# Summary results

## Elia Febeliec EnergyVille Demand Response Survey



EnergyVille is an “International Applied Research Centre for Advanced Energy Technology”, a co-operation between VITO, KULeuven and IMEC.

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# 2 INTRODUCTION

## 2.1 Background

Some time ago State Secretary Wathelet (Environment, Energy and Mobility) drew up a plan to **improve the security of electricity supply**. Part of this plan is to create **strategic reserves on the demand side** (i.e. **'demand response'** (DR) or **'flexibility in electricity consumption'**) **alongside strategic reserves on the production side** (power stations) in order to guarantee electricity supply during periods of high consumption.

In order to manage the balance (between production and consumption) of the Belgian control area, Elia currently purchases already a part (261 MW) of its necessary reserved upward controllable flexibility from consumers who are directly connected to the Elia grid. From next year onwards, consumers who are not connected to the transmission grid can also supply part of the total reserved flexibility needed.
Elia is also currently working on the development of a **new market platform** ('Bid Ladder platform') **on which non-reserved flexibility on the production and consumer side, for both upward and downward control**, can be offered, activated and reimbursed in order to keep the control area in balance.

Following on from the plan for strategic reserves and developments concerning the purchase of flexibility for managing the balance of the control zone, a questionnaire has been drawn up which should give some insight into the **potential for flexible or interruptible (i.e. the capacity to be switched off temporarily) consumers** among the large electricity consumers, and under what **technical and economic conditions** this can be done. This questionnaire has been drawn up in cooperation between Febeliec, Elia and EnergyVille. This questionnaire was distributed to all Elia grid connected industrial customers.

## 2.2 Scope of this document

In this document, the results of the survey are reported. The individual company questionnaires contain sensitive information which must be treated in the strictest confidence. This document presents the results of the survey in an aggregated and anonymised way. The document is organized in 3 parts:

- Summary survey results
- Extrapolation and conclusions
- Appendix: Detailed survey results

**EnergyVille has drafted this report and has done the underlying analysis by order of Elia and Febeliec based on the results of a survey drawn up in collaboration with Elia and Febeliec. The data and the data processing is solely done by EnergyVille.**

# 3 SUMMARY SURVEY RESULTS

## 3.1 Introduction

This section summarizes the main lines and trends of the survey. This summary should be comprehensive also for readers which don't know the details of the questionnaire. In principle, however, all statements are backed up by the answers of the survey. All questions and aggregated answers can be found in Appendix.

Notations:

- [q12,q14]: means that a statement is based on the results of questions 12 and 14 in the survey)
- (12/32): indicates 12 answers out of 32 valid answers. Sometimes, the number of valid answers exceeds the number of surveys. Some questionnaires cover several company locations or grid connections points. For many answers, the number of locations is used as a reference instead of the number of surveys.
- (59/442MW): indicates that the answer represents 59MW of the 442MW available capacity represented in the valid answers of the question.

## 3.2 Relevance of the survey

The questionnaire was distributed to all companies directly connected to the Elia transmission grid. In total, the questionnaire was sent to more than 100 companies, some with several connection points. In total **29 companies replied** to the questionnaire, 2 indicating that they had no interest, 27 submitted a filled out questionnaire, covering **38 connection points**, 23 in Flanders, 15 in Wallonia. This means that **nearly 25%** of the companies replied to this survey. The yearly energy consumption of the contributors to the survey is **11,1TWh** [q14], which is **13,6% compared to the Belgian electricity consumption** in 2012 (81,7TWh).

## 3.3 Company profiles

As expected from companies connected to the transmission grid, nearly all companies have a 24/7 way of working. A significant amount of the answers comes from companies which are already familiar with the topic. They indicate that they are quite confident in filling out the questionnaire [q86,q87] and many of them (21/33) already offer flexibility to some market party [q76]. On average, the companies indicate that **electricity represents 10 to 25% of their operational cost** [q18].

## 3.4 Summary basic questions

In order to keep the questionnaire as accessible as possible, but at the same time to be able to ask complex questions, the questionnaire was organized in a block with "Basic questions" and a block with "Detailed questions". In principle, the "Basic questions" could be completed by any company with a very limited knowledge on flexibility and/or interruptible energy consumption. This section summarizes the answers in the "Basic questions" section.

The majority of access points (21/36) indicate that they have a clear picture on the available flexible consumers and/or producers within their company [q19]. On average, companies consider the active exploitation of flexibility when this results in an electricity cost reduction of 5% [q20]. Many answers (12/33) indicate that "No" additional investment costs are needed to actively exploit flexibility, but in most cases this means that the company already offers flexibility today to a market party [q21]. Companies have very different requirements regarding the time interval for announcement of activation. The main trend, however, is that it can be activated either within 15 minutes (31% of respondents) or it needs 16h or longer (44% of respondents) [q22]. The results get even more remarkable when companies, which already use flexibility for cost reduction, are excluded: In that case 70% indicates that 16h or more is needed for activation.

From contractual point of view, nearly all companies prefer a combined remuneration for both reservation and activation [q23]. The contractual availability [q24], however, shows 2 major preferences: a year or longer (56%) or a flexible contractual availability (26%) where it must be

possible to decide on an ad hoc basis to offer flexibility, depending on the operational conditions of the company. Also here, it is interesting to note that 70% of the companies, which don't use their flexibility yet, prefer an ad hoc contractual obligation.

## 3.5 Summary detailed questions

The "Detailed questions" section was (partially) filled out in **24 of the 27 surveys**.

### 3.5.1 Flexible producers

In total 10 flexible producers were identified in the questionnaires. In practice 1 producer was removed from the results because the operation (and adjacent flexibility) was outsourced to the company's energy supplier. The remaining flexible producers are mainly CHP's, some backup generators and a PV installation [q26]. All CHP's and the PV installation receive production subsidies [q39].

The installed capacity varies in the range from 2 to 40MW, in total 105MW of flexible production capacity is covered in the survey [q27]. Half of the installations can be switched off completely, the other half needs to run at a certain minimum power. The total minimum power is 63.5MW [q28]. The estimated annual production of the installations is 537GWh [q29]. All installations are operational during the whole year, except for the back-up generators which only run a couple of hours [q30].

All producers except for the PV installation can be regulated [q31] and are considered as potential flexible units [q32]. The way they can be regulated (upwards, downwards or both) is equally spread [q31]. In most cases the regulation is done as function of the company's activities (6/9), in some cases it is done based on economic parameters [q33]. The total regulation potential in the survey is 57.5MW upwards and 20.5MW downwards [q35,q36]. Although nearly all units are considered as flexible, only (3/10) is already actively using the present flexibility [q37].

### 3.5.2 Flexible consumers

19 surveys indicated the presence of flexible consumers in their facilities. One connection site can have more than 1 flexible consumer. In total 37 different flexible consumers were specified with a rated power varying from 0.5 to 150MW. The bulk of the flexible consumers is in the 5-10MW range [q43]. The total maximum power of all consumers in the survey is 962MW [q43] which can be reduced to a minimum of 190MW [q44]. Only a small number of consumers (7/37 or 59MW) can be switched off completely [q44]. A significant amount of consumers (18/30 or 239/442MW (only 442/631MW answered question) have a continuous availability, only (4/30 or 59/442MW) have an availability which is less or equal to 360h/month [q45]. Most companies work 24/7 which results in nearly no preferred timeslots in the day [q50], the week [q51] or the year [q52] for the availability of the flexibility. 70% of the number of flexible consumers or 384/631MW is able to reduce and/or increase power consumption for 4h or longer [q54]. The most common source of flexibility is the presence of buffers and/or the possibility to modulate the process [q46].

For a significant amount of the consumers (24/37 or 473/631MW) it is indicated that no additional investment is needed in order to make the consumer flexible [q47]. Further, (19/34 or 488.6/631MW) of the consumers are already using the flexibility in order to reduce energy costs [q48]. Also here, there is an important correlation between both questions: From the 13 consumers which need additional investment, 12 are not using the present flexibility yet. Most companies (17/27) prefer a contractual commitment of 1 year or longer [q49]. According to a similar question [q24] in the "Basic questions" section, however, there is no significant difference between flexible consumers which are already using the present flexibility for energy cost reduction and those which do not.

The total flexible power in the survey is 631 MW [q53] from which 488.6MW is already used for energy cost reduction [q53,q48] and 134.1MW is not. Quite a lot (17/37 or 400/628MW) of consumers are able to activate the flexibility in 15 minutes or faster, (15/37 or 204/628MW) need 1h to 8h and only (5/37 or 24/628MW) need a day or more [q55]. The results are, again, a bit in contrast with the results in the "Basic questions" section: flexible consumers, which are not using the present flexibility yet, typically indicate a 1h activation time instead of 16h in the previous section. The number of activations varies, but the bulk of the answers indicates 1-2 activations per month [q56]. Instead of specifying an actual number, some companies indicate that they don't have a specific

preference (6/37), that it depends on the remuneration they can get for it (5/37) or on the production level (3/37).

Most flexible consumers (20/37) have ramping constraints [q57]. Most installations (15/19) can reduce consumption within 15 minutes [q58]. Increasing consumption is more diverse: (7/19) installations react instantaneous and the rest of the installations is quite spread out in a range from 5 minutes to 6 hours [q59].

Single reservation or activation payments are not preferred [q60,q63]. Also here, nearly all answers indicate a preference for a combined reservation and activation remuneration [q66] because companies want to be sure that as well the fixed costs as the activation costs are covered [q67]. The reservation fees typically vary from 1 to 4.5 €/MW/h [q68] with a median of 1.8€/MW/h, the activation fees from 150 to 3000 €/MWh [q69] with a median of 2000 €/MWh. Most companies (25/30) indicate that a payment of 3000 €/MWh is sufficient to cover the actual costs for activating flexibility in combination with an reservation payment also in a range from 0 to 4.5 €/MW/h, but the median value of 1.14 €/MW/h is significantly lower [q72].

### 3.5.3 Flexibility and regulatory/economic framework

Most companies (25/31) indicate that they already buy electricity at variable prices, mainly via the Belpex [q73]. The companies which don't use these options indicate that they would do it if their energy supplier would allow it [q74, q75]. Most companies (21/33) already offer flexibility to certain market parties, mostly for economic reasons [q77]. Lack of flexibility and lack of interest are indicated as the most important reasons why companies not actively use the options of energy flexibility [q77]. Most companies offer their flexibility at this moment to Elia (14/21) and aggregators (5/21) [q78]. The Elia R3 ICH products are most commonly used [q79]. At this moment flexibility is not often used for spot market optimization or balancing with BRP [q78]. From the companies which are not offering flexibility yet, (5/8) see an aggregator as a possible way to offer flexibility to the market [q80] if it is not too complex and the requirements are lower [q81].

Nearly all companies (33/36) share energy consumption programmes with their BRP's [q82] mostly on a daily basis (20/32) [q83]. In general, they consider these programmes as an accurate representation of the actual electricity consumption [q84].

### 3.5.4 Background and interest

Most (17/31) respondents indicated that it was easy for them to complete the questionnaire [Q86]; 4 of them are already familiar with or even already participate in DR programs [Q87]. The ones who find the questionnaire difficult to complete mention, among others, a lack of flexibility and focus on this topic within the company [Q87].

Most companies feel very confident to estimate their flexibility (21/32) [Q88], about half (15/31) also feel confident to activate this flexibility [Q89], less than half are confident in energy market mechanisms and regulatory framework [Q91] and only one third is confident on the valorisation options at the moment (10/31) [Q90].

12 companies out of 31 show interest in a further investigation on their presence of flexibility [Q92]. The ones that are not interested in a further screening mostly mention that they already did a flexibility screening (5/8) [Q93]. Almost all respondents (29/31), would like to be informed of interesting developments in the area of energy flexibility, smart grids and demand response [Q04].

Finally, (7/26) companies encountered situations where restrictions on the energy supply impacted their company [Q95], 3 of them refer to the activation of DR services by Elia affecting their processes [Q96].

### 3.5.5 General questions, comments and feedback

In this section some general comments were written down by the companies [q97]. Some comments suggest that a broader flexibility market could be achieved by making the products more accessible (e.g. day ahead nomination of flexibility). It is also clear that some production processes are not designed for energy flexibility and that there is not always a lot of focus within the companies for the opportunities created by flexible energy consumption.

# 4 MAIN RESULTS AND CONCLUSION

## 4.1 Main results

The survey was answered by 27 companies, representing 13.6% of the Belgian electricity consumption. The survey mainly reached companies where “Demand Response” is already a “living topic” and this has a significant impact on the results.

### Available versus used flexibility

The survey identified 631MW of demand side flexibility but it is difficult to estimate how much of this flexibility is already used today. In the survey, it is assumed that the present flexibility is already offered to a market player in case question 48 of the questionnaire *(“Is this consumer already operated on a smart basis to reduce energy costs?”)* is answered with “yes”. Since quite some questionnaires showed inconsistencies in their answering, it is difficult to estimate how the question was interpreted by the reader. The impact on the results, however, is important because the number of 134.1MW will be considered as the present available flexibility which is not used yet. For that reason, it seems useful to check again with the different companies.

### Contractual obligations

Although there is some mismatch between the results in the “Basic” and “Detailed questions” section, there is definitely an indication that relaxation of the contractual obligations will make it a lot easier for companies to make the step to actively exploit flexibility in their installations. In many installations, energy flexibility is directly related with production capacity and offering flexibility to a third party means handing over control on the production capacity. This is reflected in the answers that “ad hoc” contractual obligations are preferred. In some remarks a “day ahead” mechanism for flexibility is suggested to overcome this issue.

### Announcement time

The survey shows that quite some companies prefer a significant announcement time before activation. Especially for companies who do not use the present flexibility yet, the results in the “Basic questions” section are quite explicit: 70% of the companies prefer an announcement time of 16 hours or more. In the “Detailed questions” section, the answer is more moderate: (8/15 or 107/134MW) of the companies which are not using the present flexibility yet, indicate that an announcement time of 1 hour or more is needed. Also quite some companies, which are already using flexibility today with short announcement time (typically R3 ICH), make remarks in the survey that short announcement times are feasible but not preferred. Consequently, it is reasonable to assume that new flexibility products with a long announcement time will address a new population of flexible consumers.

### Technical potential of flexible producers

As expected, more flexible consumers than flexible producers were identified. Amongst the consumers, the installed power, the claimed flexibility and the number of flexible consumers is higher. The survey shows that many consumers are already offering flexibility to market parties and the resulting “unused” flexibility is limited. At the producer side, however, nearly no flexibility is actively used today. While the survey identified 37 flexible consumers, 19 (19/37 or 497/631MW) are already using the present flexibility in order to reduce energy costs. From the 10 identified producers with potential for flexibility, however, only 3 (3/10 or 44/78MW) are using the flexibility today. Percentage-wise, there is more unused flexibility amongst the producers compared to the consumers.

## 4.2 Conclusion

The results, as presented in this document, are based on a survey performed amongst the Elia transmission grid connected industrial customers. The contribution of the companies was on a voluntary basis and for that reason it is obvious that companies with focus on demand side flexibility are well represented in the answers. This resulted in the identification of a significant capacity of flexible consumers but most of the detected flexibility in this inquiry is already used in order to reduce the electricity cost in some way (e.g. Belpex trading, aggregator, reserve capacity Elia).

Due to the biased population in the survey, it is impossible to perform a reliable quantitative extrapolation for the Belgian industry. Nevertheless, it is seen that companies already using flexibility typically do not describe new sources of flexibility and limit the answers to describing their current active flexible processes. Quite often they describe huge energy consumers (10MW+) and it is quite realistic to assume they consider e.g. 1MW flexible process as irrelevant. From that point of view, it makes sense that the technical potential in these companies is even bigger than estimated now.
Since most of the unused flexibility is identified in companies which don't have other actively used flexibility, it is realistic to assume that additional capacity is available in the companies which did not contribute to the survey. The detected flexible capacity in the inquiry is not contradictory with findings in literature on flexibility.

The survey also indicates that less strict contractual obligations and longer announcement times (>1h) will help to address/extract new sources of flexibility in the industry. These findings are relevant for the further development of demand side products.

Based on the results in this report, Elia, Febeliec and EnergyVille concluded that there is potential for demand side flexibility in the Belgian industry, for which further investigation should be considered.

# 5 APPENDIX: DETAILED SURVEY RESULTS

## 5.1 General company information

### 5.1.1 Contact information

The following companies contributed to the survey:

In order to guarantee confidentiality of individual company information, this part is removed from the public version of the report.

Some companies have different locations and filled out the questionnaire for several locations at a time. In total **29 companies** replied to the questionnaire, 2 indicating that they had no interest, 27 submitted a filled out questionnaire, covering **38 connections points**, 23 in Flanders, 15 in Wallonia.

### 5.1.2 Work regime

Almost every company in this survey works 24/7, 360 or 365 days a year. Only 2 locations work 5 days a week, in some companies only a part of the activities runs 24/7 also in the weekend. Bottomline is that nearly **all companies have a very continuous work regime**.

## 5.2 Basic questions

### 5.2.1 Energy need

***Question 14:*** *Electricity consumption*

| Number of answers | 34 |
|---|---|
| Total energy consumption | 11.1 TWh |

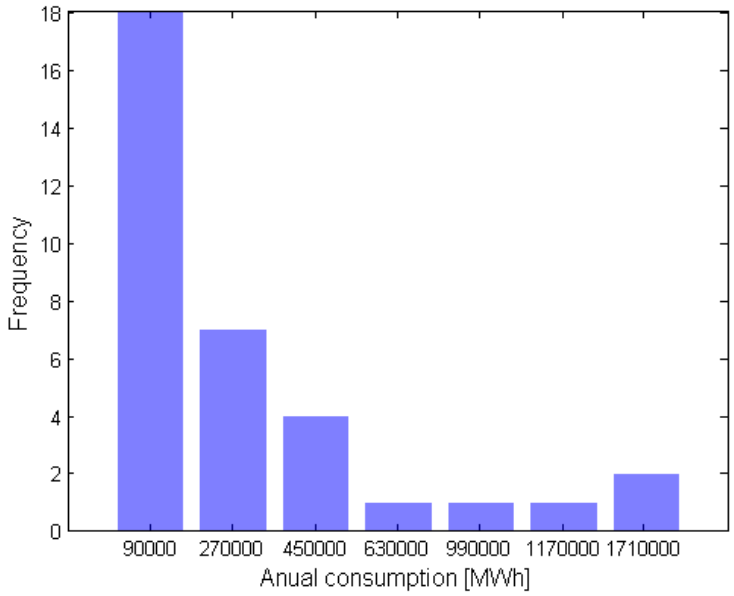



**Figure 1: Histogram average consumption (Q14)**

***Question 15:*** *Electricity production*

| Number of answers | 30 |
|---|---|
| Number of locations with production facilities | 6 |
| Total energy production | **760** GWh |

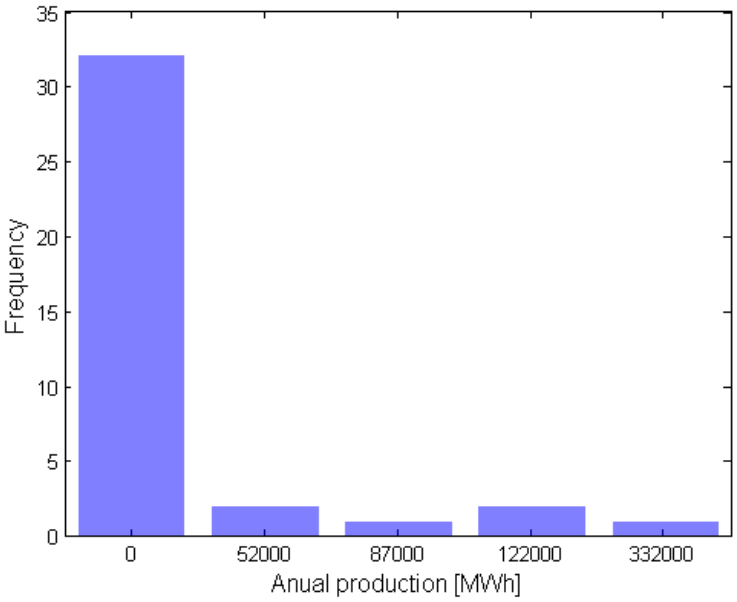



**Figure 2: Histogram annual production (Q15)**

#### 5.2.1.1 Connection power (question 16)

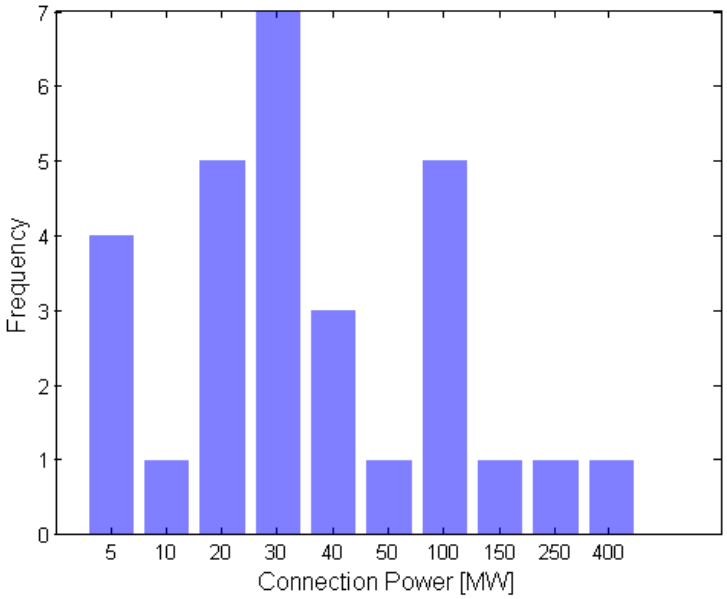



**Figure 3: Histogram connection power (Q16)**

#### 5.2.1.2 Connection voltage (question 17)

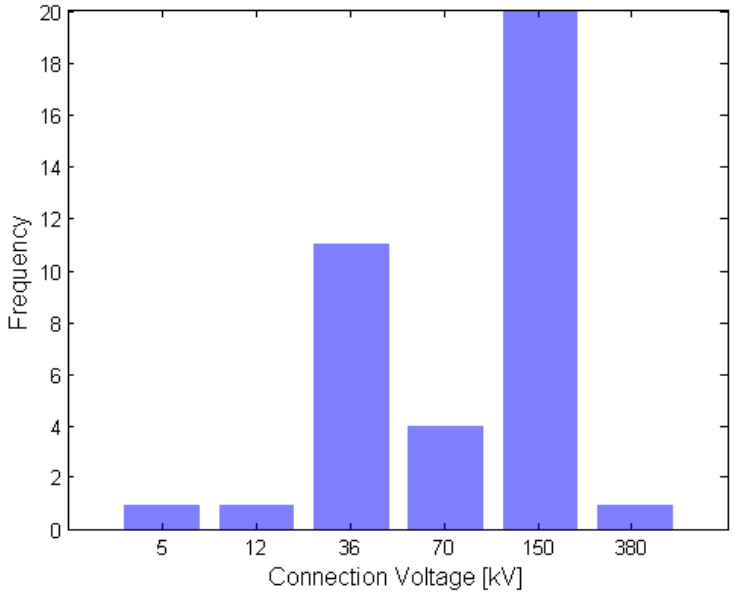



**Figure 4: Histogram connection voltage (Q17)**

#### 5.2.1.3 Cost indication

***Question 18:*** *Indication of electrical power costs as a percentage of the company's operational costs*

| Number of answers | 35 |
|---|---|
| < 5% | 4 |
| between 5% and 10% | 8 |
| between 10% and 25% | 18 |
| between 25% and 50% | 4 |
| > 50% | 6 |

Remark: In practice, a couple of companies indicated more than one option. In that case all options are counted. This explains why the sum of all answers > 35.

### 5.2.2 Availability of flexible and interruptible consumers

***Question 19:*** *Does your company have flexible and/or interruptible consumers or can your company produce electricity itself in a flexible way? (e.g. packaging department, electrolysis processes, assembly buffer, certain thermal processes, compressors, water treatment system, …)*

| Number of answers | 36 |
|---|---|
| No | 5 |
| No idea, but we are interested in finding out (eventually with help of a third party) | 2 |
| Probably, but we don't know exactly how much | 8 |
| Yes, we have a clear picture of this | 21 |

### 5.2.3 Economic and technical conditions

***Question 20:*** *What level of electricity cost reduction would need to be reached before you consider the options of flexible energy consumption?*

| Number of answers | 25 |
|---|---|
| 0.5% | 2 |
| 1% | 1 |
| 2% | 6 |
| 5% | 5 |
| 10% | 6 |
| 20% | 3 |
| 50% | 2 |

***Question 21:*** *Would additional investment be needed to make this consumption flexible?*

| Number of answers | 33 |
|---|---|
| No idea | 3 |
| No | 12 |
| < € 10,000 | 6 |
| between € 10,000 and € 20,000 | 2 |
| between € 20,000 and € 50,000 | 3 |
| between € 50,000 and € 100,000 | 1 |
| > € 100,000 | 6 |

Remark: Quite a significant number of answers indicate that no additional cost is needed in order to make the consumption flexible (12/33). There is, however, an important correlation with question 76 (Do you already offer flexibility to certain market parties?). In practice 8/12 companies, indicating that no additional investment costs are needed, are already offering flexibility to some market party.

***Question 22:*** *Your company is interested in reducing consumption if this is announced beforehand with a time interval of*

| Number of answers | 31 |
|---|---|
| 5 minutes | 14 |
| 15 minutes | 8 |
| 1 hour | 9 |
| 4 hours | 8 |
| 16 hours | 10 |
| 1 day | 14 |
| > 1 day | 7 |

Remark 1: In practice, many companies indicated more than 1 option. In that case all options are counted. This explains why the sum of all answers > 31.
Remark 2: Later in the survey it becomes more clear that a significant amount of companies offers flexibility to Elia under the form of R3 and/or ICH. In practice, an important relationship is seen between the 5 and 15 minutes answer and the companies which indicate offering flexibility to Elia. 8/14 answers of the "5 minutes" answer and 3/8 of the "15 minutes" answer are in that case. In the above list, 13 answers are from companies which currently use their present flexibility in order to reduce energy cost. The table below gives an overview of their answers:

| Number of answers | 13 |
|---|---|
| 5 minutes | 1 |
| 15 minutes | 0 |
| 1 hour | 2 |
| 4 hours | 1 |
| 16 hours | 4 |
| 1 day | 4 |
| > 1 day | 1 |

***Question 23:*** *If your company can reduce its electricity consumption temporarily, in that case what kind of incentive would be acceptable?*

| Number of answers | 30 |
|---|---|
| a fixed payment, independently of the activation(s) | 1 |
| a variable payment with each activation | 3 |
| a combination of a fixed payment with a variable payment per activation | 28 |

Remark: In practice, a company indicated that all options could be acceptable. This is covered in the above table by adding 1 to each option.

***Question 24:*** *If your company can reduce electricity consumption temporarily, how would you like to make this available contractually?*

| Number of answers | 32 |
|---|---|
| Continuous | 3 |
| continuous, with exception of some planned testing and maintenance periods | 14 |
| in blocks of 1 (or several) weeks | 1 |
| in blocks of 1 (or several) months | 1 |
| in blocks of 1 (or several) years | 6 |
| during certain hours in the week (e.g. nights, weekend …) | 5 |
| it must always be possible to decide on an ad hoc basis, depending on operational conditions in our company | 11 |

Remark 1: In practice, many companies indicated several options.
Remark 2: Also in this question, there is an important correlation with question 76 (Do you already offer flexibility to certain market parties?). In total, 11 locations indicated that they have flexibility but they don't offer it yet to a market party. The table below gives an overview of the answers of these locations:

| Number of answers | 10 |
|---|---|
| Continuous | 1 |
| continuous, with exception of some planned testing and maintenance periods | 1 |
| in blocks of 1 (or several) weeks | 0 |
| in blocks of 1 (or several) months | 0 |
| in blocks of 1 (or several) years | |
| during certain hours in the week (e.g. nights, weekend …) | 1 |
| it must always be possible to decide on an ad hoc basis, depending on operational conditions in our company | 7 |

***Question 25:*** *Explanation:*

| **Number of answers** | **12** |
|---|---|
| Day – 1 we can give the available flexible power for each hour the next day (depending on production schedule) | |
| Difficulties to stop and restart the process | |
| **Production process** requirements may not allow for any flexibility | |
| It depends on the process and shall be linked to the duration of the reduction, the frequency and the time between two reductions. If the time between activation is sufficient (as an example 3 days) and the reduction frequency is limited (5-10 per year) then the flexibility can be offer for 1 year. If more frequent reductions are requested, it should be contracted on shorter term basis to reduce our risk to be able to deliver our clients (per example for each winter month, high flexibility can be offered if load of the plant not to high, level of storage high and good availability of our plants). A limited flexibility can be offered on a daily basis for a limited period : for example the user offers to reduce its consumption every day between 17pm and 19 pm. | |
| No flexibility for consumption, probably flexibility for production | |
| No interest in reducing consumption if this is announced in a certain time interval | |
| Our company has no direct connection with the Elia grid but we already participate with our ARP partner in the Elia interruptability program. | |
| Process wise we are not capable to reduce electricity consumption. Operation of our Cogen could be altered on demand | |
| Seasonality in the production/sales of our products, maintenance periods etc. The connection boxes of **an aggregator** are already installed | |
| The production of **our product** is a very complex process that cannot be interrupted | |
| Two possibilities depending of concerned process/product: interuptabillity is possible for some products not for all qualities | |
| We're already in R3-ICH but we can deliver a higher amount of flexibility depending on the conditions. | |

Remark: In some answers, explicit reference is made to the product or production process in a way that anonymity is not guaranteed. In those cases the explanation is edited. All changes are indicated **in bold green**.

## 5.3 Detailed questions

### 5.3.1 Flexibility in electricity production

Over all surveys, 10 flexible producers were filled out. One of the companies indicated the presence of a flexible producer which is operated by its energy supplier. This means that the company has no control over the flexibility and for that reason the producer has been removed from the statistics.

***Question 26:*** *Description (Example: CHP, PV, etc.):*

| Number of answers | 10 |
|---|---|
| CHP | 6 |
| Backup generator | 2 |
| Gas boiler + turbo generator | 1 |
| PV | 1 |

***Question 27:*** *Peak power*

| Number of answers | 9 |
|---|---|
| Total peak power | 105 MW |

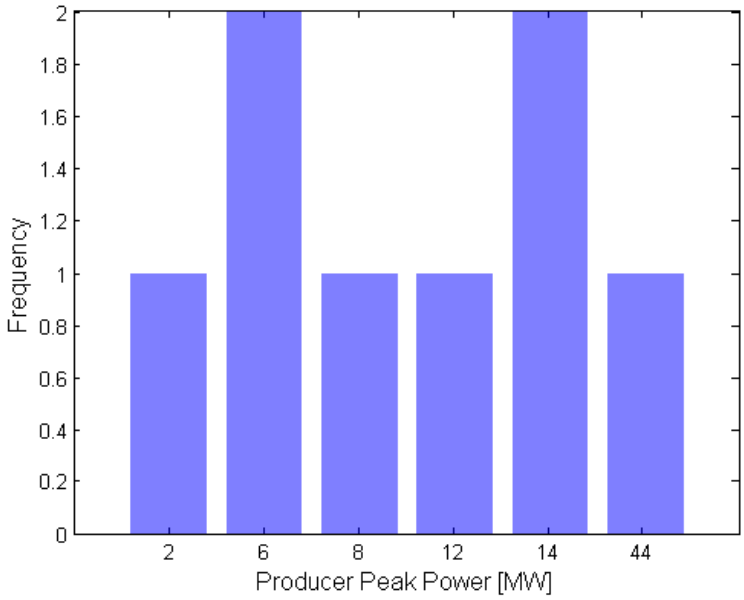



**Figure 5: Peak power producers (Q27)**

***Question 28:*** *Minimum available power (Example: a CHP must supply a minimum level of power)*

| Number of answers | 9 |
|---|---|
| Minimal power | 63.5 MW |

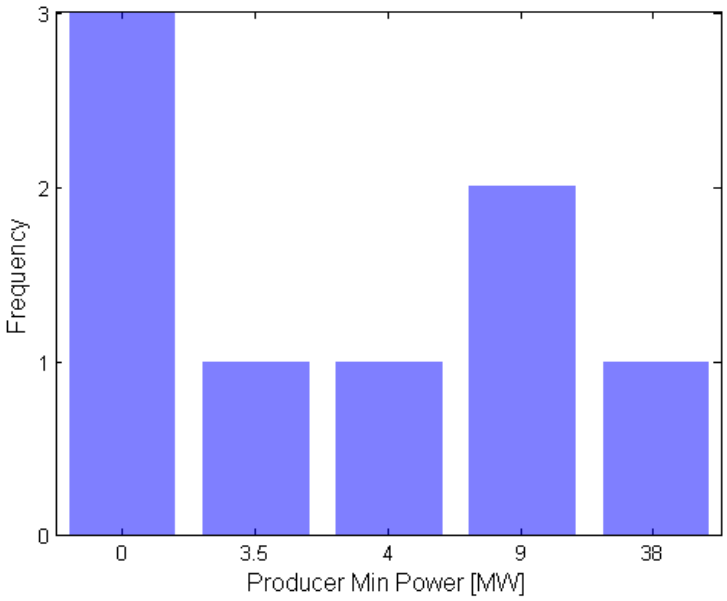



**Figure 6: Minimum power producers (Q28)**

***Question 29:*** *Estimated annual production*

| Number of answers | 9 |
|---|---|
| Total annual production | 537 GWh |

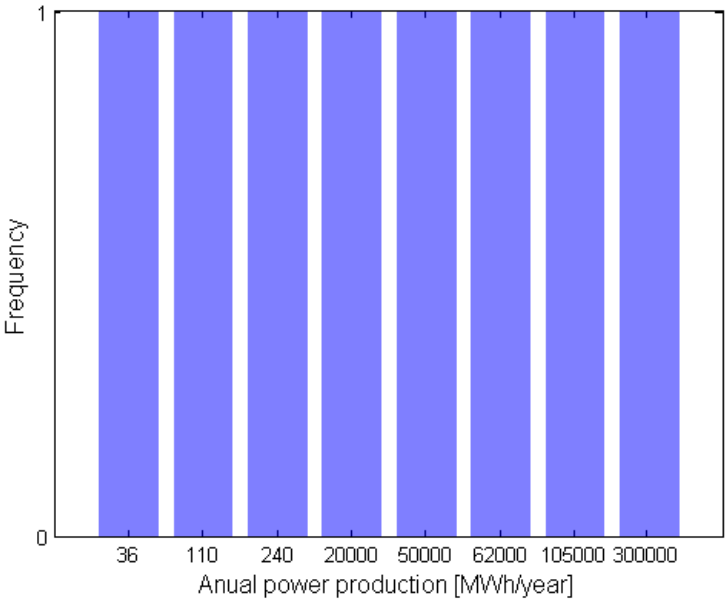



**Figure 7: Estimated annual power production (Q29)**

***Question 30:*** *Number of operating hours*

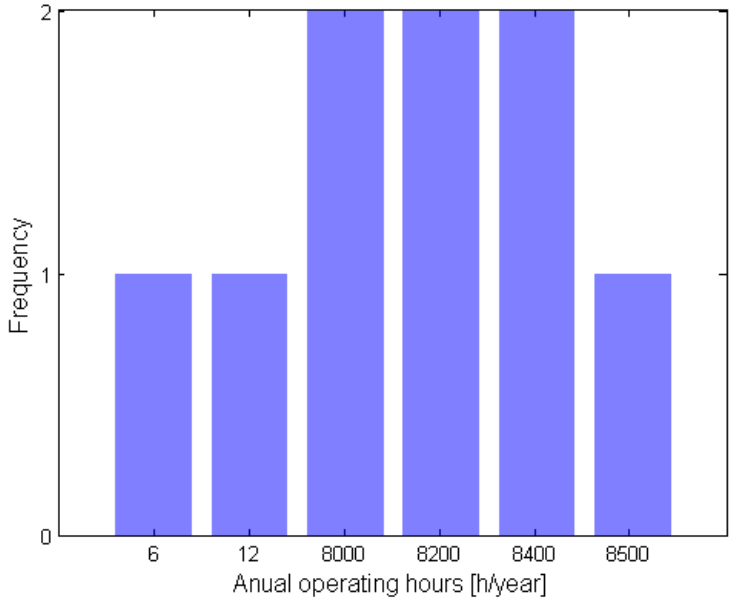



**Figure 8: Number of operating hours (Q30)**

Remark: All installations run most of the time (>90%) except for the 2 backup/emergency generators which run very limited number of hours a year.

***Question 31:*** *Can this production unit be regulated?*

| Number of answers | 10 |
|---|---|
| Yes, only downwards (production can only be reduced) | 2 |
| Yes, only upwards (production can only be increased) | 3 |
| Yes, upwards and downwards | 3 |
| No | 1 |

***Question 32:*** *Does this production unit have any potential flexibility? (e.g. CHP power production can be controlled)*

| Number of answers | 10 |
|---|---|
| Yes | 9 |
| No | 1 |

***Question 33:*** *If the answer to the previous question is 'Yes': On what basis is this unit now regulated?*

| Number of answers | 9 |
|---|---|
| as a function of the business activity | 6 |
| on the basis of economic parameters | 3 |
| rescue of the processes during grid problems | 1 |

***Question 34:*** *If the answer to the previous question is 'No': Can this unit be made flexible by making changes to your business processes?*

| Number of answers | 1 |
|---|---|
| Yes | 0 |
| No | 1 |

***Question 35 & 36:*** *If applicable: how much does the estimated average flexible share of the production unit amount to?*

| Number of answers | 9 |
|---|---|
| Total upwards regulation [MW] | 57.5 MW |
| Total downwards regulation [MW] | 20.5 MW |

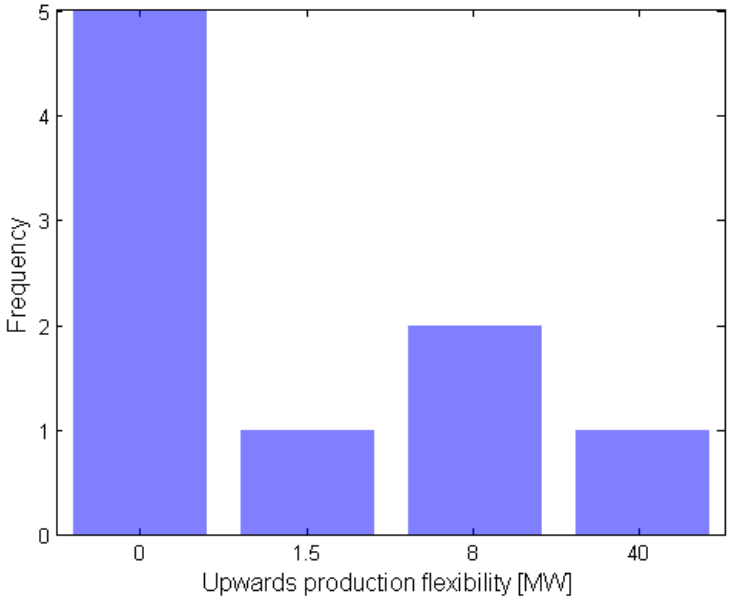



**Figure 9: Upward production flexibility (Q35)**

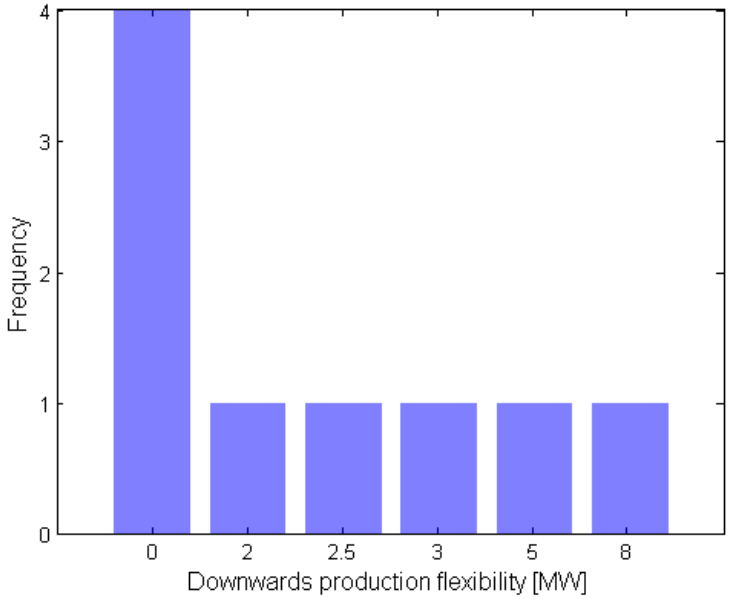



**Figure 10: Downward production flexibility (Q36)**

***Question 37:*** *Is this production unit currently already controlled in a smart way? (Example: as a function of the actual company energy consumption, Belpex prices, peak consumption, …)*

| Number of answers | 10 |
|---|---|
| Yes | 3 |
| No | 7 |

***Question 38:*** *Explanation of the manner and aim of the smart control:*

| Number of answers | 2 |
|---|---|
| Explanation of the manner and aim of the smart control: **Calculation** based on Belpex, **operational conditions** , WKK certificaten value, CO2 emission value. Normally the unit is operated in full load. | |
| In function of 'heat' requirements of the plant: always at 100% (heat required > heat out of CHP) | |

Remark: In some answers, explicit reference is made to the product or production process in a way that anonymity is not guaranteed. In those cases the explanation is edited. All changes are indicated **in bold green**.

***Question 39:*** *Is this unit subject to subsidies?*

| Number of answers | 10 |
|---|---|
| Yes, investment subsidy | 0 |
| Yes, production subsidy (example: green power certificates) | 5 |
| Yes, investment subsidy + production subsidy | 1 |
| No | 4 |

### 5.3.2 Flexibility in electricity consumption

In **19 surveys**, individual flexible consumers are filled out. In total **37 different flexible consumers** were specified.

***Question 40:*** *In how many specific business activities, departments and/or industrial processes do you believe that flexibility could be available? (Examples: packaging department, cooling towers, electrolysis processes, assembly buffer, certain thermal processes, etc.)*

| Number of answers | 23 |
|---|---|
| 1 | 10 |
| 2-5 | 9 |
| 5-10 | 2 |
| 10-50 | 1 |
| >50 | 0 |
| No idea | 1 |

***Question 43:*** *Maximum power of the flexible consumer?*

| Number of answers | 37 |
|---|---|
| Total maximum power | 962 MW |

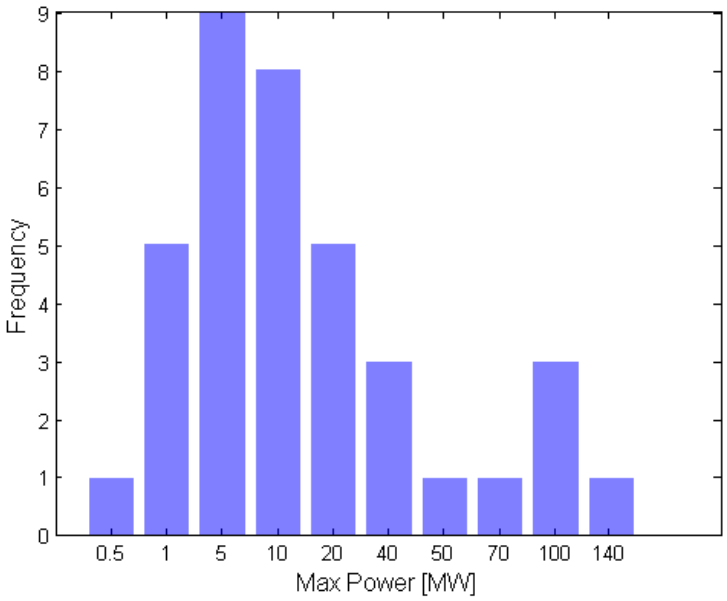
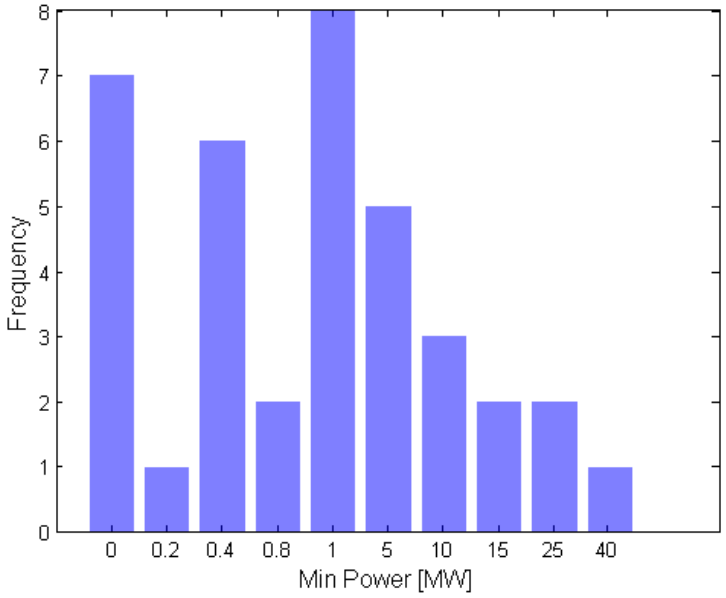



**Figure 11: Histogram maximum power flexible consumer (Q43)**

***Question 44:*** *Minimum power of the flexible consumer?*

| Number of answers | 37 |
|---|---|
| Total minimum power | 190 MW |




***Question 45:*** *Duration of use?*

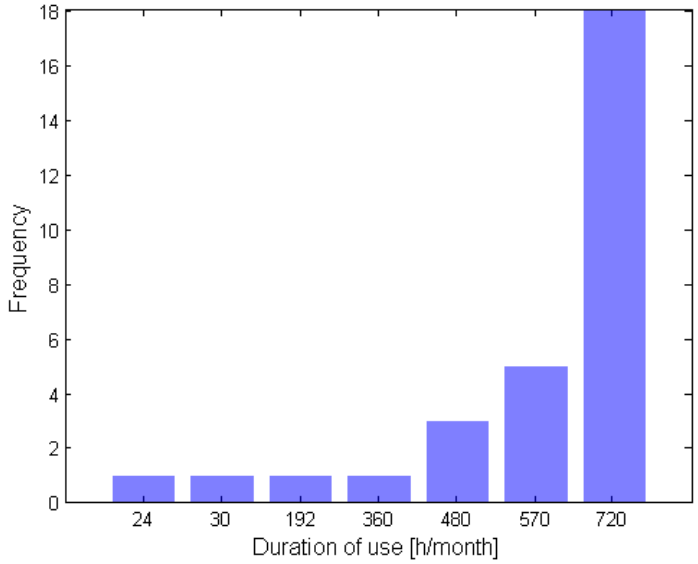



**Figure 12: Histogram duration of user (Q45)**

Remark: There is no hard correlation of this question with question 48 (*Is this consumer already operated on a smart basis to reduce energy costs?*). This means that flexible consumers, which don't use their present flexibility yet, have a similar availability compared to flexible consumers which already do.

***Question 46:*** *Reason why flexibility could be available?*

| Number of answers | 21 |
|---|---|
| Cost Reduction | 1 |
| Modulate or stop the process | 4 |
| Various installations | 1 |
| Buffer available | 8 |
| Not critical for the process | 1 |
| Flexible installation available | 3 |
| Possibility for an extra shift | 1 |
| Batch production | 2 |

***Question 47:*** *Is additional investment needed to make the consumer flexible?*

| Number of answers | 37 |
|---|---|
| No | 24 |
| Yes | 13 |

***Question 48:*** *Is this consumer already operated on a smart basis to reduce energy costs?*

| Number of answers | 34 |
|---|---|
| No | 15 |
| Yes | 19 |

Remark: Question 47 and 48 show an important correlation. 24 flexible consumers don't require additional investments in order to make the consumer flexible. In practice, however, 16/24 are already operated on a smart basis. 13 flexible consumers need further investments, 12/13 of these consumers are not operated on a smart basis yet.

***Question 49:*** *Possible period of time flexibility could be made contractually available (Example: continuous, 1 month, 6 months, 1 year, 2 years, etc.)*

| Number of answers | All | Question 48 "Yes" | Question 48 "No" |
|---|---|---|---|
| 1 day | 7 | 6 | 1 |
| 1 month | 2 | | 2 |
| 1 year | 14 | 6 | 6 |
| >1 year | 3 | 2 | |
| No opinion | 1 | | 1 |

Remark: For this question, the answers were split out based on question 48 (*Is this consumer already operated on a smart basis to reduce energy costs?*).

***Question 50:*** *When would it be preferable for flexibility to be made available during the day? (Example: between 4 pm and 10 pm)*

| Number of answers | 30 |
|---|---|
| Based on spot market prices | 1 |
| Not analysed | 1 |
| No Preference | 20 |
| 8am – 5pm | 1 |
| 4pm – 8pm | 1 |
| 7am – 10pm | 1 |
| 9am – 6 pm | 1 |
| After 2pm | 1 |
| Any time during day shifts | 3 |

***Question 51:*** *When would it be preferable for flexibility to be made available during the week? (Example: in the weekend)*

| Number of answers | 30 |
|---|---|
| Based on spot market prices | 1 |
| Week | 1 |
| Not analysed | 1 |
| No Preference | 26 |
| Weekend | 1 |

***Question 52:*** *When would it be preferable for flexibility to be made available during the year? (Example: during the months from July to September)*

| Number of answers | 30 |
|---|---|
| Based on spot market prices | 1 |
| No Preference | 28 |
| During April to September | 1 |

***Question 53:*** *What is the estimated* ***maximum*** *amount of flexible power that could be reduced, increased or shifted?*

| Number of answers | 37 |
|---|---|
| Total available flexibility | 631.2MW |

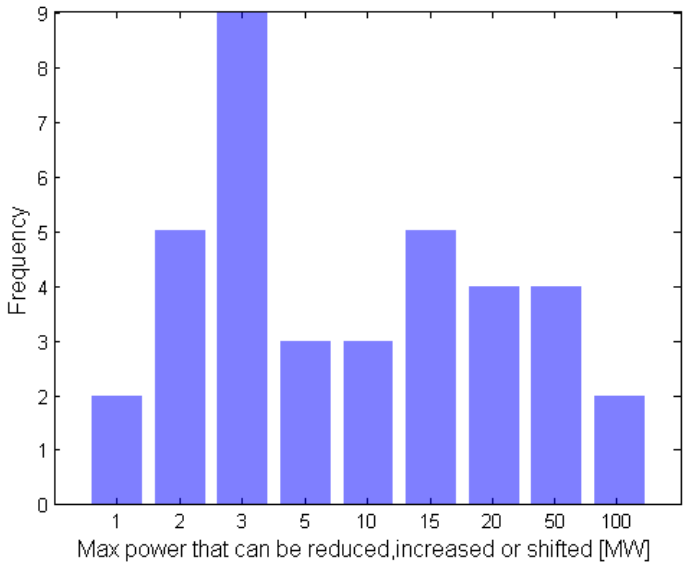



**Figure 13: Histogram of max amount of flexibility (Q53)**

Remark: When correlated with question 48 (*Is this consumer already operated on a smart basis to reduce energy costs?*) 134.1MW of the above flexible capacity (631.2MW) is not used by the company for energy cost reduction.

***Question 54:*** *What is the estimated* ***maximum*** *period of time for shifting, reducing or increasing this flexible power?*

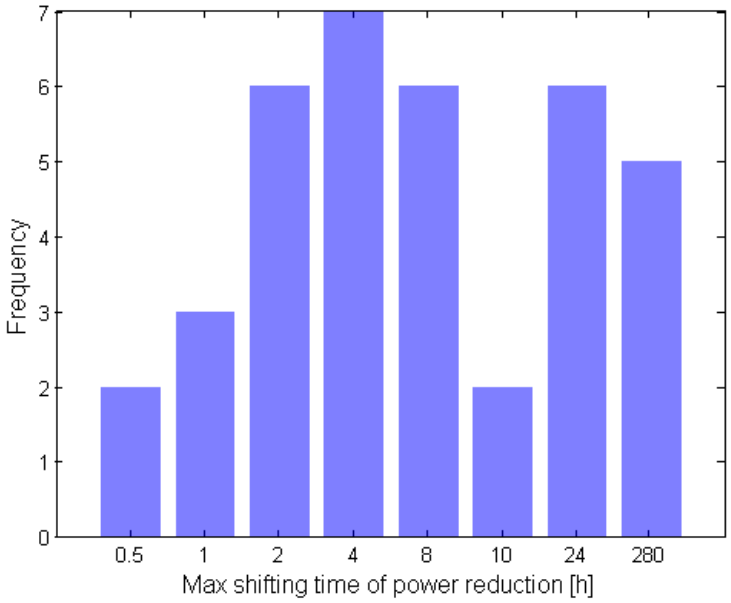



**Figure 14: Histogram of max shifting time of flexibility (Q54)**

***Question 55:*** *How long in advance would any shift or reduction or increase in consumption need to be announced? (Example: 10 minutes, 1 hour, 4 hours, 1 day, 1 week)*

| Number of answers | All | Question 48 "Yes" | Question 48 "No" |
|---|---|---|---|
| Not analysed | 1 | | 1 |
| 30s | 1 | 1 | |
| 3m | 2 | 2 | |
| 5m | 8 | 4 | 4 |
| 10m | 1 | 1 | |
| 15m | 4 | 2 | 2 |
| 1h | 8 | 2 | 6 |
| 2h | 1 | | 1 |
| 8h | 6 | 6 | |
| 1d | 4 | 1 | 1 |
| 2d | 1 | | |

Remark 1: For this question, the answers were split out based on question 48 (*Is this consumer already operated on a smart basis to reduce energy costs?*).
Remark 2: In this question, a lot of companies make a remark stating that "if needed" it can be quite quickly but it would be very convenient to know 1 day before the activation. In the above table, a company indicates a couple of times offering R3 while indicating as well that a D-1 warning at 16:00h would be convenient.
Remark 3: This table contradicts with the results in question 22 where it seems to be obvious that companies currently not offering flexibility want an announcement 16h before activation. In this table most companies seem to be happy with 1h.

The figure below combines the answers of question 48, 53 and 55.

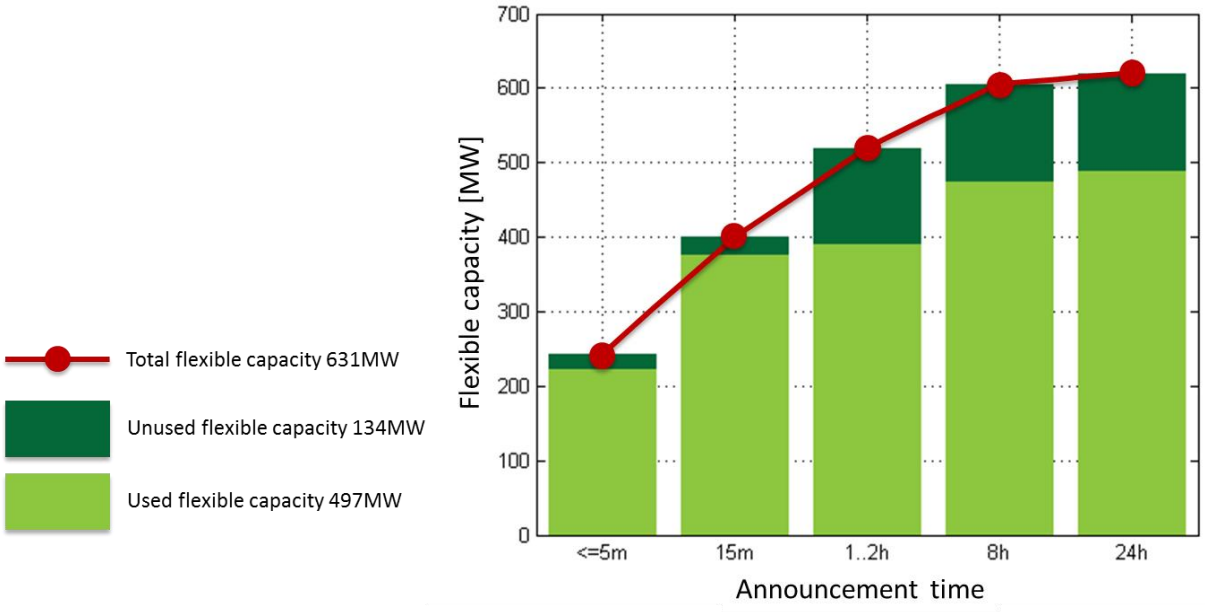



**Figure 15: Cumulative flexible power as function of the announcement time. Light green is the used flexible capacity (497MW), dark green is the unused flexible capacity (134MW) and the brown line is the total flexible capacity (631MW).**

***Question 56:*** *What is the maximum number of activations of the flexibility specified above? (Example: 2x per day, 5x per month, 2x per year)*

| Number of answers | 37 |
|---|---|
| No preference | 6 |
| Depending on production level | 3 |
| Depending on renumeration | 5 |
| 1x/day | 3 |
| 1x/3days | 1 |
| 2x/month | 7 |
| 4x/month | 1 |
| 10x/year | 6 |
| 10 to 15x/year | 2 |
| 12x/year | 1 |
| 40x/year | 1 |
| 3 | 1 |

***Question 57:*** *Does this flexible consumer have 'ramping constraints'? (i.e. once the flexibility has been activated, for example a reduction in demand, how long will it take before the full reduction in demand is delivered)*

| Number of answers | 37 |
|---|---|
| Yes | 20 |
| No | 17 |

***Question 58:*** *In the case of ramping constraints: how long does it take before the requested flexibility (e.g. reduction in demand) will be fully delivered following activation of a* ***consumption reduction?***

| Number of answers | 19 |
|---|---|
| 1m | 2 |
| 3m | 4 |
| 5m | 4 |
| 15m | 5 |
| 30m | 1 |
| 180m | 1 |
| 360m | 2 |

***Question 59:*** *In the case of ramping constraints: how long does it take before the requested flexibility (e.g. reduction in demand) will be fully delivered following activation of a* ***consumption increase?***

| Number of answers | 19 |
|---|---|
| 0m | 7 |
| 1m | 1 |
| 5m | 1 |
| 15m | 2 |
| 20m | 1 |
| 30m | 1 |
| 120m | 1 |
| 240m | 2 |
| 180m | 1 |
| 360m | 2 |

***Question 60:*** *Would you choose only an activation payment for the flexibility of this consumer (i.e. only a payment per MWh flexibility which is effectively activated)?*

| Number of answers | 30 |
|---|---|
| Yes | 2 |
| No | 28 |

***Question 61:*** *Why/Why not?*

| Number of answers | 26 |
|---|---|
| Availability has a value / fixed cost even with no activation | 22 |
| All options are open | 4 |

***Question 62:*** *How much would an exclusive activation payment for the flexibility of this consumer need to be to make it an attractive option for your company?*

| Number of answers | 14 |
|---|---|
| 300 €/MWh | 1 |
| 1000 €/MWh | 1 |
| 2000 €/MWh | 1 |
| 2500 €/MWh | 6 |
| >5000 €/MWh | 3 |
| Under investigation | 2 |

***Question 63:*** *Would you choose solely a reservation payment for this consumer (i.e. only a payment per MW/h flexibility which would be made available during the agreed period, independently of whether it is activated or not)?*

| Number of answers | 28 |
|---|---|
| Yes | 1 |
| No | 27 |

***Question 64:*** *Why/Why not?*

| Number of answers | 27 |
|---|---|
| All options are open | 4 |
| As the energy is bought we have to compensate for it (open risk) | 2 |
| A combination of both is needed | 5 |
| Activation costs because of influence on production process | 15 |
| Direct relation effort & benefit | 1 |

***Question 65:*** *How much would an exclusive reservation payment for the flexibility of this consumer need to be to make it an attractive option for your company?*

| Number of answers | 4 |
|---|---|
| 1.7 €/MW/h | 1 |
| 500 €/MW/h | 1 |
| 150000 €/MW/h | 1 |
| Depending on several factors (confidential) | 1 |

***Question 66:*** *Would you choose a combination of a reservation and activation payment for this consumer? (i.e. a payment per MW/h flexibility which would be made available during the agreed period, as well as an activation payment (€/MWh) when this flexibility is effectively called upon)?*

| Number of answers | 28 |
|---|---|
| Yes | 28 |
| No | 2 |

***Question 67:*** *Why/Why not?*

| Number of answers | 25 |
|---|---|
| Reservation payment covers the fixed costs and the activation payment covers the rest | 23 |
| Most fair fee for both parties | 2 |

***Question 68 – 69:*** *What would the minimum combined reservation and activation payment have to be for this consumer to make this an attractive option for your company?*

**In order to guarantee confidentiality of individual company information, this part is removed from the public version of the report.**

***Question 70:*** *The price limit on the day ahead market resulting from the existing market structure is 3000€/MWh: this could be a target value for the activation payment. Is this sufficient incentive for this consumer to make the flexibility available?*

| Number of answers | 30 |
|---|---|
| Yes | 25 |
| No | 5 |

***Question 71:*** *Why/Why not?*

| Number of answers | 12 |
|---|---|

| Reasons "Why" | 8 |
|---|---|
| We do it already in some processes | |
| We do it already | |
| Covers our costs | |
| Yes, if limited in time to 2 hours per activation – and limited to x activations per year | |
| Compensation of variable costs | |
| Sufficient to cover the internal costs | |
| Yes, in combination with the reservation payment | |
| The profit of using the flexibility must be higher than not using it | |

| Reasons "Why not" | 4 |
|---|---|
| Very uncertain | |
| Oportunity cost + actual cost of deactivation is high, especially when unplanned | |
| If the flexibility reduces efficiency, this could potentially exceed 3000€/MWh | |
| To much operational burden | |

***Question 72:*** *Given the activation payment of 3000€/MWh, what would the minimum reservation payment need to be attractive for this consumer (assumption = DR contract of 1 or 2 years)?*

**In order to guarantee confidentiality of individual company information, this part is removed from the public version of the report.**

### 5.3.3 Flexibility and regulatory/economic framework

***Question 73:*** *Do you already make use of the variable energy prices on the energy markets to manage your energy consumption?*

| Number of answers | 31 |
|---|---|
| Yes, Belpex market | 25 |
| Yes, Intraday market | 7 |
| OTC, bilateral agreement | 5 |
| Balancing | 9 |
| No | 6 |

Remark: In practice, a couple of companies indicated more than 1 option. In that case all options are counted. This explains why the sum of all answers > 31.

***Question 74:*** *If you answered 'No' to the previous question: Why do you not buy/sell any energy on these markets? (several options possible)*

| Number of answers | 6 |
|---|---|
| insufficient volume to trade on these markets | 1 |
| access to these markets is too complex | 0 |
| the average price on the Belpex/Intraday market differs too little from the long-term energy prices | 1 |
| volatility on the Belpex/Intraday market is too low to be interesting to us | 1 |
| the current contract with the supplier does not permit it | 5 |
| other reason (see also table below) | 2 |

| Other reasons | 2 |
|---|---|
| Currently only "after-event" action is taken for balancing purposes of our perimeter. => Variations of our consumption causes us to undertake market actions (Intraday & OTC)<br>Pro-active actions or actions for economic reasons are not yet done. | |
| no people available to manage this type of work | |

***Question 75:*** *If the reason you gave in the previous question were no longer to apply, would flexible energy consumption then be of interest to you?*

| Number of answers | 6 |
|---|---|
| Yes | 6 |
| No | 0 |

***Question 76:*** *Do you already offer flexibility to certain market parties?*

| Number of answers | 33 |
|---|---|
| Yes | 21 |
| No | 11 |

***Question 77:*** *Why/why not?*

| Number of answers | 12 |
|---|---|

| Reasons "Why" | 8 |
|---|---|
| Cost/benefit/ technology makes it possible | |
| Net stability | |
| In tender phase | |
| There is a value | |
| Existing flexibility / reward | |
| Indirectly through ARP | |
| Necessary to remain competitive | |
| Gains + principally in favour | |

| Reasons "Why not" | 4 |
|---|---|
| Difficulties to stop and restart the process | |
| We are still in the preliminary relfection phase | |
| To be developed | |
| No mindset | |

***Question 78:*** *If yes, to which parties is this flexibility currently being offered?*

| Number of answers | 21 |
|---|---|
| Aggregator | 5 |
| Elia | 14 |
| Spot market | 1 |
| Energy supplier / BRP | 2 |
| Classified | 1 |

Remark: In practice, a couple of companies indicated more than 1 option. In that case all options are counted. This explains why the sum of all answers > 21.

***Question 79:*** *If yes, what form of flexibility do you offer? (Examples: primary reserves (R1), secondary reserves (R2), tertiary reserves (R3), other…)*

| Number of answers | 18 |
|---|---|
| R1 | 3 |
| R2 via BRP | 1 |
| R3 | 8 |
| R3-ICH | 9 |

Remark: In this question, it is quite difficult to distinguish R3 and ICH.

***Question 80:*** *If not, would you wish to offer the flexibility available via an intermediary who aggregates the flexibility of several companies?*

| Number of answers | 8 |
|---|---|
| Yes | 5 |
| No | 3 |

***Question 81:*** *Why/why not?*

| Number of answers | 5 |
|---|---|

| Reasons "Why" | 3 |
|---|---|
| If this can be done in a transparant way | |
| Requirements for flexibility will be less severe | |
| Depends on the complexity of the system. | |

| Reasons "Why not" | 1 |
|---|---|
| We prefer direct access to the market. Which we have at the moment and we are a BRP ourselves. | |

| Remarks | 1 |
|---|---|
| I only see value if there is a technical link between my company and another one. **The production of our company is directly dependent on the offtake by our customers.** | |

Remark: In some answers, explicit reference is made to the product or production process in a way that anonymity is not guaranteed. In those cases the explanation is edited. All changes are indicated **in bold green**.

***Question 82:*** *Your energy supplier (or its BRP) must send in an electricity consumption programme daily for the next day. Are you aware of the existence of such programmes?*

| Number of answers | 36 |
|---|---|
| Yes | 33 |
| No | 3 |

***Question 83:*** *Do you share information with your electricity supplier (or its BRP) to improve the quality of the consumption programme?*

| Number of answers | 32 |
|---|---|
| No | 3 |
| Yes, daily | 20 |
| Yes, weekly | 2 |
| Yes, monthly | 3 |
| Yes, yearly | 2 |
| Yes, other | 2 |

| Explanation other period | 2 |
|---|---|
| Yes, we inform our supplier when an event will take place in the company which has an impact on our consumption | |
| Yes, ad hoc, when electricity off take changes | |

***Question 84:*** *Do you consider these consumption programmes as an accurate representation of your actual consumption?*

| Number of answers | 30 |
|---|---|
| Yes | 25 |
| No | 2 |
| No opinion | 3 |

***Question 85:*** *Remarks*

| Number of answers | 5 |
|---|---|
| A lot of time and money is invested last years in IT tools to predict a accurate consumption for day + 1. | |
| Actual consumption can change a lot due to production stops caused by upsets | |
| The best communication would be to send consumption programme daily, divided in fixed part (not flexible) and flexible part (which can be interrupted with short notice) | |
| We make daile forecasts on quarterly basis | |
| Weekly forecasts are made on Friday for the week ahead. These are then adjusted day-ahead and intra-day to reflect our forecast consumption. Intra-day forecast can be very different from previous day-ahead forecast due to increasing/decreasing scheduled quantities of **our product**. | |

Remark: In some answers, explicit reference is made to the product or production process in a way that anonymity is not guaranteed. In those cases the explanation is edited. All changes are indicated **in bold green**.

## 5.4 Background and interest in DR valorization

***Question 86:*** *Was this questionnaire easy for you to fill in?*

| Number of answers | 31 |
|---|---|
| Yes | 17 |
| No | 14 |

***Question 87:*** *Why/why not? (Examples: not confident with the subject, no time, no priority, familiar with the subject but no idea of the flexibility, …)*

| Number of answers | 13 |
|---|---|

| Reasons "Why" | 6 |
|---|---|
| Demand reduction is no priority | |
| Subject is in active development in our company | |
| Familiarity with subject | |
| Got some experience | |
| Because we already participate indirectly through our ARP | |
| Some information is classified | |

| Reasons "Why not" | 7 |
|---|---|
| Too much time consuming when we are focused on the budgets + some questions are not in my scope | |
| No production flexibility at this moment | |
| Not yet confident enough with the subject, especially at the economical part. | |
| Flexibility would rarely be a viable option due to the nature of our business | |
| Not easy to convince people that stopping a plant has some value when they are working each day to improve the reliability and availability of the assets.<br>Difficult to calculate the impact of many stop/restart of a machine (reduce life time and increase risk of failure). (**Rest of the comment is removed in order to ensure anonymity)** | |
| For **some parts of our facilities** it is difficult | |
| The company is not ready for these questions | |

Remark: In some answers, explicit reference is made to the product or production process in a way that anonymity is not guaranteed. In those cases the explanation is edited. All changes are indicated **in bold green**.

***Question 88:*** *To what extent is your company confident in estimating flexibility in your energy demand and/or production?*

| Number of answers | 32 |
|---|---|
| Not at all | 3 |
| A little | 8 |
| Very confident | 21 |

***Question 89:*** *To what extent is your company confident in activating flexibility in your energy demand and/or production?*

| Number of answers | 31 |
|---|---|
| Not at all | 5 |
| A little | 11 |
| Very confident | 15 |

***Question 90:*** *To what extent is your company confident in the valorisation options of flexibility in general?*

| Number of answers | 31 |
|---|---|
| Not at all | 4 |
| A little | 16 |
| Very confident | 10 |

***Question 91:*** *To what extent is your company confident in the energy market mechanisms, the regulatory framework and their options and limitations?*

| Number of answers | 30 |
|---|---|
| Not at all | 0 |
| A little | 16 |
| Very confident | 14 |

***Question 92:*** *Would you be interested in a flexibility screening of your company on site by VITO/EnergyVille?*

| Number of answers | 31 |
|---|---|
| Yes | 12 |
| No | 16 |

***Question 93:*** *Why/why not? (Examples: not confident with the subject, no time, no priority, familiar with the subject but no idea of the flexibility, …)*

| Number of answers | 15 |
|---|---|

| Reasons "Why" | 7 |
|---|---|
| Evaluation of cogen operation | |
| We are always interested in participating in new flexibility mechanisms which allow to reduce our energy costs and contribute to the net stability. | |
| Outside view can help find potential flexibility | |
| Second screening can be useful | |
| We think that there is potential | |
| To check if we have explored all options | |
| Maybe | |

| Reasons "Why not" | 8 |
|---|---|
| We know our flexibility, we lack resources, mostly computerization and metering, to activate it. | |
| Already done by myself | |
| Already done with other consultants | |
| Already done by **an aggregator** | |
| Flexibility would depend entirely on customers requirements | |
| We don't go for flexibility (production process) | |
| Source of flexibility well known. Internal studies are needed to make it available and usable. | |
| Will depend on the potential valorization of the flexibility – currently not interested | |

Remark: In some answers, explicit reference is made to the product or production process in a way that anonymity is not guaranteed. In those cases the explanation is edited. All changes are indicated **in bold green**.

***Question 94:*** *I would like to be kept informed of interesting developments in the area of energy flexibility, smart grids and demand response.*

| Number of answers | 31 |
|---|---|
| Yes | 29 |
| No | 2 |

***Question 95:*** *Have any situations already arisen where restrictions on the energy supply had an impact on your company?*

| Number of answers | 26 |
|---|---|
| Yes | 7 |
| No | 19 |

***Question 96:*** *Explanation:*

| Number of answers | 6 |
|---|---|

| Explanation "yes" | 5 |
|---|---|
| Interruptibility activation with customer service (delay) and quality problems due to interruption | |
| 17/01/13 energy cut off from Elia. Production stop. | |
| Activation ICH | |
| But not in Belgium | |
| Regional black-out a couple of years ago | |

| Explanation "no" | 1 |
|---|---|
| ICH not activated in 2013 until now | |

## 5.5 General questions, comments, feedback

In order to guarantee confidentiality of individual company information, this part is removed from the public version of the report.