EFC the DG companies pull ahead however and are on average rated 1.3%-points more efficient than their counterparts. When the 5 MW is added to the DG companies, they are still on average rated more efficient, however the gap is decreasing. The increase in DG has had almost no effect on the average scores of the non-DG companies, while the DG companies are now almost half a percent less efficient. Valuing the correctness of this reduction would require significant data on the actual costs of DG on the grid companies. Without this data, we can only conclude that as we add DG to the industry, the model remunerates the grid companies less and less for distributed generation, and it would appear this decrease is very rapid from the first MW added.

14.6 Conclusion

We have seen in this chapter that when the industry adds large amounts of DG the DEA Scores drop for the companies that add this marginal project. If the companies were adding other outputs it is likely they would not be dropping as much in DEA efficiency. We also see that as enormous amounts of DG are added to the industry, the DG coefficient drops rapidly and the DG companies are compensated less and less for their share of DG. We also saw that even though the DG coefficients plummet, the EFC brings the DG companies ahead of the non-DG companies in total efficiency scores. Whether this means the model over- or under-compensates DG companies is impossible to tell without better cost data and further analysis.

We also see however that large additions of DG and major changes in the industry on the most part leave the efficiency scores of the non-DG companies as they were. The DG coefficient in unison with the DEA analysis and the EFC regression step do not seem to influence the other companies' scores at least.

In conclusion, it seems that the DG coefficients can be quite volatile, and that this can affect the EFC calculation of the DG companies. Grid companies that are looking at projects where DG is connected to their grid should expect higher remuneration in the first years, and later, when more DG is connected, it seems likely the amount of compensation per share of DG will go down.

15 Price for Distributed Generation

15.1 Introduction

In chapters 13 and 14 we showed that the DG coefficient in the EFC is quite sensitive to changes in the DG capacity, particularly so if large parts of the industry move together. Considering this, calculating a precise price per MW of DG will be very difficult. Especially so when we consider that each company divides its DG capacity in MW by its grid value to make it size independent before the EFC calculation. Also, the EFC corrects the DEA efficiency for each company, and this is weighted with the regional efficiency score, which further clouds the final NOK/MW value. In this chapter we try to illustrate the price for one added MW of DG capacity.

15.2 Method

We want to find a price that the model gives for one added MW of DG. Adding DG changes the amount of efficiency compensation the company gets in the EFC. So, first, we will have to calculate the amount of compensation the model gives for one extra MW of DG. The EFC is calculated as follows:

$$EFC = e^{\hat{\alpha} + \hat{\beta}_1 * \left(\frac{Interfaces}{Grid\ Value}\right) + \hat{\beta}_2 * \left(\frac{Islands}{Grid\ Value}\right) + \hat{\beta}_3 * \left(\frac{DG}{Grid\ Value}\right)} - e^{\hat{\alpha}}$$

The coefficients $\hat{\alpha}$ and $\hat{\beta}_1$, $\hat{\beta}_2$ and $\hat{\beta}_3$ are calculated for the entire industry, and are the same for all grid companies. Interfaces, Islands, DG and Grid Value are company specific variables. In this analysis we will compare the calculated EFC of the company for 2010 and then calculate a new EFC where we have added one MW to the DG variable; we keep all the other variables fixed. We will apply the difference between these two EFCs to the revenue cap calculation and by doing so gain an approximation of how much the revenue cap will change due to one more unit of DG.

There is one problem however: we know from the previous chapters that as soon as we add DG these coefficients will change. We have also shown however that the only coefficient that changes significantly is the DG coefficient ($\hat{\beta}_3$). We will therefore do the same analysis three times with three different sets of coefficients. We will use the coefficients as they are in the revenue cap calculations for 2010, the BE Nett adds 25 MW scenario and the Industry adds 5 MW scenario. We use the different coefficient sets to see an example of how much the price per MW can change as the industry changes. We should then have three currency values for 1 MW of DG for each individual company.

15.3 Analysis

For our analysis we have decided to use three different companies. We chose BE Nett, for which the project was originally developed, and also Lyse Nett as the representative for large companies. We have also chosen Stranda Energiverk to represent smaller grid companies with exceptionally large share of DG compared to Grid Value.

We start with BE Nett, which in 2010 has a calculated EFC of -3.32% at 21.939MW of DG. Table 15-1 shows the efficiency changes for BE Nett from -2 MW to +2 MW change in DG. The table shows, in the grey middle row, BE Nett with its current amount of outputs for the three sets of coefficients. Hence ΔEFC is 0.

	BE Nett AS					
DG	Base	ΔEFC	BE +25MW	ΔEFC	Industry +5MW	ΔEFC
19.939	-3.192336 %	0.065467 %	-3.094413 %	0.061135 %	-2.956941 %	0.053590 %
20.939	-3.257804 %	0.065416 %	-3.155548 %	0.061090 %	-3.010531 %	0.053556 %
21.939	-3.323219 %	-	-3.216638 %	-	-3.064087 %	-
22.939	-3.388584 %	-0.065364 %	-3.277683 %	-0.061045 %	-3.117608 %	-0.053521 %
23.939	-3.453896 %	-0.065313 %	-3.338683 %	-0.061000 %	-3.171095 %	-0.053487 %

Table 15-1 Change in EFC BE Nett AS for 1 MW increments of DG

We see that by adding one MW of DG increases the size of the EFC by 0.065%-points in the base case. The difference is 0.061%-points with the BE Nett 25 MW coefficients and much less with the industry 5 MW coefficients when the EFC changes by 0.053%-points.

We have prepared an identical table for Lyse Nett.

DG	Lyse Nett AS					
	Base	ΔEFC	BE +25MW	ΔEFC	Industry +5MW	ΔEFC
36.808	-5.129587 %	0.019666 %	-5.080063 %	0.018353 %	-4.972912 %	0.016082 %
37.808	-5.149253 %	0.019661 %	-5.098416 %	0.018349 %	-4.988994 %	0.016079 %
38.808	-5.168914 %	-	-5.116764 %	-	-5.005073 %	-
39.808	-5.188570 %	-0.019656 %	-5.135109 %	-0.018345 %	-5.021148 %	-0.016076 %
40.808	-5.208221 %	-0.019651 %	-5.153450 %	-0.018340 %	-5.037221 %	-0.016073 %

Table 15-2 Change in EFC Lyse Nett AS for 1 MW of DG

For Lyse Nett the change in EFC is much smaller than the change for BE Nett. This is because Lyse Nett's Grid Value is much larger than that of BE Nett and one extra unit of DG does not increase the fraction[22] that is multiplied with the DG coefficient as much.

When we prepare the same table for Stranda Energiverk we see that this grid company experiences a much larger increase in EFC when increasing the amount of DG by one. It is interesting to note that all three companies have comparable amounts of installed DG.

DG	Stranda Energiverk AS					
	Base	ΔEFC	BE +25MW	ΔEFC	Industry +5MW	ΔEFC
27.58	-12.424174 %	0.389274 %	-12.424174 %	0.389274 %	-12.424174 %	0.389274 %
28.58	-12.813448 %	0.387226 %	-12.813448 %	0.387226 %	-12.813448 %	0.387226 %
29.58	-13.200673 %	-	-13.200673 %	-	-13.200673 %	-
30.58	-13.585861 %	-0.385188 %	-13.585861 %	-0.385188 %	-13.585861 %	-0.385188 %
31.58	-13.969022 %	-0.383161 %	-13.969022 %	-0.383161 %	-13.969022 %	-0.383161 %

Table 15-3 Change in EFC Stranda Energiverk for 1 MW of DG

With the information in these three tables, we have enough information to create a unit price per MW of DG for the three companies and each of the coefficient scenarios. We subtract the 1 MW ΔEFCs from the Revenue Cap efficiencies and note the changes in Revenue Cap$_1$. We use RC1 to see the most direct changes to the revenue cap, without corrections. The results are in Table 15-4.

	BE Nett AS		Lyse Nett AS		Stranda Energiverk AS	
	RC1	ΔRC1	RC1	ΔRC1	RC1	ΔRC1
Original Revenue Cap 1	119766	-	642805	-	24509	-
Original Coefficients	119800	34	642828	23	24558	48
Coefficients BE Nett +25MW	119800	34	642828	23	24555	46
Coefficients Industry +5MW	119793	27	642828	23	24550	41

Table 15-4 Price of 1 MW DG for 3 sets of coefficients (numbers in thousand NOKs)

[22] $\hat{\beta}_3 * (\frac{DG}{Grid\ Value})$

We see that the amount by which each company is compensated for one extra MW of DG is very different – for BE Nett this amount is 34,000 NOK per 1 MW when using the original coefficients. Respective values for Lyse Nett and Stranda Energiverk are 23,000 NOK and 48,000 NOK. If we use the coefficients from the industry +5 MW scenario however the price per megawatt for BE Nett is down to 27,000 NOK. Respective values for Lyse Nett and Stranda Energiverk are 23,000 NOK and 41,000 NOK.

The results in price per MW of DG are quite interesting. Where we initially would think that the price per MW would vary greatly between the different coefficients, it turns out that these numbers are quite stable for all three companies. The main difference is how much each company is reimbursed per unit of DG. We can only assume this is related to how large their Grid values are compared to the amount of DG.

Where BE Nett has roughly 20 MW, Lyse has almost 40 MW of installed DG capacity. Stranda Energiverk is in between these two with 30 MW, so the difference between how these companies are compensated must be the grid values. Table 15-5 shows grid values, DG capacities and the change in EFC for the three companies.

Company	Delta EFC	Grid Values	DG	DG/Grid Value
Lyse Nett AS	0.0197 %	3,003	38.808	0.01
BE Nett AS	0.0650 %	923	21.939	0.02
Stranda Energiverk AS	0.3850 %	138	29.58	0.21

Table 15-5 Grid Values, DG Values and Change in EFC (numbers in thousand NOKs)

We cannot determine any relationship between the unit price for DG and the specific DG or Grid Values. We shall have to settle on the fact that the higher a share of DG versus grid value the companies have, the higher a price they will receive per unit of DG.

16 Changing the model – Moving Environmental Variables into the Second Stage

16.1 Introduction

In this part of our analysis, we will change the model so that it follows theory more closely and clearly distinguishes between endogenous and exogenous, i.e. environmental, factors. For this, we will move the three environmental factors that remained in the DEA model until now over to the second stage, so that our new version of the model looks as follows:

1. DEA with one input (costs) and five outputs (Energy Delivered, Customers with and without cabins, Network stations and High Voltage Lines)
2. Regression with one dependent (DEA efficiency) and six independent variables (Islands, DG, Interfaces, Forest, Snow and Wind)

In order to simplify the analysis and to limit the analysis to a pure model analysis, we use 2008 values only when calculating the EFC and thus skip the comparison and adaptation to averaged values of the last four years. This change has been made to both the original and the adapted model. With this, we make the original and the adapted model directly comparable and independent of adjustments to average scores of the last four years. This change implies that the values of the previous analyses will not be directly comparable to the values we find in this analysis, when it comes to the calibrated efficiency scores and the revenue cap values in NOK. Thus, the results just serve as an indication of the direction of change and cannot be assumed to become the actual values if the model changes according to our new model.

In order to be able to move the environmental factors over to the second stage, they need to be scaled. For the three independent variables Forest, Snow and Wind, we decided to scale them by total high voltage lines. Each of the variables will therefore be calculated as follows:

$$Independent\ variables\ (forest, snow, wind) = \frac{(forest, snow, wind) * high\ voltage\ in\ air}{total\ high\ voltage\ lines}$$

This scaling of the parameters takes the interaction effects between high voltage lines and environmental factors into account and gives us a value that shows us, how exposed each grid company is to the environmental factors forest, snow, or wind.

After analyzing the changes in the model for the grid companies when we make no changes in inputs or outputs, we add the DG project to BE Nett once more and do a short analysis and comparison on the effects of adding the project in both the original and the adapted model.

16.2 Effects of Moving the Variables

Removing three output variables from the DEA has the expected effect on the DEA efficiency scores: they stay the same or decrease. While 18 of the 132 grid companies in the dataset experience no change in their efficiency score, 14 grid companies lose more than 20%-points in efficiency from DEA. One way to understand the large losses of efficiency in the adapted model for some companies would be that these companies have been overcompensated for the environmental variables forest, snow and wind in the old model. Figure 16-1 and Figure 16-2 show the industry development of the DEA score and the EFC. Intuitively, the decrease in DEA suggests a negative effect for the grid companies. Most of the EFC scores however decrease as well, resulting in an increase of the total efficiency scores. Looking at the new coefficients and the new EFC more closely will show how the new model compensates grid companies for environmental factors and in how far the overall efficiency changes when adapting the model.

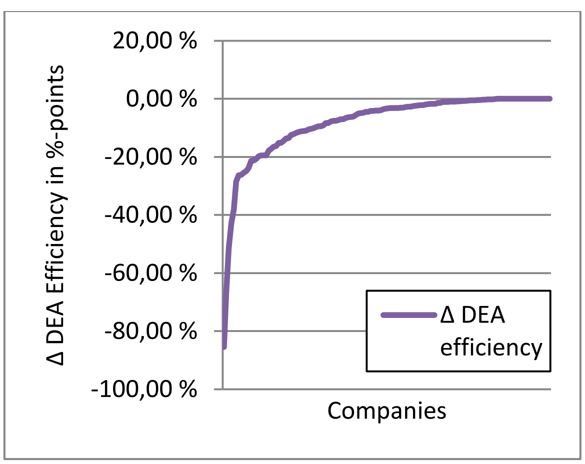


Figure 16-1 Change in DEA efficiency

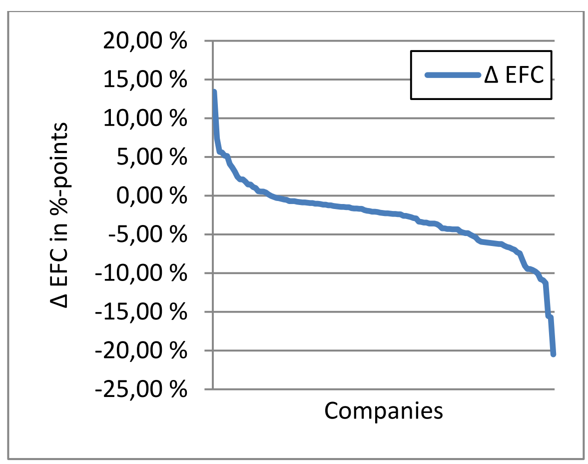


Figure 16-2 Change in EFC

As shown in Figure 16-2, the EFC values take a very interesting development. Ranging from an increase in EFC compensation of 20%-points up to a decrease in EFC compensation of 13%-points, the EFC in the adapted model has a much larger - positive or negative - effect on some companies and nearly the same effect on others. The reason for these large variations can be found when looking at the changes in the coefficients shown in Table 16-1, together with the composition of environmental factors of each grid company. As can be seen, the coefficients increase in value for all independent variables except the interfaces variable, where the coefficient increases by 71.34%. Thus, intuitively, companies with a high amount of Interfaces will suffer most from the change in the model, especially, if they do not have any other high values in one of the other variables to compensate for the loss. In contrast to the negative impact the change of the model has on grid companies with a high value in Interfaces, we assume that companies with large values in forest, snow or wind, will experience a decrease rather than an increase in their EFC. We will see later, if they are being compensated for their potential loss in the DEA efficiency score.

coefficients	Interfaces	Islands	DG	Forest	Snow	Wind
original	-0.0047354	-1.2669700	-0.7267780	-	-	-
adapted	-0.0013570	-2.0479300	-1.2814660	-0.0965388	-0.0000142	-2.3855550
Δ coefficient	0.0033784	-0.7809600	-0.5546880	-0.0965388	-0.0000142	-2.3855550
% change	71.34%	-61.64%	-76.32%	-	-	-

Table 16-1 Change in Coefficients original versus Changed Model

There are only a few companies that actually experience an increase in total efficiency before calibration when adapting the model. Those companies that have a positive increase of their total efficiency before calibration experience a small decrease in DEA efficiency plus a considerably larger increase in their EFC, benefiting from the large increase of the coefficients' values used in both models, as well as from the three newly added coefficients. As an example we will take a short look at Sandøy Energi, the company that profits the most from the adapted model. Sandøy Energi is a very inefficient company with a huge amount of islands in its area (2^{nd} largest) and a comparatively large amount of wind (ranks 15^{th}). Due to these values, Sandøy Energi benefits a lot from the decrease in the Islands coefficient (decreases by 61.64%) and the additional coefficient for Wind and thus experiences an increase in total efficiency before calibration.

Other companies that experience an increase in total efficiency before calibration when changing the model are mostly companies with very low efficiency (ranging from 48% to 88% with an average of 68%). Similar to our example company Sandøy Energi, these companies experience a relatively small decrease in DEA efficiency and benefit from a large increase in their EFC.

The companies with the biggest losses in total efficiency before calibration (Tysnes Kraftlag: -74.61%, Rødøy-Lurøy Kraftverk: - 51.19%) are extreme companies, whose efficiency scores will likely be manually adapted by the regulator as is the case in the current model. Both change from highly super efficient companies to very inefficient companies when the three environmental variables are moved out of the DEA model. The EFC, though quite high, does not compensate them for this loss. If we assume that the adapted model is more correct, these companies have probably been overcompensated through their high values in forest, snow or wind and are likely to experience a decrease in efficiency in case the model will be changed in the future.

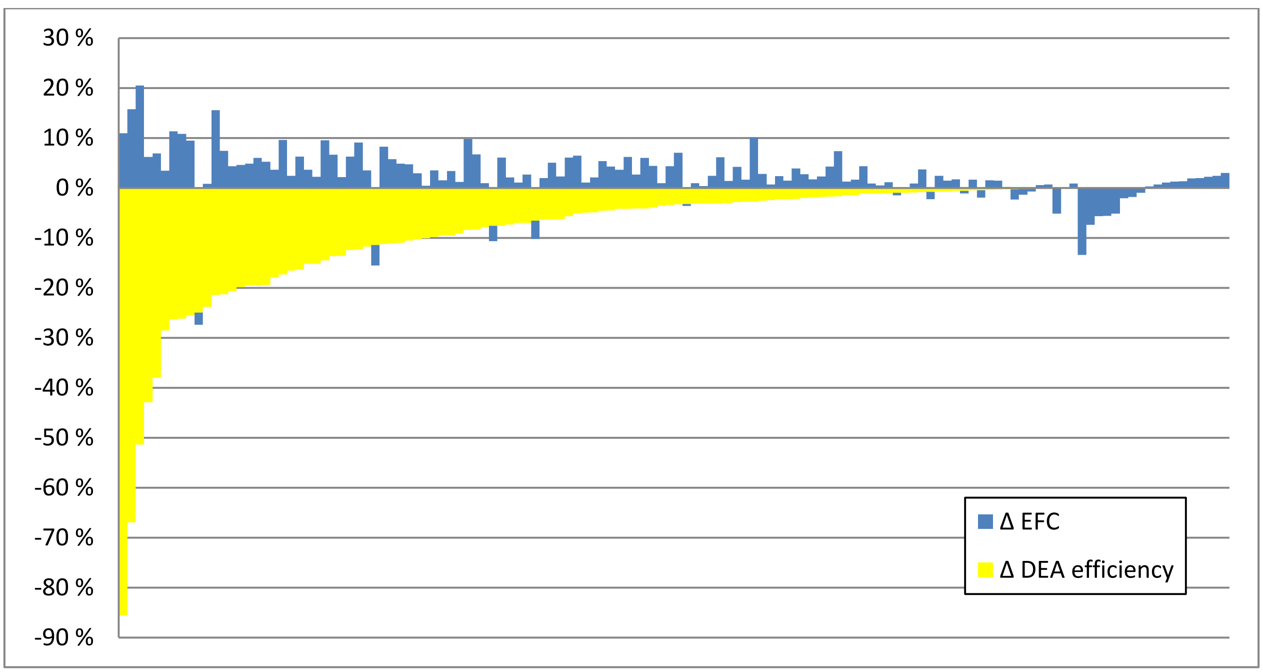


Figure 16-3 Decomposition of changes in total efficiency

Figure 16-3 shows how much effect the change in DEA efficiency and the change in EFC have on the total change in efficiency. It illustrates how much of the change in total efficiency before calibration comes from changes in DEA efficiency and how much of the change comes from changes in EFC. The values of EFC have been inverted in this figure so that a positive value actually shows an increase in efficiency and vice versa.

As mentioned before, there are a total of 18 companies for which DEA efficiency does not change. Obviously, for those companies with no change in DEA efficiency, all of the change results from EFC, both negative and positive. For 30 companies the change in efficiency before calibration is less than 1%-point. For all these companies, the changes in both DEA efficiency and EFC are very small and have similar amounts, so they almost offset each other (e.g. Malvik Everk AS: DEA efficiency decreases by 1.89%-points and is increased by EFC by 1.71%-points).

All in all, we see a much larger negative effect of the decrease in DEA efficiency (-8.22%) than we see EFC decreasing (average -2.85%) and thus compensating. This leads to different conclusions. If we assume that, as according to theory, the adapted model is more correct and has a fairer way of compensating companies for environmental factors, today's model is overcompensating most companies for their environmental variables Forest, Snow and Wind. If this is the case, NVE is likely to change the regulation model to a model closer to this one and the majority of companies will have to expect a slight decrease in efficiency.

After calibrating the efficiency scores, we map them against each other in Figure 16-4. We can clearly see that the model change tends to have a negative effect on most companies (only 43 out of 132 companies experience a slight increase). Looking at the calibrated efficiency, however, leaves approximately half of the grid companies (64 of 132) with a slightly positive change in calibrated efficiency, while the other half experiences partly dramatic decreases. The most extreme changes occur for Sandøy Energi with an increase in 8.96%-points after calibration and Tysnes Kraftlag with a decrease in calibrated efficiency of 73%-points.

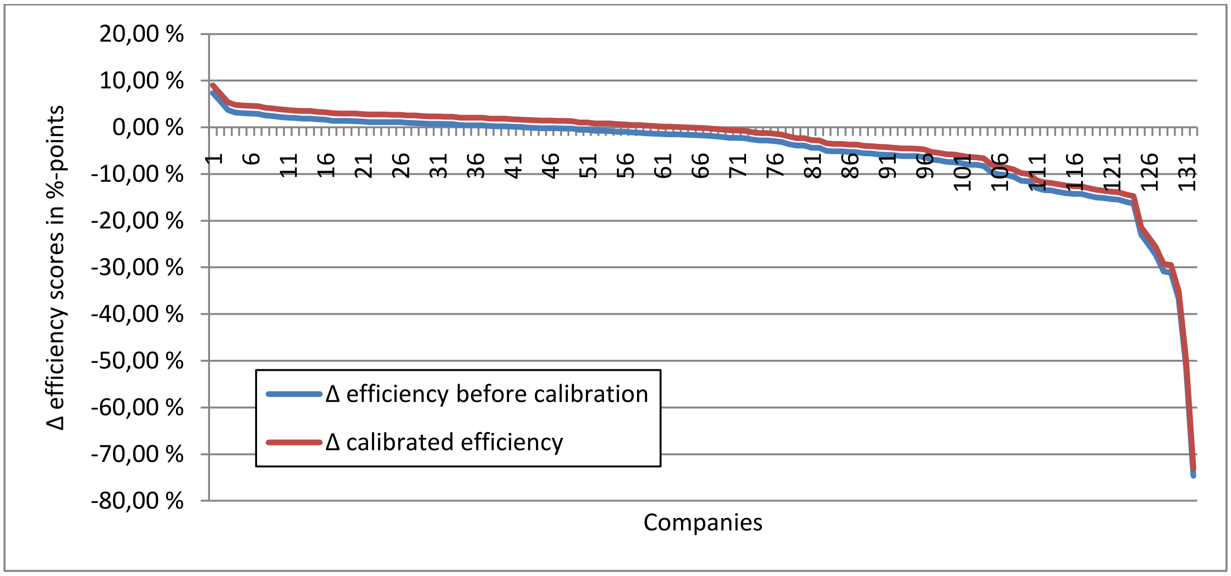


Figure 16-4 Delta efficiencies original versus adapted model (before and after calibration)

The cost weighted average efficiency used for calibration of the efficiency scores decreases by 1.61%-points. This amount is added to the calibrated efficiency for each company. This decrease amounts to a decrease of 1.8% compared to the average efficiency of the original model. While this does not have a direct effect on the industry, it means that the calibration will have to add more in efficiency to each company in order to ensure an average efficiency of 100% and therewith full coverage of industry costs. It also means that – on average - with the new model less of the revenue cap will be granted to the companies due to their own efficiency. For the grid companies, this is rather better than worse, because they get more in the calibration. So unless their efficiency before calibration decreases by more than the average efficiency, they would appreciate the change of the model.

It is important to note that a large amount of the decrease in total efficiency before calibration is caused by a handful of companies, which experience a huge loss in DEA efficiency (up to 86%) when removing the three environmental variables from the DEA model. This loss is not offset by the EFC and results in a decrease in total efficiency before calibration of up to 74%. While we would assume that this is due to these companies being largely overcompensated by the environmental variables Forest, Snow and Wind in the DEA model, we also assume that NVE will find a way to decrease the loss of these companies. This is partly done in the current model by using the average values of the last four years to determine the efficiency that is used to calculate EFC. As a result to that, the efficiency of these companies is not considered to be as high in the current model as it actually is.

This will decrease their loss, if they are not efficient anymore in the adapted model. With the usage of the average values, the effects for extreme companies are likely to weaken and the change in the model will be even less volatile compared to the original used today.

16.3 Effects of the Adaptation on Three Sample Companies

To give an even better understanding of what happens when we change the model, we will take a short look at how our three sample companies are affected when the environmental variables are moved over to the regression stage. First of all, it is interesting to see that none of these companies experiences a very high decrease or increase in efficiency, and thus their revenue cap will be relatively similar. As can be seen from Table 16-2, both BE Nett and Lyse Nett actually increase their efficiency by 2.97%-points and 0.11%-points respectively. Dalane Energi experiences a decrease in efficiency by 0.73%-points.

ID	Company	Δ DEA efficiency	Δ EFC	Δ Total Efficiency	Δ Calibrated efficiency
7262008	BE Nett AS	-5.11%	6.47%	1.36%	2.97%
2572008	Dalane Energi IKS	-0.27%	-2.08%	-2.34%	-0.73%
5112008	Lyse Nett AS	-0.98%	-0.51%	-1.50%	0.11%

Table 16-2 Effects of the Model Changes on Three Sample Companies

Both Lyse Nett and Dalane Energi experience a decrease in DEA efficiency and EFC. This is due to their high values in Interfaces, which is the only factor that companies get less compensation for.

16.4 Effects of Adding the Project to BE Nett AS in the Adapted Model

As a last step of this analysis we add the project once more to BE Nett, to see how the effects of the project are both on BE Nett itself and on the industry as a whole. We keep the analysis simple, adding the project as described in chapter 8, and keeping everything else as it is in the original, i.e. in this case the adapted model.

coefficients	Interfaces	Islands	DG	Forest	Snow	Wind
adapted	-0.0013570	-2.0479300	-1.2814660	-0.0965388	-0.0000142	-2.3855550
adapted w/ project	-0.0013698	-2.0580970	-1.2263160	-0.0989986	-0.0000184	-2.3692590
Δ coefficient	-0.0000128	-0.0101670	0.0551500	-0.0024598	-0.0000042	0.0162960
% change	-0.94%	-0.50%	4.30%	-2.55%	-29.58%	0.68%

Table 16-3 Change in Coefficients when Adding the Project to BE Nett AS in the Adapted Model

Table 16-3 shows how the coefficients change. As we would expect, the DG coefficient increases the most with 4.3% and will thus have a lesser impact on the EFC. While all other coefficients change in a range from 0.5% to 2.55%, the snow coefficient decreases by almost 30%, resulting in a much bigger compensation for a high value in snow. The following analysis will, however, show that neither the increase in the DG coefficient, nor the decrease in the snow coefficient, have an extremely large effect on the efficiency scores or the revenue caps of the industry.

BE NETT	Δ
Δ DEA efficiency	-0.99%
Δ EFC	2.38%
Δ efficiency before calibration	1.39%
Δ calibrated efficiency / total change	1.37%
Δ Total Revenue Cap 3	kr 1,518,392

Table 16-4 Change in Efficiencies and Revenue Cap for BE Nett AS

Industry averages	Δ
Δ DEA efficiency	-0.01%
Δ EFC	0.00%
Δ efficiency before calibration	0.00%
Δ calibrated efficiency / total change	-0.02%
Δ Total Revenue Cap 3	kr 6,000

Table 16-5 Change in Efficiencies and Revenue Cap for the Industry

Comparing the effects adding the project has for BE Nett and for the whole industry, we get very interesting results that are summarized in Table 16-4 and Table 16-5. DEA efficiency decreases by 0.99%-points for BE Nett AS; this also is the single cause for the decrease in average industry DEA efficiency. The changes in EFC average at 0% change for the industry. The high increase in EFC for BE Nett however is offset by a few companies being less compensated for their environmental factors. The distribution of EFC changes can be seen from Figure 16-5.

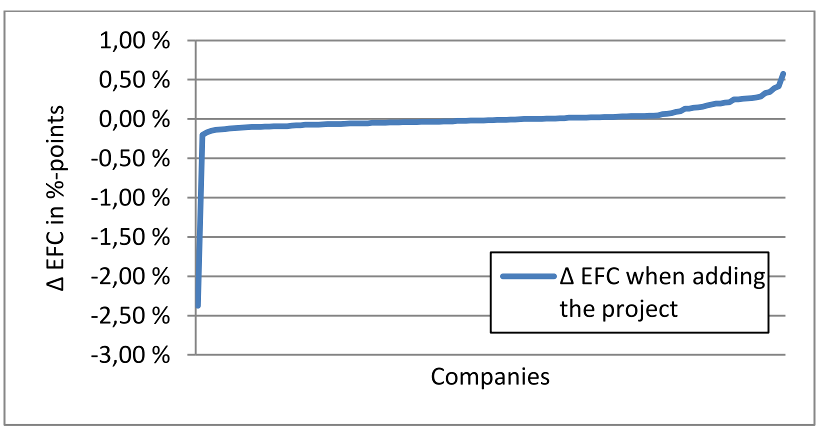


Figure 16-5 Changes in EFC when Adding the Project to BE Nett AS

As a result of the DEA efficiency as well as the EFC decrease, the total efficiency before calibration of BE Nett increases by 1.39%-points. The same companies that suffer an increase in their EFC have it offset by the increase in efficiency before calibration of BE Nett, causing the industry effect of the efficiency before calibration to be zero. Due to the calibrations and adjustments afterwards, the total industry is affected by BE Nett AS investing in their DG project by an increase in total revenue cap of 6,000 NOK. The effect on BE Nett AS however, is much more positive; it increases by 1.5 MNOK

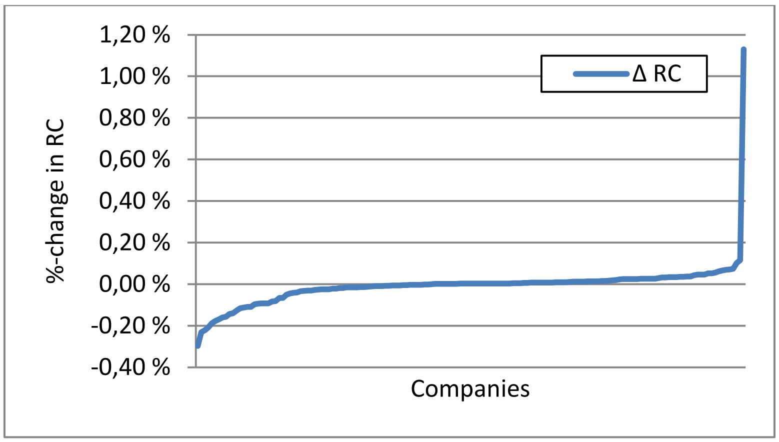


Figure 16-6 Change in Industry Revenue Cap when Adding the Project to BE Nett AS

The few companies that experience an increase in EFC, and thus less compensation for their environmental factors are again – like when adding the project to the old model - companies with a lot of DG in their area. The companies that lose the most are Stranda Energiverk AS, Kvinnherad Energi AS, Norddal Elverk AS, Hjartdal Elverk AS and Modalen Kraftlag BA. These are the same companies that experienced the largest decreases in their efficiency scores with the old model, when we added the project to BE Nett, Lyse Nett and Dalane Energi separately and at the same time. The distribution of changes in revenue cap for the industry is illustrated in Figure 16-6. We see from the graph that the effects are relatively small except for the few exceptions mentioned.

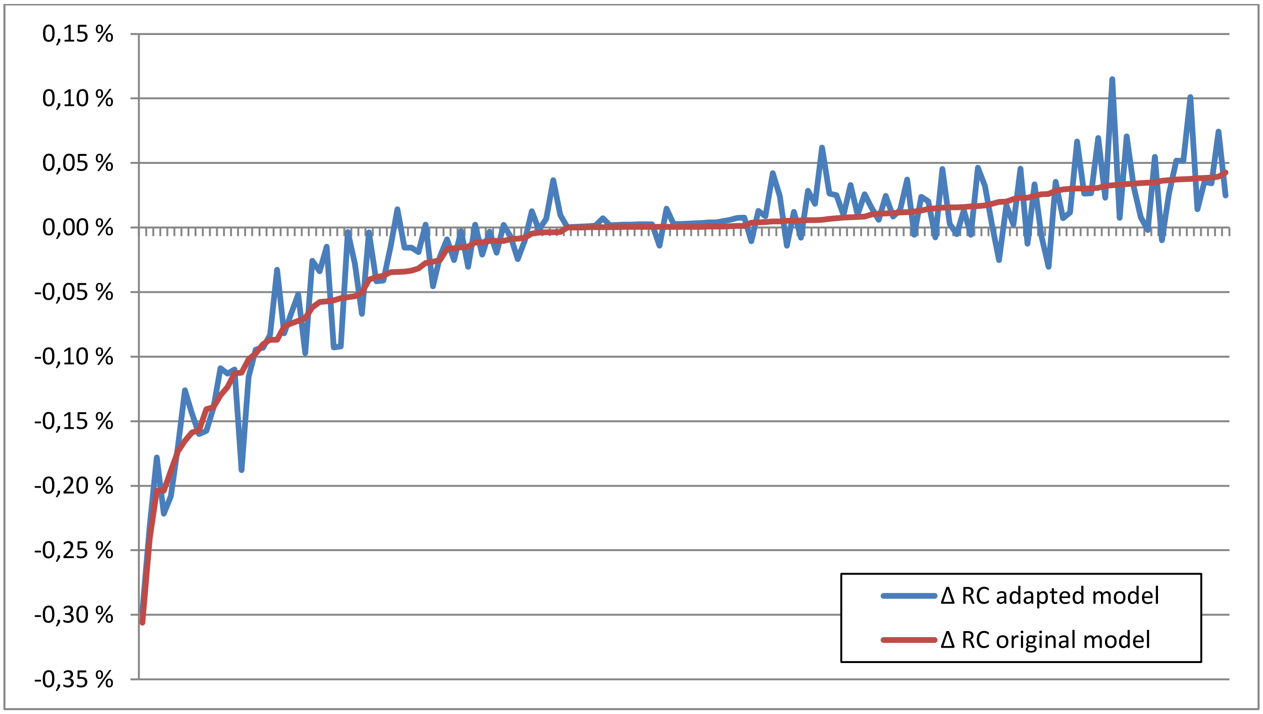


Figure 16-7 Comparison of Changes in Industry Revenue Caps when Adding the Project to BE Nett AS in the Original and the Adapted Model

A very positive effect that can be observed here is that the average change in Revenue Cap 3 for the industry without BE Nett increases by 0.58%-points, while BE Nett AS is compensated 70% more for their project than in the old model. Figure 16-7 shows the effects on the companies' revenue caps, when we add the project to BE Nett in the adapted model and compare it to the revenue cap effect of adding the project to BE Nett in the original model.

16.5 Summary of Results

Concluding, we can say that the adaptation of the model yields very interesting results. While all other coefficients increase in importance to the EFC, the Interface coefficient drops immensely and thus causes the companies with a high number of Interfaces a decrease in their efficiency. Looking at the results of this analysis, it seems this version of the two-stage model will be beneficial for many companies and less beneficial for other companies, especially those with high values in Snow, Forest and Wind. If we assume that they have been overcompensated for these variables in the current model, we can conclude that the adapted version of the model draws a better picture of reality and assume it is possible that NVE will change the model to a version more similar to this one in the future.

When analyzing the effects of adding the project to BE Nett in the adapted model, we find that the only difference when adding the project to the original model used by NVE today, is that the effects on the company adding the project are even more positive. BE Nett earns almost twice as much when adding the project in the new model compared to adding it to the original. As a result of this, the profitability of the project would be even higher and executing the project will be less risky with respect to uncertainty of the size of revenue caps in the years to come. Further research on both the sensitivity of the coefficients to changed inputs and outputs as well as the effect of other projects will need to be done.

Part 5 -

Conclusion

17 Conclusion

The purpose of this thesis was to examine how adding distributed generation would change revenue caps of companies. We also wanted to analyze how sensitive the model was to different changes in the inputs and outputs, parameters and model-specification. Also we presented a general intuition for the grid companies to understand how distributed generation works in the model, and how their business is affected by it.

In the first step of our analysis we found that the project increases the revenue cap significantly for the companies we added it to. We also found that the project also affects the revenue caps of other companies in the industry, however not to a great extent.

We illustrate how changing one of the model's parameters changes the revenue cap for the companies in the industry, also related to the project. Changing the parameter rho had a distributional effect and by reducing it to 0.5 the model would reward the efficient companies less, and compensate the inefficient companies more.

For our investment contribution chapter we illustrated how demanding investment contribution may not always be the most profitable decision. In addition to showing that super-efficient companies will earn more revenue than the costs due to their efficiency rating, we also showed that the companies are rewarded higher revenue caps due to increases in their return base.

Adding the project to the companies had an effect on the rest of the industry. For the sensitivity analysis we examined how the addition of distributed generation affected the amount of compensation the companies receive. We found that the companies receive less and less compensation per unit of distributed generation as the industry, or a single company, adds distributed generation capacity.

Finally we looked at the future model we think is the most likely to be presented by NVE in 2012. According to theory, we moved all environmental variables out of the DEA model and into the second stage regression. We found that the new model compensates the company that adds the project even more, and affects the industry to the same extent. This is only a short analysis of the new model and future research into this topic would be very interesting.

Our analysis is focused on the revenue side and we have not really analyzed the cost side of the project. We can conclude that the current model is responsive to the individual company's addition of distributed generation, and that the revenue cap increases significantly for the companies that add DG. We also found that the earlier they do it the better as the revenue increase for adding distributed generation decreases as other grid companies and the industry increase their DG capacity.

18 Suggestions for Future Research

Because of time limitations and the complexity of the project we were unable to research all the issues we would have liked to. In the following we present a few ideas that we would have liked to develop.

Simulating different levels of DG for each company in the sensitivity analysis of the industry is one approach to the DG sensitivity analysis that we did not have time to do. One possibility for our sharply decreasing DG coefficient could be our uniformly adding DG to all DG companies. By making the DG companies more similar to each other, we might be removing the regression models discriminatory power.

Sensitivity analysis of the other variables in the model. We only looked at DG in our thesis; however the other environmental variables are also open to scrutiny. While most of them are more of a constant nature than the DG variable, they mean a lot to certain companies. Some few companies rely heavily on the interfaces variable while others have significant amounts of islands. It would be interesting to see how these variables compensate the grid companies for their disadvantages, and to see how these companies compare to the rest of the industry in terms of efficiency.

Returning to a one stage model would also have been interesting. We cannot be sure that the NVE is satisfied with the two stage model and a return to the DEA only analysis is one possibility for future regulation models. It would be interesting to see how the model would compensate for DG in a model like this, along with the other variables. Also determining how much each variable means to each DG company by analyzing the shadow prices in the DEA model would be part of this analysis.

Performing the regression step before the DEA analysis is a common alternative to the two stage model that is used in today’s regulation. By running a regression on the DEA input costs, one attempts to deal with one major problem in the two stage model: intercorrelation between the DEA and regression variables.

New inputs and outputs in the DEA base model is another venue of possible research. The current outputs in the DEA model resemble the old model, and many still give a sense of describing geography rather than the pure input/output ratio the DEA model is supposed to benchmark. We would have liked to explore new models that reflect this change, and then compensated the companies for environmental factors in another way.

Weight Restrictions on Environmental Variables in the DEA model is an alternative model that NVE has done some research on. They have not used this method in the current model because industry representatives have commented that this method would make the model more complicated and they feel NVE should concentrate on making the model more easily understood (NVE, 2009).We feel however that this may be an interesting way to make the model more stable and fair. If NVE manages to design a stable and fair model, then the industry will eventually learn to understand it.

Different projects for different companies would have added to the depth of this thesis. If one could do the same kind of analysis with data from different companies, then this would surely add to the strength of the analysis. In our paper we have only used the one project from BE Nett, because we had no other data to work with. Our data also lacked information on operation & maintenance costs after the completion of the project, so we could not do a full cost analysis of adding the project.

An analysis for several years would have given us a better idea of how profitable the project would be over time. In our analysis we only look at how the revenue cap would have changed in 2010. Further research could be done to see what the changes in revenue cap might be when there are changes in the industry and over a period of several years.

International comparisons would have been interesting to gain new insight in how other companies do the same job that NVE does. Possibly there are different ways of regulation that could be incorporated into the Norwegian model, and certainly it would be interesting to see how well the different models discriminate between efficient and inefficient companies. Also a discussion on the incentive effects of the different national models would have been interesting to see.

A cost approach would be good to see what the real cost are for e.g. distributed generation and see how the model compensates due to this. It would be nice to set up an analysis that is closer to the cost than the revenues.

Glossary

Distributed Generation	Småkraft
Environmental Factor Correction	Rammevilkårskorrigering
Grid value	Nettverdi
Cost Base	Kostnadsgrunnlag
Cost Norm	Kostnadsnorm
Deviation Correction	Avvikskorrigering
Regulated Rate of Return	Referanse rente
Return base	Avkastningsgrunnlag m/1% Arbeidskapital
Revenue Cap	Inntektsramme
Required Planning Costs	Utredningsansvar
Network Loss	Nettverkstap
Investment Contribution	Anleggsbidrag
Meshed grid	Maskete Nett

List of References

Andersen, C. (2007). *Essays on electricity networks and regulation.* Bergen, Norway: NHH Phd Thesis.

Banker, R. D., & Morey, R. C. (1986a, July-August). Efficiency Analysis for Exogenously Fixed Inputs and Outputs. *Operations Research* (Vol. 34, No. 4), pp. 513-521.

Banker, R. D., & Morey, R. C. (1986b, December). The Use of Categorical Variables in Data Envelopment Analysis. *Management Science , Vol. 32, No. 12*.

Barnum, D. T., & Gleason, J. M. (2008). Bias and precision in the DEA two-stage method. *Applied Economics* (40), pp. 2305-2311.

Bjørndal, E. J., Bjørndal, M. H., & Fange, K.-A. (Forthcoming). *Benchmarking in Regulation of Electricity Networks in Norway – An Overview, chapter in Energy, Natural Resources, and Environmental Economics.* (E. J. Bjørndal, M. H. Bjørndal, & M. Rönnqvist, Eds.) Springer.

BKK. (2010). *bkk.no: Priser og avgifter*. Retrieved April 25, 2010, from http://www.bkk.no/privat/nettleie/priser-avgifter/

Bråten, J., & Magnus, E. (2000). Efficiency and Cost in Distribution Companies. In E. Magnus, & A. Midttun, *Electricity Market Reform in Norway* (pp. 139-157). London, UK: Macmillan Press Ltd.

Coelli, T. J., Rao, D. P., O'Donnell, C. J., & Battese, G. E. (1998). *An Introduction to Efficiency and Productivity Analysis.* New York: Springer+Business Media, LLC.

Coelli, T. J., Rao, D. P., O'Donnell, C. J., & Battese, G. E. (2005). *An Introduction to Efficiency and Productivity Analysis.* New York, NY, USA: Springer Science+Business Media, LLC.

Cooper, W. C., Seiford, L. M., Zhu, J., & Banker, R. D. (2004). Data Envelopment Analysis: History, Models and Interpretations. In *Handbook on Data Envelopment Analysis* (pp. 1-74). Dodrech, The Netherlands: Kluwer Academic Publishers Group.

Edvardsen, D. F., Førsund, F. R., Hansen, W., Kittelsen, S. A., & Neurauter, T. (2006). Productivity and Regulatory Reform of Norwegian Electricity Distribution Utilities. In T. Coelli, & D. Lawrence, *Performance Measurement and Regulation of Network Utilities* (pp. 97-131). Cheltenham: Edward Elgar Publishing Limited.

Edvardsen, D. F., Førsund, F. R., Hansen, W., Kittelsen, S. A., & Neurauter, T. (2006). Productivity and Regulatory Reform of Norwegian Electricity Distribution Utilities. In T. Coelli, & D. Lawrence, *Performance Measurement and Regulation of Network Utilities* (pp. 97-131). Cheltenham: Edward Elgar Publishing Limited.

Energi Norge. (2007, August 31). Retrieved February 25, 2010, from Kraftkartet.no: http://www.kraftkartet.no/swf/main_content.htm

Energi Norge. (2007, January 17). *Kraftkartet - Veien til komplett informasjon om kraftmarkedet*. Retrieved May 19, 2010, from Kraftkartet - Veien til komplett informasjon om kraftmarkedet: http://www.kraftkartet.no/default.asp?gruppe=3305

EnergiLink. (2008). *Energiloven*. Retrieved May 13, 2010, from http://energilink.tu.no/leksikon/energiloven.aspx

Grønli, H. (2003). The Norwegian and Nordic Power Sectors. In G. Rothwell, & T. Gómez, *Electricity Economics: Regulation and Deregulation* (pp. 161-185). Piscataway, NJ, USA: IEEE Press.

Houmöller, A. (2000). The Nordic Power Exchange: Nord Pool. In E. Magnus, & A. Midttun, *Electricity Market Reform in Norway* (pp. 52-79). Houndmills, Basingstoke, Hampshire, London: Macmillan Press Ltd.

Kirschen, D., & Strbac, G. (2004). *Fundamentals of Power System Economics.* West Sussex, England: John Wiley & Sons Ltd.

Lovdata. (2010). *Forskrift om økonomisk og teknisk rapportering, inntektsramme for nettvirksomheten og tariffer*. Retrieved April 22, 2010, from Forskrift om økonomisk og teknisk rapportering, inntektsramme for nettvirksomheten og tariffer: http://www.lovdata.no/for/sf/oe/oe-19990311-0302.html

Magnus, E. (2000). Incentives for Efficiency in Grid Operations. In E. Magnus, & A. Midttun, *Electricity Market Reform in Norway* (pp. 121-138). London: Macmillan Press Ltd.

McGowan, F. (1993). *The struggle for power in Europe: Competition and regulation in the EC electricity industry.* London: The Royal Institute of International Affairs.

Nord Pool ASA. (2009, September 3). *General Information - Nordpool*. Retrieved April 15, 2010, from http://www.nordpool.com/en/asa/General-information

NVE. (2009). Retrieved February 25, 2010, from Norges Vassdrags- og Energidirektoratet: http://www.nve.no/Global/Energi/Analyser/Energi%20i%20Norge%20folder/Energy%20in%20Norway%202009%20edition.pdf

NVE. (2009). *Endring i Normkostnadsmodellen for Distribusjonsnett.* Oslo: Norges Vassdrags- og Energidirektorat.

NVE. (2009, February 26). *Norges vassdrags- og energidirektoratet - Areas of responsibility*. Retrieved April 28, 2010, from http://www.nve.no/en/About-NVE/Area-of-responsibility/

NVE. (2009a, April 23). *Norges vassdrags- og energidirektoratet*. Retrieved May 24, 2010, from http://www.nve.no/no/om-nve/lover-og-forskrifter/forskrifter-pa-horing/forslag-til-endringer-i-forskrift-302/

NVE. (2009b, October 08). *Norges vassdrags- og energidirektoratet*. Retrieved 2010, from http://www.nve.no/no/Kraftmarked/Regulering-av-nettselskapene/InntektsrammerNy/Inntektsrammer-2007---/Inntektsrammer-for-2010/

NVE. (2010, March 15). *Norges vassdrags- og energidirektoratet*. Retrieved March 15, 2010, from http://nve.no/no/Kraftmarked/Regulering-av-nettselskapene/InntektsrammerNy/Om-beregning-av-inntektsrammer/

NVE. (2008). *NVE: Sluttbrukermarkedet*. Retrieved May 2, 2010, from http://www.nve.no/no/Kraftmarked/Sluttbrukermarkedet/

OED. (2008). Retrieved February 25, 2010, from Regjeringen - Faktaheftet: http://www.regjeringen.no/upload/OED/pdf%20filer/Faktaheftet/EVfakta08/Evfakta08_kap05_no.pdf

OED. (2006). *Energi i Norge: Evaluering av energiloven*. Retrieved May 13, 2010, from http://www.regjeringen.no/nb/dep/oed/tema/fornybar-energi/Evalueringen-av-energiloven--oversikt-ov.html?id=464675

Ray, S. C. (1991, December 12). Resource-Use Efficiency in Public Schools: A Study of Connecticut Data. *Management Science, Vol. 37* , pp. 1620-1628.

Regjeringen.no. (2010). *Energi i Norge*. Retrieved April 15, 2010, from http://www.regjeringen.no/nb/dep/oed/tema/fornybar-energi.html?id=86981

Rubinfeld, R. S., & Pindyck, D. L. (2009). *Microeconomics.* New Jersey: Pearson Education, Inc.

Rud, L. (2009). *Essays on Electricity Markets.* Bergen, Norway: Samfunns- og næringslivsforskning.

Statistisk sentralbyrå. (2010). *Tilgang og forbruk av elektrisitet 1998-2009. GWh*. Retrieved May 14, 2010, from Tilgang og forbruk av elektrisitet 1998-2009. GWh: http://www.ssb.no/emner/01/03/10/energiregn/tab-2010-04-23-07.html

Svartsund, T. (2008, March 12). *Energi Norge.* Retrieved May 5, 2010, from http://www.energinorge.no/avholdte-presentasjoner-linker-til-dok-ebl-kompetanse-no/anleggsbidrag-praktiske-loesninger-article7469-493.html

Wangensteen, I. (2007). *Power System Economics - The Nordic Electricity Market.* Trondheim: Tapir Academic Press.

Appendix

19 Original Efficiencies and Revenue Caps

ID	Company	DEA Efficiency	EFC	Total Efficiency	Calibrated Efficiency	Final Efficiency	RC1	RC2	RC3
72008	Alta Kraftlag AL	72.83%	-7.22%	80.05%	93.09%	93.09%	75533	75356	83136
92008	Andøy Energi AS	128.13%	-0.40%	113.13%	126.17%	124.15%	27585	27519	30387
142008	Askøy Energi AS	95.30%	-5.47%	100.77%	113.81%	113.81%	40048	39922	45468
162008	Austevoll Kraftlag BA	104.92%	-5.25%	106.93%	119.97%	119.97%	21926	21872	24251
182008	Ballangen Energi AS	97.79%	-7.27%	105.06%	118.10%	118.10%	19672	19622	21810
222008	Bindal Kraftlag AL	74.31%	-1.25%	75.56%	88.60%	88.60%	9883	9866	10624
232008	Elkem Bjølvefossen AS	93.38%	-2.95%	96.33%	109.37%	109.37%	2012	2012	2033
322008	Fredrikstad Energi Nett AS	106.66%	-3.89%	105.16%	118.20%	118.20%	119381	119043	133898
342008	Dragefossen Kraftanlegg AS	69.72%	-1.35%	71.07%	84.11%	84.11%	17619	17578	19360
352008	Drangedal Everk KF	77.35%	-6.17%	83.52%	96.56%	96.56%	19296	19248	21363
372008	Eidefoss AS	100.15%	-1.37%	101.37%	114.41%	120.40%	75332	75165	82516
412008	Etne Elektrisitetslag	69.12%	-4.53%	73.65%	86.69%	86.69%	10168	10150	10943
422008	Fauske Lysverk AS	64.19%	0.00%	64.19%	77.23%	77.23%	28374	28289	32004
432008	Finnås Kraftlag	93.14%	-2.09%	95.23%	108.27%	108.27%	34043	33950	38040
452008	Fitjar Kraftlag BA	72.01%	-13.83%	85.84%	98.88%	98.88%	16392	16364	17597
462008	Fjelberg Kraftlag	70.87%	-0.37%	71.24%	84.28%	84.28%	9908	9881	11050
522008	Forsand Elverk KF	54.08%	-6.60%	60.68%	73.72%	73.72%	7324	7303	8194
532008	Fosenkraft AS	88.03%	-1.53%	89.56%	102.60%	102.60%	35676	35545	41314
552008	Fusa Kraftlag	76.61%	-1.83%	78.44%	91.48%	91.48%	20766	20706	23351
562008	Sunnfjord Energi AS	76.59%	-6.99%	83.58%	96.62%	89.47%	120303	119944	135709
622008	Hadeland Energinett AS	79.40%	-6.66%	86.06%	99.10%	99.10%	81918	81712	90802
632008	Trollfjord Kraft AS	98.70%	-13.75%	112.45%	125.49%	125.49%	39346	39269	42656
652008	Hammerfest Energi Nett AS	84.88%	-1.05%	85.93%	98.97%	92.93%	60943	60811	66596
712008	HelgelandsKraft AS	79.92%	-2.29%	82.21%	95.25%	96.62%	342052	341215	378030
722008	Hemne kraftlag BA	75.00%	-2.39%	77.39%	90.43%	90.43%	25560	25500	28143
822008	Hurum Energiverk AS	79.93%	0.00%	79.93%	92.97%	92.97%	27739	27671	30658
842008	Høland og Setskog Elverk	68.81%	-0.20%	69.01%	82.05%	82.05%	26544	26465	29968
862008	Istad Nett AS	94.08%	-1.58%	95.66%	108.70%	109.09%	126884	126532	142013
872008	Jondal Energi KF	72.64%	-4.26%	76.90%	89.94%	89.94%	6323	6308	6944
882008	Jæren Everk Komm. f. i Hå	84.67%	-8.54%	93.21%	106.25%	106.25%	35382	35261	40588
912008	Klepp Energi AS	108.65%	-8.15%	108.15%	121.19%	121.19%	30165	30070	34235
932008	Kragerø Energi AS	67.19%	-17.31%	84.50%	97.54%	97.54%	39847	39750	43986
952008	Krødsherad Everk KF	153.64%	0.00%	115.70%	128.74%	128.74%	8962	8942	9816
962008	Kvam Kraftverk AS	84.36%	-4.84%	89.20%	102.24%	102.24%	25692	25604	29481
972008	Kvinnherad Energi AS	90.50%	-10.06%	100.56%	113.60%	113.60%	35708	35613	39773
1022008	Lier Everk AS	93.50%	-0.01%	93.51%	106.55%	106.55%	52489	52381	57116
1032008	Luostejok Kraftlag AL	71.15%	-11.60%	82.75%	95.79%	95.79%	38337	38248	42170
1042008	Luster Energiverk AS	103.06%	-5.85%	105.85%	118.89%	118.89%	20753	20717	22337
1062008	Lærdal Energi	50.61%	-15.49%	66.10%	79.14%	79.14%	13757	13734	14732
1082008	Løvenskiold Fossum Kraft	40.91%	0.00%	40.91%	53.95%	53.95%	2415	2405	2866
1112008	Malvik Everk AS	61.55%	0.00%	61.55%	74.59%	74.59%	22489	22432	24965
1162008	Meløy Energi AS	95.52%	-4.38%	99.90%	112.94%	112.94%	30713	30642	33735
1192008	Gauldal Energi AS	92.25%	-0.80%	93.05%	106.09%	106.09%	28313	28257	30720
1212008	Modalen Kraftlag BA	108.18%	-8.65%	108.65%	121.69%	121.69%	3053	3042	3489
1322008	Nord-Salten Kraftlag AL	118.71%	-1.48%	101.48%	114.52%	117.52%	62557	62440	67582
1332008	Nord Troms Kraftlag AS	93.17%	-2.16%	95.33%	108.37%	114.27%	79026	78861	86155
1352008	Nord-Østerdal Kraftlag AL	104.88%	-1.21%	101.21%	114.25%	114.25%	59557	59432	64920
1362008	Norddal Elverk AS	77.81%	-9.26%	87.07%	100.11%	100.11%	11052	11028	12090
1382008	Nordkyn Kraftlag AL	68.88%	-2.34%	71.22%	84.26%	93.77%	27166	27115	29355
1462008	Odda Energi AS	84.51%	-9.41%	93.92%	106.96%	106.96%	27055	26978	30358
1472008	Evenes Kraftforsyning AS	58.37%	-4.48%	62.85%	75.89%	75.89%	9929	9911	10673
1492008	Oppdal Everk AS	89.67%	-0.77%	90.44%	103.48%	103.48%	25571	25500	28630
1532008	Orkdal Energi AS	87.99%	-1.82%	89.81%	102.85%	102.85%	26750	26658	30687
1572008	Rakkestad Energiverk AS	80.81%	-3.93%	84.74%	97.78%	97.78%	24311	24254	26758
1612008	Rauland Kraftforsyningslag	91.30%	-5.44%	96.74%	109.78%	109.78%	23625	23597	24792
1622008	Rauma Energi AS	93.87%	-2.90%	96.77%	109.81%	109.81%	34031	33964	36945
1632008	Kvikne-Rennebu Kraftlag AL	95.04%	-1.53%	96.57%	109.61%	109.61%	20022	19971	22208
1642008	Repvåg Kraftlag AL	69.28%	-1.99%	71.27%	84.31%	94.70%	50861	50744	55866
1662008	Rissa Kraftlag BA	76.44%	-0.71%	77.15%	90.19%	90.19%	17875	17833	19668
1812008	Sandøy Energi AS	51.19%	-12.09%	63.28%	76.32%	76.32%	6472	6458	7100
1832008	Hjartdal Elverk AS	67.64%	-7.94%	75.58%	88.62%	88.62%	11000	10977	12009
1842008	Selbu Energiverk AS	67.71%	-8.38%	76.09%	89.13%	89.13%	17755	17707	19803

ID	Company	DEA Efficiency	EFC	Total Efficiency	Calibrated Efficiency	Final Efficiency	RC1	RC2	RC3
1942008	Skjåk Energi	66.38%	-0.46%	66.84%	79.88%	79.88%	16714	16675	18376
1962008	Skånevik Ølen Kraftlag	81.67%	-1.92%	83.59%	96.63%	96.63%	18789	18733	21210
1972008	Sognekraft AS	55.12%	-1.93%	57.05%	70.09%	69.82%	70611	70460	77092
2042008	Stranda Energiverk AS	108.98%	-13.20%	118.18%	131.22%	131.22%	25214	25181	26622
2052008	Stryn Energi AS	90.31%	-5.67%	95.98%	109.02%	109.02%	26876	26817	29429
2062008	Suldal Elverk	77.23%	-13.62%	90.85%	103.89%	103.89%	28854	28776	32248
2102008	Sunnhordland Kraftlag AS	56.15%	-2.88%	59.03%	72.07%	102.32%	146320	145926	163255
2132008	Sykkylven Energi AS	72.28%	-4.50%	76.78%	89.82%	89.82%	21055	20992	23726
2142008	Sør-Aurdal Energi BA	70.19%	-5.24%	75.43%	88.47%	88.47%	17561	17503	20031
2152008	TrønderEnergi Nett AS	77.99%	-1.62%	79.61%	92.65%	92.20%	226225	225631	251724
2182008	Sørfold Kraftlag AL	86.61%	-3.24%	89.85%	102.89%	102.89%	10850	10836	11457
2192008	Tafjord Kraftnett AS	73.91%	-0.53%	74.44%	87.48%	87.42%	194655	194112	217985
2232008	Tinn Energi AS	68.31%	-3.24%	71.55%	84.59%	84.59%	40693	40573	45861
2272008	Troms Kraft Nett AS	97.16%	-0.99%	98.15%	111.19%	112.77%	446596	445486	494312
2312008	Trøgstad Elverk AS	105.73%	-0.96%	102.78%	115.82%	115.82%	16239	16201	17848
2332008	Tydal Kommunale Energiverk KF	110.01%	-5.70%	109.54%	122.58%	122.58%	8770	8758	9310
2342008	Tysnes Kraftlag PL	144.75%	-0.44%	115.06%	128.10%	128.10%	21057	21008	23165
2352008	Tyssefaldene Aktieselskabet	149.22%	-6.26%	106.26%	119.30%	104.54%	20742	20708	22211
2382008	Indre Hardanger Kraftlag AS	99.88%	-8.08%	107.96%	121.00%	121.00%	36806	36736	39813
2422008	Uvdal Kraftforsyning AL	77.78%	-0.01%	77.79%	90.83%	90.83%	9324	9301	10313
2482008	Vang Energiverk KF	72.43%	-2.16%	74.59%	87.63%	87.63%	15170	15131	16848
2492008	Varanger Kraftnett AS	82.29%	-0.63%	82.92%	95.96%	101.93%	134239	133912	148283
2512008	Vest-Telemark Kraftlag AS	89.83%	-2.33%	92.16%	105.20%	104.31%	88322	88126	96744
2572008	Dalane Energi IKS	69.01%	-10.22%	79.23%	92.27%	92.27%	71511	71284	81300
2622008	Ørskog Energi AS	109.79%	0.00%	100.00%	113.04%	113.04%	17884	17840	19761
2642008	Øvre Eiker Nett AS	75.56%	-2.60%	78.16%	91.20%	91.20%	43220	43106	48104
2672008	Årdal Energi KF	64.09%	-0.49%	64.58%	77.62%	77.62%	15925	15877	17989
2692008	SFE Nett AS	71.84%	-8.39%	80.23%	93.27%	97.21%	209267	208730	232369
2742008	Svorka Energi AS	78.18%	-4.88%	83.06%	96.10%	96.10%	41672	41574	45871
2752008	Hallingdal Kraftnett AS	86.45%	-1.40%	87.85%	100.89%	99.19%	102434	102199	112554
2952008	Gudbrandsdal Energi AS	80.49%	-0.68%	81.17%	94.21%	96.71%	74541	74362	82234
3062008	Valdres Energiverk AS	64.43%	-0.41%	64.84%	77.88%	77.88%	59750	59540	68766
3112008	Nordmøre Energiverk AS	86.12%	-0.78%	86.90%	99.94%	104.38%	162350	161957	179258
3432008	Hemsedal Energi KF	82.52%	-6.86%	89.38%	102.42%	102.42%	21662	21552	26410
3492008	Notodden			average	100.00%	100.00%	44719	44605	49604
3542008	Lofotkraft AS	68.29%	-2.27%	70.56%	83.60%	86.92%	123006	122700	136145
3732008	Nore Energi AS	66.23%	-3.86%	70.09%	83.13%	83.13%	12189	12158	13509
4182008	Aurland Energiverk AS	58.29%	-6.73%	65.02%	78.06%	78.06%	14065	14028	15653
4332008	Hålogaland Kraft AS	91.23%	-1.67%	92.90%	105.94%	106.62%	124351	124006	139174
4602008	Tussa Nett AS	77.46%	-5.73%	83.19%	96.23%	93.23%	167609	167140	187779
4642008	Vesterålskraft Nett AS	68.40%	-1.93%	70.33%	83.37%	89.35%	73550	73360	81694
4912008	Elkem Energi Bremanger AS	56.70%	-18.90%	75.60%	88.64%	88.64%	3553	3546	3853
4952008	Elverum Energiverk Nett AS	81.30%	-3.51%	84.81%	97.85%	97.85%	49692	49528	56729
5032008	Haugaland Kraft AS	71.83%	-0.71%	72.54%	85.58%	87.51%	279396	278795	305241
5112008	Lyse Nett AS	99.27%	-5.17%	104.44%	117.48%	111.50%	642527	640842	714949
5122008	Lyse Produksjon			average	100.00%	100.00%	5069	5050	5866
5362008	Trondheim Energiverk Nett AS	121.69%	-0.31%	110.71%	123.75%	126.51%	343545	342754	377529
5422008	Vokks Nett AS	86.37%	-1.50%	87.87%	100.91%	100.91%	60171	60017	66813
5492008	Fortum Distribution AS	83.22%	-3.55%	86.77%	99.81%	99.81%	347846	346990	384638
5662008	BKK Nett AS	75.91%	-3.88%	79.79%	92.83%	89.56%	988075	985374	1104214
5742008	Eidsiva Energi Nett AS	93.74%	-0.52%	94.26%	107.30%	110.67%	849577	847337	945922
5782008	Flesberg Elektrisitetsverk AS	87.81%	-0.95%	88.76%	101.80%	101.80%	15572	15532	17257
5912008	Midt Nett Buskerud AS	61.74%	-8.04%	69.78%	82.82%	82.82%	62816	62625	71017
5932008	Nesset Kraft AS	115.75%	-3.89%	103.89%	116.93%	116.93%	16124	16100	17133
5992008	Sunndal Energi KF	67.94%	-5.75%	73.69%	86.73%	86.73%	27398	27333	30201
6112008	Skagerak Nett AS	73.02%	-0.47%	73.49%	86.53%	87.62%	991521	988925	1103140
6132008	Nordvest Nett AS	100.96%	-1.92%	104.30%	117.34%	117.34%	42718	42613	47220

ID	Company	DEA Efficiency	EFC	Total Efficiency	Calibrated Efficiency	Final Efficiency	RC1	RC2	RC3
6142008	Energi 1 Follo-Røyken as	111.43%	-0.17%	103.23%	116.27%	116.27%	107535	107274	118773
6152008	EB Nett AS	87.75%	-0.84%	88.59%	101.63%	105.02%	317039	316138	355793
6242008	Agder Energi Nett AS	75.30%	-1.33%	76.63%	89.67%	88.79%	878854	876343	986831
6252008	Voss Energi AS	71.88%	-11.66%	83.54%	96.58%	96.58%	52920	52755	60009
6372008	Narvik Energinett AS	77.91%	-0.41%	78.32%	91.36%	96.28%	69126	68940	77102
6522008	Svorka Produksjon AS			average	100.00%	100.00%	685	682	785
6592008	Midt-Telemark Energi AS	77.83%	-6.14%	83.97%	97.01%	97.01%	47762	47615	54110
6692008	Stange Energi Nett AS	80.35%	-4.48%	84.83%	97.87%	97.87%	50666	50523	56801
6752008	Hafslund Nett AS	96.39%	-0.16%	96.55%	109.59%	105.87%	2388680	2383070	2629915
6862008	Yara Norge AS	196.01%	-19.71%	119.71%	132.75%	132.50%	17113	17098	17724
6932008	Ringeriks-Kraft Nett AS	78.30%	-0.77%	79.07%	92.11%	92.11%	84962	84722	95278
6992008	Nord-Trøndelag Elektrisitetsverk	107.55%	-0.96%	100.96%	114.00%	111.54%	489263	488131	537930
7262008	BE Nett AS	93.35%	-3.32%	96.67%	109.71%	109.71%	120270	119974	133003
7432008	Mo Industripark			average	100.00%	100.00%	23170	23101	26130

20 Efficiencies and Revenue Cap when BE Nett AS adds the project

ID	Company	DEA Efficiency	EFC	Total Efficiency	Calibrated Efficiency	Final Efficiency	RC1	RC2	RC3
72008	Alta Kraftlag AL	72.83%	-7.13%	79.96%	93.06%	93.06%	75519	75341	83122
92008	Andøy Energi AS	128.13%	-0.37%	113.10%	126.20%	124.17%	27588	27522	30390
142008	Askøy Energi AS	95.30%	-5.48%	100.78%	113.88%	113.88%	40064	39937	45484
162008	Austevoll Kraftlag BA	104.92%	-5.23%	106.91%	120.01%	120.01%	21931	21877	24256
182008	Ballangen Energi AS	97.79%	-7.10%	104.89%	117.99%	117.99%	19660	19610	21799
222008	Bindal Kraftlag AL	74.31%	-1.24%	75.55%	88.65%	88.65%	9886	9869	10627
232008	Elkem Bjølvefossen AS	93.38%	-2.95%	96.33%	109.43%	109.43%	2013	2012	2033
322008	Fredrikstad Energi Nett AS	106.66%	-3.89%	105.16%	118.26%	118.26%	119420	119080	133937
342008	Dragefossen Kraftanlegg AS	69.72%	-1.27%	70.99%	84.09%	84.09%	17616	17576	19358
352008	Drangedal Everk KF	77.35%	-6.04%	83.39%	96.49%	96.49%	19288	19239	21355
372008	Eidefoss AS	100.15%	-1.29%	101.29%	114.39%	120.38%	75325	75157	82510
412008	Etne Elektrisitetslag	69.12%	-4.53%	73.65%	86.75%	86.75%	10172	10154	10947
422008	Fauske Lysverk AS	64.19%	0.00%	64.19%	77.29%	77.29%	28386	28301	32016
432008	Finnås Kraftlag	93.14%	-2.08%	95.22%	108.32%	108.32%	34053	33960	38050
452008	Fitjar Kraftlag BA	72.01%	-13.71%	85.72%	98.82%	98.82%	16386	16358	17591
462008	Fjelberg Kraftlag	70.87%	-0.37%	71.24%	84.34%	84.34%	9912	9885	11054
522008	Forsand Elverk KF	54.08%	-6.46%	60.54%	73.64%	73.64%	7319	7299	8190
532008	Fosenkraft AS	88.03%	-1.50%	89.53%	102.63%	102.63%	35682	35550	41321
552008	Fusa Kraftlag	76.61%	-1.81%	78.42%	91.52%	91.52%	20772	20711	23357
562008	Sunnfjord Energi AS	76.59%	-6.64%	83.23%	96.33%	89.25%	120134	119774	135541
622008	Hadeland Energinett AS	79.40%	-6.58%	85.98%	99.08%	99.08%	81908	81700	90793
632008	Trollfjord Kraft AS	98.70%	-13.70%	112.40%	125.50%	125.50%	39348	39270	42658
652008	Hammerfest Energi Nett AS	84.88%	-1.00%	85.88%	98.98%	92.94%	60946	60813	66599
712008	HelgelandsKraft AS	79.92%	-2.22%	82.14%	95.24%	96.62%	342036	341194	378016
722008	Hemne kraftlag BA	75.00%	-2.27%	77.27%	90.37%	90.37%	25550	25490	28133
822008	Hurum Energiverk AS	79.93%	0.00%	79.93%	93.03%	93.03%	27749	27681	30669
842008	Høland og Setskog Elverk	68.81%	-0.19%	69.00%	82.10%	82.10%	26553	26473	29977
862008	Istad Nett AS	94.08%	-1.55%	95.63%	108.73%	109.11%	126902	126547	142032
872008	Jondal Energi KF	72.64%	-4.10%	76.74%	89.84%	89.84%	6319	6304	6940
882008	Jæren Everk Komm. f. i Hå	84.67%	-8.53%	93.20%	106.30%	106.30%	35392	35270	40598
912008	Klepp Energi AS	108.65%	-8.16%	108.16%	121.26%	121.26%	30176	30081	34246
932008	Kragerø Energi AS	67.19%	-17.11%	84.30%	97.40%	97.40%	39813	39716	43953
952008	Krødsherad Everk KF	153.64%	0.00%	115.70%	128.80%	128.80%	8965	8945	9819
962008	Kvam Kraftverk AS	84.36%	-4.56%	88.92%	102.02%	102.02%	25658	25570	29447
972008	Kvinnherad Energi AS	90.50%	-9.59%	100.09%	113.19%	113.19%	35626	35531	39692
1022008	Lier Everk AS	93.50%	-0.01%	93.51%	106.61%	106.61%	52507	52398	57135
1032008	Luostejok Kraftlag AL	71.15%	-11.60%	82.75%	95.85%	95.85%	38352	38262	42184
1042008	Luster Energiverk AS	103.06%	-5.53%	105.53%	118.63%	118.63%	20724	20687	22308
1062008	Lærdal Energi	50.61%	-15.32%	65.93%	79.03%	79.03%	13746	13724	14721
1082008	Løvenskiold Fossum Kraft	40.91%	0.00%	40.91%	54.01%	54.01%	2416	2406	2868
1112008	Malvik Everk AS	61.55%	0.00%	61.55%	74.65%	74.65%	22499	22441	24975
1162008	Meløy Energi AS	95.52%	-4.29%	99.81%	112.91%	112.91%	30708	30637	33730
1192008	Gauldal Energi AS	92.25%	-0.75%	93.00%	106.10%	106.10%	28315	28258	30722
1212008	Modalen Kraftlag BA	108.18%	-8.15%	108.15%	121.25%	121.25%	3045	3035	3482
1322008	Nord-Salten Kraftlag AL	118.71%	-1.44%	101.44%	114.54%	117.54%	62561	62444	67587
1332008	Nord Troms Kraftlag AS	93.17%	-2.09%	95.26%	108.36%	114.26%	79023	78856	86152
1352008	Nord-Østerdal Kraftlag AL	104.88%	-1.16%	101.16%	114.26%	114.26%	59560	59435	64923
1362008	Norddal Elverk AS	77.81%	-8.76%	86.57%	99.67%	99.67%	11023	10998	12061
1382008	Nordkyn Kraftlag AL	68.88%	-2.20%	71.08%	84.18%	93.70%	27155	27104	29345
1462008	Odda Energi AS	84.51%	-9.04%	93.55%	106.65%	106.65%	27006	26929	30310
1472008	Evenes Kraftforsyning AS	58.37%	-4.48%	62.85%	75.95%	75.95%	9933	9915	10678
1492008	Oppdal Everk AS	89.67%	-0.73%	90.40%	103.50%	103.50%	25574	25502	28633
1532008	Orkdal Energi AS	87.99%	-1.71%	89.70%	102.80%	102.80%	26742	26650	30679
1572008	Rakkestad Energiverk AS	80.81%	-3.84%	84.65%	97.75%	97.75%	24307	24249	26753
1612008	Rauland Kraftforsyningslag	91.30%	-5.44%	96.74%	109.84%	109.84%	23633	23605	24801
1622008	Rauma Energi AS	93.87%	-2.73%	96.60%	109.70%	109.70%	34010	33942	36924
1632008	Kvikne-Rennebu Kraftlag AL	95.04%	-1.46%	96.50%	109.60%	109.60%	20021	19970	22207
1642008	Repvåg Kraftlag AL	69.28%	-1.94%	71.22%	84.32%	94.71%	50863	50746	55869
1662008	Rissa Kraftlag BA	76.44%	-0.67%	77.11%	90.21%	90.21%	17877	17835	19671
1682008	Rollag Elektrisitetsverk LL	64.20%	-1.73%	65.93%	79.03%	79.03%	8183	8166	8940
1712008	Rødøy-Lurøy Kraftverk AS	133.77%	-7.92%	107.92%	121.02%	121.02%	41306	41231	44531
1732008	Røros Elektrisitetsverk AS	88.98%	-3.71%	92.69%	105.79%	105.79%	26566	26513	28830
1812008	Sandøy Energi AS	51.19%	-12.04%	63.23%	76.33%	76.33%	6473	6458	7101
1832008	Hjartdal Elverk AS	67.64%	-7.56%	75.20%	88.30%	88.30%	10977	10954	11986
1842008	Selbu Energiverk AS	67.71%	-8.19%	75.90%	89.00%	89.00%	17740	17692	19788

ID	Company	DEA Efficiency	EFC	Total Efficiency	Calibrated Efficiency	Final Efficiency	RC1	RC2	RC3
1942008	Skjåk Energi	66.38%	-0.46%	66.84%	79.94%	79.94%	16721	16682	18383
1962008	Skånevik Ølen Kraftlag	81.67%	-1.84%	83.51%	96.61%	96.61%	18787	18730	21208
1972008	Sognekraft AS	55.12%	-1.81%	56.93%	70.03%	69.77%	70586	70435	77068
2042008	Stranda Energiverk AS	108.98%	-12.50%	117.48%	130.58%	130.58%	25132	25099	26541
2052008	Stryn Energi AS	90.31%	-5.49%	95.80%	108.90%	108.90%	26858	26798	29411
2062008	Suldal Elverk	77.23%	-13.26%	90.49%	103.59%	103.59%	28804	28724	32197
2102008	Sunnhordland Kraftlag AS	56.15%	-2.88%	59.03%	72.13%	102.34%	146337	145940	163272
2132008	Sykkylven Energi AS	72.28%	-4.28%	76.56%	89.66%	89.66%	21033	20971	23705
2142008	Sør-Aurdal Energi BA	70.19%	-4.93%	75.12%	88.22%	88.22%	17532	17475	20003
2152008	TrønderEnergi Nett AS	77.99%	-1.57%	79.56%	92.66%	92.21%	226233	225636	251734
2182008	Sørfold Kraftlag AL	86.61%	-3.05%	89.66%	102.76%	102.76%	10842	10827	11449
2192008	Tafjord Kraftnett AS	73.91%	-0.53%	74.44%	87.54%	87.46%	194704	194158	218035
2232008	Tinn Energi AS	68.31%	-3.18%	71.49%	84.59%	84.59%	40693	40572	45861
2272008	Troms Kraft Nett AS	97.16%	-0.95%	98.11%	111.21%	112.78%	446634	445517	494351
2312008	Trøgstad Elverk AS	105.73%	-0.96%	102.78%	115.88%	115.88%	16244	16207	17853
2332008	Tydal Kommunale Energiverk KF	110.01%	-5.36%	109.20%	122.30%	122.30%	8757	8745	9297
2342008	Tysnes Kraftlag PL	144.75%	-0.41%	115.03%	128.13%	128.13%	21060	21011	23168
2352008	Tyssefaldene Aktieselskabet	149.22%	-6.26%	106.26%	119.36%	104.55%	20743	20709	22212
2382008	Indre Hardanger Kraftlag AS	99.88%	-7.91%	107.79%	120.89%	120.89%	36784	36714	39792
2422008	Uvdal Kraftforsyning AL	77.78%	-0.01%	77.79%	90.89%	90.89%	9328	9305	10317
2482008	Vang Energiverk KF	72.43%	-2.03%	74.46%	87.56%	87.56%	15163	15124	16842
2492008	Varanger Kraftnett AS	82.29%	-0.59%	82.88%	95.98%	101.94%	134250	133921	148296
2512008	Vest-Telemark Kraftlag AS	89.83%	-2.19%	92.02%	105.12%	104.24%	88289	88091	96711
2572008	Dalane Energi IKS	69.01%	-10.06%	79.07%	92.17%	92.17%	71466	71237	81256
2622008	Ørskog Energi AS	109.79%	0.00%	100.00%	113.10%	113.10%	17890	17846	19767
2642008	Øvre Eiker Nett AS	75.56%	-2.44%	78.00%	91.10%	91.10%	43192	43078	48077
2672008	Årdal Energi KF	64.09%	-0.49%	64.58%	77.68%	77.68%	15931	15883	17996
2692008	SFE Nett AS	71.84%	-8.09%	79.93%	93.03%	97.05%	209064	208523	232167
2742008	Svorka Energi AS	78.18%	-4.77%	82.95%	96.05%	96.05%	41659	41560	45858
2752008	Hallingdal Kraftnett AS	86.45%	-1.32%	87.77%	100.87%	99.17%	102423	102187	112544
2952008	Gudbrandsdal Energi AS	80.49%	-0.63%	81.12%	94.22%	96.72%	74545	74364	82238
3062008	Valdres Energiverk AS	64.43%	-0.39%	64.82%	77.92%	77.92%	59766	59555	68783
3112008	Nordmøre Energiverk AS	86.12%	-0.76%	86.88%	99.98%	104.41%	162378	161983	179287
3432008	Hemsedal Energi KF	82.52%	-6.83%	89.35%	102.45%	102.45%	21666	21555	26414
3492008	Notodden			average	100.00%	100.00%	44719	44604	49604
3542008	Lofotkraft AS	68.29%	-2.19%	70.48%	83.58%	86.90%	122993	122686	136133
3732008	Nore Energi AS	66.23%	-3.63%	69.86%	82.96%	82.96%	12175	12144	13496
4182008	Aurland Energiverk AS	58.29%	-6.39%	64.68%	77.78%	77.78%	14038	14001	15626
4332008	Hålogaland Kraft AS	91.23%	-1.60%	92.83%	105.93%	106.61%	124345	123998	139169
4602008	Tussa Nett AS	77.46%	-5.44%	82.90%	96.00%	93.05%	167425	166953	187596
4642008	Vesterålskraft Nett AS	68.40%	-1.84%	70.24%	83.34%	89.32%	73537	73346	81682
4912008	Elkem Energi Bremanger AS	56.70%	-18.65%	75.35%	88.45%	88.45%	3549	3542	3849
4952008	Elverum Energiverk Nett AS	81.30%	-3.47%	84.77%	97.87%	97.87%	49698	49533	56735
5032008	Haugaland Kraft AS	71.83%	-0.68%	72.51%	85.61%	87.53%	279440	278835	305287
5112008	Lyse Nett AS	99.27%	-5.12%	104.39%	117.49%	111.51%	642550	640855	714975
5122008	Lyse Produksjon			average	100.00%	100.00%	5069	5050	5866
5362008	Trondheim Energiverk Nett AS	121.69%	-0.29%	110.69%	123.79%	126.54%	343602	342807	377588
5422008	Vokks Nett AS	86.37%	-1.47%	87.84%	100.94%	100.94%	60182	60026	66824
5492008	Fortum Distribution AS	83.22%	-3.53%	86.75%	99.85%	99.85%	347930	347068	384724
5662008	BKK Nett AS	75.91%	-3.82%	79.73%	92.83%	89.56%	988075	985357	1104219
5742008	Eidsiva Energi Nett AS	93.74%	-0.48%	94.22%	107.32%	110.69%	849646	847391	945995
5782008	Flesberg Elektrisitetsverk AS	87.81%	-0.90%	88.71%	101.81%	101.81%	15573	15533	17258
5912008	Midt Nett Buskerud AS	61.74%	-7.96%	69.70%	82.80%	82.80%	62807	62615	71009
5932008	Nesset Kraft AS	115.75%	-3.66%	103.66%	116.76%	116.76%	16109	16085	17118
5992008	Sunndal Energi KF	67.94%	-5.41%	73.35%	86.45%	86.45%	27348	27282	30151
6112008	Skagerak Nett AS	73.02%	-0.44%	73.46%	86.56%	87.64%	991654	989041	1103278

ID	Company	DEA Efficiency	EFC	Total Efficiency	Calibrated Efficiency	Final Efficiency	RC1	RC2	RC3
6132008	Nordvest Nett AS	100.96%	-1.90%	104.28%	117.38%	117.38%	42727	42622	47229
6142008	Energi 1 Follo-Røyken as	111.43%	-0.17%	103.23%	116.33%	116.33%	107570	107307	118809
6152008	EB Nett AS	87.75%	-0.83%	88.58%	101.68%	105.05%	317093	316186	355849
6242008	Agder Energi Nett AS	75.30%	-1.26%	76.56%	89.66%	88.78%	878811	876283	986793
6252008	Voss Energi AS	71.88%	-11.61%	83.49%	96.59%	96.59%	52924	52758	60012
6372008	Narvik Energinett AS	77.91%	-0.39%	78.30%	91.40%	96.31%	69138	68952	77115
6522008	Svorka Produksjon AS			average	100.00%	100.00%	685	682	785
6592008	Midt-Telemark Energi AS	77.83%	-6.03%	83.86%	96.96%	96.96%	47748	47599	54095
6692008	Stange Energi Nett AS	80.35%	-4.49%	84.84%	97.94%	97.94%	50687	50544	56822
6752008	Hafslund Nett AS	96.39%	-0.15%	96.54%	109.64%	105.91%	2389155	2383508	2630401
6862008	Yara Norge AS	196.01%	-19.73%	119.73%	132.83%	132.58%	17119	17105	17731
6932008	Ringeriks-Kraft Nett AS	78.30%	-0.73%	79.03%	92.13%	92.13%	84973	84731	95290
6992008	Nord-Trøndelag Elektrisitetsverk	107.55%	-0.92%	100.92%	114.02%	111.56%	489306	488167	537976
7262008	BE Nett AS	92.31%	-4.75%	97.06%	110.16%	110.16%	120990	120688	133885
7432008	Mo Industripark			average	100.00%	100.00%	23170	23100	26130

21 Industry changes with project added to BE Nett AS

ID	Company	Revenue Caps with project RC1	RC2	RC3	Differences in RCs ΔRC1	ΔRC2	ΔRC3	%-changes in RCs %Δ RC1	%Δ RC2	%Δ RC3
72008	Alta Kraftlag AL	75,519	75,341	83,122	-14	-15	-14	-0.02%	-0.02%	-0.02%
92008	Andøy Energi AS	27,588	27,522	30,390	3	3	3	0.01%	0.01%	0.01%
102008	Arendals Fossekompani ASA	4,271	4,260	4,734	0	0	0	0.00%	0.00%	0.00%
142008	Askøy Energi AS	40,064	39,937	45,484	16	15	16	0.04%	0.04%	0.03%
162008	Austevoll Kraftlag BA	21,931	21,877	24,256	5	4	5	0.02%	0.02%	0.02%
182008	Ballangen Energi AS	19,660	19,610	21,799	-12	-12	-12	-0.06%	-0.06%	-0.05%
222008	Bindal Kraftlag AL	9,886	9,869	10,627	3	3	3	0.03%	0.03%	0.03%
232008	Elkem Bjølvefossen AS	2,013	2,012	2,033	1	1	1	0.03%	0.03%	0.03%
322008	Fredrikstad Energi Nett AS	119,420	119,080	133,937	39	37	39	0.03%	0.03%	0.03%
342008	Dragefossen Kraftanlegg AS	17,616	17,576	19,358	-2	-3	-2	-0.01%	-0.01%	-0.01%
352008	Drangedal Everk KF	19,288	19,239	21,355	-8	-9	-8	-0.04%	-0.04%	-0.04%
372008	Eidefoss AS	75,325	75,157	82,510	-7	-8	-7	-0.01%	-0.01%	-0.01%
412008	Etne Elektrisitetslag	10,172	10,154	10,947	4	4	4	0.04%	0.04%	0.04%
422008	Fauske Lysverk AS	28,386	28,301	32,016	12	11	12	0.04%	0.04%	0.04%
432008	Finnås Kraftlag	34,053	33,960	38,050	10	9	10	0.03%	0.03%	0.03%
452008	Fitjar Kraftlag BA	16,386	16,358	17,591	-6	-6	-6	-0.04%	-0.04%	-0.03%
462008	Fjelberg Kraftlag	9,912	9,885	11,054	4	4	4	0.04%	0.04%	0.04%
522008	Forsand Elverk KF	7,319	7,299	8,190	-4	-4	-4	-0.06%	-0.06%	-0.05%
532008	Fosenkraft AS	35,682	35,550	41,321	6	5	7	0.02%	0.02%	0.02%
552008	Fusa Kraftlag	20,772	20,711	23,357	5	5	5	0.03%	0.02%	0.02%
562008	Sunnfjord Energi AS	120,134	119,774	135,541	-168	-171	-168	-0.14%	-0.14%	-0.12%
622008	Hadeland Energinett AS	81,908	81,700	90,793	-10	-11	-10	-0.01%	-0.01%	-0.01%
632008	Trollfjord Kraft AS	39,348	39,270	42,658	2	2	2	0.01%	0.00%	0.01%
652008	Hammerfest Energi Nett AS	60,946	60,813	66,599	3	2	3	0.00%	0.00%	0.00%
712008	HelgelandsKraft AS	342,036	341,194	378,016	-16	-21	-14	0.00%	-0.01%	0.00%
722008	Hemne kraftlag BA	25,550	25,490	28,133	-10	-10	-10	-0.04%	-0.04%	-0.03%
822008	Hurum Energiverk AS	27,749	27,681	30,669	10	10	11	0.04%	0.04%	0.03%
842008	Høland og Setskog Elverk	26,553	26,473	29,977	9	8	9	0.03%	0.03%	0.03%
862008	Istad Nett AS	126,902	126,547	142,032	18	16	19	0.01%	0.01%	0.01%
872008	Jondal Energi KF	6,319	6,304	6,940	-4	-4	-4	-0.06%	-0.07%	-0.06%
882008	Jæren Everk Komm. f. i Hå	35,392	35,270	40,598	10	9	10	0.03%	0.03%	0.03%
912008	Klepp Energi AS	30,176	30,081	34,246	11	11	11	0.04%	0.04%	0.03%
932008	Kragerø Energi AS	39,813	39,716	43,953	-34	-35	-34	-0.09%	-0.09%	-0.08%
952008	Krødsherad Everk KF	8,965	8,945	9,819	3	3	3	0.03%	0.03%	0.03%
962008	Kvam Kraftverk AS	25,658	25,570	29,447	-33	-34	-33	-0.13%	-0.13%	-0.11%
972008	Kvinnherad Energi AS	35,626	35,531	39,692	-81	-82	-81	-0.23%	-0.23%	-0.20%
982008	Kvænangen Kraftverk AS	2,041	2,019	2,956	0	0	0	0.00%	-0.01%	0.00%
1022008	Lier Everk AS	52,507	52,398	57,135	18	17	18	0.03%	0.03%	0.03%
1032008	Luostejok Kraftlag AL	38,352	38,262	42,184	14	14	14	0.04%	0.04%	0.03%
1042008	Luster Energiverk AS	20,724	20,687	22,308	-29	-29	-29	-0.14%	-0.14%	-0.13%
1062008	Lærdal Energi	13,746	13,724	14,721	-10	-11	-10	-0.08%	-0.08%	-0.07%
1082008	Løvenskiold Fossum Kraft	2,416	2,406	2,868	1	1	1	0.05%	0.05%	0.04%
1112008	Malvik Everk AS	22,499	22,441	24,975	10	9	10	0.04%	0.04%	0.04%
1162008	Meløy Energi AS	30,708	30,637	33,730	-5	-6	-5	-0.02%	-0.02%	-0.01%
1192008	Gauldal Energi AS	28,315	28,258	30,722	2	1	2	0.01%	0.00%	0.01%
1212008	Modalen Kraftlag BA	3,045	3,035	3,482	-7	-7	-7	-0.23%	-0.24%	-0.20%
1322008	Nord-Salten Kraftlag AL	62,561	62,444	67,587	5	4	5	0.01%	0.01%	0.01%
1332008	Nord Troms Kraftlag AS	79,023	78,856	86,152	-3	-4	-3	0.00%	-0.01%	0.00%
1352008	Nord-Østerdal Kraftlag AL	59,560	59,435	64,923	3	2	4	0.01%	0.00%	0.01%
1362008	Norddal Elverk AS	11,023	10,998	12,061	-29	-29	-29	-0.26%	-0.27%	-0.24%
1382008	Nordkyn Kraftlag AL	27,155	27,104	29,345	-10	-11	-10	-0.04%	-0.04%	-0.03%
1462008	Odda Energi AS	27,006	26,929	30,310	-48	-49	-48	-0.18%	-0.18%	-0.16%
1472008	Evenes Kraftforsyning AS	9,933	9,915	10,678	4	4	4	0.04%	0.04%	0.04%
1492008	Oppdal Everk AS	25,574	25,502	28,633	3	3	3	0.01%	0.01%	0.01%
1522008	Opplandskraft DA	9,844	9,826	10,613	0	0	0	0.00%	0.00%	0.00%
1532008	Orkdal Energi AS	26,742	26,650	30,679	-8	-8	-8	-0.03%	-0.03%	-0.03%
1562008	Porsa Kraftlag	649	646	778	0	0	0	0.00%	0.00%	0.00%
1572008	Rakkestad Energiverk AS	24,307	24,249	26,753	-4	-5	-4	-0.02%	-0.02%	-0.02%
1612008	Rauland Kraftforsyningslag	23,633	23,605	24,801	8	8	8	0.03%	0.03%	0.03%
1622008	Rauma Energi AS	34,010	33,942	36,924	-21	-22	-21	-0.06%	-0.06%	-0.06%

ID	Company	Revenue Caps with project RC1	RC2	RC3	Differences in RCs ΔRC1	ΔRC2	ΔRC3	%-changes in RCs %Δ RC1	%Δ RC2	%Δ RC3
1632008	Kvikne-Rennebu Kraftlag AL	20,021	19,970	22,207	-1	-1	-1	-0.01%	-0.01%	0.00%
1642008	Repvåg Kraftlag AL	50,863	50,746	55,869	2	2	3	0.00%	0.00%	0.00%
1662008	Rissa Kraftlag BA	17,877	17,835	19,671	2	2	2	0.01%	0.01%	0.01%
1672008	Norsk Hydro Produksjon AS	7,406	7,401	7,607	0	0	0	0.00%	0.00%	0.00%
1682008	Rollag Elektrisitetsverk LL	8,183	8,166	8,940	-3	-3	-3	-0.04%	-0.04%	-0.04%
1712008	Rødøy-Lurøy Kraftverk AS	41,306	41,231	44,531	0	0	0	0.00%	0.00%	0.00%
1732008	Røros Elektrisitetsverk AS	26,566	26,513	28,830	-3	-3	-3	-0.01%	-0.01%	-0.01%
1762008	SKS Nett AS	74,059	73,943	79,050	0	-1	0	0.00%	0.00%	0.00%
1812008	Sandøy Energi AS	6,473	6,458	7,101	0	0	0	0.01%	0.01%	0.01%
1832008	Hjartdal Elverk AS	10,977	10,954	11,986	-23	-23	-23	-0.21%	-0.21%	-0.19%
1842008	Selbu Energiverk AS	17,740	17,692	19,788	-15	-15	-15	-0.08%	-0.09%	-0.07%
1872008	Sira-Kvina kraftselskap	7,410	7,395	8,047	0	0	0	0.00%	0.00%	0.00%
1942008	Skjåk Energi	16,721	16,682	18,383	7	7	7	0.04%	0.04%	0.04%
1962008	Skånevik Ølen Kraftlag	18,787	18,730	21,208	-2	-3	-2	-0.01%	-0.01%	-0.01%
1972008	Sognekraft AS	70,586	70,435	77,068	-25	-26	-24	-0.03%	-0.04%	-0.03%
2042008	Stranda Energiverk AS	25,132	25,099	26,541	-82	-82	-81	-0.32%	-0.32%	-0.31%
2052008	Stryn Energi AS	26,858	26,798	29,411	-18	-19	-18	-0.07%	-0.07%	-0.06%
2062008	Suldal Elverk	28,804	28,724	32,197	-51	-51	-51	-0.18%	-0.18%	-0.16%
2102008	Sunnhordland Kraftlag AS	146,337	145,940	163,272	17	14	17	0.01%	0.01%	0.01%
2132008	Sykkylven Energi AS	21,033	20,971	23,705	-22	-22	-21	-0.10%	-0.10%	-0.09%
2142008	Sør-Aurdal Energi BA	17,532	17,475	20,003	-28	-29	-28	-0.16%	-0.16%	-0.14%
2152008	TrønderEnergi Nett AS	226,233	225,636	251,734	9	5	10	0.00%	0.00%	0.00%
2182008	Sørfold Kraftlag AL	10,842	10,827	11,449	-8	-8	-8	-0.08%	-0.08%	-0.07%
2192008	Tafjord Kraftnett AS	194,704	194,158	218,035	49	46	50	0.03%	0.02%	0.02%
2232008	Tinn Energi AS	40,693	40,572	45,861	0	-1	0	0.00%	0.00%	0.00%
2272008	Troms Kraft Nett AS	446,634	445,517	494,351	38	30	40	0.01%	0.01%	0.01%
2312008	Trøgstad Elverk AS	16,244	16,207	17,853	5	5	5	0.03%	0.03%	0.03%
2332008	Tydal Kommunale Energiverk	8,757	8,745	9,297	-13	-13	-13	-0.15%	-0.15%	-0.14%
2342008	Tysnes Kraftlag PL	21,060	21,011	23,168	3	3	3	0.02%	0.01%	0.01%
2352008	Tyssefaldene Aktieselskabet	20,743	20,709	22,212	1	1	1	0.00%	0.00%	0.00%
2382008	Indre Hardanger Kraftlag AS	36,784	36,714	39,792	-22	-22	-21	-0.06%	-0.06%	-0.05%
2422008	Uvdal Kraftforsyning AL	9,328	9,305	10,317	4	3	4	0.04%	0.04%	0.03%
2482008	Vang Energiverk KF	15,163	15,124	16,842	-7	-7	-7	-0.05%	-0.05%	-0.04%
2492008	Varanger Kraftnett AS	134,250	133,921	148,296	12	9	12	0.01%	0.01%	0.01%
2512008	Vest-Telemark Kraftlag AS	88,289	88,091	96,711	-33	-35	-33	-0.04%	-0.04%	-0.03%
2572008	Dalane Energi IKS	71,466	71,237	81,256	-45	-46	-45	-0.06%	-0.07%	-0.05%
2622008	Ørskog Energi AS	17,890	17,846	19,767	6	6	6	0.03%	0.03%	0.03%
2642008	Øvre Eiker Nett AS	43,192	43,078	48,077	-27	-28	-27	-0.06%	-0.07%	-0.06%
2672008	Årdal Energi KF	15,931	15,883	17,996	7	6	7	0.04%	0.04%	0.04%
2692008	SFE Nett AS	209,064	208,523	232,167	-203	-207	-202	-0.10%	-0.10%	-0.09%
2712008	Driva Kraftverk	4,219	4,219	4,247	0	0	0	0.00%	0.00%	0.00%
2742008	Svorka Energi AS	41,659	41,560	45,858	-13	-13	-13	-0.03%	-0.03%	-0.03%
2752008	Hallingdal Kraftnett AS	102,423	102,187	112,544	-10	-12	-10	-0.01%	-0.01%	-0.01%
2822008	Åbjørakraft Kolsvik Kraftverk	830	825	1,039	0	0	0	0.00%	0.00%	0.00%
2872008	Ustekveikja Kraftverk DA	518	515	618	0	0	0	0.00%	0.00%	0.00%
2882008	Kraftverkene i Orkla	15,961	15,918	17,804	0	0	0	0.00%	0.00%	0.00%
2952008	Gudbrandsdal Energi AS	74,545	74,364	82,238	4	3	4	0.01%	0.00%	0.01%
3062008	Valdres Energiverk AS	59,766	59,555	68,783	17	15	17	0.03%	0.03%	0.02%
3072008	Vinstra Kraftselskap DA	441	441	462	0	0	0	0.00%	0.00%	0.00%
3112008	Nordmøre Energiverk AS	162,378	161,983	179,287	28	26	29	0.02%	0.02%	0.02%
3432008	Hemsedal Energi KF	21,666	21,555	26,414	4	3	4	0.02%	0.01%	0.02%
3492008	Notodden Energi AS	44,719	44,604	49,604	0	-1	0	0.00%	0.00%	0.00%
3542008	Lofotkraft AS	122,993	122,686	136,133	-12	-14	-12	-0.01%	-0.01%	-0.01%
3732008	Nore Energi AS	12,175	12,144	13,496	-14	-14	-14	-0.11%	-0.12%	-0.10%
4182008	Aurland Energiverk AS	14,038	14,001	15,626	-27	-27	-27	-0.19%	-0.20%	-0.17%
4332008	Hålogaland Kraft AS	124,345	123,998	139,169	-6	-8	-5	0.00%	-0.01%	0.00%
4472008	E-CO Vannkraft AS	29,906	29,827	33,249	0	-1	0	0.00%	0.00%	0.00%

ID	Company	Revenue Caps with project			Differences in RCs			%-changes in RCs		
		RC1	RC2	RC3	ΔRC1	ΔRC2	ΔRC3	%Δ RC1	%Δ RC2	%Δ RC3
4532008	Statoil ASA	1,984	1,969	2,633	0	0	0	0.00%	-0.01%	0.00%
4602008	Tussa Nett AS	167,425	166,953	187,596	-184	-187	-183	-0.11%	-0.11%	-0.10%
4642008	Vesterålskraft Nett AS	73,537	73,346	81,682	-13	-14	-13	-0.02%	-0.02%	-0.02%
4842008	TrønderEnegi Kraft	8,298	8,277	9,185	0	0	0	0.00%	0.00%	0.00%
4912008	Elkem Energi Bremanger AS	3,549	3,542	3,849	-4	-4	-4	-0.12%	-0.12%	-0.11%
4952008	Elverum Energiverk Nett AS	49,698	49,533	56,735	6	5	6	0.01%	0.01%	0.01%
5032008	Haugaland Kraft AS	279,440	278,835	305,287	44	40	46	0.02%	0.01%	0.01%
5112008	Lyse Nett AS	642,550	640,855	714,975	23	12	26	0.00%	0.00%	0.00%
5122008	Lyse Produksjon	5,069	5,050	5,866	0	0	0	0.00%	0.00%	0.00%
5242008	Otra Kraft DA	56,923	56,881	58,693	0	0	0	0.00%	0.00%	0.00%
5362008	Trondheim Energiverk Nett AS	343,602	342,807	377,588	58	52	59	0.02%	0.02%	0.02%
5422008	Vokks Nett AS	60,182	60,026	66,824	11	10	11	0.02%	0.02%	0.02%
5492008	Fortum Distribution AS	347,930	347,068	384,724	84	78	85	0.02%	0.02%	0.02%
5662008	BKK Nett AS	988,075	985,357	1,104,219	0	-18	5	0.00%	0.00%	0.00%
5742008	Eidsiva Energi Nett AS	849,646	847,391	945,995	69	54	73	0.01%	0.01%	0.01%
5782008	Flesberg Elektrisitetsverk AS	15,573	15,533	17,258	1	1	1	0.01%	0.00%	0.01%
5912008	Midt Nett Buskerud AS	62,807	62,615	71,009	-8	-10	-8	-0.01%	-0.02%	-0.01%
5932008	Nesset Kraft AS	16,109	16,085	17,118	-15	-15	-15	-0.09%	-0.09%	-0.09%
5992008	Sunndal Energi KF	27,348	27,282	30,151	-50	-50	-50	-0.18%	-0.18%	-0.17%
6112008	Skagerak Nett AS	991,654	989,041	1,103,278	133	116	138	0.01%	0.01%	0.01%
6132008	Nordvest Nett AS	42,727	42,622	47,229	9	9	9	0.02%	0.02%	0.02%
6142008	Energi 1 Follo-Røyken as	107,570	107,307	118,809	35	34	36	0.03%	0.03%	0.03%
6152008	EB Nett AS	317,093	316,186	355,849	54	48	55	0.02%	0.02%	0.02%
6242008	Agder Energi Nett AS	878,811	876,283	986,793	-43	-59	-38	0.00%	-0.01%	0.00%
6252008	Voss Energi AS	52,924	52,758	60,012	3	2	4	0.01%	0.00%	0.01%
6372008	Narvik Energinett AS	69,138	68,952	77,115	13	12	13	0.02%	0.02%	0.02%
6522008	Svorka Produksjon AS	685	682	785	0	0	0	0.00%	0.00%	0.00%
6592008	Midt-Telemark Energi AS	47,748	47,599	54,095	-15	-16	-14	-0.03%	-0.03%	-0.03%
6692008	Stange Energi Nett AS	50,687	50,544	56,822	22	21	22	0.04%	0.04%	0.04%
6752008	Hafslund Nett AS	2,389,155	2,383,508	2,630,401	475	438	485	0.02%	0.02%	0.02%
6842008	Ringeriks-Kraft Produksjon AS	1,030	1,025	1,207	0	0	0	0.00%	0.00%	0.00%
6852008	Statkraft Energi AS	469	464	690	0	0	0	0.00%	-0.01%	0.00%
6862008	Yara Norge AS	17,119	17,105	17,731	7	7	7	0.04%	0.04%	0.04%
6932008	Ringeriks-Kraft Nett AS	84,973	84,731	95,290	11	9	11	0.01%	0.01%	0.01%
6992008	Nord-Trøndelag Elektrisitetsv	489,306	488,167	537,976	43	36	45	0.01%	0.01%	0.01%
7262008	BE Nett AS	120,990	120,688	133,885	720	714	882	0.60%	0.60%	0.66%
7432008	Mo Industripark	23,170	23,100	26,130	0	0	0	0.00%	0.00%	0.00%
7532008	Aktieselskapet Saudefaldene	16,333	16,282	18,487	0	0	0	0.00%	0.00%	0.00%
Sum		15,085,559	15,047,119	16,727,695	644	389	876	0.00%	0.00%	0.01%

22 Industry changes with project added to Lyse Nett AS

ID	Company	Revenue Caps with project RC1	RC2	RC3	Differences in RCs ΔRC1	ΔRC2	ΔRC3	%-changes in RCs %Δ RC1	%Δ RC2	%Δ RC3
72008	Alta Kraftlag AL	75528	75350	83131	-5	-6	-5	-0.01%	-0.01%	-0.01%
92008	Andøy Energi AS	27585	27519	30387	0	0	0	0.00%	0.00%	0.00%
102008	Arendals Fossekompani ASA	4271	4260	4734	0	0	0	0.00%	0.00%	0.00%
142008	Askøy Energi AS	40053	39926	45472	4	3	5	0.01%	0.01%	0.01%
162008	Austevoll Kraftlag BA	21928	21873	24252	1	1	1	0.01%	0.00%	0.01%
182008	Ballangen Energi AS	19669	19619	21808	-2	-3	-2	-0.01%	-0.01%	-0.01%
222008	Bindal Kraftlag AL	9884	9867	10625	1	1	1	0.01%	0.01%	0.01%
232008	Elkem Bjølvefossen AS	2012	2012	2033	0	0	0	0.01%	0.01%	0.01%
322008	Fredrikstad Energi Nett AS	119387	119047	133904	6	4	7	0.01%	0.00%	0.01%
342008	Dragefossen Kraftanlegg AS	17619	17578	19360	0	0	0	0.00%	0.00%	0.00%
352008	Drangedal Everk KF	19295	19246	21362	-1	-2	-1	-0.01%	-0.01%	-0.01%
372008	Eidefoss AS	75329	75160	82513	-3	-5	-3	0.00%	-0.01%	0.00%
412008	Etne Elektrisitetslag	10169	10151	10944	1	1	1	0.01%	0.01%	0.01%
422008	Fauske Lysverk AS	28376	28291	32006	2	1	2	0.01%	0.00%	0.01%
432008	Finnås Kraftlag	34045	33952	38042	2	1	2	0.01%	0.00%	0.01%
452008	Fitjar Kraftlag BA	16391	16362	17596	-1	-1	-1	-0.01%	-0.01%	-0.01%
462008	Fjelberg Kraftlag	9908	9882	11050	1	0	1	0.01%	0.00%	0.01%
522008	Forsand Elverk KF	7323	7302	8193	-1	-1	-1	-0.01%	-0.02%	-0.01%
532008	Fosenkraft AS	35678	35546	41316	2	1	2	0.01%	0.00%	0.01%
552008	Fusa Kraftlag	20768	20707	23353	1	1	1	0.01%	0.00%	0.01%
562008	Sunnfjord Energi AS	120268	119907	135674	-35	-37	-34	-0.03%	-0.03%	-0.03%
622008	Hadeland Energinett AS	81918	81710	90803	0	-2	0	0.00%	0.00%	0.00%
632008	Trollfjord Kraft AS	39348	39270	42658	2	1	2	0.01%	0.00%	0.00%
652008	Hammerfest Energi Nett AS	60943	60810	66596	0	-1	0	0.00%	0.00%	0.00%
712008	HelgelandsKraft AS	342052	341209	378031	0	-6	1	0.00%	0.00%	0.00%
722008	Hemne kraftlag BA	25557	25496	28139	-3	-4	-3	-0.01%	-0.01%	-0.01%
822008	Hurum Energiverk AS	27741	27672	30660	2	1	2	0.01%	0.00%	0.01%
842008	Høland og Setskog Elverk	26546	26466	29969	2	1	2	0.01%	0.00%	0.01%
862008	Istad Nett AS	126884	126529	142014	0	-3	0	0.00%	0.00%	0.00%
872008	Jondal Energi KF	6322	6307	6943	-1	-1	-1	-0.01%	-0.01%	-0.01%
882008	Jæren Everk Komm. f. i Hå	35386	35264	40592	4	3	4	0.01%	0.01%	0.01%
912008	Klepp Energi AS	30168	30073	34238	3	2	3	0.01%	0.01%	0.01%
932008	Kragerø Energi AS	39842	39745	43982	-5	-6	-5	-0.01%	-0.01%	-0.01%
952008	Krødsherad Everk KF	8963	8943	9817	0	0	0	0.01%	0.00%	0.00%
962008	Kvam Kraftverk AS	25684	25596	29473	-8	-8	-8	-0.03%	-0.03%	-0.03%
972008	Kvinnherad Energi AS	35690	35595	39756	-18	-19	-18	-0.05%	-0.05%	-0.04%
982008	Kvænangen Kraftverk AS	2041	2019	2956	0	0	0	0.00%	-0.01%	0.00%
1022008	Lier Everk AS	52492	52383	57120	3	2	3	0.01%	0.00%	0.01%
1032008	Luostejok Kraftlag AL	38342	38252	42175	5	4	5	0.01%	0.01%	0.01%
1042008	Luster Energiverk AS	20747	20710	22331	-7	-7	-7	-0.03%	-0.03%	-0.03%
1062008	Lærdal Energi	13756	13733	14731	-1	-1	-1	-0.01%	-0.01%	-0.01%
1082008	Løvenskiold Fossum Kraft	2415	2405	2867	0	0	0	0.01%	0.01%	0.01%
1112008	Malvik Everk AS	22491	22433	24967	2	1	2	0.01%	0.01%	0.01%
1162008	Meløy Energi AS	30711	30640	33733	-2	-2	-2	-0.01%	-0.01%	0.00%
1192008	Gauldal Energi AS	28313	28257	30720	0	0	0	0.00%	0.00%	0.00%
1212008	Modalen Kraftlag BA	3051	3041	3488	-1	-2	-1	-0.05%	-0.05%	-0.04%
1322008	Nord-Salten Kraftlag AL	62557	62439	67582	0	-1	0	0.00%	0.00%	0.00%
1332008	Nord Troms Kraftlag AS	79023	78856	86151	-3	-5	-3	0.00%	-0.01%	0.00%
1352008	Nord-Østerdal Kraftlag AL	59557	59431	64920	0	-1	0	0.00%	0.00%	0.00%
1362008	Norddal Elverk AS	11045	11021	12084	-7	-7	-7	-0.06%	-0.06%	-0.05%
1382008	Nordkyn Kraftlag AL	27163	27112	29352	-3	-3	-3	-0.01%	-0.01%	-0.01%
1462008	Odda Energi AS	27044	26966	30347	-11	-11	-11	-0.04%	-0.04%	-0.04%
1472008	Evenes Kraftforsyning AS	9929	9912	10674	1	1	1	0.01%	0.01%	0.01%
1492008	Oppdal Everk AS	25571	25499	28630	0	-1	0	0.00%	0.00%	0.00%
1522008	Opplandskraft DA	9844	9826	10613	0	0	0	0.00%	0.00%	0.00%
1532008	Orkdal Energi AS	26746	26654	30684	-3	-4	-3	-0.01%	-0.01%	-0.01%
1562008	Porsa Kraftlag	649	646	778	0	0	0	0.00%	0.00%	0.00%
1572008	Rakkestad Energiverk AS	24310	24252	26756	-1	-2	-1	-0.01%	-0.01%	-0.01%
1612008	Rauland Kraftforsyningslag	23626	23599	24794	1	1	1	0.01%	0.00%	0.01%
1622008	Rauma Energi AS	34027	33959	36942	-4	-4	-4	-0.01%	-0.01%	-0.01%

ID	Company	Revenue Caps with project			Differences in RCs			%-changes in RCs		
		RC1	RC2	RC3	ΔRC1	ΔRC2	ΔRC3	%Δ RC1	%Δ RC2	%Δ RC3
1632008	Kvikne-Rennebu Kraftlag AL	20022	19971	22208	0	0	0	0.00%	0.00%	0.00%
1642008	Repvåg Kraftlag AL	50861	50743	55866	0	-1	0	0.00%	0.00%	0.00%
1662008	Rissa Kraftlag BA	17875	17833	19668	0	0	0	0.00%	0.00%	0.00%
1672008	Norsk Hydro Produksjon AS	7406	7401	7607	0	0	0	0.00%	0.00%	0.00%
1682008	Rollag Elektrisitetsverk LL	8186	8168	8942	-1	-1	-1	-0.01%	-0.02%	-0.01%
1712008	Rødøy-Lurøy Kraftverk AS	41306	41231	44531	0	-1	0	0.00%	0.00%	0.00%
1732008	Røros Elektrisitetsverk AS	26568	26514	28831	-2	-2	-1	-0.01%	-0.01%	-0.01%
1762008	SKS Nett AS	74059	73943	79049	0	-1	0	0.00%	0.00%	0.00%
1812008	Sandøy Energi AS	6472	6458	7100	0	0	0	0.00%	0.00%	0.00%
1832008	Hjartdal Elverk AS	10995	10972	12004	-5	-5	-5	-0.05%	-0.05%	-0.04%
1842008	Selbu Energiverk AS	17751	17703	19800	-3	-4	-3	-0.02%	-0.02%	-0.02%
1872008	Sira-Kvina kraftselskap	7410	7395	8047	0	0	0	0.00%	0.00%	0.00%
1942008	Skjåk Energi	16715	16676	18377	1	1	1	0.01%	0.01%	0.01%
1962008	Skånevik Ølen Kraftlag	18788	18731	21209	-1	-2	-1	-0.01%	-0.01%	-0.01%
1972008	Sognekraft AS	70603	70451	77084	-8	-9	-8	-0.01%	-0.01%	-0.01%
2042008	Stranda Energiverk AS	25196	25163	26605	-18	-18	-18	-0.07%	-0.07%	-0.07%
2052008	Stryn Energi AS	26872	26812	29424	-5	-5	-5	-0.02%	-0.02%	-0.02%
2062008	Suldal Elverk	28844	28765	32238	-10	-11	-10	-0.04%	-0.04%	-0.03%
2102008	Sunnhordland Kraftlag AS	146326	145929	163261	6	3	6	0.00%	0.00%	0.00%
2132008	Sykkylven Energi AS	21049	20987	23721	-5	-6	-5	-0.03%	-0.03%	-0.02%
2142008	Sør-Aurdal Energi BA	17555	17497	20026	-6	-6	-6	-0.03%	-0.03%	-0.03%
2152008	TrønderEnergi Nett AS	226225	225627	251725	0	-4	1	0.00%	0.00%	0.00%
2182008	Sørfold Kraftlag AL	10848	10834	11455	-2	-2	-2	-0.02%	-0.02%	-0.02%
2192008	Tafjord Kraftnett AS	194663	194117	217993	8	4	9	0.00%	0.00%	0.00%
2232008	Tinn Energi AS	40693	40572	45861	0	-1	0	0.00%	0.00%	0.00%
2272008	Troms Kraft Nett AS	446596	445478	494313	0	-8	1	0.00%	0.00%	0.00%
2312008	Trøgstad Elverk AS	16240	16202	17849	1	1	1	0.01%	0.00%	0.01%
2332008	Tydal Kommunale Energiverk KF	8768	8755	9307	-3	-3	-3	-0.03%	-0.03%	-0.03%
2342008	Tysnes Kraftlag PL	21057	21008	23165	0	0	0	0.00%	0.00%	0.00%
2352008	Tyssefaldene Aktieselskabet	20743	20708	22211	0	0	0	0.00%	0.00%	0.00%
2382008	Indre Hardanger Kraftlag AS	36802	36732	39809	-4	-4	-4	-0.01%	-0.01%	-0.01%
2422008	Uvdal Kraftforsyning AL	9325	9302	10314	1	0	1	0.01%	0.00%	0.01%
2482008	Vang Energiverk KF	15168	15129	16846	-2	-2	-2	-0.01%	-0.01%	-0.01%
2492008	Varanger Kraftnett AS	134239	133909	148284	0	-2	0	0.00%	0.00%	0.00%
2512008	Vest-Telemark Kraftlag AS	88314	88116	96736	-8	-10	-8	-0.01%	-0.01%	-0.01%
2572008	Dalane Energi IKS	71502	71273	81291	-9	-11	-9	-0.01%	-0.02%	-0.01%
2622008	Ørskog Energi AS	17885	17841	19762	1	1	1	0.01%	0.00%	0.01%
2642008	Øvre Eiker Nett AS	43212	43097	48096	-8	-9	-8	-0.02%	-0.02%	-0.02%
2672008	Årdal Energi KF	15926	15877	17990	1	1	1	0.01%	0.00%	0.01%
2692008	SFE Nett AS	209216	208675	232319	-51	-55	-50	-0.02%	-0.03%	-0.02%
2712008	Driva Kraftverk	4219	4219	4247	0	0	0	0.00%	0.00%	0.00%
2742008	Svorka Energi AS	41669	41571	45868	-3	-3	-2	-0.01%	-0.01%	-0.01%
2752008	Hallingdal Kraftnett AS	102434	102197	112554	0	-2	0	0.00%	0.00%	0.00%
2822008	Åbjørakraft Kolsvik Kraftverk	830	825	1039	0	0	0	0.00%	0.00%	0.00%
2872008	Ustekveikja Kraftverk DA	518	515	618	0	0	0	0.00%	0.00%	0.00%
2882008	Kraftverkene i Orkla	15961	15918	17804	0	0	0	0.00%	0.00%	0.00%
2952008	Gudbrandsdal Energi AS	74541	74360	82234	0	-1	0	0.00%	0.00%	0.00%
3062008	Valdres Energiverk AS	59750	59539	68766	0	-2	0	0.00%	0.00%	0.00%
3072008	Vinstra Kraftselskap DA	441	441	462	0	0	0	0.00%	0.00%	0.00%
3112008	Nordmøre Energiverk AS	162357	161961	179265	7	4	7	0.00%	0.00%	0.00%
3432008	Hemsedal Energi KF	21664	21552	26412	1	0	1	0.01%	0.00%	0.01%
3492008	Notodden Energi AS	44719	44604	49604	0	-1	0	0.00%	0.00%	0.00%
3542008	Lofotkraft AS	122999	122692	136139	-6	-8	-6	0.00%	-0.01%	0.00%
3732008	Nore Energi AS	12185	12154	13506	-3	-3	-3	-0.03%	-0.03%	-0.02%
4182008	Aurland Energiverk AS	14059	14022	15647	-6	-6	-6	-0.04%	-0.04%	-0.04%
4332008	Hålogaland Kraft AS	124351	124004	139174	0	-3	0	0.00%	0.00%	0.00%
4472008	E-CO Vannkraft AS	29906	29827	33249	0	-1	0	0.00%	0.00%	0.00%

ID	Company	Revenue Caps with project			Differences in RCs			%-changes in RCs		
		RC1	RC2	RC3	ΔRC1	ΔRC2	ΔRC3	%Δ RC1	%Δ RC2	%Δ RC3
4532008	Statoil ASA	1984	1969	2633	0	0	0	0.00%	-0.01%	0.00%
4602008	Tussa Nett AS	167569	167097	187740	-40	-44	-40	-0.02%	-0.03%	-0.02%
4642008	Vesterålskraft Nett AS	73545	73355	81690	-4	-6	-4	-0.01%	-0.01%	-0.01%
4842008	TrønderEnegi Kraft	8298	8277	9185	0	0	0	0.00%	0.00%	0.00%
4912008	Elkem Energi Bremanger AS	3553	3546	3852	-1	-1	-1	-0.02%	-0.02%	-0.02%
4952008	Elverum Energiverk Nett AS	49695	49530	56732	3	2	3	0.01%	0.00%	0.01%
5032008	Haugaland Kraft AS	279396	278790	305242	0	-5	1	0.00%	0.00%	0.00%
5112008	Lyse Nett AS	643328	641627	715913	801	785	964	0.12%	0.12%	0.13%
5122008	Lyse Produksjon	5069	5050	5866	0	0	0	0.00%	0.00%	0.00%
5242008	Otra Kraft DA	56923	56881	58693	0	0	0	0.00%	0.00%	0.00%
5362008	Trondheim Energiverk Nett AS	343559	342763	377544	14	8	15	0.00%	0.00%	0.00%
5422008	Vokks Nett AS	60171	60016	66814	0	-1	0	0.00%	0.00%	0.00%
5492008	Fortum Distribution AS	347867	347005	384660	21	14	22	0.01%	0.00%	0.01%
5662008	BKK Nett AS	988075	985354	1104217	0	-20	2	0.00%	0.00%	0.00%
5742008	Eidsiva Energi Nett AS	849577	847320	945924	0	-17	2	0.00%	0.00%	0.00%
5782008	Flesberg Elektrisitetsverk AS	15572	15532	17257	0	0	0	0.00%	0.00%	0.00%
5912008	Midt Nett Buskerud AS	62816	62624	71017	0	-1	0	0.00%	0.00%	0.00%
5932008	Nesset Kraft AS	16120	16097	17129	-4	-4	-3	-0.02%	-0.02%	-0.02%
5992008	Sunndal Energi KF	27387	27322	30190	-11	-11	-11	-0.04%	-0.04%	-0.04%
6112008	Skagerak Nett AS	991521	988905	1103143	0	-20	2	0.00%	0.00%	0.00%
6132008	Nordvest Nett AS	42721	42615	47222	2	2	2	0.01%	0.00%	0.01%
6142008	Energi 1 Follo-Røyken as	107541	107277	118779	6	4	6	0.01%	0.00%	0.01%
6152008	EB Nett AS	317050	316142	355805	11	4	12	0.00%	0.00%	0.00%
6242008	Agder Energi Nett AS	878854	876324	986833	0	-19	2	0.00%	0.00%	0.00%
6252008	Voss Energi AS	52924	52757	60012	3	2	3	0.01%	0.00%	0.01%
6372008	Narvik Energinett AS	69129	68942	77106	3	2	3	0.00%	0.00%	0.00%
6522008	Svorka Produksjon AS	685	682	785	0	0	0	0.00%	0.00%	0.00%
6592008	Midt-Telemark Energi AS	47759	47610	54107	-3	-4	-3	-0.01%	-0.01%	-0.01%
6692008	Stange Energi Nett AS	50672	50528	56807	6	5	6	0.01%	0.01%	0.01%
6752008	Hafslund Nett AS	2388775	2383123	2630015	95	53	100	0.00%	0.00%	0.00%
6842008	Ringeriks-Kraft Produksjon AS	1030	1025	1207	0	0	0	0.00%	0.00%	0.00%
6852008	Statkraft Energi AS	469	464	690	0	0	0	0.00%	-0.01%	0.00%
6862008	Yara Norge AS	17116	17102	17728	3	3	3	0.02%	0.02%	0.02%
6932008	Ringeriks-Kraft Nett AS	84962	84720	95279	0	-2	0	0.00%	0.00%	0.00%
6992008	Nord-Trøndelag Elektrisitetsverk	489263	488123	537931	0	-9	1	0.00%	0.00%	0.00%
7262008	BE Nett AS	120263	119965	132997	-7	-9	-7	-0.01%	-0.01%	0.00%
7432008	Mo Industripark	23170	23100	26130	0	-1	0	0.00%	0.00%	0.00%
7532008	Aktieselskapet Saudefaldene	16333	16282	18487	0	0	0	0.00%	0.00%	0.00%
Sum		15085596	15047119	16727695	681	389	876	0.00%	0.003%	0.01%

23 Industry changes with project added to Dalane Energi

		Revenue Caps with project			Differences in RCs			%-changes in RCs		
ID	Company	RC1	RC2	RC3	ΔRC1	ΔRC2	ΔRC3	%Δ RC1	%Δ RC2	%Δ RC3
72008	Alta Kraftlag AL	75524	75345	83126	-9	-11	-10	-0.01%	-0.01%	-0.01%
92008	Andøy Energi AS	27587	27521	30389	2	1	2	0.01%	0.00%	0.01%
102008	Arendals Fossekompani ASA	4271	4260	4734	0	0	0	0.00%	0.00%	0.00%
142008	Askøy Energi AS	40055	39928	45474	7	5	6	0.02%	0.01%	0.01%
162008	Austevoll Kraftlag BA	21929	21874	24253	2	2	2	0.01%	0.01%	0.01%
182008	Ballangen Energi AS	19666	19616	21805	-5	-6	-5	-0.03%	-0.03%	-0.02%
222008	Bindal Kraftlag AL	9885	9867	10625	1	1	1	0.01%	0.01%	0.01%
232008	Elkem Bjølvefossen AS	2013	2012	2033	0	0	0	0.02%	0.02%	0.02%
322008	Fredrikstad Energi Nett AS	119400	119059	133917	19	16	19	0.02%	0.01%	0.01%
342008	Dragefossen Kraftanlegg AS	17618	17577	19359	-1	-2	-1	-0.01%	-0.01%	-0.01%
352008	Drangedal Everk KF	19292	19244	21360	-4	-4	-4	-0.02%	-0.02%	-0.02%
372008	Eidefoss AS	75329	75160	82513	-3	-5	-4	0.00%	-0.01%	0.00%
412008	Etne Elektrisitetslag	10170	10152	10945	2	2	2	0.02%	0.02%	0.02%
422008	Fauske Lysverk AS	28380	28294	32010	6	5	6	0.02%	0.02%	0.02%
432008	Finnås Kraftlag	34049	33955	38046	6	5	6	0.02%	0.01%	0.01%
452008	Fitjar Kraftlag BA	16390	16361	17595	-2	-2	-2	-0.01%	-0.01%	-0.01%
462008	Fjelberg Kraftlag	9910	9883	11052	2	2	2	0.02%	0.02%	0.02%
522008	Forsand Elverk KF	7321	7301	8192	-2	-2	-2	-0.03%	-0.03%	-0.03%
532008	Fosenkraft AS	35680	35548	41318	4	3	4	0.01%	0.01%	0.01%
552008	Fusa Kraftlag	20769	20708	23354	3	2	3	0.01%	0.01%	0.01%
562008	Sunnfjord Energi AS	120221	119860	135627	-81	-85	-82	-0.07%	-0.07%	-0.06%
622008	Hadeland Energinett AS	81913	81705	90797	-5	-7	-5	-0.01%	-0.01%	-0.01%
632008	Trollfjord Kraft AS	39346	39268	42656	0	-1	0	0.00%	0.00%	0.00%
652008	Hammerfest Energi Nett AS	60946	60813	66599	3	2	3	0.00%	0.00%	0.00%
712008	HelgelandsKraft AS	342052	341207	378029	0	-8	-1	0.00%	0.00%	0.00%
722008	Hemne kraftlag BA	25555	25494	28138	-5	-5	-5	-0.02%	-0.02%	-0.02%
822008	Hurum Energiverk AS	27744	27675	30663	5	5	5	0.02%	0.02%	0.02%
842008	Høland og Setskog Elverk	26550	26469	29973	5	5	5	0.02%	0.02%	0.02%
862008	Istad Nett AS	126890	126534	142019	6	3	6	0.00%	0.00%	0.00%
872008	Jondal Energi KF	6321	6306	6942	-2	-2	-2	-0.03%	-0.03%	-0.03%
882008	Jæren Everk Komm. f. i Hå	35386	35264	40592	4	3	4	0.01%	0.01%	0.01%
912008	Klepp Energi AS	30170	30074	34239	5	4	5	0.02%	0.01%	0.01%
932008	Kragerø Energi AS	39830	39732	43969	-17	-18	-17	-0.04%	-0.05%	-0.04%
952008	Krødsherad Everk KF	8963	8943	9818	1	1	1	0.02%	0.01%	0.01%
962008	Kvam Kraftverk AS	25675	25586	29464	-17	-18	-17	-0.07%	-0.07%	-0.06%
972008	Kvinnherad Energi AS	35668	35573	39734	-40	-41	-40	-0.11%	-0.11%	-0.10%
982008	Kvænangen Kraftverk AS	2041	2019	2956	0	0	0	0.00%	-0.01%	0.00%
1022008	Lier Everk AS	52498	52389	57125	9	8	9	0.02%	0.02%	0.02%
1032008	Luostejok Kraftlag AL	38342	38252	42175	5	4	5	0.01%	0.01%	0.01%
1042008	Luster Energiverk AS	20739	20702	22323	-15	-15	-15	-0.07%	-0.07%	-0.07%
1062008	Lærdal Energi	13751	13728	14726	-6	-6	-6	-0.04%	-0.04%	-0.04%
1082008	Løvenskiold Fossum Kraft	2416	2405	2867	1	0	1	0.02%	0.02%	0.02%
1112008	Malvik Everk AS	22494	22436	24970	5	4	5	0.02%	0.02%	0.02%
1162008	Meløy Energi AS	30711	30640	33733	-2	-2	-2	-0.01%	-0.01%	-0.01%
1192008	Gauldal Energi AS	28315	28258	30722	2	1	2	0.01%	0.00%	0.01%
1212008	Modalen Kraftlag BA	3049	3039	3486	-3	-4	-3	-0.11%	-0.12%	-0.10%
1322008	Nord-Salten Kraftlag AL	62559	62441	67584	2	1	2	0.00%	0.00%	0.00%
1332008	Nord Troms Kraftlag AS	79023	78856	86151	-3	-5	-4	0.00%	-0.01%	0.00%
1352008	Nord-Østerdal Kraftlag AL	59557	59431	64920	0	-1	0	0.00%	0.00%	0.00%
1362008	Norddal Elverk AS	11037	11013	12076	-15	-15	-15	-0.13%	-0.13%	-0.12%
1382008	Nordkyn Kraftlag AL	27160	27109	29350	-5	-6	-5	-0.02%	-0.02%	-0.02%
1462008	Odda Energi AS	27031	26954	30335	-23	-24	-23	-0.09%	-0.09%	-0.08%
1472008	Evenes Kraftforsyning AS	9931	9913	10676	2	2	2	0.02%	0.02%	0.02%
1492008	Oppdal Everk AS	25573	25501	28632	2	1	1	0.01%	0.00%	0.00%
1522008	Opplandskraft DA	9844	9826	10613	0	0	0	0.00%	0.00%	0.00%
1532008	Orkdal Energi AS	26745	26652	30682	-5	-6	-5	-0.02%	-0.02%	-0.02%
1562008	Porsa Kraftlag	649	646	778	0	0	0	0.00%	0.00%	0.00%
1572008	Rakkestad Energiverk AS	24308	24251	26755	-3	-4	-3	-0.01%	-0.01%	-0.01%
1612008	Rauland Kraftforsyningslag	23629	23601	24796	4	4	4	0.02%	0.02%	0.02%
1622008	Rauma Energi AS	34022	33953	36936	-10	-10	-10	-0.03%	-0.03%	-0.03%

ID	Company	Revenue Caps with project			Differences in RCs			%-changes in RCs		
		RC1	RC2	RC3	ΔRC1	ΔRC2	ΔRC3	%Δ RC1	%Δ RC2	%Δ RC3
1632008	Kvikne-Rennebu Kraftlag AL	20022	19971	22208	0	-1	0	0.00%	0.00%	0.00%
1642008	Repvåg Kraftlag AL	50863	50746	55869	2	1	2	0.00%	0.00%	0.00%
1662008	Rissa Kraftlag BA	17876	17834	19669	1	1	1	0.01%	0.00%	0.01%
1672008	Norsk Hydro Produksjon AS	7406	7401	7607	0	0	0	0.00%	0.00%	0.00%
1682008	Rollag Elektrisitetsverk LL	8185	8167	8941	-2	-2	-2	-0.02%	-0.02%	-0.02%
1712008	Rødøy-Lurøy Kraftverk AS	41309	41233	44533	2	1	2	0.01%	0.00%	0.00%
1732008	Røros Elektrisitetsverk AS	26568	26514	28831	-2	-2	-2	-0.01%	-0.01%	-0.01%
1762008	SKS Nett AS	74059	73942	79049	0	-1	0	0.00%	0.00%	0.00%
1812008	Sandøy Energi AS	6473	6458	7100	0	0	0	0.01%	0.00%	0.01%
1832008	Hjartdal Elverk AS	10989	10965	11997	-11	-12	-11	-0.10%	-0.11%	-0.09%
1842008	Selbu Energiverk AS	17747	17699	19795	-8	-8	-8	-0.04%	-0.05%	-0.04%
1872008	Sira-Kvina kraftselskap	7410	7395	8047	0	0	0	0.00%	0.00%	0.00%
1942008	Skjåk Energi	16717	16678	18380	3	3	3	0.02%	0.02%	0.02%
1962008	Skånevik Ølen Kraftlag	18788	18731	21209	-1	-2	-1	-0.01%	-0.01%	-0.01%
1972008	Sognekraft AS	70599	70446	77080	-12	-14	-13	-0.02%	-0.02%	-0.02%
2042008	Stranda Energiverk AS	25174	25141	26583	-39	-40	-40	-0.16%	-0.16%	-0.15%
2052008	Stryn Energi AS	26867	26807	29420	-9	-10	-9	-0.03%	-0.04%	-0.03%
2062008	Suldal Elverk	28829	28749	32223	-25	-26	-25	-0.09%	-0.09%	-0.08%
2102008	Sunnhordland Kraftlag AS	146328	145931	163263	8	4	8	0.01%	0.00%	0.00%
2132008	Sykkylven Energi AS	21044	20981	23715	-11	-11	-11	-0.05%	-0.05%	-0.05%
2142008	Sør-Aurdal Energi BA	17547	17489	20018	-14	-14	-14	-0.08%	-0.08%	-0.07%
2152008	TrønderEnergi Nett AS	226233	225634	251732	9	3	8	0.00%	0.00%	0.00%
2182008	Sørfold Kraftlag AL	10846	10832	11453	-4	-4	-4	-0.04%	-0.04%	-0.03%
2192008	Tafjord Kraftnett AS	194680	194132	218009	25	19	24	0.01%	0.01%	0.01%
2232008	Tinn Energi AS	40693	40572	45861	0	-1	0	0.00%	0.00%	0.00%
2272008	Troms Kraft Nett AS	446615	445494	494329	19	8	17	0.00%	0.00%	0.00%
2312008	Trøgstad Elverk AS	16242	16204	17850	3	2	3	0.02%	0.01%	0.01%
2332008	Tydal Kommunale Energiverk KF	8764	8751	9303	-6	-7	-7	-0.07%	-0.08%	-0.07%
2342008	Tysnes Kraftlag PL	21059	21010	23167	2	2	2	0.01%	0.01%	0.01%
2352008	Tyssefaldene Aktieselskabet	20743	20708	22211	0	0	0	0.00%	0.00%	0.00%
2382008	Indre Hardanger Kraftlag AS	36794	36724	39801	-12	-12	-12	-0.03%	-0.03%	-0.03%
2422008	Uvdal Kraftforsyning AL	9326	9303	10315	2	2	2	0.02%	0.02%	0.02%
2482008	Vang Energiverk KF	15166	15127	16844	-4	-4	-4	-0.03%	-0.03%	-0.02%
2492008	Varanger Kraftnett AS	134244	133914	148289	6	3	5	0.00%	0.00%	0.00%
2512008	Vest-Telemark Kraftlag AS	88305	88107	96727	-17	-19	-17	-0.02%	-0.02%	-0.02%
2572008	Dalane Energi IKS	72398	72164	82348	887	881	1048	1.24%	1.24%	1.29%
2622008	Ørskog Energi AS	17887	17843	19764	3	3	3	0.02%	0.01%	0.01%
2642008	Øvre Eiker Nett AS	43206	43091	48090	-14	-15	-14	-0.03%	-0.03%	-0.03%
2672008	Årdal Energi KF	15928	15879	17992	3	3	3	0.02%	0.02%	0.02%
2692008	SFE Nett AS	209166	208623	232267	-102	-107	-102	-0.05%	-0.05%	-0.04%
2712008	Driva Kraftverk	4219	4219	4247	0	0	0	0.00%	0.00%	0.00%
2742008	Svorka Energi AS	41666	41568	45865	-5	-6	-5	-0.01%	-0.01%	-0.01%
2752008	Hallingdal Kraftnett AS	102429	102191	112549	-5	-8	-6	-0.01%	-0.01%	0.00%
2822008	Åbjørakraft Kolsvik Kraftverk	830	825	1039	0	0	0	0.00%	-0.01%	0.00%
2872008	Ustekveikja Kraftverk DA	518	515	618	0	0	0	0.00%	0.00%	0.00%
2882008	Kraftverkene i Orkla	15961	15918	17804	0	0	0	0.00%	0.00%	0.00%
2952008	Gudbrandsdal Energi AS	74545	74364	82237	4	2	4	0.01%	0.00%	0.00%
3062008	Valdres Energiverk AS	59758	59546	68774	8	6	8	0.01%	0.01%	0.01%
3072008	Vinstra Kraftselskap DA	441	441	462	0	0	0	0.00%	0.00%	0.00%
3112008	Nordmøre Energiverk AS	162364	161967	179272	14	10	14	0.01%	0.01%	0.01%
3432008	Hemsedal Energi KF	21664	21552	26411	1	0	1	0.01%	0.00%	0.00%
3492008	Notodden Energi AS	44719	44604	49603	0	-1	0	0.00%	0.00%	0.00%
3542008	Lofotkraft AS	122999	122691	136138	-6	-9	-7	0.00%	-0.01%	0.00%
3732008	Nore Energi AS	12182	12151	13503	-7	-7	-7	-0.05%	-0.06%	-0.05%
4182008	Aurland Energiverk AS	14051	14014	15639	-14	-14	-14	-0.10%	-0.10%	-0.09%
4332008	Hålogaland Kraft AS	124351	124003	139174	0	-3	0	0.00%	0.00%	0.00%
4472008	E-CO Vannkraft AS	29906	29827	33248	0	-1	0	0.00%	0.00%	0.00%

ID	Company	Revenue Caps with project RC1	RC2	RC3	Differences in RCs ΔRC1	ΔRC2	ΔRC3	%-changes in RCs %Δ RC1	%Δ RC2	%Δ RC3
4532008	Statoil ASA	1984	1969	2633	0	0	0	0.00%	-0.01%	0.00%
4602008	Tussa Nett AS	167521	167048	187691	-88	-93	-89	-0.05%	-0.06%	-0.05%
4642008	Vesterålskraft Nett AS	73545	73354	81689	-4	-6	-5	-0.01%	-0.01%	-0.01%
4842008	TrønderEnegi Kraft	8298	8277	9185	0	0	0	0.00%	0.00%	0.00%
4912008	Elkem Energi Bremanger AS	3551	3544	3851	-2	-2	-2	-0.06%	-0.07%	-0.06%
4952008	Elverum Energiverk Nett AS	49695	49530	56732	3	1	3	0.01%	0.00%	0.00%
5032008	Haugaland Kraft AS	279411	278804	305255	15	9	14	0.01%	0.00%	0.00%
5112008	Lyse Nett AS	642527	640826	714947	0	-17	-2	0.00%	0.00%	0.00%
5122008	Lyse Produksjon	5069	5050	5866	0	0	0	0.00%	0.00%	0.00%
5242008	Otra Kraft DA	56923	56881	58693	0	0	0	0.00%	0.00%	0.00%
5362008	Trondheim Energiverk Nett AS	343574	342775	377557	29	21	28	0.01%	0.01%	0.01%
5422008	Vokks Nett AS	60175	60019	66817	4	2	3	0.01%	0.00%	0.01%
5492008	Fortum Distribution AS	347888	347024	384679	42	33	41	0.01%	0.01%	0.01%
5662008	BKK Nett AS	988075	985348	1104210	0	-27	-4	0.00%	0.00%	0.00%
5742008	Eidsiva Energi Nett AS	849612	847349	945953	35	12	31	0.00%	0.00%	0.00%
5782008	Flesberg Elektrisitetsverk AS	15573	15533	17258	1	1	1	0.01%	0.00%	0.01%
5912008	Midt Nett Buskerud AS	62812	62619	71013	-4	-6	-4	-0.01%	-0.01%	-0.01%
5932008	Nesset Kraft AS	16117	16093	17126	-7	-7	-7	-0.04%	-0.05%	-0.04%
5992008	Sunndal Energi KF	27373	27307	30176	-25	-26	-25	-0.09%	-0.09%	-0.08%
6112008	Skagerak Nett AS	991565	988944	1103181	44	19	41	0.00%	0.00%	0.00%
6132008	Nordvest Nett AS	42723	42617	47224	5	4	4	0.01%	0.01%	0.01%
6142008	Energi 1 Follo-Røyken as	107553	107289	118790	18	15	17	0.02%	0.01%	0.01%
6152008	EB Nett AS	317061	316151	355814	22	13	20	0.01%	0.00%	0.01%
6242008	Agder Energi Nett AS	878811	876275	986785	-43	-68	-46	0.00%	-0.01%	0.00%
6252008	Voss Energi AS	52920	52754	60009	0	-2	0	0.00%	0.00%	0.00%
6372008	Narvik Energinett AS	69132	68945	77108	6	5	6	0.01%	0.01%	0.01%
6522008	Svorka Produksjon AS	685	682	785	0	0	0	0.00%	0.00%	0.00%
6592008	Midt-Telemark Energi AS	47753	47604	54101	-9	-10	-9	-0.02%	-0.02%	-0.02%
6692008	Stange Energi Nett AS	50675	50531	56810	9	8	9	0.02%	0.02%	0.02%
6752008	Hafslund Nett AS	2388870	2383205	2630097	190	135	182	0.01%	0.01%	0.01%
6842008	Ringeriks-Kraft Produksjon AS	1030	1025	1207	0	0	0	0.00%	0.00%	0.00%
6852008	Statkraft Energi AS	469	464	690	0	0	0	0.00%	-0.01%	0.00%
6862008	Yara Norge AS	17115	17101	17727	3	2	3	0.01%	0.01%	0.01%
6932008	Ringeriks-Kraft Nett AS	84967	84725	95283	5	3	5	0.01%	0.00%	0.01%
6992008	Nord-Trøndelag Elektrisitetsverk	489285	488142	537950	22	10	20	0.00%	0.00%	0.00%
7262008	BE Nett AS	120263	119964	132996	-7	-10	-7	-0.01%	-0.01%	-0.01%
7432008	Mo Industripark	23170	23100	26130	0	-1	0	0.00%	0.00%	0.00%
7532008	Aktieselskapet Saudefaldene	16333	16282	18487	0	0	0	0.00%	0.00%	0.00%
Sum		15085684	15047119	16727695	769	389	876	0.01%	0.003%	0.01%

24 Industry changes with project added to BE Nett, Lyse Nett and Dalane Energi

ID	Company	Revenue Caps with project RC1	RC2	RC3	Differences in RCs ΔRC1	ΔRC2	ΔRC3	%-changes in RCs %Δ RC1	%Δ RC2	%Δ RC3
72008	Alta Kraftlag AL	75509	75331	83115	-24	-25	-21	-0.03%	-0.03%	-0.02%
92008	Andøy Energi AS	27590	27524	30393	5	4	6	0.02%	0.02%	0.02%
102008	Arendals Fossekompani ASA	4271	4260	4734	0	0	0	0.00%	0.00%	0.00%
142008	Askøy Energi AS	40071	39944	45492	22	21	24	0.06%	0.05%	0.05%
162008	Austevoll Kraftlag BA	21933	21879	24259	7	7	8	0.03%	0.03%	0.03%
182008	Ballangen Energi AS	19651	19601	21791	-20	-21	-19	-0.10%	-0.11%	-0.09%
222008	Bindal Kraftlag AL	9888	9871	10629	5	5	5	0.05%	0.05%	0.05%
232008	Elkem Bjølvefossen AS	2013	2013	2034	1	1	1	0.06%	0.06%	0.06%
322008	Fredrikstad Energi Nett AS	119439	119099	133961	58	55	64	0.05%	0.05%	0.05%
342008	Dragefossen Kraftanlegg AS	17614	17573	19356	-5	-5	-4	-0.03%	-0.03%	-0.02%
352008	Drangedal Everk KF	19280	19232	21349	-15	-16	-15	-0.08%	-0.08%	-0.07%
372008	Eidefoss AS	75315	75146	82502	-17	-18	-14	-0.02%	-0.02%	-0.02%
412008	Etne Elektrisitetslag	10175	10156	10950	7	6	7	0.07%	0.06%	0.06%
422008	Fauske Lysverk AS	28392	28306	32024	18	17	19	0.06%	0.06%	0.06%
432008	Finnås Kraftlag	34059	33965	38057	16	15	17	0.05%	0.04%	0.05%
452008	Fitjar Kraftlag BA	16382	16354	17587	-10	-10	-9	-0.06%	-0.06%	-0.05%
462008	Fjelberg Kraftlag	9914	9887	11056	6	6	6	0.06%	0.06%	0.06%
522008	Forsand Elverk KF	7316	7296	8187	-7	-7	-7	-0.10%	-0.10%	-0.08%
532008	Fosenkraft AS	35684	35552	41325	8	7	11	0.02%	0.02%	0.03%
552008	Fusa Kraftlag	20774	20714	23360	8	7	9	0.04%	0.04%	0.04%
562008	Sunnfjord Energi AS	120018	119657	135430	-284	-287	-278	-0.24%	-0.24%	-0.20%
622008	Hadeland Energinett AS	81899	81690	90786	-20	-21	-16	-0.02%	-0.03%	-0.02%
632008	Trollfjord Kraft AS	39346	39268	42657	0	-1	1	0.00%	0.00%	0.00%
652008	Hammerfest Energi Nett AS	60946	60813	66601	3	2	5	0.00%	0.00%	0.01%
712008	HelgelandsKraft AS	342020	341176	378013	-32	-39	-18	-0.01%	-0.01%	0.00%
722008	Hemne kraftlag BA	25542	25482	28126	-18	-18	-17	-0.07%	-0.07%	-0.06%
822008	Hurum Energiverk AS	27754	27686	30675	16	15	17	0.06%	0.05%	0.05%
842008	Høland og Setskog Elverk	26557	26476	29981	12	12	14	0.05%	0.04%	0.05%
862008	Istad Nett AS	126908	126553	142043	24	21	30	0.02%	0.02%	0.02%
872008	Jondal Energi KF	6316	6301	6937	-7	-7	-7	-0.11%	-0.11%	-0.10%
882008	Jæren Everk Komm. f. i Hå	35398	35276	40606	16	15	18	0.05%	0.04%	0.05%
912008	Klepp Energi AS	30183	30087	34254	18	17	19	0.06%	0.06%	0.06%
932008	Kragerø Energi AS	39791	39694	43932	-56	-57	-54	-0.14%	-0.14%	-0.12%
952008	Krødsherad Everk KF	8966	8946	9821	4	4	4	0.05%	0.04%	0.05%
962008	Kvam Kraftverk AS	25636	25547	29426	-56	-57	-55	-0.22%	-0.22%	-0.19%
972008	Kvinnherad Energi AS	35569	35474	39636	-139	-139	-137	-0.39%	-0.39%	-0.34%
982008	Kvænangen Kraftverk AS	2041	2019	2956	0	0	0	0.00%	-0.01%	0.01%
1022008	Lier Everk AS	52516	52407	57146	27	26	29	0.05%	0.05%	0.05%
1032008	Luostejok Kraftlag AL	38359	38269	42193	21	21	23	0.06%	0.05%	0.05%
1042008	Luster Energiverk AS	20703	20666	22288	-50	-51	-50	-0.24%	-0.24%	-0.22%
1062008	Lærdal Energi	13738	13715	14713	-19	-19	-18	-0.14%	-0.14%	-0.13%
1082008	Løvenskiold Fossum Kraft	2417	2406	2868	2	2	2	0.07%	0.07%	0.07%
1112008	Malvik Everk AS	22504	22446	24981	14	14	15	0.06%	0.06%	0.06%
1162008	Meløy Energi AS	30702	30632	33726	-10	-11	-9	-0.03%	-0.04%	-0.03%
1192008	Gauldal Energi AS	28315	28258	30723	2	1	3	0.01%	0.00%	0.01%
1212008	Modalen Kraftlag BA	3041	3030	3477	-12	-12	-12	-0.39%	-0.40%	-0.34%
1322008	Nord-Salten Kraftlag AL	62564	62446	67591	7	6	9	0.01%	0.01%	0.01%
1332008	Nord Troms Kraftlag AS	79016	78849	86147	-10	-11	-7	-0.01%	-0.01%	-0.01%
1352008	Nord-Østerdal Kraftlag AL	59557	59431	64922	0	-1	2	0.00%	0.00%	0.00%
1362008	Norddal Elverk AS	11003	10978	12042	-49	-49	-49	-0.44%	-0.45%	-0.40%
1382008	Nordkyn Kraftlag AL	27148	27096	29338	-18	-18	-17	-0.07%	-0.07%	-0.06%
1462008	Odda Energi AS	26972	26895	30277	-83	-83	-81	-0.31%	-0.31%	-0.27%
1472008	Evenes Kraftforsyning AS	9936	9918	10681	7	7	7	0.07%	0.07%	0.07%
1492008	Oppdal Everk AS	25574	25502	28634	3	2	4	0.01%	0.01%	0.01%
1522008	Opplandskraft DA	9844	9826	10613	0	0	0	0.00%	0.00%	0.00%
1532008	Orkdal Energi AS	26734	26642	30673	-16	-17	-14	-0.06%	-0.06%	-0.05%
1562008	Porsa Kraftlag	649	646	778	0	0	0	0.00%	0.00%	0.01%
1572008	Rakkestad Energiverk AS	24304	24246	26751	-7	-8	-6	-0.03%	-0.03%	-0.02%
1612008	Rauland Kraftforsyningslag	23637	23609	24805	12	12	13	0.05%	0.05%	0.05%
1622008	Rauma Energi AS	33995	33926	36910	-37	-37	-35	-0.11%	-0.11%	-0.10%

ID	Company	Revenue Caps with project			Differences in RCs			%-changes in RCs		
		RC1	RC2	RC3	ΔRC1	ΔRC2	ΔRC3	%Δ RC1	%Δ RC2	%Δ RC3
1632008	Kvikne-Rennebu Kraftlag AL	20019	19967	22205	-3	-4	-3	-0.02%	-0.02%	-0.01%
1642008	Repvåg Kraftlag AL	50861	50743	55868	0	-1	2	0.00%	0.00%	0.00%
1662008	Rissa Kraftlag BA	17877	17835	19671	2	2	3	0.01%	0.01%	0.02%
1672008	Norsk Hydro Produksjon AS	7406	7401	7607	0	0	0	0.00%	0.00%	0.00%
1682008	Rollag Elektrisitetsverk LL	8181	8163	8938	-6	-6	-5	-0.07%	-0.07%	-0.06%
1712008	Rødøy-Lurøy Kraftverk AS	41306	41231	44533	0	-1	1	0.00%	0.00%	0.00%
1732008	Røros Elektrisitetsverk AS	26563	26510	28828	-6	-7	-5	-0.02%	-0.02%	-0.02%
1762008	SKS Nett AS	74059	73942	79051	0	-1	2	0.00%	0.00%	0.00%
1812008	Sandøy Energi AS	6473	6458	7101	0	0	1	0.01%	0.01%	0.01%
1832008	Hjartdal Elverk AS	10962	10938	11971	-38	-38	-38	-0.35%	-0.35%	-0.32%
1842008	Selbu Energiverk AS	17730	17682	19779	-25	-25	-24	-0.14%	-0.14%	-0.12%
1872008	Sira-Kvina kraftselskap	7410	7395	8047	0	0	0	0.00%	0.00%	0.00%
1942008	Skjåk Energi	16724	16685	18387	10	10	11	0.06%	0.06%	0.06%
1962008	Skånevik Ølen Kraftlag	18784	18728	21206	-5	-5	-4	-0.02%	-0.03%	-0.02%
1972008	Sognekraft AS	70570	70418	77054	-41	-42	-39	-0.06%	-0.06%	-0.05%
2042008	Stranda Energiverk AS	25078	25045	26487	-136	-137	-136	-0.54%	-0.54%	-0.51%
2052008	Stryn Energi AS	26844	26784	29398	-32	-33	-31	-0.12%	-0.12%	-0.11%
2062008	Suldal Elverk	28768	28689	32163	-86	-87	-85	-0.30%	-0.30%	-0.26%
2102008	Sunnhordland Kraftlag AS	146345	145948	163287	25	22	32	0.02%	0.01%	0.02%
2132008	Sykkylven Energi AS	21017	20954	23689	-38	-38	-37	-0.18%	-0.18%	-0.15%
2142008	Sør-Aurdal Energi BA	17513	17455	19985	-48	-48	-47	-0.27%	-0.27%	-0.23%
2152008	TrønderEnergi Nett AS	226233	225635	251743	9	4	19	0.00%	0.00%	0.01%
2182008	Sørfold Kraftlag AL	10835	10821	11442	-15	-15	-14	-0.14%	-0.14%	-0.13%
2192008	Tafjord Kraftnett AS	194729	194182	218068	74	70	83	0.04%	0.04%	0.04%
2232008	Tinn Energi AS	40691	40570	45861	-3	-4	-1	-0.01%	-0.01%	0.00%
2272008	Troms Kraft Nett AS	446634	445515	494368	38	28	56	0.01%	0.01%	0.01%
2312008	Trøgstad Elverk AS	16247	16209	17856	8	8	9	0.05%	0.05%	0.05%
2332008	Tydal Kommunale Energiverk	8749	8736	9288	-22	-22	-22	-0.25%	-0.25%	-0.23%
2342008	Tysnes Kraftlag PL	21063	21013	23171	5	5	6	0.03%	0.02%	0.03%
2352008	Tyssefaldene Aktieselskabet	20744	20709	22213	1	1	2	0.01%	0.01%	0.01%
2382008	Indre Hardanger Kraftlag AS	36771	36700	39779	-35	-36	-34	-0.10%	-0.10%	-0.09%
2422008	Uvdal Kraftforsyning AL	9330	9307	10319	5	5	6	0.06%	0.06%	0.06%
2482008	Vang Energiverk KF	15157	15118	16836	-13	-13	-12	-0.08%	-0.09%	-0.07%
2492008	Varanger Kraftnett AS	134250	133921	148300	12	9	17	0.01%	0.01%	0.01%
2512008	Vest-Telemark Kraftlag AS	88264	88066	96689	-58	-60	-55	-0.07%	-0.07%	-0.06%
2572008	Dalane Energi IKS	72272	72038	82226	760	755	926	1.06%	1.06%	1.14%
2622008	Ørskog Energi AS	17893	17849	19771	9	9	10	0.05%	0.05%	0.05%
2642008	Øvre Eiker Nett AS	43173	43059	48059	-47	-47	-45	-0.11%	-0.11%	-0.09%
2672008	Årdal Energi KF	15934	15886	18000	10	10	11	0.06%	0.06%	0.06%
2692008	SFE Nett AS	208920	208379	232032	-347	-351	-338	-0.17%	-0.17%	-0.15%
2712008	Driva Kraftverk	4219	4219	4247	0	0	0	0.00%	0.00%	0.00%
2742008	Svorka Energi AS	41646	41548	45847	-26	-26	-24	-0.06%	-0.06%	-0.05%
2752008	Hallingdal Kraftnett AS	102413	102176	112537	-21	-23	-17	-0.02%	-0.02%	-0.02%
2822008	Åbjørakraft Kolsvik Kraftverk	830	825	1039	0	0	0	0.00%	0.00%	0.01%
2872008	Ustekveikja Kraftverk DA	518	515	618	0	0	0	0.00%	0.00%	0.01%
2882008	Kraftverkene i Orkla	15961	15918	17804	0	0	1	0.00%	0.00%	0.00%
2952008	Gudbrandsdal Energi AS	74549	74368	82245	8	7	11	0.01%	0.01%	0.01%
3062008	Valdres Energiverk AS	59771	59559	68790	21	19	24	0.03%	0.03%	0.04%
3072008	Vinstra Kraftselskap DA	441	441	462	0	0	0	0.00%	0.00%	0.00%
3112008	Nordmøre Energiverk AS	162385	161989	179300	36	32	42	0.02%	0.02%	0.02%
3432008	Hemsedal Energi KF	21669	21557	26419	6	5	8	0.03%	0.03%	0.03%
3492008	Notodden Energi AS	44719	44604	49605	0	-1	2	0.00%	0.00%	0.00%
3542008	Lofotkraft AS	122975	122667	136119	-31	-33	-25	-0.02%	-0.03%	-0.02%
3732008	Nore Energi AS	12165	12134	13486	-24	-24	-23	-0.19%	-0.20%	-0.17%
4182008	Aurland Energiverk AS	14018	13981	15607	-47	-47	-46	-0.33%	-0.33%	-0.29%
4332008	Hålogaland Kraft AS	124339	123991	139168	-12	-15	-6	-0.01%	-0.01%	0.00%
4472008	E-CO Vannkraft AS	29906	29827	33250	0	-1	1	0.00%	0.00%	0.00%

ID	Company	Revenue Caps with project			Differences in RCs			%-changes in RCs		
		RC1	RC2	RC3	ΔRC1	ΔRC2	ΔRC3	%Δ RC1	%Δ RC2	%Δ RC3
4532008	Statoil ASA	1984	1969	2633	0	0	0	0.00%	-0.01%	0.01%
4602008	Tussa Nett AS	167297	166824	187475	-312	-316	-304	-0.19%	-0.19%	-0.16%
4642008	Vesterålskraft Nett AS	73524	73333	81671	-26	-27	-23	-0.04%	-0.04%	-0.03%
4842008	TrønderEnegi Kraft	8298	8277	9186	0	0	0	0.00%	0.00%	0.00%
4912008	Elkem Energi Bremanger AS	3546	3539	3846	-7	-7	-7	-0.21%	-0.21%	-0.19%
4952008	Elverum Energiverk Nett AS	49701	49536	56741	9	8	12	0.02%	0.02%	0.02%
5032008	Haugaland Kraft AS	279455	278849	305311	59	54	69	0.02%	0.02%	0.02%
5112008	Lyse Nett AS	643235	641533	715848	709	691	899	0.11%	0.11%	0.13%
5122008	Lyse Produksjon	5069	5050	5866	0	0	0	0.00%	0.00%	0.01%
5242008	Otra Kraft DA	56923	56881	58694	0	0	1	0.00%	0.00%	0.00%
5362008	Trondheim Energiverk Nett AS	343631	342834	377629	86	80	100	0.03%	0.02%	0.03%
5422008	Vokks Nett AS	60182	60026	66827	11	9	13	0.02%	0.02%	0.02%
5492008	Fortum Distribution AS	347971	347109	384778	125	118	140	0.04%	0.03%	0.04%
5662008	BKK Nett AS	988075	985352	1104260	0	-22	46	0.00%	0.00%	0.00%
5742008	Eidsiva Energi Nett AS	849681	847422	946064	104	85	142	0.01%	0.01%	0.01%
5782008	Flesberg Elektrisitetsverk AS	15573	15533	17259	1	1	2	0.01%	0.00%	0.01%
5912008	Midt Nett Buskerud AS	62795	62603	70999	-21	-23	-18	-0.03%	-0.04%	-0.03%
5932008	Nesset Kraft AS	16098	16075	17108	-25	-26	-25	-0.16%	-0.16%	-0.15%
5992008	Sunndal Energi KF	27312	27247	30116	-86	-86	-85	-0.31%	-0.32%	-0.28%
6112008	Skagerak Nett AS	991698	989081	1103362	178	156	222	0.02%	0.02%	0.02%
6132008	Nordvest Nett AS	42732	42627	47235	14	13	16	0.03%	0.03%	0.03%
6142008	Energi 1 Follo-Røyken as	107582	107318	118824	47	45	51	0.04%	0.04%	0.04%
6152008	EB Nett AS	317125	316217	355895	86	79	101	0.03%	0.02%	0.03%
6242008	Agder Energi Nett AS	878682	876150	986702	-172	-192	-129	-0.02%	-0.02%	-0.01%
6252008	Voss Energi AS	52924	52757	60015	3	2	6	0.01%	0.00%	0.01%
6372008	Narvik Energinett AS	69142	68954	77121	16	14	19	0.02%	0.02%	0.02%
6522008	Svorka Produksjon AS	685	682	785	0	0	0	0.00%	0.00%	0.01%
6592008	Midt-Telemark Energi AS	47733	47584	54083	-29	-30	-27	-0.06%	-0.06%	-0.05%
6692008	Stange Energi Nett AS	50696	50553	56834	31	30	33	0.06%	0.06%	0.06%
6752008	Hafslund Nett AS	2389440	2383784	2630771	760	714	855	0.03%	0.03%	0.03%
6842008	Ringeriks-Kraft Produksjon AS	1030	1025	1207	0	0	0	0.00%	0.00%	0.01%
6852008	Statkraft Energi AS	469	464	690	0	0	0	0.00%	-0.01%	0.01%
6862008	Yara Norge AS	17124	17109	17735	11	11	11	0.06%	0.06%	0.06%
6932008	Ringeriks-Kraft Nett AS	84978	84736	95299	16	14	20	0.02%	0.02%	0.02%
6992008	Nord-Trøndelag Elektrisitetsv	489306	488165	537993	43	34	62	0.01%	0.01%	0.01%
7262008	BE Nett AS	120928	120626	133828	658	652	825	0.55%	0.54%	0.62%
7432008	Mo Industripark	23170	23100	26131	0	-1	1	0.00%	0.00%	0.00%
7532008	Aktieselskapet Saudefaldene	16333	16282	18488	0	0	1	0.00%	0.00%	0.00%
Sum		15086410	15047898	16729447	1495	1168	2628	0.01%	0.01%	0.02%

25 Profitability of the project for BE Nett AS over 30 years

BE Nett (RC1 w/o project 120,270)			
year	Revenue Cap Efficiency	RC 1	Yearly Project Revenue
1	110.16%	120,990	720
2	110.18%	120,995	724
3	110.21%	121,006	736
4	110.23%	121,011	740
5	110.25%	121,015	745
6	110.27%	121,020	750
7	110.30%	121,031	761
8	110.32%	121,036	765
9	110.34%	121,040	770
10	110.36%	121,045	774
11	110.39%	121,056	786
12	110.41%	121,060	790
13	110.43%	121,065	795
14	110.45%	121,070	799
15	110.48%	121,081	811
16	110.50%	121,086	815
17	110.52%	121,090	820
18	110.54%	121,095	824
19	110.57%	121,106	836
20	110.59%	121,110	840
21	110.61%	121,115	845
22	110.63%	121,119	849
23	110.66%	121,131	861
24	110.68%	121,135	865
25	110.70%	121,140	870
26	110.72%	121,144	874
27	110.75%	121,156	886
28	110.77%	121,160	890
29	110.79%	121,165	895
30	110.81%	121,169	899
after depreciation	111.17%	121,541	1,271

26 Revenue Caps for Rho 0.5 and 0.6

					ρ = 0,6			ρ = 0,5			Δ					
ID	Cost Base (CB)	Cost of network losses in Regional grid	Required Study Costs	Efficiency	RC1	RC2	RC3	RC1	RC2	RC3	RC1	RC2	RC3	ΔRC3	ΔRC3/CB	Extra Cost/CB
2822008	1,219	0	0	46.77 %	830	825	1,039	895	891	1,105	65	66	66	6.33 %	5.39 %	0.00 %
1082008	3,337	0	0	54.47 %	2,425	2,415	2,877	2,577	2,569	3,030	152	154	154	5.34 %	4.61 %	0.00 %
3072008	572	0	0	61.87 %	441	441	462	463	463	484	22	22	22	4.74 %	3.83 %	0.00 %
982008	2,523	0	0	68.15 %	2,041	2,019	2,956	2,121	2,103	3,040	80	84	84	2.84 %	3.33 %	0.00 %
1972008	85,763	2,091	0	69.43 %	70,418	70,266	76,898	72,975	72,849	79,481	2,557	2,583	2,583	3.36 %	3.01 %	2.44 %
522008	8,695	0	0	73.39 %	7,306	7,286	8,177	7,538	7,521	8,412	231	235	235	2.87 %	2.70 %	0.00 %
1812008	7,544	0	0	73.58 %	6,348	6,334	6,976	6,548	6,535	7,178	199	202	202	2.89 %	2.67 %	0.00 %
1522008	10,643	5,596	0	73.61 %	9,844	9,826	10,613	9,977	9,962	10,749	133	136	136	1.28 %	1.28 %	52.58 %
1112008	26,535	0	0	75.11 %	22,572	22,514	25,048	23,233	23,184	25,718	660	670	670	2.68 %	2.53 %	0.00 %
4182008	16,197	0	0	75.75 %	13,841	13,803	15,428	14,233	14,202	15,827	393	399	399	2.59 %	2.46 %	0.00 %
1472008	11,608	0	0	76.80 %	9,992	9,974	10,737	10,261	10,247	11,009	269	272	272	2.54 %	2.35 %	0.00 %
422008	32,864	0	0	77.75 %	28,476	28,391	32,106	29,208	29,137	32,852	731	745	745	2.32 %	2.27 %	0.00 %
2672008	18,395	0	0	78.18 %	15,986	15,938	18,051	16,388	16,347	18,460	401	409	409	2.27 %	2.23 %	0.00 %
3062008	68,893	0	0	78.23 %	59,895	59,684	68,909	61,394	61,218	70,444	1,500	1,535	1,535	2.23 %	2.23 %	0.00 %
1682008	9,361	0	0	78.66 %	8,163	8,145	8,919	8,362	8,348	9,122	200	203	203	2.27 %	2.17 %	0.00 %
1062008	15,725	0	0	79.05 %	13,748	13,726	14,723	14,078	14,059	15,056	329	333	333	2.26 %	2.12 %	0.00 %
1942008	19,008	0	0	80.44 %	16,778	16,739	18,440	17,149	17,117	18,818	372	378	378	2.05 %	1.99 %	0.00 %
3732008	13,561	0	0	81.69 %	12,071	12,040	13,392	12,320	12,294	13,646	248	253	253	1.89 %	1.87 %	0.00 %
6852008	525	0	0	82.23 %	469	464	690	478	474	700	9	10	10	1.48 %	1.94 %	0.00 %
842008	29,748	0	0	82.47 %	26,619	26,539	30,042	27,141	27,074	30,577	521	535	535	1.78 %	1.80 %	0.00 %
5912008	70,035	0	0	83.13 %	62,946	62,754	71,146	64,128	63,968	72,360	1,181	1,213	1,213	1.71 %	1.73 %	0.00 %
342008	19,475	0	0	83.94 %	17,599	17,558	19,340	17,912	17,878	19,659	313	320	320	1.65 %	1.64 %	0.00 %
5992008	29,766	0	0	84.34 %	26,971	26,906	29,774	27,437	27,383	30,250	466	477	477	1.60 %	1.60 %	0.00 %
2232008	44,839	0	0	84.77 %	40,742	40,621	45,909	41,425	41,324	46,612	683	703	703	1.53 %	1.57 %	0.00 %
462008	10,940	0	523	84.83 %	9,944	9,917	11,086	10,110	10,087	11,256	166	170	170	1.54 %	1.56 %	0.00 %
4472008	32,846	67	0	85.05 %	29,906	29,827	33,248	30,396	30,331	33,751	490	503	503	1.51 %	1.53 %	0.20 %
1832008	11,806	0	0	85.99 %	10,814	10,790	11,822	10,979	10,960	11,992	165	169	169	1.43 %	1.43 %	0.00 %
2142008	18,866	0	0	86.34 %	17,320	17,262	19,790	17,577	17,529	20,057	258	267	267	1.35 %	1.42 %	0.00 %
3542008	132,965	6,094	0	86.58 %	122,749	122,441	135,886	124,451	124,195	137,640	1,703	1,754	1,754	1.29 %	1.32 %	4.58 %
2482008	16,386	0	0	87.05 %	15,113	15,074	16,791	15,325	15,293	17,010	212	219	219	1.30 %	1.33 %	0.00 %
562008	128,275	2,053	0	87.38 %	118,719	118,359	134,123	120,312	120,012	135,776	1,593	1,653	1,653	1.23 %	1.29 %	1.60 %
412008	11,050	0	0	87.58 %	10,227	10,209	11,002	10,364	10,349	11,142	137	140	140	1.27 %	1.27 %	0.00 %
5032008	301,518	6,393	0	87.69 %	279,722	279,117	305,563	283,354	282,850	309,297	3,633	3,734	3,734	1.22 %	1.24 %	2.12 %
2192008	209,506	12,286	0	87.77 %	195,066	194,520	218,392	197,473	197,018	220,890	2,407	2,498	2,498	1.14 %	1.19 %	5.86 %
6112008	1,063,706	91,826	0	87.83 %	992,764	990,151	1,104,366	1,004,587	1,002,410	1,116,625	11,824	12,259	12,259	1.11 %	1.15 %	8.63 %
4912008	3,813	0	0	88.06 %	3,540	3,533	3,840	3,586	3,580	3,886	46	47	47	1.22 %	1.22 %	0.00 %
1842008	18,993	0	0	88.46 %	17,678	17,630	19,726	17,898	17,858	19,953	219	227	227	1.15 %	1.20 %	0.00 %
2132008	22,424	0	0	88.50 %	20,877	20,814	23,548	21,135	21,083	23,816	258	268	268	1.14 %	1.20 %	0.00 %
6242008	938,611	48,026	0	88.67 %	878,211	875,683	986,171	888,277	886,171	996,659	10,067	10,488	10,488	1.06 %	1.12 %	5.12 %
222008	10,609	0	0	88.76 %	9,893	9,876	10,634	10,013	9,998	10,756	119	122	122	1.15 %	1.15 %	0.00 %
4642008	78,404	2,463	0	89.00 %	73,391	73,200	81,534	74,226	74,067	82,401	835	867	867	1.06 %	1.11 %	3.14 %
872008	6,729	0	0	89.24 %	6,294	6,280	6,915	6,367	6,355	6,990	72	75	75	1.08 %	1.11 %	0.00 %
5662008	1,051,187	42,199	0	89.73 %	989,129	986,410	1,105,250	999,472	997,206	1,116,046	10,343	10,796	10,796	0.98 %	1.03 %	4.01 %
722008	27,117	0	0	89.84 %	25,464	25,404	28,046	25,740	25,689	28,332	276	286	286	1.02 %	1.05 %	0.00 %
1662008	18,993	0	0	90.34 %	17,892	17,850	19,685	18,075	18,040	19,876	183	190	190	0.97 %	1.00 %	0.00 %
2642008	45,629	0	0	90.39 %	42,998	42,884	47,881	43,437	43,341	48,339	438	458	458	0.96 %	1.00 %	0.00 %
4532008	2,094	0	0	91.22 %	1,984	1,969	2,632	2,002	1,990	2,653	18	21	21	0.79 %	1.00 %	0.00 %
2422008	9,867	0	0	91.34 %	9,355	9,331	10,343	9,440	9,421	10,433	85	89	89	0.86 %	0.91 %	0.00 %
4602008	174,548	3,419	0	91.53 %	165,863	165,391	186,030	167,310	166,917	187,556	1,447	1,526	1,526	0.82 %	0.87 %	1.96 %
552008	21,885	0	0	91.95 %	20,828	20,767	23,413	21,004	20,954	23,599	176	186	186	0.80 %	0.85 %	0.00 %
2572008	74,989	0	0	92.01 %	71,394	71,165	81,182	71,994	71,803	81,819	599	637	637	0.79 %	0.85 %	0.00 %
2152008	236,520	15,538	0	92.13 %	226,127	225,531	251,623	227,860	227,362	253,455	1,732	1,832	1,832	0.73 %	0.77 %	6.57 %
6932008	89,184	0	0	92.34 %	85,085	84,844	95,400	85,768	85,567	96,123	683	723	723	0.76 %	0.81 %	0.00 %
652008	63,575	1,504	0	92.97 %	60,957	60,825	66,609	61,394	61,283	67,068	436	458	458	0.69 %	0.72 %	2.37 %
1382008	28,122	2,523	0	93.20 %	27,078	27,027	29,267	27,252	27,209	29,450	174	183	183	0.62 %	0.65 %	8.97 %
72008	78,800	0	0	93.32 %	75,642	75,464	83,243	76,168	76,020	83,799	526	556	556	0.67 %	0.71 %	0.00 %
822008	28,960	0	0	93.49 %	27,829	27,761	30,748	28,018	27,961	30,948	189	200	200	0.65 %	0.69 %	0.00 %
1642008	52,458	2,210	0	94.50 %	50,801	50,684	55,806	51,077	50,980	56,102	276	296	296	0.53 %	0.56 %	4.21 %
452008	16,503	0	0	95.43 %	16,050	16,022	17,255	16,126	16,102	17,335	75	80	80	0.46 %	0.49 %	0.00 %
2692008	212,682	8,393	0	95.48 %	207,135	206,595	230,234	208,060	207,609	231,249	924	1,014	1,014	0.44 %	0.48 %	3.95 %
2742008	42,670	0	0	95.87 %	41,613	41,514	45,811	41,789	41,707	46,004	176	193	193	0.42 %	0.45 %	0.00 %
352008	19,702	0	0	95.88 %	19,215	19,167	21,283	19,297	19,256	21,372	81	89	89	0.42 %	0.45 %	0.00 %
932008	40,443	0	0	95.97 %	39,466	39,369	43,605	39,629	39,548	43,784	163	179	179	0.41 %	0.44 %	0.00 %
712008	348,587	25,389	0	96.33 %	341,479	340,637	377,452	342,664	341,962	378,777	1,185	1,325	1,325	0.35 %	0.38 %	7.28 %
1362008	11,045	0	0	96.36 %	10,803	10,779	11,842	10,843	10,823	11,886	40	44	44	0.37 %	0.40 %	0.00 %
6372008	70,656	2,062	0	96.52 %	69,225	69,038	77,200	69,463	69,308	77,470	239	270	270	0.35 %	0.38 %	2.92 %
1962008	19,177	0	0	96.54 %	18,779	18,722	21,199	18,845	18,798	21,275	66	76	76	0.36 %	0.40 %	0.00 %
6592008	48,635	0	853	96.77 %	47,692	47,543	54,039	47,849	47,725	54,220	157	182	182	0.34 %	0.37 %	0.00 %
2952008	76,023	1,023	0	96.86 %	74,609	74,429	82,301	74,845	74,694	82,567	236	266	266	0.32 %	0.35 %	1.35 %
1032008	39,331	0	0	97.08 %	38,642	38,552	42,474	38,757	38,682	42,604	115	130	130	0.31 %	0.33 %	0.00 %
6252008	54,029	0	0	97.42 %	53,193	53,027	60,280	53,332	53,194	60,447	139	167	167	0.28 %	0.31 %	0.00 %
1572008	24,639	0	0	97.79 %	24,313	24,255	26,759	24,367	24,319	26,823	54	64	64	0.24 %	0.26 %	0.00 %
4952008	50,341	0	0	98.31 %	49,831	49,666	56,867	49,916	49,779	56,979	85	113	113	0.20 %	0.22 %	0.00 %
6692008	51,321	0	0	98.78 %	50,946	50,802	57,080	51,008	50,889	57,166	63	87	87	0.15 %	0.17 %	0.00 %
2752008	102,928	1,449	0	99.05 %	102,350	102,113	112,469	102,447	102,249	112,605	96	136	136	0.12 %	0.13 %	1.41 %
622008	82,363	0	0	99.36 %	82,047	81,839	90,929	82,099	81,926	91,017	53	87	87	0.10 %	0.11 %	0.00 %
3492008	44,719	0	0	100.00 %	44,719	44,604	49,603	44,719	44,624	49,622	0	19	19	0.04 %	0.04 %	0.00 %
5122008	5,069	0	0	100.00 %	5,069	5,050	5,866	5,069	5,053	5,869	0	3	3	0.05 %	0.06 %	0.00 %
6522008	685	0	145	100.00 %	685	682	785	685	683	786	0	0	0	0.05 %	0.06 %	0.00 %
7432008	23,170	0	0	100.00 %	23,170	23,100	26,130	23,170	23,112	26,141	0	12	12	0.04 %	0.05 %	0.00 %
5492008	348,243	0	0	100.38 %	349,037	348,176	385,824	348,905	348,187	385,835	-132	11	11	0.00 %	0.00 %	0.00 %
962008	25,351	0	939	100.41 %	25,414	25,325	29,202	25,403	25,329	29,206	-10	4	4	0.02 %	0.02 %	0.00 %
5422008	59,844	0	0	101.22 %	60,282	60,127	66,924	60,209	60,080	66,877	-73	-47	-47	-0.07 %	-0.08 %	0.00 %
2062008	28,196	0	431	101.73 %	28,489	28,410	31,882	28,440	28,374	31,847	-49	-36	-36	-0.11 %	-0.13 %	0.00 %
2182008	10,665	0	0	101.76 %	10,778	10,763	11,385	10,759	10,747	11,368	-19	-16	-16	-0.14 %	-0.15 %	0.00 %
5782008	15,405	0	189	101.91 %	15,582	15,542	17,267	15,552	15,520	17,245	-29	-23	-23	-0.13 %	-0.15 %	0.00 %
2492008	132,740	3,194	0	102.07 %	134,348	134,019	148,391	134,080	133,806	148,178	-268	-213	-213	-0.14 %	-0.16 %	2.41 %
2102008	144,464	10,778	0	102.39 %	146,375	145,979	163,308	146,057	145,727	163,055	-319	-252	-252	-0.15 %	-0.17 %	7.46 %
1532008	26,300	0	0	102.44 %	26,685	26,593	30,622	26,621	26,544	30,573	-64	-49	-49	-0.16 %	-0.19 %	0.00 %
532008	35,128	0	0	102.57 %	35,669	35,538	41,307	35,579	35,469	41,239	-90	-68	-68	-0.17 %	-0.19 %	0.00 %
3432008	21,352	0	0	103.20 %	21,762	21,651	26,510	21,694	21,601	26,460	-68	-50	-50	-0.19 %	-0.23 %	0.00 %

ID	Cost Base (CB)	Cost of network losses in Regional grid	Required Study Costs	Efficiency	ρ = 0,6 RC1	ρ = 0,6 RC2	ρ = 0,6 RC3	ρ = 0,5 RC1	ρ = 0,5 RC2	ρ = 0,5 RC3	Δ RC1	Δ RC2	Δ RC3	ΔRC3	ΔRC3/CB	Extra Cost/CB
1492008	25,048	0	0	103.61 %	25,591	25,519	28,649	25,500	25,440	28,571	-90	-78	-78	-0.27 %	-0.31 %	0.00 %
2512008	86,218	4,827	0	103.75 %	88,051	87,854	96,472	87,746	87,581	96,199	-305	-273	-273	-0.28 %	-0.32 %	5.60 %
1672008	7,240	0	0	103.82 %	7,406	7,401	7,607	7,378	7,374	7,580	-28	-27	-27	-0.35 %	-0.37 %	0.00 %
1462008	25,970	0	0	104.48 %	26,668	26,591	29,971	26,552	26,487	29,868	-116	-103	-103	-0.35 %	-0.40 %	0.00 %
3112008	158,414	8,497	0	104.57 %	162,528	162,132	179,433	161,842	161,512	178,814	-686	-620	-620	-0.35 %	-0.39 %	5.36 %
2352008	20,268	2,860	0	104.69 %	20,758	20,723	22,226	20,676	20,647	22,150	-82	-76	-76	-0.34 %	-0.37 %	14.11 %
6152008	308,625	29,135	0	105.36 %	317,620	316,713	356,368	316,121	315,365	355,020	-1,499	-1,348	-1,348	-0.38 %	-0.44 %	9.44 %
1732008	25,674	0	0	105.88 %	26,580	26,527	28,843	26,429	26,385	28,701	-151	-142	-142	-0.49 %	-0.55 %	0.00 %
6752008	2,311,090	107,342	0	106.19 %	2,392,956	2,387,308	2,634,154	2,379,312	2,374,605	2,621,451	-13,644	-12,703	-12,703	-0.48 %	-0.55 %	4.64 %
1192008	27,315	0	0	106.20 %	28,331	28,275	30,738	28,162	28,115	30,578	-169	-160	-160	-0.52 %	-0.59 %	0.00 %
4332008	119,702	2,424	0	106.45 %	124,232	123,885	139,053	123,477	123,188	138,356	-755	-697	-697	-0.50 %	-0.58 %	2.03 %
1022008	50,504	0	0	107.06 %	52,643	52,535	57,270	52,287	52,196	56,932	-357	-339	-339	-0.59 %	-0.67 %	0.00 %
882008	34,103	0	0	107.29 %	35,595	35,473	40,800	35,346	35,245	40,571	-249	-228	-228	-0.56 %	-0.67 %	0.00 %
2052008	25,496	0	0	108.22 %	26,754	26,694	29,306	26,544	26,494	29,106	-210	-200	-200	-0.68 %	-0.78 %	0.00 %
432008	32,434	0	0	108.45 %	34,078	33,985	38,075	33,804	33,726	37,816	-274	-258	-258	-0.68 %	-0.80 %	0.00 %
1622008	32,140	0	0	108.87 %	33,850	33,782	36,764	33,565	33,508	36,490	-285	-274	-274	-0.74 %	-0.85 %	0.00 %
7262008	113,649	0	0	108.97 %	119,766	119,467	132,497	118,746	118,498	131,527	-1,019	-970	-970	-0.73 %	-0.85 %	0.00 %
862008	120,512	3,678	0	109.06 %	126,866	126,511	141,993	125,807	125,511	140,993	-1,059	-1,000	-1,000	-0.70 %	-0.83 %	3.05 %
1632008	18,931	0	0	109.53 %	20,013	19,962	22,198	19,833	19,790	22,027	-180	-172	-172	-0.77 %	-0.91 %	0.00 %
972008	33,014	0	0	110.03 %	35,001	34,905	39,066	34,669	34,590	38,750	-331	-315	-315	-0.81 %	-0.95 %	0.00 %
232008	1,905	0	0	110.15 %	2,021	2,021	2,042	2,002	2,001	2,022	-19	-19	-19	-0.94 %	-1.01 %	0.00 %
1612008	22,315	0	0	110.55 %	23,728	23,700	24,895	23,492	23,469	24,664	-235	-231	-231	-0.93 %	-1.03 %	0.00 %
5742008	801,796	55,332	0	110.87 %	850,440	848,184	946,770	842,333	840,453	939,039	-8,107	-7,731	-7,731	-0.82 %	-0.96 %	6.90 %
5112008	603,244	32,862	0	111.58 %	642,805	641,109	715,216	636,211	634,799	708,905	-6,593	-6,311	-6,311	-0.88 %	-1.05 %	5.45 %
6992008	458,283	10,551	166	111.61 %	489,457	488,318	538,117	484,261	483,312	533,111	-5,196	-5,006	-5,006	-0.93 %	-1.09 %	2.30 %
1162008	28,500	0	0	112.28 %	30,600	30,529	33,622	30,250	30,191	33,284	-350	-338	-338	-1.01 %	-1.19 %	0.00 %
2272008	416,671	25,771	0	112.84 %	446,765	445,648	494,473	441,749	440,819	489,644	-5,016	-4,829	-4,829	-0.98 %	-1.16 %	6.18 %
2622008	16,586	0	314	113.56 %	17,935	17,892	19,813	17,711	17,674	19,595	-225	-218	-218	-1.10 %	-1.31 %	0.00 %
1332008	72,942	1,878	0	114.01 %	78,916	78,749	86,043	77,920	77,781	85,075	-996	-968	-968	-1.12 %	-1.33 %	2.57 %
1352008	54,866	0	0	114.32 %	59,580	59,454	64,942	58,794	58,690	64,177	-786	-765	-765	-1.18 %	-1.39 %	0.00 %
142008	36,984	0	0	114.80 %	40,268	40,141	45,687	39,721	39,615	45,160	-547	-526	-526	-1.15 %	-1.42 %	0.00 %
1762008	69,572	19,286	0	115.13 %	74,059	73,943	79,049	73,312	73,214	78,320	-748	-728	-728	-0.92 %	-1.05 %	27.72 %
5932008	14,637	0	0	115.47 %	15,996	15,972	17,004	15,769	15,750	16,782	-226	-222	-222	-1.31 %	-1.52 %	0.00 %
2312008	14,831	0	1,153	116.42 %	16,292	16,255	17,901	16,049	16,017	17,664	-244	-237	-237	-1.33 %	-1.60 %	0.00 %
1042008	18,641	0	0	116.66 %	20,504	20,467	22,088	20,193	20,163	21,783	-311	-304	-304	-1.38 %	-1.63 %	0.00 %
6142008	97,971	0	0	116.73 %	107,805	107,542	119,042	106,166	105,947	117,446	-1,639	-1,595	-1,595	-1.34 %	-1.63 %	0.00 %
182008	17,745	0	0	117.16 %	19,572	19,521	21,710	19,267	19,225	21,414	-304	-296	-296	-1.36 %	-1.67 %	0.00 %
6132008	38,693	0	0	117.45 %	42,744	42,638	47,245	42,069	41,981	46,587	-675	-658	-658	-1.39 %	-1.70 %	0.00 %
1322008	57,018	4,342	0	117.50 %	62,549	62,432	67,574	61,628	61,530	66,672	-922	-902	-902	-1.34 %	-1.58 %	7.61 %
1212008	2,701	0	1,567	117.88 %	2,991	2,981	3,428	2,942	2,934	3,381	-48	-47	-47	-1.36 %	-1.72 %	0.00 %
322008	107,628	0	366	118.84 %	119,794	119,454	134,309	117,767	117,483	132,338	-2,028	-1,971	-1,971	-1.47 %	-1.83 %	0.00 %
162008	19,580	0	0	119.02 %	21,815	21,760	24,139	21,442	21,397	23,776	-372	-363	-363	-1.51 %	-1.86 %	0.00 %
102008	3,832	0	0	119.11 %	4,271	4,260	4,734	4,198	4,189	4,662	-73	-71	-71	-1.51 %	-1.86 %	0.00 %
2712008	4,049	2,558	0	119.11 %	4,219	4,219	4,247	4,191	4,190	4,219	-28	-28	-28	-0.67 %	-0.70 %	63.19 %
2882008	14,726	3,954	19	119.11 %	15,961	15,918	17,803	15,755	15,719	17,605	-206	-199	-199	-1.12 %	-1.35 %	26.85 %
4842008	7,688	2,377	0	119.11 %	8,298	8,277	9,185	8,196	8,179	9,087	-102	-98	-98	-1.07 %	-1.28 %	30.91 %
5242008	55,480	42,894	0	119.11 %	56,923	56,881	58,693	56,682	56,648	58,459	-241	-234	-234	-0.40 %	-0.42 %	77.31 %
1712008	36,680	0	0	119.25 %	40,917	40,841	44,141	40,211	40,148	43,448	-706	-694	-694	-1.57 %	-1.89 %	0.00 %
2332008	7,724	0	0	120.22 %	8,661	8,648	9,201	8,505	8,494	9,046	-156	-154	-154	-1.67 %	-1.99 %	0.00 %
372008	67,372	2,335	2,339	120.24 %	75,271	75,102	82,454	73,954	73,814	81,165	-1,316	-1,288	-1,288	-1.56 %	-1.91 %	3.47 %
2382008	32,687	0	0	120.51 %	36,710	36,639	39,717	36,039	35,981	39,058	-670	-659	-659	-1.66 %	-2.02 %	0.00 %
912008	26,762	0	0	122.40 %	30,359	30,264	34,428	29,760	29,680	33,845	-599	-584	-584	-1.70 %	-2.18 %	0.00 %
92008	24,254	1,274	0	124.37 %	27,615	27,550	30,417	27,055	27,000	29,868	-560	-549	-549	-1.81 %	-2.26 %	5.25 %
2042008	21,236	0	0	125.69 %	24,509	24,476	25,918	23,964	23,936	25,377	-546	-540	-540	-2.08 %	-2.54 %	0.00 %
1562008	561	0	0	126.11 %	649	646	778	634	632	764	-15	-14	-14	-1.82 %	-2.52 %	0.00 %
632008	34,126	0	919	126.45 %	39,542	39,465	42,852	38,639	38,575	41,962	-903	-890	-890	-2.08 %	-2.61 %	0.00 %
5362008	298,177	12,944	0	126.81 %	344,064	343,268	378,043	336,416	335,753	370,528	-7,648	-7,515	-7,515	-1.99 %	-2.52 %	4.34 %
7532008	14,456	3,301	0	128.03 %	16,333	16,282	18,487	16,020	15,978	18,183	-313	-304	-304	-1.65 %	-2.10 %	22.83 %
2342008	18,019	0	0	128.41 %	21,091	21,041	23,198	20,579	20,538	22,694	-512	-504	-504	-2.17 %	-2.80 %	0.00 %
952008	7,644	0	0	129.26 %	8,986	8,966	9,840	8,762	8,746	9,620	-224	-220	-220	-2.24 %	-2.88 %	0.00 %
2872008	434	0	349	132.05 %	518	515	618	504	502	605	-14	-14	-14	-2.19 %	-3.11 %	0.00 %
6862008	14,320	0	0	134.50 %	17,285	17,270	17,896	16,791	16,779	17,404	-494	-492	-492	-2.75 %	-3.43 %	0.00 %
1872008	5,786	0	0	146.77 %	7,410	7,395	8,046	7,139	7,126	7,778	-271	-268	-268	-3.33 %	-4.63 %	0.00 %
6842008	643	200	0	245.07 %	1,030	1,025	1,207	965	962	1,143	-64	-64	-64	-5.28 %	-9.90 %	31.02 %
Sum	15,046,730	677,200	10,271		15,085,168	15,046,730	16,726,819	15,078,762	15,046,730	16,726,819	-6,406.311	0.000	0.000			

27 Coefficient changes when adding 5 MW increments to BE Nett AS

	Constant	Interfaces	Islands	DG
Base	4.45900700	-0.00473540	-1.26697400	-0.72677830
5MW	4.45879700	-0.00473780	-1.26592300	-0.71787210
10MW	4.45857800	-0.00474030	-1.26484600	-0.70858810
15MW	4.45835000	-0.00474280	-1.26374800	-0.69894560
20MW	4.45811400	-0.00474550	-1.26262900	-0.68896500
25MW	4.45787000	-0.00474810	-1.26149200	-0.67866730
30MW	4.45761800	-0.00475090	-1.26034000	-0.66807450
35MW	4.45736000	-0.00475370	-1.25917400	-0.65720900
40MW	4.45709500	-0.00475650	-1.25799800	-0.64609380
45MW	4.45682500	-0.00475940	-1.25681200	-0.63475200
50MW	4.45654900	-0.00476230	-1.25562000	-0.62320710
55MW	4.45626900	-0.00476520	-1.25442400	-0.61148240
60MW	4.45598500	-0.00476810	-1.25322600	-0.59960120
65MW	4.45569700	-0.00477110	-1.25202700	-0.58758670
70MW	4.45540700	-0.00477410	-1.25083100	-0.57546160
75MW	4.45511400	-0.00477700	-1.24963800	-0.56324810
80MW	4.45481900	-0.00478000	-1.24845100	-0.55096810
85MW	4.45452300	-0.00478300	-1.24727200	-0.53864260
90MW	4.45422600	-0.00478590	-1.24610100	-0.52629210
95MW	4.45392900	-0.00478890	-1.24494100	-0.51393630
100MW	4.45363200	-0.00479180	-1.24379300	-0.50159390

28 EFC for industry when BE Nett adds DG

Company	EFC when BE Nett adds DG: 0 MW	35 MW	65 MW	100 MW
Fauske Lysverk AS	0.00 %	0.00 %	0.00 %	0.00 %
Hurum Energiverk AS	0.00 %	0.00 %	0.00 %	0.00 %
Krødsherad Everk KF	0.00 %	0.00 %	0.00 %	0.00 %
Løvenskiold Fossum Kraft	0.00 %	0.00 %	0.00 %	0.00 %
Malvik Everk AS	0.00 %	0.00 %	0.00 %	0.00 %
Ørskog Energi AS	0.00 %	0.00 %	0.00 %	0.00 %
Uvdal Kraftforsyning AL	-0.01 %	-0.01 %	-0.01 %	-0.01 %
Lier Everk AS	-0.01 %	-0.01 %	-0.01 %	-0.01 %
Hafslund Nett AS	-0.16 %	-0.15 %	-0.14 %	-0.13 %
Energi 1 Follo-Røyken as	-0.17 %	-0.16 %	-0.16 %	-0.15 %
Høland og Setskog Elverk	-0.20 %	-0.18 %	-0.16 %	-0.14 %
Trondheim Energiverk Nett AS	-0.31 %	-0.28 %	-0.25 %	-0.21 %
Fjelberg Kraftlag	-0.37 %	-0.37 %	-0.37 %	-0.37 %
Andøy Energi AS	-0.40 %	-0.36 %	-0.32 %	-0.27 %
Valdres Energiverk AS	-0.41 %	-0.38 %	-0.34 %	-0.30 %
Narvik Energinett AS	-0.41 %	-0.37 %	-0.33 %	-0.28 %
Tysnes Kraftlag PL	-0.44 %	-0.40 %	-0.36 %	-0.31 %
Skjåk Energi	-0.46 %	-0.46 %	-0.46 %	-0.46 %
Skagerak Nett AS	-0.47 %	-0.42 %	-0.38 %	-0.32 %
Årdal Energi KF	-0.49 %	-0.49 %	-0.49 %	-0.49 %
Eidsiva Energi Nett AS	-0.52 %	-0.47 %	-0.42 %	-0.35 %
Tafjord Kraftnett AS	-0.53 %	-0.53 %	-0.52 %	-0.52 %
Varanger Kraftnett AS	-0.63 %	-0.56 %	-0.50 %	-0.43 %
Gudbrandsdal Energi AS	-0.68 %	-0.61 %	-0.54 %	-0.46 %
Haugaland Kraft AS	-0.71 %	-0.66 %	-0.62 %	-0.56 %
Rissa Kraftlag BA	-0.71 %	-0.64 %	-0.57 %	-0.49 %
Ringeriks-Kraft Nett AS	-0.77 %	-0.71 %	-0.65 %	-0.58 %
Oppdal Everk AS	-0.77 %	-0.70 %	-0.62 %	-0.53 %
Nordmøre Energiverk AS	-0.78 %	-0.75 %	-0.71 %	-0.66 %
Gauldal Energi AS	-0.80 %	-0.72 %	-0.65 %	-0.55 %
EB Nett AS	-0.84 %	-0.83 %	-0.82 %	-0.82 %
Flesberg Elektrisitetsverk AS	-0.95 %	-0.87 %	-0.79 %	-0.70 %
Trøgstad Elverk AS	-0.96 %	-0.96 %	-0.96 %	-0.96 %
Nord-Trøndelag Elektrisitetsverk	-0.96 %	-0.89 %	-0.82 %	-0.73 %
Troms Kraft Nett AS	-0.99 %	-0.92 %	-0.86 %	-0.78 %
Hammerfest Energi Nett AS	-1.05 %	-0.97 %	-0.90 %	-0.81 %
Nord-Østerdal Kraftlag AL	-1.21 %	-1.12 %	-1.03 %	-0.92 %
Bindal Kraftlag AL	-1.25 %	-1.24 %	-1.23 %	-1.22 %
Agder Energi Nett AS	-1.33 %	-1.21 %	-1.09 %	-0.93 %
Dragefossen Kraftanlegg AS	-1.35 %	-1.22 %	-1.09 %	-0.93 %
Eidefoss AS	-1.37 %	-1.24 %	-1.10 %	-0.94 %
Hallingdal Kraftnett AS	-1.40 %	-1.27 %	-1.14 %	-0.98 %
Nord-Salten Kraftlag AL	-1.48 %	-1.42 %	-1.36 %	-1.29 %
Vokks Nett AS	-1.50 %	-1.45 %	-1.39 %	-1.33 %
Fosenkraft AS	-1.53 %	-1.48 %	-1.42 %	-1.35 %
Kvikne-Rennebu Kraftlag AL	-1.53 %	-1.42 %	-1.30 %	-1.15 %
Istad Nett AS	-1.58 %	-1.53 %	-1.48 %	-1.41 %
TrønderEnergi Nett AS	-1.62 %	-1.54 %	-1.47 %	-1.37 %
Hålogaland Kraft AS	-1.67 %	-1.56 %	-1.45 %	-1.32 %
Orkdal Energi AS	-1.82 %	-1.64 %	-1.47 %	-1.25 %
Fusa Kraftlag	-1.83 %	-1.80 %	-1.77 %	-1.73 %
Rollag Elektrisitetsverk LL	-1.85 %	-1.67 %	-1.49 %	-1.27 %
Skånevik Ølen Kraftlag	-1.92 %	-1.80 %	-1.67 %	-1.52 %
Nordvest Nett AS	-1.92 %	-1.89 %	-1.87 %	-1.83 %
Sognekraft AS	-1.93 %	-1.74 %	-1.56 %	-1.33 %
Vesterålskraft Nett AS	-1.93 %	-1.78 %	-1.63 %	-1.45 %
Repvåg Kraftlag AL	-1.99 %	-1.90 %	-1.81 %	-1.69 %
Finnås Kraftlag	-2.09 %	-2.08 %	-2.07 %	-2.06 %
Nord Troms Kraftlag AS	-2.16 %	-2.05 %	-1.94 %	-1.80 %
Vang Energiverk KF	-2.16 %	-1.95 %	-1.74 %	-1.49 %
Lofotkraft AS	-2.27 %	-2.14 %	-2.00 %	-1.84 %
HelgelandsKraft AS	-2.29 %	-2.18 %	-2.07 %	-1.94 %
Vest-Telemark Kraftlag AS	-2.33 %	-2.11 %	-1.89 %	-1.61 %
Nordkyn Kraftlag AL	-2.34 %	-2.11 %	-1.89 %	-1.61 %
Hemne kraftlag BA	-2.39 %	-2.20 %	-2.01 %	-1.79 %

Company	EFC when BE Nett adds DG: 0 MW	35 MW	65 MW	100 MW
Øvre Eiker Nett AS	-2.60 %	-2.35 %	-2.10 %	-1.79 %
Sunnhordland Kraftlag AS	-2.88 %	-2.88 %	-2.87 %	-2.86 %
Rauma Energi AS	-2.90 %	-2.63 %	-2.35 %	-2.01 %
Elkem Bjølvefossen AS	-2.95 %	-2.96 %	-2.96 %	-2.97 %
Sørfold Kraftlag AL	-3.24 %	-2.93 %	-2.62 %	-2.24 %
Tinn Energi AS	-3.24 %	-3.15 %	-3.05 %	-2.93 %
BE Nett AS	-3.32 %	-3.17 %	-3.02 %	-2.83 %
Elverum Energiverk Nett AS	-3.51 %	-3.46 %	-3.40 %	-3.33 %
Fortum Distribution AS	-3.55 %	-3.52 %	-3.48 %	-3.44 %
Røros Elektrisitetsverk AS	-3.79 %	-3.67 %	-3.55 %	-3.40 %
Nore Energi AS	-3.86 %	-3.49 %	-3.13 %	-2.67 %
BKK Nett AS	-3.88 %	-3.79 %	-3.71 %	-3.60 %
Fredrikstad Energi Nett AS	-3.89 %	-3.89 %	-3.89 %	-3.89 %
Nesset Kraft AS	-3.89 %	-3.52 %	-3.15 %	-2.69 %
Rakkestad Energiverk AS	-3.93 %	-3.80 %	-3.66 %	-3.50 %
Jondal Energi KF	-4.26 %	-4.01 %	-3.76 %	-3.45 %
Meløy Energi AS	-4.38 %	-4.23 %	-4.08 %	-3.89 %
Evenes Kraftforsyning AS	-4.48 %	-4.49 %	-4.49 %	-4.50 %
Stange Energi Nett AS	-4.48 %	-4.49 %	-4.50 %	-4.51 %
Sykkylven Energi AS	-4.50 %	-4.14 %	-3.79 %	-3.35 %
Etne Elektrisitetslag	-4.53 %	-4.54 %	-4.54 %	-4.54 %
Kvam Kraftverk AS	-4.84 %	-4.40 %	-3.95 %	-3.41 %
Svorka Energi AS	-4.88 %	-4.70 %	-4.52 %	-4.29 %
Lyse Nett AS	-5.17 %	-5.09 %	-5.02 %	-4.93 %
Sør-Aurdal Energi BA	-5.24 %	-4.75 %	-4.25 %	-3.63 %
Austevoll Kraftlag BA	-5.25 %	-5.21 %	-5.17 %	-5.12 %
Rauland Kraftforsyningslag	-5.44 %	-5.44 %	-5.45 %	-5.45 %
Askøy Energi AS	-5.47 %	-5.48 %	-5.49 %	-5.50 %
Stryn Energi AS	-5.67 %	-5.38 %	-5.10 %	-4.74 %
Tydal Kommunale Energiverk KF	-5.70 %	-5.16 %	-4.62 %	-3.95 %
Tussa Nett AS	-5.73 %	-5.27 %	-4.80 %	-4.22 %
Sunndal Energi KF	-5.75 %	-5.21 %	-4.66 %	-3.99 %
Luster Energiverk AS	-5.85 %	-5.33 %	-4.81 %	-4.17 %
Midt-Telemark Energi AS	-6.14 %	-5.96 %	-5.77 %	-5.54 %
Drangedal Everk KF	-6.17 %	-5.96 %	-5.74 %	-5.48 %
Tyssefaldene Aktieselskabet	-6.26 %	-6.27 %	-6.28 %	-6.29 %
Forsand Elverk KF	-6.60 %	-6.38 %	-6.16 %	-5.89 %
Hadeland Energinett AS	-6.66 %	-6.54 %	-6.41 %	-6.26 %
Aurland Energiverk AS	-6.73 %	-6.19 %	-5.64 %	-4.97 %
Hemsedal Energi KF	-6.86 %	-6.82 %	-6.78 %	-6.73 %
Sunnfjord Energi AS	-6.99 %	-6.43 %	-5.87 %	-5.18 %
Alta Kraftlag AL	-7.22 %	-7.08 %	-6.95 %	-6.78 %
Ballangen Energi AS	-7.27 %	-7.00 %	-6.73 %	-6.40 %
Hjartdal Elverk AS	-7.94 %	-7.33 %	-6.72 %	-5.97 %
Rødøy-Lurøy Kraftverk AS	-7.98 %	-7.88 %	-7.79 %	-7.68 %
Midt Nett Buskerud AS	-8.04 %	-7.91 %	-7.78 %	-7.61 %
Indre Hardanger Kraftlag AS	-8.08 %	-7.82 %	-7.55 %	-7.23 %
Klepp Energi AS	-8.15 %	-8.17 %	-8.18 %	-8.20 %
Selbu Energiverk AS	-8.38 %	-8.08 %	-7.79 %	-7.42 %
SFE Nett AS	-8.39 %	-7.91 %	-7.43 %	-6.83 %
Jæren Everk Komm. f. i Hå	-8.54 %	-8.53 %	-8.51 %	-8.49 %
Modalen Kraftlag BA	-8.65 %	-7.85 %	-7.04 %	-6.04 %
Norddal Elverk AS	-9.26 %	-8.46 %	-7.65 %	-6.65 %
Odda Energi AS	-9.41 %	-8.81 %	-8.21 %	-7.46 %
Kvinnherad Energi AS	-10.06 %	-9.30 %	-8.54 %	-7.58 %
Dalane Energi IKS	-10.22 %	-9.97 %	-9.72 %	-9.41 %
Luostejok Kraftlag AL	-11.60 %	-11.59 %	-11.58 %	-11.57 %
Voss Energi AS	-11.66 %	-11.58 %	-11.49 %	-11.38 %
Sandøy Energi AS	-12.09 %	-12.00 %	-11.92 %	-11.82 %
Stranda Energiverk AS	-13.20 %	-12.08 %	-10.95 %	-9.53 %
Suldal Elverk	-13.62 %	-13.04 %	-12.47 %	-11.75 %
Trollfjord Kraft AS	-13.75 %	-13.67 %	-13.58 %	-13.46 %
Fitjar Kraftlag BA	-13.83 %	-13.63 %	-13.43 %	-13.20 %
Lærdal Energi	-15.49 %	-15.21 %	-14.93 %	-14.58 %
Kragerø Energi AS	-17.31 %	-16.99 %	-16.67 %	-16.27 %
Elkem Energi Bremanger AS	-18.90 %	-18.51 %	-18.11 %	-17.62 %
Yara Norge AS	-19.71 %	-19.74 %	-19.78 %	-19.81 %

29 EFC when Industry adds DG (DG Companies)

			EFC When Industry adds DG:									
ID	Company	Original	5MW	10MW	15MW	20MW	25MW	30MW	35MW	40MW	45MW	50MW
6752008	Hafslund Nett AS	-0.16 %	-0.14 %	-0.13 %	-0.12 %	-0.11 %	-0.11 %	-0.11 %	-0.11 %	-0.10 %	-0.10 %	-0.10 %
5362008	Trondheim Energiverk Nett AS	-0.31 %	-0.25 %	-0.19 %	-0.16 %	-0.15 %	-0.14 %	-0.13 %	-0.13 %	-0.12 %	-0.12 %	-0.12 %
92008	Andøy Energi AS	-0.40 %	-0.32 %	-0.25 %	-0.21 %	-0.19 %	-0.18 %	-0.17 %	-0.16 %	-0.16 %	-0.15 %	-0.15 %
3062008	Valdres Energiverk AS	-0.41 %	-0.35 %	-0.28 %	-0.25 %	-0.23 %	-0.23 %	-0.22 %	-0.21 %	-0.21 %	-0.21 %	-0.20 %
6372008	Narvik Energinett AS	-0.41 %	-0.34 %	-0.26 %	-0.22 %	-0.20 %	-0.18 %	-0.18 %	-0.17 %	-0.16 %	-0.16 %	-0.16 %
6112008	Skagerak Nett AS	-0.47 %	-0.38 %	-0.29 %	-0.25 %	-0.22 %	-0.21 %	-0.20 %	-0.19 %	-0.19 %	-0.18 %	-0.18 %
5742008	Eidsiva Energi Nett AS	-0.52 %	-0.42 %	-0.32 %	-0.27 %	-0.25 %	-0.23 %	-0.22 %	-0.21 %	-0.21 %	-0.20 %	-0.20 %
2492008	Varanger Kraftnett AS	-0.63 %	-0.51 %	-0.39 %	-0.33 %	-0.30 %	-0.28 %	-0.27 %	-0.26 %	-0.25 %	-0.24 %	-0.24 %
2952008	Gudbrandsdal Energi AS	-0.68 %	-0.55 %	-0.42 %	-0.36 %	-0.32 %	-0.30 %	-0.29 %	-0.28 %	-0.27 %	-0.26 %	-0.26 %
5032008	Haugaland Kraft AS	-0.71 %	-0.63 %	-0.54 %	-0.50 %	-0.47 %	-0.46 %	-0.45 %	-0.44 %	-0.43 %	-0.43 %	-0.42 %
1662008	Rissa Kraftlag BA	-0.71 %	-0.58 %	-0.44 %	-0.38 %	-0.34 %	-0.32 %	-0.30 %	-0.29 %	-0.28 %	-0.27 %	-0.27 %
6932008	Ringeriks-Kraft Nett AS	-0.77 %	-0.66 %	-0.54 %	-0.49 %	-0.46 %	-0.44 %	-0.43 %	-0.42 %	-0.42 %	-0.41 %	-0.41 %
1492008	Oppdal Everk AS	-0.77 %	-0.63 %	-0.48 %	-0.41 %	-0.37 %	-0.35 %	-0.33 %	-0.32 %	-0.31 %	-0.30 %	-0.29 %
3112008	Nordmøre Energiverk AS	-0.78 %	-0.72 %	-0.65 %	-0.61 %	-0.59 %	-0.58 %	-0.57 %	-0.57 %	-0.56 %	-0.56 %	-0.55 %
1192008	Gauldal Energi AS	-0.80 %	-0.66 %	-0.50 %	-0.43 %	-0.38 %	-0.36 %	-0.34 %	-0.33 %	-0.32 %	-0.31 %	-0.30 %
6152008	EB Nett AS	-0.84 %	-0.82 %	-0.80 %	-0.79 %	-0.79 %	-0.80 %	-0.80 %	-0.80 %	-0.80 %	-0.80 %	-0.81 %
5782008	Flesberg Elektrisitetsverk AS	-0.95 %	-0.80 %	-0.64 %	-0.56 %	-0.52 %	-0.50 %	-0.48 %	-0.47 %	-0.46 %	-0.45 %	-0.44 %
6992008	Nord-Trøndelag Elektrisitetsverk	-0.96 %	-0.83 %	-0.69 %	-0.62 %	-0.58 %	-0.56 %	-0.55 %	-0.53 %	-0.52 %	-0.51 %	-0.51 %
2272008	Troms Kraft Nett AS	-0.99 %	-0.87 %	-0.75 %	-0.69 %	-0.65 %	-0.63 %	-0.62 %	-0.61 %	-0.60 %	-0.59 %	-0.58 %
652008	Hammerfest Energi Nett AS	-1.05 %	-0.91 %	-0.76 %	-0.69 %	-0.65 %	-0.63 %	-0.61 %	-0.60 %	-0.58 %	-0.57 %	-0.57 %
1352008	Nord-Østerdal Kraftlag AL	-1.21 %	-1.04 %	-0.86 %	-0.77 %	-0.73 %	-0.70 %	-0.68 %	-0.67 %	-0.66 %	-0.65 %	-0.64 %
6242008	Agder Energi Nett AS	-1.33 %	-1.10 %	-0.86 %	-0.74 %	-0.67 %	-0.63 %	-0.60 %	-0.58 %	-0.57 %	-0.55 %	-0.54 %
342008	Dragefossen Kraftanlegg AS	-1.35 %	-1.11 %	-0.85 %	-0.72 %	-0.65 %	-0.61 %	-0.58 %	-0.56 %	-0.54 %	-0.53 %	-0.51 %
372008	Eidefoss AS	-1.37 %	-1.12 %	-0.86 %	-0.73 %	-0.66 %	-0.61 %	-0.59 %	-0.56 %	-0.55 %	-0.53 %	-0.52 %
2752008	Hallingdal Kraftnett AS	-1.40 %	-1.16 %	-0.90 %	-0.77 %	-0.70 %	-0.66 %	-0.64 %	-0.61 %	-0.60 %	-0.58 %	-0.57 %
1322008	Nord-Salten Kraftlag AL	-1.48 %	-1.38 %	-1.27 %	-1.21 %	-1.18 %	-1.16 %	-1.14 %	-1.13 %	-1.12 %	-1.11 %	-1.10 %
5422008	Vokks Nett AS	-1.50 %	-1.39 %	-1.28 %	-1.23 %	-1.20 %	-1.19 %	-1.18 %	-1.18 %	-1.18 %	-1.17 %	-1.17 %
532008	Fosenkraft AS	-1.53 %	-1.44 %	-1.34 %	-1.29 %	-1.25 %	-1.23 %	-1.22 %	-1.21 %	-1.20 %	-1.19 %	-1.18 %
1632008	Kvikne-Rennebu Kraftlag AL	-1.53 %	-1.31 %	-1.07 %	-0.96 %	-0.89 %	-0.86 %	-0.83 %	-0.82 %	-0.80 %	-0.79 %	-0.78 %
862008	Istad Nett AS	-1.58 %	-1.50 %	-1.41 %	-1.36 %	-1.33 %	-1.32 %	-1.30 %	-1.29 %	-1.28 %	-1.27 %	-1.26 %
2152008	TrønderEnergi Nett AS	-1.62 %	-1.49 %	-1.34 %	-1.27 %	-1.22 %	-1.20 %	-1.18 %	-1.16 %	-1.15 %	-1.14 %	-1.13 %
4332008	Hålogaland Kraft AS	-1.67 %	-1.48 %	-1.26 %	-1.16 %	-1.10 %	-1.06 %	-1.04 %	-1.02 %	-1.00 %	-0.99 %	-0.97 %
1532008	Orkdal Energi AS	-1.82 %	-1.49 %	-1.14 %	-0.97 %	-0.87 %	-0.82 %	-0.78 %	-0.75 %	-0.73 %	-0.71 %	-0.69 %
1682008	Rollag Elektrisitetsverk LL	-1.85 %	-1.51 %	-1.16 %	-0.98 %	-0.89 %	-0.83 %	-0.79 %	-0.76 %	-0.74 %	-0.72 %	-0.70 %
1962008	Skånevik Ølen Kraftlag	-1.92 %	-1.68 %	-1.43 %	-1.31 %	-1.24 %	-1.21 %	-1.18 %	-1.16 %	-1.15 %	-1.14 %	-1.13 %
6132008	Nordvest Nett AS	-1.92 %	-1.88 %	-1.84 %	-1.81 %	-1.80 %	-1.79 %	-1.78 %	-1.78 %	-1.77 %	-1.77 %	-1.76 %
1972008	Sognekraft AS	-1.93 %	-1.58 %	-1.21 %	-1.03 %	-0.93 %	-0.87 %	-0.83 %	-0.80 %	-0.77 %	-0.75 %	-0.74 %
4642008	Vesterålskraft Nett AS	-1.93 %	-1.66 %	-1.36 %	-1.22 %	-1.14 %	-1.09 %	-1.06 %	-1.03 %	-1.01 %	-0.99 %	-0.97 %
1642008	Repvåg Kraftlag AL	-1.99 %	-1.84 %	-1.66 %	-1.57 %	-1.52 %	-1.49 %	-1.46 %	-1.44 %	-1.43 %	-1.41 %	-1.40 %
1332008	Nord Troms Kraftlag AS	-2.16 %	-1.97 %	-1.76 %	-1.65 %	-1.59 %	-1.55 %	-1.53 %	-1.51 %	-1.49 %	-1.47 %	-1.46 %
2482008	Vang Energiverk KF	-2.16 %	-1.77 %	-1.35 %	-1.15 %	-1.04 %	-0.97 %	-0.93 %	-0.89 %	-0.86 %	-0.84 %	-0.82 %
3542008	Lofotkraft AS	-2.27 %	-2.04 %	-1.78 %	-1.65 %	-1.58 %	-1.53 %	-1.50 %	-1.48 %	-1.46 %	-1.44 %	-1.42 %
712008	HelgelandsKraft AS	-2.29 %	-2.10 %	-1.90 %	-1.79 %	-1.73 %	-1.69 %	-1.67 %	-1.65 %	-1.63 %	-1.61 %	-1.59 %
2512008	Vest-Telemark Kraftlag AS	-2.33 %	-1.91 %	-1.47 %	-1.25 %	-1.13 %	-1.06 %	-1.02 %	-0.98 %	-0.95 %	-0.92 %	-0.90 %
1382008	Nordkyn Kraftlag AL	-2.34 %	-1.91 %	-1.47 %	-1.25 %	-1.12 %	-1.05 %	-1.01 %	-0.97 %	-0.94 %	-0.91 %	-0.89 %
722008	Hemne kraftlag BA	-2.39 %	-2.04 %	-1.68 %	-1.50 %	-1.40 %	-1.34 %	-1.30 %	-1.26 %	-1.24 %	-1.21 %	-1.19 %
2642008	Øvre Eiker Nett AS	-2.60 %	-2.12 %	-1.63 %	-1.39 %	-1.25 %	-1.17 %	-1.12 %	-1.08 %	-1.04 %	-1.01 %	-0.99 %
1622008	Rauma Energi AS	-2.90 %	-2.38 %	-1.83 %	-1.56 %	-1.41 %	-1.33 %	-1.27 %	-1.22 %	-1.18 %	-1.15 %	-1.12 %
2182008	Sørfold Kraftlag AL	-3.24 %	-2.65 %	-2.04 %	-1.73 %	-1.56 %	-1.47 %	-1.40 %	-1.34 %	-1.30 %	-1.27 %	-1.24 %
2232008	Tinn Energi AS	-3.24 %	-3.03 %	-2.83 %	-2.74 %	-2.70 %	-2.68 %	-2.66 %	-2.66 %	-2.65 %	-2.65 %	-2.65 %
7262008	BE Nett AS	-3.32 %	-3.06 %	-2.77 %	-2.63 %	-2.54 %	-2.49 %	-2.45 %	-2.42 %	-2.39 %	-2.37 %	-2.35 %
4952008	Elverum Energiverk Nett AS	-3.51 %	-3.37 %	-3.26 %	-3.21 %	-3.19 %	-3.18 %	-3.19 %	-3.19 %	-3.19 %	-3.20 %	-3.21 %
5492008	Fortum Distribution AS	-3.55 %	-3.45 %	-3.37 %	-3.33 %	-3.33 %	-3.33 %	-3.34 %	-3.34 %	-3.35 %	-3.36 %	-3.37 %
1732008	Røros Elektrisitetsverk AS	-3.79 %	-3.53 %	-3.28 %	-3.17 %	-3.11 %	-3.08 %	-3.07 %	-3.06 %	-3.05 %	-3.05 %	-3.05 %
3732008	Nore Energi AS	-3.86 %	-3.17 %	-2.43 %	-2.07 %	-1.86 %	-1.75 %	-1.67 %	-1.61 %	-1.55 %	-1.51 %	-1.48 %
5662008	BKK Nett AS	-3.88 %	-3.69 %	-3.51 %	-3.43 %	-3.39 %	-3.38 %	-3.37 %	-3.37 %	-3.37 %	-3.37 %	-3.37 %
5932008	Nesset Kraft AS	-3.89 %	-3.19 %	-2.45 %	-2.09 %	-1.88 %	-1.76 %	-1.68 %	-1.62 %	-1.57 %	-1.52 %	-1.49 %
1572008	Rakkestad Energiverk AS	-3.93 %	-3.65 %	-3.38 %	-3.25 %	-3.19 %	-3.16 %	-3.14 %	-3.13 %	-3.12 %	-3.12 %	-3.12 %
872008	Jondal Energi KF	-4.26 %	-3.77 %	-3.26 %	-3.01 %	-2.88 %	-2.81 %	-2.76 %	-2.73 %	-2.70 %	-2.68 %	-2.66 %
1162008	Meløy Energi AS	-4.38 %	-4.11 %	-3.82 %	-3.68 %	-3.60 %	-3.55 %	-3.52 %	-3.49 %	-3.47 %	-3.45 %	-3.43 %
2132008	Sykkylven Energi AS	-4.50 %	-3.82 %	-3.11 %	-2.76 %	-2.56 %	-2.46 %	-2.38 %	-2.32 %	-2.28 %	-2.24 %	-2.21 %
962008	Kvam Kraftverk AS	-4.84 %	-4.00 %	-3.12 %	-2.68 %	-2.43 %	-2.30 %	-2.20 %	-2.12 %	-2.06 %	-2.01 %	-1.97 %
2742008	Svorka Energi AS	-4.88 %	-4.50 %	-4.13 %	-3.95 %	-3.86 %	-3.82 %	-3.79 %	-3.77 %	-3.76 %	-3.75 %	-3.75 %
5112008	Lyse Nett AS	-5.17 %	-5.01 %	-4.85 %	-4.78 %	-4.75 %	-4.74 %	-4.74 %	-4.74 %	-4.74 %	-4.74 %	-4.74 %
2142008	Sør-Aurdal Energi BA	-5.24 %	-4.30 %	-3.31 %	-2.82 %	-2.54 %	-2.39 %	-2.28 %	-2.19 %	-2.12 %	-2.06 %	-2.02 %
2052008	Stryn Energi AS	-5.67 %	-5.10 %	-4.52 %	-4.24 %	-4.10 %	-4.02 %	-3.97 %	-3.93 %	-3.90 %	-3.88 %	-3.87 %
2332008	Tydal Kommunale Energiverk KF	-5.70 %	-4.68 %	-3.61 %	-3.07 %	-2.77 %	-2.60 %	-2.48 %	-2.38 %	-2.31 %	-2.25 %	-2.20 %
4602008	Tussa Nett AS	-5.73 %	-4.86 %	-3.94 %	-3.48 %	-3.22 %	-3.08 %	-2.97 %	-2.89 %	-2.82 %	-2.76 %	-2.71 %
5992008	Sunndal Energi KF	-5.75 %	-4.72 %	-3.64 %	-3.10 %	-2.79 %	-2.62 %	-2.50 %	-2.40 %	-2.33 %	-2.27 %	-2.22 %
1042008	Luster Energiverk AS	-5.85 %	-4.87 %	-3.83 %	-3.31 %	-3.02 %	-2.86 %	-2.75 %	-2.66 %	-2.59 %	-2.53 %	-2.48 %

			EFC When Industry adds DG:									
ID	Selskap	Original	5MW	10MW	15MW	20MW	25MW	30MW	35MW	40MW	45MW	50MW
6592008	Midt-Telemark Energi AS	-6.14 %	-5.75 %	-5.37 %	-5.19 %	-5.10 %	-5.06 %	-5.03 %	-5.02 %	-5.01 %	-5.00 %	-5.00 %
352008	Drangedal Everk KF	-6.17 %	-5.75 %	-5.32 %	-5.11 %	-5.01 %	-4.95 %	-4.91 %	-4.88 %	-4.86 %	-4.85 %	-4.83 %
522008	Forsand Elverk KF	-6.60 %	-6.13 %	-5.69 %	-5.47 %	-5.37 %	-5.32 %	-5.29 %	-5.27 %	-5.26 %	-5.25 %	-5.25 %
622008	Hadeland Energinett AS	-6.66 %	-6.36 %	-6.10 %	-5.98 %	-5.94 %	-5.92 %	-5.92 %	-5.92 %	-5.93 %	-5.94 %	-5.94 %
4182008	Aurland Energiverk AS	-6.73 %	-5.69 %	-4.60 %	-4.06 %	-3.76 %	-3.60 %	-3.48 %	-3.39 %	-3.32 %	-3.26 %	-3.21 %
3432008	Hemsedal Energi KF	-6.86 %	-6.71 %	-6.61 %	-6.57 %	-6.58 %	-6.59 %	-6.61 %	-6.63 %	-6.65 %	-6.68 %	-6.69 %
562008	Sunnfjord Energi AS	-6.99 %	-5.95 %	-4.84 %	-4.29 %	-3.97 %	-3.80 %	-3.67 %	-3.57 %	-3.49 %	-3.42 %	-3.36 %
72008	Alta Kraftlag AL	-7.22 %	-6.89 %	-6.61 %	-6.48 %	-6.43 %	-6.41 %	-6.41 %	-6.41 %	-6.42 %	-6.42 %	-6.43 %
182008	Ballangen Energi AS	-7.27 %	-6.74 %	-6.20 %	-5.94 %	-5.81 %	-5.73 %	-5.69 %	-5.65 %	-5.62 %	-5.60 %	-5.58 %
1832008	Hjartdal Elverk AS	-7.94 %	-6.77 %	-5.55 %	-4.95 %	-4.61 %	-4.42 %	-4.29 %	-4.19 %	-4.11 %	-4.05 %	-4.00 %
1712008	Rødøy-Lurøy Kraftverk AS	-7.98 %	-7.93 %	-7.80 %	-7.71 %	-7.66 %	-7.62 %	-7.58 %	-7.55 %	-7.51 %	-7.46 %	-7.42 %
5912008	Midt Nett Buskerud AS	-8.04 %	-7.72 %	-7.43 %	-7.31 %	-7.26 %	-7.25 %	-7.25 %	-7.26 %	-7.26 %	-7.28 %	-7.29 %
2382008	Indre Hardanger Kraftlag AS	-8.08 %	-7.52 %	-6.98 %	-6.73 %	-6.60 %	-6.54 %	-6.51 %	-6.49 %	-6.47 %	-6.47 %	-6.46 %
1842008	Selbu Energiverk AS	-8.38 %	-7.76 %	-7.16 %	-6.87 %	-6.73 %	-6.65 %	-6.61 %	-6.59 %	-6.57 %	-6.55 %	-6.54 %
2692008	SFE Nett AS	-8.39 %	-7.50 %	-6.56 %	-6.08 %	-5.82 %	-5.67 %	-5.56 %	-5.48 %	-5.41 %	-5.35 %	-5.30 %
882008	Jæren Everk Komm. f. i Hå	-8.54 %	-8.42 %	-8.36 %	-8.34 %	-8.37 %	-8.40 %	-8.43 %	-8.46 %	-8.50 %	-8.53 %	-8.55 %
1212008	Modalen Kraftlag BA	-8.65 %	-7.13 %	-5.51 %	-4.70 %	-4.24 %	-3.98 %	-3.80 %	-3.66 %	-3.54 %	-3.45 %	-3.37 %
1362008	Norddal Elverk AS	-9.26 %	-7.73 %	-6.12 %	-5.31 %	-4.86 %	-4.61 %	-4.43 %	-4.29 %	-4.18 %	-4.09 %	-4.01 %
1462008	Odda Energi AS	-9.41 %	-8.24 %	-7.03 %	-6.43 %	-6.10 %	-5.92 %	-5.80 %	-5.71 %	-5.63 %	-5.58 %	-5.53 %
972008	Kvinnherad Energi AS	-10.06 %	-8.61 %	-7.07 %	-6.31 %	-5.88 %	-5.64 %	-5.47 %	-5.34 %	-5.24 %	-5.15 %	-5.08 %
2572008	Dalane Energi IKS	-10.22 %	-9.66 %	-9.14 %	-8.90 %	-8.79 %	-8.74 %	-8.72 %	-8.71 %	-8.71 %	-8.71 %	-8.71 %
1032008	Luostejok Kraftlag AL	-11.60 %	-11.46 %	-11.41 %	-11.40 %	-11.44 %	-11.48 %	-11.53 %	-11.58 %	-11.62 %	-11.66 %	-11.70 %
6252008	Voss Energi AS	-11.66 %	-11.38 %	-11.19 %	-11.10 %	-11.10 %	-11.12 %	-11.15 %	-11.18 %	-11.21 %	-11.24 %	-11.27 %
2042008	Stranda Energiverk AS	-13.20 %	-11.06 %	-8.78 %	-7.63 %	-6.97 %	-6.61 %	-6.35 %	-6.15 %	-5.99 %	-5.86 %	-5.75 %
2062008	Suldal Elverk	-13.62 %	-12.46 %	-11.30 %	-10.73 %	-10.43 %	-10.27 %	-10.18 %	-10.11 %	-10.05 %	-10.01 %	-9.98 %
632008	Trollfjord Kraft AS	-13.75 %	-13.45 %	-13.24 %	-13.15 %	-13.16 %	-13.18 %	-13.22 %	-13.26 %	-13.29 %	-13.33 %	-13.37 %
452008	Fitjar Kraftlag BA	-13.83 %	-13.65 %	-13.35 %	-13.17 %	-13.06 %	-12.97 %	-12.91 %	-12.84 %	-12.77 %	-12.70 %	-12.62 %
1062008	Lærdal Energi	-15.49 %	-14.83 %	-14.24 %	-13.97 %	-13.87 %	-13.82 %	-13.82 %	-13.82 %	-13.83 %	-13.85 %	-13.86 %
932008	Kragerø Energi AS	-17.31 %	-16.68 %	-16.04 %	-15.73 %	-15.59 %	-15.51 %	-15.47 %	-15.44 %	-15.42 %	-15.40 %	-15.38 %
4912008	Elkem Energi Bremanger AS	-18.90 %	-18.01 %	-17.18 %	-16.79 %	-16.63 %	-16.56 %	-16.54 %	-16.53 %	-16.53 %	-16.54 %	-16.55 %

30 EFC when Industry adds DG (Non-DG Companies)

			EFC When Industry adds DG:									
ID	Selskap	Original	5MW	10MW	15MW	20MW	25MW	30MW	35MW	40MW	45MW	50MW
422008	Fauske Lysverk AS	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
822008	Hurum Energiverk AS	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
952008	Krødsherad Everk KF	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
1082008	Løvenskiold Fossum Kraft	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
1112008	Malvik Everk AS	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
2622008	Ørskog Energi AS	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
2422008	Uvdal Kraftforsyning AL	-0.01 %	-0.01 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
1022008	Lier Everk AS	-0.01 %	-0.01 %	-0.01 %	-0.01 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %
6142008	Energi 1 Follo-Røyken as	-0.17 %	-0.16 %	-0.15 %	-0.14 %	-0.14 %	-0.14 %	-0.14 %	-0.14 %	-0.13 %	-0.13 %	-0.13 %
842008	Høland og Setskog Elverk	-0.20 %	-0.17 %	-0.13 %	-0.11 %	-0.10 %	-0.09 %	-0.09 %	-0.08 %	-0.08 %	-0.08 %	-0.08 %
462008	Fjelberg Kraftlag	-0.37 %	-0.36 %	-0.36 %	-0.37 %	-0.37 %	-0.37 %	-0.37 %	-0.37 %	-0.37 %	-0.38 %	-0.38 %
2342008	Tysnes Kraftlag PL	-0.44 %	-0.36 %	-0.28 %	-0.24 %	-0.22 %	-0.21 %	-0.20 %	-0.19 %	-0.19 %	-0.18 %	-0.18 %
1942008	Skjåk Energi	-0.46 %	-0.46 %	-0.46 %	-0.46 %	-0.46 %	-0.46 %	-0.47 %	-0.47 %	-0.47 %	-0.47 %	-0.47 %
2672008	Årdal Energi KF	-0.49 %	-0.48 %	-0.48 %	-0.48 %	-0.49 %	-0.49 %	-0.49 %	-0.49 %	-0.50 %	-0.50 %	-0.50 %
2192008	Tafjord Kraftnett AS	-0.53 %	-0.52 %	-0.52 %	-0.51 %	-0.51 %	-0.51 %	-0.51 %	-0.51 %	-0.51 %	-0.52 %	-0.52 %
2312008	Trøgstad Elverk AS	-0.96 %	-0.95 %	-0.95 %	-0.95 %	-0.96 %	-0.96 %	-0.97 %	-0.97 %	-0.98 %	-0.98 %	-0.98 %
222008	Bindal Kraftlag AL	-1.25 %	-1.25 %	-1.24 %	-1.23 %	-1.23 %	-1.22 %	-1.22 %	-1.21 %	-1.21 %	-1.20 %	-1.19 %
552008	Fusa Kraftlag	-1.83 %	-1.76 %	-1.69 %	-1.66 %	-1.65 %	-1.65 %	-1.65 %	-1.65 %	-1.65 %	-1.65 %	-1.66 %
432008	Finnås Kraftlag	-2.09 %	-2.09 %	-2.08 %	-2.07 %	-2.07 %	-2.07 %	-2.06 %	-2.06 %	-2.06 %	-2.05 %	-2.05 %
2102008	Sunnhordland Kraftlag AS	-2.88 %	-2.88 %	-2.87 %	-2.86 %	-2.86 %	-2.86 %	-2.86 %	-2.86 %	-2.86 %	-2.86 %	-2.85 %
232008	Elkem Bjølvefossen AS	-2.95 %	-2.93 %	-2.93 %	-2.94 %	-2.95 %	-2.97 %	-2.98 %	-3.00 %	-3.01 %	-3.02 %	-3.03 %
322008	Fredrikstad Energi Nett AS	-3.89 %	-3.86 %	-3.86 %	-3.86 %	-3.88 %	-3.89 %	-3.91 %	-3.92 %	-3.93 %	-3.94 %	-3.95 %
1472008	Evenes Kraftforsyning AS	-4.48 %	-4.44 %	-4.45 %	-4.45 %	-4.48 %	-4.50 %	-4.52 %	-4.55 %	-4.56 %	-4.58 %	-4.60 %
6692008	Stange Energi Nett AS	-4.48 %	-4.45 %	-4.45 %	-4.46 %	-4.48 %	-4.50 %	-4.53 %	-4.55 %	-4.57 %	-4.59 %	-4.60 %
412008	Etne Elektrisitetslag	-4.53 %	-4.49 %	-4.48 %	-4.49 %	-4.51 %	-4.53 %	-4.55 %	-4.57 %	-4.59 %	-4.61 %	-4.63 %
162008	Austevoll Kraftlag BA	-5.25 %	-5.26 %	-5.22 %	-5.18 %	-5.16 %	-5.14 %	-5.12 %	-5.09 %	-5.07 %	-5.04 %	-5.01 %
1612008	Rauland Kraftforsyningslag	-5.44 %	-5.40 %	-5.40 %	-5.40 %	-5.43 %	-5.45 %	-5.47 %	-5.49 %	-5.51 %	-5.53 %	-5.54 %
142008	Askøy Energi AS	-5.47 %	-5.43 %	-5.43 %	-5.44 %	-5.47 %	-5.50 %	-5.53 %	-5.55 %	-5.58 %	-5.60 %	-5.62 %
2352008	Tyssefaldene Aktieselskabet	-6.26 %	-6.21 %	-6.21 %	-6.22 %	-6.26 %	-6.29 %	-6.32 %	-6.35 %	-6.38 %	-6.40 %	-6.43 %
912008	Klepp Energi AS	-8.15 %	-8.09 %	-8.09 %	-8.11 %	-8.16 %	-8.19 %	-8.23 %	-8.27 %	-8.31 %	-8.34 %	-8.37 %
1812008	Sandøy Energi AS	-12.09 %	-12.12 %	-12.03 %	-11.96 %	-11.91 %	-11.86 %	-11.82 %	-11.77 %	-11.72 %	-11.66 %	-11.60 %
6862008	Yara Norge AS	-19.71 %	-19.57 %	-19.58 %	-19.61 %	-19.71 %	-19.79 %	-19.88 %	-19.97 %	-20.05 %	-20.12 %	-20.19 %

31 DEA Efficiency as Industry adds DG (DG Companies)

		DEA Efficiency as Industry adds DG:										
ID	Selskap	Orig	5MW	10MW	15MW	20MW	25MW	30MW	35MW	40MW	45MW	50MW
1062008	Lærdal Energi	50.61 %	50.27 %	49.95 %	49.64 %	49.30 %	48.91 %	48.38 %	47.86 %	47.35 %	46.86 %	46.38 %
522008	Forsand Elverk KF	54.08 %	52.77 %	51.54 %	50.36 %	49.25 %	48.20 %	47.20 %	46.24 %	45.33 %	44.47 %	43.64 %
1972008	Sognekraft AS	55.12 %	55.27 %	55.42 %	55.56 %	55.66 %	55.66 %	55.64 %	55.62 %	55.56 %	55.50 %	55.44 %
4912008	Elkem Energi Bremanger AS	56.70 %	53.18 %	50.08 %	47.34 %	44.90 %	42.70 %	40.69 %	38.85 %	37.17 %	35.63 %	34.22 %
4182008	Aurland Energiverk AS	58.29 %	57.54 %	56.83 %	56.13 %	55.46 %	54.80 %	54.17 %	53.55 %	52.96 %	52.38 %	51.81 %
5912008	Midt Nett Buskerud AS	61.74 %	61.70 %	61.63 %	61.52 %	61.39 %	61.25 %	61.12 %	60.99 %	60.85 %	60.72 %	60.59 %
1682008	Rollag Elektrisitetsverk LL	64.20 %	62.82 %	61.50 %	60.24 %	59.03 %	57.87 %	56.75 %	55.68 %	54.65 %	53.66 %	52.71 %
3062008	Valdres Energiverk AS	64.43 %	64.27 %	64.10 %	63.94 %	63.78 %	63.62 %	63.46 %	63.30 %	63.14 %	62.98 %	62.83 %
3732008	Nore Energi AS	66.23 %	65.36 %	64.51 %	63.68 %	62.88 %	62.11 %	61.36 %	60.63 %	59.93 %	59.24 %	58.57 %
932008	Kragerø Energi AS	67.19 %	66.82 %	66.46 %	66.10 %	65.75 %	65.40 %	65.06 %	64.71 %	64.38 %	64.04 %	63.71 %
1832008	Hjartdal Elverk AS	67.64 %	67.12 %	66.61 %	66.12 %	65.66 %	64.50 %	63.36 %	62.26 %	61.20 %	60.17 %	59.18 %
1842008	Selbu Energiverk AS	67.71 %	67.23 %	66.77 %	66.31 %	65.87 %	65.42 %	64.80 %	64.20 %	63.61 %	63.03 %	62.47 %
5992008	Sunndal Energi KF	67.94 %	68.09 %	68.19 %	68.27 %	68.34 %	68.40 %	68.47 %	68.45 %	68.10 %	67.69 %	67.30 %
3542008	Lofotkraft AS	68.29 %	68.98 %	69.66 %	70.24 %	70.83 %	71.41 %	71.99 %	72.57 %	73.14 %	73.72 %	74.28 %
2232008	Tinn Energi AS	68.31 %	68.35 %	68.39 %	68.43 %	68.47 %	68.50 %	68.54 %	68.57 %	68.23 %	67.90 %	67.58 %
4642008	Vesterålskraft Nett AS	68.40 %	69.11 %	69.82 %	70.52 %	71.22 %	71.91 %	72.59 %	73.14 %	73.62 %	74.06 %	74.48 %
1382008	Nordkyn Kraftlag AL	68.88 %	69.32 %	69.09 %	68.87 %	68.65 %	68.44 %	68.24 %	68.04 %	67.84 %	67.65 %	67.46 %
2572008	Dalane Energi IKS	69.01 %	69.24 %	69.48 %	69.71 %	69.94 %	70.16 %	70.11 %	70.03 %	69.95 %	69.87 %	69.78 %
1642008	Repvåg Kraftlag AL	69.28 %	70.24 %	70.47 %	70.70 %	70.92 %	71.14 %	71.36 %	71.57 %	71.78 %	71.99 %	72.20 %
342008	Dragefossen Kraftanlegg AS	69.72 %	69.36 %	69.01 %	68.67 %	68.34 %	67.97 %	67.40 %	66.83 %	66.28 %	65.72 %	65.17 %
2142008	Sør-Aurdal Energi BA	70.19 %	69.41 %	68.64 %	67.89 %	67.16 %	66.45 %	65.75 %	65.07 %	64.40 %	63.75 %	63.11 %
1032008	Luostejok Kraftlag AL	71.15 %	71.02 %	70.89 %	70.76 %	70.64 %	70.51 %	70.39 %	70.27 %	70.15 %	70.03 %	69.92 %
5032008	Haugaland Kraft AS	71.83 %	71.95 %	72.07 %	72.19 %	72.31 %	72.43 %	72.54 %	72.62 %	72.70 %	72.77 %	72.85 %
2692008	SFE Nett AS	71.84 %	72.15 %	72.47 %	72.78 %	73.08 %	73.33 %	73.58 %	73.83 %	74.08 %	74.33 %	74.58 %
6252008	Voss Energi AS	71.88 %	71.90 %	71.92 %	71.94 %	71.92 %	71.86 %	71.73 %	71.59 %	71.40 %	71.17 %	70.94 %
452008	Fitjar Kraftlag BA	72.01 %	71.47 %	70.95 %	70.44 %	69.88 %	69.24 %	68.60 %	67.98 %	67.37 %	66.77 %	66.16 %
2132008	Sykkylven Energi AS	72.28 %	71.79 %	71.28 %	70.78 %	70.13 %	69.49 %	68.85 %	68.22 %	67.56 %	66.91 %	66.28 %
2482008	Vang Energiverk KF	72.43 %	71.94 %	71.27 %	70.62 %	69.96 %	69.29 %	68.62 %	67.98 %	67.35 %	66.74 %	66.15 %
872008	Jondal Energi KF	72.64 %	70.25 %	68.02 %	65.94 %	64.00 %	62.17 %	60.46 %	58.85 %	57.32 %	55.89 %	54.53 %
72008	Alta Kraftlag AL	72.83 %	73.13 %	73.43 %	73.72 %	74.02 %	74.31 %	74.60 %	74.89 %	75.14 %	75.28 %	75.28 %
6112008	Skagerak Nett AS	73.02 %	73.02 %	73.02 %	73.02 %	73.02 %	73.01 %	73.00 %	72.99 %	72.98 %	72.98 %	72.97 %
722008	Hemne kraftlag BA	75.00 %	74.94 %	74.88 %	74.82 %	74.76 %	74.70 %	74.65 %	74.59 %	74.37 %	74.09 %	73.83 %
6242008	Agder Energi Nett AS	75.30 %	75.34 %	75.38 %	75.42 %	75.46 %	75.50 %	75.54 %	75.55 %	75.57 %	75.59 %	75.61 %
2642008	Øvre Eiker Nett AS	75.56 %	75.14 %	74.72 %	74.30 %	73.89 %	73.49 %	73.09 %	72.69 %	72.30 %	71.91 %	71.52 %
5662008	BKK Nett AS	75.91 %	76.04 %	76.18 %	76.31 %	76.44 %	76.57 %	76.70 %	76.82 %	76.94 %	77.06 %	77.18 %
1662008	Rissa Kraftlag BA	76.44 %	75.54 %	74.66 %	73.81 %	72.98 %	72.17 %	71.38 %	70.61 %	69.86 %	69.12 %	68.41 %
562008	Sunnfjord Energi AS	76.59 %	76.89 %	77.15 %	77.37 %	77.56 %	77.74 %	77.75 %	77.73 %	77.69 %	77.64 %	77.59 %
2062008	Suldal Elverk	77.23 %	77.29 %	77.34 %	77.39 %	77.44 %	77.49 %	77.54 %	77.59 %	77.63 %	77.58 %	77.41 %
352008	Drangedal Everk KF	77.35 %	76.63 %	75.92 %	75.23 %	74.55 %	73.88 %	73.19 %	72.52 %	71.86 %	71.22 %	70.59 %
4602008	Tussa Nett AS	77.46 %	77.75 %	78.03 %	78.32 %	78.51 %	78.49 %	78.46 %	78.44 %	78.42 %	78.39 %	78.37 %
1362008	Norddal Elverk AS	77.81 %	78.27 %	77.34 %	76.46 %	75.61 %	74.80 %	74.02 %	73.27 %	72.55 %	71.77 %	70.71 %
6592008	Midt-Telemark Energi AS	77.83 %	77.50 %	77.18 %	76.86 %	76.50 %	76.15 %	75.79 %	75.45 %	75.10 %	74.76 %	74.42 %
6372008	Narvik Energinett AS	77.91 %	77.97 %	78.03 %	78.09 %	78.14 %	78.20 %	78.14 %	77.85 %	77.56 %	77.28 %	77.00 %
2152008	TrønderEnergi Nett AS	77.99 %	78.42 %	78.79 %	79.13 %	79.46 %	79.80 %	79.93 %	80.04 %	80.15 %	80.27 %	80.38 %
2742008	Svorka Energi AS	78.18 %	78.08 %	77.98 %	77.89 %	77.79 %	77.70 %	77.60 %	77.51 %	77.37 %	77.19 %	77.02 %
6932008	Ringeriks-Kraft Nett AS	78.30 %	78.10 %	77.90 %	77.70 %	77.50 %	77.30 %	77.11 %	76.91 %	76.72 %	76.52 %	76.33 %
622008	Hadeland Energinett AS	79.40 %	79.17 %	78.94 %	78.71 %	78.48 %	78.26 %	78.03 %	77.81 %	77.58 %	77.36 %	77.14 %
712008	HelgelandsKraft AS	79.92 %	80.73 %	81.53 %	82.33 %	83.11 %	83.84 %	84.57 %	85.25 %	85.81 %	86.33 %	86.57 %
2952008	Gudbrandsdal Energi AS	80.49 %	80.41 %	80.33 %	80.25 %	80.16 %	80.08 %	80.00 %	79.78 %	79.53 %	79.28 %	79.04 %
1572008	Rakkestad Energiverk AS	80.81 %	80.05 %	79.30 %	78.57 %	77.86 %	77.16 %	76.47 %	75.79 %	75.13 %	74.47 %	73.83 %
4952008	Elverum Energiverk Nett AS	81.30 %	81.19 %	81.08 %	80.97 %	80.87 %	80.75 %	80.47 %	80.17 %	79.87 %	79.58 %	79.29 %
1962008	Skånevik Ølen Kraftlag	81.67 %	80.85 %	79.98 %	79.14 %	78.32 %	77.43 %	76.56 %	75.71 %	74.89 %	74.08 %	73.29 %
2492008	Varanger Kraftnett AS	82.29 %	82.97 %	83.59 %	84.21 %	84.70 %	85.12 %	85.55 %	85.97 %	86.39 %	86.80 %	86.93 %
3432008	Hemsedal Energi KF	82.52 %	81.73 %	80.96 %	80.21 %	79.47 %	78.75 %	78.04 %	77.35 %	76.67 %	76.01 %	75.36 %
5492008	Fortum Distribution AS	83.22 %	83.30 %	83.39 %	83.48 %	83.56 %	83.59 %	83.59 %	83.58 %	83.58 %	83.58 %	83.57 %
962008	Kvam Kraftverk AS	84.36 %	83.77 %	83.19 %	82.61 %	82.05 %	81.50 %	80.96 %	80.43 %	79.82 %	79.23 %	78.64 %
1462008	Odda Energi AS	84.51 %	84.59 %	84.58 %	84.52 %	84.04 %	83.58 %	83.12 %	82.68 %	82.24 %	81.81 %	81.38 %
882008	Jæren Everk Komm. f. i Hå	84.67 %	84.14 %	83.60 %	83.06 %	82.53 %	82.00 %	81.49 %	80.98 %	80.48 %	79.98 %	79.49 %
652008	Hammerfest Energi Nett AS	84.88 %	85.66 %	86.42 %	87.18 %	87.93 %	88.67 %	89.41 %	90.13 %	90.75 %	91.26 %	91.39 %
3112008	Nordmøre Energiverk AS	86.12 %	86.87 %	87.61 %	88.35 %	89.08 %	89.81 %	90.54 %	91.19 %	91.72 %	92.25 %	92.77 %
5422008	Vokks Nett AS	86.37 %	86.50 %	86.62 %	86.70 %	86.77 %	86.84 %	86.91 %	86.94 %	86.91 %	86.76 %	86.61 %
2752008	Hallingdal Kraftnett AS	86.45 %	86.45 %	86.45 %	86.45 %	86.45 %	86.45 %	86.44 %	86.39 %	86.22 %	86.05 %	85.86 %
2182008	Sørfold Kraftlag AL	86.61 %	85.62 %	84.65 %	83.66 %	82.70 %	81.79 %	80.92 %	80.08 %	79.28 %	78.23 %	77.14 %
6152008	EB Nett AS	87.75 %	87.67 %	87.59 %	87.51 %	87.43 %	87.35 %	87.27 %	87.19 %	87.12 %	87.04 %	86.96 %
5782008	Flesberg Elektrisitetsverk AS	87.81 %	87.33 %	86.87 %	86.39 %	85.92 %	84.74 %	83.57 %	82.43 %	81.32 %	80.25 %	79.20 %
1532008	Orkdal Energi AS	87.99 %	87.56 %	87.13 %	86.70 %	86.07 %	85.44 %	84.82 %	84.21 %	83.62 %	83.03 %	82.41 %
532008	Fosenkraft AS	88.03 %	87.74 %	87.42 %	87.11 %	86.80 %	86.50 %	86.20 %	85.91 %	85.62 %	85.33 %	85.05 %
1732008	Røros Elektrisitetsverk AS	88.98 %	89.15 %	88.76 %	88.38 %	88.00 %	87.63 %	87.27 %	86.91 %	86.56 %	86.19 %	85.69 %

		DEA Efficiency as Industry adds DG:										
ID	Selskap	Orig	5MW	10MW	15MW	20MW	25MW	30MW	35MW	40MW	45MW	50MW
1492008	Oppdal Everk AS	89.67 %	89.73 %	89.27 %	88.83 %	88.40 %	87.97 %	87.55 %	87.14 %	86.73 %	86.28 %	85.66 %
2512008	Vest-Telemark Kraftlag AS	89.83 %	90.04 %	90.26 %	90.47 %	90.68 %	90.89 %	91.10 %	91.30 %	91.51 %	91.63 %	91.66 %
2052008	Stryn Energi AS	90.31 %	90.13 %	89.94 %	89.74 %	89.31 %	88.77 %	88.24 %	87.72 %	87.21 %	86.68 %	86.15 %
972008	Kvinnherad Energi AS	90.50 %	90.19 %	89.88 %	89.58 %	89.28 %	88.96 %	88.64 %	88.31 %	87.91 %	87.51 %	87.08 %
4332008	Hålogaland Kraft AS	91.23 %	91.93 %	92.62 %	93.31 %	93.96 %	94.60 %	95.15 %	95.62 %	96.07 %	96.53 %	96.98 %
1192008	Gauldal Energi AS	92.25 %	91.64 %	91.04 %	90.46 %	89.88 %	89.32 %	88.77 %	88.18 %	87.61 %	87.05 %	86.49 %
1332008	Nord Troms Kraftlag AS	93.17 %	93.52 %	93.87 %	94.21 %	94.55 %	94.89 %	95.22 %	95.35 %	95.43 %	95.52 %	95.61 %
7262008	BE Nett AS	93.35 %	93.62 %	93.88 %	94.08 %	94.19 %	94.30 %	94.41 %	94.52 %	94.62 %	94.73 %	94.84 %
5742008	Eidsiva Energi Nett AS	93.74 %	93.71 %	93.68 %	93.65 %	93.62 %	93.60 %	93.57 %	93.54 %	93.51 %	93.48 %	93.45 %
1622008	Rauma Energi AS	93.87 %	94.06 %	94.24 %	94.42 %	94.38 %	94.19 %	94.00 %	93.66 %	93.27 %	92.82 %	92.39 %
862008	Istad Nett AS	94.08 %	94.15 %	94.23 %	94.30 %	94.37 %	94.43 %	94.48 %	94.52 %	94.56 %	94.60 %	94.62 %
1632008	Kvikne-Rennebu Kraftlag AL	95.04 %	94.22 %	93.43 %	92.65 %	91.89 %	91.16 %	90.43 %	89.73 %	89.04 %	88.37 %	87.71 %
1162008	Meløy Energi AS	95.52 %	95.36 %	95.07 %	94.78 %	94.50 %	94.21 %	93.91 %	93.61 %	93.32 %	93.04 %	92.75 %
6752008	Hafslund Nett AS	96.39 %	96.44 %	96.49 %	96.54 %	96.59 %	96.64 %	96.69 %	96.74 %	96.79 %	96.84 %	96.89 %
2272008	Troms Kraft Nett AS	97.16 %	98.10 %	99.04 %	99.97 %	100.89 %	101.82 %	102.74 %	103.65 %	104.56 %	105.40 %	106.24 %
182008	Ballangen Energi AS	97.79 %	98.00 %	97.26 %	96.55 %	95.85 %	95.17 %	94.44 %	93.72 %	93.02 %	92.34 %	91.68 %
632008	Trollfjord Kraft AS	98.70 %	99.22 %	99.73 %	100.24 %	100.74 %	101.23 %	101.71 %	102.19 %	102.55 %	102.63 %	102.71 %
5112008	Lyse Nett AS	99.27 %	99.26 %	99.25 %	99.24 %	99.22 %	99.19 %	99.17 %	99.14 %	99.12 %	99.09 %	99.07 %
2382008	Indre Hardanger Kraftlag AS	99.88 %	100.82 %	101.44 %	102.05 %	102.64 %	103.19 %	103.65 %	104.08 %	104.47 %	104.75 %	105.02 %
372008	Eidefoss AS	100.15 %	100.11 %	100.07 %	100.03 %	99.99 %	99.95 %	99.89 %	99.82 %	99.75 %	99.69 %	99.61 %
6132008	Nordvest Nett AS	100.96 %	101.24 %	101.52 %	101.79 %	102.06 %	102.32 %	102.57 %	102.81 %	103.05 %	103.28 %	103.51 %
1042008	Luster Energiverk AS	103.06 %	103.09 %	102.77 %	102.46 %	102.15 %	101.75 %	101.33 %	100.71 %	100.01 %	99.34 %	98.68 %
1352008	Nord-Østerdal Kraftlag AL	104.88 %	104.91 %	104.92 %	104.92 %	104.93 %	104.94 %	104.95 %	104.86 %	104.70 %	104.54 %	104.38 %
6992008	Nord-Trøndelag Elektrisitetsv	107.55 %	108.15 %	108.76 %	109.36 %	109.96 %	110.53 %	111.07 %	111.61 %	111.80 %	111.88 %	111.96 %
1212008	Modalen Kraftlag BA	108.18 %	99.29 %	91.85 %	85.52 %	80.05 %	75.29 %	71.12 %	67.43 %	64.14 %	61.19 %	58.53 %
2042008	Stranda Energiverk AS	108.98 %	108.38 %	107.79 %	107.14 %	106.02 %	104.92 %	103.84 %	102.79 %	101.76 %	100.76 %	99.77 %
2332008	Tydal Kommunale Energiverk	110.01 %	108.73 %	105.69 %	102.81 %	100.08 %	97.49 %	95.04 %	92.70 %	90.48 %	88.36 %	86.34 %
5932008	Nesset Kraft AS	115.75 %	115.17 %	114.60 %	114.02 %	113.46 %	112.59 %	111.41 %	110.27 %	109.16 %	108.08 %	107.04 %
1322008	Nord-Salten Kraftlag AL	118.71 %	119.72 %	120.71 %	121.69 %	122.65 %	123.59 %	124.52 %	125.45 %	126.36 %	127.25 %	128.14 %
5362008	Trondheim Energiverk Nett AS	121.69 %	121.57 %	121.46 %	121.34 %	121.23 %	121.11 %	121.00 %	120.88 %	120.77 %	120.66 %	120.54 %
92008	Andøy Energi AS	128.13 %	126.92 %	125.73 %	124.59 %	123.48 %	122.40 %	121.35 %	120.33 %	119.34 %	118.37 %	117.43 %
1712008	Rødøy-Lurøy Kraftverk AS	133.77 %	133.60 %	133.42 %	133.25 %	133.08 %	132.91 %	132.75 %	132.58 %	132.42 %	132.26 %	132.11 %

32 DEA Efficiency as Industry adds DG (Non-DG Companies)

		DEA Efficiency as Industry adds DG:										
ID	Selskap	Orig	5MW	10MW	15MW	20MW	25MW	30MW	35MW	40MW	45MW	50MW
1082008	Løvenskiold Fossum Kraft	40.91 %	41.10 %	41.28 %	41.47 %	41.66 %	41.85 %	42.04 %	42.22 %	42.41 %	42.60 %	42.79 %
1812008	Sandøy Energi AS	51.19 %	51.66 %	52.12 %	52.59 %	53.05 %	53.52 %	53.98 %	54.45 %	54.91 %	55.38 %	55.84 %
2102008	Sunnhordland Kraftlag AS	56.15 %	56.20 %	56.26 %	56.31 %	56.37 %	56.42 %	56.48 %	56.54 %	56.59 %	56.63 %	56.65 %
1472008	Evenes Kraftforsyning AS	58.37 %	58.93 %	59.47 %	59.95 %	60.43 %	60.91 %	61.39 %	61.86 %	62.26 %	62.66 %	63.07 %
1112008	Malvik Everk AS	61.55 %	61.60 %	61.65 %	61.70 %	61.75 %	61.79 %	61.84 %	61.89 %	61.94 %	61.99 %	62.04 %
2672008	Årdal Energi KF	64.09 %	64.48 %	64.88 %	65.27 %	65.67 %	65.91 %	66.08 %	66.25 %	66.42 %	66.59 %	66.75 %
422008	Fauske Lysverk AS	64.19 %	64.60 %	65.01 %	65.42 %	65.83 %	66.18 %	66.35 %	66.51 %	66.67 %	66.84 %	67.00 %
1942008	Skjåk Energi	66.38 %	66.68 %	66.97 %	67.26 %	67.56 %	67.85 %	68.15 %	68.44 %	68.73 %	69.03 %	69.32 %
842008	Høland og Setskog Elverk	68.81 %	69.04 %	69.28 %	69.52 %	69.76 %	69.96 %	70.05 %	70.13 %	70.22 %	70.30 %	70.38 %
412008	Etne Elektrisitetslag	69.12 %	69.28 %	69.45 %	69.61 %	69.78 %	69.94 %	70.10 %	70.27 %	70.43 %	70.60 %	70.76 %
462008	Fjelberg Kraftlag	70.87 %	71.34 %	71.81 %	72.02 %	72.23 %	72.43 %	72.63 %	72.79 %	72.95 %	73.11 %	73.24 %
2192008	Tafjord Kraftnett AS	73.91 %	74.28 %	74.65 %	74.99 %	75.19 %	75.39 %	75.59 %	75.78 %	75.93 %	76.08 %	76.23 %
222008	Bindal Kraftlag AL	74.31 %	75.13 %	75.96 %	76.78 %	77.50 %	78.21 %	78.88 %	79.53 %	80.18 %	80.83 %	81.48 %
552008	Fusa Kraftlag	76.61 %	76.72 %	76.83 %	76.93 %	77.04 %	77.14 %	77.25 %	77.35 %	77.46 %	77.56 %	77.62 %
2422008	Uvdal Kraftforsyning AL	77.78 %	78.77 %	79.77 %	80.77 %	81.77 %	81.80 %	81.80 %	81.80 %	81.80 %	81.80 %	81.80 %
822008	Hurum Energiverk AS	79.93 %	80.01 %	80.05 %	80.05 %	80.06 %	80.06 %	80.06 %	80.07 %	80.07 %	80.08 %	80.08 %
6692008	Stange Energi Nett AS	80.35 %	80.35 %	80.35 %	80.35 %	80.35 %	80.35 %	80.35 %	80.35 %	80.35 %	80.35 %	80.35 %
1612008	Rauland Kraftforsyningslag	91.30 %	96.03 %	97.92 %	99.81 %	101.70 %	102.94 %	103.31 %	103.69 %	104.06 %	104.44 %	104.81 %
432008	Finnås Kraftlag	93.14 %	93.38 %	93.61 %	93.85 %	94.09 %	94.32 %	94.56 %	94.76 %	94.92 %	95.08 %	95.24 %
232008	Elkem Bjølvefossen AS	93.38 %	93.53 %	93.65 %	93.76 %	93.86 %	93.91 %	93.97 %	94.02 %	94.07 %	94.13 %	94.16 %
1022008	Lier Everk AS	93.50 %	93.50 %	93.51 %	93.51 %	93.52 %	93.53 %	93.53 %	93.54 %	93.54 %	93.55 %	93.56 %
142008	Askøy Energi AS	95.30 %	95.71 %	96.12 %	96.53 %	96.94 %	97.35 %	97.76 %	98.02 %	98.05 %	98.09 %	98.12 %
162008	Austevoll Kraftlag BA	104.92 %	105.70 %	106.48 %	107.26 %	108.05 %	108.74 %	109.36 %	109.97 %	110.58 %	111.16 %	111.75 %
2312008	Trøgstad Elverk AS	105.73 %	105.77 %	105.81 %	105.86 %	105.90 %	105.95 %	105.99 %	106.03 %	106.08 %	106.12 %	106.17 %
322008	Fredrikstad Energi Nett AS	106.66 %	106.72 %	106.77 %	106.83 %	106.87 %	106.90 %	106.93 %	106.97 %	107.00 %	107.04 %	107.07 %
912008	Klepp Energi AS	108.65 %	108.72 %	108.80 %	108.87 %	108.94 %	109.00 %	109.06 %	109.12 %	109.17 %	109.23 %	109.29 %
2622008	Ørskog Energi AS	109.79 %	110.31 %	110.83 %	111.34 %	111.86 %	112.36 %	112.49 %	112.61 %	112.74 %	112.86 %	112.99 %
6142008	Energi 1 Follo-Røyken as	111.43 %	111.51 %	111.60 %	111.68 %	111.77 %	111.86 %	111.94 %	112.03 %	112.12 %	112.20 %	112.29 %
2342008	Tysnes Kraftlag PL	144.75 %	145.01 %	145.26 %	145.51 %	145.76 %	146.01 %	146.26 %	146.51 %	146.51 %	146.51 %	146.51 %
952008	Krødsherad Everk KF	153.64 %	155.04 %	156.45 %	157.85 %	159.25 %	160.66 %	162.06 %	163.47 %	164.87 %	166.27 %	167.27 %

33 Total DEA Efficiency before Calibration (DG Companies)

			DG Companies add:									
ID	Company	Original	5MW	10MW	15MW	20MW	25MW	30MW	35MW	40MW	45MW	50MW
1972008	Sognekraft AS	57.05 %	56.70 %	56.33 %	56.15 %	56.05 %	55.99 %	55.95 %	55.92 %	55.89 %	55.87 %	55.86 %
522008	Forsand Elverk KF	60.68 %	60.21 %	59.77 %	59.55 %	59.45 %	59.40 %	59.37 %	59.35 %	59.34 %	59.33 %	59.33 %
3062008	Valdres Energiverk AS	64.84 %	64.78 %	64.71 %	64.68 %	64.66 %	64.66 %	64.65 %	64.64 %	64.64 %	64.64 %	64.63 %
4182008	Aurland Energiverk AS	65.02 %	63.98 %	62.89 %	62.35 %	62.05 %	61.89 %	61.77 %	61.68 %	61.61 %	61.55 %	61.50 %
1682008	Rollag Elektrisitetsverk LL	66.05 %	65.71 %	65.36 %	65.18 %	65.09 %	65.03 %	64.99 %	64.96 %	64.94 %	64.92 %	64.90 %
1062008	Lærdal Energi	66.10 %	65.44 %	64.85 %	64.58 %	64.48 %	64.43 %	64.43 %	64.43 %	64.44 %	64.46 %	64.47 %
5912008	Midt Nett Buskerud AS	69.78 %	69.46 %	69.17 %	69.05 %	69.00 %	68.99 %	68.99 %	69.00 %	69.00 %	69.02 %	69.03 %
3732008	Nore Energi AS	70.09 %	69.40 %	68.66 %	68.30 %	68.09 %	67.98 %	67.90 %	67.84 %	67.78 %	67.74 %	67.71 %
4642008	Vesterålskraft Nett AS	70.33 %	70.06 %	69.76 %	69.62 %	69.54 %	69.49 %	69.46 %	69.43 %	69.41 %	69.39 %	69.37 %
3542008	Lofotkraft AS	70.56 %	70.33 %	70.07 %	69.94 %	69.87 %	69.82 %	69.79 %	69.77 %	69.75 %	69.73 %	69.71 %
342008	Dragefossen Kraftanlegg AS	71.07 %	70.83 %	70.57 %	70.44 %	70.37 %	70.33 %	70.30 %	70.28 %	70.26 %	70.25 %	70.23 %
1382008	Nordkyn Kraftlag AL	71.22 %	70.79 %	70.35 %	70.13 %	70.00 %	69.93 %	69.89 %	69.85 %	69.82 %	69.79 %	69.77 %
1642008	Repvåg Kraftlag AL	71.27 %	71.12 %	70.94 %	70.85 %	70.80 %	70.77 %	70.74 %	70.72 %	70.71 %	70.69 %	70.68 %
2232008	Tinn Energi AS	71.55 %	71.34 %	71.14 %	71.05 %	71.01 %	70.99 %	70.97 %	70.97 %	70.96 %	70.96 %	70.96 %
5032008	Haugaland Kraft AS	72.54 %	72.46 %	72.37 %	72.33 %	72.30 %	72.29 %	72.28 %	72.27 %	72.26 %	72.26 %	72.25 %
6112008	Skagerak Nett AS	73.49 %	73.40 %	73.31 %	73.27 %	73.24 %	73.23 %	73.22 %	73.21 %	73.21 %	73.20 %	73.20 %
5992008	Sunndal Energi KF	73.69 %	72.66 %	71.58 %	71.04 %	70.73 %	70.56 %	70.44 %	70.34 %	70.27 %	70.21 %	70.16 %
2482008	Vang Energiverk KF	74.59 %	74.20 %	73.78 %	73.58 %	73.47 %	73.40 %	73.36 %	73.32 %	73.29 %	73.27 %	73.25 %
2142008	Sør-Aurdal Energi BA	75.43 %	74.49 %	73.50 %	73.01 %	72.73 %	72.58 %	72.47 %	72.38 %	72.31 %	72.25 %	72.21 %
1832008	Hjartdal Elverk AS	75.58 %	74.41 %	73.19 %	72.59 %	72.25 %	72.06 %	71.93 %	71.83 %	71.75 %	71.69 %	71.64 %
4912008	Elkem Energi Bremanger AS	75.60 %	74.71 %	73.88 %	73.49 %	73.33 %	73.26 %	73.24 %	73.23 %	73.23 %	73.24 %	73.25 %
1842008	Selbu Energiverk AS	76.09 %	75.47 %	74.87 %	74.58 %	74.44 %	74.36 %	74.32 %	74.30 %	74.28 %	74.26 %	74.25 %
6242008	Agder Energi Nett AS	76.63 %	76.40 %	76.16 %	76.04 %	75.97 %	75.93 %	75.90 %	75.88 %	75.87 %	75.85 %	75.84 %
2132008	Sykkylven Energi AS	76.78 %	76.10 %	75.39 %	75.04 %	74.84 %	74.74 %	74.66 %	74.60 %	74.56 %	74.52 %	74.49 %
872008	Jondal Energi KF	76.90 %	76.41 %	75.90 %	75.65 %	75.52 %	75.45 %	75.40 %	75.37 %	75.34 %	75.32 %	75.30 %
1662008	Rissa Kraftlag BA	77.15 %	77.02 %	76.88 %	76.82 %	76.78 %	76.76 %	76.74 %	76.73 %	76.72 %	76.71 %	76.71 %
722008	Hemne kraftlag BA	77.39 %	77.04 %	76.68 %	76.50 %	76.40 %	76.34 %	76.30 %	76.26 %	76.24 %	76.21 %	76.19 %
2642008	Øvre Eiker Nett AS	78.16 %	77.68 %	77.19 %	76.95 %	76.81 %	76.73 %	76.68 %	76.64 %	76.60 %	76.57 %	76.55 %
6372008	Narvik Energinett AS	78.32 %	78.25 %	78.17 %	78.13 %	78.11 %	78.09 %	78.09 %	78.08 %	78.07 %	78.07 %	78.07 %
6932008	Ringeriks-Kraft Nett AS	79.07 %	78.96 %	78.84 %	78.79 %	78.76 %	78.74 %	78.73 %	78.72 %	78.72 %	78.71 %	78.71 %
2572008	Dalane Energi IKS	79.23 %	78.67 %	78.15 %	77.91 %	77.80 %	77.75 %	77.73 %	77.72 %	77.72 %	77.72 %	77.72 %
2152008	TrønderEnergi Nett AS	79.61 %	79.48 %	79.33 %	79.26 %	79.21 %	79.19 %	79.17 %	79.15 %	79.14 %	79.13 %	79.12 %
5662008	BKK Nett AS	79.79 %	79.60 %	79.42 %	79.34 %	79.30 %	79.29 %	79.28 %	79.28 %	79.28 %	79.28 %	79.28 %
72008	Alta Kraftlag AL	80.05 %	79.72 %	79.44 %	79.31 %	79.26 %	79.24 %	79.24 %	79.24 %	79.25 %	79.25 %	79.26 %
2692008	SFE Nett AS	80.23 %	79.34 %	78.40 %	77.92 %	77.66 %	77.51 %	77.40 %	77.32 %	77.25 %	77.19 %	77.14 %
2952008	Gudbrandsdal Energi AS	81.17 %	81.04 %	80.91 %	80.85 %	80.81 %	80.79 %	80.78 %	80.77 %	80.76 %	80.75 %	80.75 %
712008	HelgelandsKraft AS	82.21 %	82.02 %	81.82 %	81.71 %	81.65 %	81.61 %	81.59 %	81.57 %	81.55 %	81.53 %	81.51 %
1032008	Luostejok Kraftlag AL	82.75 %	82.61 %	82.56 %	82.55 %	82.59 %	82.63 %	82.68 %	82.73 %	82.77 %	82.81 %	82.85 %
2492008	Varanger Kraftnett AS	82.92 %	82.80 %	82.68 %	82.62 %	82.59 %	82.57 %	82.56 %	82.55 %	82.54 %	82.53 %	82.53 %
2742008	Svorka Energi AS	83.06 %	82.68 %	82.31 %	82.13 %	82.04 %	82.00 %	81.97 %	81.95 %	81.94 %	81.93 %	81.93 %
4602008	Tussa Nett AS	83.19 %	82.32 %	81.40 %	80.94 %	80.68 %	80.54 %	80.43 %	80.35 %	80.28 %	80.22 %	80.17 %
352008	Drangedal Everk KF	83.52 %	83.10 %	82.67 %	82.46 %	82.36 %	82.30 %	82.26 %	82.23 %	82.21 %	82.20 %	82.18 %
6252008	Voss Energi AS	83.54 %	83.26 %	83.07 %	82.98 %	82.98 %	83.00 %	83.03 %	83.06 %	83.09 %	83.12 %	83.15 %
562008	Sunnfjord Energi AS	83.58 %	82.54 %	81.43 %	80.88 %	80.56 %	80.39 %	80.26 %	80.16 %	80.08 %	80.01 %	79.95 %
1962008	Skånevik Ølen Kraftlag	83.59 %	83.35 %	83.10 %	82.98 %	82.91 %	82.88 %	82.85 %	82.83 %	82.82 %	82.81 %	82.80 %
6592008	Midt-Telemark Energi AS	83.97 %	83.58 %	83.20 %	83.02 %	82.93 %	82.89 %	82.86 %	82.85 %	82.84 %	82.83 %	82.83 %
932008	Kragerø Energi AS	84.50 %	83.87 %	83.23 %	82.92 %	82.78 %	82.70 %	82.66 %	82.63 %	82.61 %	82.59 %	82.57 %
1572008	Rakkestad Energiverk AS	84.74 %	84.46 %	84.19 %	84.06 %	84.00 %	83.97 %	83.95 %	83.94 %	83.93 %	83.93 %	83.93 %
4952008	Elverum Energiverk Nett AS	84.81 %	84.67 %	84.56 %	84.51 %	84.49 %	84.48 %	84.49 %	84.49 %	84.49 %	84.50 %	84.51 %
452008	Fitjar Kraftlag BA	85.84 %	85.66 %	85.36 %	85.18 %	85.07 %	84.98 %	84.92 %	84.85 %	84.78 %	84.71 %	84.63 %
652008	Hammerfest Energi Nett AS	85.93 %	85.79 %	85.64 %	85.57 %	85.53 %	85.51 %	85.49 %	85.48 %	85.46 %	85.45 %	85.45 %
622008	Hadeland Energinett AS	86.06 %	85.76 %	85.50 %	85.38 %	85.34 %	85.32 %	85.32 %	85.32 %	85.33 %	85.34 %	85.34 %
5492008	Fortum Distribution AS	86.77 %	86.67 %	86.59 %	86.55 %	86.55 %	86.55 %	86.56 %	86.56 %	86.57 %	86.58 %	86.59 %
3112008	Nordmøre Energiverk AS	86.90 %	86.84 %	86.77 %	86.73 %	86.71 %	86.70 %	86.69 %	86.69 %	86.68 %	86.68 %	86.67 %
1362008	Norddal Elverk AS	87.07 %	85.54 %	83.93 %	83.12 %	82.67 %	82.42 %	82.24 %	82.10 %	81.99 %	81.90 %	81.82 %
2752008	Hallingdal Kraftnett AS	87.85 %	87.61 %	87.35 %	87.22 %	87.15 %	87.11 %	87.09 %	87.06 %	87.05 %	87.03 %	87.02 %
5422008	Vokks Nett AS	87.87 %	87.76 %	87.65 %	87.60 %	87.57 %	87.56 %	87.55 %	87.55 %	87.55 %	87.54 %	87.54 %
6152008	EB Nett AS	88.59 %	88.57 %	88.55 %	88.54 %	88.54 %	88.55 %	88.55 %	88.55 %	88.55 %	88.55 %	88.56 %
5782008	Flesberg Elektrisitetsverk AS	88.76 %	88.61 %	88.45 %	88.37 %	88.33 %	88.31 %	88.29 %	88.28 %	88.27 %	88.26 %	88.25 %
962008	Kvam Kraftverk AS	89.20 %	88.36 %	87.48 %	87.04 %	86.79 %	86.66 %	86.56 %	86.48 %	86.42 %	86.37 %	86.33 %
3432008	Hemsedal Energi KF	89.38 %	89.23 %	89.13 %	89.09 %	89.10 %	89.11 %	89.13 %	89.15 %	89.17 %	89.20 %	89.21 %
532008	Fosenkraft AS	89.56 %	89.47 %	89.37 %	89.32 %	89.28 %	89.26 %	89.25 %	89.24 %	89.23 %	89.22 %	89.21 %
1532008	Orkdal Energi AS	89.81 %	89.48 %	89.13 %	88.96 %	88.86 %	88.81 %	88.77 %	88.74 %	88.72 %	88.70 %	88.68 %
2182008	Sørfold Kraftlag AL	89.85 %	89.26 %	88.65 %	88.34 %	88.17 %	88.08 %	88.01 %	87.95 %	87.91 %	87.88 %	87.85 %
1492008	Oppdal Everk AS	90.44 %	90.30 %	90.15 %	90.08 %	90.04 %	90.02 %	90.00 %	89.99 %	89.98 %	89.97 %	89.96 %
2062008	Suldal Elverk	90.85 %	89.69 %	88.53 %	87.96 %	87.66 %	87.50 %	87.41 %	87.34 %	87.28 %	87.24 %	87.21 %
2512008	Vest-Telemark Kraftlag AS	92.16 %	91.74 %	91.30 %	91.08 %	90.96 %	90.89 %	90.85 %	90.81 %	90.78 %	90.75 %	90.73 %
1732008	Røros Elektrisitetsverk AS	92.77 %	92.51 %	92.26 %	92.15 %	92.09 %	92.06 %	92.05 %	92.04 %	92.03 %	92.03 %	92.03 %
4332008	Hålogaland Kraft AS	92.90 %	92.71 %	92.49 %	92.39 %	92.33 %	92.29 %	92.27 %	92.25 %	92.23 %	92.22 %	92.20 %
1192008	Gauldal Energi AS	93.05 %	92.91 %	92.75 %	92.68 %	92.63 %	92.61 %	92.59 %	92.58 %	92.57 %	92.56 %	92.55 %
882008	Jæren Everk Komm. f. i Hå	93.21 %	93.09 %	93.03 %	93.01 %	93.04 %	93.07 %	93.10 %	93.13 %	93.17 %	93.20 %	93.22 %
1462008	Odda Energi AS	93.92 %	92.75 %	91.54 %	90.94 %	90.61 %	90.43 %	90.31 %	90.22 %	90.14 %	90.09 %	90.04 %

							DG Companies add:					
ID	Company	Original	5MW	10MW	15MW	20MW	25MW	30MW	35MW	40MW	45MW	50MW
5742008	Eidsiva Energi Nett AS	94.26 %	94.16 %	94.06 %	94.01 %	93.99 %	93.97 %	93.96 %	93.95 %	93.95 %	93.94 %	93.94 %
1332008	Nord Troms Kraftlag AS	95.33 %	95.14 %	94.93 %	94.82 %	94.76 %	94.72 %	94.70 %	94.68 %	94.66 %	94.64 %	94.63 %
862008	Istad Nett AS	95.66 %	95.58 %	95.49 %	95.44 %	95.41 %	95.40 %	95.38 %	95.37 %	95.36 %	95.35 %	95.34 %
2052008	Stryn Energi AS	95.98 %	95.41 %	94.83 %	94.55 %	94.41 %	94.33 %	94.28 %	94.24 %	94.21 %	94.19 %	94.18 %
6752008	Hafslund Nett AS	96.55 %	96.53 %	96.52 %	96.51 %	96.50 %	96.50 %	96.50 %	96.50 %	96.49 %	96.49 %	96.49 %
1632008	Kvikne-Rennebu Kraftlag AL	96.57 %	96.35 %	96.11 %	96.00 %	95.93 %	95.90 %	95.87 %	95.86 %	95.84 %	95.83 %	95.82 %
7262008	BE Nett AS	96.67 %	96.41 %	96.12 %	95.98 %	95.89 %	95.84 %	95.80 %	95.77 %	95.74 %	95.72 %	95.70 %
1622008	Rauma Energi AS	96.77 %	96.25 %	95.70 %	95.43 %	95.28 %	95.20 %	95.14 %	95.09 %	95.05 %	95.02 %	94.99 %
2272008	Troms Kraft Nett AS	98.15 %	98.03 %	97.91 %	97.85 %	97.81 %	97.79 %	97.78 %	97.77 %	97.76 %	97.75 %	97.74 %
1162008	Meløy Energi AS	99.90 %	99.63 %	99.34 %	99.20 %	99.12 %	99.07 %	99.04 %	99.01 %	98.99 %	98.97 %	98.95 %
972008	Kvinnherad Energi AS	100.56 %	99.11 %	97.57 %	96.81 %	96.38 %	96.14 %	95.97 %	95.84 %	95.74 %	95.65 %	95.58 %
6992008	Nord-Trøndelag Elektrisitetsverk	100.96 %	100.83 %	100.69 %	100.62 %	100.58 %	100.56 %	100.55 %	100.53 %	100.52 %	100.51 %	100.51 %
1352008	Nord-Østerdal Kraftlag AL	101.21 %	101.04 %	100.86 %	100.77 %	100.73 %	100.70 %	100.68 %	100.67 %	100.66 %	100.65 %	100.64 %
372008	Eidefoss AS	101.37 %	101.12 %	100.86 %	100.73 %	100.66 %	100.61 %	100.59 %	100.56 %	100.55 %	100.53 %	100.52 %
1322008	Nord-Salten Kraftlag AL	101.48 %	101.38 %	101.27 %	101.21 %	101.18 %	101.16 %	101.14 %	101.13 %	101.12 %	101.11 %	101.10 %
5932008	Nesset Kraft AS	103.89 %	103.19 %	102.45 %	102.09 %	101.88 %	101.76 %	101.68 %	101.62 %	101.57 %	101.52 %	101.49 %
6132008	Nordvest Nett AS	104.30 %	104.26 %	104.22 %	104.19 %	104.18 %	104.17 %	104.16 %	104.16 %	104.15 %	104.15 %	104.14 %
5112008	Lyse Nett AS	104.44 %	104.28 %	104.12 %	104.05 %	104.02 %	104.01 %	104.01 %	104.01 %	104.01 %	104.01 %	104.01 %
182008	Ballangen Energi AS	105.06 %	104.53 %	103.99 %	103.73 %	103.60 %	103.52 %	103.48 %	103.44 %	103.41 %	103.39 %	103.37 %
1042008	Luster Energiverk AS	105.85 %	104.87 %	103.83 %	103.31 %	103.02 %	102.86 %	102.75 %	102.66 %	102.59 %	102.53 %	102.48 %
2382008	Indre Hardanger Kraftlag AS	107.96 %	107.40 %	106.86 %	106.61 %	106.48 %	106.42 %	106.39 %	106.37 %	106.35 %	106.35 %	106.34 %
1712008	Rødøy-Lurøy Kraftverk AS	107.98 %	107.93 %	107.80 %	107.71 %	107.66 %	107.62 %	107.58 %	107.55 %	107.51 %	107.46 %	107.42 %
1212008	Modalen Kraftlag BA	108.65 %	107.13 %	105.51 %	104.70 %	104.24 %	103.98 %	103.80 %	103.66 %	103.54 %	103.45 %	103.37 %
2332008	Tydal Kommunale Energiverk KF	109.54 %	108.52 %	107.45 %	106.91 %	106.61 %	106.44 %	106.32 %	106.22 %	106.15 %	106.09 %	106.04 %
5362008	Trondheim Energiverk Nett AS	110.71 %	110.65 %	110.59 %	110.56 %	110.55 %	110.54 %	110.53 %	110.53 %	110.52 %	110.52 %	110.52 %
632008	Trollfjord Kraft AS	112.45 %	112.15 %	111.94 %	111.85 %	111.86 %	111.88 %	111.92 %	111.96 %	111.99 %	112.03 %	112.07 %
92008	Andøy Energi AS	113.13 %	113.05 %	112.98 %	112.94 %	112.92 %	112.91 %	112.90 %	112.89 %	112.89 %	112.88 %	112.88 %
2042008	Stranda Energiverk AS	118.18 %	116.04 %	113.76 %	112.61 %	111.95 %	111.59 %	111.33 %	111.13 %	110.97 %	110.84 %	110.73 %

34 Total DEA Efficiency before Calibration (Non-DG Companies)

							DG Companies add:					
ID	Company	Original	5MW	10MW	15MW	20MW	25MW	30MW	35MW	40MW	45MW	50MW
1082008	Løvenskiold Fossum Kraft	40.91 %	40.91 %	40.91 %	40.91 %	40.91 %	40.91 %	40.91 %	40.91 %	40.91 %	40.91 %	40.91 %
2102008	Sunnhordland Kraftlag AS	59.03 %	59.03 %	59.02 %	59.01 %	59.01 %	59.01 %	59.01 %	59.01 %	59.01 %	59.01 %	59.00 %
1112008	Malvik Everk AS	61.55 %	61.55 %	61.55 %	61.55 %	61.55 %	61.55 %	61.55 %	61.55 %	61.55 %	61.55 %	61.55 %
1472008	Evenes Kraftforsyning AS	62.85 %	62.81 %	62.82 %	62.82 %	62.85 %	62.87 %	62.89 %	62.92 %	62.93 %	62.95 %	62.97 %
1812008	Sandøy Energi AS	63.28 %	63.31 %	63.22 %	63.15 %	63.10 %	63.05 %	63.01 %	62.96 %	62.91 %	62.85 %	62.79 %
422008	Fauske Lysverk AS	64.19 %	64.19 %	64.19 %	64.19 %	64.19 %	64.19 %	64.19 %	64.19 %	64.19 %	64.19 %	64.19 %
2672008	Årdal Energi KF	64.58 %	64.57 %	64.57 %	64.57 %	64.58 %	64.58 %	64.58 %	64.58 %	64.59 %	64.59 %	64.59 %
1942008	Skjåk Energi	66.84 %	66.84 %	66.84 %	66.84 %	66.84 %	66.84 %	66.85 %	66.85 %	66.85 %	66.85 %	66.85 %
842008	Høland og Setskog Elverk	69.01 %	68.98 %	68.94 %	68.92 %	68.91 %	68.90 %	68.90 %	68.89 %	68.89 %	68.89 %	68.89 %
462008	Fjelberg Kraftlag	71.24 %	71.23 %	71.23 %	71.24 %	71.24 %	71.24 %	71.24 %	71.24 %	71.24 %	71.25 %	71.25 %
412008	Etne Elektrisitetslag	73.65 %	73.61 %	73.60 %	73.61 %	73.63 %	73.65 %	73.67 %	73.69 %	73.71 %	73.73 %	73.75 %
2192008	Tafjord Kraftnett AS	74.44 %	74.43 %	74.43 %	74.42 %	74.42 %	74.42 %	74.42 %	74.42 %	74.42 %	74.43 %	74.43 %
222008	Bindal Kraftlag AL	75.56 %	75.56 %	75.55 %	75.54 %	75.54 %	75.53 %	75.53 %	75.52 %	75.52 %	75.51 %	75.50 %
2422008	Uvdal Kraftforsyning AL	77.79 %	77.79 %	77.78 %	77.78 %	77.78 %	77.78 %	77.78 %	77.78 %	77.78 %	77.78 %	77.78 %
552008	Fusa Kraftlag	78.44 %	78.37 %	78.30 %	78.27 %	78.26 %	78.26 %	78.26 %	78.26 %	78.26 %	78.26 %	78.27 %
822008	Hurum Energiverk AS	79.93 %	79.93 %	79.93 %	79.93 %	79.93 %	79.93 %	79.93 %	79.93 %	79.93 %	79.93 %	79.93 %
6692008	Stange Energi Nett AS	84.83 %	84.80 %	84.80 %	84.81 %	84.83 %	84.85 %	84.88 %	84.90 %	84.92 %	84.94 %	84.95 %
1022008	Lier Everk AS	93.51 %	93.51 %	93.51 %	93.51 %	93.50 %	93.50 %	93.50 %	93.50 %	93.50 %	93.50 %	93.50 %
432008	Finnås Kraftlag	95.23 %	95.23 %	95.22 %	95.21 %	95.21 %	95.21 %	95.20 %	95.20 %	95.20 %	95.19 %	95.19 %
232008	Elkem Bjølvefossen AS	96.33 %	96.31 %	96.31 %	96.32 %	96.33 %	96.35 %	96.36 %	96.38 %	96.39 %	96.40 %	96.41 %
1612008	Rauland Kraftforsyningslag	96.74 %	96.70 %	96.70 %	96.70 %	96.73 %	96.75 %	96.77 %	96.79 %	96.81 %	96.83 %	96.84 %
2622008	Ørskog Energi AS	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %
142008	Askøy Energi AS	100.77 %	100.73 %	100.73 %	100.74 %	100.77 %	100.80 %	100.83 %	100.85 %	100.88 %	100.90 %	100.92 %
2312008	Trøgstad Elverk AS	102.78 %	102.77 %	102.77 %	102.77 %	102.78 %	102.78 %	102.79 %	102.79 %	102.80 %	102.80 %	102.80 %
6142008	Energi 1 Follo-Røyken as	103.23 %	103.22 %	103.21 %	103.20 %	103.20 %	103.20 %	103.20 %	103.20 %	103.19 %	103.19 %	103.19 %
322008	Fredrikstad Energi Nett AS	105.16 %	105.13 %	105.13 %	105.13 %	105.15 %	105.16 %	105.18 %	105.19 %	105.20 %	105.21 %	105.22 %
2352008	Tyssefaldene Aktieselskabet	106.26 %	106.21 %	106.21 %	106.22 %	106.26 %	106.29 %	106.32 %	106.35 %	106.38 %	106.40 %	106.43 %
162008	Austevoll Kraftlag BA	106.93 %	106.94 %	106.90 %	106.86 %	106.84 %	106.82 %	106.80 %	106.77 %	106.75 %	106.72 %	106.69 %
912008	Klepp Energi AS	108.15 %	108.09 %	108.09 %	108.11 %	108.16 %	108.19 %	108.23 %	108.27 %	108.31 %	108.34 %	108.37 %
2342008	Tysnes Kraftlag PL	115.06 %	114.98 %	114.90 %	114.86 %	114.84 %	114.83 %	114.82 %	114.81 %	114.81 %	114.80 %	114.80 %
952008	Krødsherad Everk KF	115.70 %	115.70 %	115.70 %	115.70 %	115.70 %	115.70 %	115.70 %	115.70 %	115.70 %	115.70 %	115.70 %
6862008	Yara Norge AS	119.71 %	119.57 %	119.58 %	119.61 %	119.71 %	119.79 %	119.88 %	119.97 %	120.05 %	120.12 %	120.19 %

35 Coefficients when Industry Adds 5 MW Increments of DG

Coefficients	Constant	Interfaces	Islands	DG
Original	4.459007	-0.004735	-1.266974	-0.726778
5MW	4.457716	-0.004703	-1.272053	-0.593999
10MW	4.455170	-0.004719	-1.266105	-0.455734
15mw	4.454095	-0.004735	-1.259386	-0.387166
20MW	4.453687	-0.004765	-1.254016	-0.348351
25MW	4.453597	-0.004787	-1.248864	-0.326913
30MW	4.453615	-0.004812	-1.244086	-0.311634
35MW	4.453658	-0.004836	-1.238641	-0.299610
40MW	4.453694	-0.004857	-1.232506	-0.289966
45MW	4.453739	-0.004878	-1.226000	-0.282164
50MW	4.453759	-0.004896	-1.218727	-0.275735