Competitiveness of corporate sourcing of renewable energy

Annex C to Part 2 *of the Study on the competitiveness of the renewable energy sector*

Synopsis Report: Online survey and interviews with EU stakeholders

ENER/C2/2016-501
28 June 2019

EUROPE DIRECT is a service to help you find answers to your questions about the European Union

Freephone number (*):
00 800 6 7 8 9 10 11

(*) The information given is free, as are most calls (though some operators, phone boxes or hotels may charge you)

LEGAL NOTICE

Luxembourg: Publications Office of the European Union, 2019

ISBN: 978-92-76-09286-5
Doi: 10.2833/331857
Catalogue: MJ-02-19-628-EN-N

EUROPEAN COMMISSION

DIRECTORATE C
Renewables, Research and Innovation, Energy Efficiency

European Commission
B-1049 Brussels

Competitiveness of corporate sourcing of renewable energy

Annex C to Part 2 *of the Study on the competitiveness of the renewable energy sector*

Synopsis Report: Online survey and interviews with EU stakeholders

ENER/C2/2016-501
28 June 2019

Authors: Felice Simonelli, Antonella Zarra, William Schmitt (CEPS)

Table of Contents

1 Introduction

The present Annex summarises the main findings of an **online survey on corporate sourcing of renewable energy** (RE) which was prepared in cooperation with the Directorate-General for Energy (DG ENER) of the European Commission and administered by the Study Team via the SurveyMonkey®[1] platform, between July and September 2018. Survey results are complemented by data and information provided by selected **stakeholders consulted via semi-structured interviews**.

Box 1 Data visualisation and geographical scope

In what follows, the **aggregated results** of the online survey are presented by showing:

- **Bar charts with averages**. For each question, average scores were computed by dividing respondents into two groups: i) companies that are sourcing RE or are planning to source it in the next three years; ii) companies that are not sourcing RE because either they have deliberated to discard this opportunity after assessing pros and cons or they have never considered this option. Averages do not account for those respondents who answered "don't know/no opinion" to the question under analysis. The data labels of the bar charts feature the number of respondents on the left and the average score on the right.
- **Top-two Box/Bottom-two Box tables**. Each bar chart with averages is followed by a top-two box/bottom-two box table. The top-two box/bottom-two box approach is a survey analysis technique that summarises the positive and negative responses from a Likert scale survey by combining the highest two and lowest two responses of the scale to create a single number (in this case, the percentage of respondents that provided the two highest and two lowest responses). It simplifies the analysis and allows for a better comparison of the results. In addition, a colour scale from red to green provides a swift overview of the results. Red is assigned to lower shares of respondents and green to higher shares of respondents.

When it comes to the **geographical scope** of the analysis**, all results are presented at the EU level**. This is because the limited number of answers received with reference to a specific Member State (see Section 2.1) does not allow for a robust cross-country comparison. Nevertheless, Member State level results have been used to validate and complement information collected from national stakeholders and presented in the **country factsheet included in Annex B** to Part 2 of this Study.

Source: Author's elaboration.

2 Sample Composition

2.1 Survey

The online survey was responded to by **68 companies operating in the European Union** (EU). With regard to the company size, **20 respondents have less than 250 employees**, which is the threshold adopted in this Study to define small and medium-sized enterprises (SMEs). More than half (51%) of the companies are operating in more than one country: 36 respondents are operating, *inter alia*, in Germany, 31 in Italy, 27 in France and 26 in Spain. Interestingly, 24 companies are also operating in non-EU countries. Whereas 47 companies provided their views with reference to one

[1] For further details, please see: https://www.surveymonkey.com

specific Member State (15 Member States are covered), 21 respondents referred to their experience in multiple EU Member States. The majority of respondents (62%) belong to the "manufacturing" class (NACE rev.2 C), followed by "professional, scientific and technical activities" (7%, NACE rev.2 MC) and "wholesale and retail trade" (7%, NACE rev.2 G). When distinguishing between energy-intensive and non-energy intensive sectors, the sample is quite balanced, with **35 energy-intensive companies** and 33 non-energy intensive companies. Interestingly, with very few exceptions, respondents do not participate in the RE100 initiative;[2] therefore, the main findings presented in this synopsis report may complement those of similar studies presenting the views of RE100 members.

2.2 Interviews

To complete the main findings of the online survey and improve the understanding of drivers and constraints behind the corporate sector's transition to RE, the Study Team conducted interviews with **14 different stakeholder groups at the EU level**, including research institutes, renewable energy associations, sectoral associations representing energy-intensive as well as non-energy intensive sectors, associations representing energy market players and companies operating in multiple Member States. More specifically, a total of 19 interviews were carried out, as three associations preferred to arrange multiple interviews with their members providing different viewpoints on the issues at stake.

3 Corporate sourcing of renewable electricity (RES-E)

This Section first discusses the **main challenges** faced by companies operating in the EU when sourcing (or trying to source) renewable electricity as well as **key opportunities** stemming from corporate sourcing of renewable electricity. It then presents the **drivers and barriers** affecting companies' decisions to rely on the following options to sourcing renewable electricity: i) self-generation; ii) renewable power purchase agreements (PPAs); iii) unbundled guarantee of origins (GOs); and iv) green energy offers. **Stakeholders interviewed for this Study** emphasised that, whereas opportunities and decision drivers tend to be sectoral-specific, challenges and barriers are also affected by the size of the company and the Member State(s) where it operates. Stakeholders also pointed out that most of the companies, especially those belonging to energy-intensive sectors, prefer to diversify their procurement risk by relying on multiple options to source renewables; for instance, they combine self-generation with one or more PPAs while they keep on buying a share of electricity either from a supplier (occasionally green) or on the wholesale market.

3.1 Opportunities

Figure 1 and Table 1 show that most of the **respondents to the online survey that are currently sourcing or are planning to source renewable electricity** in the next three years believe that this may help improve their corporate social responsibility (CSR) strategy, thus differentiating their offer and generating a competitive advantage ('differentiation'). This competitive advantage seems to lead to an increased demand for products/services provided by green companies: 25 respondents confirmed that the decision to source renewable electricity has increased (or is expected to increase) the demand for their products; some of them estimated an increase between 1 and 10%. In addition, a sound CSR strategy brings more value to shareholders, as (institutional) investors are increasingly concerned about environmental sustainability. The majority of these companies also rely on renewable

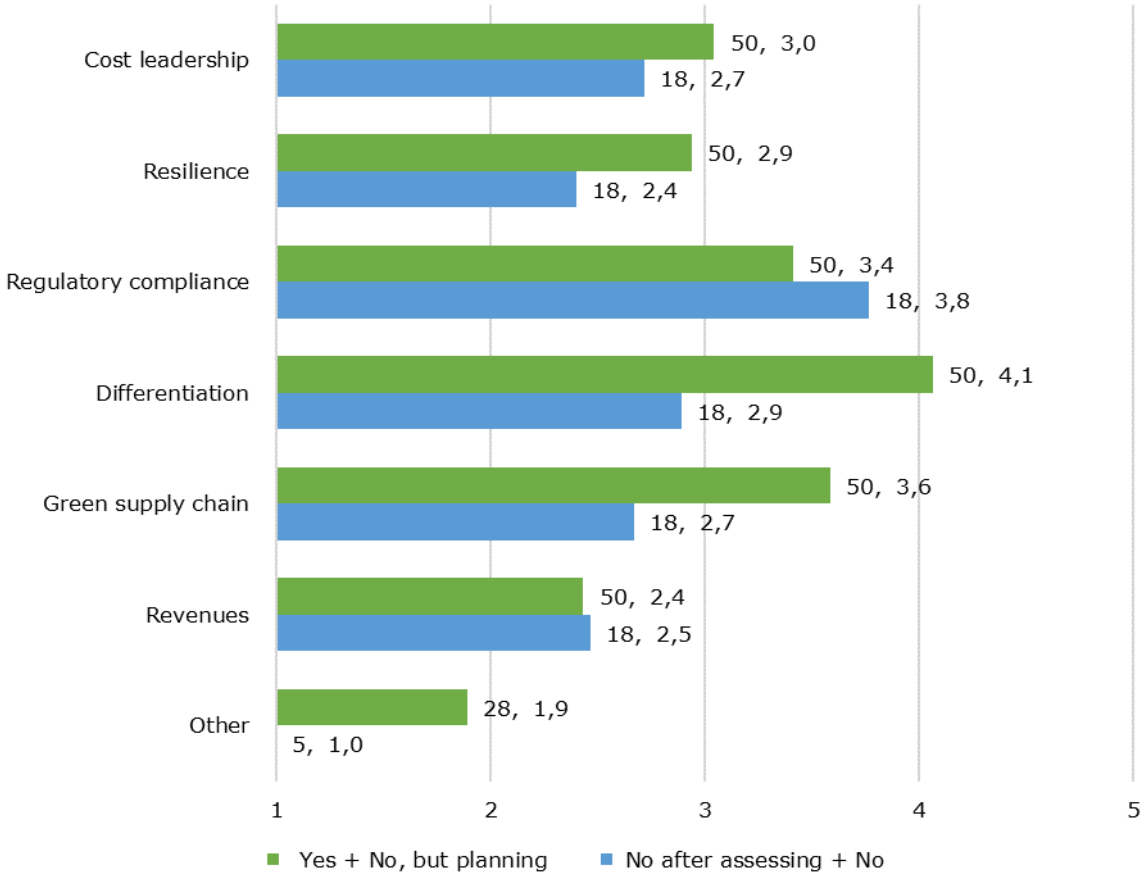
[2] For further details, please see: http://there100.org/

electricity to meet green requirements established by their customers and participate in green supply chains. In this respect, large companies may play a pivotal role in making supply chains greener. **Some of the stakeholders interviewed for this Study** emphasised that while consumers and customers are increasingly interested in green products, the willingness to pay a premium price for such products is still limited. In some sectors, participating in green supply chains paves the way for opportunities stemming from green public procurement.

A large share of respondents sourcing renewable electricity also believe that RE may contribute to regulatory compliance; however, based on follow-up interviews, this is about complying with internal sustainability targets and rules set by headquarters to implement the CSR strategy rather than national or EU legal obligations. Impacts on costs are unclear, as the number of respondents emphasising cost reductions linked to renewable electricity is equivalent to the number of respondents pointing at negligible impacts in terms of cost reduction. This is mainly for two reasons: i) generation costs for renewable electricity are going down fast, however only recent projects seem to be cost competitive; ii) while generation costs are relevant for self-generation, they are less relevant for PPAs and, especially, green energy offers, as generators and suppliers look at the electricity market price when negotiating with buyers. However, 25 respondents to the survey have confirmed that the decision to source renewable electricity has reduced (or is expected to reduce) the company's operating costs; most of them estimate a reduction between 1% and 10%.

Interestingly, the only opportunity considered by those **companies that are not sourcing renewable electricity** is regulatory compliance. However, for the time being, there is no legal obligation for companies to meet part of their electricity needs via renewables. Therefore, this driver may be partially referred to internal company rules. This cluster of companies does not see any benefit in terms of CSR strategy/differentiation, participation in green supply chains or increased resilience. Furthermore, it is worth mentioning that **follow-up interviews** showed that renewable electricity by itself does not seem to increase the price stability, predictability and security of energy inputs ('resilience'), due to the fluctuating nature of renewable energy sources for electricity (RES-E) such as wind or solar; resilience may only be increased by complementing renewable electricity sourcing with e.g. balancing agreements (in case of PPAs) or net metering solutions (in case of self-generation). Generally speaking, revenues stemming from support schemes (subsidies, tax credits) have a very limited role in corporates' decisions to source renewable electricity.

Figure 1 Renewable electricity: opportunities (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 1 Renewable electricity: opportunities (top/bottom two boxes)

	Yes + No, but planning		No after assessing + No	
	TOP 2 BOXES	**BOTTOM 2 BOXES**	**TOP 2 BOXES**	**BOTTOM 2 BOXES**
Cost leadership	42.0%	42.0%	11.1%	33.3%
Resilience	36.0%	44.0%	16.7%	50.0%
Regulatory compliance	48.0%	24.0%	72.2%	11.1%
Differentiation	72.0%	10.0%	33.3%	44.4%
Green supply chain	56.0%	20.0%	22.2%	55.6%
Revenues	20.0%	52.0%	11.1%	38.9%
Other	7.1%	25.0%	0.0%	20.0%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

No substantial differences are recorded between **SMEs** and large enterprises when it comes to opportunities from renewable electricity. In fact, respondents with less than 250 employees confirmed the general trends presented above: almost 86% of SMEs

believe that sourcing renewable electricity has a positive impact (to a high or the fullest extent) in terms of CSR and creates a competitive advantage ('differentiation'). This is also confirmed by respondents operating in **energy-intensive industries**; interestingly, most of the energy-intensive companies emphasised that renewable electricity did not help so far reduce operating costs or increase resilience.

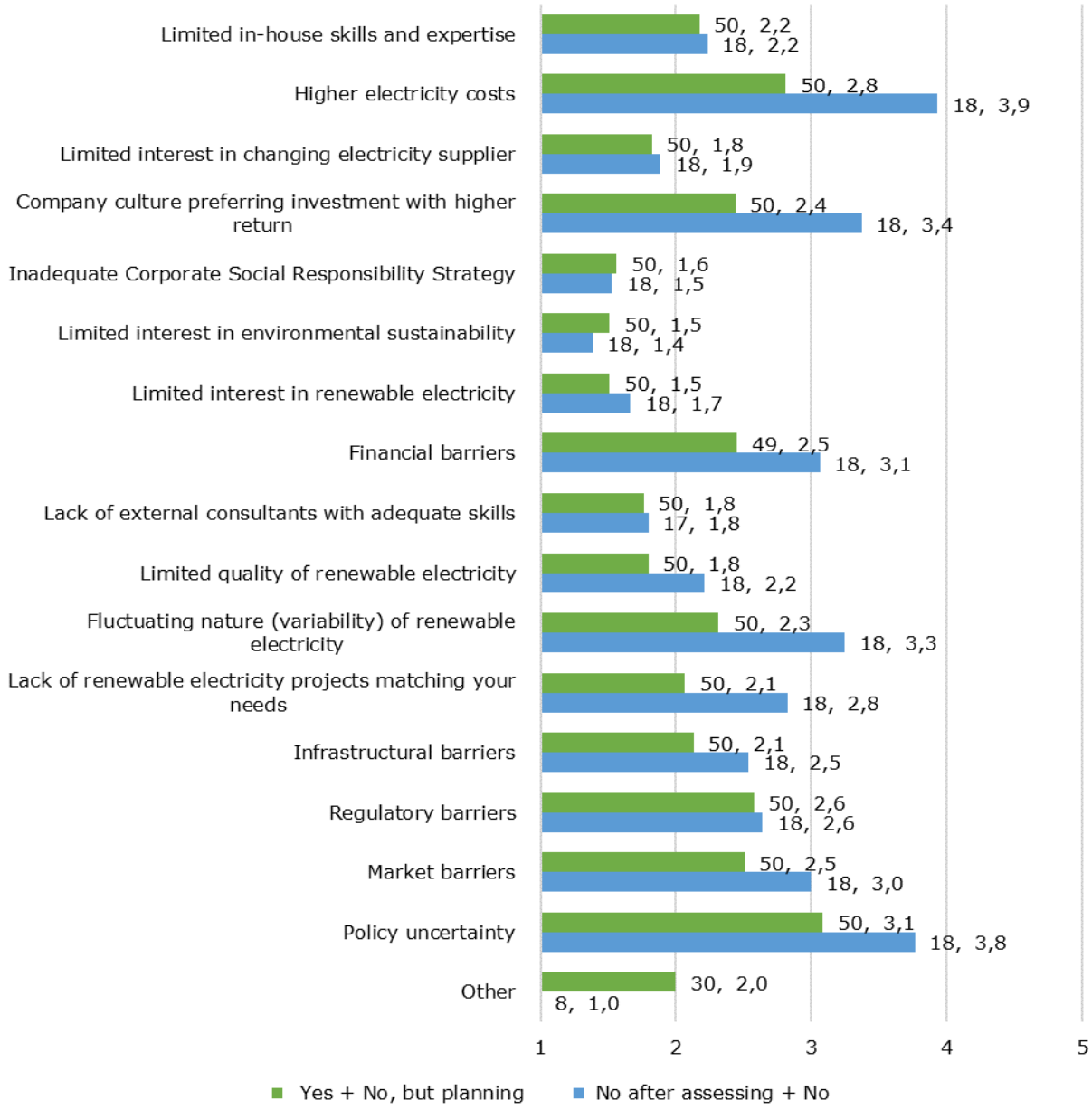
3.2 Challenges

According to the **respondents that are sourcing or planning to source renewable electricity**, policy uncertainty and regulatory barriers are the most relevant challenges, followed by higher electricity costs compared to grid electricity (Figure 2 and Table 2). Nevertheless, no challenge seems to create substantial obstacles to corporate sourcing of renewable electricity. Interestingly, policy uncertainty ranks first also among the challenges identified by **companies that are not relying on RES-E**; in fact, according to this group of respondents, changes in support schemes and, more importantly, changes in the regulated components of the electricity prices hinder the decision to source renewable electricity. Reportedly, rules change too fast and are quite different across Member States, thus making the sourcing strategy of companies operating in multiple EU countries quite complex. The decision not to rely on RES-E is also affected (at least to a high extent) by: i) higher electricity costs compared to grid electricity; ii) company culture preferring investments with higher returns; iii) the (perceived) fluctuating nature of renewable electricity (solar, wind); and iv) financial barriers. Similar trends are registered among energy-intensive players and SMEs. **Small companies** emphasised that financial barriers, inadequate company culture and policy uncertainty are limiting corporate sourcing of renewable electricity. For **energy-intensive players** that have a highly variable consumption profile (e.g. steelmakers using electric arc furnaces), the fluctuating nature of renewable electricity may represent a key challenge, as balancing costs may be prohibitively high. More generally, electricity-intensive companies cannot afford to buy electricity above market prices, as energy costs are key for their competitiveness.

The **stakeholders interviewed for this Study** emphasised a specific challenge affecting **energy-intensive industries that are exposed to a significant risk of carbon leakage** due to costs relating to greenhouse gas emissions passed on in electricity prices. In principle, according to the relevant Commission's guidelines,[3] such companies can be granted state aid to reduce the EU emission trading system (ETS) indirect costs they face. However, stakeholders argue that in some Member States (e.g. Germany) the implementation of the Commission's guidelines does not allow companies purchasing renewable electricity to get compensated for indirect EU ETS costs. This generates big disparities between companies buying green electricity via e.g. PPAs and green energy offers and those buying 'brown' electricity. In fact, they both pay a price for electricity that is largely aligned to the electricity market price and includes indirect ETS costs; however, companies purchasing 'brown' electricity will get compensated for part of the price paid, whereas companies buying green electricity will not be eligible for such compensation. This reduces any incentive to purchase renewable electricity, which would cost substantially more than 'brown' electricity. Interviewees also stressed that the ongoing reduction of generation costs for renewable electricity may arouse the interest of a larger number of corporates seeking to reduce their energy costs.

[3] Communication from the Commission — *Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012* (SWD(2012) 130 final) (SWD(2012) 131 final). OJ C 158, 5.6.2012, p. 4–22.

Figure 2 Renewable electricity: challenges (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 2 Renewable electricity: challenges (top/bottom two boxes)

	Yes + No, but planning		No after assessing + No	
	TOP 2 BOXES	**BOTTOM 2 BOXES**	**TOP 2 BOXES**	**BOTTOM 2 BOXES**
Limited in-house skills and expertise	16.0%	54.0%	22.2%	55.6%
Higher electricity costs	26.0%	38.0%	50.0%	5.6%
Limited interest in changing electricity supplier	6.0%	68.0%	11.1%	72.2%
Company culture preferring investment with higher return	20.0%	42.0%	44.4%	22.2%
Inadequate Corporate Social Responsibility Strategy	8.0%	78.0%	5.6%	77.8%
Limited interest in environmental sustainability	4.0%	78.0%	0.0%	88.9%
Limited interest in renewable electricity	6.0%	78.0%	0.0%	83.3%
Financial barriers	20.4%	51.0%	38.9%	22.2%
Lack of external consultants with adequate skills	8.0%	70.0%	5.9%	70.6%
Limited quality of renewable electricity	10.0%	70.0%	11.1%	44.4%
Fluctuating nature of renewable electricity	16.0%	52.0%	44.4%	22.2%
Lack of renewable electricity projects matching your needs	14.0%	58.0%	22.2%	33.3%
Infrastructural barriers	12.0%	56.0%	22.2%	38.9%
Regulatory barriers	30.0%	44.0%	11.1%	27.8%
Market barriers	22.0%	46.0%	22.2%	16.7%
Policy uncertainty	40.0%	30.0%	55.6%	11.1%
Other	3.3%	20.0%	0.0%	12.5%

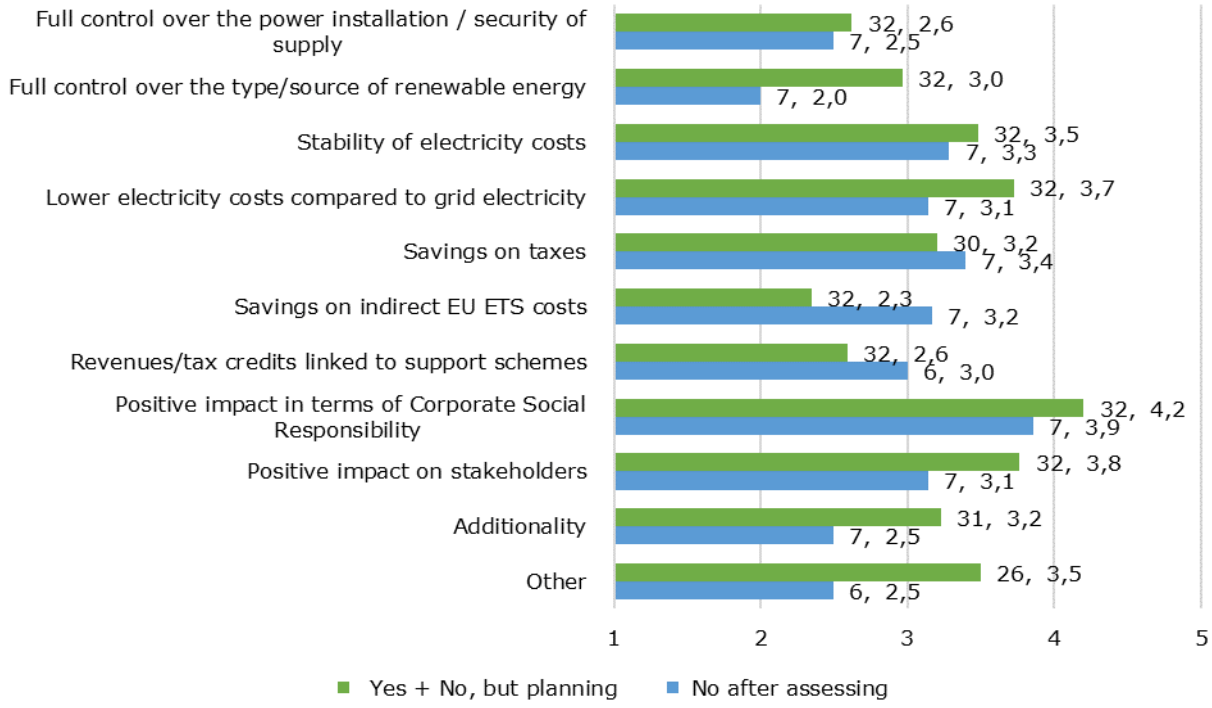
Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

3.3 Self-generation

3.3.1 Drivers

According to **respondents that are currently self-generating renewable electricity or planning to do so** in the next three years, the main factor driving their decision to self-generate is the positive impact in terms of CSR and environmental sustainability, followed by the positive impact on stakeholders (including employees) stemming from the visible link between the company's premises and the renewable power plant (Figure 3 and Table 3). The lower generation costs compared to grid electricity also play an important role for most of the companies. Self-generation ranks high also in terms of stability of electricity costs, additionality and savings on taxes and other non-energy components of the electricity price. The very same positive factors, except for additionality, were also considered by those **companies that eventually decided not to self generate renewable electricity**, after assessing this option.

Figure 3 Self-generation of renewable electricity: drivers (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 3 Self-generation of renewable electricity: drivers (top/bottom two boxes)

	Yes + No, but planning		No after assessing	
	TOP 2 BOXES	**BOTTOM 2 BOXES**	**TOP 2 BOXES**	**BOTTOM 2 BOXES**
Full control over the power installation and security of supply	21.9%	50.0%	28.6%	42.9%
Full control over the type/source of renewable energy	31.3%	37.5%	0.0%	57.1%
Stability of electricity costs	46.9%	18.8%	42.9%	14.3%
Lower electricity costs compared to grid electricity	62.5%	21.9%	42.9%	28.6%
Savings on taxes	43.3%	30.0%	42.9%	14.3%
Savings on indirect EU ETS costs	15.6%	46.9%	57.1%	28.6%
Revenues/tax credits linked to support schemes	18.8%	46.9%	16.7%	16.7%
Positive impact in terms of Corporate Social Responsibility	68.8%	9.4%	71.4%	0.0%
Positive impact on stakeholders	62.5%	21.9%	42.9%	28.6%
Additionality	45.2%	32.3%	0.0%	14.3%
Other	34.6%	19.2%	0.0%	16.7%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

Breaking down the results by **the size of the company**, on average, companies with less than 250 employees that are currently self-generating (or planning to self-

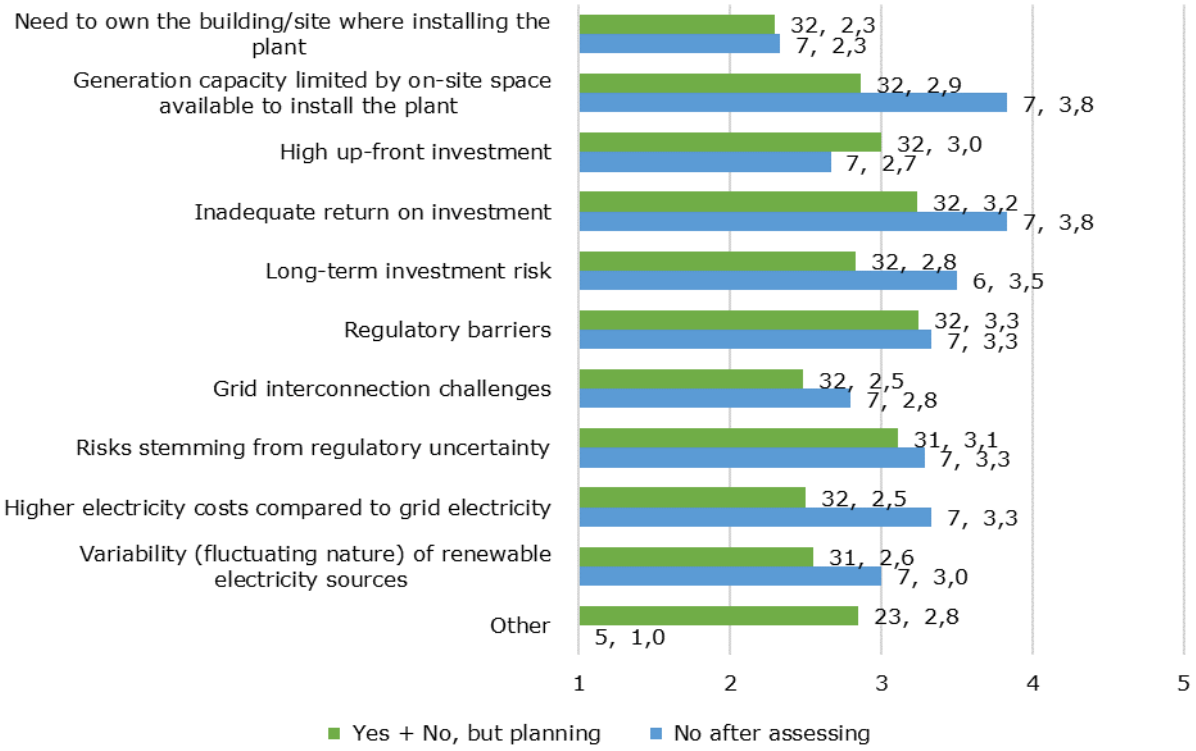
generate) give more prominence to savings in electricity costs compared to large companies. When only **energy-intensive companies** are considered, the trends are very similar to the general ones and the majority of energy-intensive companies choose to self-generate electricity in order to save on regulated components of the electricity price (and possibly on indirect EU ETS costs).

3.3.2 Barriers

When focusing on **companies that are self-generating or plan to self-generate renewable electricity** (Figure 4 and Table 4), the most prominent obstacles to overcome are the regulatory barriers (which are mostly Member State-specific, such as land use and zoning rules and environmental permits for ground-mounted solar PV and wind turbines[4] or building codes for rooftop solar PV), inadequate return on investment (relatively long pay-back period) and risks stemming from regulatory uncertainty. Reportedly, the latter barrier includes both risks related to changes in support schemes, which were modified retroactively in e.g. Italy, Romania and Spain, and risks linked to changes in energy taxation and network costs. In fact, in some Member States, self-consumption was subject to taxes (e.g. the so-called 'sun tax' in Spain) or may be subject in the future, as self-generation tends to inflate electricity network costs, which are then not charged on self-consumed electricity. Interestingly, **respondents that assessed and discarded the self-generation option** are rather concerned by the inadequate return on investment coupled with long-term investment risk. Their decision not to rely on self-generation was also affected by limited generation capacity due to limited space available on-site to install the power plant (only a few companies reported to self-generate from wind; solar PV installed rooftops provides only a share of the electricity demanded) and the variability (fluctuating nature) of RES-E (solar and wind), thus requiring grid electricity to complement and balance self-consumption. **Some of the stakeholders interviewed for this Study** emphasised that limited awareness, especially by SMEs, of RES-E solutions represents a large obstacle to corporate investment in self-generation; for instance, many SMEs are concerned by the variable generation, which can be easily addressed via e.g. net-metering mechanisms. They also confirmed that costs for grid interconnection are relatively low compared with the overall investment costs; hence, they do not represent a sizeable barrier. Other interviewees are more sceptical about self-generation, as most of the companies prefer to focus on their core business and purchase electricity rather than generate it.

[4] By way of examples, in order to install wind turbines at least the following factors need to account for: distance from buildings ('shadow flicker'), distance from radar, interaction with wild-life and impact on the landscape ('beauty spot').

Figure 4 Self-generation of renewable electricity: barriers (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 4 Self-generation of renewable electricity: barriers (top/bottom two boxes)

	Yes + No, but planning		No after assessing	
	TOP 2 BOXES	BOTTOM 2 BOXES	TOP 2 BOXES	BOTTOM 2 BOXES
Need to own the building/site where installing the plant	28.1%	59.4%	28.6%	57.1%
Generation capacity limited by on-site space available to install the plant	28.1%	37.5%	57.1%	14.3%
High up-front investment	31.3%	31.3%	42.9%	42.9%
Inadequate return on investment	43.8%	34.4%	71.4%	14.3%
Long-term investment risk	28.1%	37.5%	66.7%	16.7%
Regulatory barriers	37.5%	25.0%	42.9%	28.6%
Grid interconnection challenges	25.0%	50.0%	28.6%	28.6%
Risks stemming from regulatory uncertainty	41.9%	29.0%	42.9%	14.3%
Higher electricity costs compared to grid electricity	28.1%	59.4%	42.9%	28.6%
Variability (fluctuating nature) of renewable electricity sources	25.8%	54.8%	57.1%	42.9%
Other	21.7%	26.1%	0.0%	20.0%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

SMEs that are self-generating (or plan to self-generate) renewable electricity are mostly concerned by regulatory barriers. By contrast, **energy-intensive companies** that are self-generating place emphasis on the following obstacles: regulatory uncertainty, inadequate return on investment and higher electricity costs compared to grid electricity (this may be explained by the fact that large consumers usually are able to strike better deals with electricity suppliers and may be exempted from paying some components of the electricity price, such as RES levies). Energy-intensive companies that decided not to self-generate largely confirmed the same barriers experienced by other types of companies.

3.4 Renewable power purchase agreements (PPAs)[5]

3.4.1 Drivers

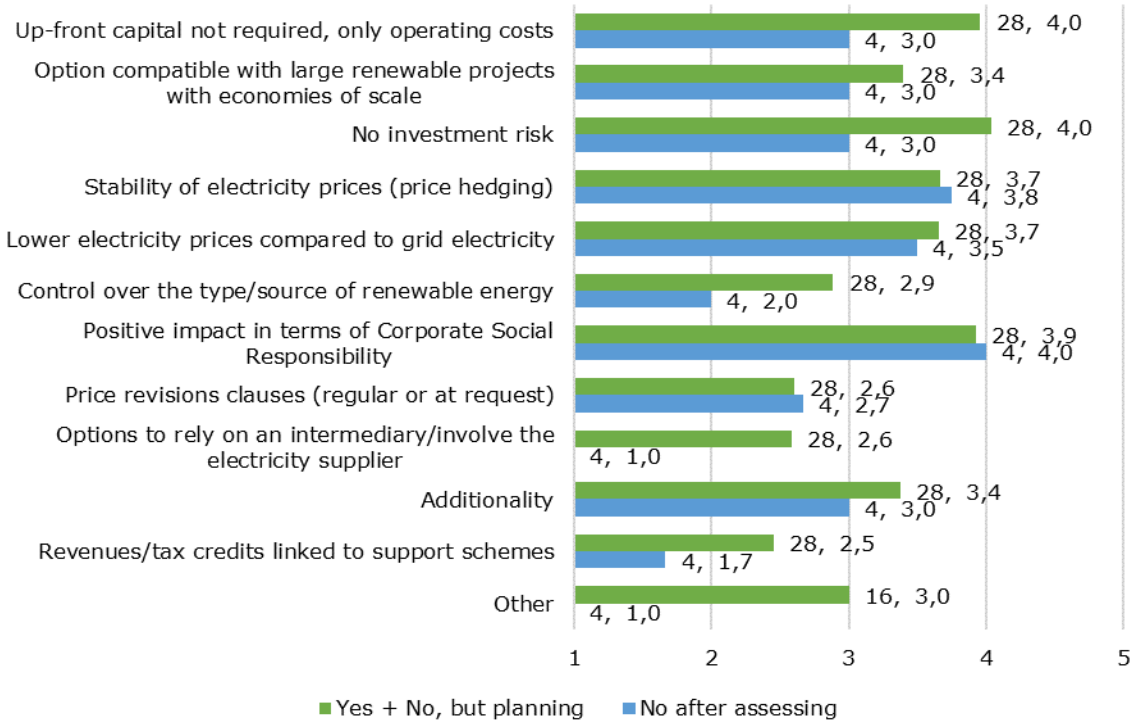
Besides featuring positive impacts in terms of CSR and environmental sustainability, according to **companies relying (or planning to rely) on RE PPAs**, this option for sourcing renewable electricity has important advantages because it does not entail up-front investments costs, has limited investment risk, ensures stability of electricity prices (price hedging) and may guarantee electricity prices lower than grid electricity (Figure 5 and Table 5). In addition, RE PPAs allow to purchase electricity from large-scale (cost-effective) renewable projects (especially when multiple buyers are allowed[6]), thus meeting a large share (in principle up to 100% in some sector) of the off-taker's electricity demand. RE PPAs may also ensure additionality. **Companies that are not sourcing renewable electricity via PPAs** believe that the main drivers to sign a RE PPAs are the positive impacts in terms of environmental sustainability, followed by the stability of electricity prices (price hedging). Interestingly, half of the respondents that are not sourcing RE via PPAs believe that prices lower than grid electricity are the key decision driver.

The lion's share of **SMEs** responding to the survey and sourcing (or planning to source) electricity via a PPA believe that the most relevant advantage of this option for corporate sourcing of renewables is the low investment risk, followed by positive impacts in terms of CSR and additionality. **Energy-intensive companies** identified drivers that are very similar to those selected by other companies; however, their decision is not driven by additionality considerations.

Stakeholders interviewed for this Study placed a large emphasis on the role played by GOs in RE PPAs. In fact, whereas companies that sign PPAs mainly for price hedging purposes may have limited interest in GOs, off-takers that look at RE PPAs as a means to improve their CSR strategy are interested in getting and cancelling GOs for the electricity purchased. In this respect, in those Member States (such as France and Germany) where renewable projects supported by public money are not allowed to receive GOs over their production, this second group of off-takers may have very little interest in signing PPAs for existing projects. In addition, some interviewees stressed that while revenue/tax credits linked to support schemes are not directly driving the off-takers' decision, they may have an impact on the deal, as they allow to reduce the strike price. Reportedly, prices are becoming competitive also for non-subsidised RE plants; in fact, generation costs are decreasing fast and, in the absence of public support, generators (especially when projects are funded by institutional investors) may accept relatively lower prices in exchange for long-term revenue streams.

[5] Contracts under which a legal or natural person agrees to purchase renewable electricity directly from a renewable energy generator.
[6] Reportedly, this is crucial for wind offshore projects, as the installed capacity can meet the demand of tenths of off-takers.

Figure 5 RE PPAs: drivers (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 5 RE PPAs: drivers (top/bottom two boxes)

	Yes + No, but planning		No after assessing	
	TOP 2 BOXES	BOTTOM 2 BOXES	TOP 2 BOXES	BOTTOM 2 BOXES
Up-front capital not required, only operating costs	57.1%	10.7%	25.0%	25.0%
Option compatible with large renewable projects with economies of scale, especially by allowing for multiple buyers	42.9%	21.4%	25.0%	25.0%
No investment risk	71.4%	14.3%	25.0%	25.0%
Stability of electricity prices (price hedging)	60.7%	14.3%	50.0%	25.0%
Lower electricity prices compared to grid electricity	60.7%	21.4%	50.0%	25.0%
Control over the type/source of renewable energy	25.0%	42.9%	25.0%	75.0%
Positive impact in terms of Corporate Social Responsibility (environmental sustainability)	64.3%	7.1%	75.0%	0.0%
Price revisions clauses (regular or at request)	14.3%	28.6%	25.0%	25.0%
Options to rely on an intermediary/involve the electricity supplier in the agreement	17.9%	39.3%	0.0%	75.0%
Additionality	46.4%	21.4%	0.0%	0.0%
Revenues/tax credits linked to support schemes	17.9%	42.9%	0.0%	50.0%
Other	12.5%	12.5%	0.0%	25.0%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

3.4.2 **Barriers**

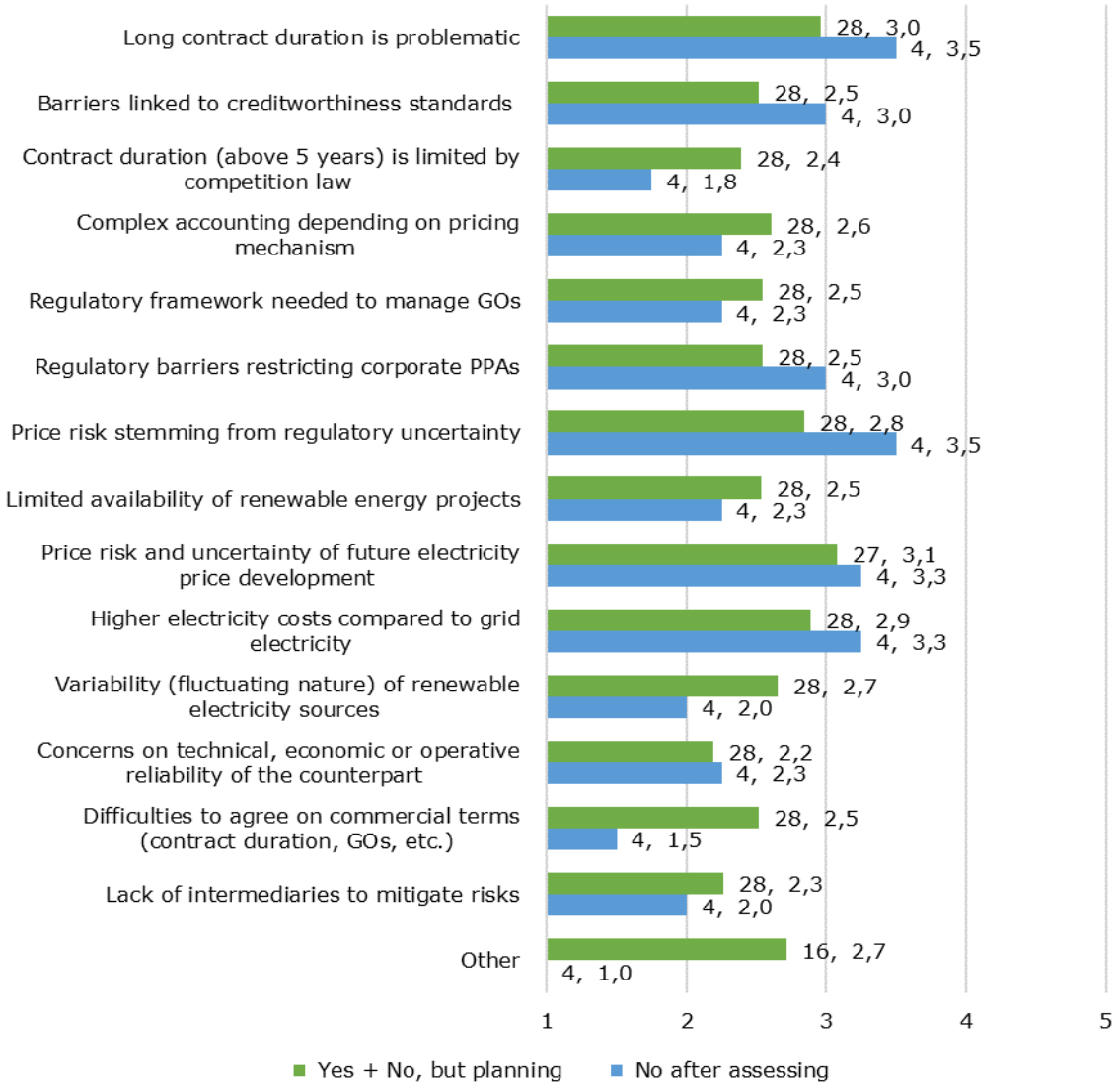
Figure 6 and Table 6 show the barriers impinging on the decision of sourcing electricity via RE PPAs. **Companies that rely (or are planning to rely) on this option** are mainly concerned by the price risk linked to the uncertainty of future electricity price development and the duration of the contract (stakeholders interviewed for this Study explained that in most sectors companies are not willing to commit for more than two to three years). Similar barriers apply to **companies that decided not to sign RE PPA**. When looking at Table 6, it is worth stressing that some companies also identified additional barriers such as creditworthiness standards and/or bank guarantees requested by generators, regulatory barriers restricting corporate PPAs (e.g. barriers to direct contracting between generators and buyers, which have been in place in some Member States such as Greece, Poland and Romania, or barriers to sign contracts with more than one supplier, which have been detected in Spain but apply to all Member States)[7] and higher electricity costs compared to grid electricity (barrier depending on the bargaining power of the PPA parties and on the relevant Member State, especially if electricity consumption in some sectors are subsidised). Reportedly, bank guarantees may be a substantial obstacle for some players, as they are costly, and they affect their ability to borrow money for investment; nonetheless, in some countries, such guarantees are granted by public agencies, thus reducing the overall costs to enter RE PPAs.

Stakeholders interviewed for this Study pointed out that in most of the Member States generators of renewable electricity so far have not been interested in entering PPAs. This is because they were granted stable revenues by (generous) public support schemes providing a 100% protection from market risks ('crowding-out effect'). However, the progressive introduction of market-based support schemes may make PPAs more interesting for generators. In fact, in a well-designed auction: i) not all generators will be able to get public support, therefore they may search for private buyers; ii) public support in €/MWh may go down and for some generators may become more interesting to search for corporate buyers rather than participating in public auctions.

When looking at responses provided by **SMEs** involved in PPAs, they are mostly concerned by the length of the contract, the reliability of the counterpart and higher electricity costs compared to grid electricity (thus confirming that the bargaining power plays a role in such agreements). **Energy-intensive companies** that signed (or are planning to sign) RE PPAs believe that the variability of renewable electricity sources is the most relevant obstacle to such agreements, which in fact generate quite high balancing costs (especially in those markets that are less liquid or for off-takers with variable consumption profiles). Reportedly, the fluctuating nature of solar and wind power generates additional complexity when it comes to PPAs with multiple buyers, as it becomes relevant to combine off-takers with different consumption profiles that help reduce balancing costs. It is worth remarking that a number of intermediaries are providing balancing services, thus reducing the complexity of RE PPAs; nevertheless, the costs to access such services increase the final price per MWh paid by the off-taker. Those energy-intensive players that decided not to enter RE PPAs are mainly concerned by the long duration of the contract, which does not necessarily match their energy procurement strategy.

[7] In most Member States, an electricity consumer can only rely on a single electricity supplier per point of supply. While this is a barrier to physical PPAs with a generator different from the supplier of grid electricity, it still allows for virtual PPAs.

Figure 6 RE PPAs: barriers (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 6 RE PPAs: barriers (top/bottom two boxes)

	Yes + No, but planning		No after assessing	
	TOP 2 BOXES	BOTTOM 2 BOXES	TOP 2 BOXES	BOTTOM 2 BOXES
Long contract duration is problematic	35.7%	28.6%	50.0%	25.0%
Barriers linked to creditworthiness standards and/or bank guarantees requested by the seller	14.3%	50.0%	50.0%	50.0%
Contract duration (above 5 years) is limited by competition law	21.4%	53.6%	25.0%	75.0%
Complex accounting depending on pricing mechanism	28.6%	53.6%	25.0%	50.0%
Regulatory framework needed to manage GOs	14.3%	35.7%	25.0%	50.0%
Regulatory barriers restricting corporate PPAs	21.4%	42.9%	50.0%	50.0%
Price risk stemming from regulatory uncertainty	17.9%	32.1%	25.0%	0.0%
Limited availability of renewable energy projects	25.0%	39.3%	25.0%	75.0%
Price risk and uncertainty of future electricity price development	37.0%	33.3%	25.0%	0.0%
Higher electricity costs compared to grid electricity	32.1%	50.0%	50.0%	50.0%
Variability (fluctuating nature) of renewable electricity sources	25.0%	46.4%	0.0%	75.0%
Concerns on technical, economic or operative reliability of the counterpart (the generator)	10.7%	60.7%	25.0%	75.0%
Difficulties to agree on commercial terms	17.9%	46.4%	0.0%	100.0%
Lack of intermediaries to mitigate risks	14.3%	46.4%	25.0%	75.0%
Other	18.8%	25.0%	0.0%	25.0%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

3.5 Unbundled Guarantee of Origins (GOs)[8]

3.5.1 Drivers

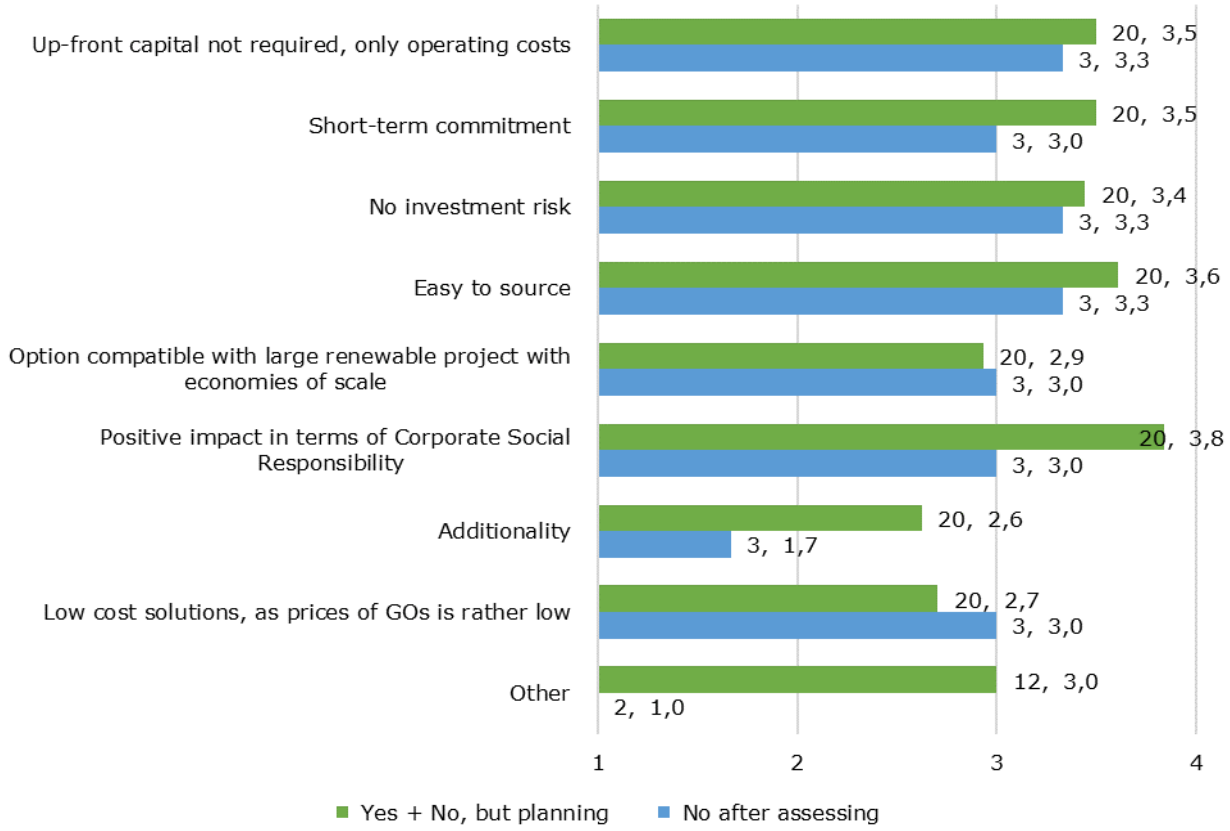
On average, **respondents that are currently purchasing (or plan to purchase) unbundled GOs** believe that the main driver to choose this approach to corporate sourcing of renewables is the positive impact on CSR together with the fact that GOs are easy to source, do not require any up-front investment or investment risk and allow for a short-term commitment (Figure 7 and Table 7). With regard to the latter factor, some stakeholders pointed out that in spite of the short-term commitment (no contractual obligation to buy GOs), purchasing unbundled GOs is part of a long-term corporate strategy. Interestingly, **companies that are not relying on unbundled GOs** believe that GOs are a low-cost solution and they hardly generate additionality, thus reflecting a lack of trust in the GO system. However, it is worth remarking that GOs provide plenty of information about the underlying renewable electricity (e.g. where and when it was generated, from which installation and technology, etc.);[9] this would potentially allow corporates to buy only specific types of GOs (e.g. from solar and wind plants) and ensure additionality in a more transparent manner (provided that companies disclose the type of GOs they are cancelling) than via green energy

[8] Purchasing GOs (from e.g. a renewable energy generator or a third-party broker) certifying the renewable attributes of electricity without acquiring the electricity for which the GOs were issued.
[9] In addition, there are some private eco-labelling schemes (e.g. EKOenergy: https://www.ekoenergy.org/) that provide additional information about the type of renewable energy linked to a specific GO.

offers. Available evidence shows that the price for certain types of GOs is growing fast.[10]

Results for **SMEs** are largely aligned with the general trends. The positive impact on CSR is the main driver pushing most of the small companies responding to the survey (80%) to purchase unbundled GOs. **Energy-intensive companies** that are currently purchasing (or plan to purchase) unbundled GOs are mainly attracted by the short-term commitment, coupled with no investment risk and the easy access to this option. Those energy-intensive respondents that have decided not to rely on this option confirmed the trends recorded for the entire sample.

Figure 7 Unbundled GOs: drivers (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

[10] See for instance: https://nos.nl/artikel/2247757-nederlandse-groene-stroom-duurste-van-europa.html; andhttps://www.ecohz.com/press-releases/european-market-for-renewable-energy-continues-to-grow-with-wind-power-surging-ahead/ .

Table 7 Unbundled GOs: drivers (top/bottom two boxes)

	Yes + No, but planning		No after assessing	
	TOP 2 BOXES	BOTTOM 2 BOXES	TOP 2 BOXES	BOTTOM 2 BOXES
Up-front capital not required, only operating costs	50.0%	15.0%	66.7%	33.3%
Short-term commitment	60.0%	15.0%	33.3%	33.3%
No investment risk	50.0%	15.0%	66.7%	33.3%
Easy to source	60.0%	15.0%	66.7%	33.3%
Option compatible with large renewable project with economies of scale	35.0%	25.0%	33.3%	33.3%
Positive impact in terms of Corporate Social Responsibility	65.0%	20.0%	33.3%	33.3%
Additionality	25.0%	40.0%	0.0%	100.0%
Low cost solutions, as prices of GOs is rather low	30.0%	35.0%	66.7%	33.3%
Other	25.0%	16.7%	0.0%	50.0%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

3.5.2 Barriers

Respondents currently relying on GOs believe that the most relevant barriers are the potentially higher electricity costs, as the cost of GOs is additional to the price paid to the electricity supplier (especially in light of the recent trends featuring an increase in GO prices in some Member States, such as the Netherlands, and for specific types of renewable electricity, such as solar and wind), and the missing framework to manage GOs, especially across borders (Figure 8 and Table 8)[11]. Interestingly, **respondents that are not buying unbundled GOs** consider electricity price volatility as the main barrier, as this option does not allow to increase the stability of electricity prices (price hedging); in fact, unbundled GOs increase such variability if one considers that the final price per MWh is also affected by trends in GOs price (currently low but increasing).

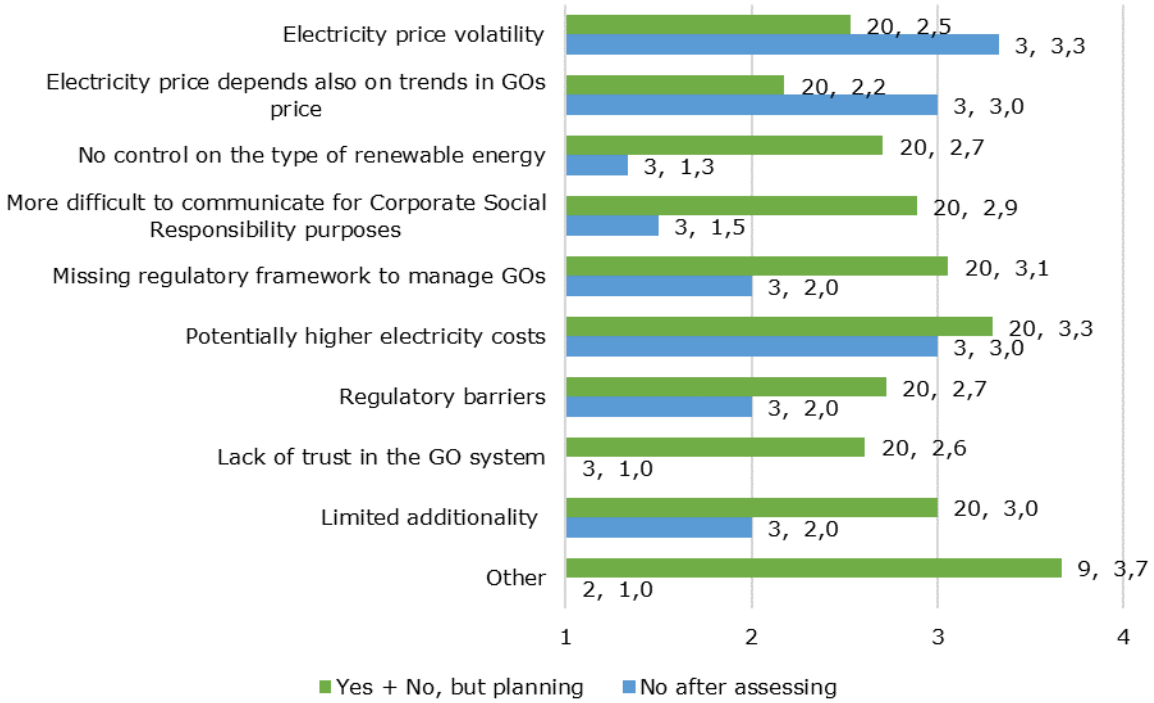
When looking at **the company size**, regulatory barriers are the most prominent obstacle perceived by SMEs purchasing (or planning to purchase) GOs, especially in those Member States where energy consumers are not entitled to buy and cancel unbundled GOs. Reportedly, in some countries (e.g. Ireland) only electricity producers or suppliers can cancel GOs, so there is no option for unbundled GOs; in other countries (e.g. in Italy), electricity consumers cannot directly buy and cancel GOs, but they can potentially rely on traders to deal with unbundled GOs. Responses by **energy-intensive companies** reflect the general trends described above.

Some stakeholders interviewed for this Study emphasised that unbundled GOs are not necessarily easy to source, especially for SMEs. In fact, the market is still not liquid enough, they are traded over-the-counter (no trading platform is available) and prices can be very different depending on the type of certificate. With regard to the cross-border trade of GOs, interviewees mentioned that European Energy Certificate System (EECS)[12] provides an efficient framework, which is accepted by a number of EU Member States; however, trade barriers between EECS members and non-

[11] This obstacle was considered as particularly relevant in Spain.
[12] For further details, please see: https://www.aib-net.org/en_US/eecs

members still exist.[13] Reportedly, in those markets where green energy offers are available (the vast majority of EU countries), unbundled GOs represent a niche option for corporate sourcing of renewables.

Figure 8 Unbundled GOs: barriers (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

[13] Barriers to trade may also affect some EECS members, when it comes e.g. to GOs from subsidised projects.

Table 8 Unbundled GOs: barriers (top/bottom two boxes)

	Yes + No, but planning		No after assessing	
	TOP 2 BOXES	BOTTOM 2 BOXES	TOP 2 BOXES	BOTTOM 2 BOXES
Electricity price volatility	20.0%	40.0%	66.7%	33.3%
Electricity price depends also on trends in GOs price (currently quite low)	15.0%	50.0%	66.7%	33.3%
No control on the type of renewable energy	35.0%	45.0%	0.0%	100.0%
More difficult to communicate for Corporate Social Responsibility purposes	35.0%	45.0%	0.0%	66.7%
Missing regulatory framework to manage GOs, especially on a cross-border basis	30.0%	30.0%	0.0%	33.3%
Potentially higher electricity costs	40.0%	20.0%	33.3%	33.3%
Regulatory barriers	25.0%	50.0%	0.0%	66.7%
Lack of trust in the GO system	25.0%	40.0%	0.0%	100.0%
Limited additionality	25.0%	35.0%	0.0%	66.7%
Other	22.2%	11.1%	0.0%	50.0%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

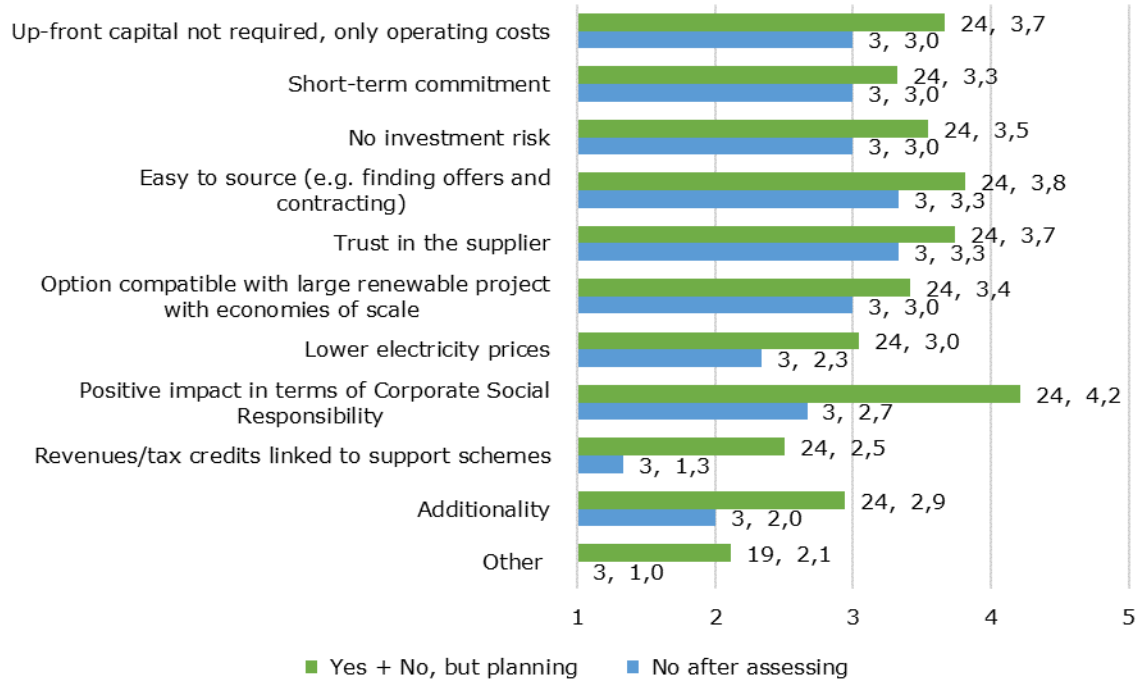
3.6 Green energy offers[14]

3.6.1 Drivers

According to **respondents that are sourcing (or planning to source) RE through green energy offers**, the main driver leading to selecting this option is the positive impact in terms of CSR and environmental sustainability, followed by a number of additional driving factors: i) no up-front capital required; ii) short-term commitment; iii) no investment risk; iv) easy to source (e.g. finding offers and contracting); v) trust in the electricity supplier (to avoid 'greenwashing' and ensure the continuity of supply); and vi) compatibility with large renewable projects with economies of scale (Figure 9 and Table 9). **Respondents that are not relying on green energy offers** agree that they are easy to source and believe that trust in the electricity supplier is a key decision making factor, especially to ensure that demand for green energy electricity translates in more investment in RE generation. CSR motivations rank high also among **SMEs** (90% of respondents believe that buying renewable electricity from green energy suppliers increases the environmental sustainability of their business at least to a high extent), which look at easy options to source renewable electricity, especially when they trust their supplier. The latter factor is decisive also for **energy-intensive players** going for green energy offers; this is *inter alia* because continuity of supply, stability of frequency and commercial quality are key factors for energy-intensive production processes.

[14] Green electricity is offered by utilities or electricity suppliers; such suppliers provide renewable grid electricity by either direct sourcing from independent RE generators or by bundling electricity with GOs (to prove that their electricity is green)

Figure 9 Green energy offers: drivers (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 9 Green energy offers: drivers (top/bottom two boxes)

	Yes + No, but planning		No after assessing	
	TOP 2 BOXES	BOTTOM 2 BOXES	TOP 2 BOXES	BOTTOM 2 BOXES
Up-front capital not required, only operating costs	58.3%	20.8%	33.3%	33.3%
Short-term commitment	41.7%	25.0%	33.3%	33.3%
No investment risk	54.2%	29.2%	33.3%	33.3%
Easy to source	66.7%	16.7%	66.7%	33.3%
Trust in the supplier	50.0%	8.3%	66.7%	33.3%
Option compatible with large renewable projects	41.7%	12.5%	33.3%	33.3%
Lower electricity prices (possibly lower prices than those applied by conventional suppliers)	37.5%	33.3%	33.3%	66.7%
Positive impact in terms of Corporate Social Responsibility (environmental sustainability)	83.3%	4.2%	33.3%	33.3%
Revenues/tax credits linked to support schemes	20.8%	41.7%	0.0%	100.0%
Additionality	29.2%	33.3%	0.0%	33.3%
Other	10.5%	26.3%	0.0%	33.3%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

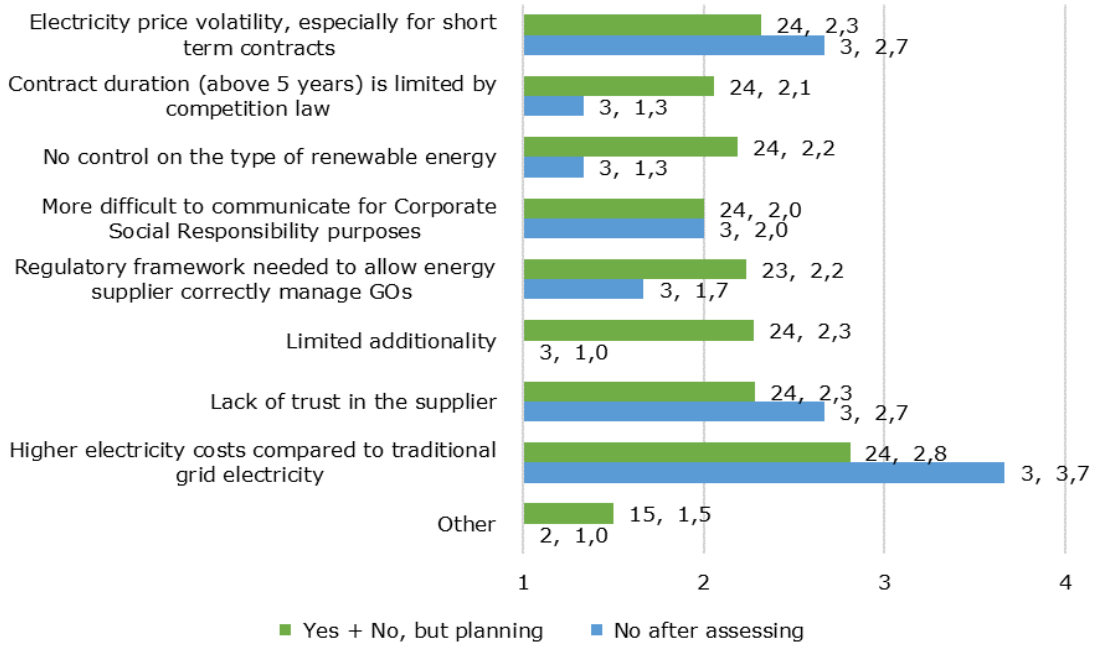
3.6.2 Barriers

With regard to barriers, on average**, respondents that are currently relying (or plan to rely) on green energy offers** have not raised any specific concern (Figure 10 and Table 10). The two barriers that score relatively higher are the limited additionality and the higher electricity costs compared to 'standard' grid electricity. Most of **the companies that decided not to rely on green energy suppliers** believe that electricity prices are higher compared to grid electricity. The latter factor is the only barrier identified by companies that have decided not to source renewable electricity via green energy offers.

Interestingly, half of the **SMEs** that took part in the online survey believe that the limited control over the type of RE that can be purchased via green energy offers has a negative impact on their decision to rely on this option. This is in line with the second barrier identified by some SMEs, i.e. the limited additionality. Based on **follow-up interviews**, this problem is particularly relevant in those Member States where utilities are not providing the so-called 'premium' offers, i.e. green energy offers allowing consumers to buy specific types of renewable electricity (e.g. solar from new installations, or wind produced in a certain Member State). The supervisory role played by national energy regulators can be essential to ensure additionality and increase trust in green energy suppliers; for instance, they may regulate the use/transfer of GOs from subsidised RE and legacy investments (e.g. hydropower plants) or they may regulate green energy offers and foster the market for premium offers.

All **energy-intensive players** responding to the survey emphasised that electricity prices for green energy offers tend to be higher than prices for 'standard' grid electricity, thus potentially inflating their production costs and impinging on their decision to source renewables via this option.

Figure 10 Green energy offers: barriers (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 10 Green energy offers: barriers (top/bottom two boxes)

	Yes + No, but planning		No after assessing	
	TOP 2 BOXES	BOTTOM 2 BOXES	TOP 2 BOXES	BOTTOM 2 BOXES
Electricity price volatility, especially for short term contracts	16.67%	45.83%	33.33%	33.33%
Contract duration (above 5 years) is limited by competition law	12.50%	54.17%	0.00%	100.00%
No control on the type of renewable energy	20.83%	54.17%	0.00%	100.00%
More difficult to communicate for Corporate Social Responsibility purposes compared to self-generation and PPAs	8.33%	62.50%	0.00%	66.67%
Regulatory framework needed to allow energy supplier correctly manage GOs	8.70%	43.48%	0.00%	66.67%
Limited additionality	20.83%	45.83%	0.00%	66.67%
Lack of trust in the supplier	16.67%	54.17%	33.33%	33.33%
Higher electricity costs compared to conventional grid electricity	20.83%	37.50%	66.67%	33.33%
Other	0.00%	20.00%	0.00%	50.00%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

4 Corporate sourcing of renewable energy for heating and/or cooling (RES-HC)

4.1 Opportunities

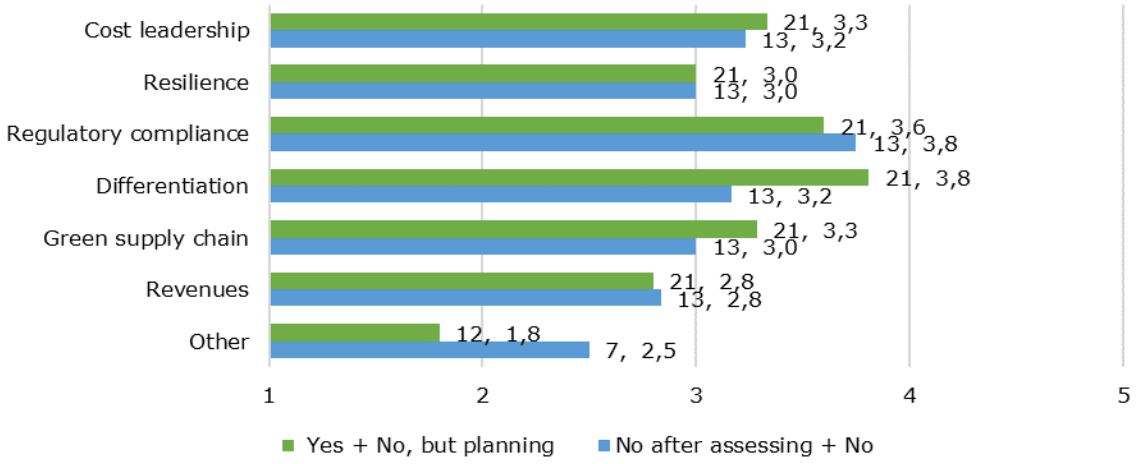
Figure 11 and Table 11 show that most of the **respondents that are currently sourcing or are planning to source RE for heating and/or cooling purposes** believe that this contributes to their CSR strategy and help differentiate their products/services from those offered by their competitors, thus creating a competitive advantage. In addition, they decided to source renewable heating and cooling to comply with climate change and environmental legislation, in particular with thresholds for CO_2 emissions established by the EU ETS but also national rules affecting all companies, including those that are not covered by the EU ETS. Reduction in production costs, resilience (price stability, predictability and security of energy inputs) and participation in green supply chains also represent interesting opportunities to rely on RE sources for heating/cooling (RES-HC). Regulatory compliance is the main opportunity considered **by companies that are not sourcing RE for heating/cooling purposes**, followed by the potential reduction of production costs.

'Differentiation' and cost leadership are the main opportunities detected by **SMEs** responding to the survey and sourcing RE for heating and/or cooling purposes; again, those SMEs that decided not to rely on RES-HC give more prominence to regulatory compliance. While seeking for improving their environmental sustainability ('differentiation'), cost leadership is also one of the main opportunities detected by **energy-intensive players** that are sourcing (or plan to source) RE for heating/cooling, closely followed by regulatory compliance. The latter opportunity is also the most relevant to energy-intensive players that are not relying on RES-HC, as they appear to be less interested in CSR and environmental sustainability targets.

Stakeholders interviewed for this Study suggested also that additional opportunities are stemming from combined heat and power solutions based on

renewable sources (e.g. biomass and biogas), which contribute to increasing energy efficiency, reducing energy costs and making RES-HC more attractive from a financial standpoint. Connection to a district heating network may also make the difference, as excess heat can be monetised.

Figure 11 RE for heating/cooling: opportunities (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 11 RE for heating/cooling: opportunities (top/bottom two boxes)

	Yes + No, but planning		No after assessing	
	TOP 2 BOXES	BOTTOM 2 BOXES	TOP 2 BOXES	BOTTOM 2 BOXES
Cost leadership. Renewable energy may help companies reduce their energy expenses and cut production/operating costs.	52,4%	28,6%	53,8%	23,1%
Resilience. Renewable energy may increase the price stability, predictability and security of energy inputs.	42,9%	28,6%	38,5%	23,1%
Regulatory compliance. Renewable energy may contribute to compliance with climate change and environmental legislation.	61,9%	19,0%	69,2%	15,4%
Differentiation. Renewable energy may contribute to Corporate Social Responsibility and the environmental sustainability	61,9%	14,3%	38,5%	23,1%
Green supply chain. Renewable energy is needed to meet green requirements requested by one or more customers.	47,6%	23,8%	38,5%	30,8%
Revenues. Renewable energy may allow companies to get subsidies or tax credits linked to support schemes for renewables.	28,6%	42,9%	30,8%	23,1%
Other (this may include non-energy related factors)	8,3%	33,3%	14,3%	14,3%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.

4.2 Challenges

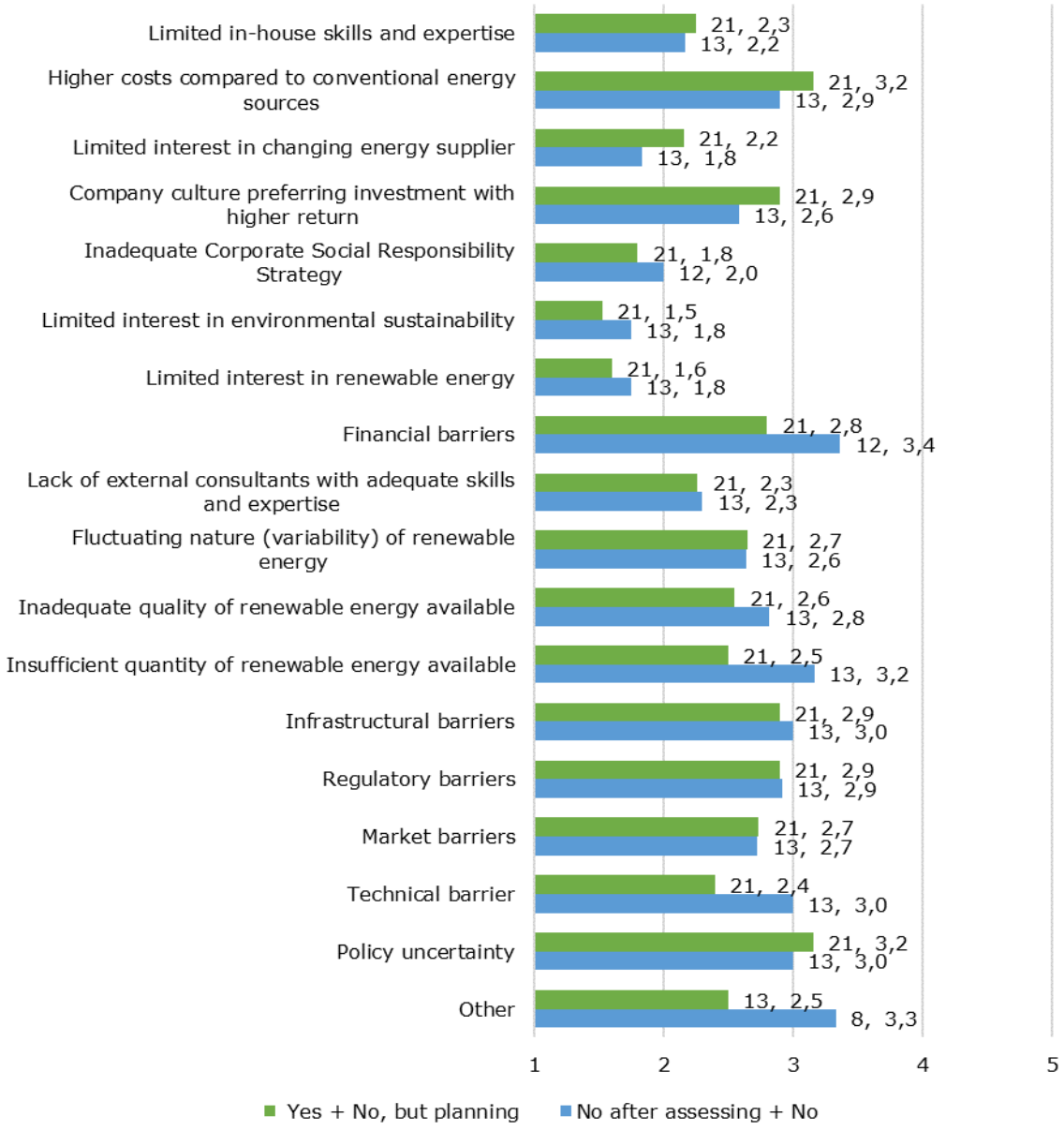
According to **respondents that are sourcing or planning to source RE for heating/cooling**, policy uncertainty (e.g. changes in support schemes) and higher costs compared to conventional heating and cooling are the most relevant challenges (Figure 12 and Table 12). However, such barriers seem to affect only a limited number of respondents. For those **respondents that are not relying on RES-HC**, the most relevant challenges are the financial barriers to invest in the relevant technologies and the insufficient amount of RES-HC available (for instance, some interviewees have claimed difficulties in accessing biogas; in the same vein, biomass requires sustainable production and large areas for storage; finally, geothermal energy is only available in some EU regions).

The biggest challenge for **SMEs** relying on RES-HC is the inadequate company culture (focusing on investments with higher returns as well as affected by limited awareness of new RE solutions for heating and cooling) and poor CSR strategy. SMEs that are not sourcing RE for heating/cooling believe that the most relevant challenge is represented by regulatory barriers (e.g. costs for permits to install renewable technologies), followed by policy uncertainty (e.g. changes in support schemes), financial barriers, higher operating costs than 'brown' energy and lack of reliable suppliers.

Energy-intensive companies that are sourcing (or planning to source) RE for heating and/or cooling purposes emphasised a negative impact on their cost competitiveness (RE is still more expensive than 'brown' energy), followed by policy uncertainty (especially when it comes to changes in support schemes). Energy-intensive players that are not relying on RES-HC mainly detected financial barriers to investing in renewable technologies and claimed that their decision was affected by the insufficient quantity of renewable energy available to meet their energy demand.

Stakeholders interviewed for this Study pointed out that investments in renewable heating and cooling solutions may have the potential to reduce energy costs. Nevertheless, the pay-back period of the relevant technology is still long and risks connected to new technologies are high: these factors may discourage companies to adopt such RE solutions for heating or cooling purposes. Reportedly, in this context, support schemes in the form of e.g. grants and loans may help address such challenges and favour the green energy transition. Similarly, to RES-E, awareness is considered a big challenge limiting the uptake of RES-HC, especially among SMEs.

Figure 12 RE for heating/cooling: challenges (number of respondents, left; average evaluation, right)



Note: 1=Not at all; 2=To a limited extent; 3=To some extent; 4=To a high extent; 5=To the fullest extent.
Source: Author's elaboration on the online survey.

Table 12 RE for heating/cooling: challenges (top/bottom two boxes)

	Yes + No, but planning		No after assessing + No	
	TOP 2 BOXES	BOTTOM 2 BOXES	TOP 2 BOXES	BOTTOM 2 BOXES
Limited in-house skills and expertise	19,0%	61,9%	15,4%	53,8%
Higher costs compared to conventional energy sources	33,3%	28,6%	30,8%	30,8%
Limited interest in changing energy supplier	14,3%	52,4%	15,4%	69,2%
Company culture preferring investment with higher return	28,6%	23,8%	23,1%	38,5%
Inadequate Corporate Social Responsibility Strategy	14,3%	71,4%	25,0%	58,3%
Limited interest in environmental sustainability	9,5%	76,2%	15,4%	69,2%
Limited interest in renewable energy	9,5%	76,2%	15,4%	69,2%
Financial barriers	28,6%	33,3%	41,7%	16,7%
Lack of external consultants with adequate skills and expertise	19,0%	52,4%	23,1%	46,2%
Fluctuating nature (variability) of renewable energy	28,6%	47,6%	30,8%	46,2%
Inadequate quality of renewable energy available	19,0%	52,4%	38,5%	38,5%
Insufficient quantity of renewable energy available	23,8%	57,1%	53,8%	38,5%
Infrastructural barriers	38,1%	42,9%	30,8%	30,8%
Regulatory barriers	33,3%	33,3%	38,5%	38,5%
Market barriers	28,6%	38,1%	23,1%	38,5%
Technical barrier	9,5%	42,9%	38,5%	30,8%
Policy uncertainty	23,8%	19,0%	38,5%	38,5%
Other	15,4%	23,1%	25,0%	12,5%

Note: Top 2 boxes=To the fullest extent + to a high extent; Bottom 2 boxes= To a limited extent + not at all.
Source: Author's elaboration on the online survey.