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Strategic Market Study

Solar Photovoltaic Market – Distributed Generation (DG)

2nd Semester 2018

July 2018

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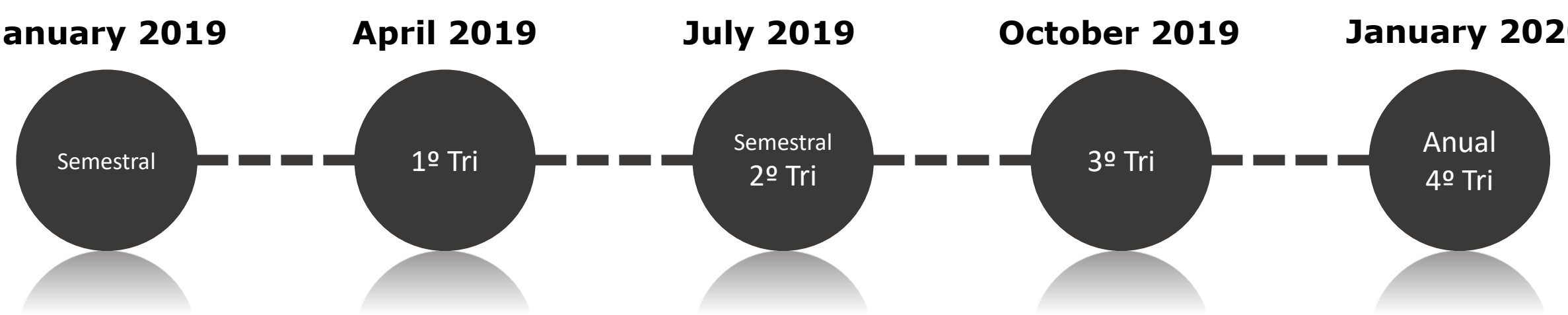
Timeline of Next Studies



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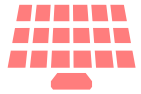
Introduction to the Study

The Distributed Generation Strategy Paper developed by **Greener** aims to evaluate the current status of the market from the perspective of solar integrator companies, as well as to generate insight and ideas for current and future entrepreneurs about the dynamics and development of the solar photovoltaic sector in Brazil.

Focal Points of the Study:

- GENERAL DATA ABOUT THE SOLAR PHOTOVOLTAIC MARKET (DG)
- STRATEGIC ANALYSIS OF THE SOLAR INTEGRATOR MARKET
- PRICES OF SOLAR PHOTOVOLTAIC SYSTEMS AND KITS
- SUPPLIERS OF THE DG SOLAR MARKET



Highlights of the Survey

Brazilian solar market grows to approximately 4.000 integrators.

DG Market achieves sales estimated at R$ 2.27 Billion in 2018.

Cumulative imports for DG surpass 950 MWp (jan/2012 until jun/2018)

Average sales volume increases by 87,62% for integrator companies.

Installed volume reaches 410 MWp for year-to-date 2018.

Sales conversion ratio drops to 5.39%.

Photovoltaic kits show an average price rise of 5.11% in the last 6 months.

Integrators feel the margin squeeze and prices for end customer drop 2.98% in last 6 months.

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New Items

Average integration price per State.

Tracking of domestically produced DG solar modules.

Analysis of the attractiveness and participation of DG in Brasil per State.

Financial analysis, segmented for small and medium sized market participants.

Average installation time, categorized per system size / installed power.

Contents

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The Survey

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The Survey

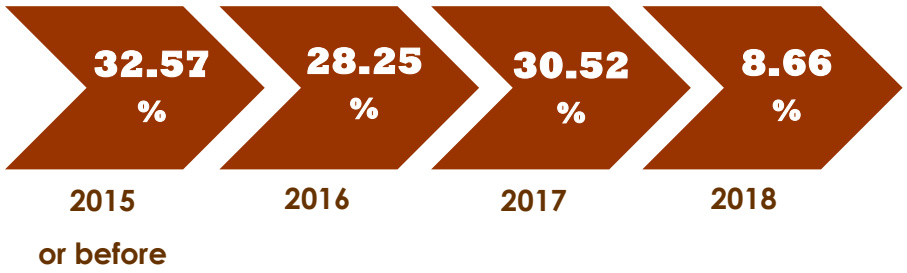
Integrator Companies Interviewed

Greener once again launched its DG solar market survey, interviewing **768 integrator companies** in the period between **18 June and 11 July 2018**. The survey was sent to a broad range of companies spread all over the country, with different sizes and experience, thereby obtaining a heterogenous sample which reliably represents the photovoltaic integrator market.

Greener would like to thank all the participating companies as well as all other parties involved in its completion and distribution.

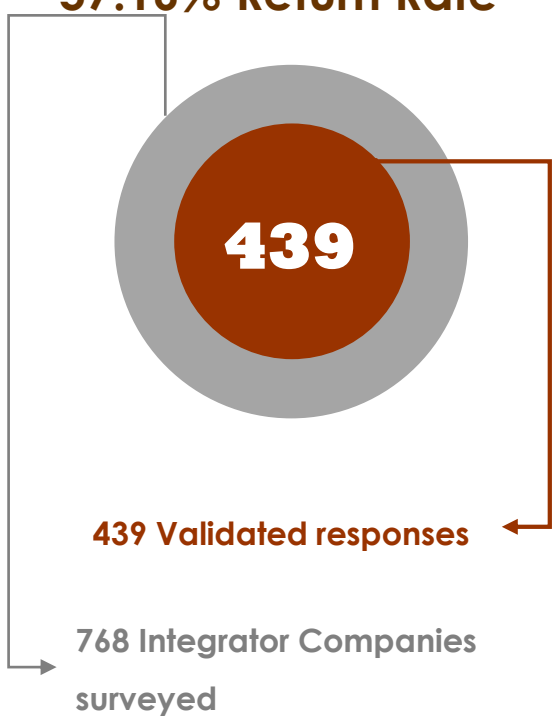
The Survey

Company start of activities – distrbution per year

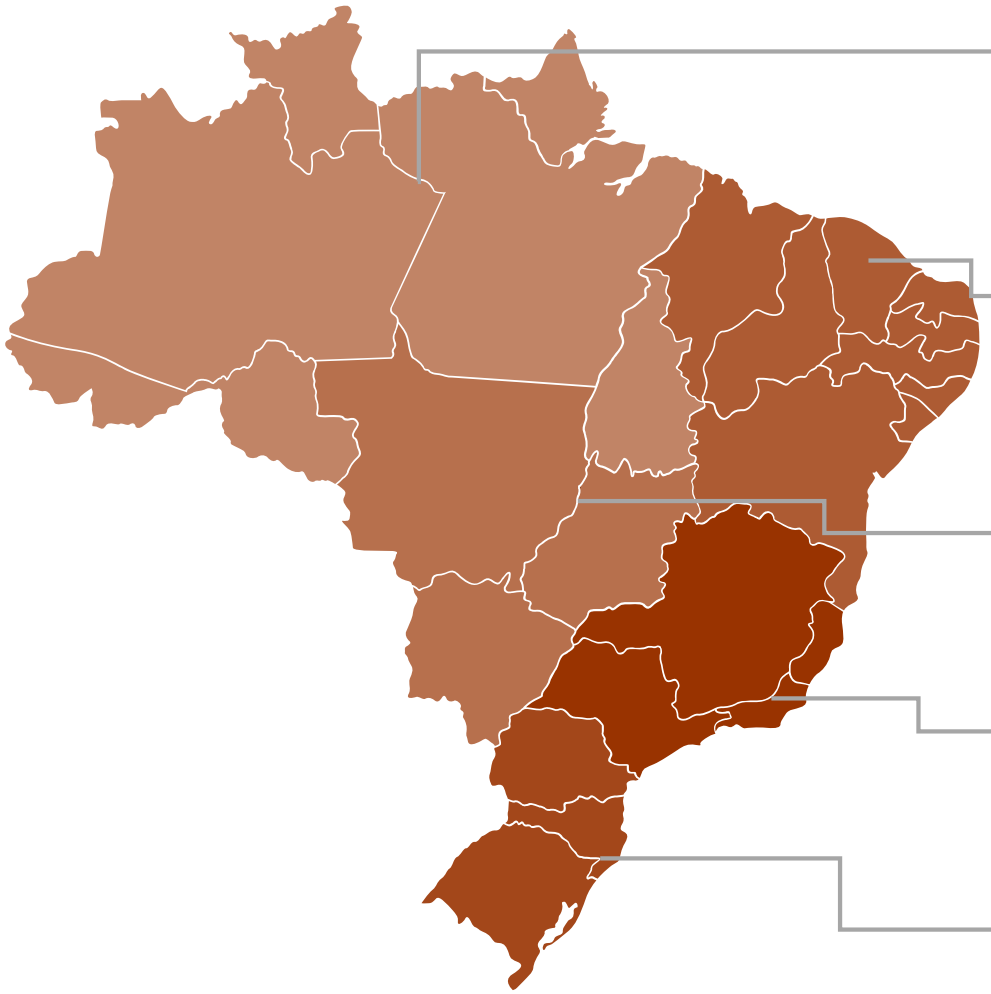


Data Validation

57.16% Return Rate



The Survey



North
1.83%

NorthEast
12.29%

Center-West
10.71%

SouthEast
48.99%

South
26.19%

Location of Company Headquarters

The Survey

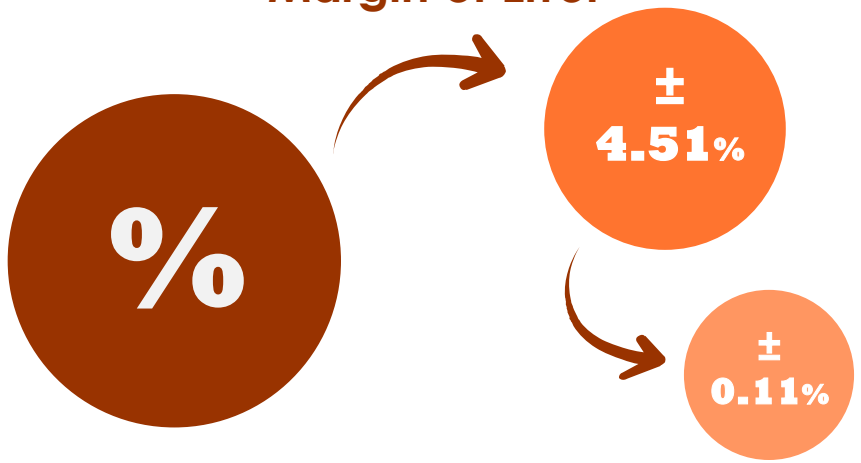
Estimated Population of Companies

1620	2741	4029
June 2017	January 2018	June 2018

The **total number of solar integrators** in Brazil is an estimate based on cross-references between Greener's own survey and information gathered by a number of sector/industry associations. In 2017 the DG solar market saw a sharp increase in the number of companies active in the sector, and this accelerated even more in the first half of 2018.

Our questionnaire achieved a **19.06%** penetration rate in the **Brazilian solar integrator market** and we obtained a **validated response rate of 10,89% .**

Margin of Error



The **Sampling Error** is the error present in any survey due to the representativeness of the sample in reference to the whole population of data. For each question, the variance in the answers due to sampling errors is less than **± 4.51%**.

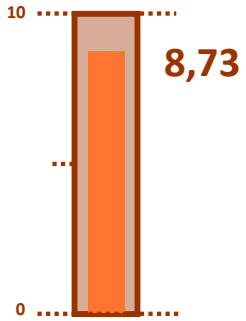
In addition, we calculatd the **variability of the sampling error,** which occurs because the total population of companies is based on an estimate: this resulted in a further intrinsic sampling error of **± 0.11%**.

The Survey

Greener takes great care with the confidence placed in it by partners and participants, and for this reason we are always open to suggestions for improvement regarding more security for participants. Over **87% of companies indicated a Confidence Level of 8 or higher in our surveys** and we constantly strive to increase this confidence level.

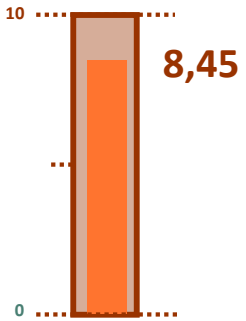
90% of companies evaluated us with grade 8 or higher with respect to the **Contribution to Company Growth** by partificipating in the survey (+8% compared to the first survey), helping with everything from simple processes like system pricing up to the selection of business tools that can help company performance

Reliability of Greener



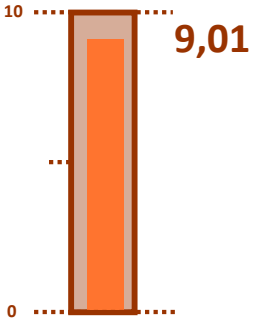
Confidence Level in Greener Surveys

(last survey: 8.69)



Confidence Level in Data Security

(last survey: 8.34)



Survey's Contribution Level to Company Growth

(last survey: 8.64)

Greener is extremely careful with the data obtained through the survey. All data is considered confidential and Greener takes responsibility for and guarantees secrecy of the data collected, meaning that **information security of participating companies is guaranteed.**

The data that is collected passes through a rigorous validation process, which means only companies that have concluded at least one sale and are actively involved in the sector will be considered. In the final analysis.

General Data about the Brazilian Photovoltaic Market

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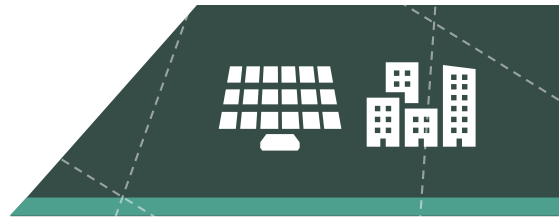
Methodology



Receita Federal

Collection of Import Data

Greener

Processing, Validation and Analysis of Data

Greener Methodology

Imported Volumes

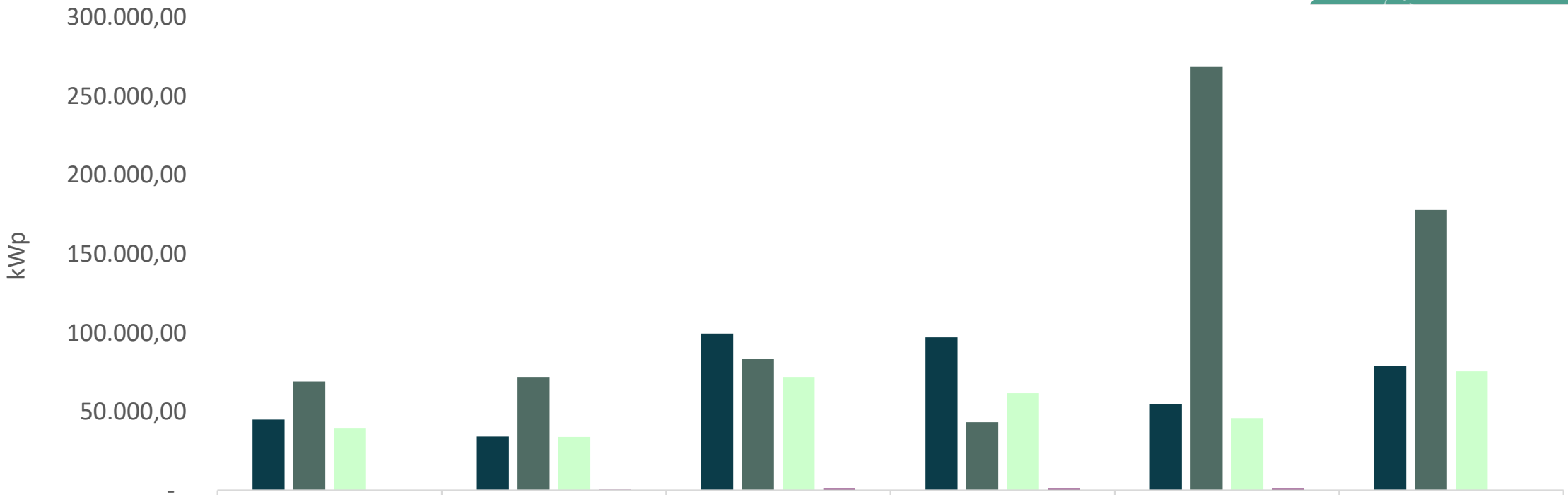
Sales Volumes

ANEEL

Data about Grid Connections

Capacity Connected to Grid

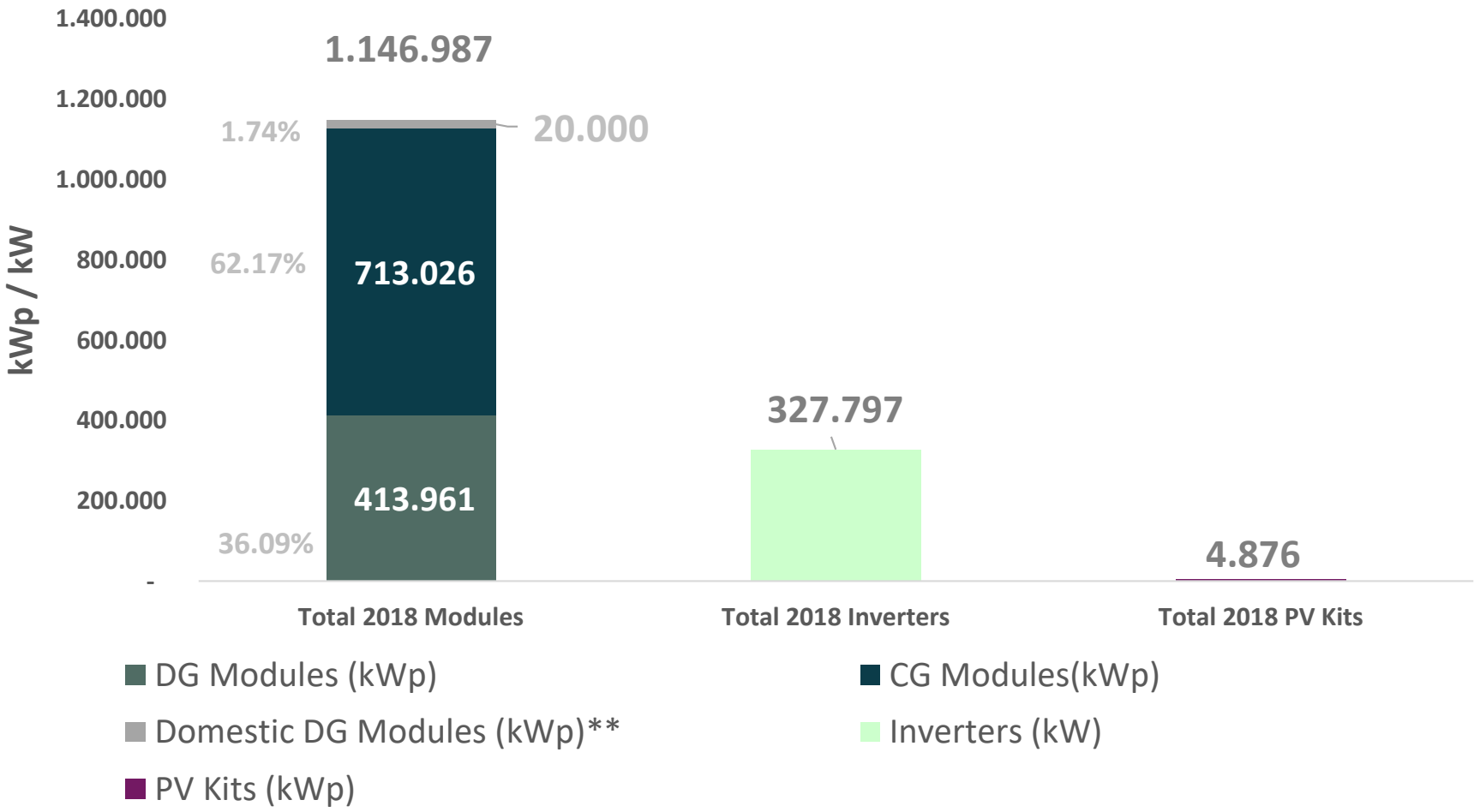
Imports of Equipment - 2018



	January	February	March	April	May	June
DG Modules (kWp)	44.892,50	34.132,95	99.386,02	96.871,95	54.882,44	78.918,51
CG Modules (kWp)	68.891,94	71.792,70	83.257,18	43.124,46	268.342,08	177.618,38
Inverters (kW)	39.495,40	33.860,50	71.901,20	61.503,86	45.909,75	75.435,50
Kits (kWp)	232,75	301,00	1.266,21	1.335,23	1.304,40	71,05

DG Modules (kWp) CG Modules (kWp) Inverters (kW) Kits (kWp)

Volumes 1st Semester 2018



DG Volumes

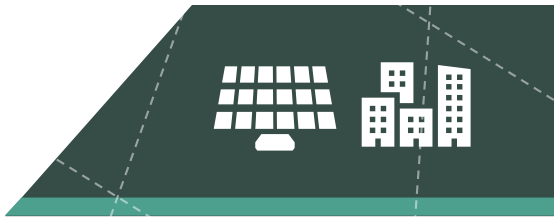
413,961 kWp

130.5%
of the 2017 modules sales volume

* Data collected until end of June 2018.

**Volumes estimated based on information collected from domestic manufacturers.

Methodology



Import

- Distributed Generation
- Volume of kWp of solar modules imported to Brazil - either directly or by way of solar kits. Data is collected directly from the tax authorities (Receita Federal.)

Commercialization

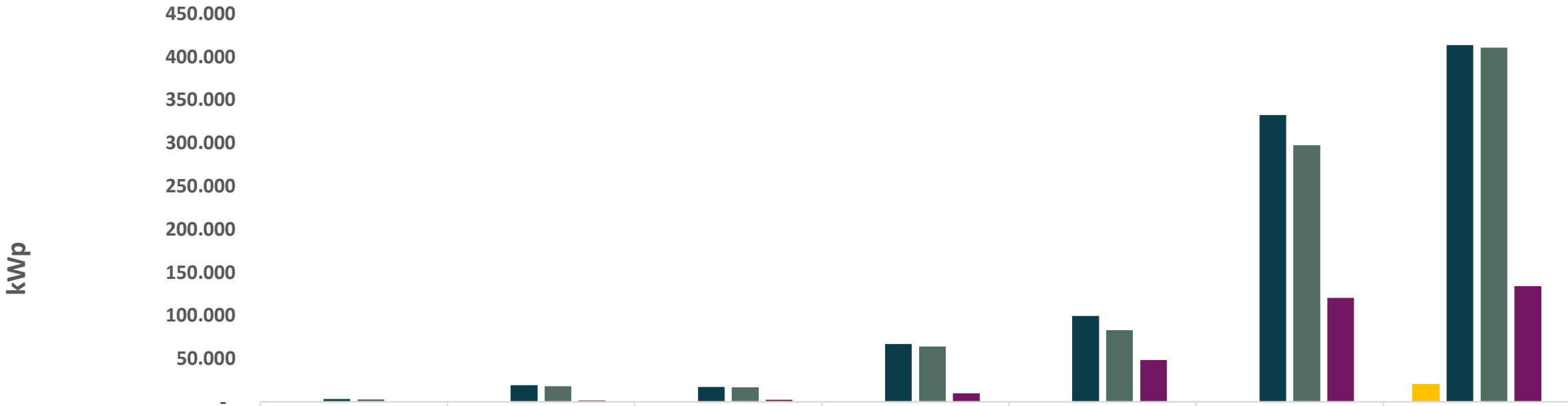
- Distributed Generation
- Total electrical capacity that has effectively been sold in the country, taking into account the bureaucratic delays that occur during customs clearing and timeframes for transport/storage before sale..
  Data has been validated with the top importers and distributors of solar equipment.

Grid Connection

- Distributed Generation
- Real system power connected to the grid according to the ANEEL database
  Although accurate, this figure shows a big DELAY compared to the actual market realities, thereby interfering with market forecasts.

The respresents the closest approcimation of the market reality in Brazil.

DG Market Evolution (kWp)

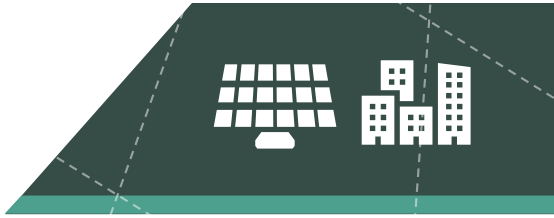


	2012	2013	2014	2015	2016	2017	2018*
Domestic Production **	-	-	-	-	-	-	20.000
Imports	3.045	19.044	16.987	66.966	99.306	332.611	413.595
Commercialization	2.659	18.114	16.651	63.996	82.938	297.617	410.590
Connected to Grid	410	1.399	2.417	9.541	48.208	120.568	133.898

Domestic Production ** Imports Commercialization Connected to Grid

Source: Receita Federal, Greener, ANEEL *Data collected until end of June 2018. ** Volumes estimated based on information collected from domestic manufacturers.

Cumulative DG Market (kWp)

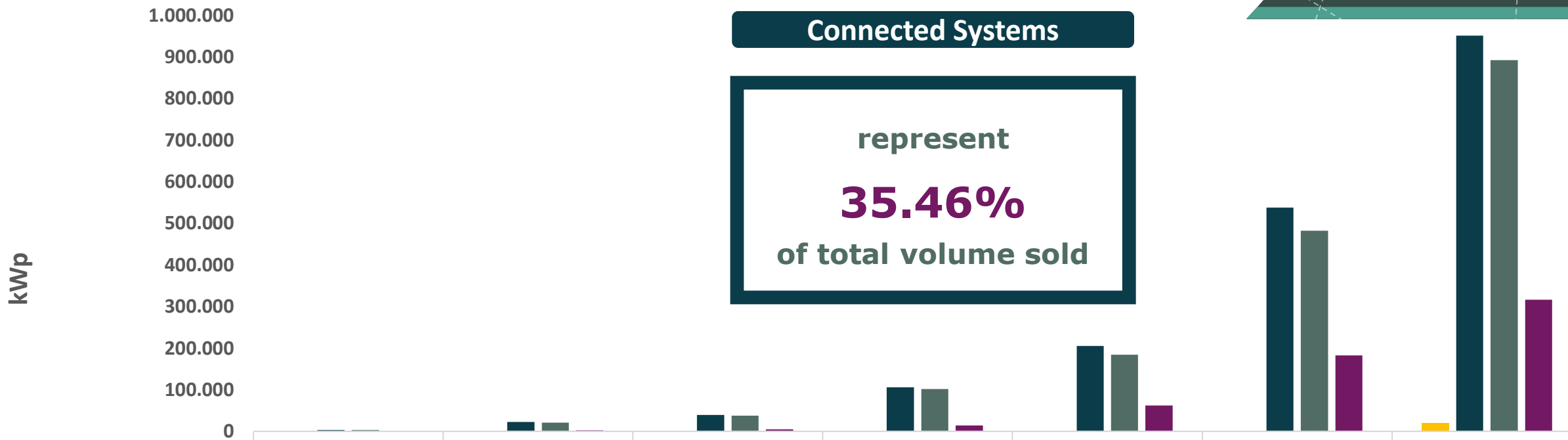


Connected Systems

represent

35.46%

of total volume sold



	2012	2013	2014	2015	2016	2017	2018*
Domestic Production**	0	0	0	0	0	0	20.000
Imports	3.045	22.089	39.076	106.042	205.348	537.959	951.555
Sales Volume	2.659	20.773	37.424	101.420	184.358	481.975	892.565
Connected to Grid	455	1.854	4.271	13.812	62.020	182.588	316.486

Domestic Production** Imports Sales Volume Connected to Grid

Source: Receita Federal, Greener, ANEEL

** Volumes estimated based on information collected from domestic manufacturers.

ANEEL Data

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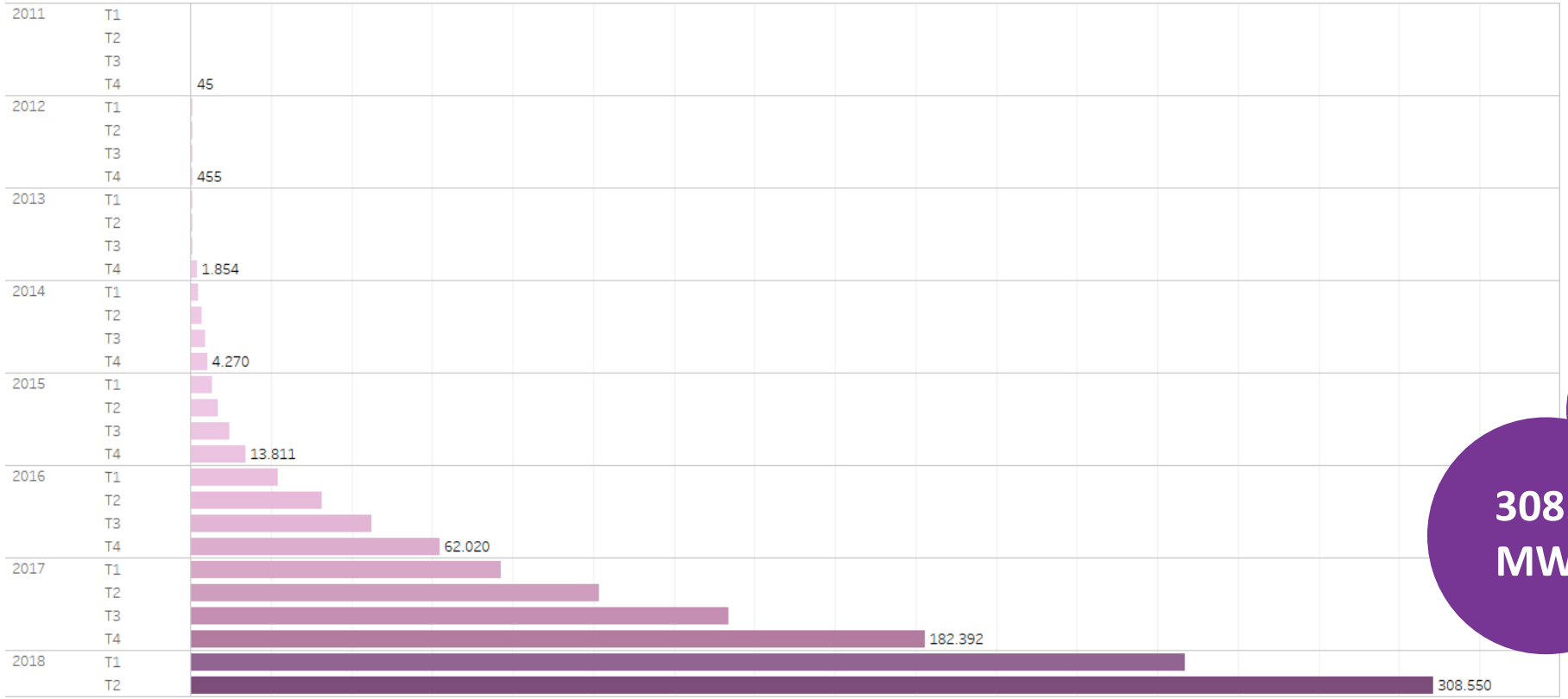
Total Capacity Connected to the Grid (kWp)

Cumulative



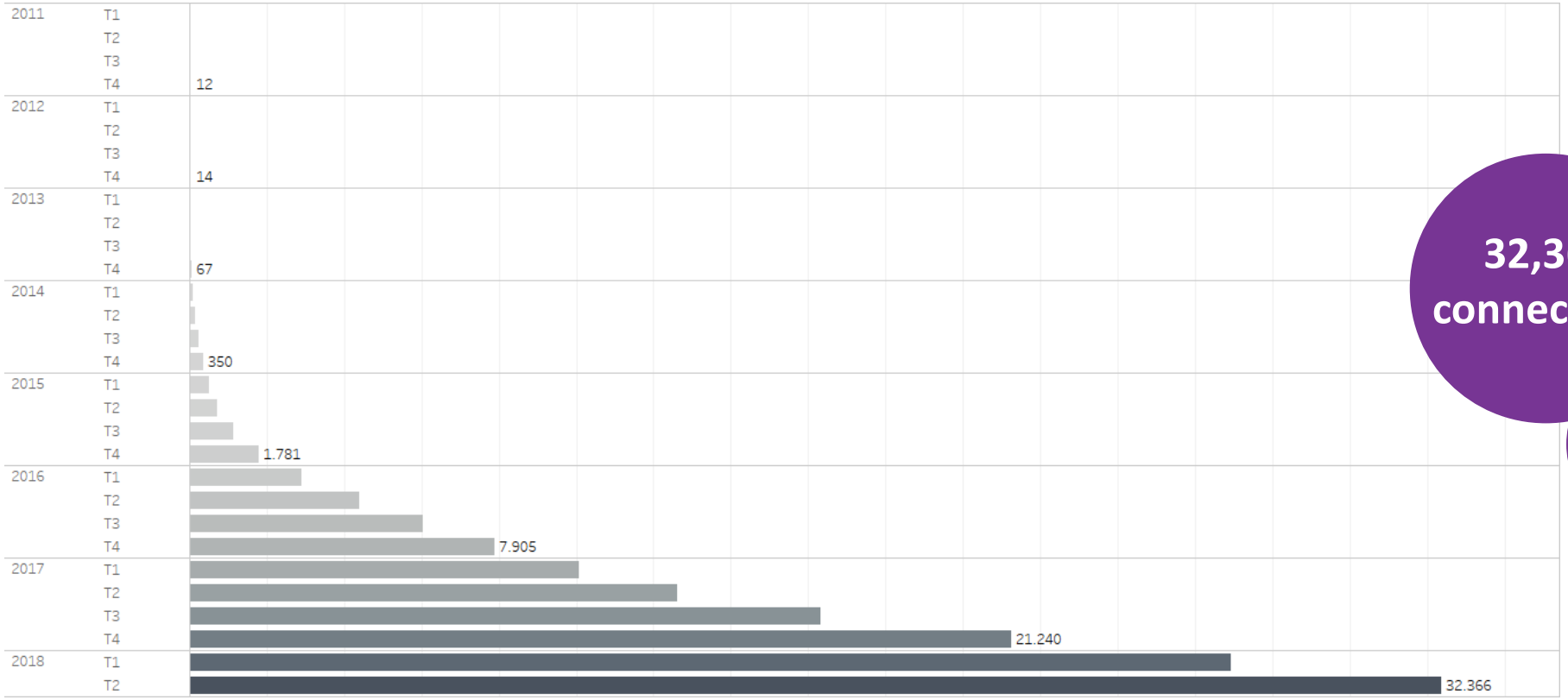
308.5 MWp

Total Capacity Connected to the Grid until June 2018

Source: ANEEL

Number of Connected Systems

Cumulative



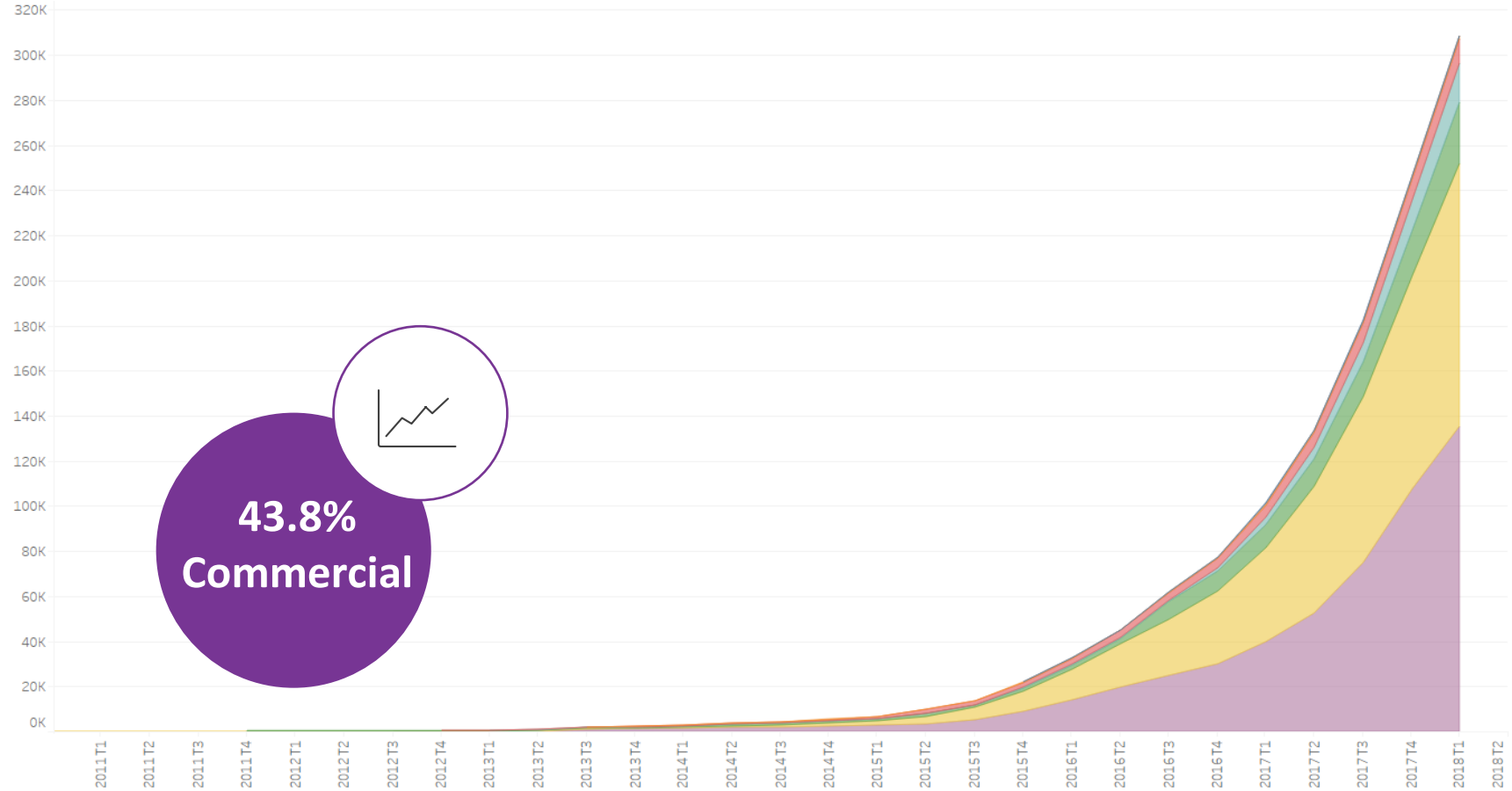
32,366 connections

Numer of Grid-Connected Solar Power Customers until June 2018

Source: ANEEL

Total Solar Capacity Connected to Grid (kWp)

Types



Type

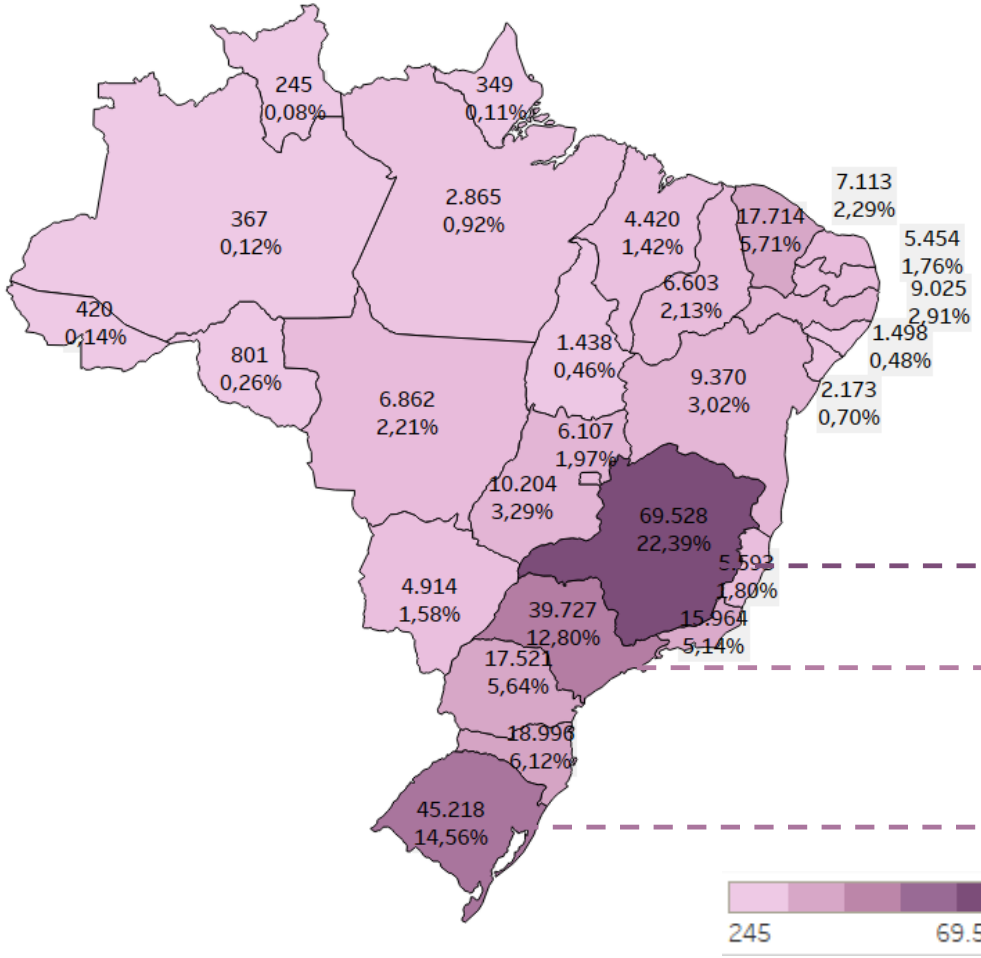
- Public Lighting
- Public Service
- Government
- Rural
- Industrial
- Commercial
- Residential

Commercial systems overtook residential systems im terms of total power and now are the leading market segment, representing +/- 44% of total grid-connected capacity, followed by residential systems, representing 40%.

Source: ANEEL

Grid-Connected Solar Capacity (kWp)

Per Federal State



Minas Gerais is the State with the highest grid-connected solar power: 69,528 kWp.

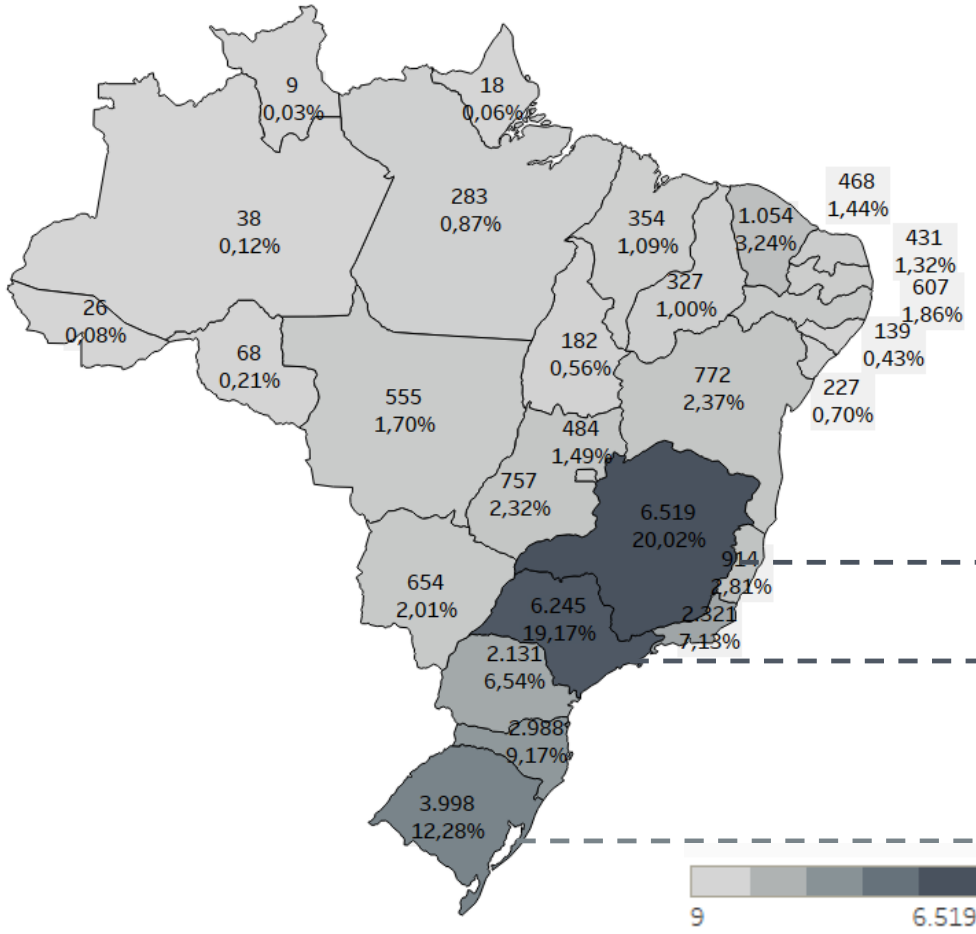
São Paulo is the State with the 3rd highest grid-connected solar power: 39,727 kWp.

Rio Grande do Sul is the State with the 2nd highest grid-connected solar power capacity: 45,218 kWp.

Source: ANEEL

Number of Grid-Connected PV Systems

Per Federal State



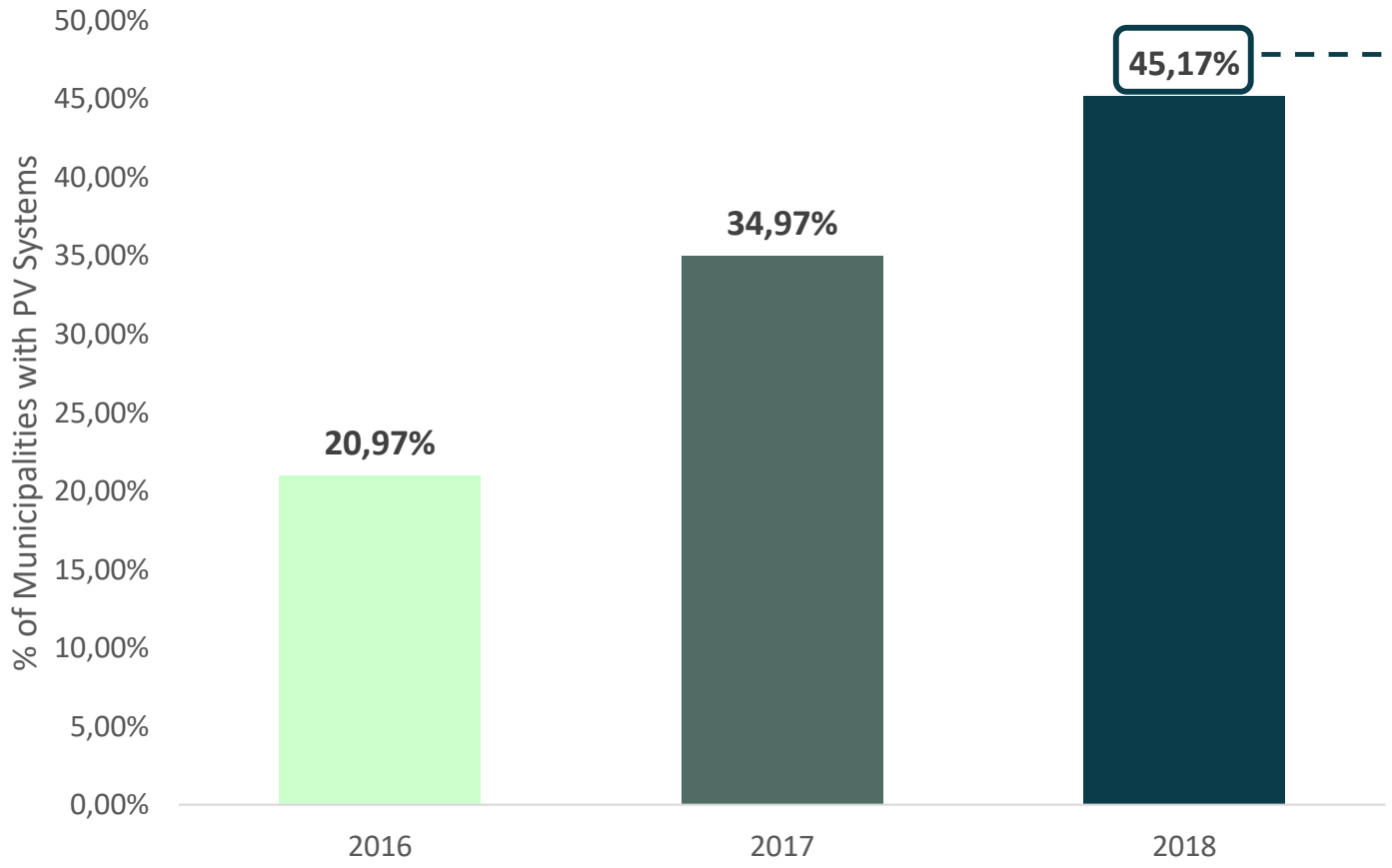
Minas Gerais is the State with the highest number of grid-connected PV systems, with 6,519 connections.

São Paulo is the State with the 2nd highest number of grid-connected PV systems, with 6,245 connections.

Rio Grande do Sul is the State with the 3rd highest number of grid-connected PV systems, with 3,998 connections.

Source: ANEEL

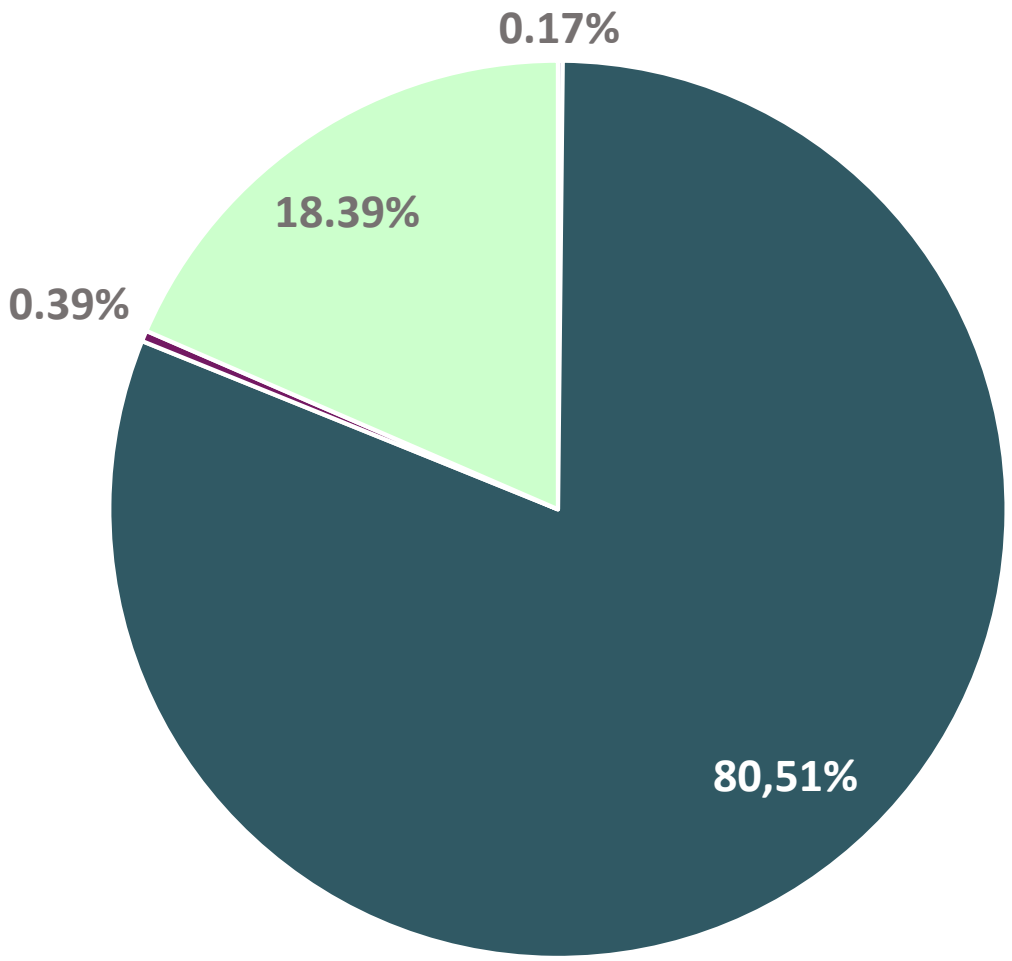
Local Municipalities with Grid-Connected PV Systems



In June 2018 there were 2,525 municipalities with at least 1 PV system connected to the electricity grid, an increase of 577 in one year.

Source: ANEEL

Modality of DG Generation



The data clearly shows that the Shared Generation model and customers with multiple consumption locations are still rarely connected to the grid, not only because of the higher complexity involved to develop them, but also because of regulatory, fiscal and legal uncertaintiess.

- Multiple Consumers / Cooperative
- Generation on Own Premises
- Shared Generation
- Remote Auto-consumption

Source: ANEEL

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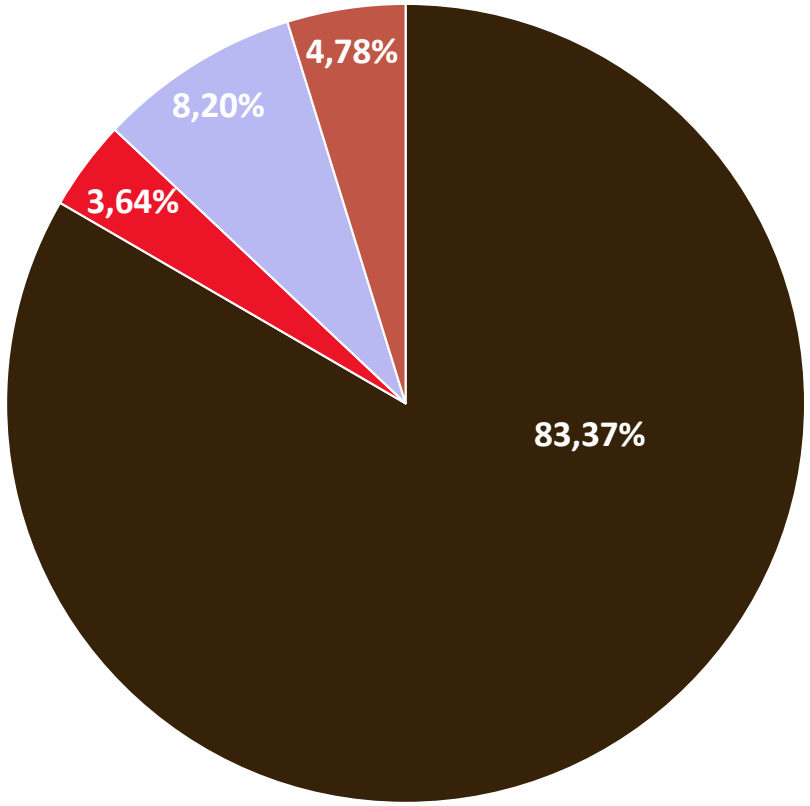
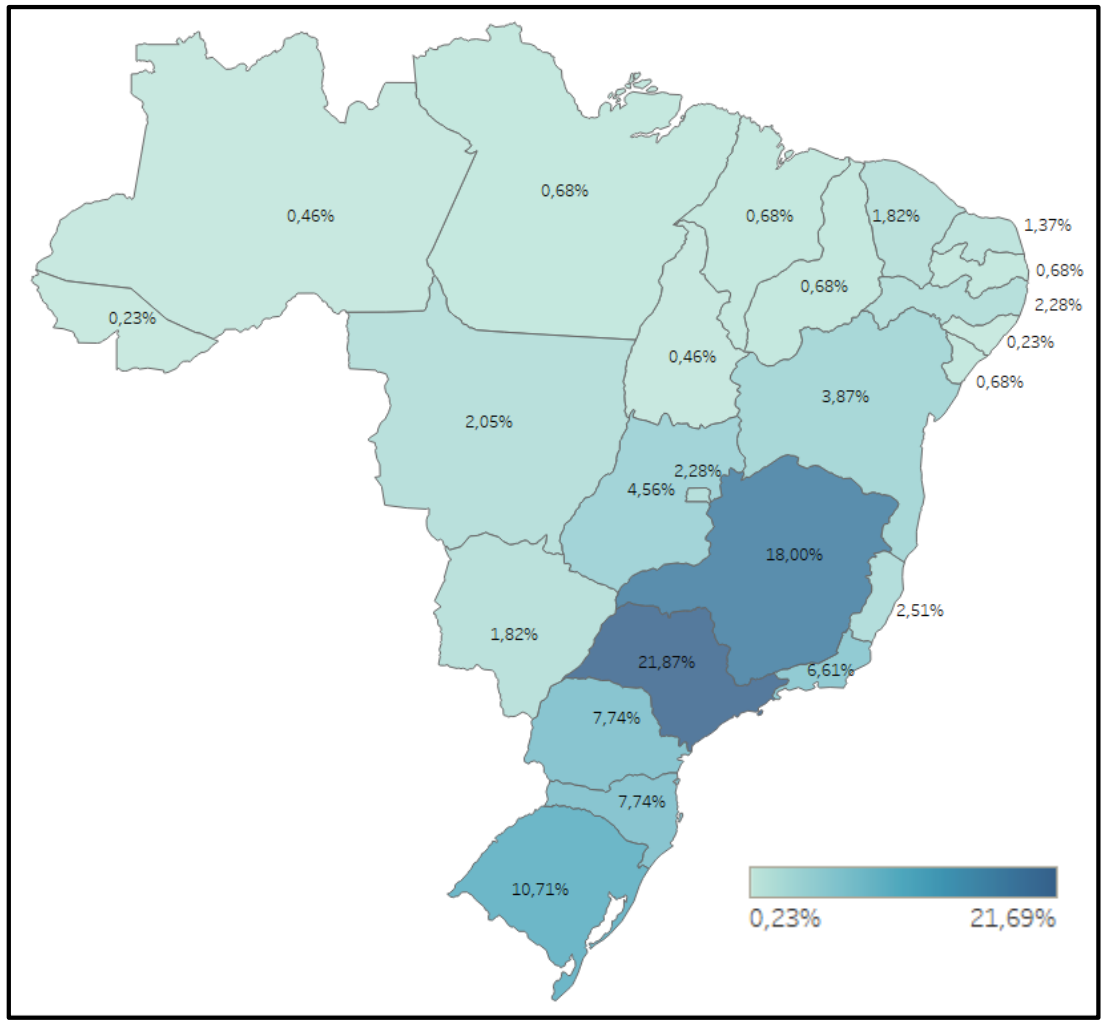
Purchase Model of PV kit



Only a small number of market participants achieved a sufficient sales volume to make it worthwhile to ‘skip’ the distribution chain and create a structure for direct purchases from the manufacturers/OEMs. It should be noted that this number is also influenced by certain groups of smaller companies that have joined forces to scale up their purchasing power and reduce their acquisition / operational costs.

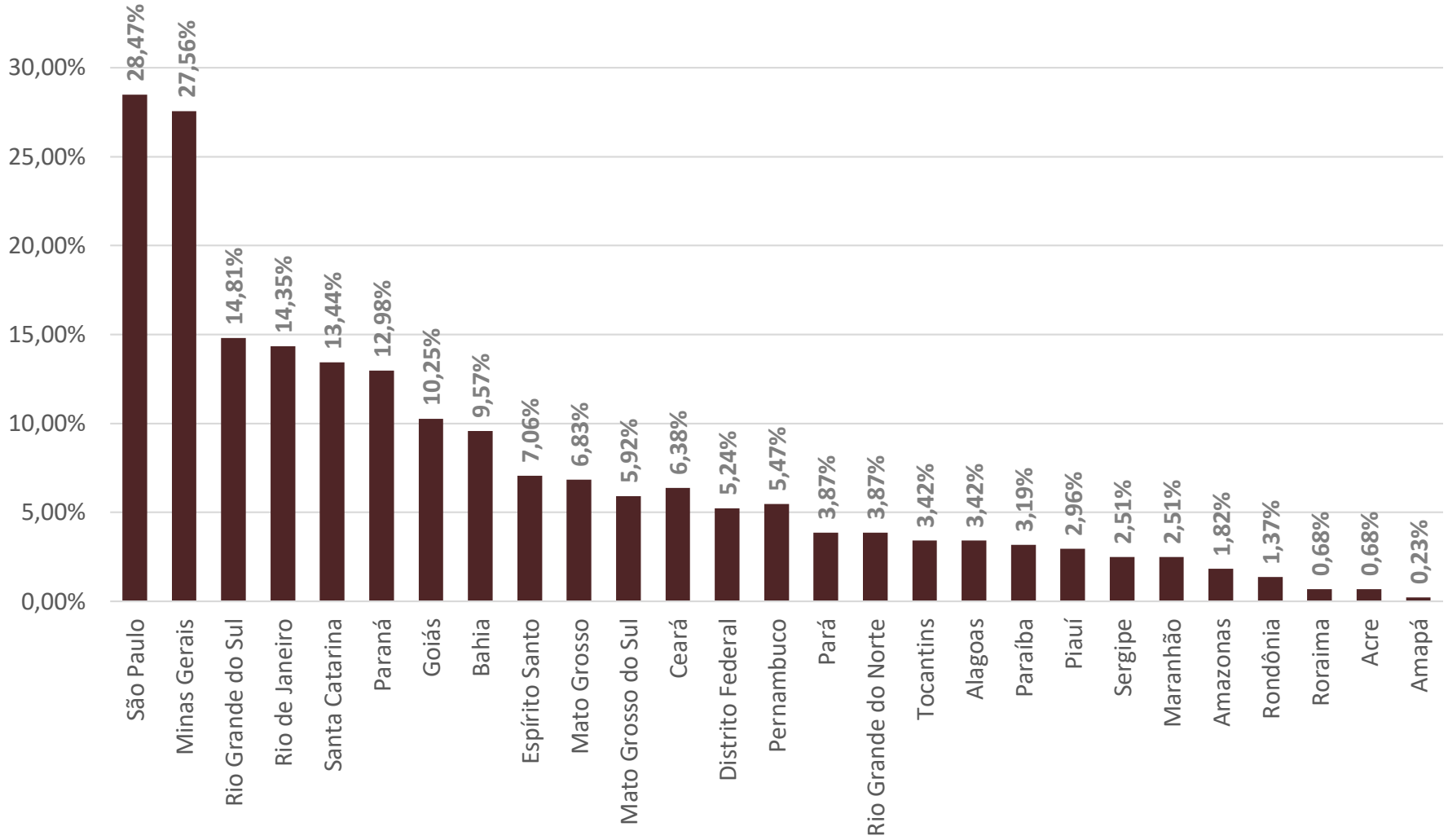
- 100% direct purchase in domestic market
- 100% direct import of whole photovoltaic kit
- more than 50% domestically purchased, rest imported
- less than 50% domestically purchased, rest imported

Location of DG Solar Companies



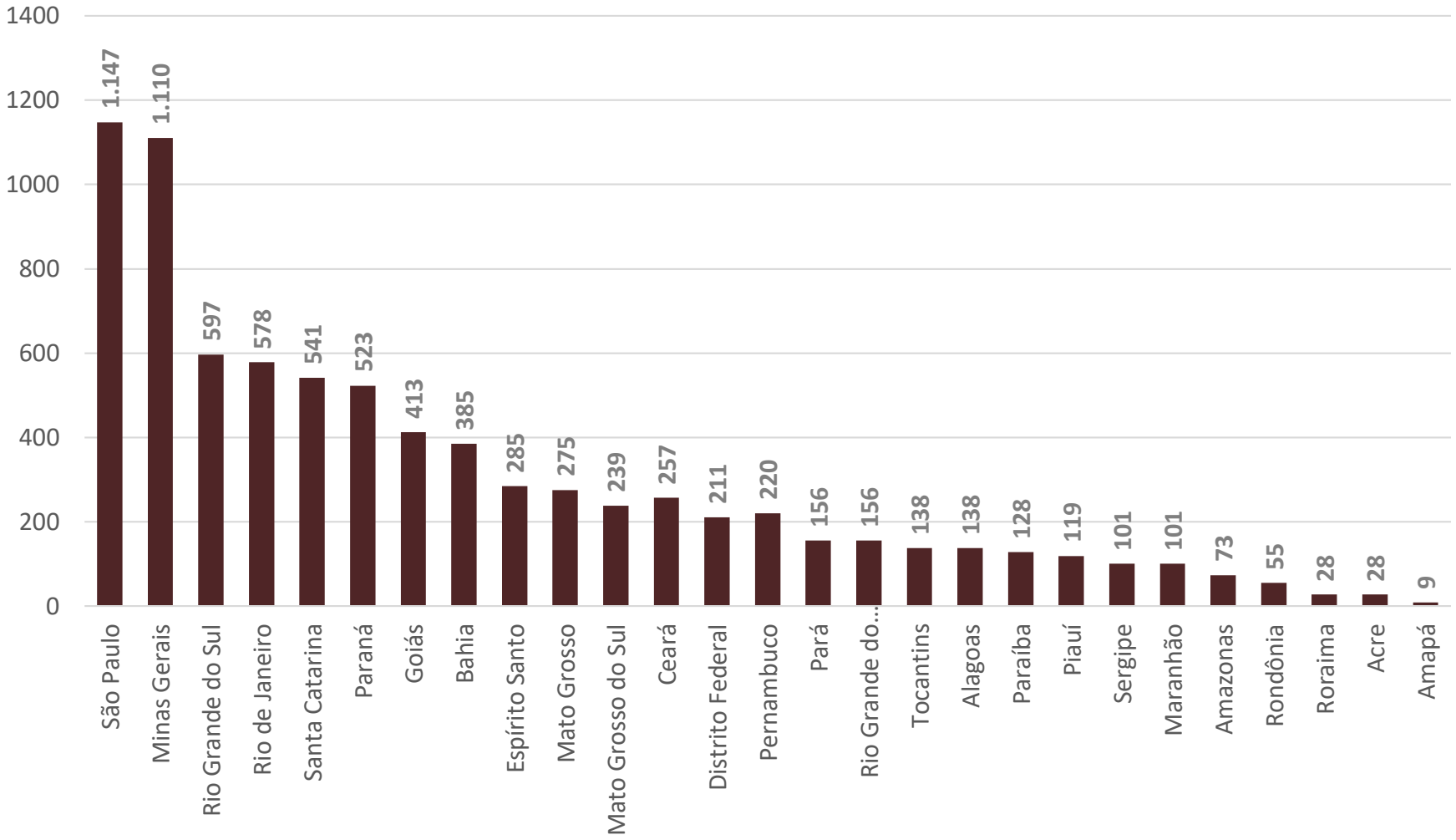
There was a small decrease in the dominance of companies from the SouthEast region, which now represents a little less than 50% of all companies. The decrease was caused by a large increase in Rio Grande do Sul and was also diluted by increases in other states.

Location of DG solar companies per Federal State



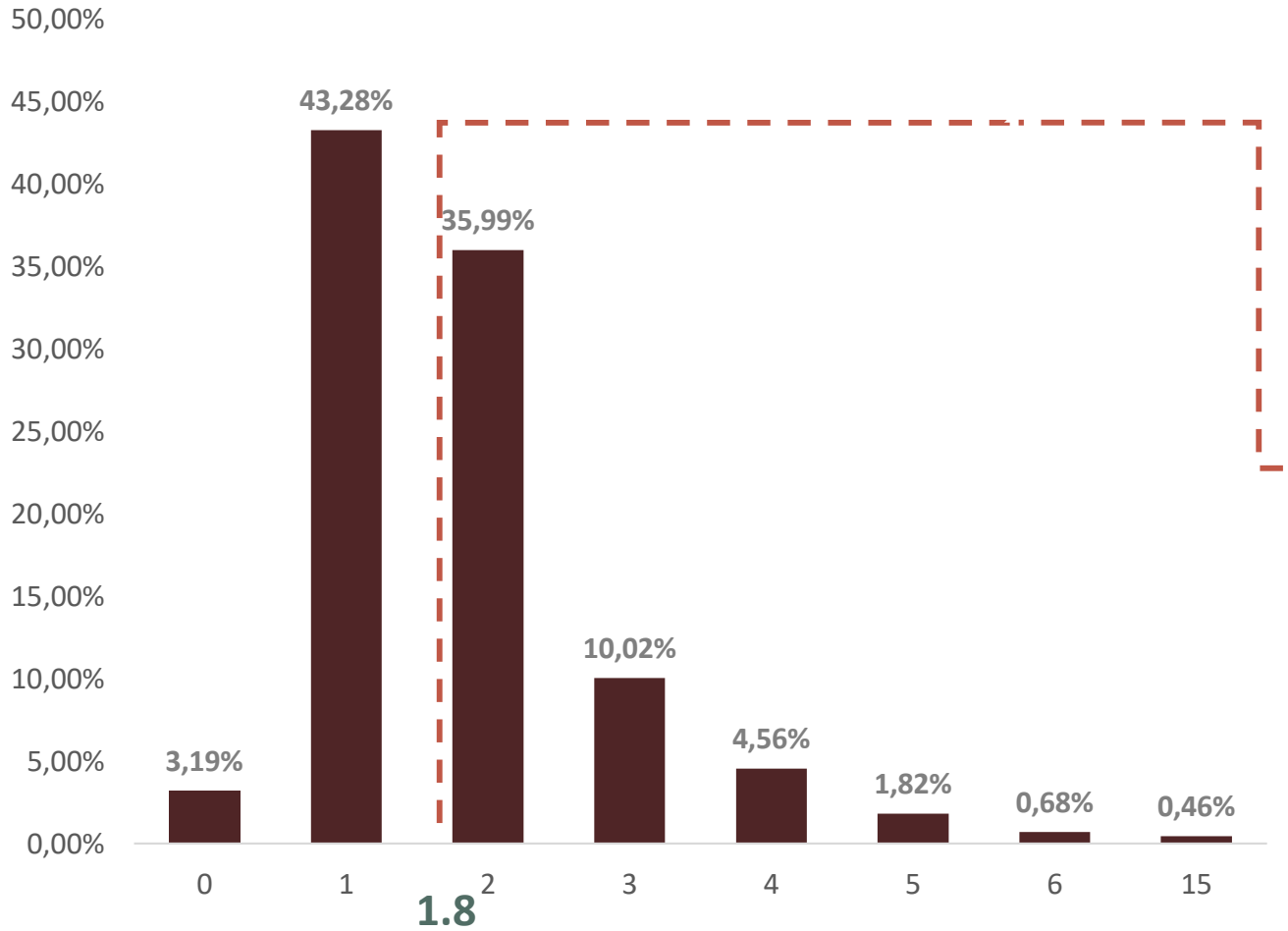
São Paulo and Minas Gerais have the highest number of DG solar companies in Brazil. 46.24% of the interviewed companies are active in at least one of those two states.

Number of Companies active in each Federal State



The data show the number of companies that are active in each State of Brasil, but not necessarily having a (head) office there, thereby giving an indication of the level of competition that is faced in each state by solar integrator companies.

Percentage of Employees working in Engineering in each Company

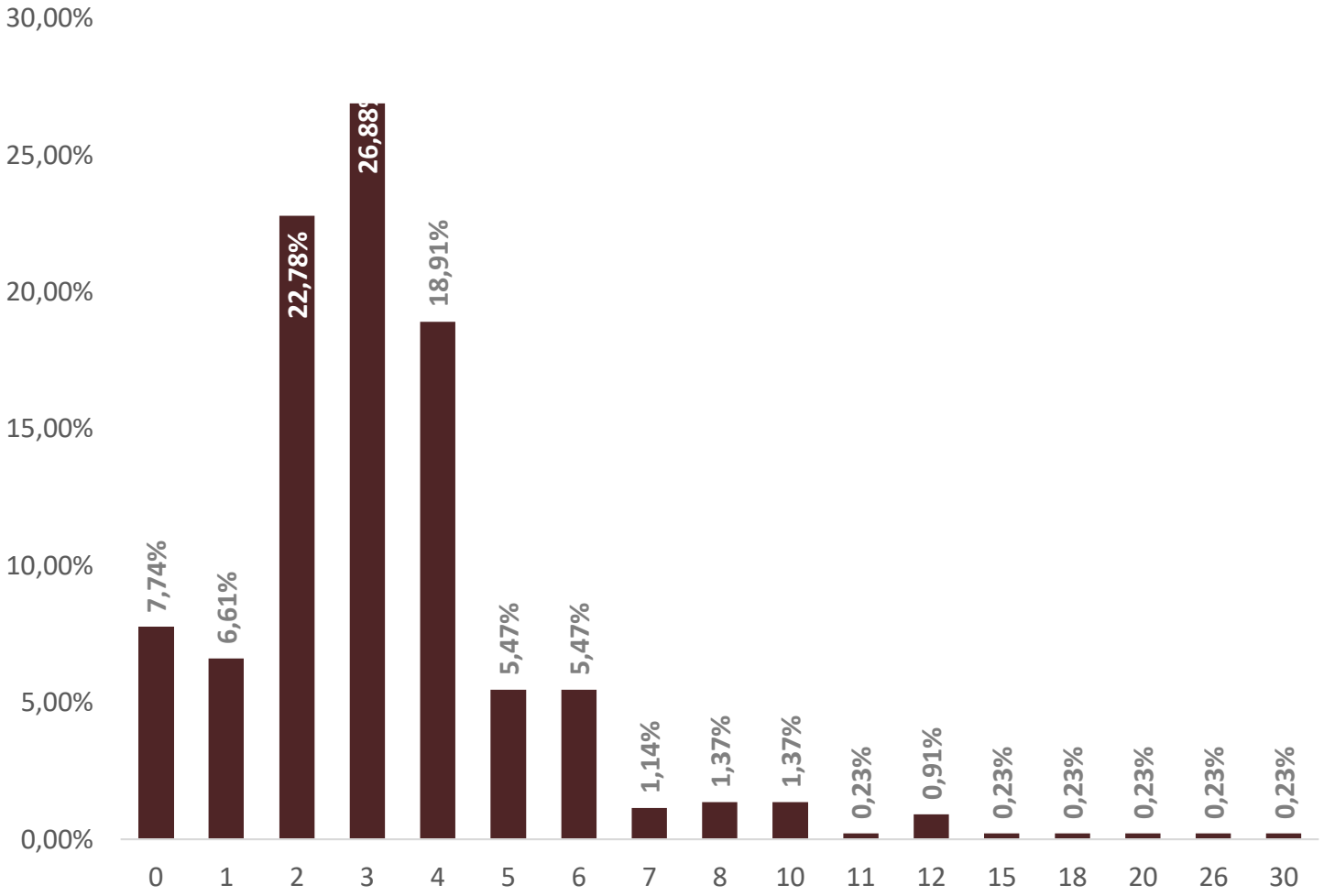


53.53% of all participating companies have at least 2 persons tasked with engineering studies.

On average **1.8 persons per company** are working on the engineering side.

Only 14 out of 439 of the interviewed companies don't have any engineering employees.

Persons tasked with the Installation of PV systems

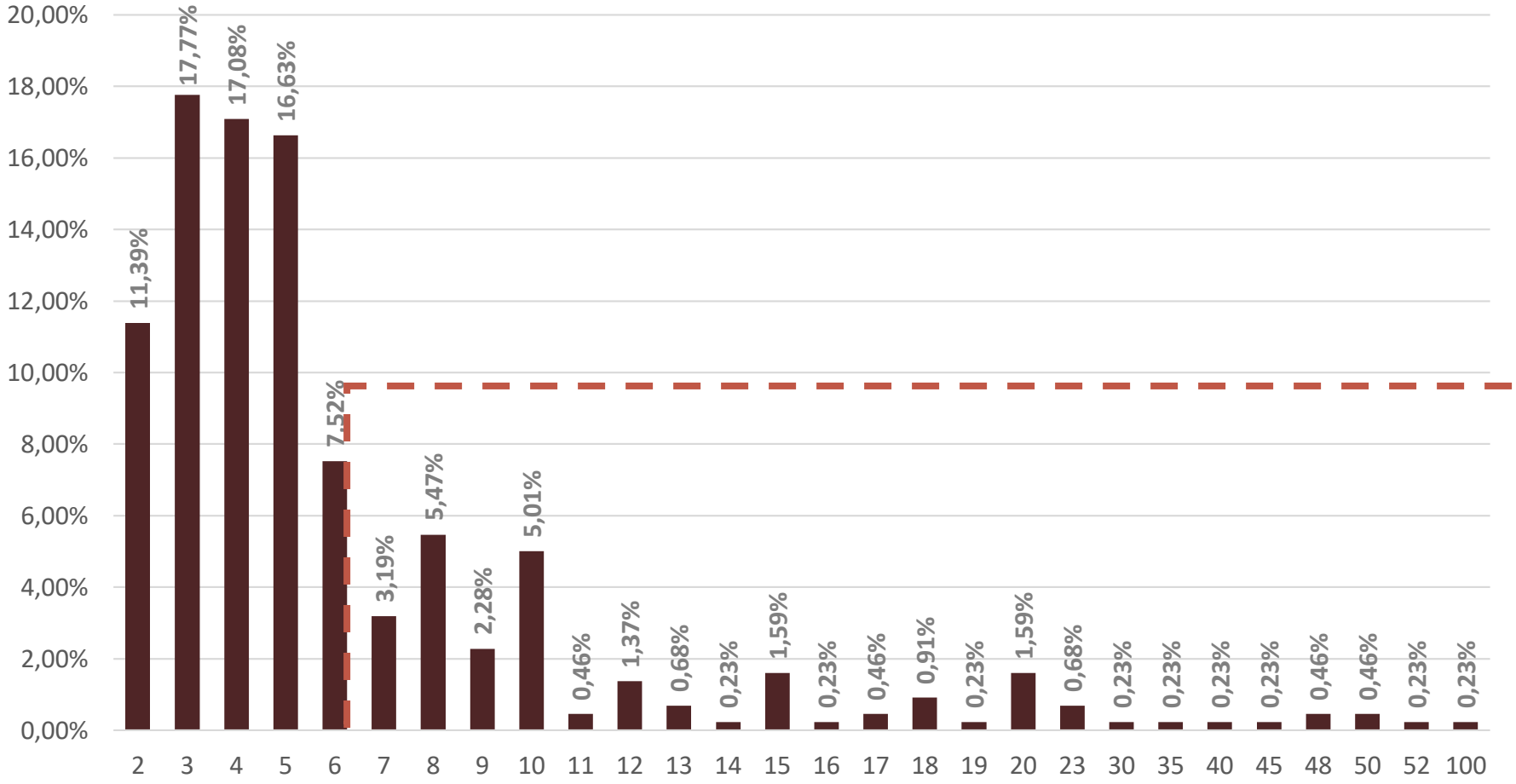


62.87% of participating companies have at least 3 people working on the installation of PV systems

On average, **3.4 employees per company** have as their principal task the installation of PV systems.

Only 34 of the 439 interviewed companies don't have any people acting in installations.

Number of Persons involved with Solar Energy per Company



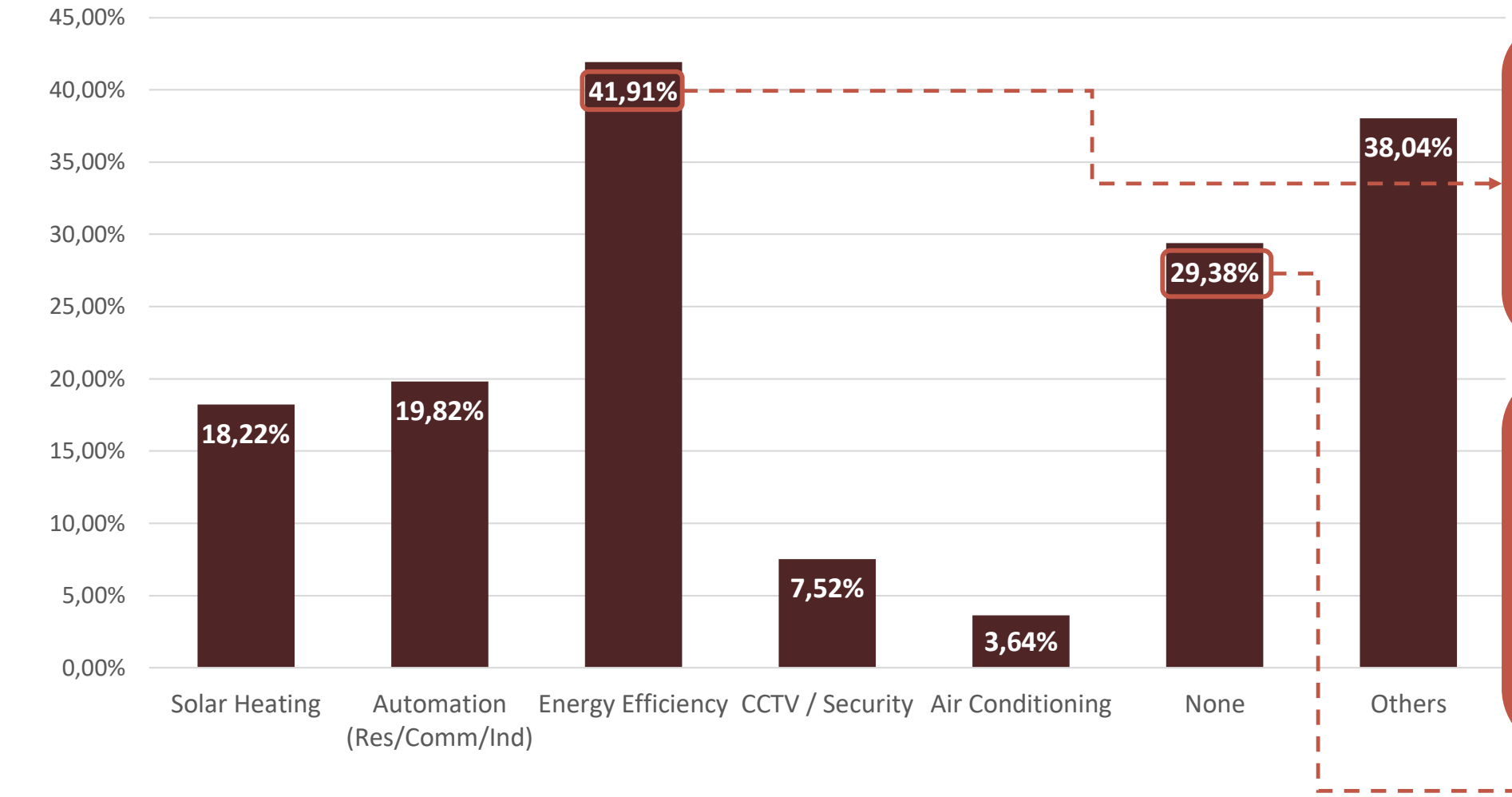
Average Nr of People

6.63 persons per company

Average Nr - Dec/2017

7.19 persons per company

Other Areas of Operation for Solar Integrators



A large proportion of the companies that are active in the solar energy market also have activities in the area of energy efficiency, **approximately 41.91%**.

More than 70% of companies involved in solar energy diversify their portfolio with other products and services.

The Market

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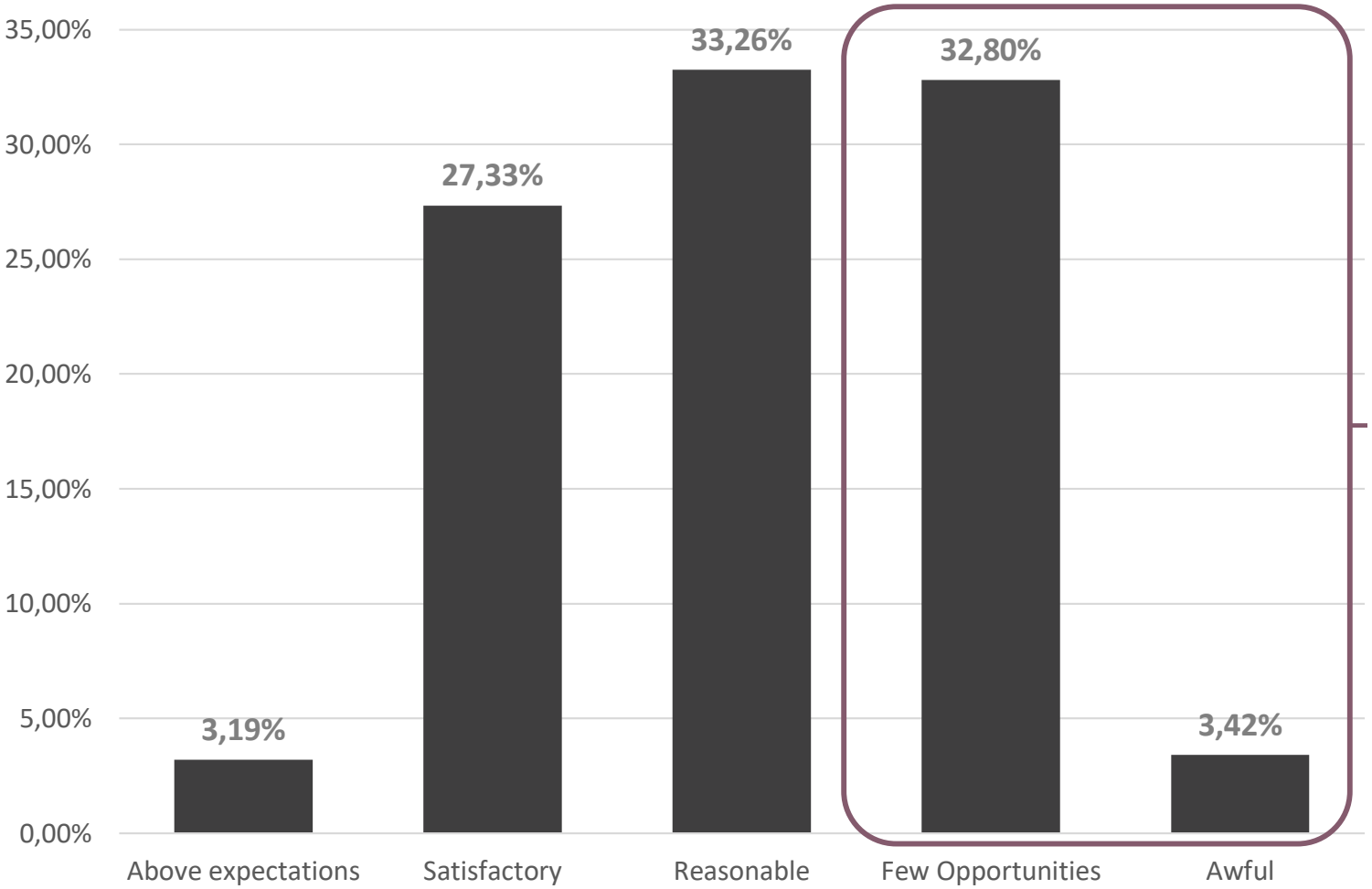
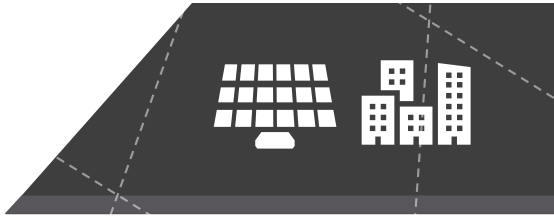
Impression of the DG Solar Market

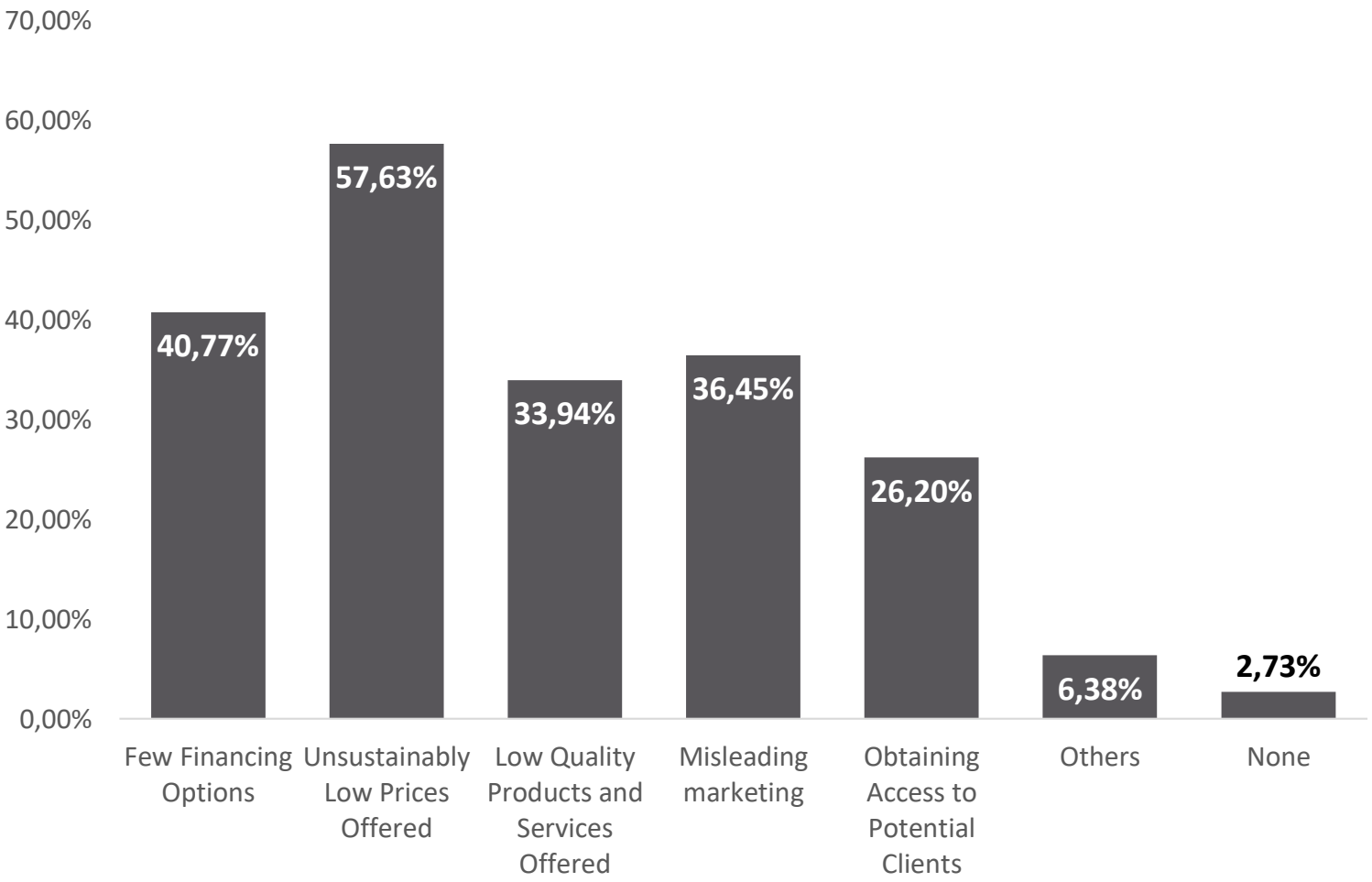
Up to July 2018

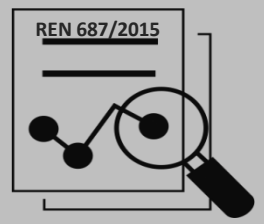


Around **36% of solar integrators** are dissatisfied with the market. Despite this, these numbers show a light improvement in the general sentiment compared to December 2017, when almost **40%** of companies were dissatisfied, and a significant improvement versus May 2017, when more than **50%** of all companies involved in the sector expressed discontent.

Biggest Challenge in Relation to Competition

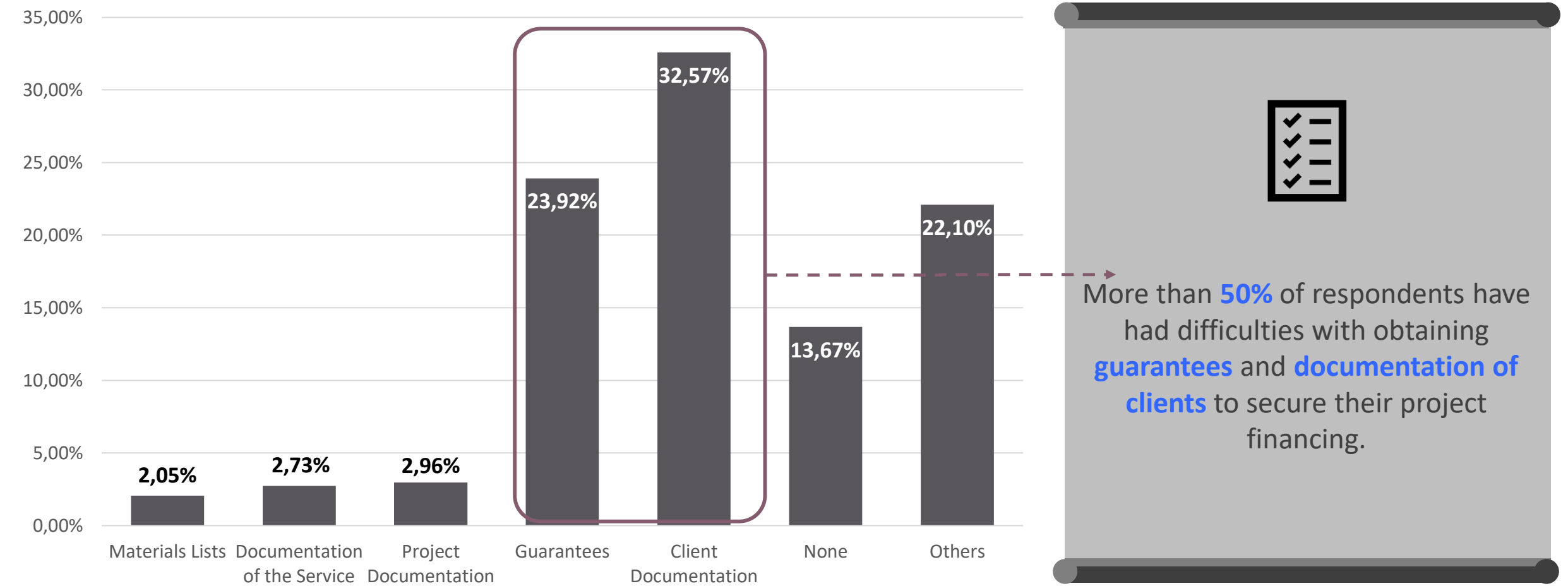






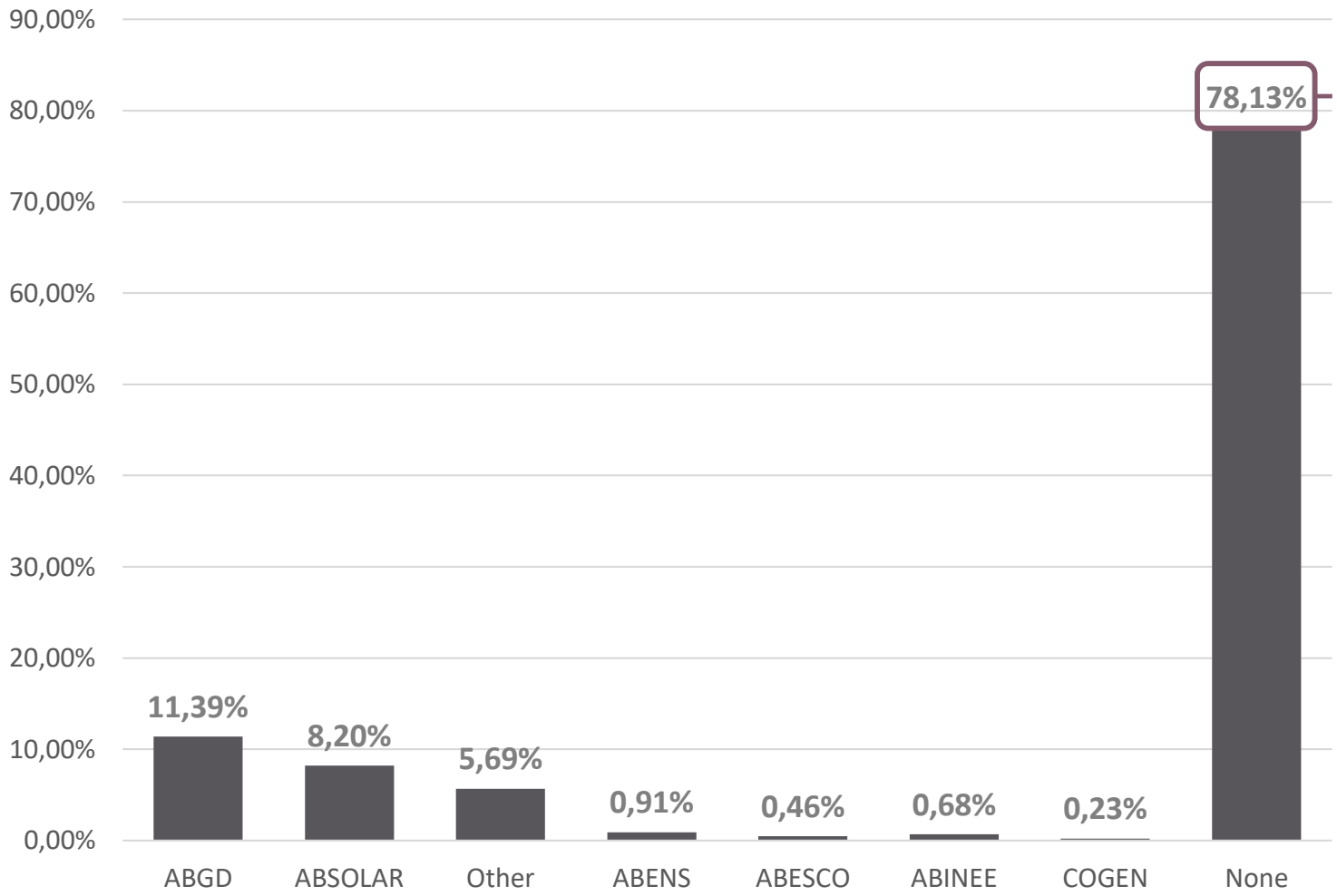
Given the high number of companies and especially new market entrants, a logical consequence is that **very low prices are offered (sometimes below cost)** to be able to execute early projects. The **unsustainable** nature of such low pricing strategies must be emphasized, as it devalues the whole market and turns it unattractive.

Biggest Difficulties in Obtaining Financing



More than **50%** of respondents have had difficulties with obtaining **guarantees** and **documentation of clients** to secure their project financing.

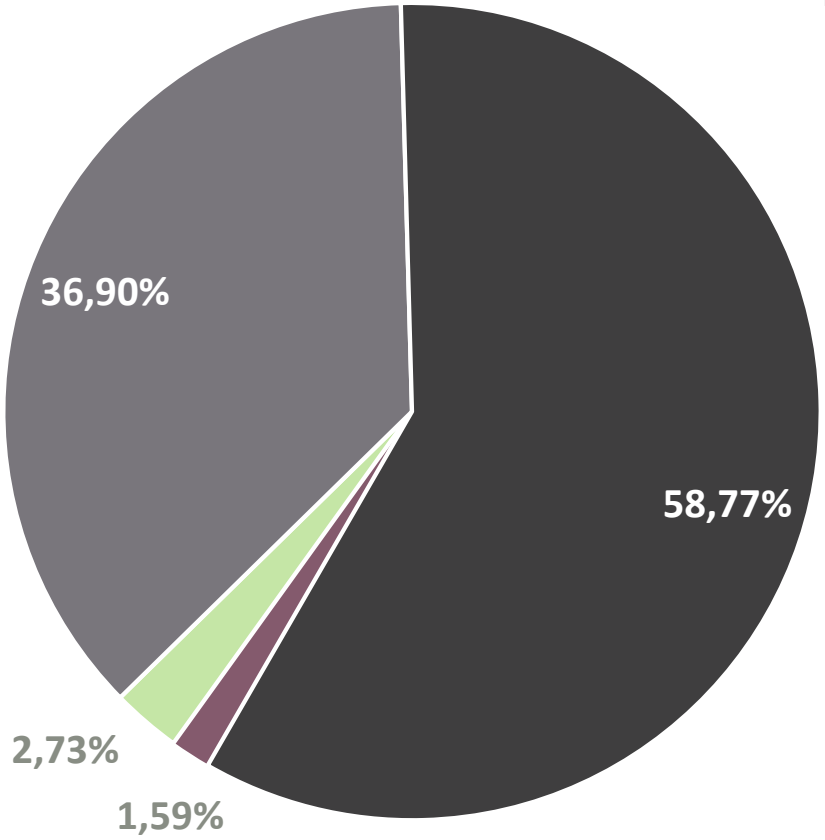
Company Participation in Sector Associations



The low participation in industry associations by solar integrators shows that the market is still immature in Brazil, and that **the cost of membership does not yet make sense within the financial constraints** of the majority of these start-up companies in the sector. Additionally, the relative number of companies that were part of an Association declined slightly vs December 2017, when around 76% were unaffiliated to any Association.

Business model of the integrators

Ways in which integrators complete projects



- Sytem rental / shared solar generation facilities
- Only (After-Sale) Services
- Supply of the PV Kit from distributor with follow-up services (design, installation, grid connection, maintenance)
- One-off sale (PV Kit, project design, installation, grid connection) - without maintenance

The percentage of companies working with a rental business model or only providing services is still **low**, with only a slight change from December 2017. We added the option **"Only services"** in this latest survey, but it still only represents a small fraction of the total number of survey respondents.

Time Interval for Grid Connection

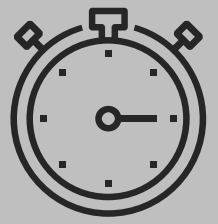
Time between access request and grid connection

Microgeneration (≤ 75kWp)

49 Days*

Minigeneration (>75kW to ≤ 5MW)

63 Days*



Minigeneration DG systems on average take more time than micro-Systems to be connected to the grid by the distributors. Compared to December 2017, there has been little variation in the connection interval, which were **50** and **64** days for micro and minigeneration respectively, meaning **just one day less than 6 months ago** in both cases.

*Average time interval between request for access and the actual grid connection for a DG solar PV system.

System Rental

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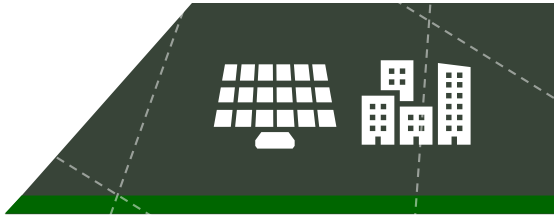
System Rental / Shared Systems

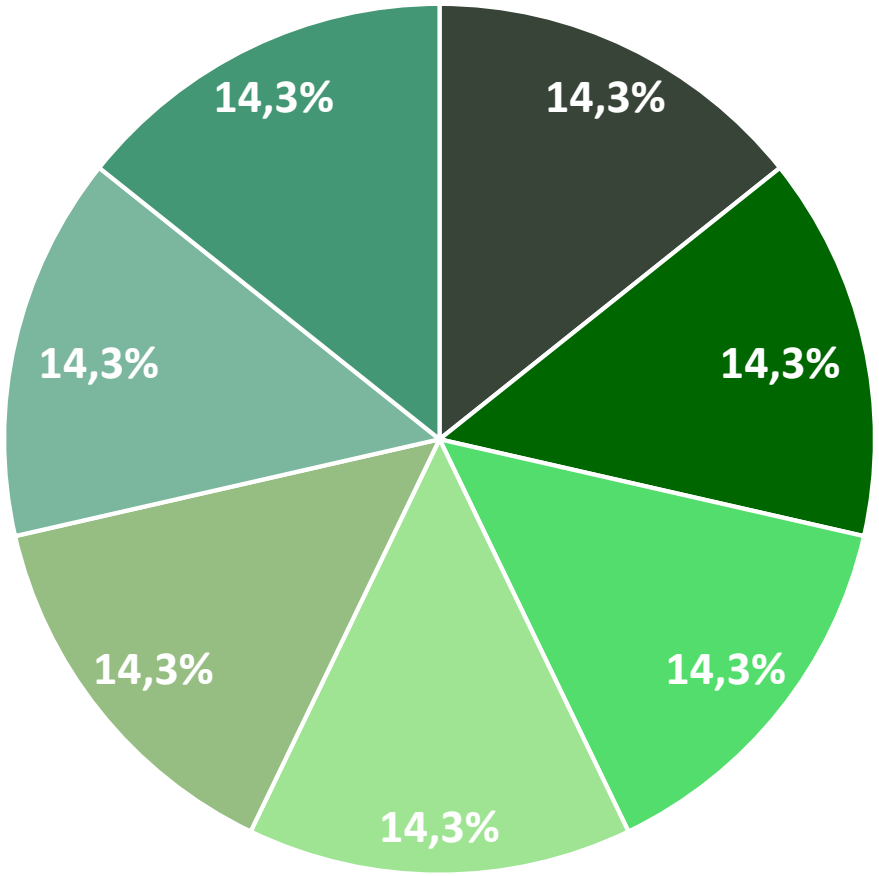


Observation: The data from this section are not based on the total validated sample of companies in the survey, but are only based on the answers given by those companies that use a shared / remote generation business model where solar capacity is shared or rented or generted remotely using Minigeration (Consortiums, Cooperatives, Remote Auto-consumption). As a result, the sampling error discussed earlier can not be applied to any of these questions. It would be advisable to consider these answers as qualitative due to limited sample size and small number of companies using these business models.

These data are not representative for the market as a whole!

% of Discount Offered vs Low-Voltage Grid Price

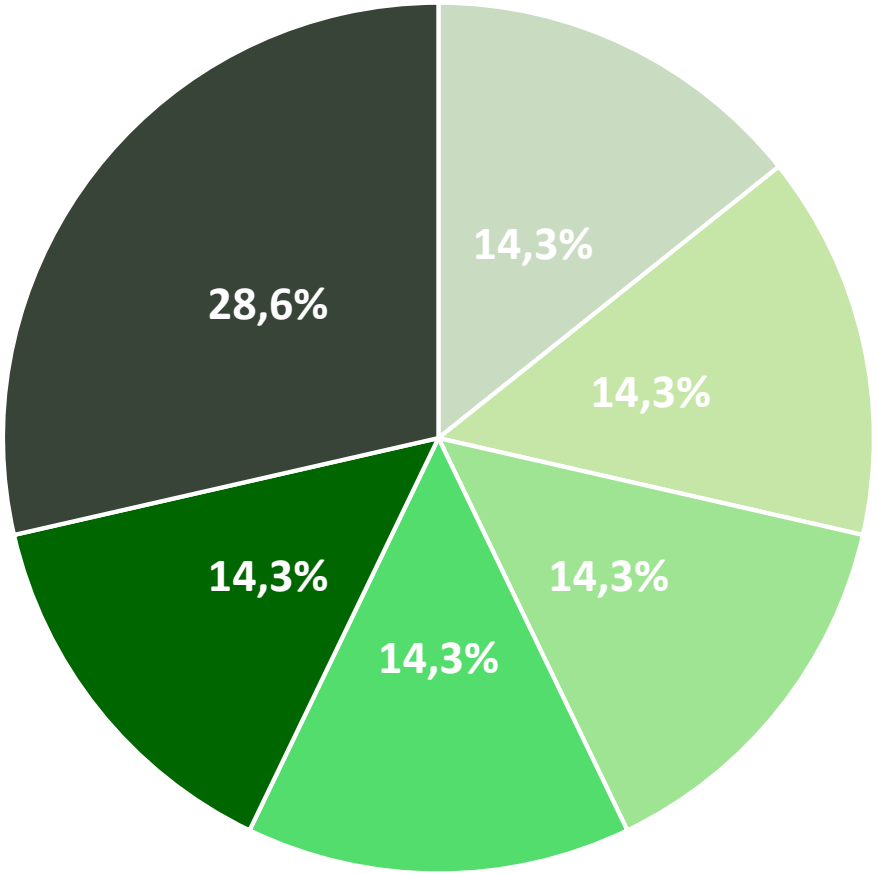
(Companies that don’t work with this model are assumed to provide 0% discount)



The amount of discount achieved for the final customer by solar integrators using this model still varies wildly, with **an average of around 18%.** The lower discounts could be contradictory in certain distribution regions because of the **ICMS tax charged over TUSD transmission charges.** This reduces the part of the bill that can generate cost savings.

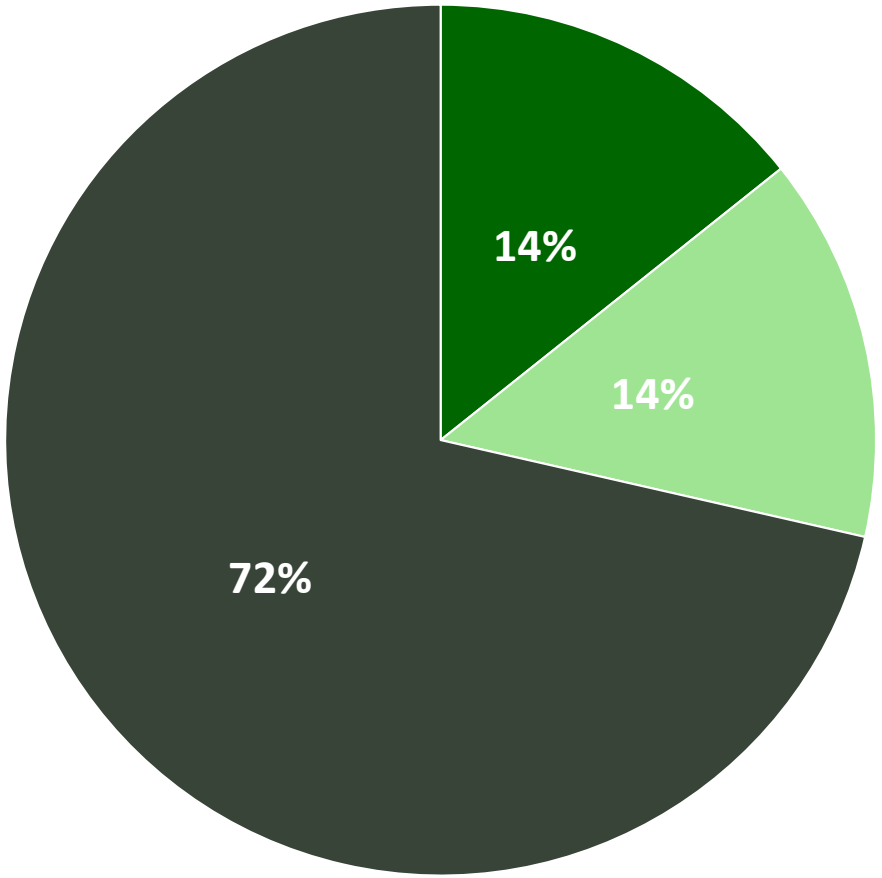
% of Discount Offered vs Mid-Voltage Grid Price

(Companies that don’t work with this model are assumed to provide 0% discount)



For Mid-Tension projects, the highest discount achieved for the end customer was 20% and the average discount achieved was 9.4%. However, the very small sample size should be taken into account, as it drastically increaseses the statistical uncertainty around this measure.

Average Duration of Rental/Leasing Contracts Agreed by Companies

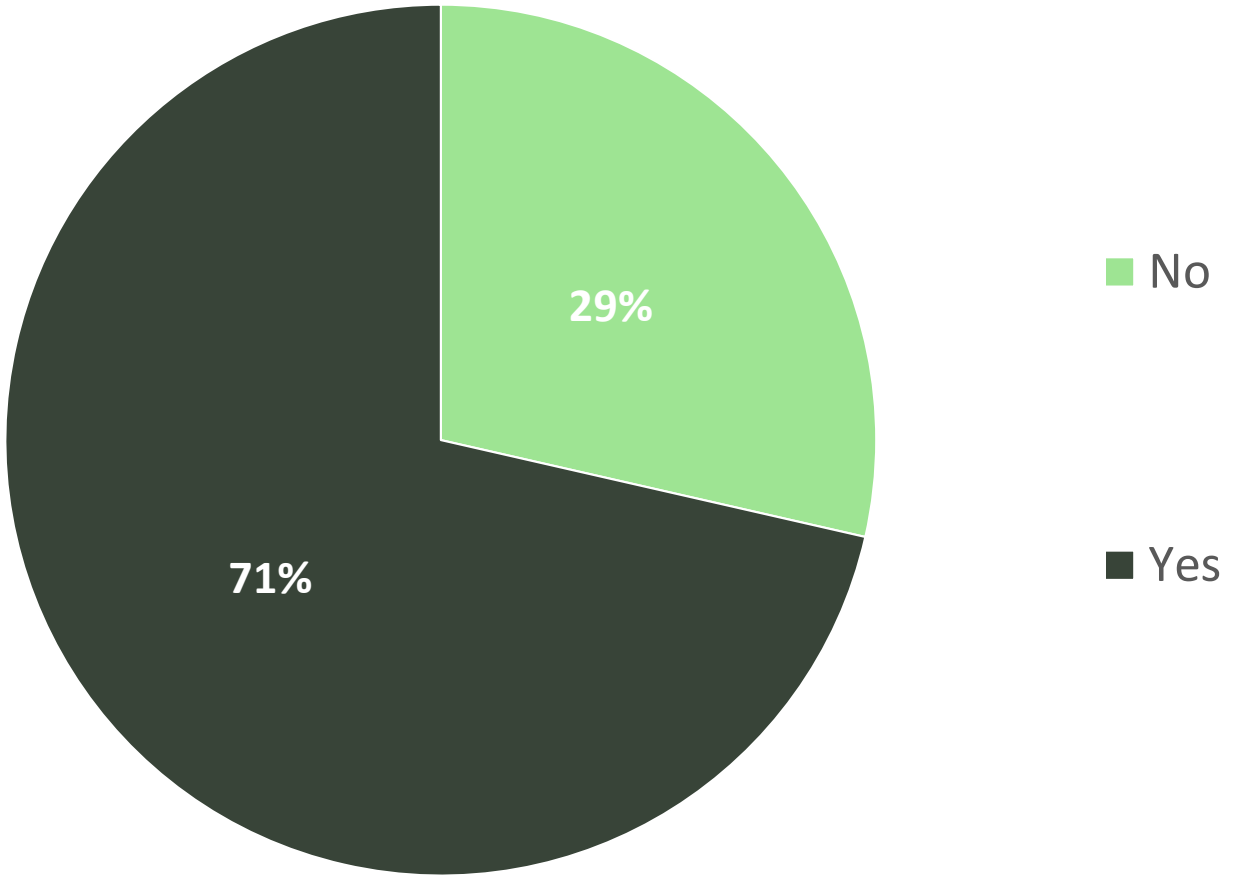


The average rental duration agreed by companies that use this business model is still relatively long. Uncertainties regarding 'vacant capacity' and in relation to bureaucracy from energy regulators and distributors for changing the members of a consortium/ cooperative stand in the way of shorter leases and greater flexibility in this type of negotiation.

The **average** contract time is **8.1 years**.

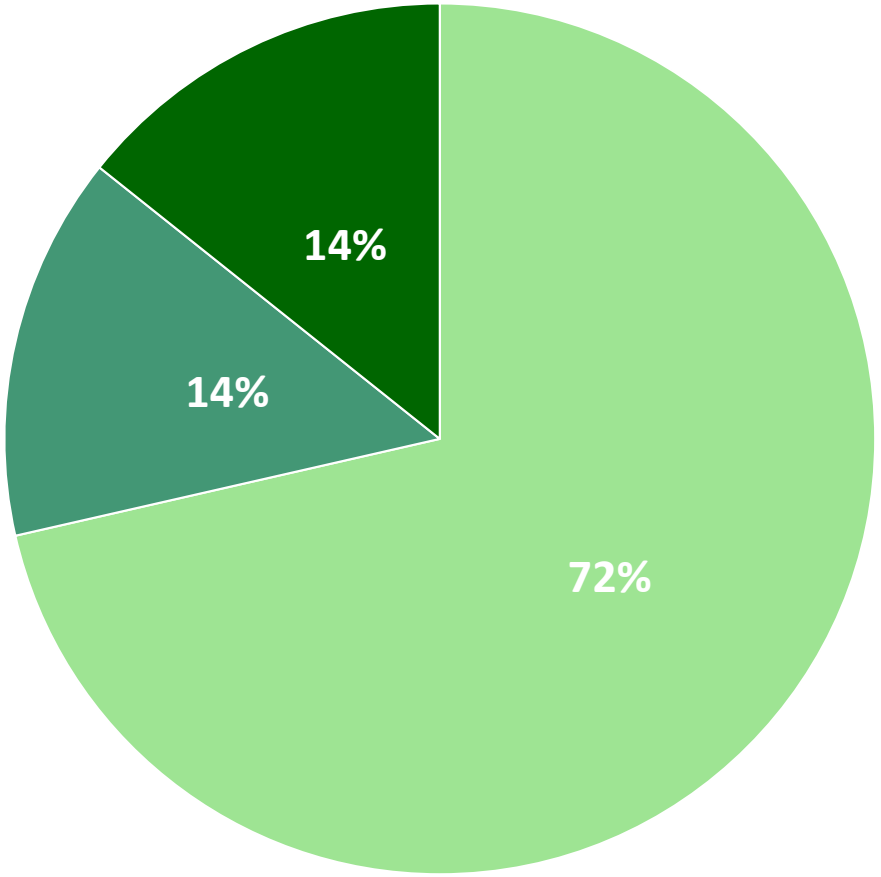
Difficulty Getting Remote Generation Projects Approved by Distributors

(Remote auto-consumption, Consortiums, Cooperatives)



Due to the legal/regulatory difficulties (lack of clarity in the legislation), a significant majority of the companies that use this business model face difficulties to get their projects approved for grid connection by the energy distributors.

Principal Source of Financial Backing for Constructing Solar Power Plants



Solar rental projects should be considered of medium complexity (in the case of plants > 1 MW), which complicates financing by commercial banks who do not yet understand this business. To obtain access to capital, these projects have to overcome the pereived higher risk (because few companies have so far succeeded in completing projects of this kind) and the lower level of operational clarity when running this type of shared/long-term business. The majority of commercial banks are reluctant to take on such uncertainty and higher level of risk.

In comparison to December 2017 there has been a significant increase in the proportion of companies with access to investors for such projects (from 40% to 72%)

Products and Services

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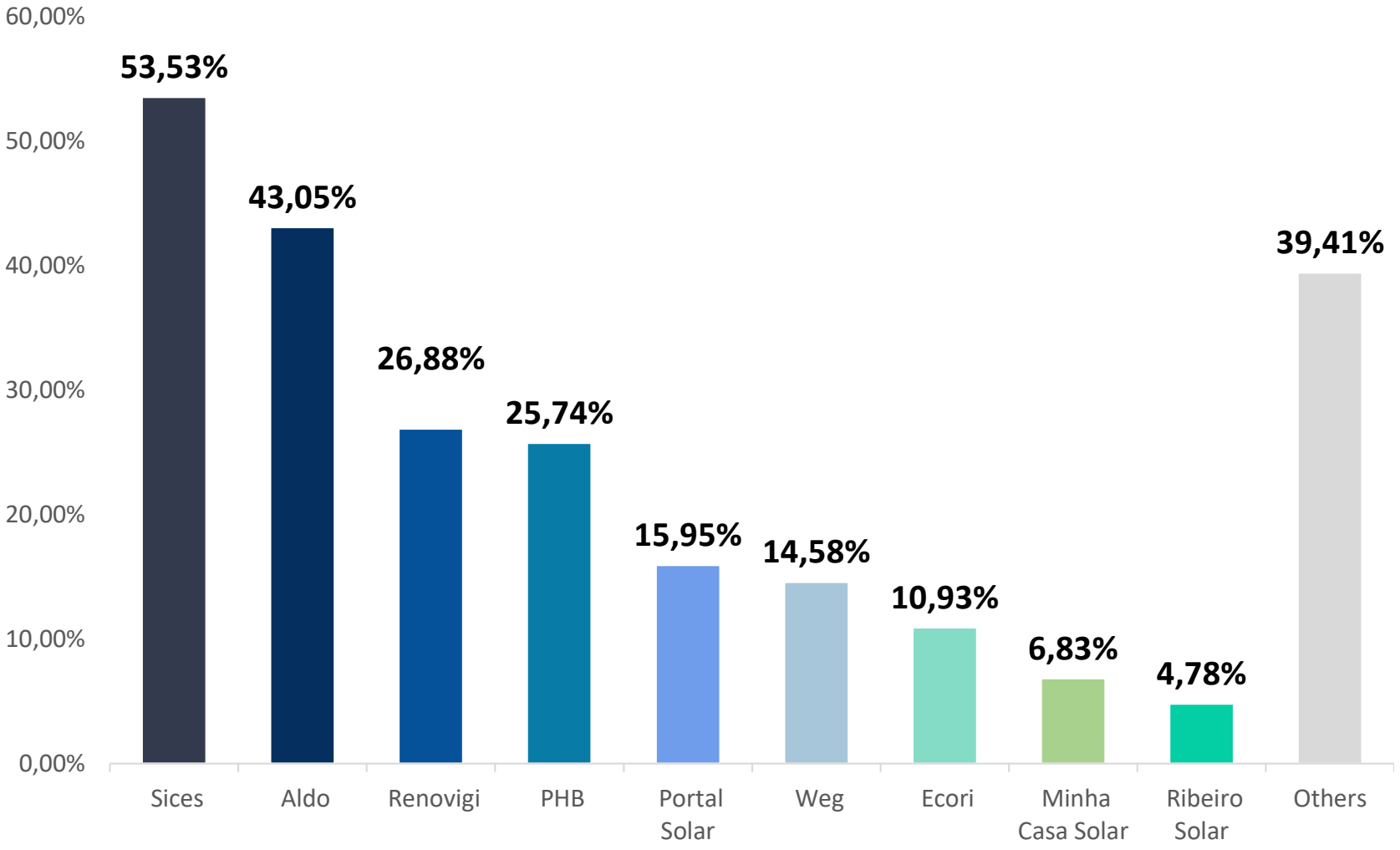
Distribution of Solar/PV Equipment

% of Integrators that buy Equipment from each Distributor

(This number does not represent market share, but more an index of market reach)



1º Sices

2º Aldo

3º Renovigi

4º PHB

5º Portal Solar

6º WEG

7º Ecori

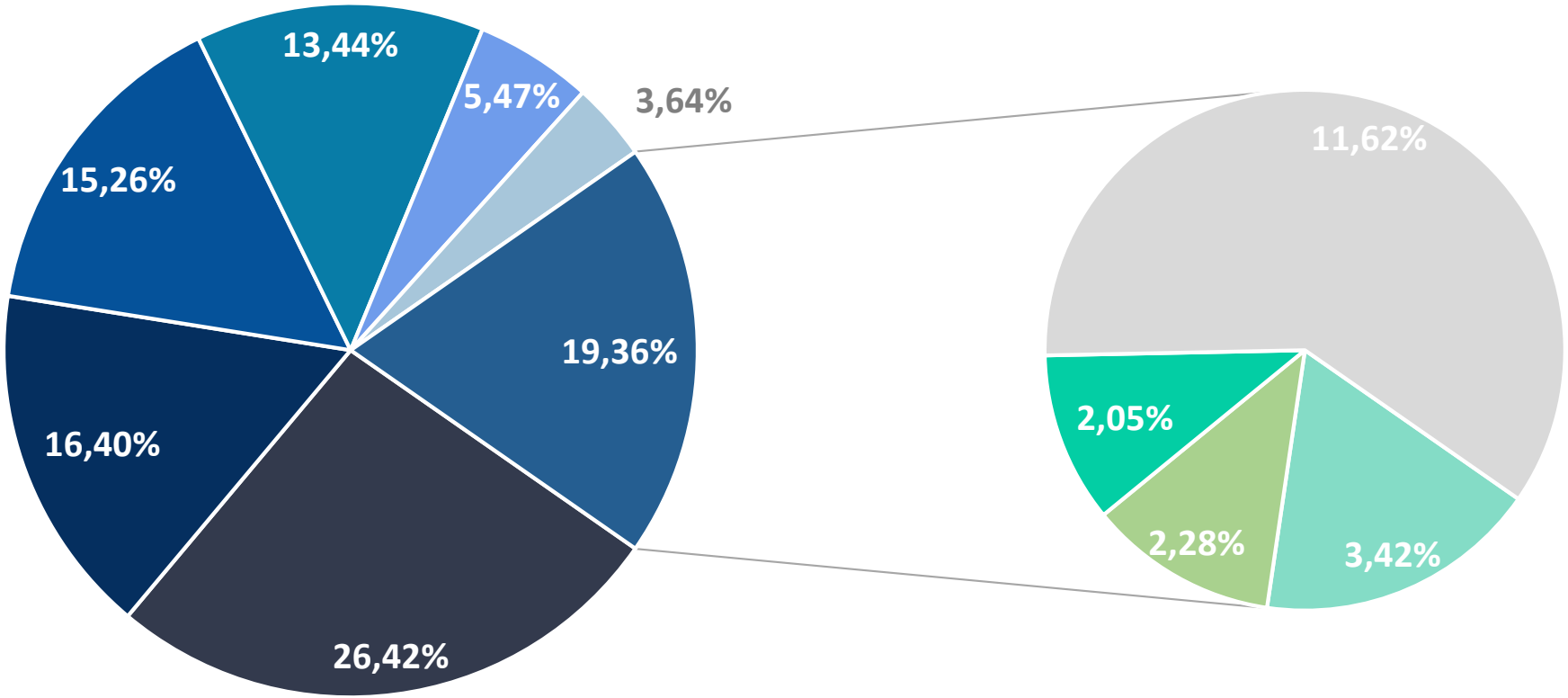
8º Minha Casa Solar

9º Ribeiro Solar

Others

Distribution of Solar/PV Equipment

The Distributor that each Integrator prefers to buy from



1º Sices

2º Renovigi

3º Aldo

4º PHB

5º WEG

None

6º Portal Solar

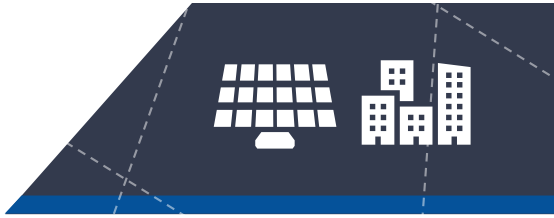
7º Ecori

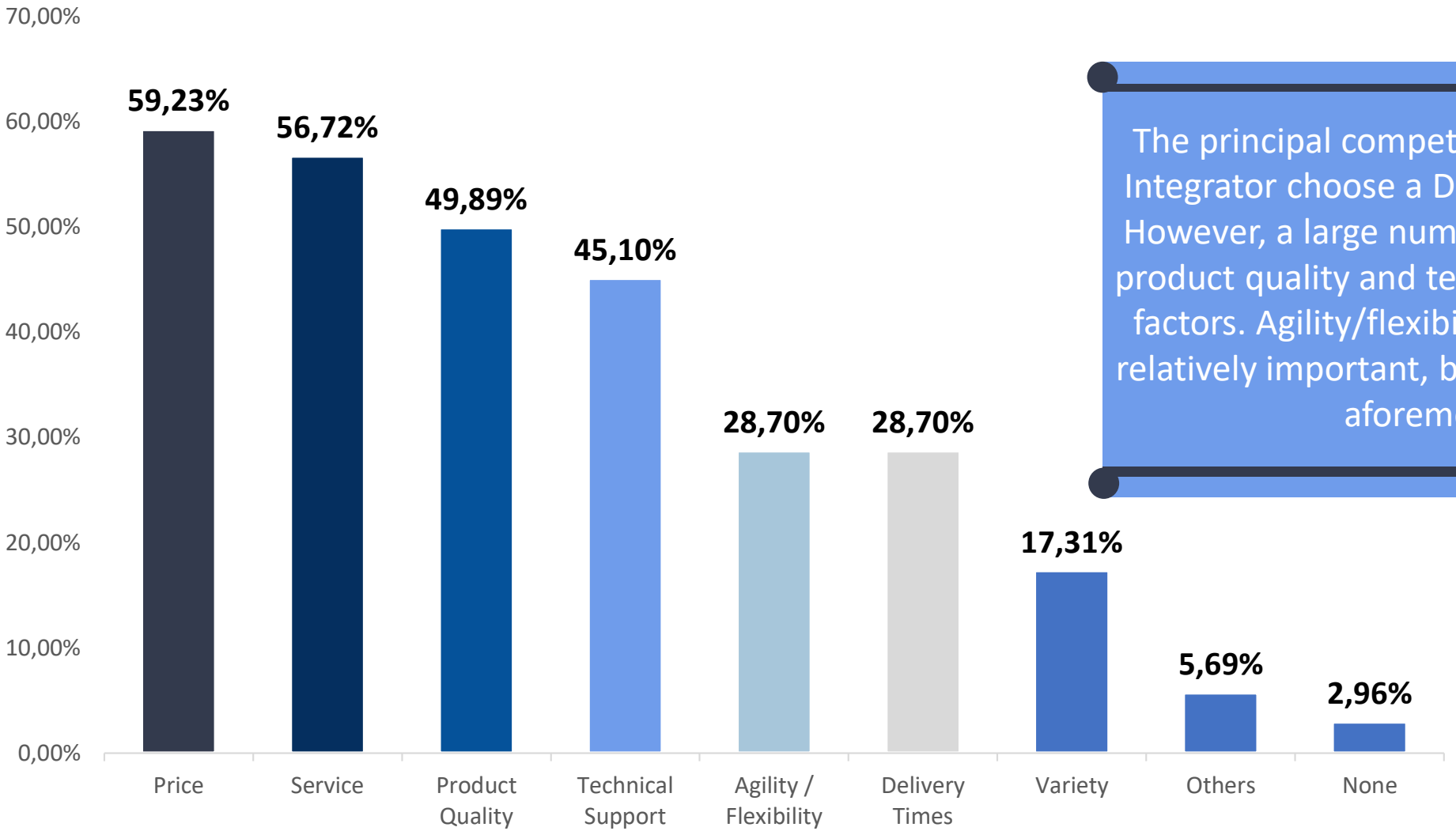
8º Demape

Others

Distribution of Photovoltaic Equipment

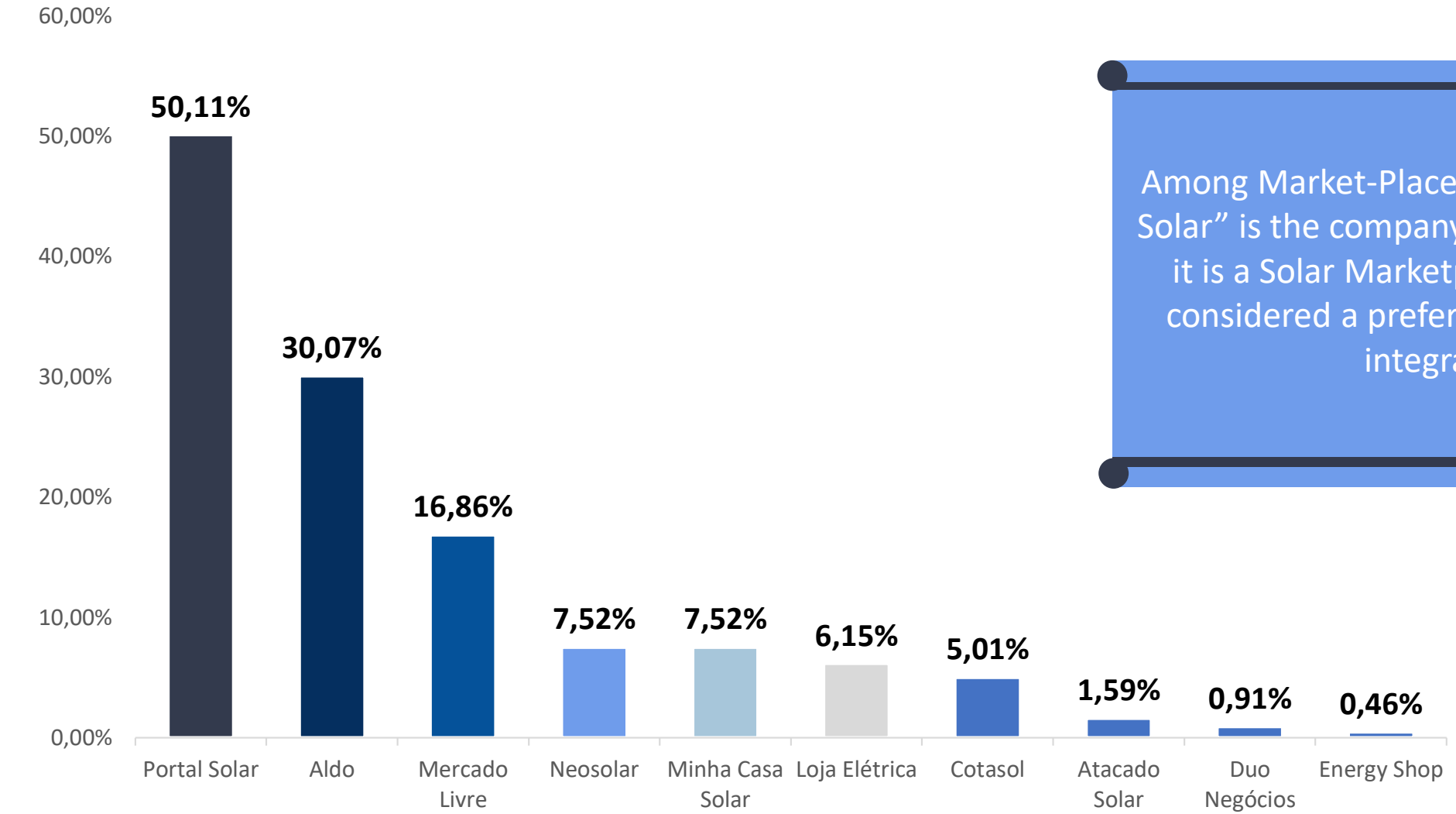
Principal competitive differentials of Preferred Distributor





The principal competitive differentials that make an Integrator choose a Distributor are price and service. However, a large number of Integrators also consider product quality and technical support to be important factors. Agility/flexibility and delivery times are also relatively important, but considerably less so than the aforementioned factors.

Marketplace/E-Commerce Sites

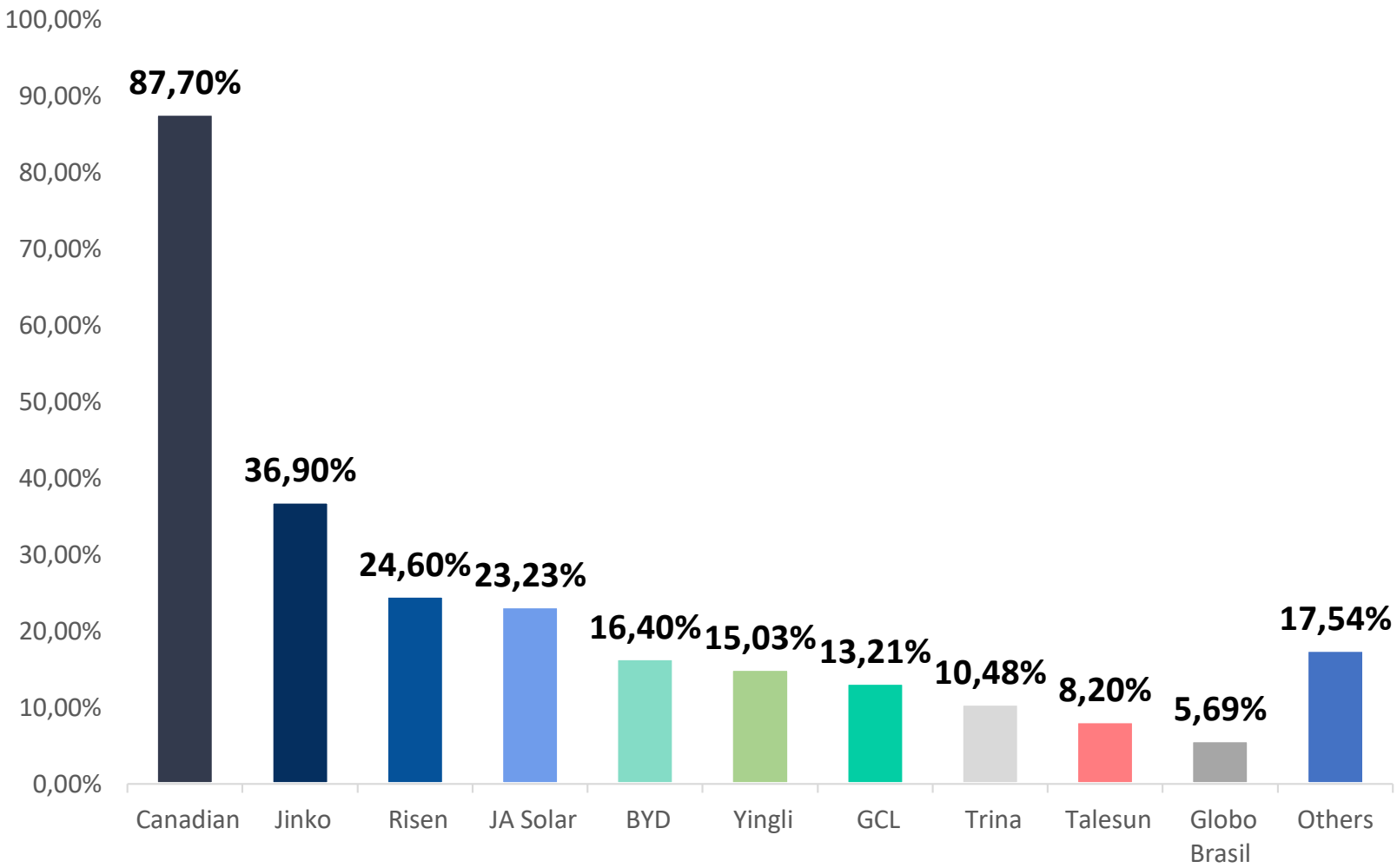


Among Market-Place/E-Commerce sites, the “Portal Solar” is the company that is best known. Given that it is a Solar Marketplace, it infers that this site is considered a preferred option amongst the solar integrator community.

Photovoltaic Modules

% of Companies that use each Brand of Solar Module

(This number does not represent market share, but more an index of market reach)



1º Canadian

2º Jinko

3º Risen

4º JA Solar

5º BYD

6º Yingli

7º GCL

8º Trina

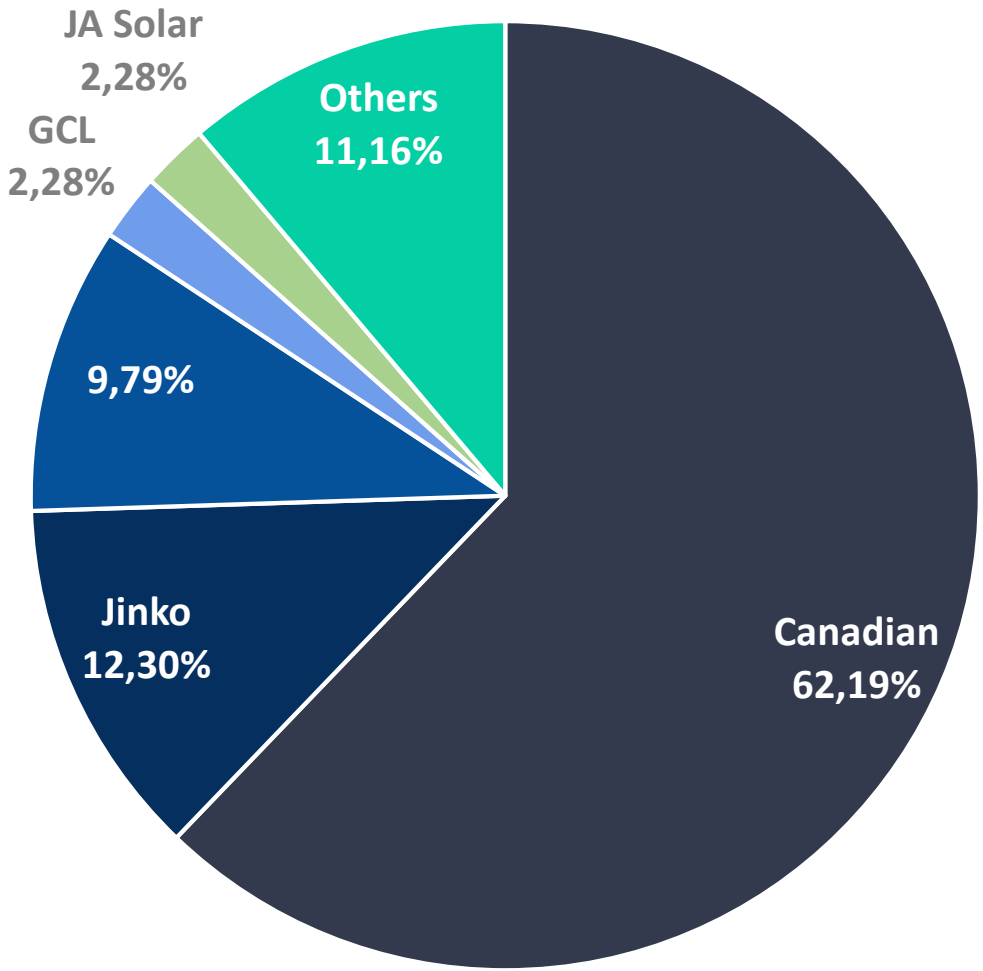
9º Talesun

10º Globo Brasil

Others

Photovoltaic Modules

Brand that is considered Preferred Supplier



1º Canadian

2º Jinko

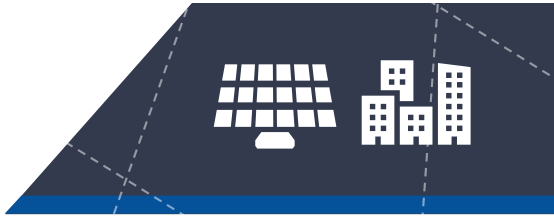
3º Risen

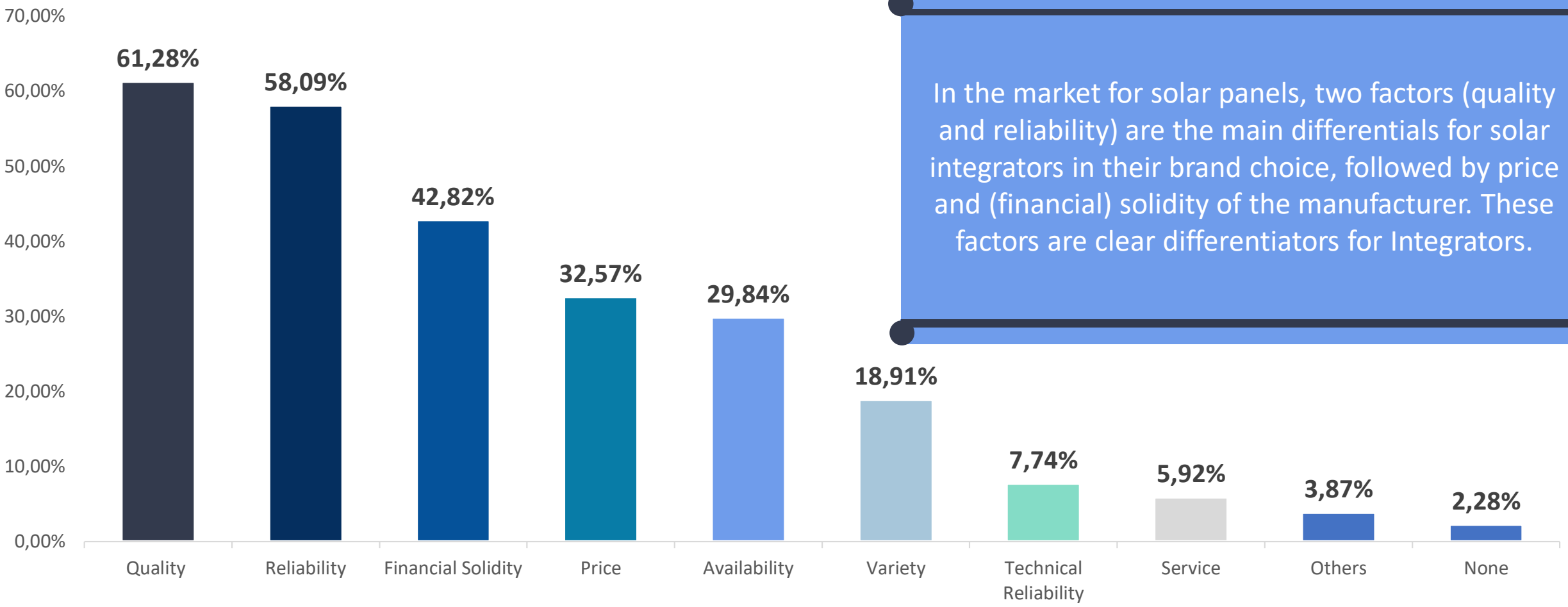
4º GCL | JA Solar

Others

Photovoltaic Modules

Principal competitive differential of Preferred Brand



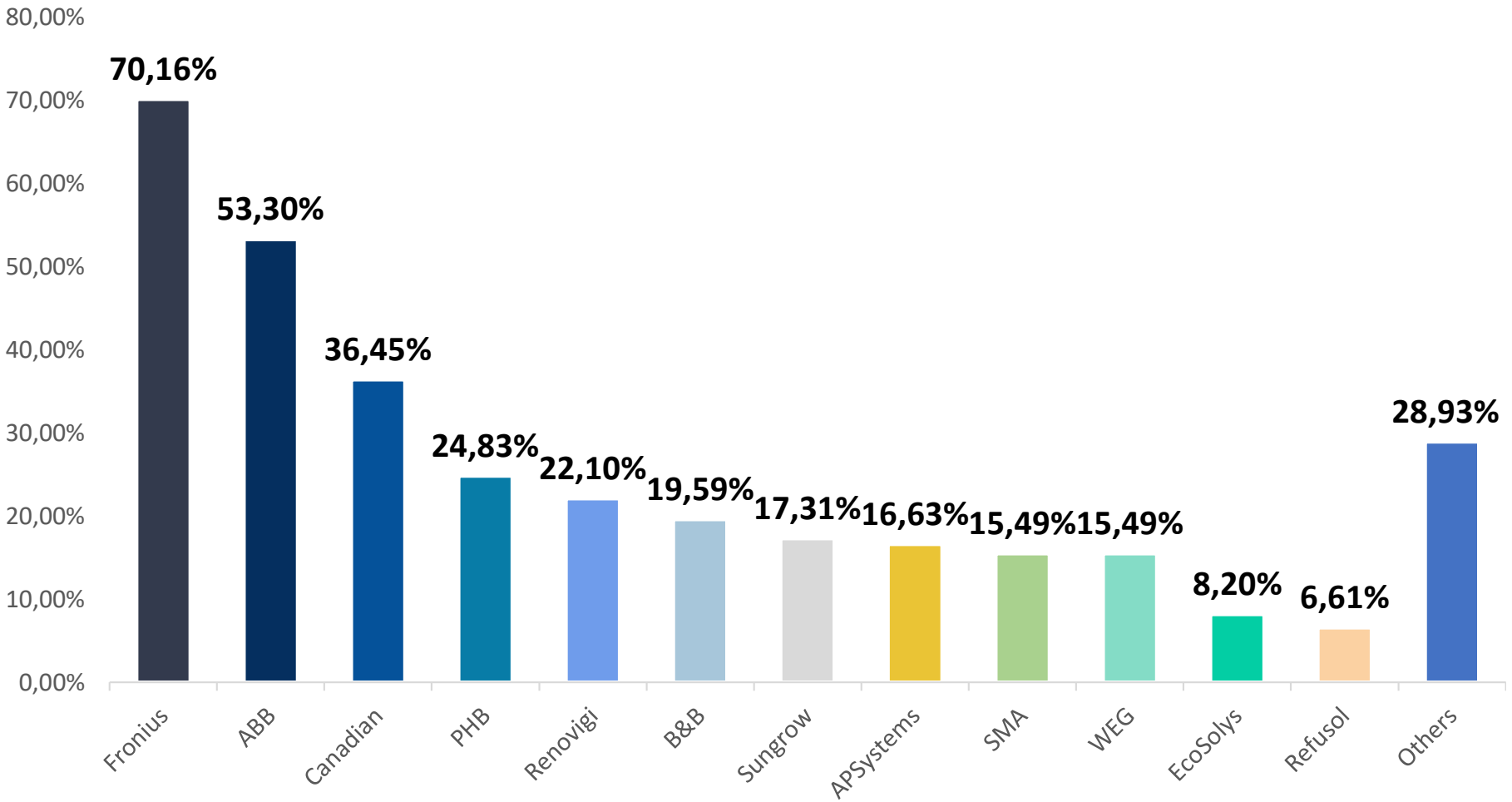


In the market for solar panels, two factors (quality and reliability) are the main differentials for solar integrators in their brand choice, followed by price and (financial) solidity of the manufacturer. These factors are clear differentiators for Integrators.

Photovoltaic Inverters

% of Companies that use each brand of Solar Inverter

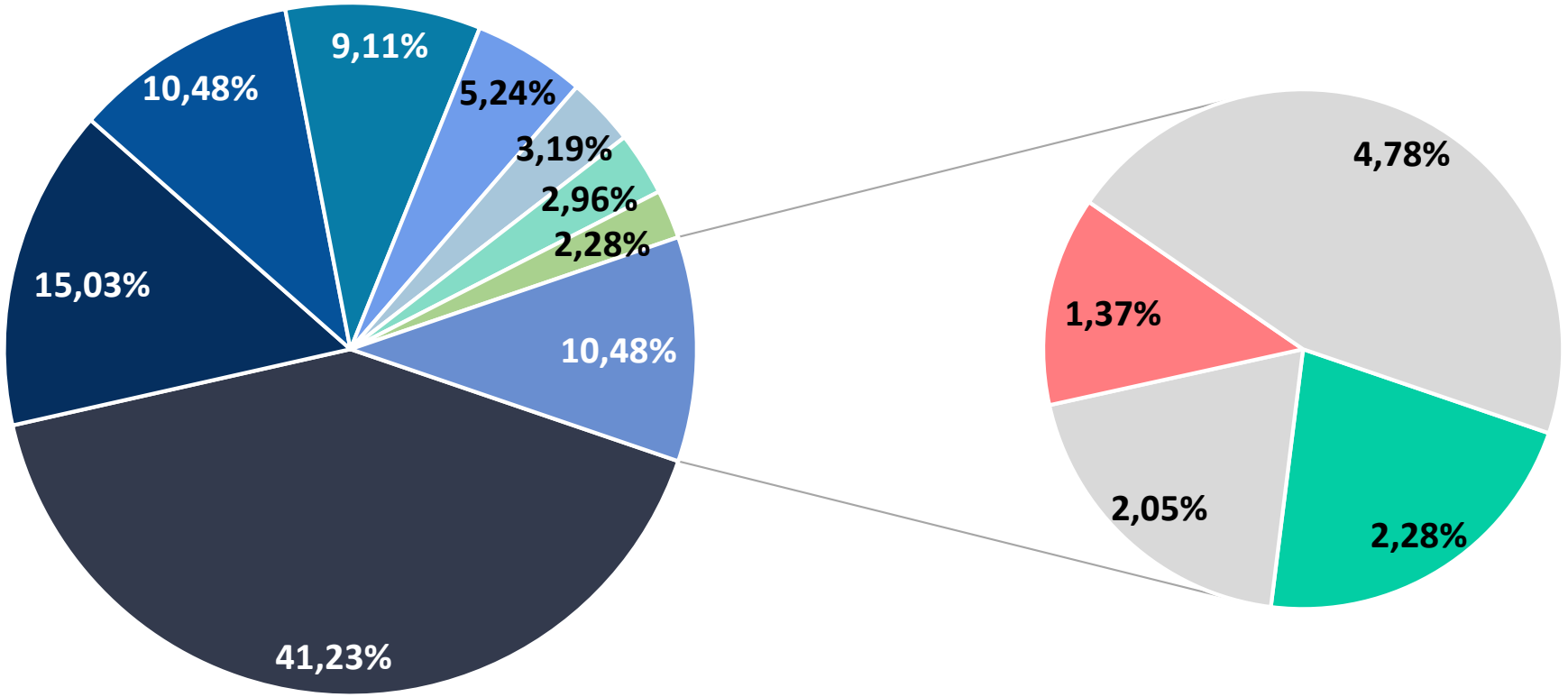
(This number does not represent market share, but more an index of market reach)



1º Fronius
2º ABB
3º Canadian
4º PHB
5º Renovigi
6º B&B
7º Sungrow
8º APSystems
9º SMA
10º WEG
11º EcoSolys
12º Refusol
Others

Photovoltaic Inverters

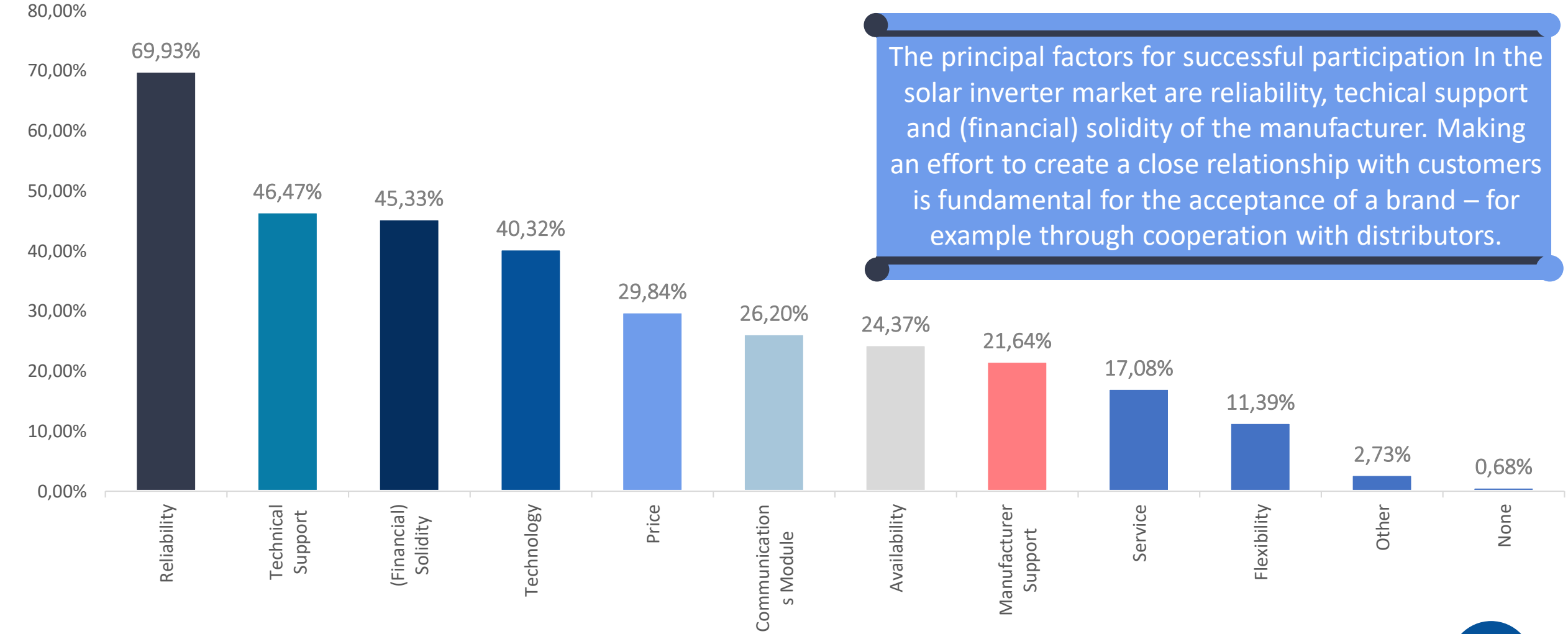
Brand that each Company considers Preferred Supplier



1º	Fronius
2º	ABB
3º	PHB
4º	Renovigi
5º	B&B
6º	SMA
7º	APSystems
8º	Canadian / WEG
9º	Sungrow
10º	Growatt
11º	Others

Photovoltaic Inverters

Principal competitive differential of Preferred Brand

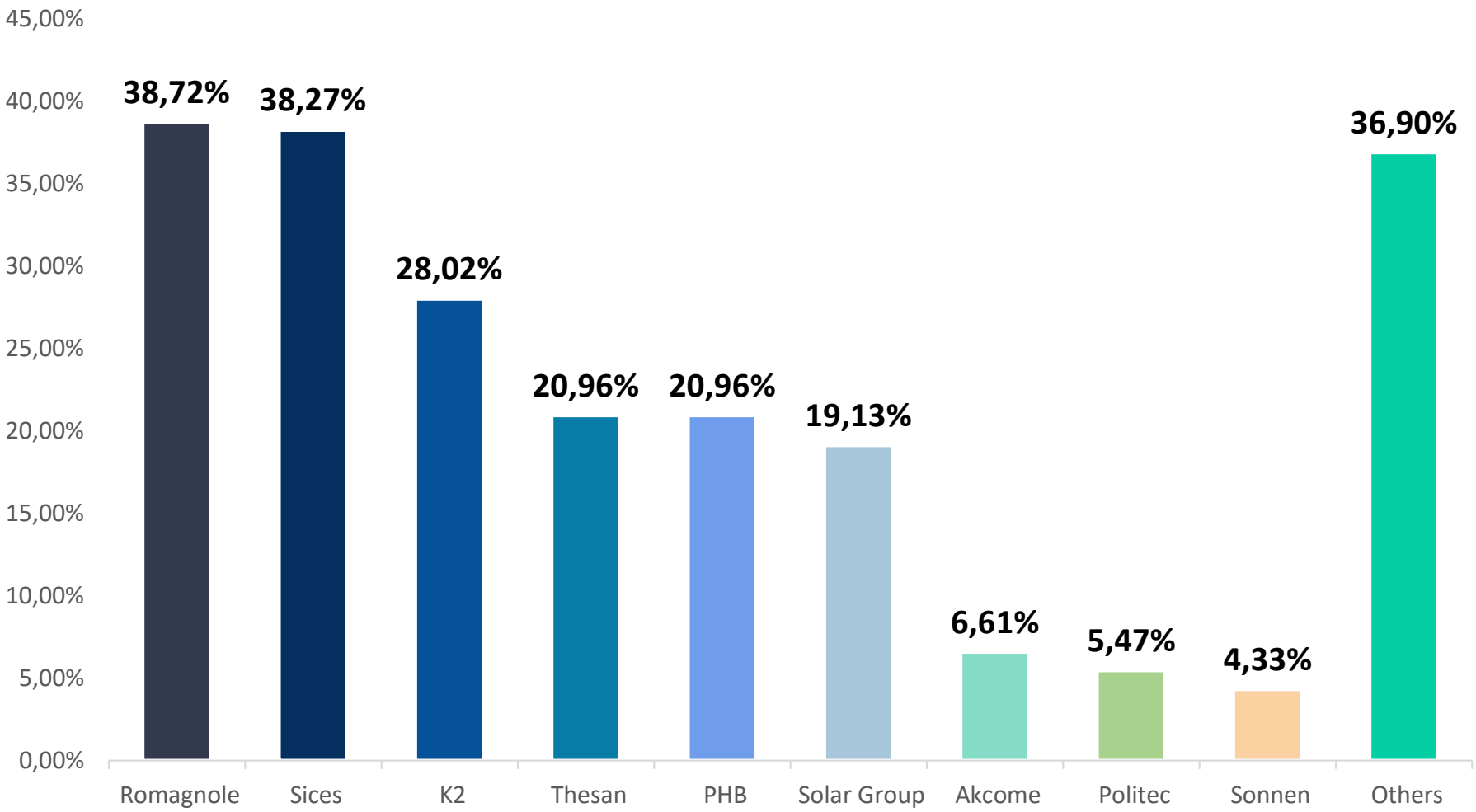


The principal factors for successful participation In the solar inverter market are reliability, techical support and (financial) solidity of the manufacturer. Making an effort to create a close relationship with customers is fundamental for the acceptance of a brand – for example through cooperation with distributors.

Mounting Systems

% of Companies that use each brand of Mounting System

(This number does not represent market share, but more an index of market reach)



1º Romagnole

2º Sices

3º K2

4º Thesan

5º PHB

6º Solar Group

7º Akcome

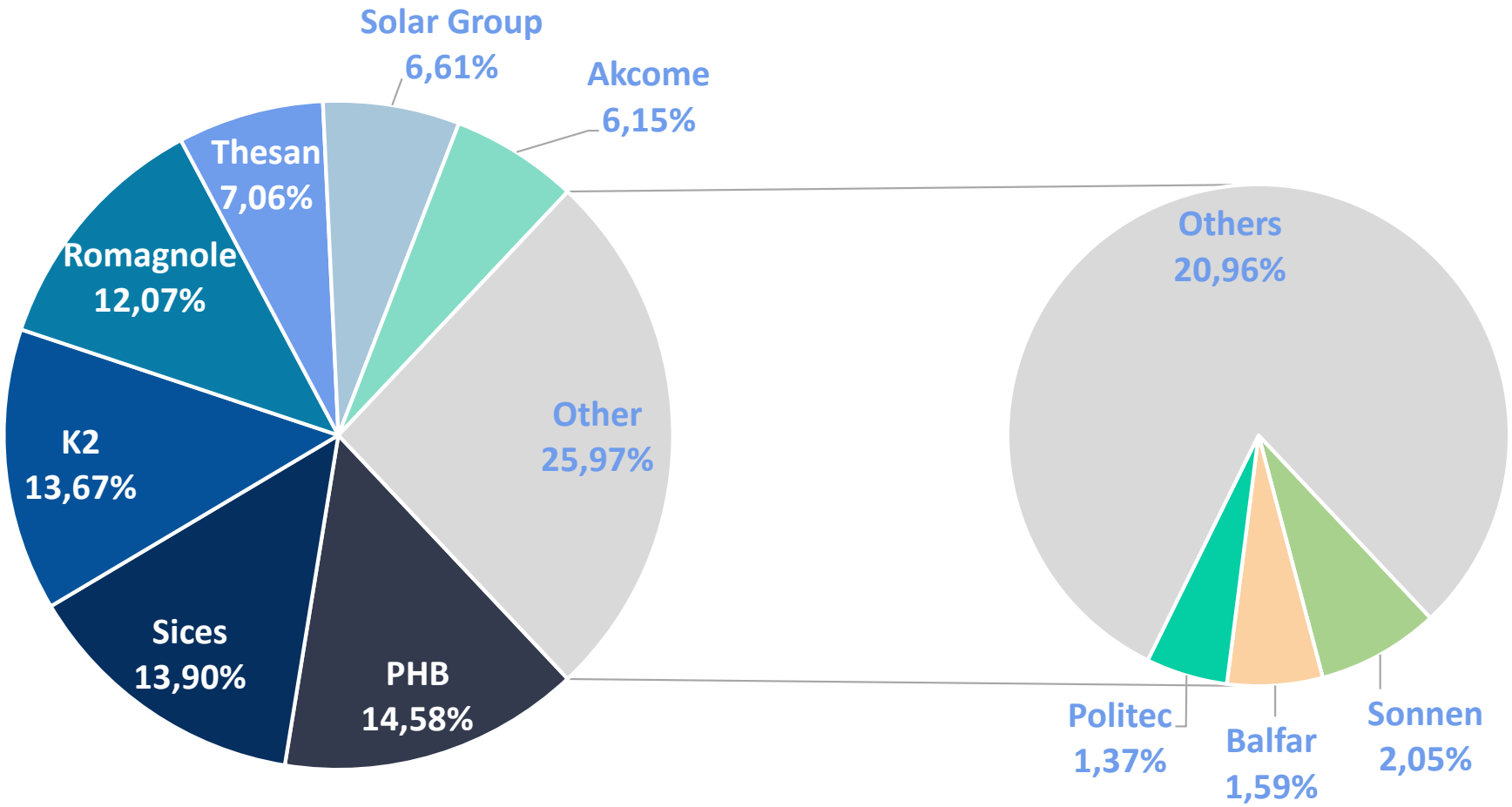
8º Politec

9º Sonnen

10º Others

Mounting Systems

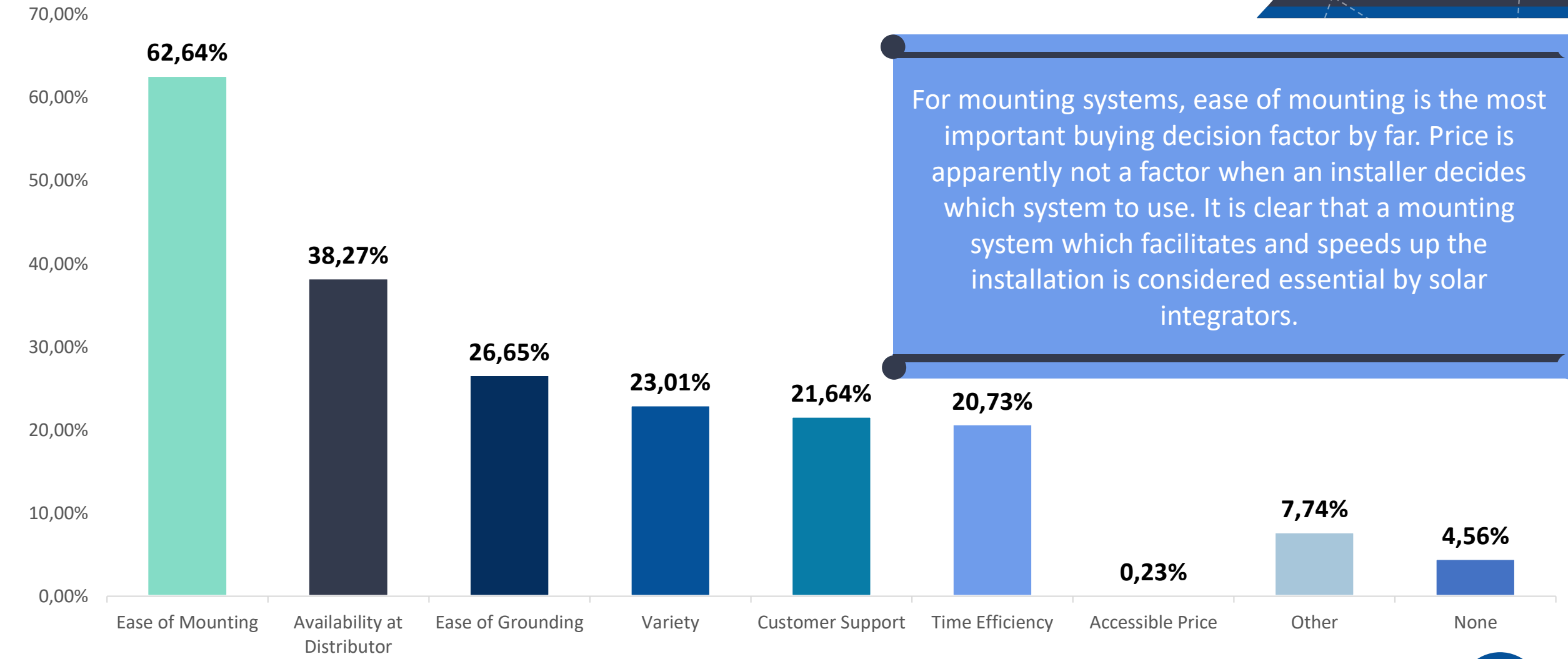
Brand that each Company considers Preferred Supplier



1º PHB
2º Sices
3º K2
4º Romagnole
5º Thesan
6º Solar Group
7º Akcome
8º Sonnen
9º Balfar
10º Politec
Others

Mounting Systems

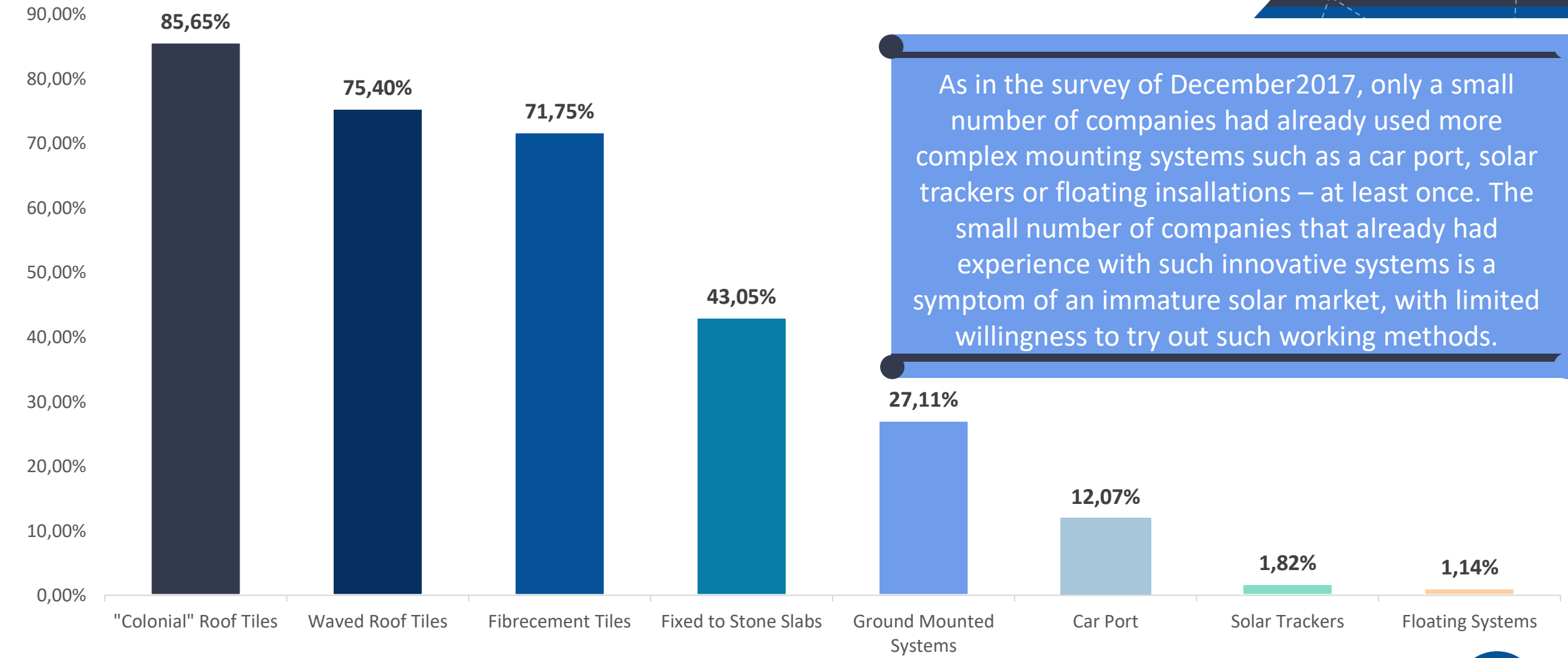
Principal differential of Preferred Brand



For mounting systems, ease of mounting is the most important buying decision factor by far. Price is apparently not a factor when an installer decides which system to use. It is clear that a mounting system which facilitates and speeds up the installation is considered essential by solar integrators.

Mounting Systems

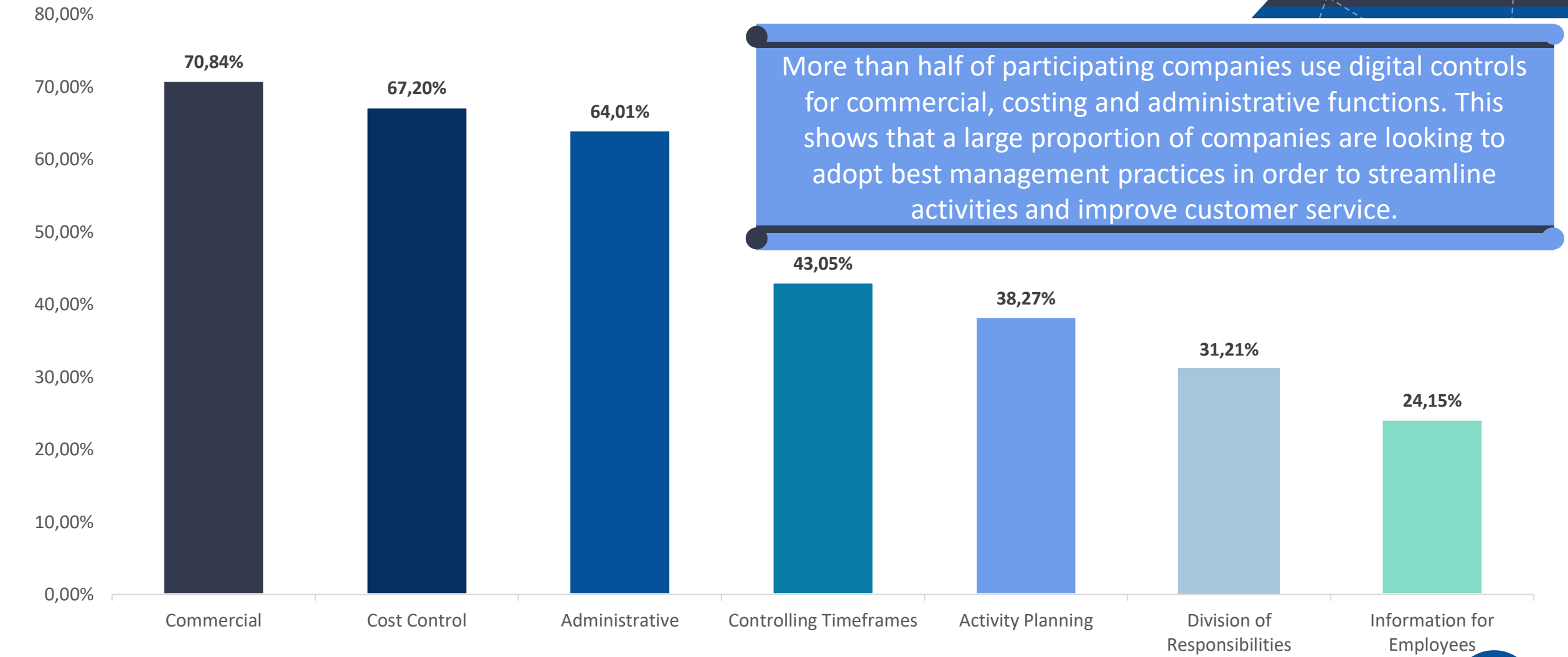
% of Companies that already used different types of mounting systems



As in the survey of December2017, only a small number of companies had already used more complex mounting systems such as a car port, solar trackers or floating insallations – at least once. The small number of companies that already had experience with such innovative systems is a symptom of an immature solar market, with limited willingness to try out such working methods.

Digital Tools

Where Digital Tools are used in each Company



More than half of participating companies use digital controls for commercial, costing and administrative functions. This shows that a large proportion of companies are looking to adopt best management practices in order to streamline activities and improve customer service.

Commercial and Sales

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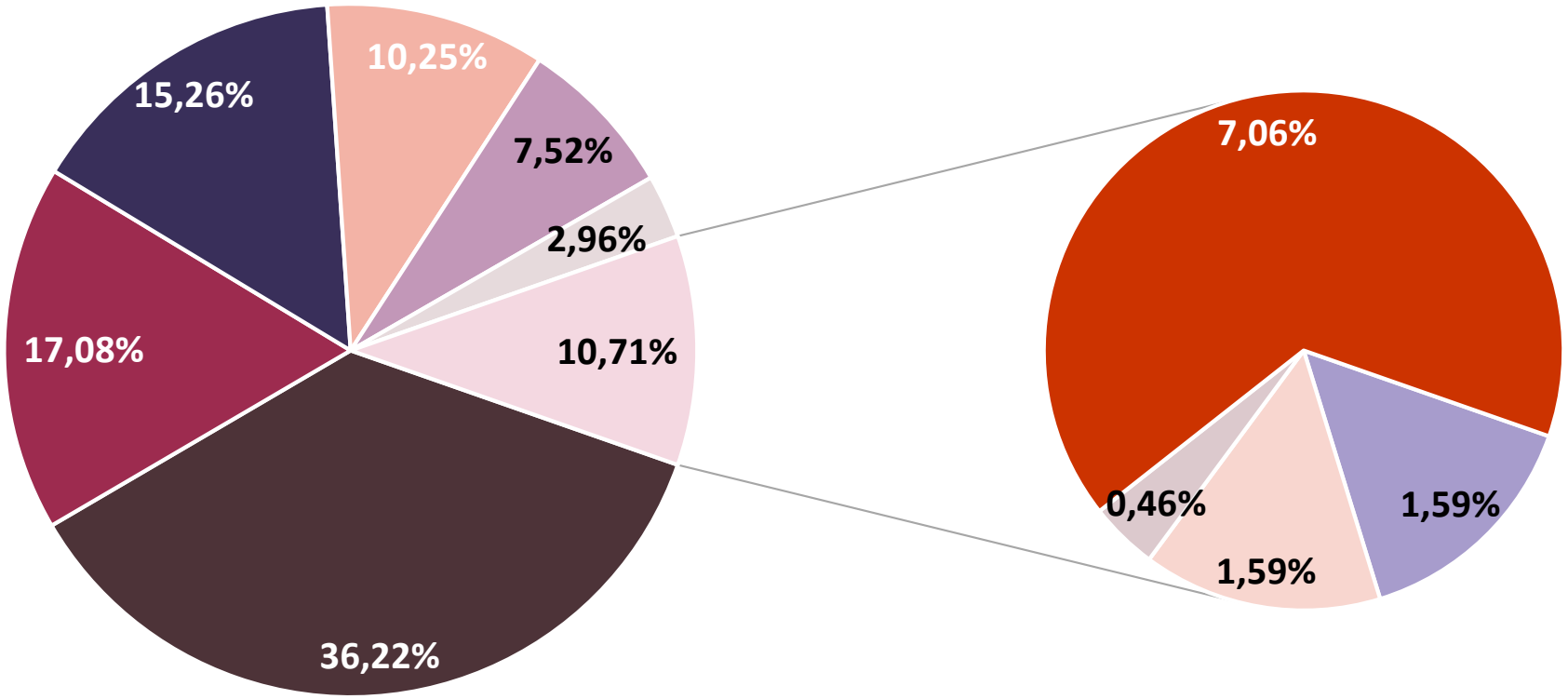
Commercial

Principal Source of Commercial Opportunities (*Leads*)



1º Customer Referral

2º Sales Representatives

3º Google Ads

4º Facebook Ads

5º Partnerships

6º Printed Media

7º Portal Solar Ads

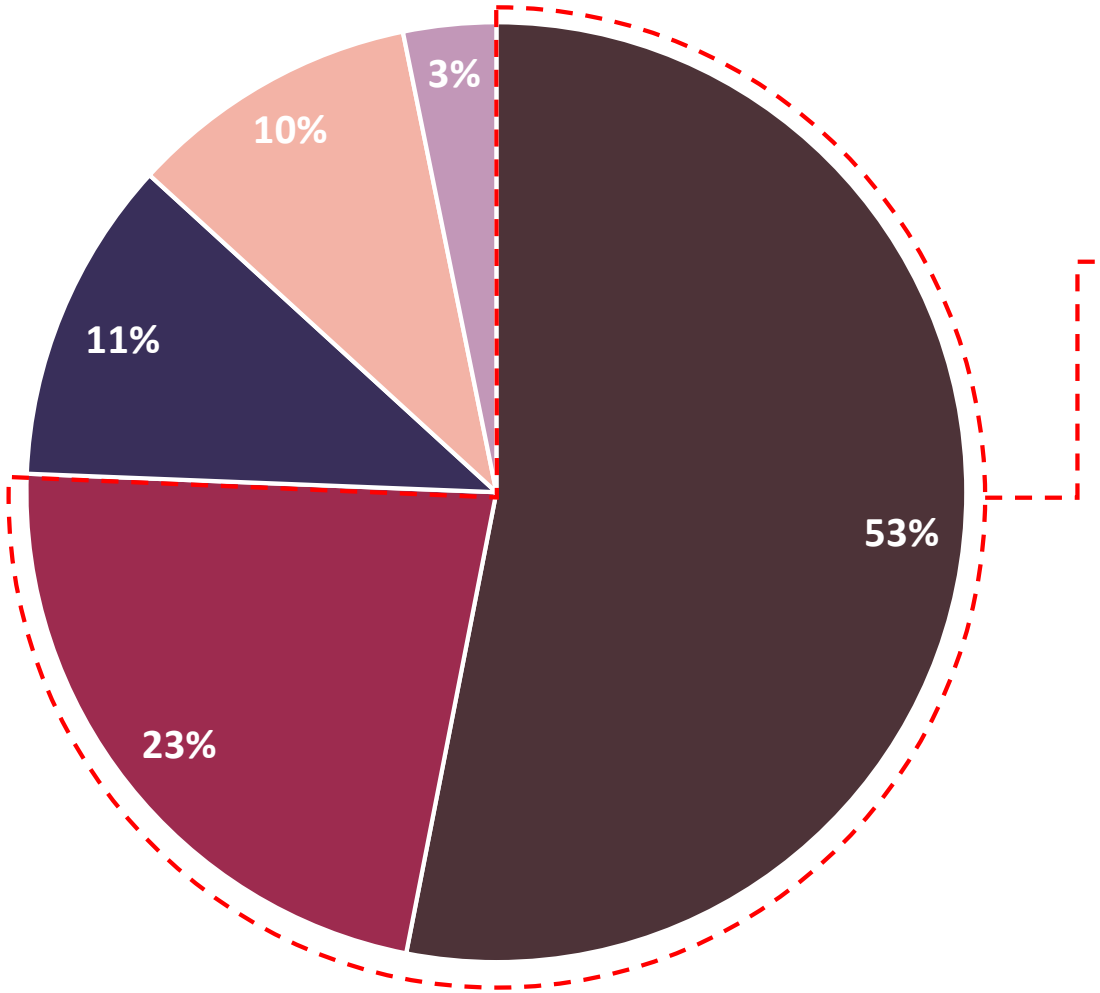
8º Events

9º LinkedIn Ads

Others

Commercial

Principal Sales Channel (How the Company achieves the majority of its sales)



Sales through the company's own sales force and independent sales reps account for the majority of sales for **more than 75% of Solar Integrators**. Partnerships and e-commerce, despite being in the minority, still are the top sales channel for about 20% of participating sales companies.

1º Own Sales Force

2º Representatives

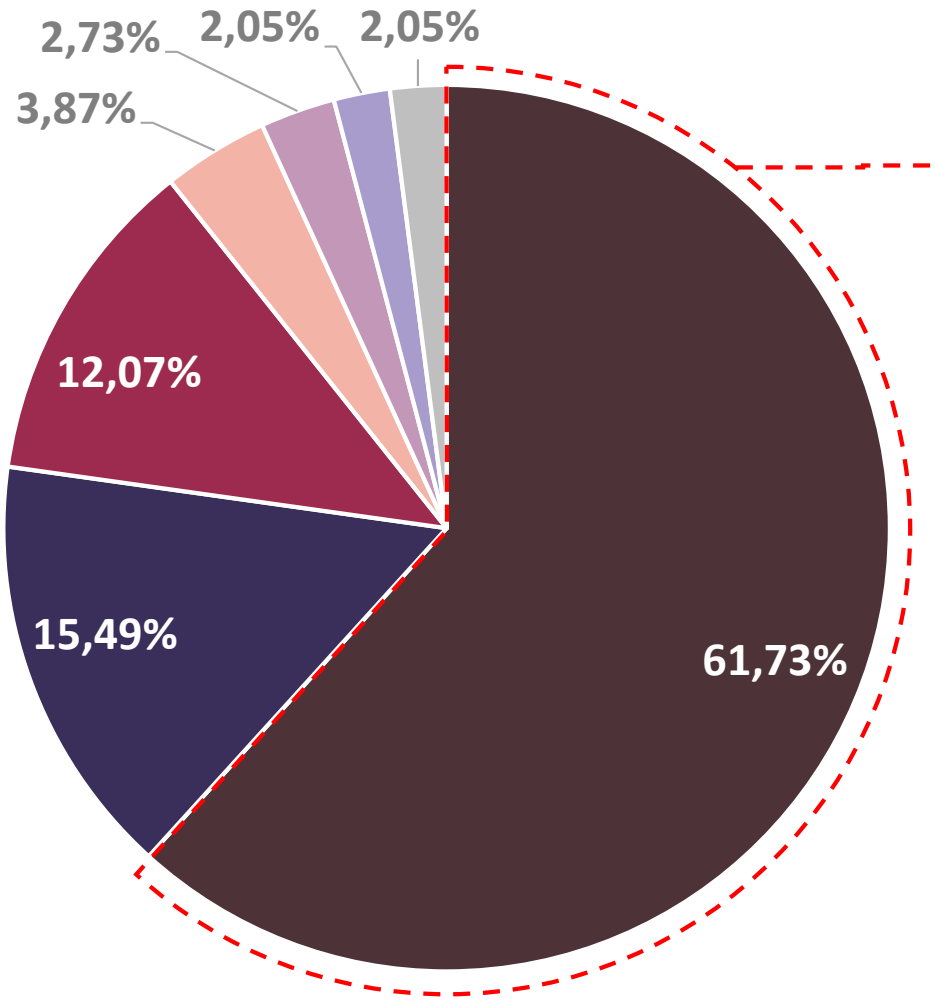
3º Partnerships

4º e-Commerce

Others

Commercial

Biggest difficulty encountered during sales process

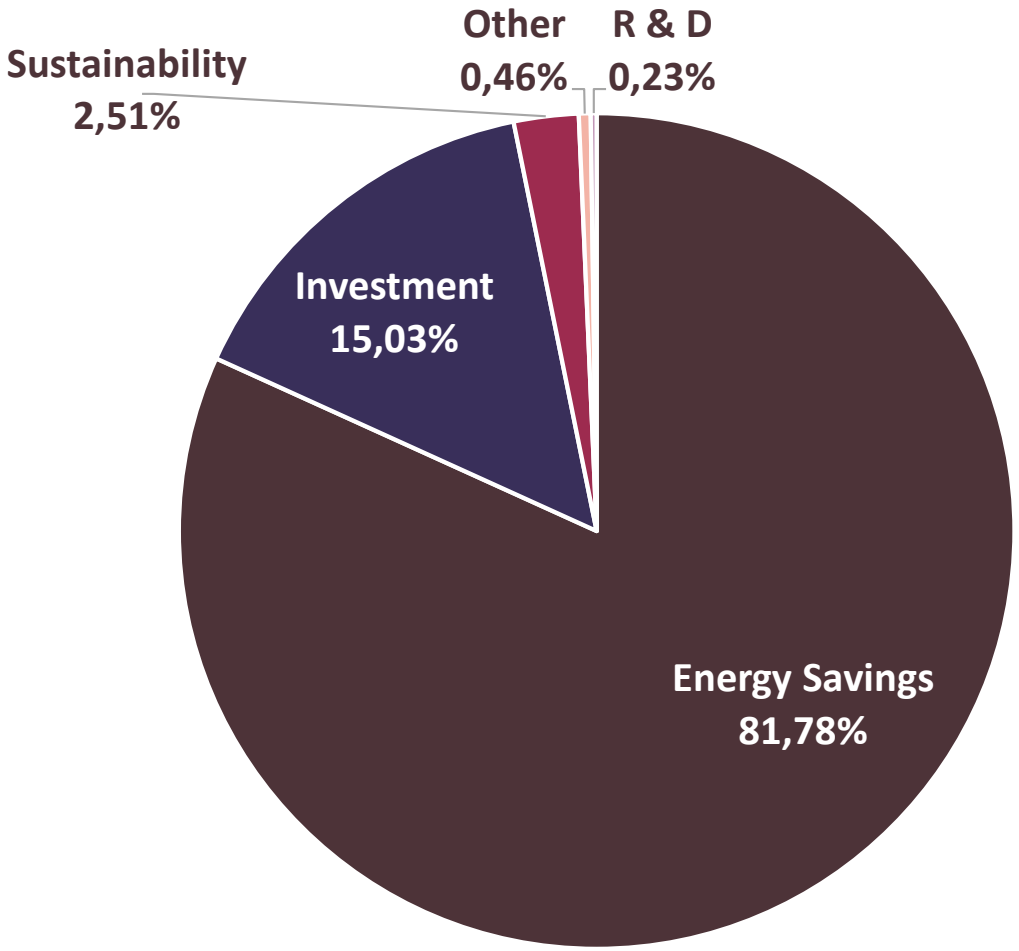


From the responses it is clear that the sales forces of many companies are still encountering many “immature” clients who are not ready to make a decision on solar. This demonstrates that a large proportion of integrators don’t have access to or make use of the most appropriate sales channels.

- Customers think solutions are very expensive
- "Just Curious"
- High Level of Competition
- Few Interested Customers
- Few Proposals Requested
- Difficulty to determine potential client profile
- None

Commercial

Principal motive for clients switching to solar



1º Energy Savings

2º Investment

3º Sustainability

4º Marketing

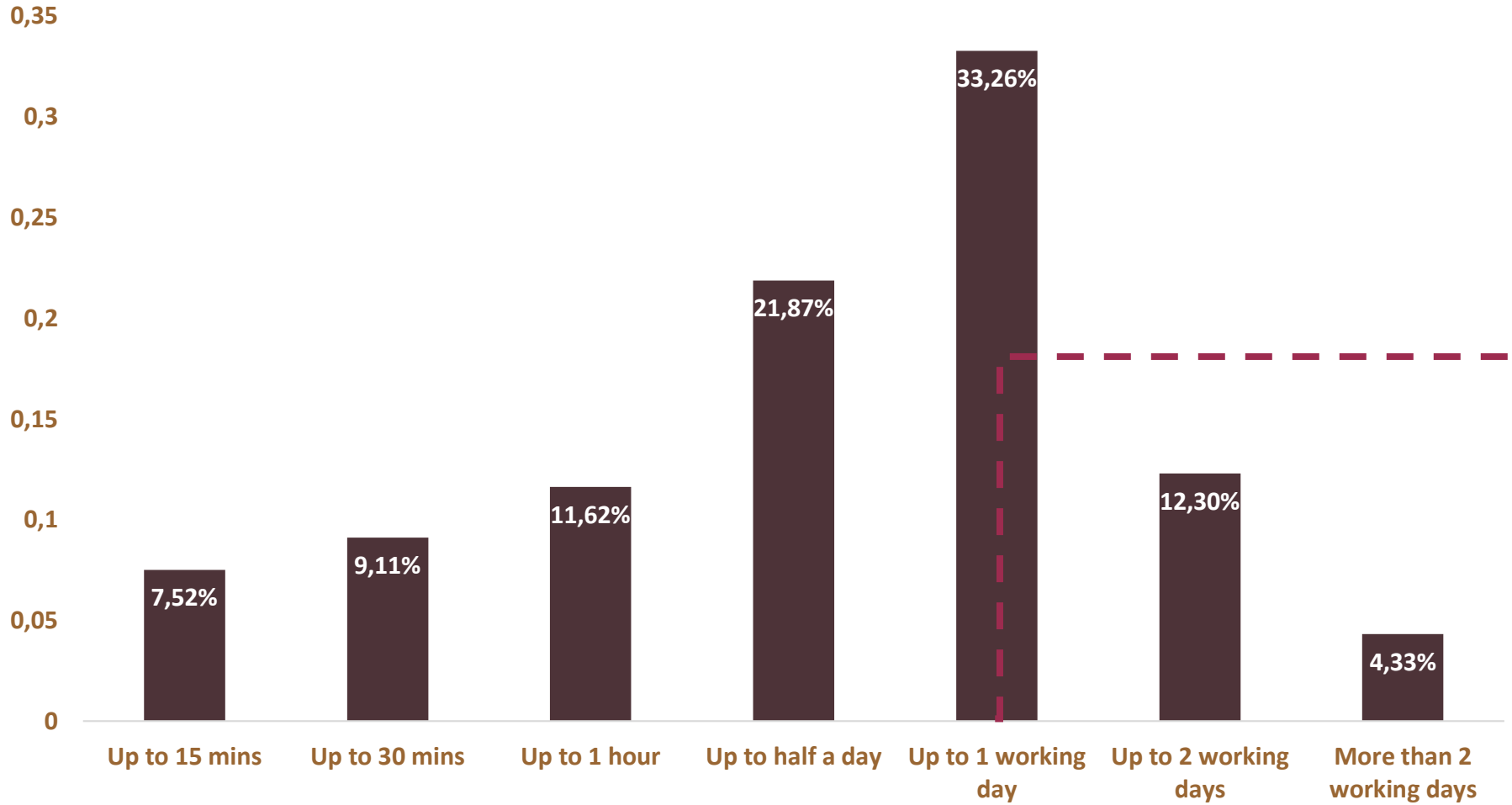
5º Status

6º Others

Commercial

Average Time to Return a Commercial First Contact

(Only contact, doesn't consider the preparation of a commercial proposal)



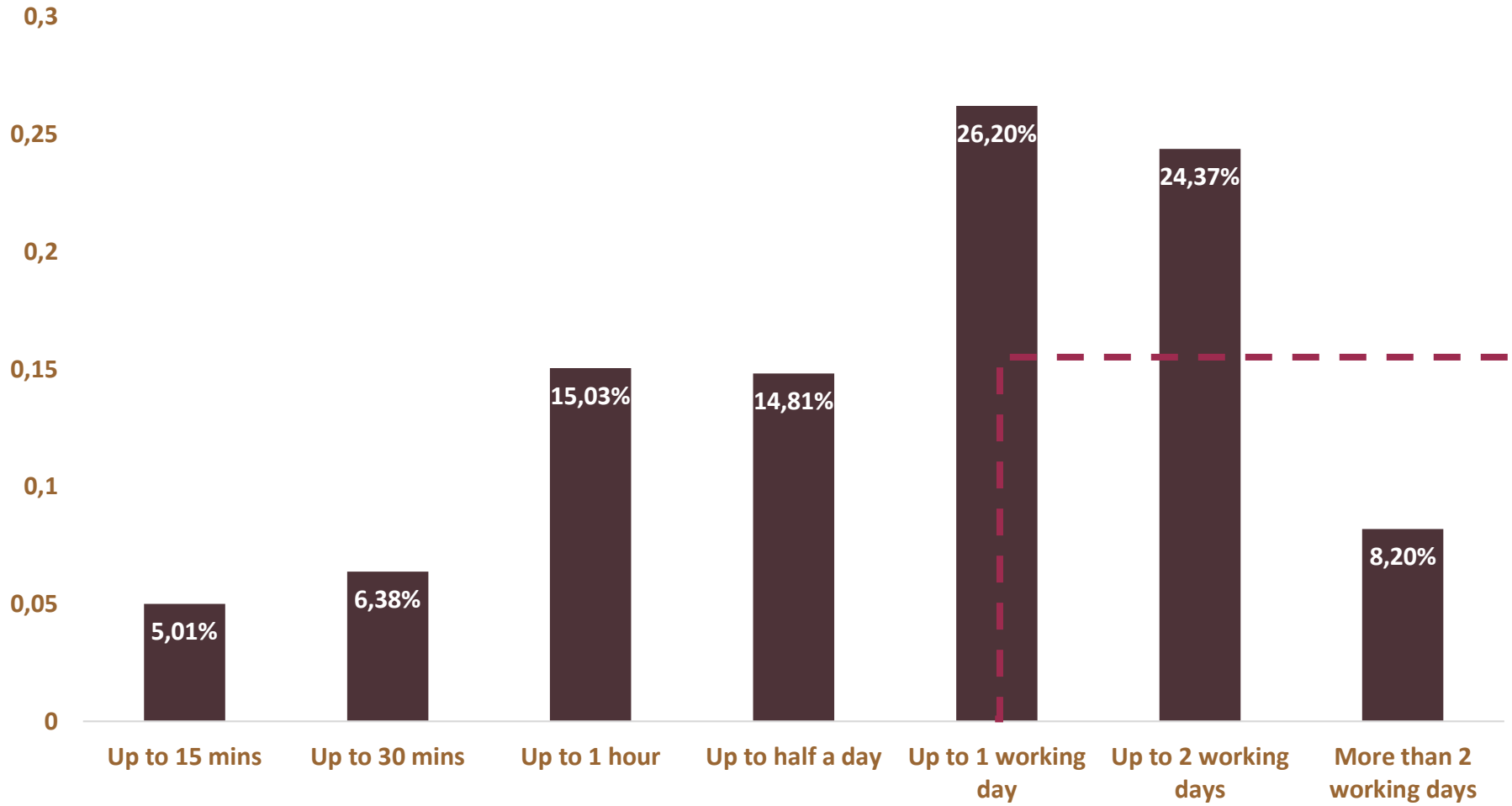
Average Time

5:11 hours

Average Time Dec/2017
6:08 hours

Commercial

Average Time to prepare and send a Commercial Proposal



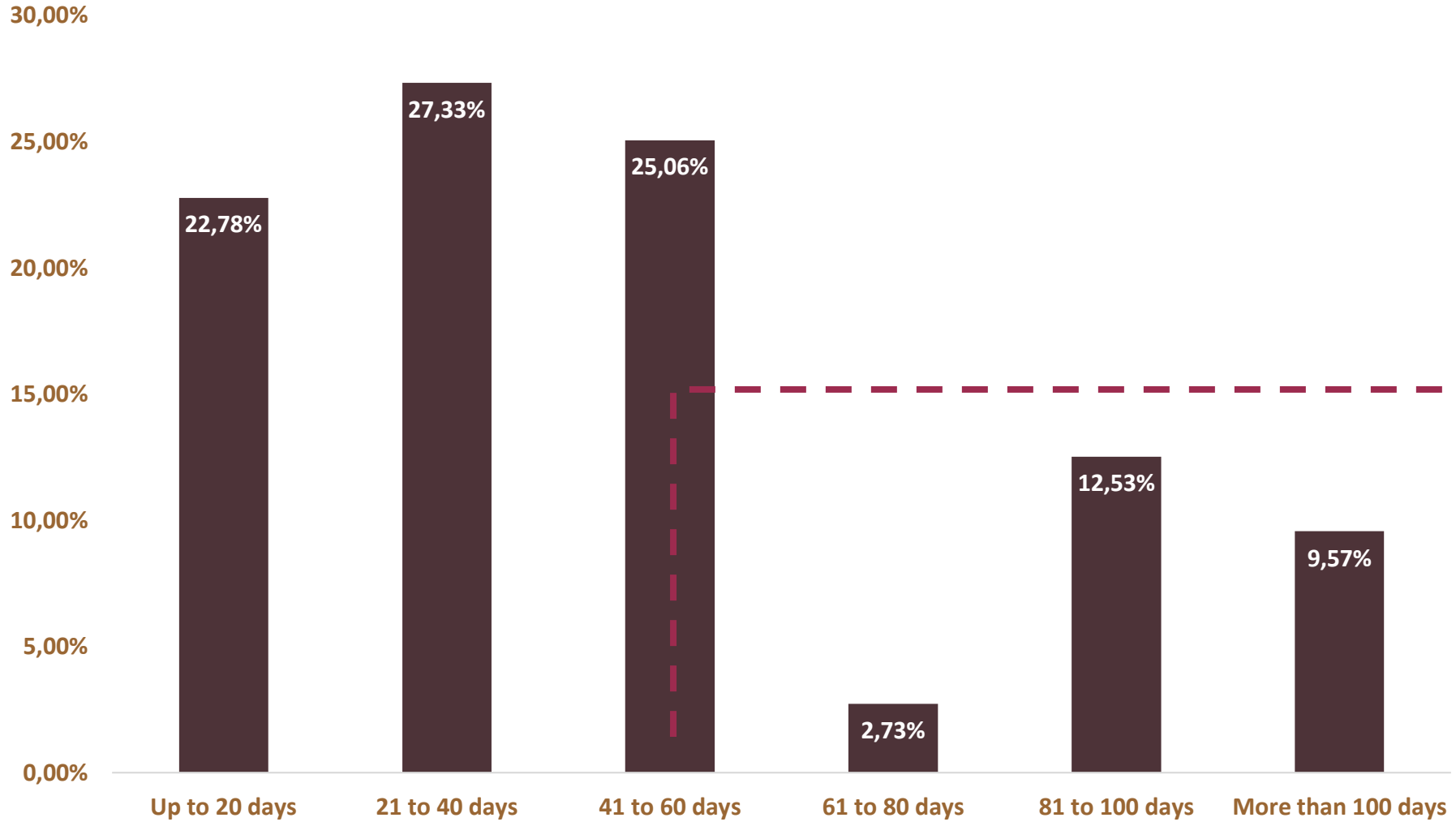
Average Time

6:58 hours

Average Time DeC/2017
8:11 hours

Commercial

Average Time to complete a sale after initial contact (Average Commercial Cycle)



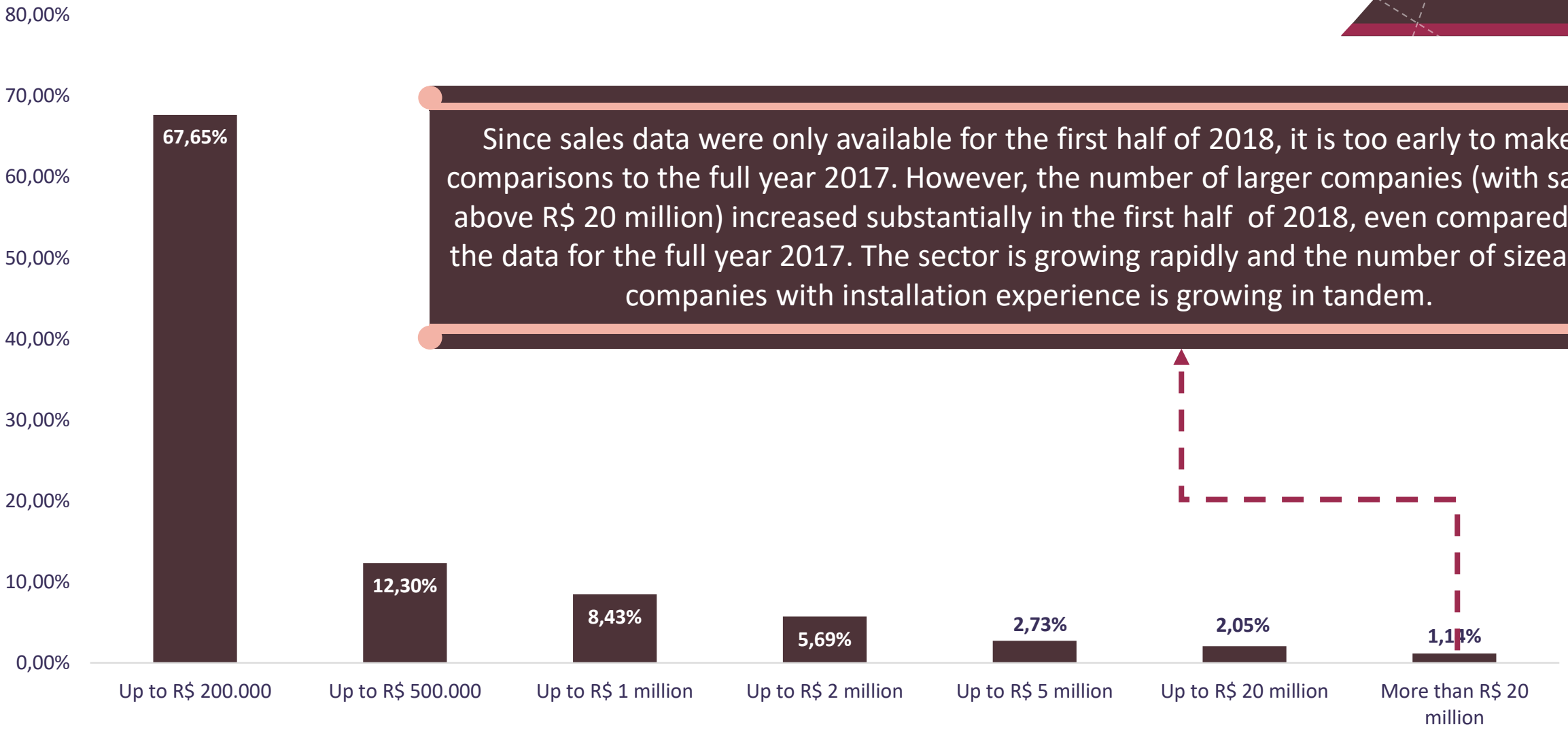
Average Time

55 days

Average Time Dec/2017
50 days

Sales

Gross Sales of each Company in 2018*

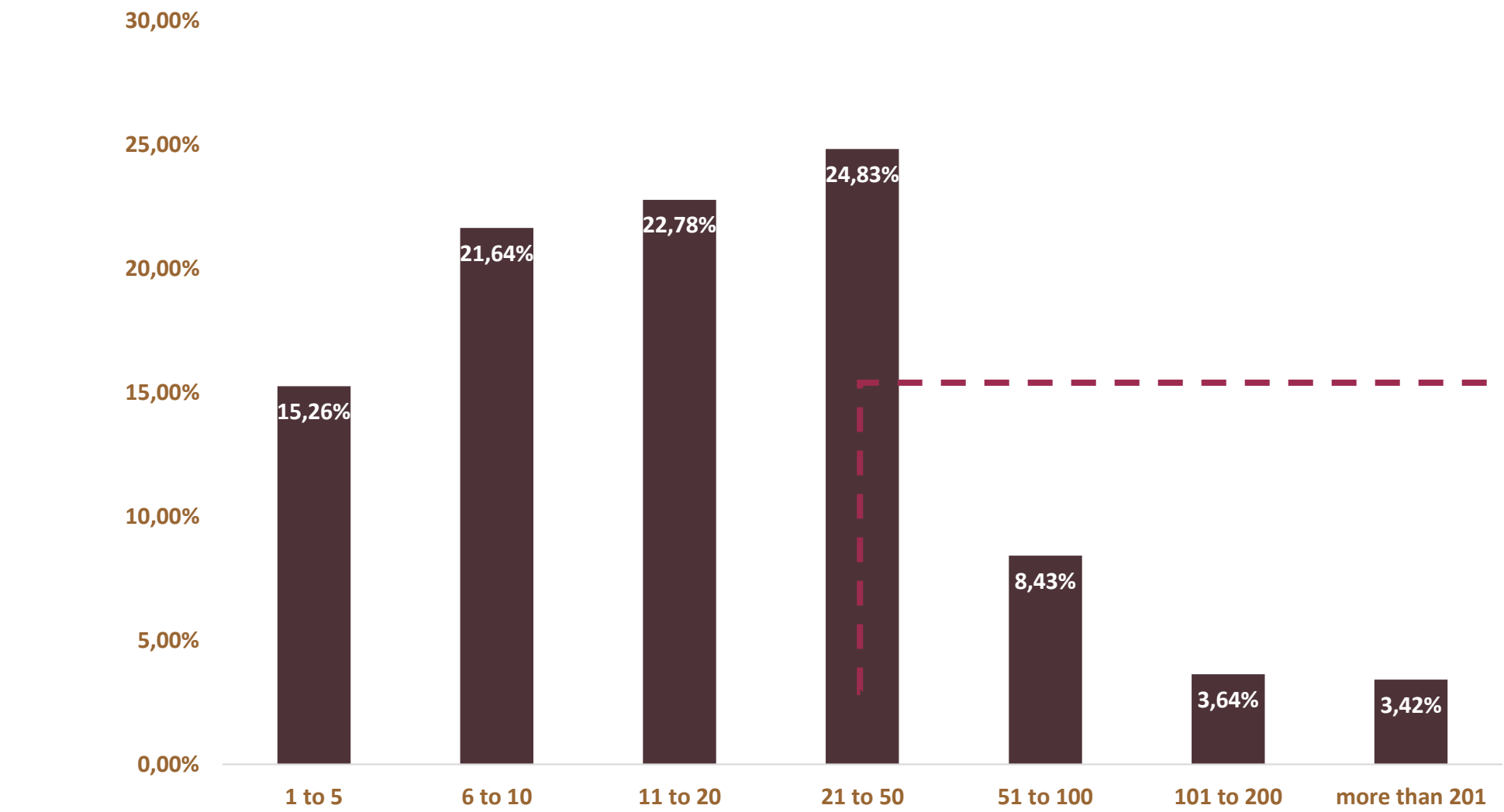


Since sales data were only available for the first half of 2018, it is too early to make comparisons to the full year 2017. However, the number of larger companies (with sales above R$ 20 million) increased substantially in the first half of 2018, even compared to the data for the full year 2017. The sector is growing rapidly and the number of sizeable companies with installation experience is growing in tandem.

*Data referring to period until end of June 2018.

Sales

Average number of commercial proposals prepared per month



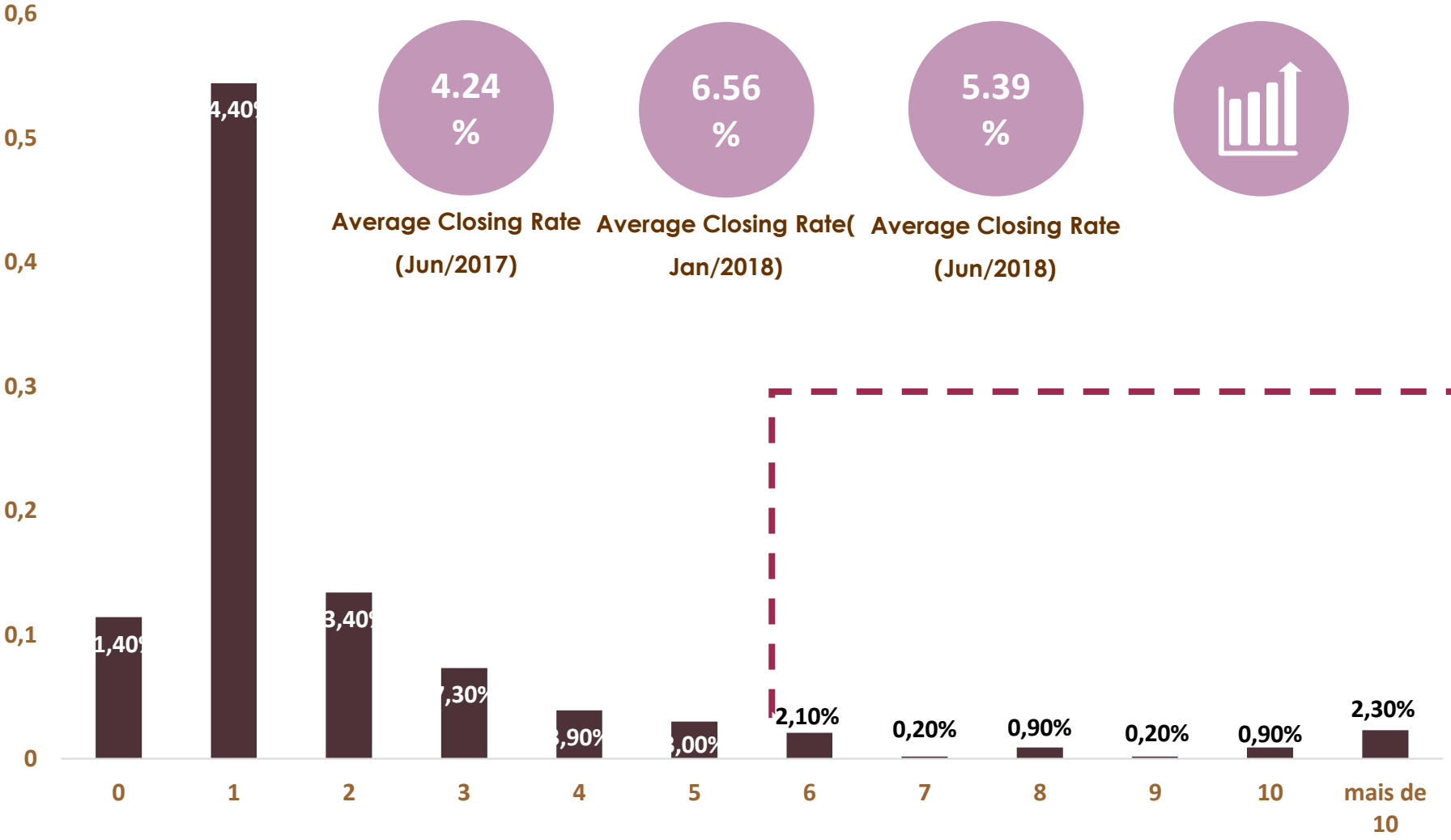
Average Number of Proposals

41.3 proposals

Average Number Dec/2017
36 proposals

Sales

Average number of commercial contracts closed per month



4.24 %

Average Closing Rate (Jun/2017)

6.56 %

Average Closing Rate(Jan/2018)

5.39 %

Average Closing Rate (Jun/2018)

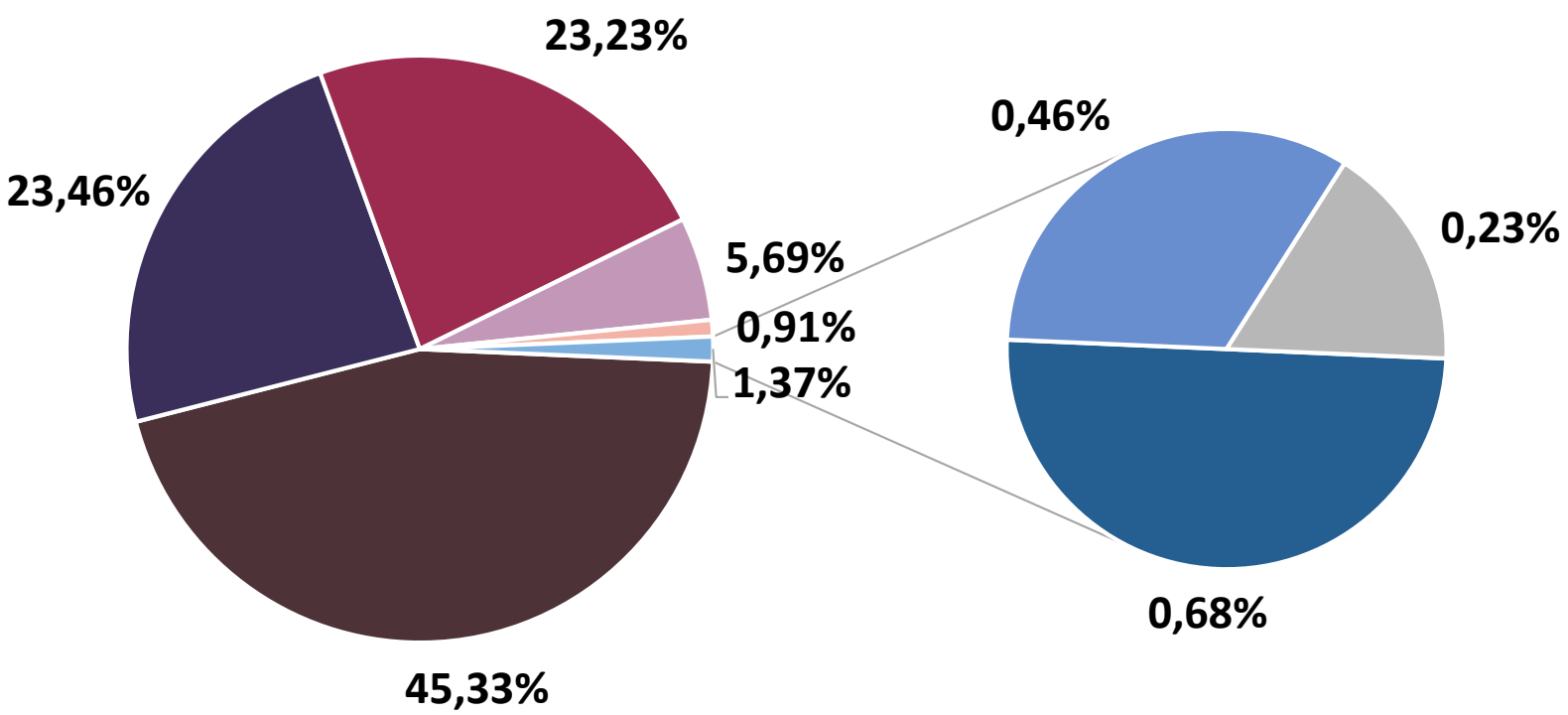
Average Number of Contracts

2.23 contracts

Average Number Dec/2017
2.36 contracts

Sales

Principal form of payment



1º Cash / No installments

2º Installments (via Integrator)

3º Bank Financing

4º Installments (via Distributor)

Other

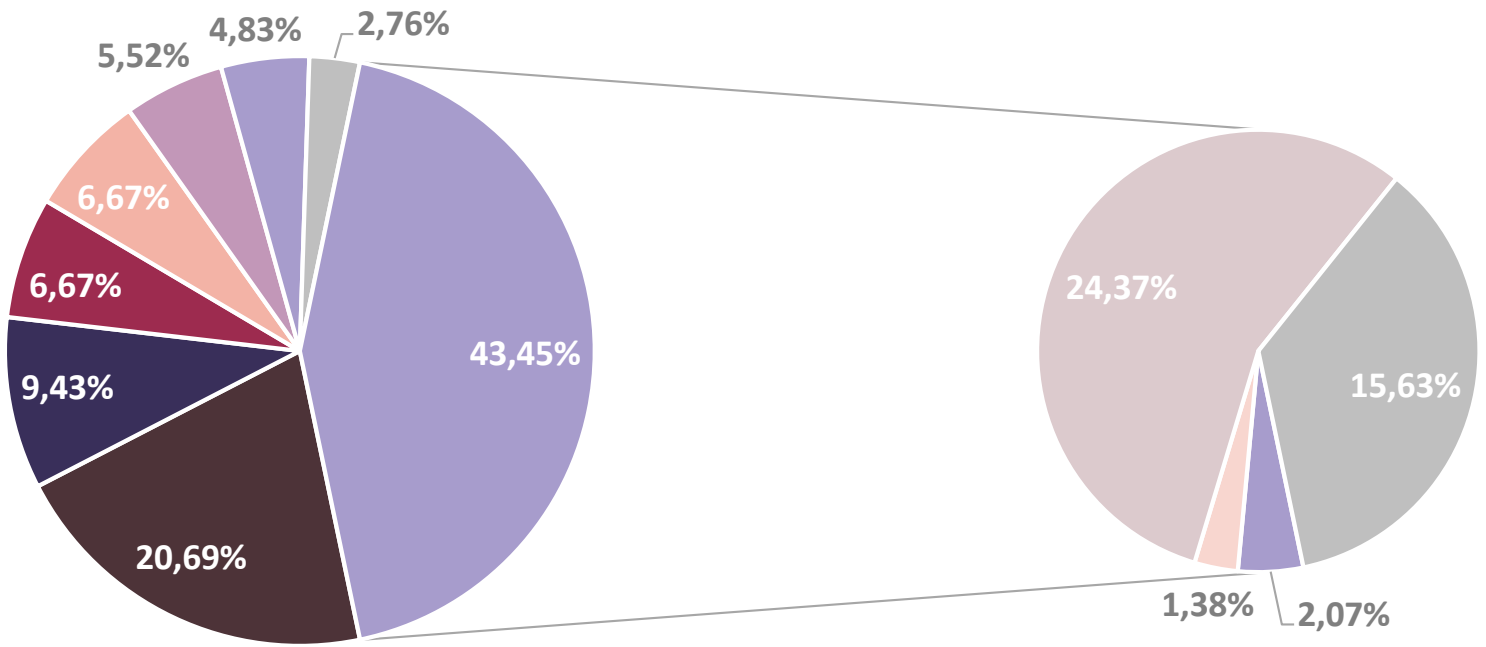
5º PV Consortium (via Distributor)

6º Monthly Rental

7º PV Consortium (via Integrator)

Sales

Banks/Credit Lines used most frequently to finance projects

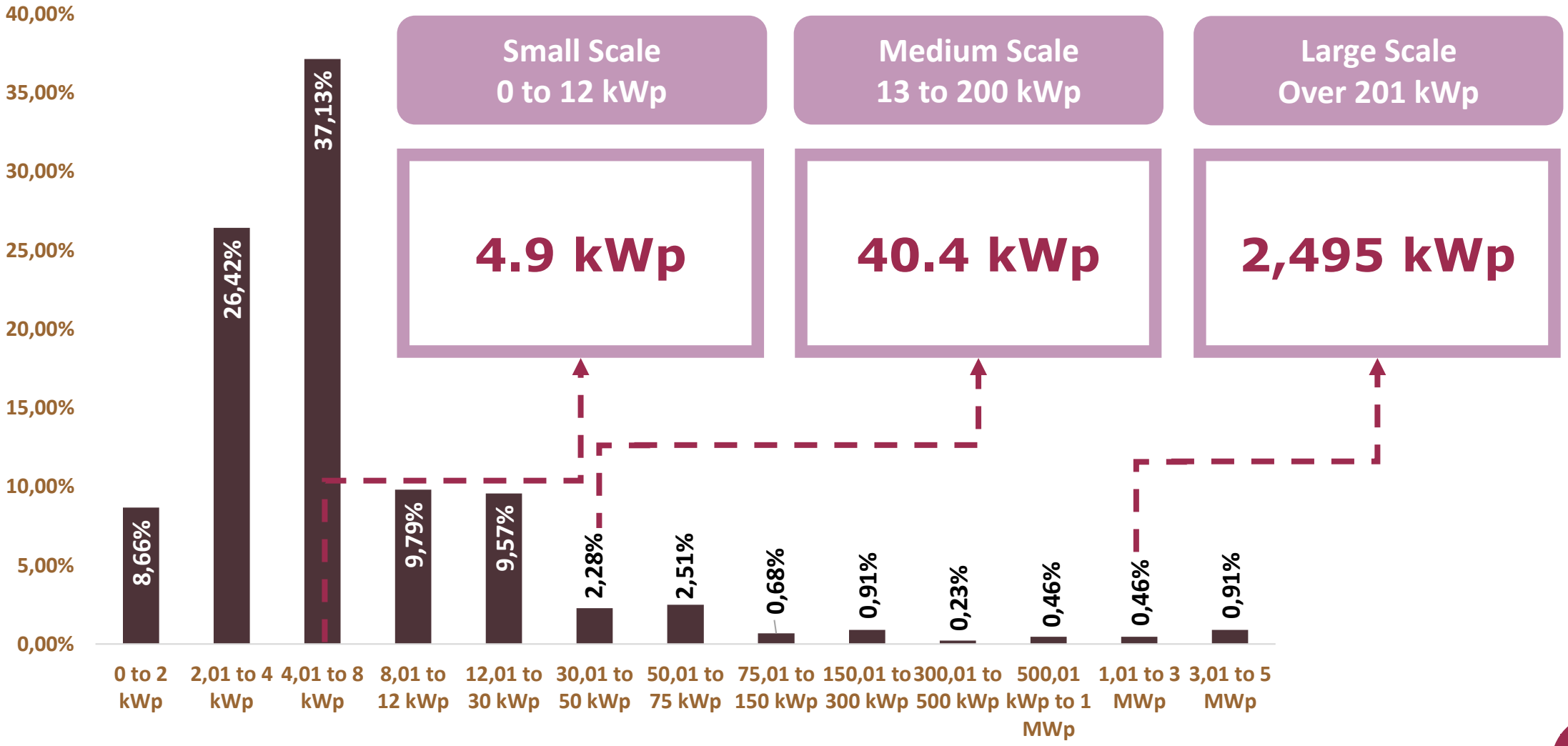


	None
1º	Santander
2º	BNB
3º	Banco do Brasil
4º	Sicredi
5º	FCO
6º	PROGER
7º	BNDES
8º	PRONAF
9º	Caixa Econômica
	Others*

*Though being unrelated to the survey and not explicitly mentioned, Banco Votorantim is an important source of solar project financing, and here it is included in the ‘Others’ category.

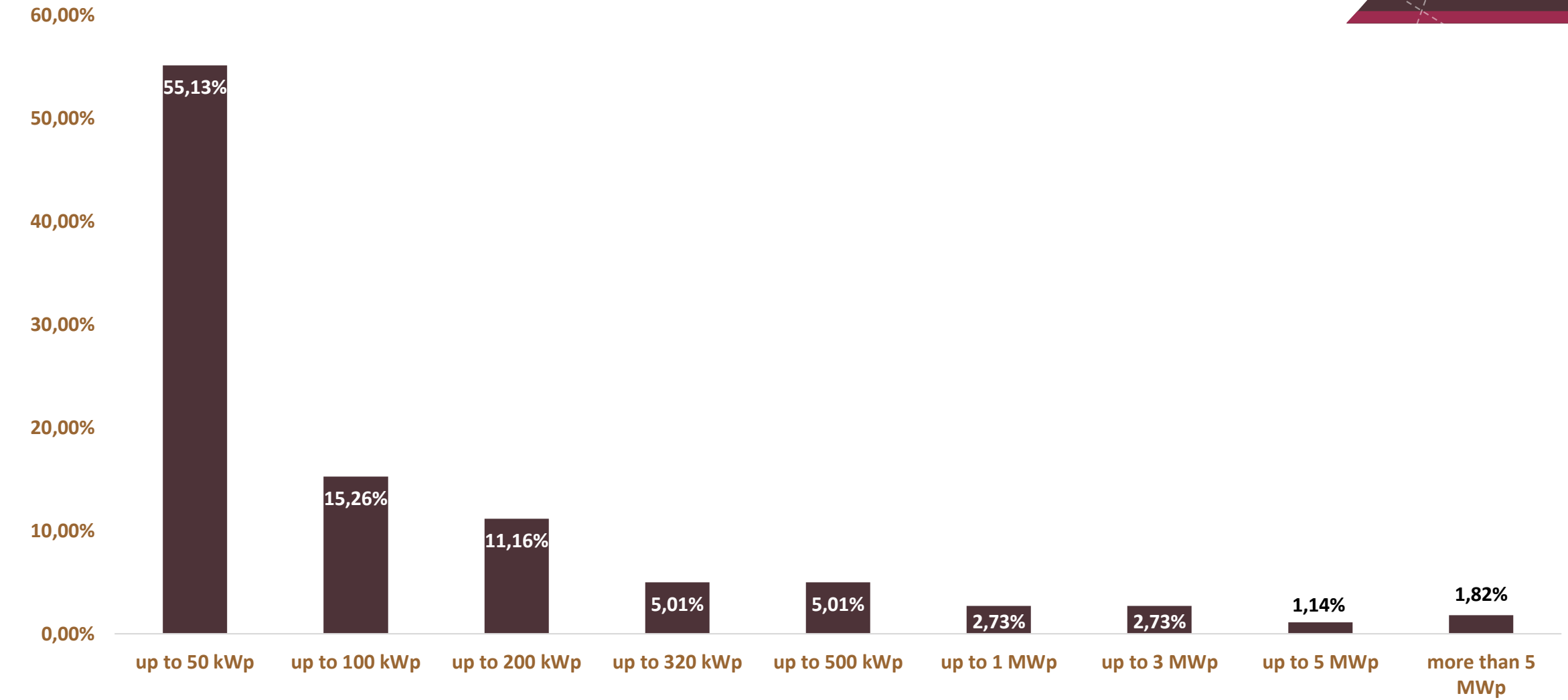
Sales

Typical project size sold by each company



Sales

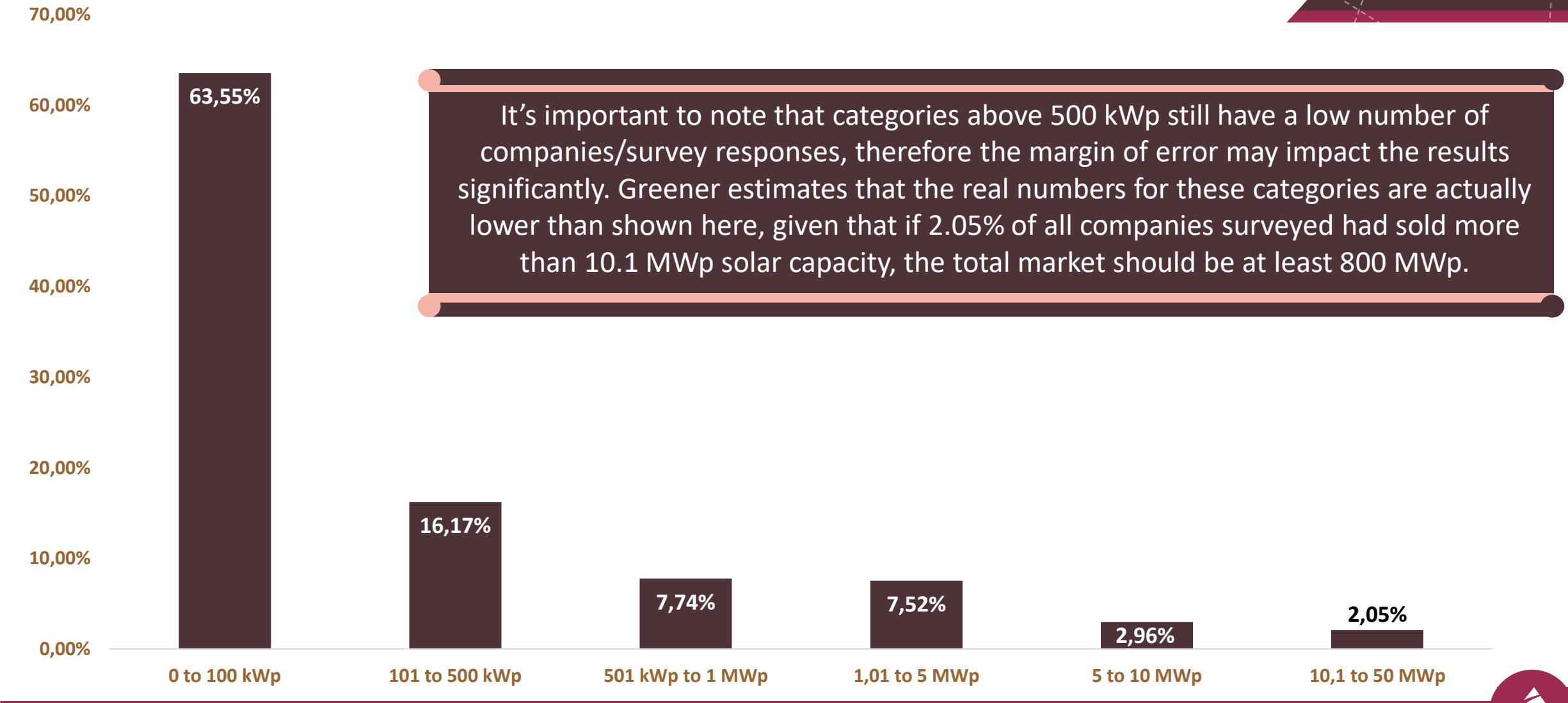
Total solar capacity sold by each company in 2018*



*Data refer to period up to June 2018.

Sales

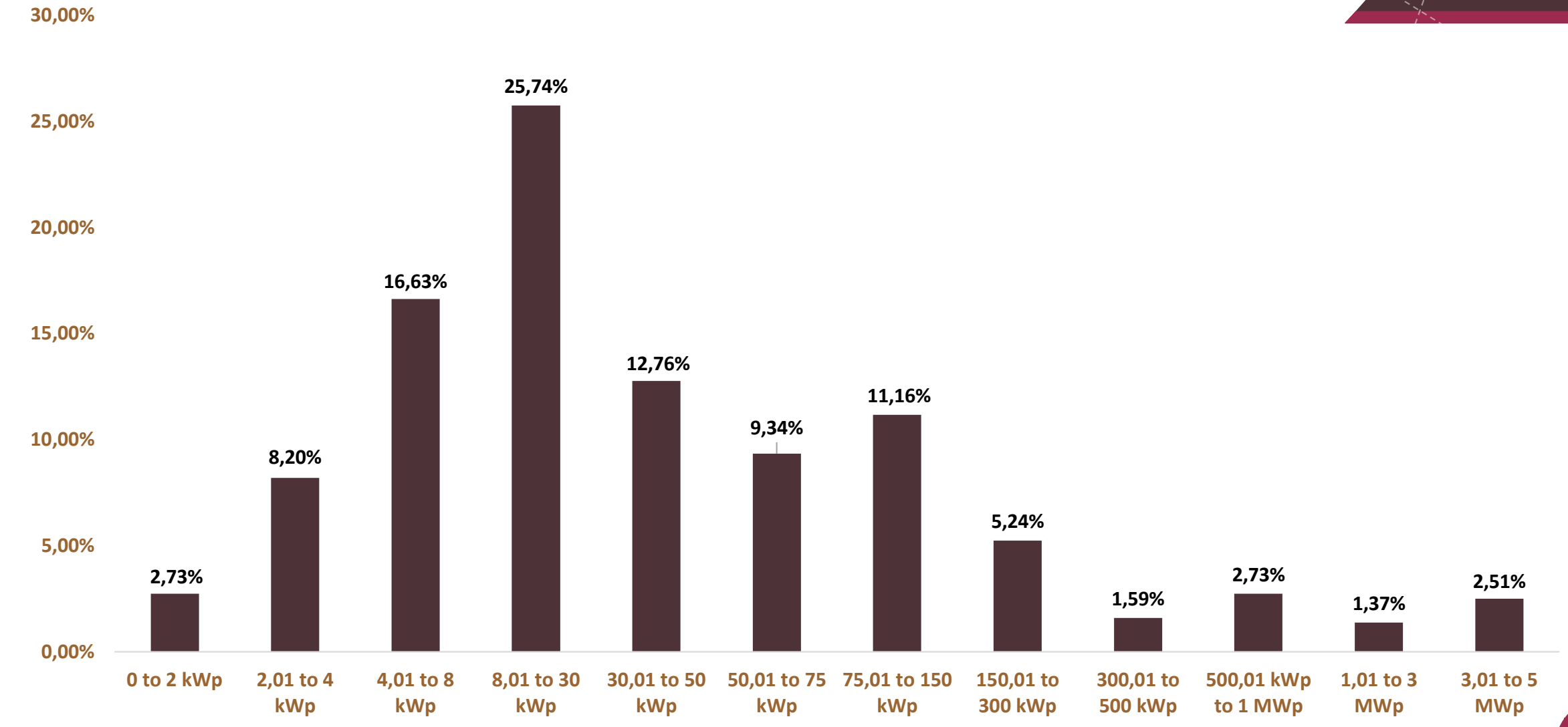
Total solar capacity sold since company started commercial activities



It's important to note that categories above 500 kWp still have a low number of companies/survey responses, therefore the margin of error may impact the results significantly. Greener estimates that the real numbers for these categories are actually lower than shown here, given that if 2.05% of all companies surveyed had sold more than 10.1 MWp solar capacity, the total market should be at least 800 MWp.

Sales

Largest solar project sold by each company




Pricing
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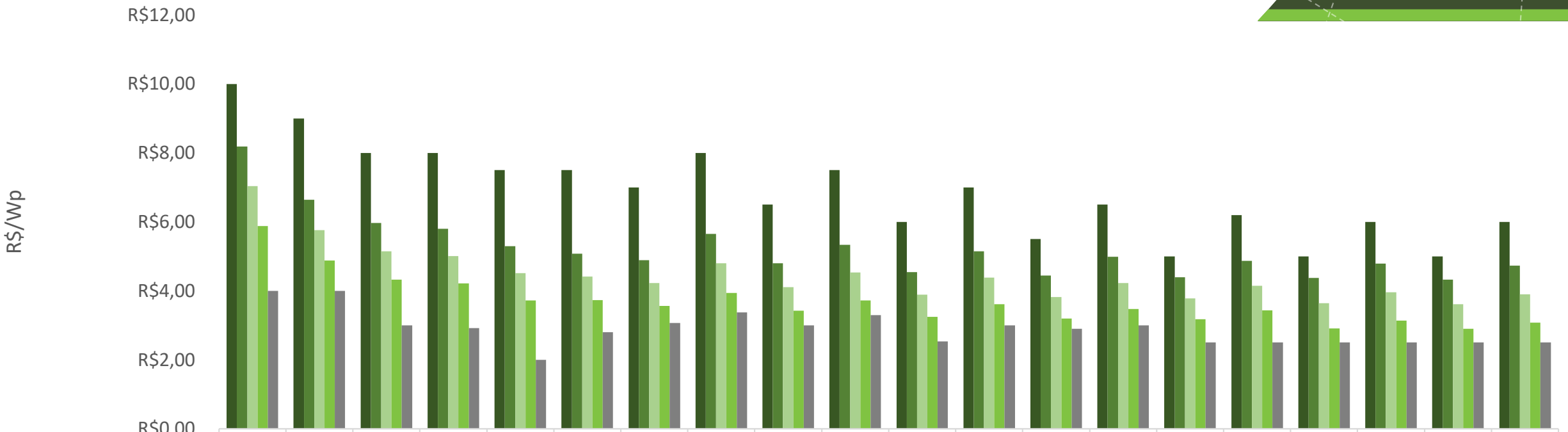
Prices for the final customer

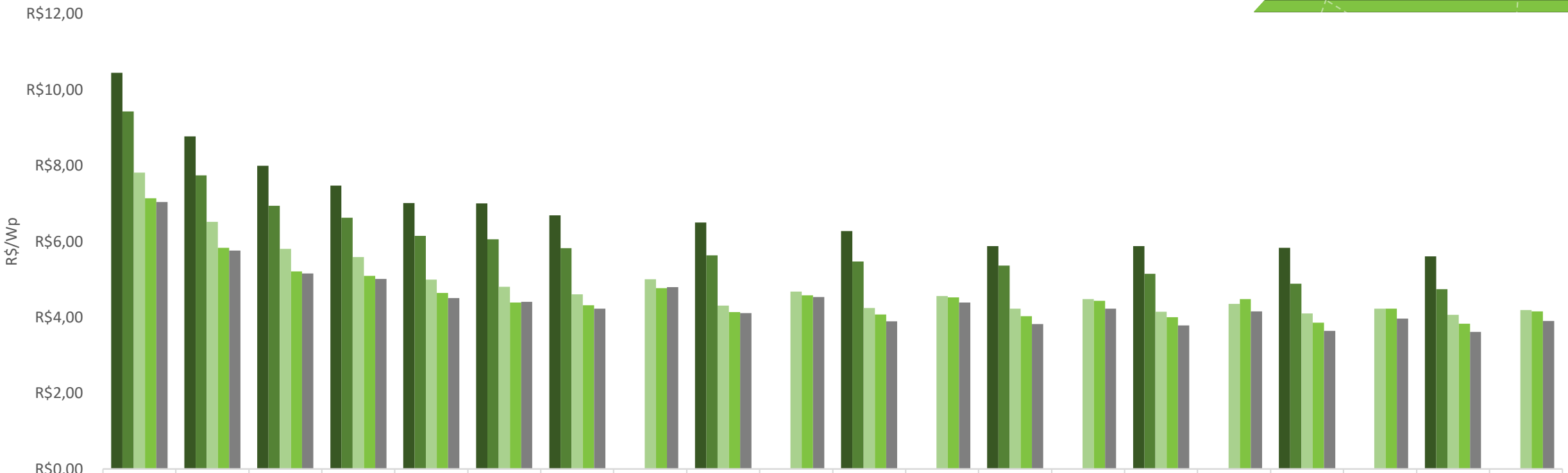
June 2018



	2 kWp	4 kWp	8 kWp	12 kWp	30 kWp	50 kWp	75 kWp	75 kWp ground	150 kWp	150 kWp ground	300 kWp	300 kWp ground	500 kWp	500 kWp ground	1.000 kWp	1.000 kWp ground	3.000 kWp	3.000 kWp ground	5.000 kWp	5.000 kWp ground
Maximum Price	R$10,00	R$9,00	R$8,00	R$8,00	R$7,50	R$7,50	R$7,00	R$8,00	R$6,50	R$7,50	R$6,00	R$7,00	R$5,50	R$6,50	R$5,00	R$6,20	R$5,00	R$6,00	R$5,00	R$6,00
Maximum Average Price	R$8,19	R$6,64	R$5,97	R$5,80	R$5,30	R$5,08	R$4,89	R$5,65	R$4,80	R$5,33	R$4,54	R$5,15	R$4,44	R$4,99	R$4,39	R$4,87	R$4,37	R$4,79	R$4,33	R$4,73
Average Price	R$7,04	R$5,76	R$5,15	R$5,01	R$4,51	R$4,41	R$4,23	R$4,80	R$4,11	R$4,53	R$3,89	R$4,38	R$3,82	R$4,23	R$3,78	R$4,15	R$3,64	R$3,96	R$3,61	R$3,90
Average Minimum Price	R$5,88	R$4,88	R$4,33	R$4,22	R$3,72	R$3,73	R$3,56	R$3,94	R$3,42	R$3,72	R$3,25	R$3,61	R$3,20	R$3,47	R$3,18	R$3,43	R$2,91	R$3,14	R$2,90	R$3,08
Minimum Price	R$4,00	R$4,00	R$3,00	R$2,92	R$2,00	R$2,80	R$3,07	R$3,37	R$3,00	R$3,30	R$2,53	R$3,00	R$2,90	R$3,00	R$2,50	R$2,50	R$2,50	R$2,50	R$2,50	R$2,50

Prices for the final customer

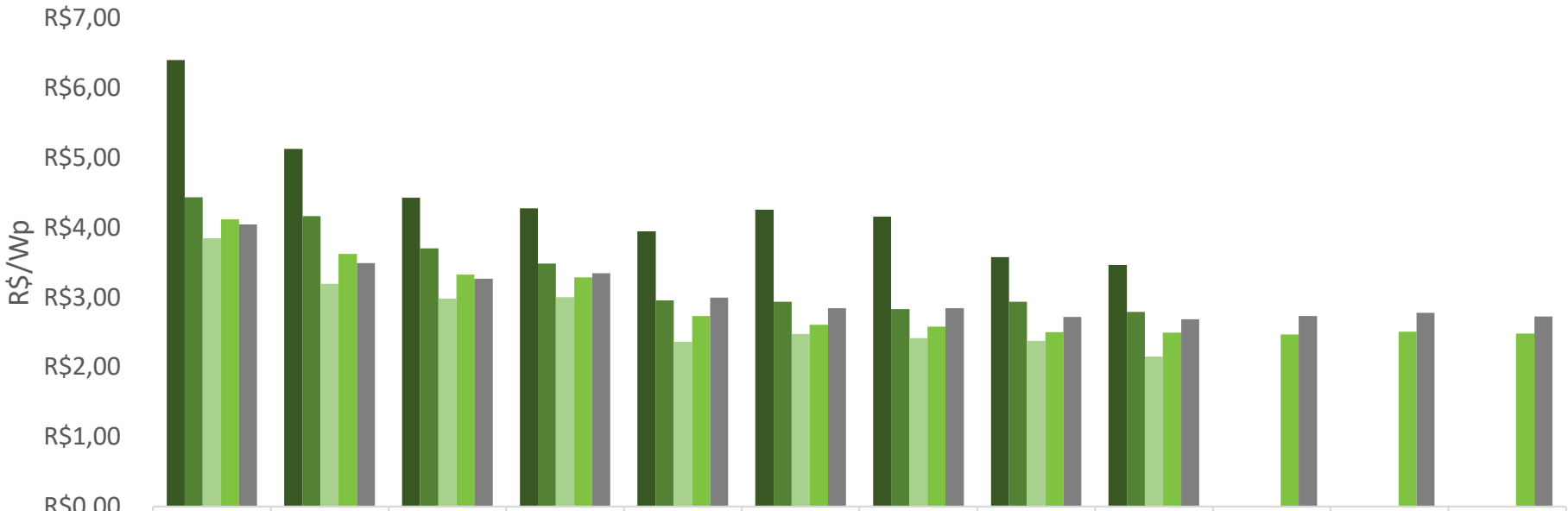
From June 2016 to June 2018



	2kWp	4kWp	8kWp	12kWp	30kWp	50kWp	75kWp	75kWp ground	150kWp	150kWp ground	300kWp	300kWp ground	500kWp	500kWp ground	1MWp	1MWp ground	3MWp	3MWp ground	5MWp	5MWp ground
jun/16	R$10,45	R$8,77	R$7,99	R$7,47	R$7,01	R$7,00	R$6,69		R$6,49		R$6,28		R$5,88		R$5,88		R$5,83		R$5,60	
jan/17	R$9,43	R$7,74	R$6,94	R$6,63	R$6,14	R$6,06	R$5,82		R$5,63		R$5,47		R$5,36		R$5,15		R$4,88		R$4,74	
jun/17	R$7,81	R$6,52	R$5,80	R$5,59	R$4,99	R$4,80	R$4,60	R$5,00	R$4,31	R$4,67	R$4,24	R$4,55	R$4,22	R$4,47	R$4,14	R$4,35	R$4,10	R$4,23	R$4,06	R$4,19
jan/18	R$7,13	R$5,83	R$5,21	R$5,09	R$4,64	R$4,39	R$4,31	R$4,77	R$4,13	R$4,57	R$4,08	R$4,52	R$4,02	R$4,43	R$4,00	R$4,48	R$3,85	R$4,22	R$3,83	R$4,15
jun/18	R$7,04	R$5,76	R$5,15	R$5,01	R$4,51	R$4,41	R$4,23	R$4,80	R$4,11	R$4,53	R$3,89	R$4,38	R$3,82	R$4,23	R$3,78	R$4,15	R$3,64	R$3,97	R$3,61	R$3,90

Prices of Photovoltaic kits

From June 2016 to June 2018

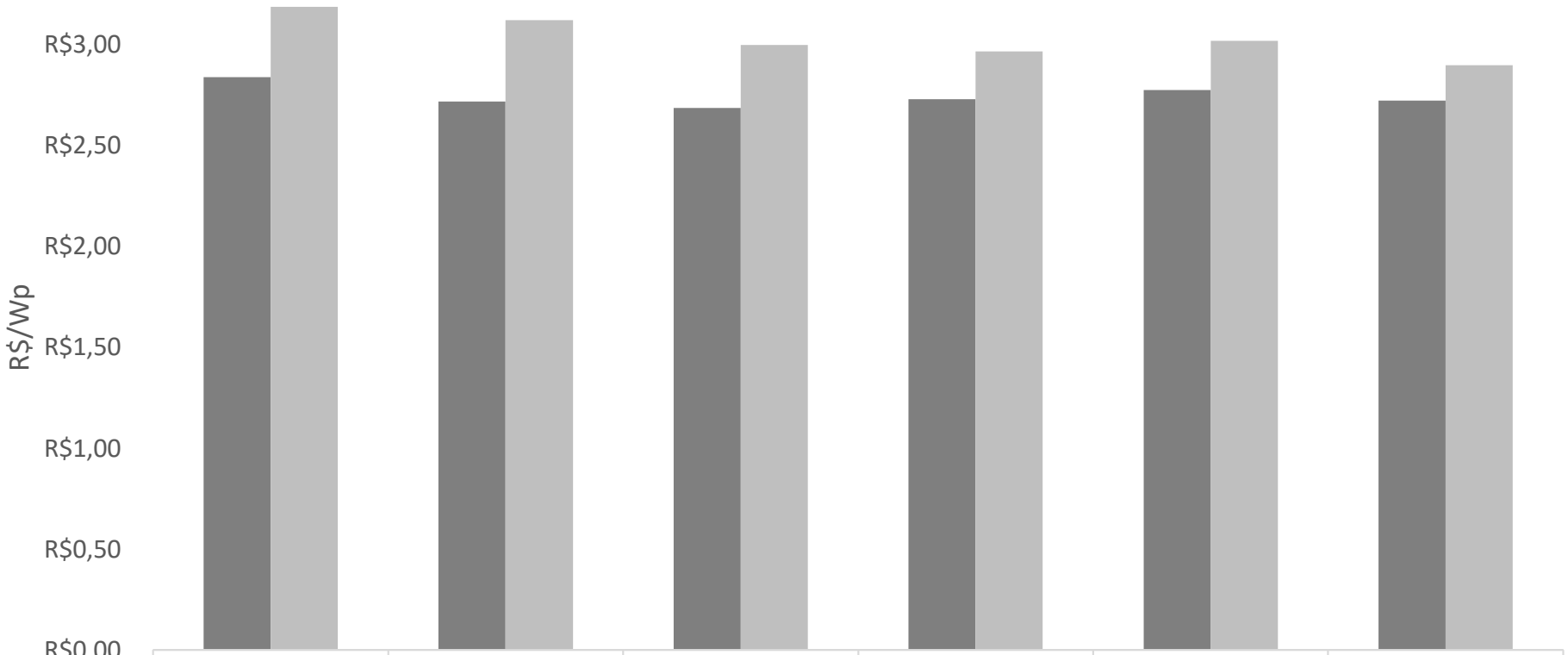


	2 kWp	4 kWp	8 kWp	12 kWp	30 kWp	50 kWp	75 kWp	150 kWp	300 kWp	500 kWp	1000 kWp	5000 kWp
jun/16	R$6,39	R$5,12	R$4,42	R$4,27	R$3,94	R$4,25	R$4,15	R$3,57	R$3,46			
jan/17	R$4,43	R$4,16	R$3,70	R$3,48	R$2,95	R$2,93	R$2,83	R$2,93	R$2,79			
jun/17	R$3,84	R$3,19	R$2,98	R$3,00	R$2,36	R$2,47	R$2,41	R$2,37	R$2,15			
jan/18	R$4,11	R$3,62	R$3,32	R$3,28	R$2,73	R$2,60	R$2,58	R$2,50	R$2,49	R$2,46	R$2,50	R$2,48
jun/18	R$4,04	R$3,49	R$3,26	R$3,34	R$2,99	R$2,84	R$2,84	R$2,72	R$2,69	R$2,73	R$2,77	R$2,72

Due to the volatitile currency markets and sharp rise of the US Dollar, PV kits have been getting more expensive. Larget kits, which usually operate with lower stock levels and specialised equipment, usually imported, have shown sharper price rises.

Prices of PV Kits

Comparison between rooftop and ground-based systems

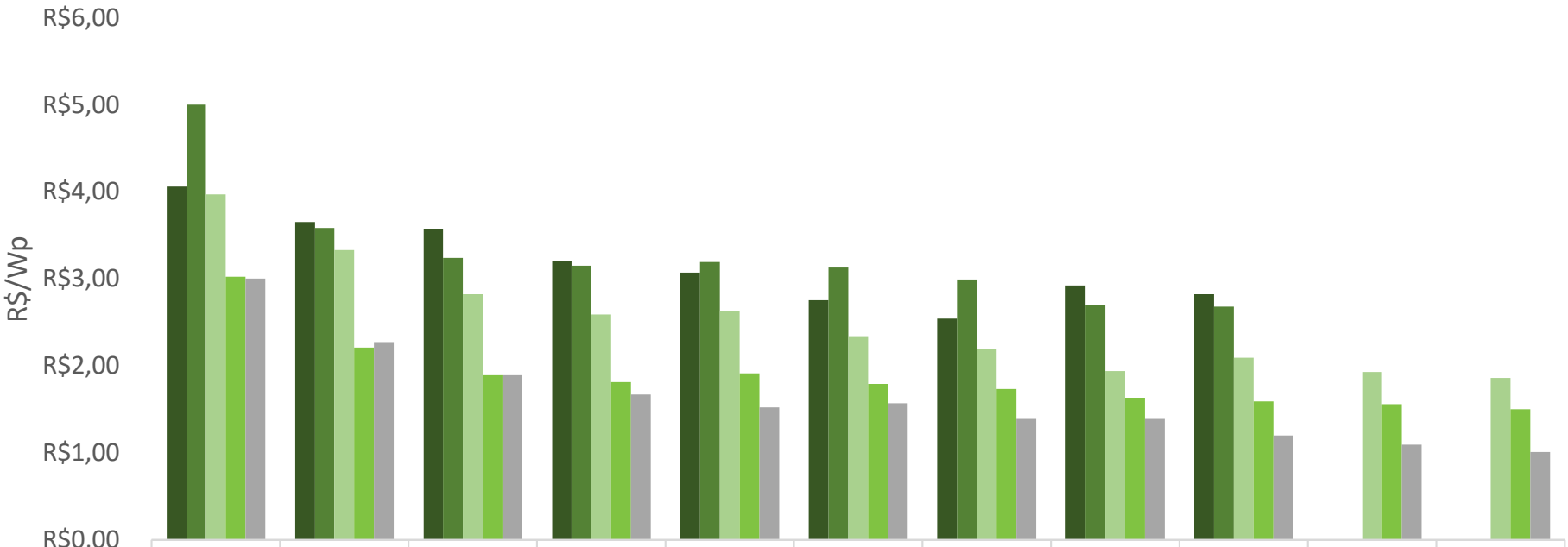


	75 kWp	150 kWp	300 kWp	500 kWp	1000 kWp	5000 kWp
Roof	R$2,84	R$2,72	R$2,69	R$2,73	R$2,77	R$2,72
Ground	R$3,19	R$3,12	R$3,00	R$2,97	R$3,02	R$2,90

Ground-based PV kits are on average 10.46% more expensive than PV systems intended for rooftop installation.

Prices for Integrator Services

From June 2016 to June 2018



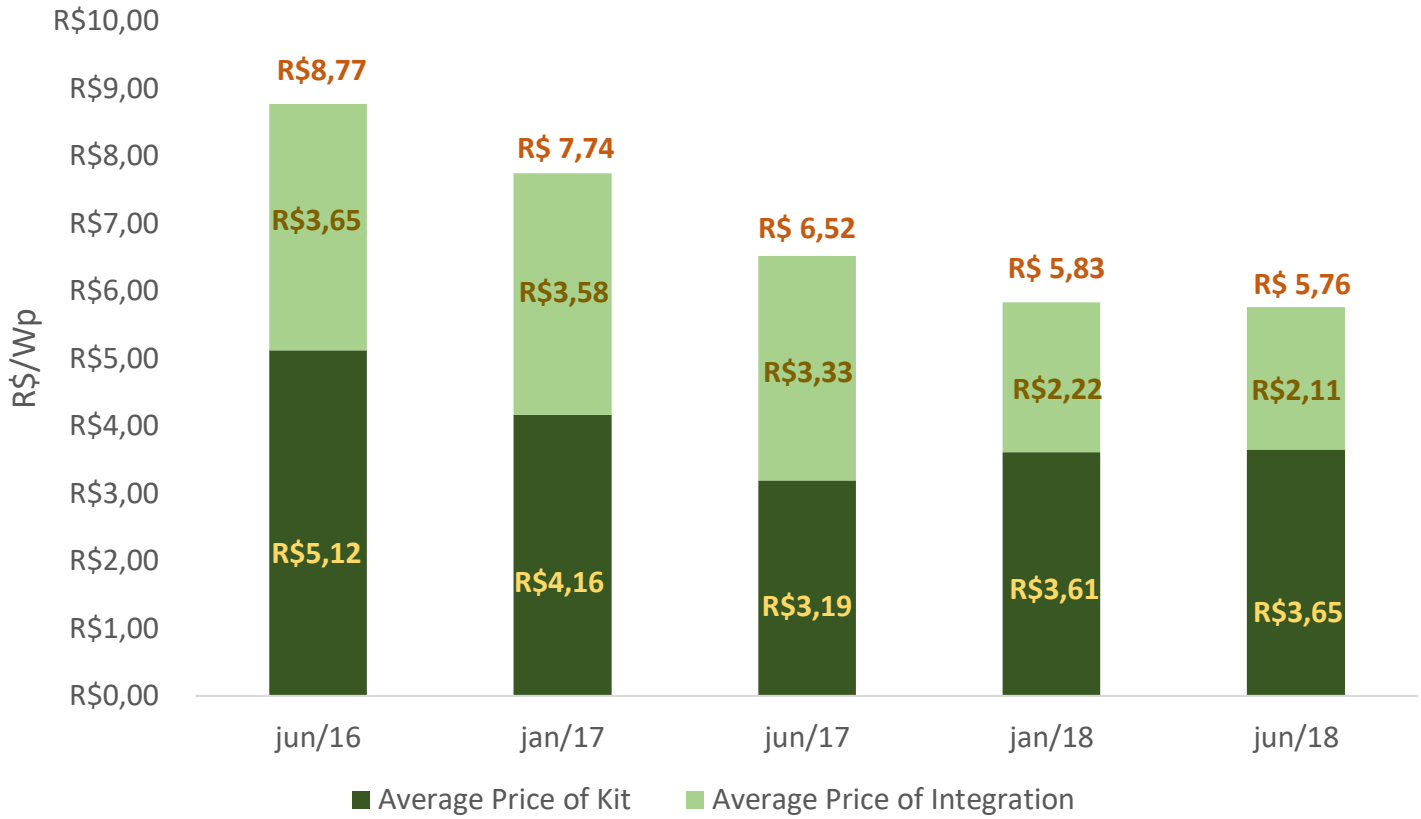
	2 kWp	4 kWp	8 kWp	12 kWp	30 kWp	50 kWp	75 kWp	150 kWp	300 kWp	500 kWp	1 MWp
jun/16	R$4,06	R$3,65	R$3,57	R$3,20	R$3,07	R$2,75	R$2,54	R$2,92	R$2,82		
jan/17	R$5,00	R$3,58	R$3,24	R$3,15	R$3,19	R$3,13	R$2,99	R$2,70	R$2,68		
jun/17	R$3,97	R$3,33	R$2,82	R$2,59	R$2,63	R$2,33	R$2,19	R$1,94	R$2,09	R$1,93	R$1,86
jan/18	R$3,02	R$2,21	R$1,89	R$1,81	R$1,91	R$1,79	R$1,73	R$1,63	R$1,59	R$1,56	R$1,50
jun/18	R$3,00	R$2,27	R$1,89	R$1,67	R$1,52	R$1,57	R$1,39	R$1,39	R$1,20	R$1,09	R$1,01

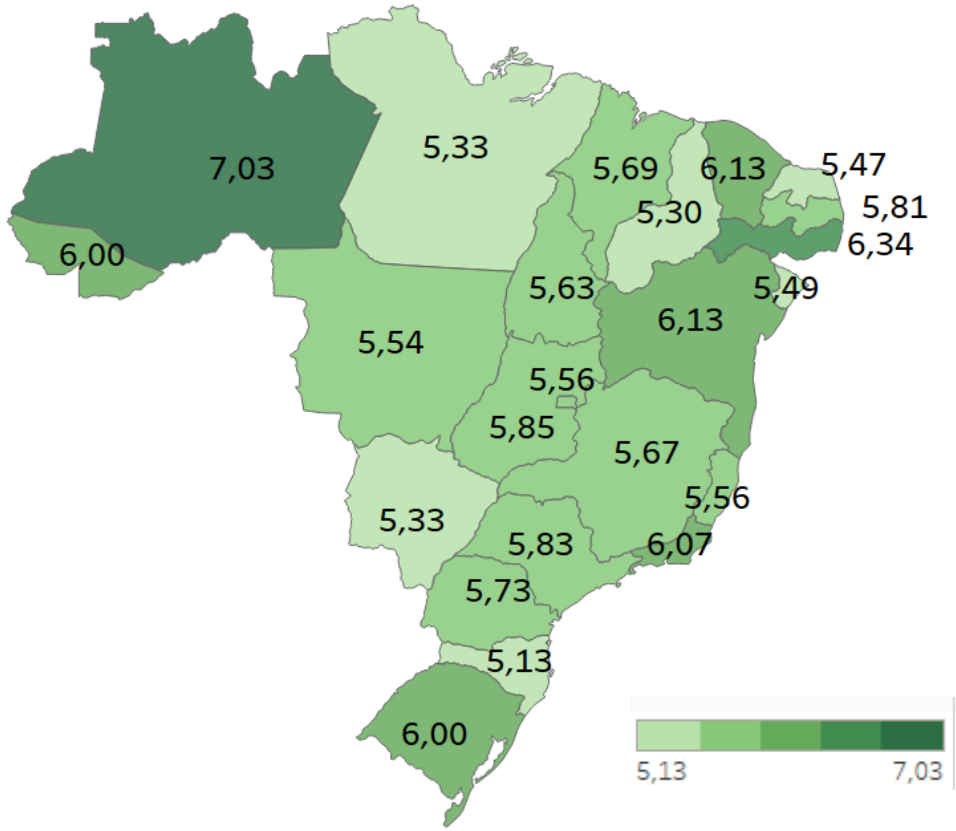
A further squeezing of integrator margins can be observed in the latest data, not just because of the increasing scale of business but also because of heavy competition and the absorption of some of the price increases in solar equipment.

Price Evolution of Photovoltaic Systems

From June 2016 to June 2018

Residential systems (4 kWp)



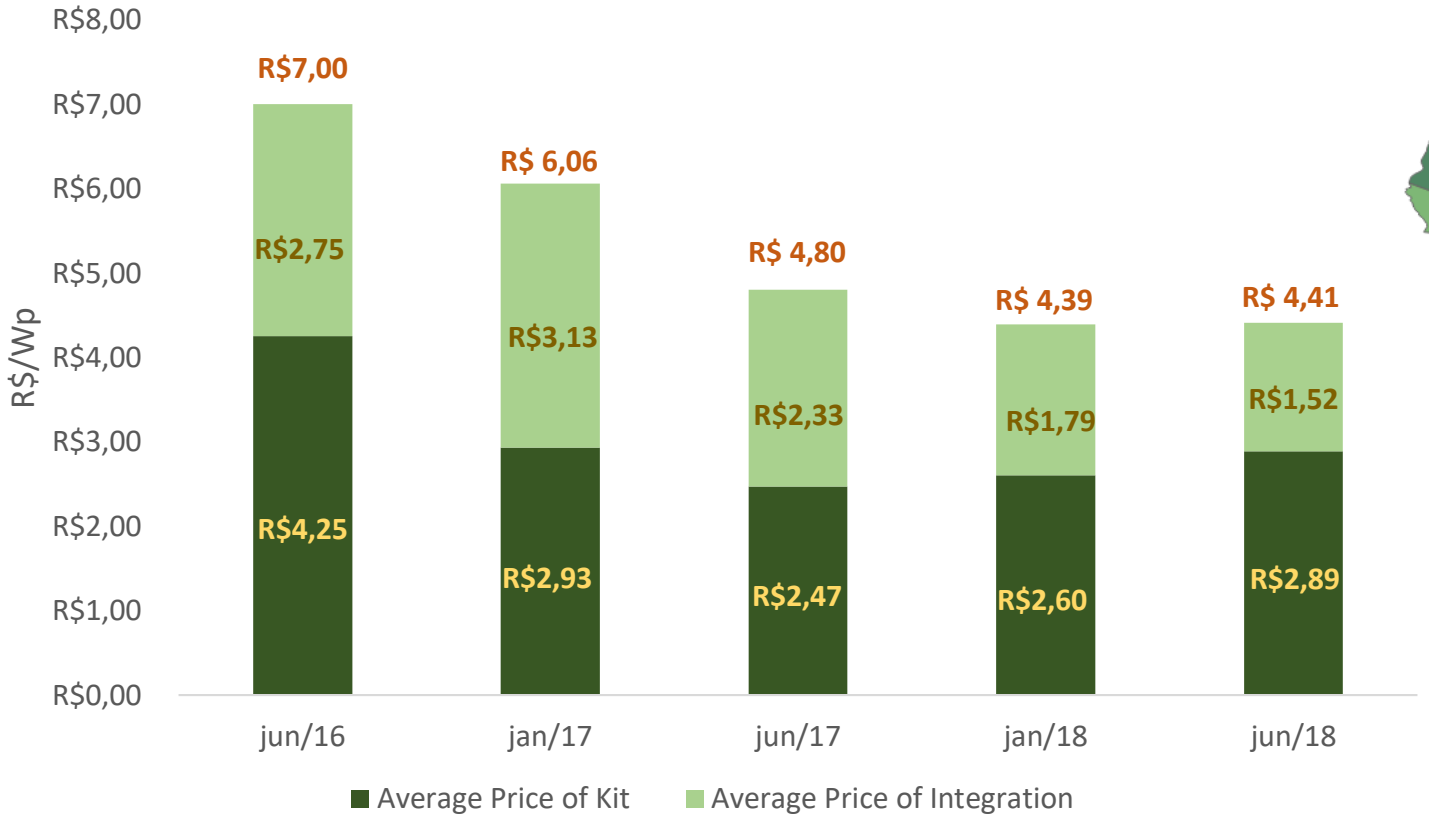


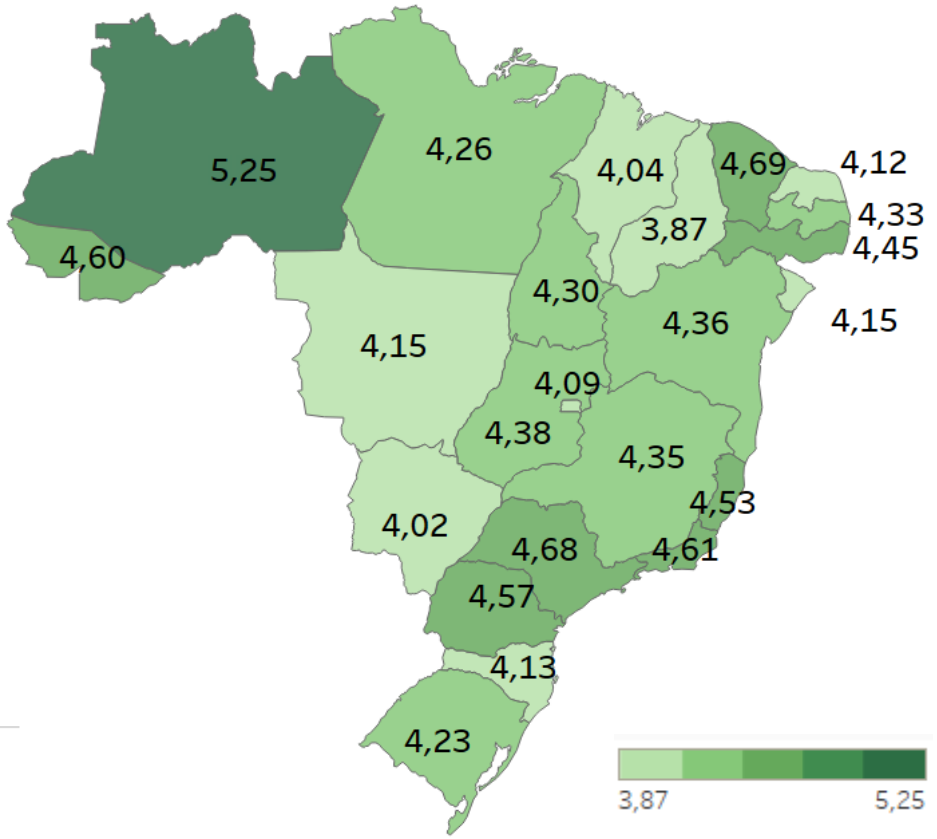
Average Price per State in June 2018 (R$/Wp)

Price Evolution of Photovoltaic Systems

From June 2016 to June 2018

Commercial System (50 kWp)



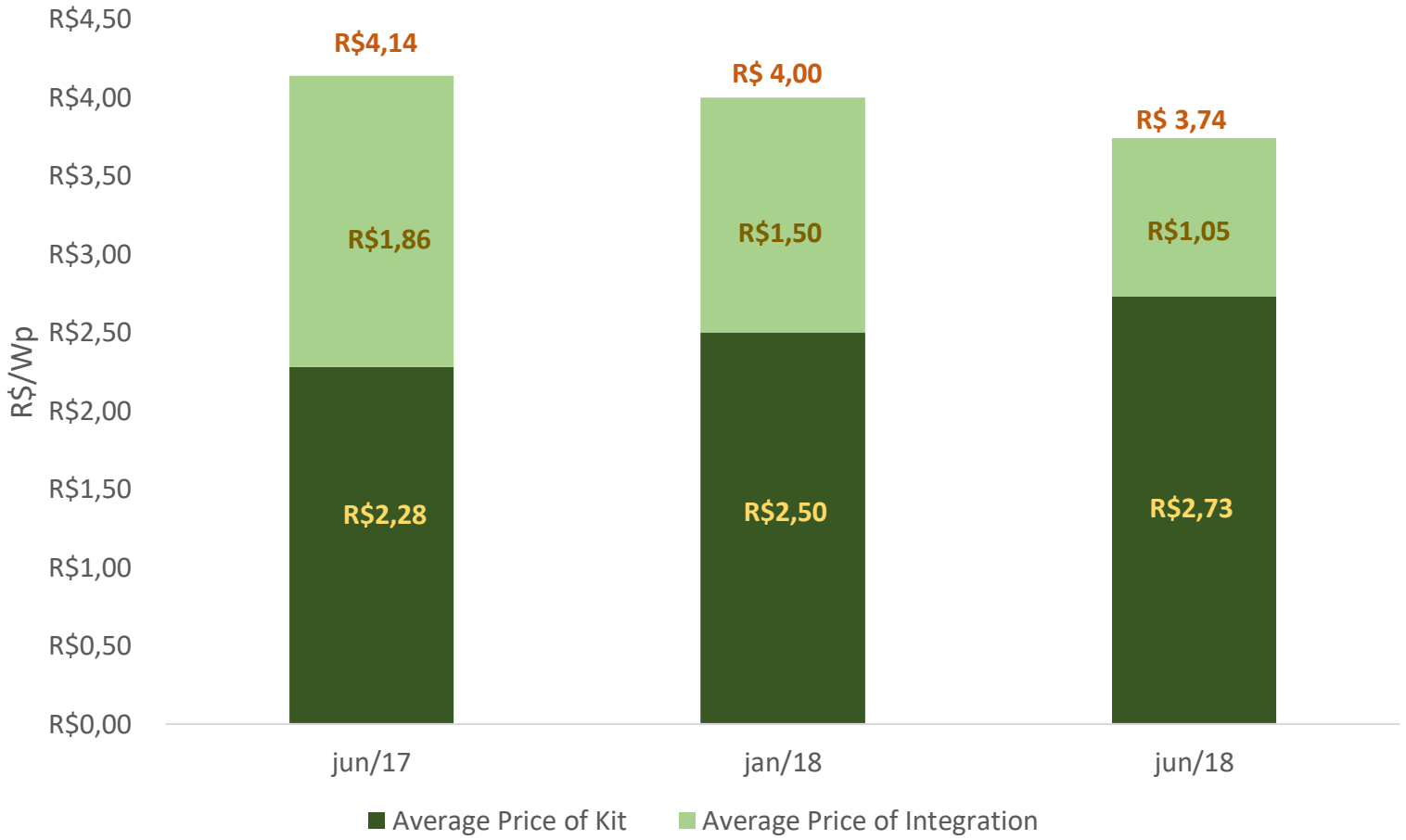


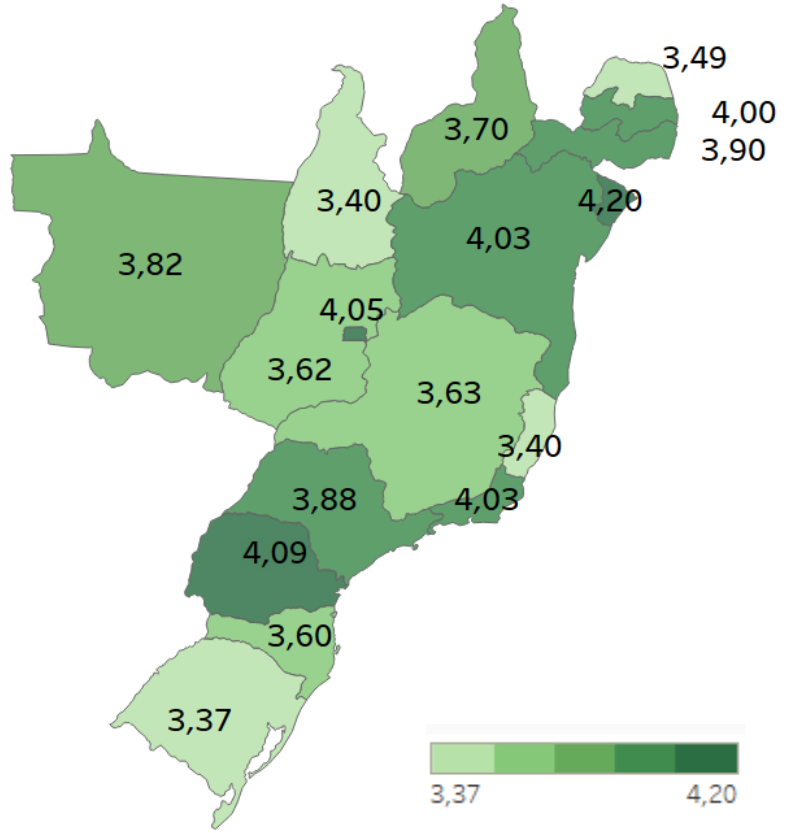
Average Price per State in June 2018 (R$/Wp)

Price Evolution of Photovoltaic Systems

From June 2017 to June 2018

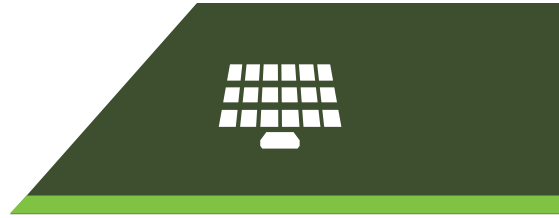
Industrial Scale System (1 MWp)





Average Price per State in June 2018 (R$/Wp)

Prices of Photovoltaic Systems



Observing the price development data for residential and commercial sytems, we note that prices are tending towards stabilization, with a smaller reduction in prices compared to previous periods/surveys.

The prices of kits showed a small increase in the past year, though less than the increase in prices of equipment. Integrators are absorbing part of the price increases by reducing their profit margins, meaning that they are suffering from the heavy competition but also showing signs of maturity and financial stability.

For larger/industrial sytems the prices for customers are still coming down steadily, but in this segment too the integrators are having to absorb some of the price increases of kits into their profit margins and operating models.


Installation
Time
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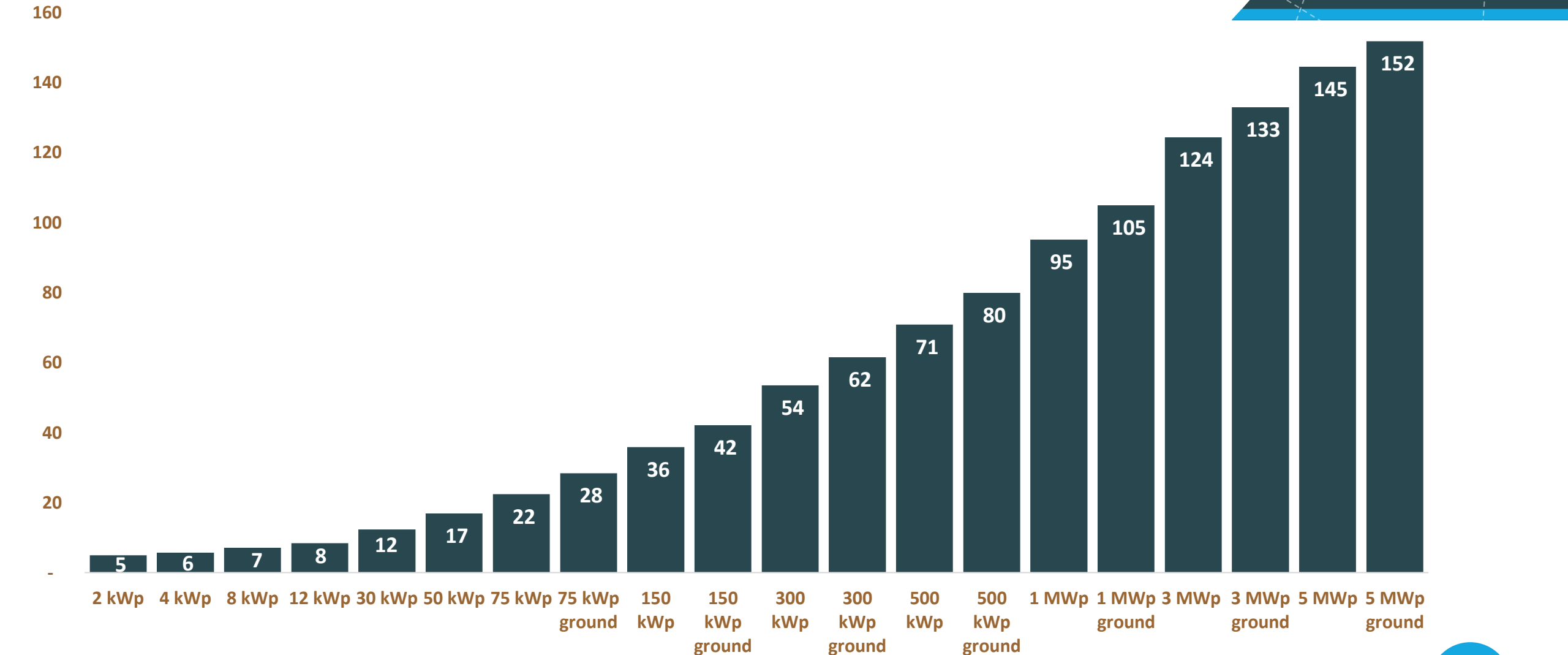
Average Intallation Time

In Days, Subdivided by System Size



Regulation and Taxation

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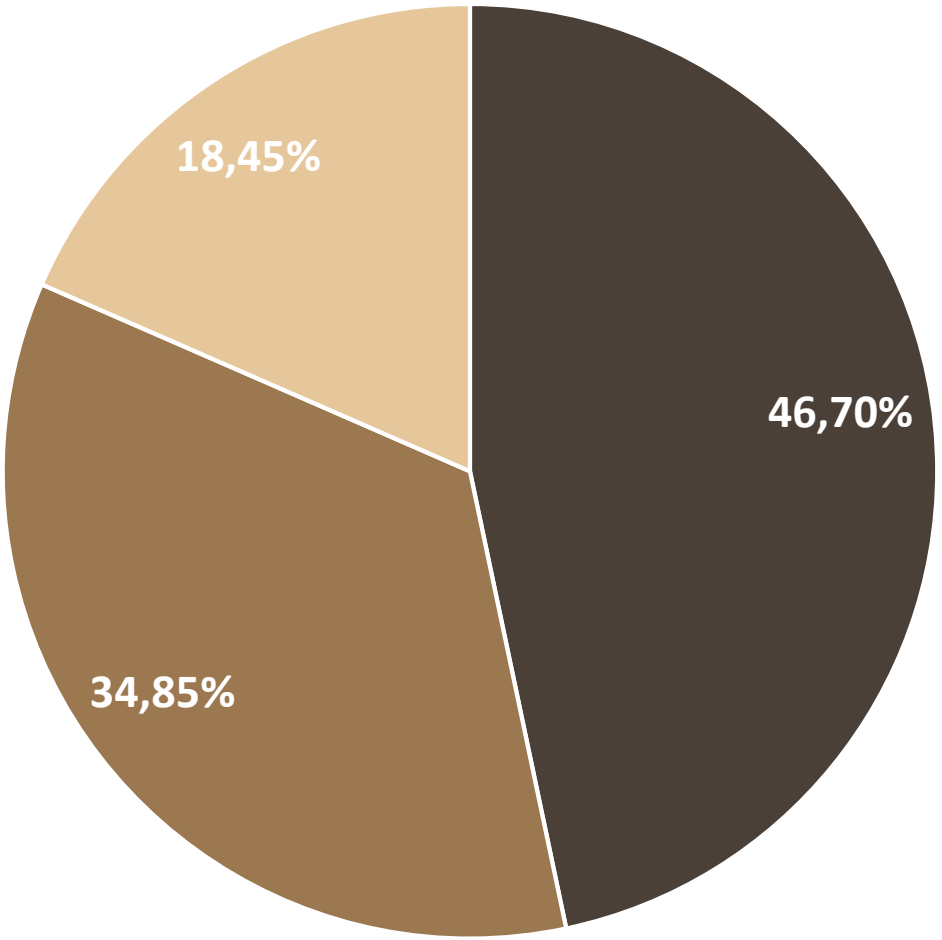
Technical/Regulatory Problems

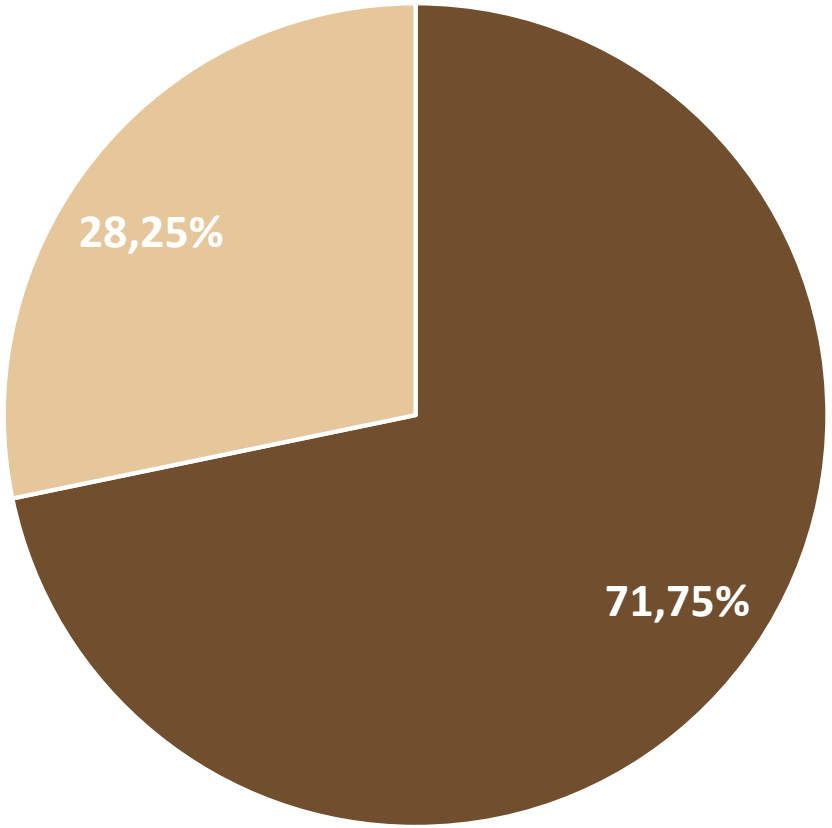
During Connection to the Grid of a Mini-generation PV Plant



- No
- Never Installed a Mini-Generation PV System
- Yes

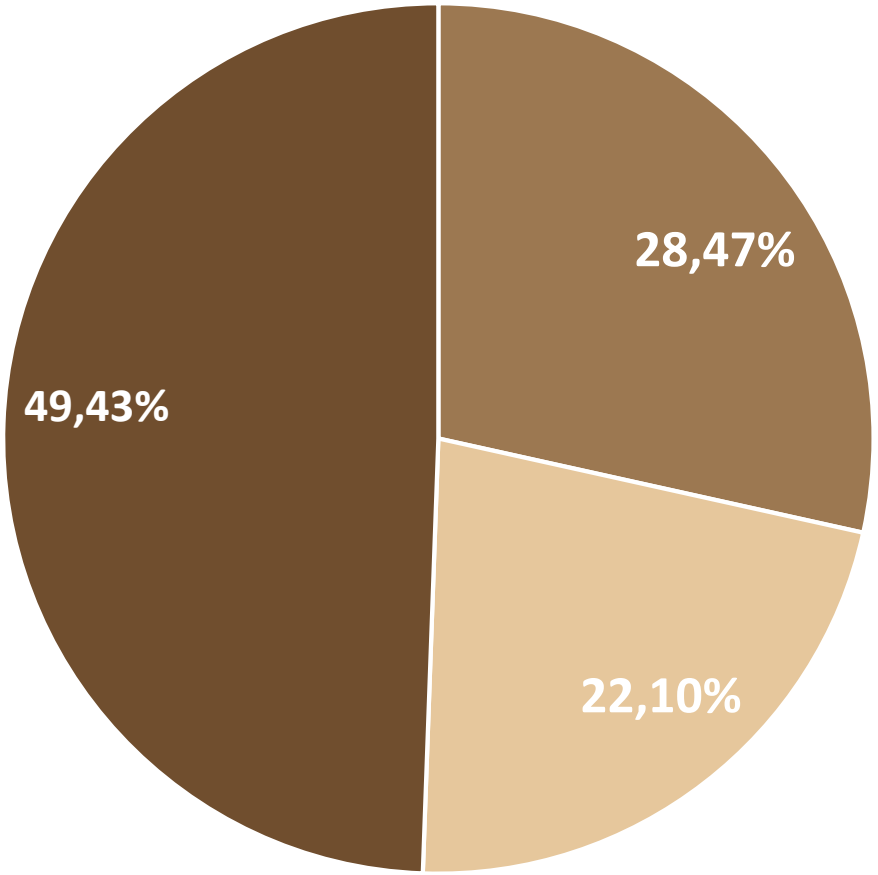
Complaints about ICMS tax over TUSD

Have Customers complained about the charging of ICMS tax over TUSD?



Difficulties with Connecting Remote Generation, Consortium/Cooperative or Condominium

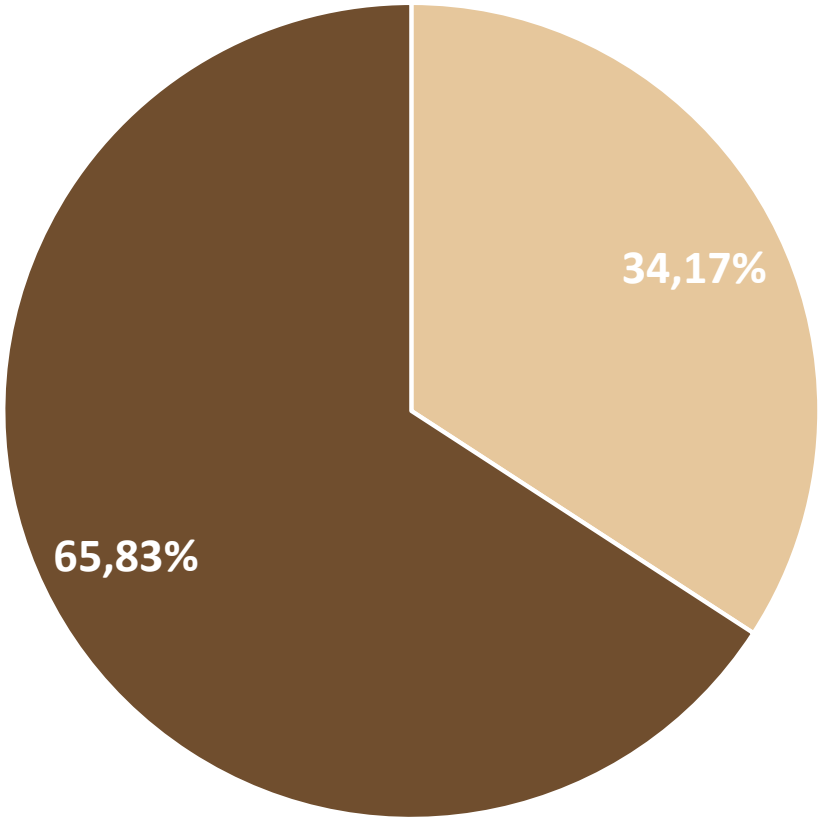
Compared to Auto-Gernation PV Systems



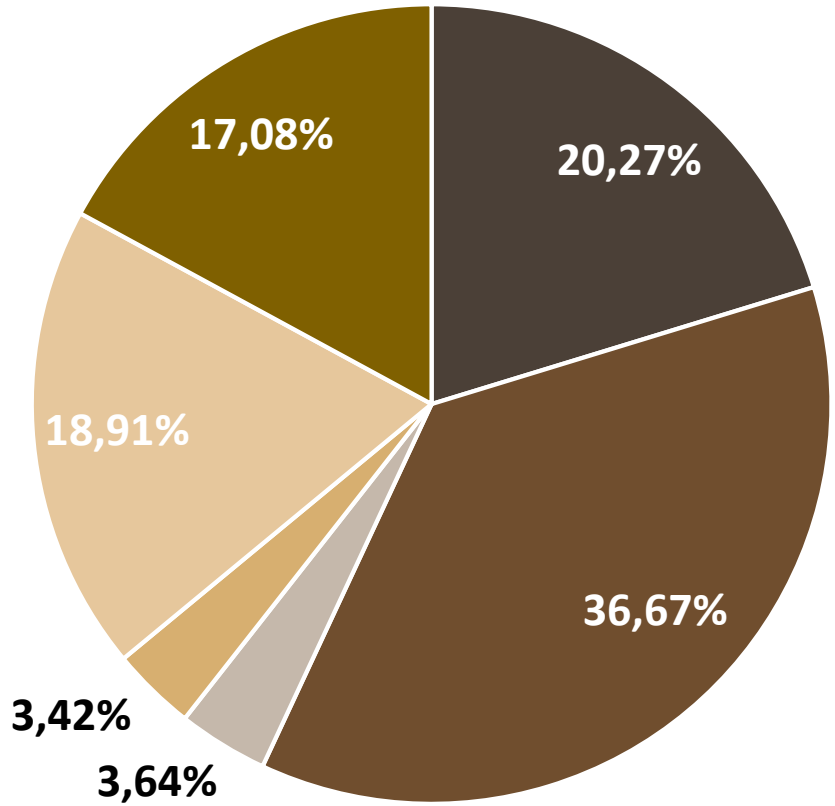
- No
- Yes
- Only Installed Auto-Generation Systems, no Remote Systems

Change to Regulation of Distributed Generation

Does your Company believe it is necessary?

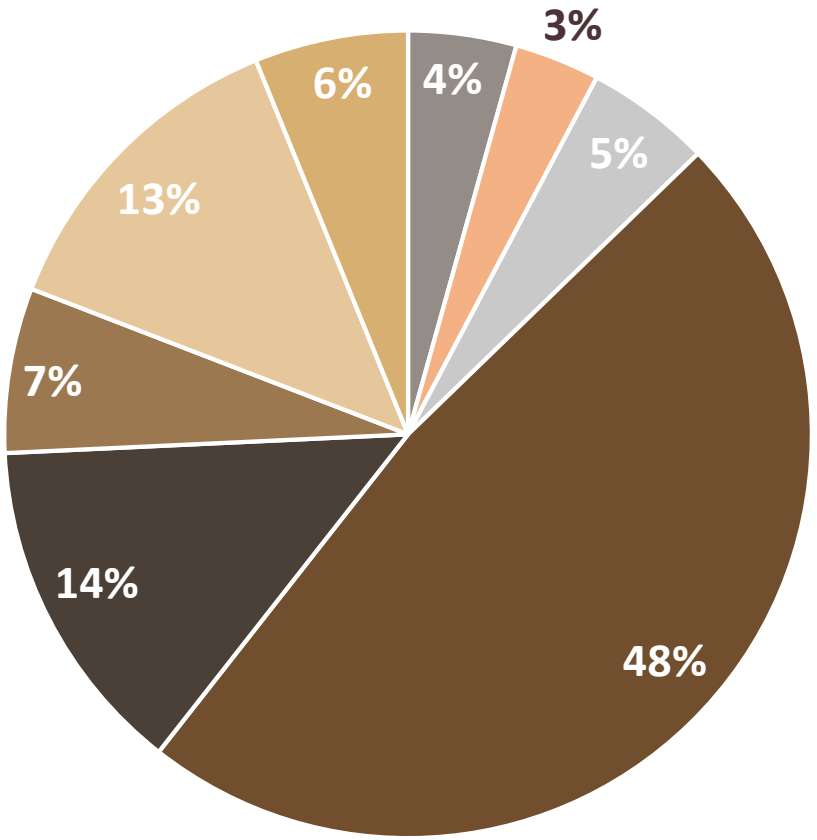


Possible changes with biggest POSITIVE impact



- Expansion of CONFAZ arrangements for tax exemption in line with REN nº 687/2015
- Exemption of ICMS taxes over TUSD charges
- None
- Other
- Reducing bureaucracy involved in process of connecting to Grid
- Reduction of fixed connection charges levied on Low Tension connections

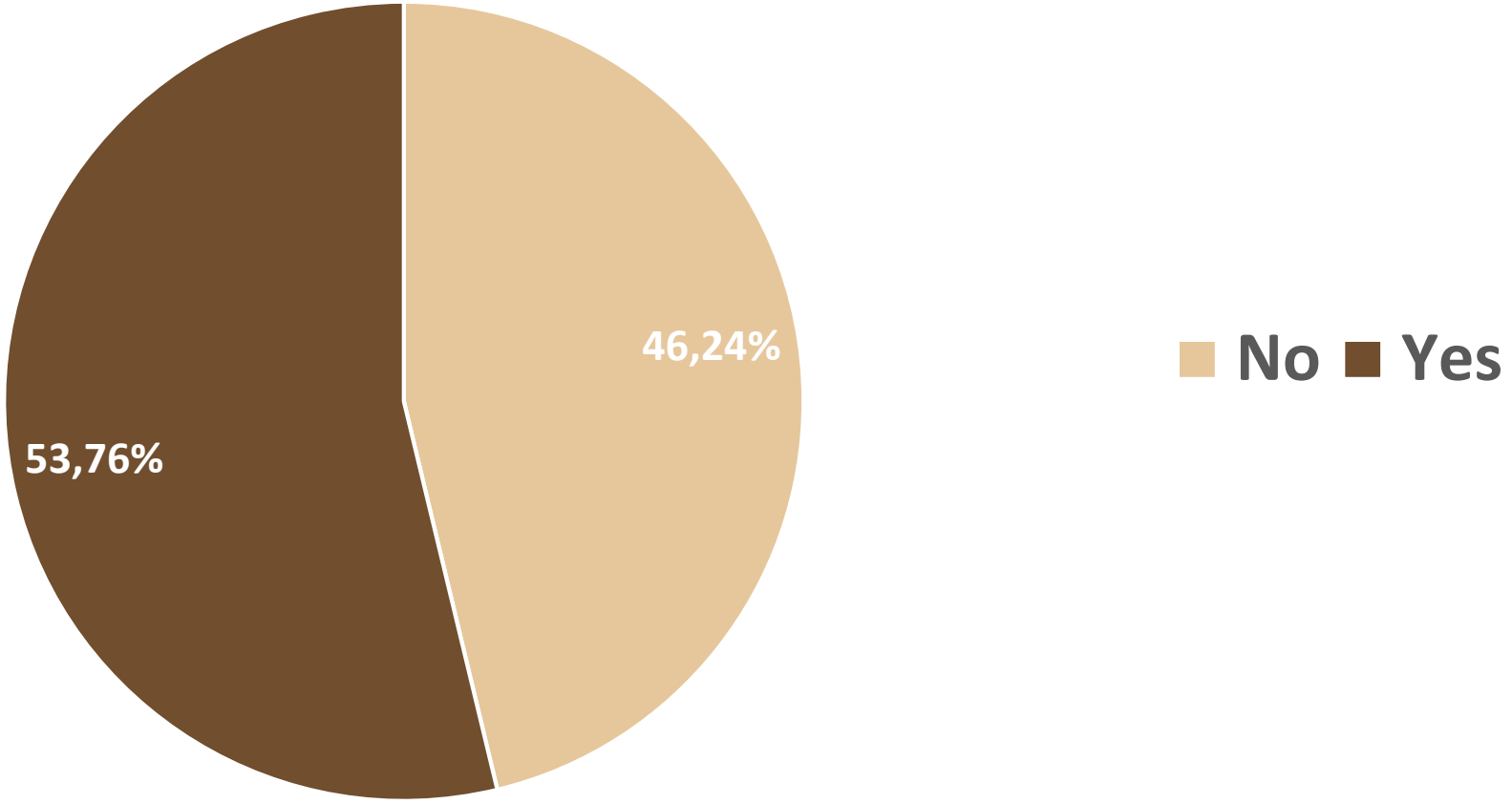
Possible changes with biggest NEGATIVE impact

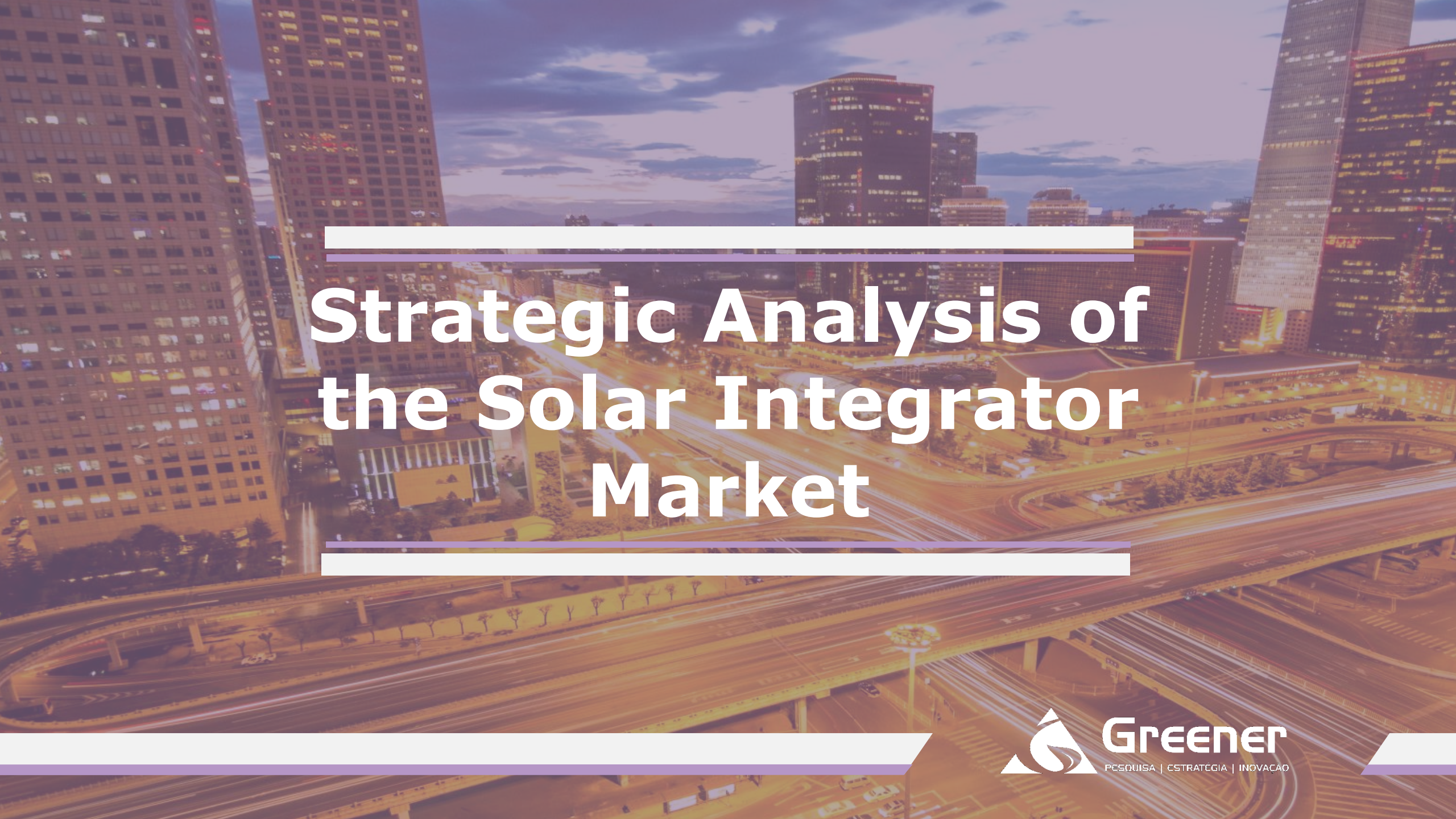


- None
- Other
- Ban on ability to rent solar plant capacity
- Removal of ICMS exemption over energy credits
- Removing TUSD charges from compensated credits instead of fixed connection charge
- Removing the different models of PV generation (such as remote generation)
- Binomial Tariff for Low Tension Consumers (Energy Price + Demand Charge)
- White Tariff (Merging Peak and Off-Peak Prices for Low Tension Customers)

CP 010/2018 ANEEL

Did you read it?





Strategic Analysis of the Solar Integrator Market

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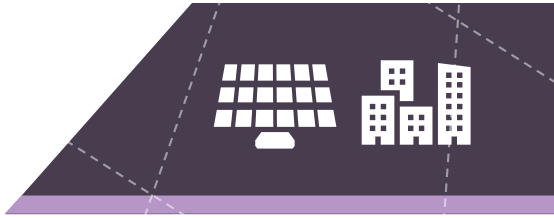
Average Sales Volume per Company



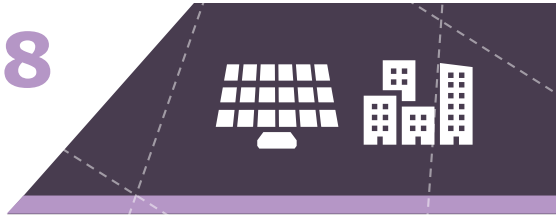
	2014	2015	2016	2017	2018*
PV Capacity Sold	16,651 MWp/year	63,996 MWp/year	82,938 MWp/year	297,617 MWp/year	410,59 MWp
Number of Active Companies	388 companies	906 companies	1500 companies	2741 companies	4029 companies
Average Sales Volume per Company	42.91 kWp/ year/company	70.64 kWp/ year/company	55.29 kWp/ year/company	108.58 kWp/ year/company	101.91 kWp /company (in 6 months)
Average Sales Volume per Company per Month	3.58 kWp/ month/company	5.89 kWp/ month/company	4.61 kWp/ month/company	9.05 kWp/ month/company	16.98 kWp/ month/company

* Total sales volume between January 2018 and June 2018

Average Sales Volume Per Company

Considering there have been only 6 months of sales so far this year, the total PV capacity sold per company/month is higher than for the full year of 2017 or any previous year.

Estimated Sales Volume for Integrators - 2018



Total Solar Capacity Sold in 2018

410.59 MWp

(Total PV capacity sold in the first 6 months of 2018)

Average Cost of Most Common PV System Installed in 2018

5.53 R$/Wp

(Average PV System sold had 5.5 Wp capacity; this is the most sold system size by solar integrators)

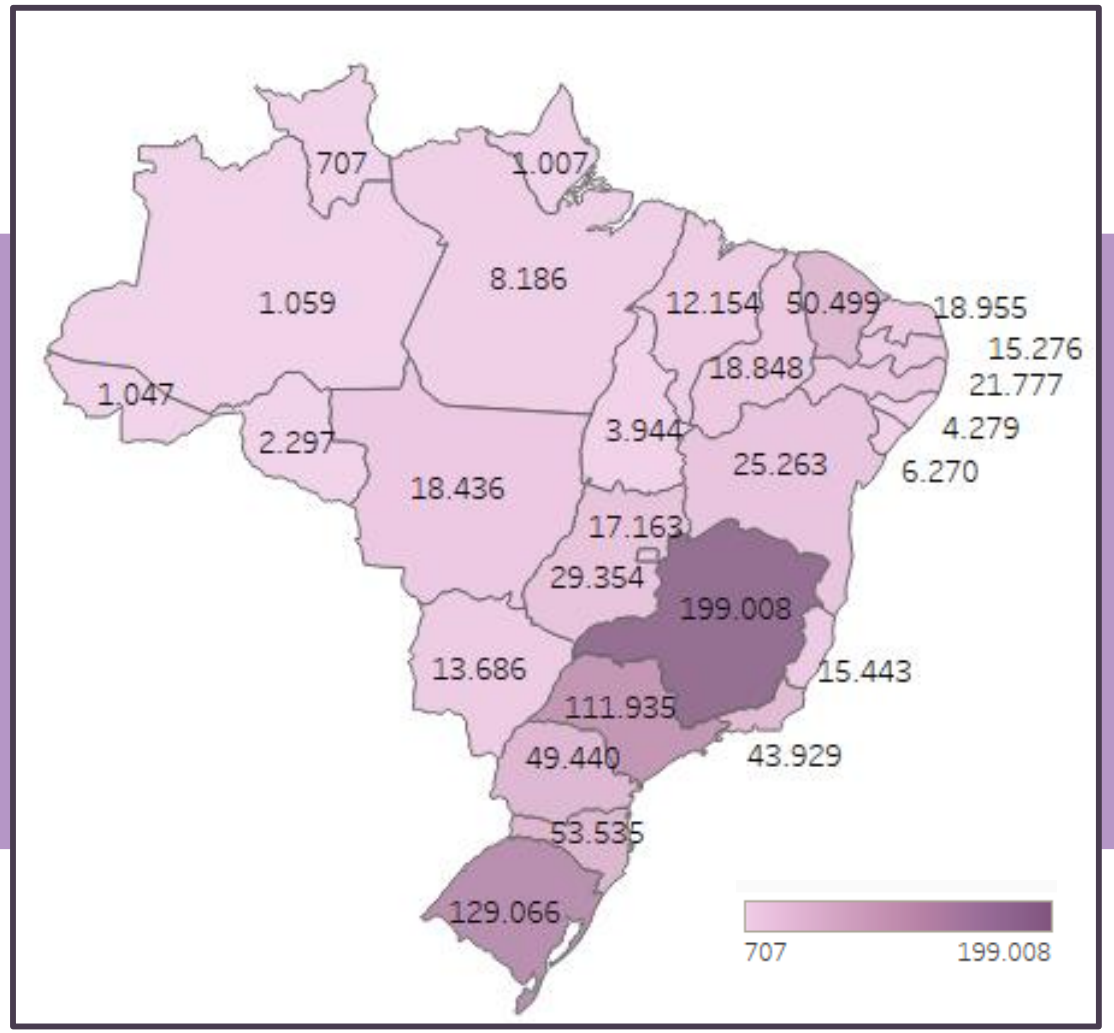
Total estimated Sales Volume in first half of 2018

R$ 2.27 billion

(Estimated Sales Volume for the first 6 months of 2018)

* Total capacity sold between January 2018 and June 2018

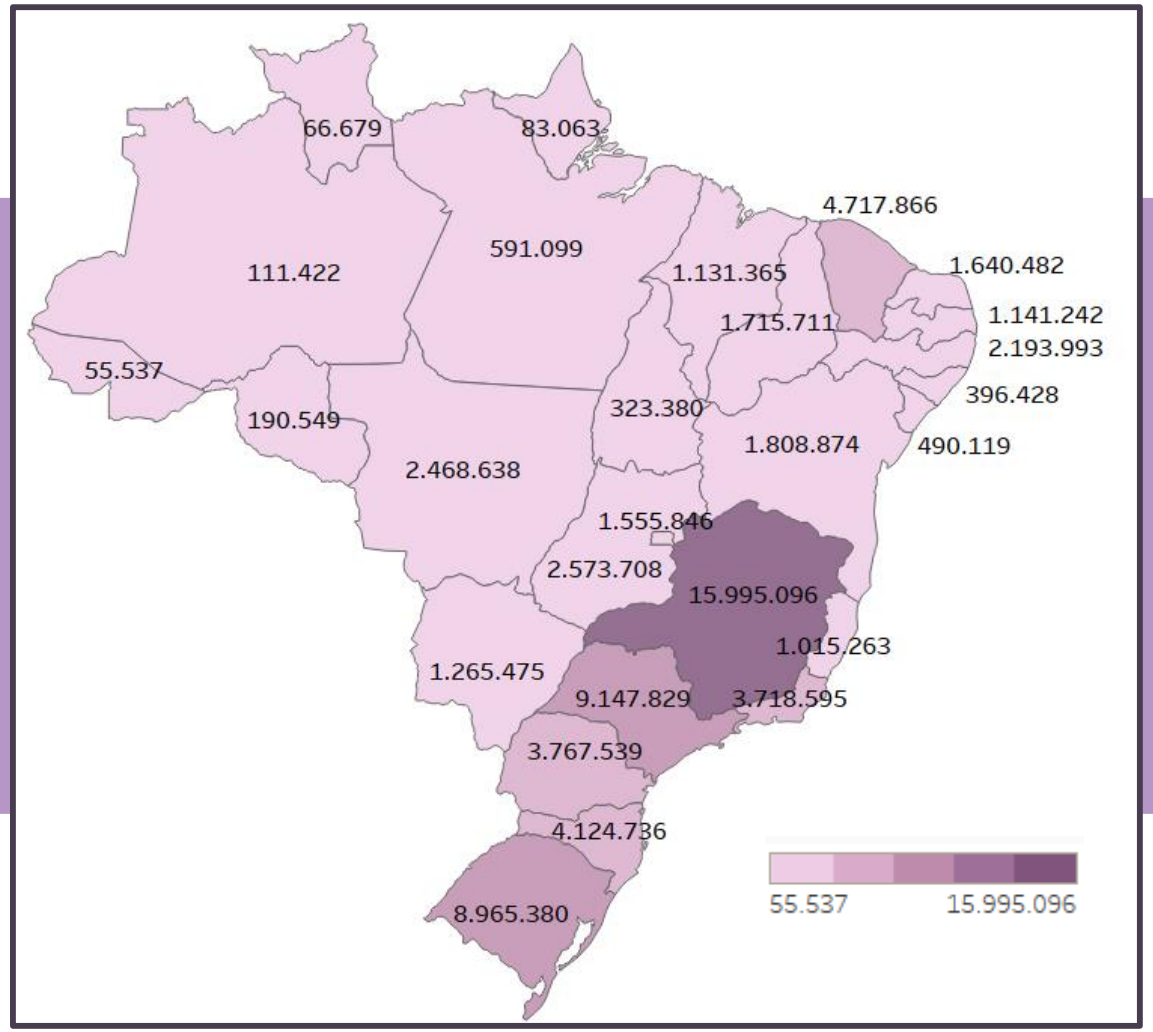
Estimated Cumulative Installations/State (kWp)



Market Estimate (in kWp) per Brazilian State based on data of number and type of systems connected to the Grid and Sales Volumes as of June 2018.

Source: Greener

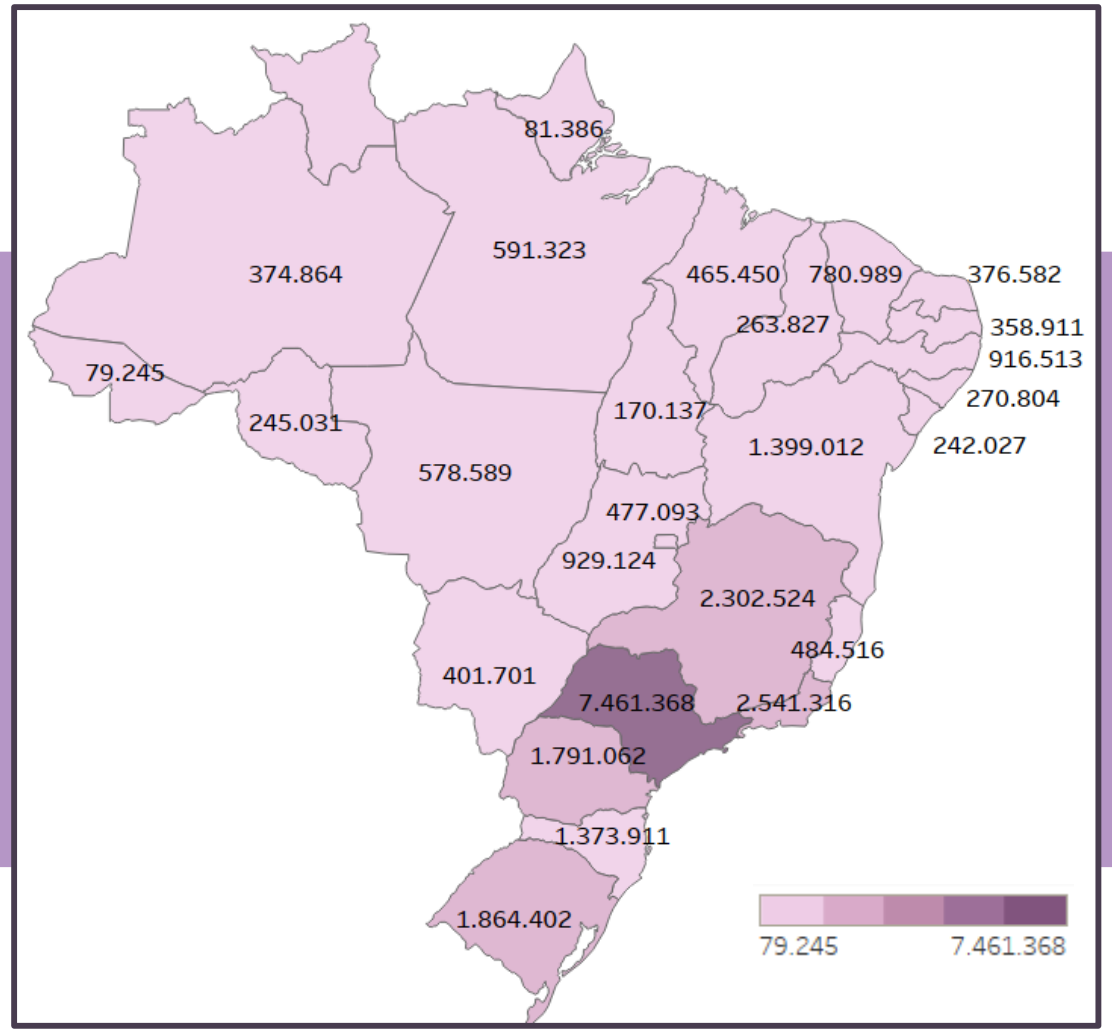
Production of Photovoltaic Energy per State (kWh)



Source: Receita Federal, Greener, ANEEL (April, 2018)

Production of Solar Photovoltaic Energy per State, based on the Capacity of the installed base and radiation data for the month of April 2018.

Electrical Energy Consumption per State (MWh)

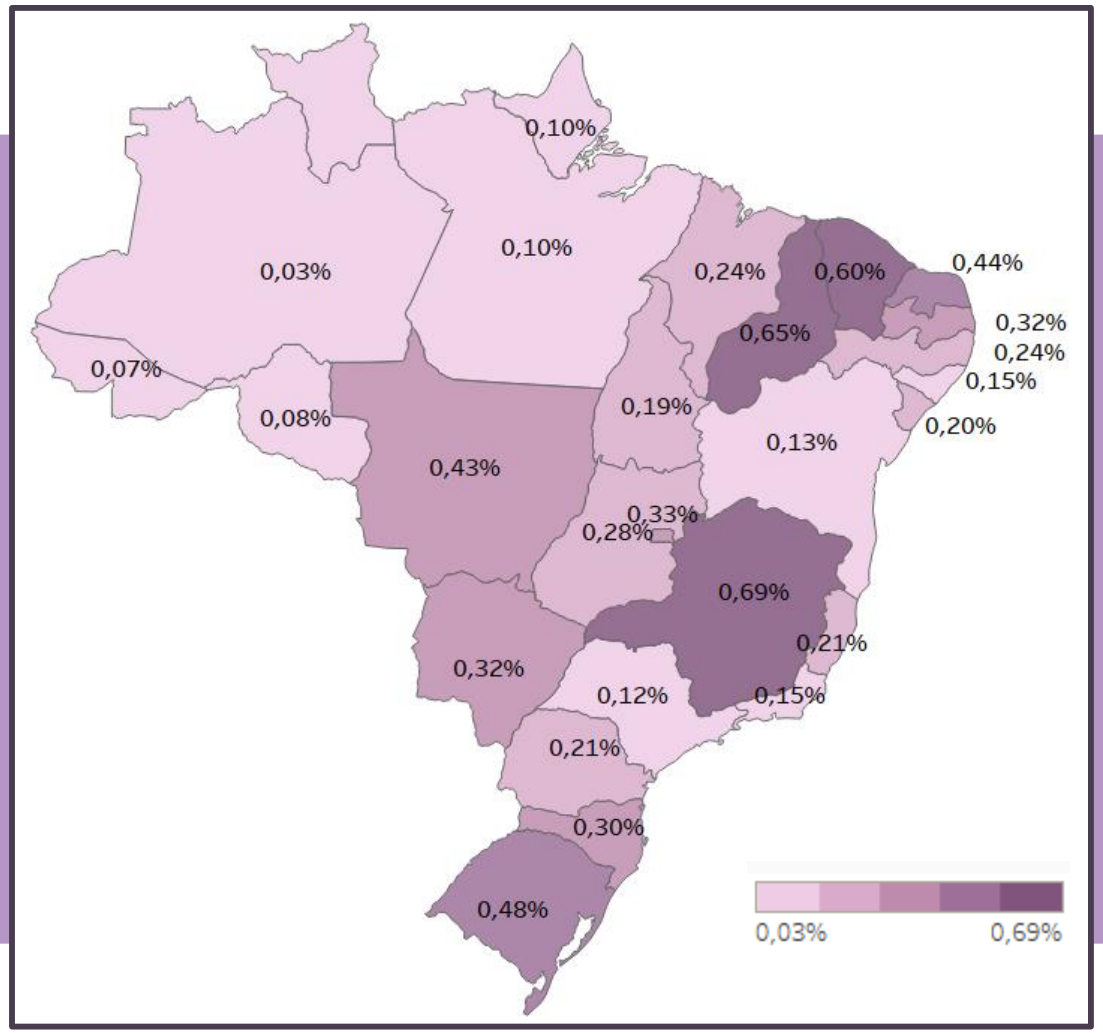


Electrical Energy Consumption (in MWh) per Brazilian State for the month of April 2018.

Source: ANEEL (April, 2018)

Share Generated by Photovoltaics (%)

Photovoltaic Energy Produced vs. Electricity Consumed – Greener Data

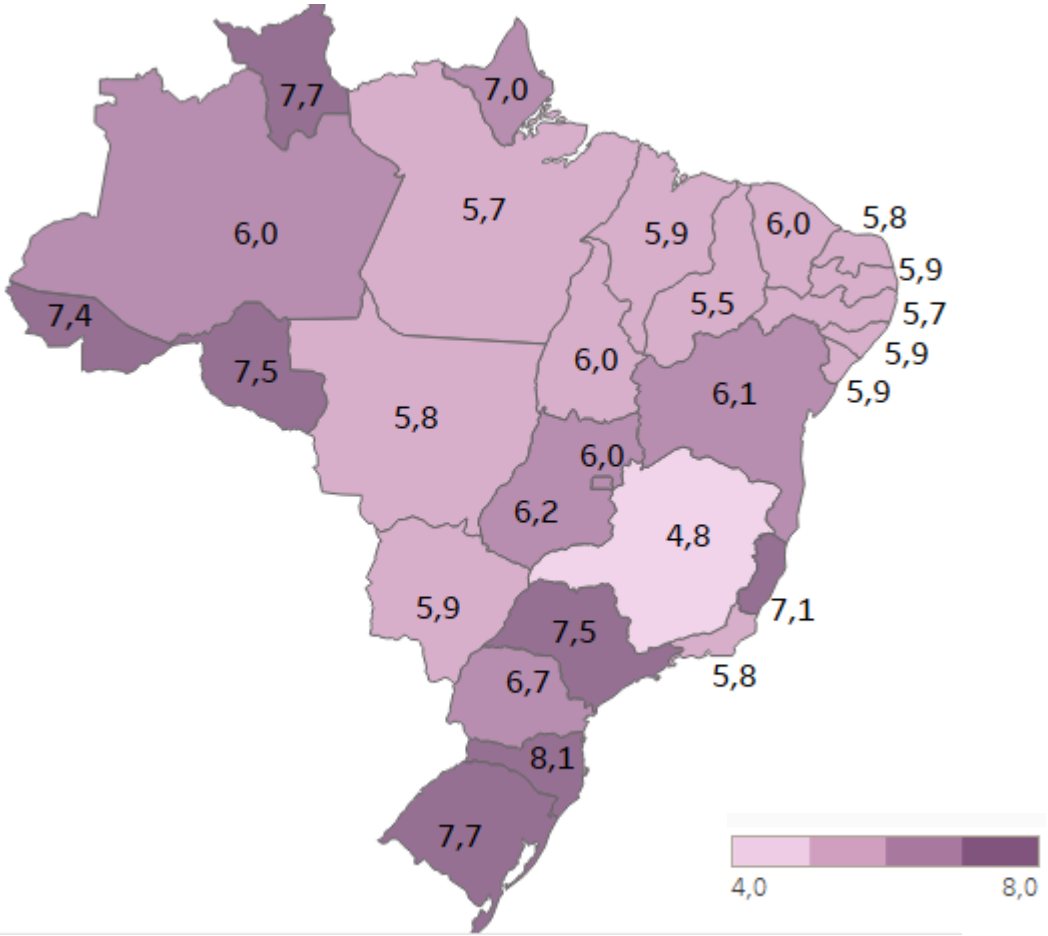


Estimate of the percentage of energy consumption generated by photovoltaic sources per Brazilian State, based on April 2018 radiation and consumption data. Minas Gerais shows the highest share of Distributed Generation solar in its state grid. Even so, the percentage is low – less than 1%. Despite rapid growth, the market share of (Distributed Generation) PV energy in the Brazilian grid is still very low.

Source: Receita Federal, Greener, ANEEL (April, 2018)

Estimate of Average Payback Time per State

Residential Tariff – Low Tension

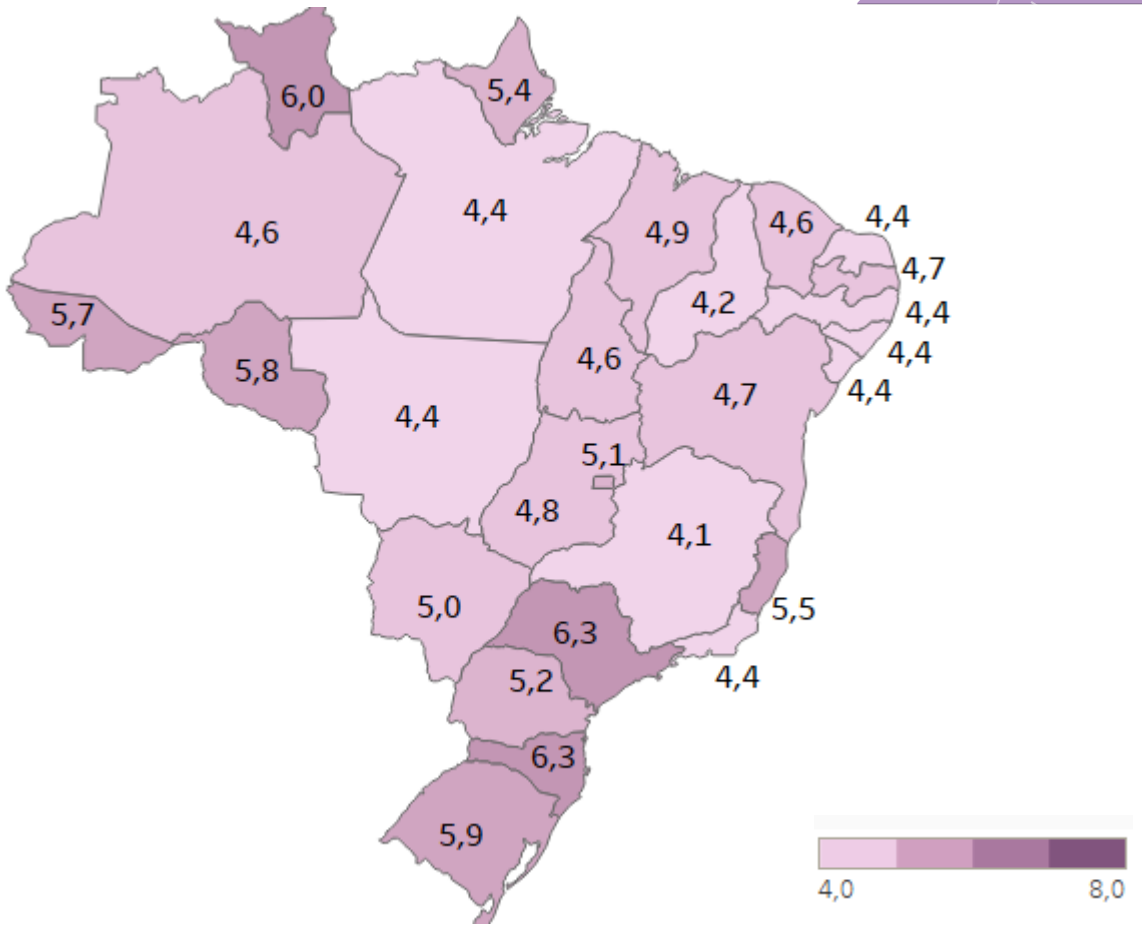


*The average system price for residential systems was R$5,83/Wp (Average Data according to Greener DG survey for 2nd half of 2018)

** The calculated figures take into account local productivity/irradiation data, average system cost, and local distributors' energy prices.

Estimate of Average Payback Time per State

Commercial Tariff – Low Tension

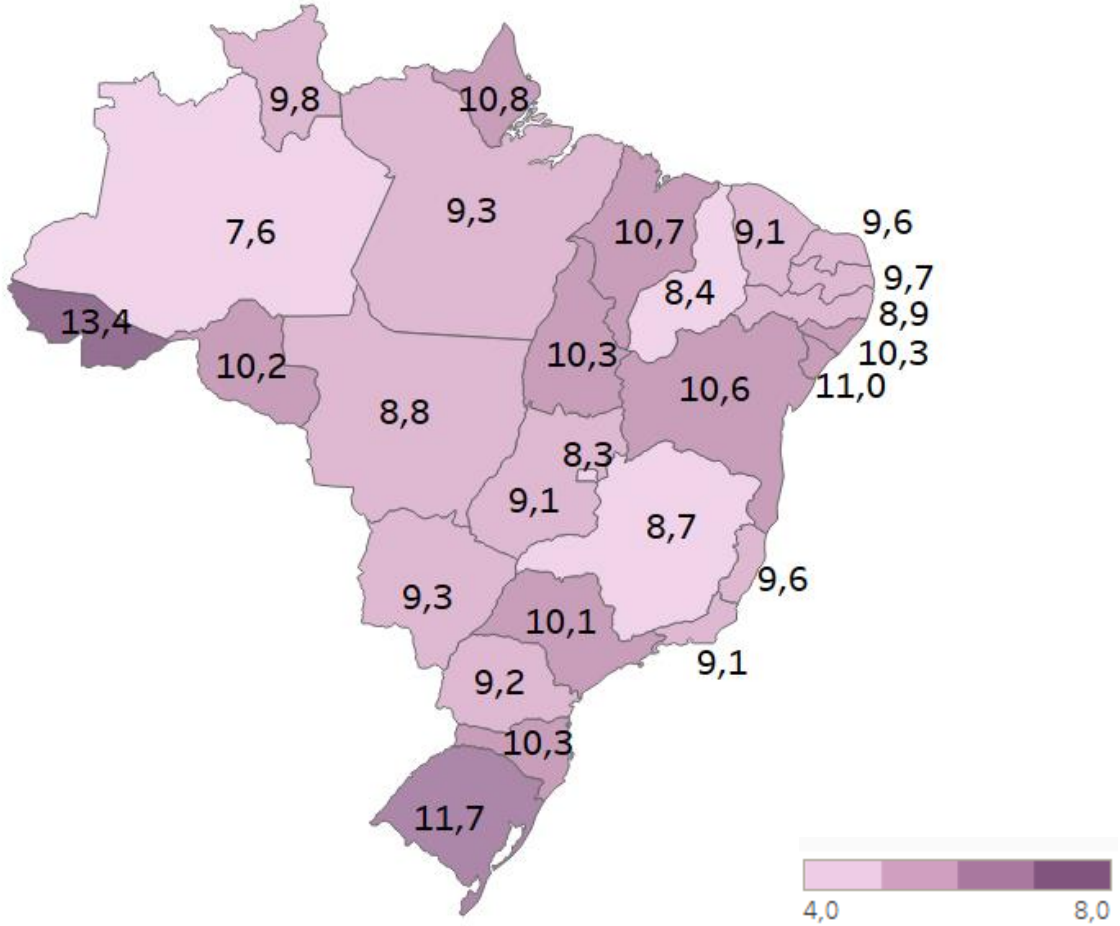


*The average installation price for commercial systems was R$4.64/Wp (Average Data according to Greener DG survey for 2nd half of 2018)

** The calculated figures take into account local productivity/irradiation data, average system cost, and local distributors' energy prices.

Estimate of Average Payback Time per State

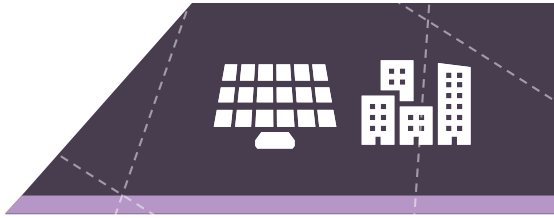
Industrial Tariff - Medium Tension



* The average installation price for industrial systems was R$4.02/Wp (Average Data according to Greener DG survey for 2nd half of 2018)

** The calculated figures take into account local productivity/irradiation data, average system cost, and local distributors' energy prices.

Analysis of a Typical Integrator (Based on Survey Data)

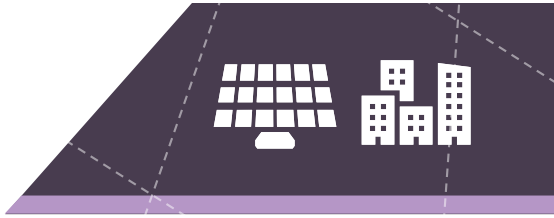


Assumptions

The objective of this analysis is to understand the profile of and the conditions for solar integrators in Brazil. In this part of the study, the companies were grouped according to the type of system they most sell. Two groups were created: Companies that sold mostly **small systems** (up to 12 kWp) and companies that mostly sold **medium-sized systems** (13 – 200 kWp). Some assumptions were made to define the size of each type of company, the tax treatment they receive and their fixed costs, thereby creating a **reference company** for each market segment.

Company Focus	Activity	Fiscal Regime	Average System Size Sold in 2018	Number of Employees active in Solar Energy
Small Size (Up to 12 kWp)	Company's activities are 100% in solar energy market and with one single business model (selling PV kits + offering integrator services)	'Simples' Taxation	4.9 kWp	6 employees
Medium Size (13 - 200 kWp)		Presumed Profit	40.4 kWp	11 employees

Analysis of an Integrator (Based on Survey Data – Small Size)



Monthly Sales Estimate (R$/month)/ Gross Sales for 2018

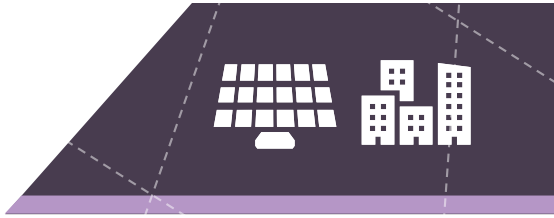
Information (For companies focused on small-sized systems)	Data
Average Number of Sales	2 sales
Average System Size in 2018	4.9 kWp
Average Price (Integration + Kit) 2018*	5,460 R$/Wp
Gross Monthly Sales per Integrator (kit + integration) 2018	R$ 53,508/month
Gross Sales for DG Solar Integrator in 2018 – Small Size** For January 2018 to June 2018 period.	**R$ 321.048,00**

Average Solar Capacity Sold: 9.8 kWp/month

*Average Price for systems of 4.9 kWp, which is the average size for each system sold by integrators that focus on small PV systems (0-12 kWp).

**Average sales based on Gross Monthly Integrator Sales for the 6 months between January 2018 and June 2018.

Analysis of an Integrator (Based on Survey Data – Small Size)



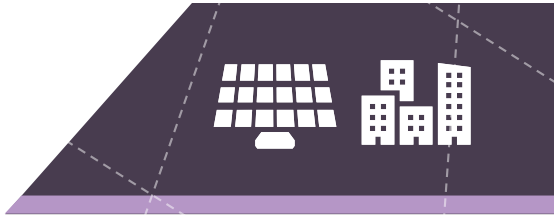
Monthly Costs for Integrator

Information (integrators with a focus on small scale PV systems)		Data (Entire Team)
Rent		R$ 2.500,00
Accounting		R$ 500,00
Energy		R$ 200,00
Water		R$ 50,00
Internet/Telephone		R$ 500,00
Marketing		R$ 2.000,00
After Sales Support		R$ 1.000,00
Supplies / Tools		R$ 3.000,00
Team (6 persons)	[1 Adm./Com. +1 manager +1 Engineer +3 Installers]	R$ 22.500,00
Total		**R$ 32.250,00**

Important

These costs are based on a small company focused on small systems (6 employees) with optimized cost structure.

Analysis of an Integrator (Based on Survey Data – Small Size)



Costs of Integration Services for a 4.9 kWp system (average system size sold)

Information (companies focused on small PV systems)	Data	Price	
PV Kit (64.5%)	3,521 R$/Wp	R$	17.253,65
Additional Equipment (6.4%)	0,352 R$/Wp	R$	1.725,37
COGS*	3,873 R$/Wp (70,9%)	R$	18.979,02
Taxes (9.5%)	0,519 R$/Wp	R$	2.541,63
Contribution Margin**	1,068 R$/Wp (19,6%)	R$	5.233,35
Final Price	**5,460 R$/Wp**	**R$**	**26.754,00**

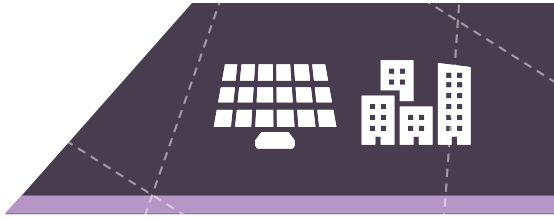
Important

Average Sales volume for each company is 9.8 kWp, equivalent to the sale of two average systems per month, meaning approximately double the figures in this table.

*COGS=Cost of Goods Sold (Includes all the costs involved for installing and connecting a small PV system, including cost of PV kit).

**Contribution Margin estimated for this example, it may vary depending on company policy (based on average price).

Analysis of an Integrator (Based on Survey Data – Small Size)



Profit and Loss of Small Solar Integrator

Information (For Integrators focused on small scale systems)	Data
Gross Sales per Integrator - 2018	R$ 53.508,00/mês
Taxes	R$ -5.083,26/mês
Average Monthly COGS*	R$ -37.958,04/mês
Gross Monthly Profit	R$ 10.466,70
Average Monthly Costs **	R$ -32.250,00
Average Net Monthly Profit	**R$ -21.783,30**

Important

We considered that the company would sell approx. 9,8 kWp/month (2 systems of 4.9 kWp per month). With this sales volume a negative net monthly profit is likely, and it is probable that the company will not even be able to pay the fixed costs related to its 6 employees. This fixed cost base is very high for this level of sales, which shows that the average solar integrator company focused on small systems is still a moneylosing proposition in today's solar market.

* Approximately the COGS equivalent of two average systems of 4,9 kWp per month.

**Taking into account average monthly cost equivalent to costs for administration, engineering, installers and other fixed costs. It should be noted that for this sales volume, gross income is not expected to cover fixed costs, resulting in a net monthly loss.

Analysis of an Integrator (Based on Survey Data – Small Size)

Profit and Loss – Small Sized Integrator Market

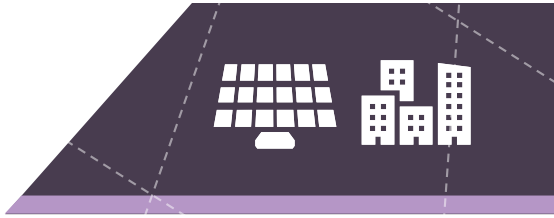
Information (For Integrators focused on small scale systems)	Data
Average Monthly Net Profit / Company	R$ -21.783,30
Average Annual Net Profit / Company	R$ -261.399,00
Number of Integrators	3280
Estimated Total Annual Net Loss - Integrators	**R$ -857.390.692,72**
Estimated Semi-Annual Net Loss – Integrators	**R$ -428.695.346,36**

Important

The information on this table was calculated based on responses to the Greener survey. Naturally certain assumptions had to be made regarding the fixed cost base, which in practice might be much lower – for example, sharing office space with other segments or areas of the company, engineering costs that are diluted over a larger number of projects per month, separate billing for PV kits and services which may reduce VAT or other taxes.

The analysis of a 'model company' shows that as a whole, this market segment has not yet achieved its breakeven point, meaning that companies active in this segment generally need to increase the number of projects sold and/or find ways to reduce their fixed cost base.

Analysis of an Integrator (Based on Survey Data – Small Size)



Scenario for Integrators to achieve *Breakeven*

Information (For Integrators focused on small scale systems)	Data
Integrator's Monthly Cost	R$ 32.250,00
Variable Cost per product*	R$ 21.520,65/product
Minimum Monthly Sales Requirement	R$ 164.868,87
Average Sales Price per Wp (average system, based on 4.9 kWp)	R$ 5,46/Wp
Monthly PV Capacity to be sold	30.2 kWp
Minimum number of Sales required for breakeven	**7 sales**

Important

In this calculation, some values were estimated in order to obtain a reference value for the Breakeven point. Conditions for installing, team/HR expenses, the size of the systems that are sold may vary considerably and the number of sales required to achieve breakeven will therefore also be a variable.

The calculation serves as a good indicator for a monthly sales target for a company that is active in this particular market segment.

*Variable Costs take into acount the cost of the PV kit, additional equipment and taxes that are directly related to the sale of the PV system.

Analysis of an Integrator (Based on Survey Data – Small Size)

30.2 kWp / month

Average Monthly Sales Volume (kWp)

Important

Only15,00% of compmanies achieved an annual sales volume of 362.4 kWp or more (30.2 kWp/month)

Considering an average system size of 4.9 kWp

7 sales / month

Average Nr. of completed sales (systems)

34.17% of integrators already managed an average monthly sales volume of 2 projects or more, though not necessarily with the average system size of 4.9 kWp.

Important

The average company (with 6 employees) should not only think about selling 7 projects per month, but should try to achieve **a sales volume of 30.2 kWp/month.**

Considering the average sales conversion rate of 5.45%

130 proposal / month

Average Nr. of sales proposals per month

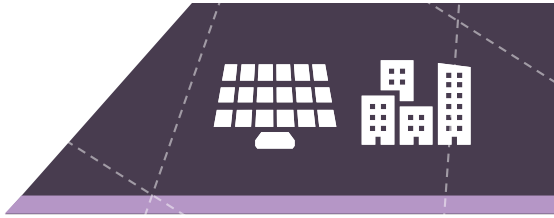
5% of integrators were able to send out more than 130 proposals/month.

Important

Despite the difficulties, the statistics show that a greater number of companies than described here can achieve *breakeven*, given that **70.55%** of companies surveyed actually employ 5 persons or less.

Source: Greener

Analysis of an Integrator (Based on Survey Data – Medium Size)



Monthly Sales Estimate (R$/month)/ Gross Sales for 2018

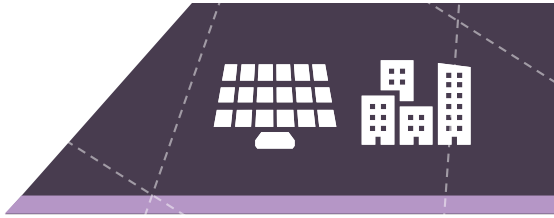
Information (integrators with a focus on medium scale PV systems)	Data
Average Number of Sales	3 sales
Average System Size in 2018	40,4 kWp
Average Price (Integration + Kit) 2018*	4,460 R$/Wp
Gross Monthly Sales per Integrator (kit + integration) 2018	R$ 540.552,00/month
Gross Sales for DG Solar Integrator in 2018 – Medium Size** For January 2018 to June 2018 period.	**R$ 3.243.312,00**

Average Sales Volume 121.2 kWp/month

*Average Price for systems of 40.4 kWp, which is the average size for each system sold by integrators that focus on medium sized PV systems (13-200 kWp).

**Average sales based on Gross Monthly Integrator Sales for the 6 months between January 2018 and June 2018.

Analysis of an Integrator (Based on Survey Data – Medium Size)



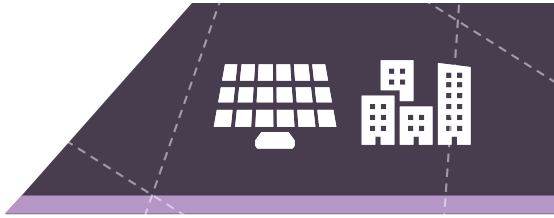
Monthly Costs per Integrator Company

Information (integrators with a focus on medium scale PV systems)	Data (Full Team)
Rent	R$ 3.000,00
Accounting	R$ 1000,00
Energy	R$ 370,00
Water	R$ 100,00
Internet/Telephone	R$ 500,00
Marketing	R$ 5.000,00
After Sales Support	R$ 2.000,00
Supplies / Tools	R$ 5.500,00
Team (11 perons) [3 Adm./Com. +1 Manager + 2 Engineers + 5 Installers]	R$ 39.500,00
Total	**R$ 56.970,00**

Important

These costs are based on an average company focused on medium sized commercial systems (11 employees) with optimized cost structure.

Analysis of an Integrator (Based on Survey Data – Medium Size)



Integration Costs for a System of size 40.4 kWp (average system sold)

Information	Data	Price	
PV Kit (66,4%)	2,961 R$/Wp	R$	119.624,16
Additional Tools/Equipment (6,6%)	0,296 R$/Wp	R$	11.962,42
COGS*	3,257 R$/Wp (73,0%)	R$	131.586,57
Taxes (14%)	0,624 R$/Wp	R$	25.225,76
Contribution Margin**	0,579 R$/Wp (13%)	R$	23.371,67
Final Price	**4,460 R$/Wp**	**R$**	**180.184,00**

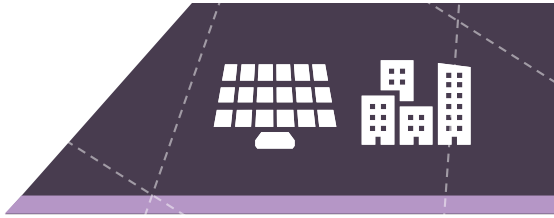
Important

Average sales volume for each company in the medium segment is 121.2 kWp, equivalent to the sale of three average systems per month, meaning real costs are approximately triple the figures in this table.

*COGS=Cost of Goods Sold (Includes all the costs involved for installing and connecting a small PV system, including cost of PV kit).

**Contribution Margin estimated for this example, it may vary depending on company policy (based on average price).

Analysis of an Integrator (Based on Survey Data – Medium Size)



Profit and Loss of Medium Sized Integrator

Information (Companies focused on medium sized systems)	Data
Gross Sales per Integrator - 2018	R$ 540.552,00/month
Taxes	R$ -75.677,28/month
Average Monthly COGS*	R$ -394.759,72/month
Gross Monthly Profit	R$ 70.115,00
Average Monthly Costs **	R$ -56.970,00
Average Net Monthly Profit	**R$ 13.145,00**

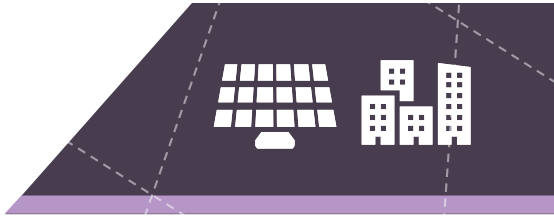
Important

It is assumed that a integrator focuses on Mediam Size systems will sell aprox. 121.2 kWp/month (3 systems of 40.4 kWp each). With this sales volume, the net financial result is positive, which means that focusing on larger systems is of interest to solar PV integrators.

* Approximately the COGS equivalent of three average systems of 40.4 kWp per month.

**Taking into account average monthly cost equivalent to costs for administration, engineering, installers and other fixed costs. It should be noted that for this sales volume, gross income is sufficient to cover fixed costs, meaning the ability to turn a Net Profit.

Analysis of an Integrator (Based on Survey Data – Medium Size)



Profit and Loss – Small Sized Integrator Market

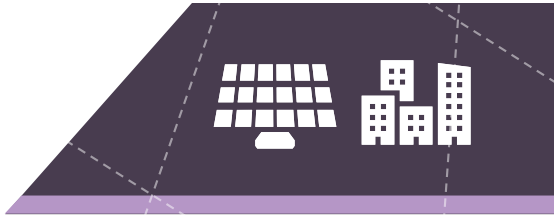
Information (For Integrators focused on medium scale systems)	Data
Average Monthly Net Profit / Company	R$ 13.145,00
Average Annual Net Profit / Company	R$ 157.740,00
Number of Integrators	620
Estimated Total Annual Net Profit – Integrators	**R$ 97.798.800,00**
Estimated Semi-Annual Net Profit – Integrators	**R$ 48.899.400,00**

Important

The information on this table was calculated based on responses to the Greener survey. Naturally certain assumptions had to be made regarding the fixed cost base, which in practice might be much lower – for example, sharing office space with other segments or areas of the company, engineering costs that are diluted over a larger number of projects per month, separate billing for PV kits and services which may reduce VAT or other taxes.

The result of this simplified analysis using average numbers shows that companies focused on the medium/commercial segment are already likely to have achieved their break-even point and are more likely than not to be making a profit.

Analysis of an Integrator (Based on Survey Results – Medium Size)



Scenario for the Medium Segment to achieve Breakeven

Information	Data
Integrator's Monthly Cost	R$ 52.970,00
Variable Cost per product*	R$ 156.812,33/product
Minimum Monthly Sales Requirement	R$ 408.372,52
Average Sales Price per Wp (average system, based on 40.4 kWp)	R$ 4,46/Wp
Monthly PV Capacity to be sold	91.56 kWp
Minimum number of Sales required for breakeven	**3 sales**

Important

In this calculation, some values were estimated in order to obtain a reference value for the Breakeven point. Conditions for installing, team/HR expenses, the size of the systems that are sold may vary considerably and the number of sales required to achieve breakeven will therefore also be a variable.

The calculation serves as a good indicator for a monthly sales target for a company that is active in this particular market segment.

*Variable Costs take into acount the cost of the PV kit, additional equipment and taxes that are directly related to the sale of the PV system.

Breakeven Integrators (Based on Survey Results – Medium Size)

91.56 kWp/ month

Average Monthly Sales Volume (kWp)

Considering an average commercial system of 40,4 kWp

3 Sales / month

Average Nr. of Completed Sales (systems)

27.94% of companies already reached the goal of 3 projects sales or more per month, however not necessarily all with the average size of 40.4 kWp

Considering the average sales conversion rate of 13,26%

23 Proposals / month

Average Monthly Nr. of Proposals Sent

52.94% of solar integrators in this segment sent out more than 23 proposals/month.

Important

Only 17.65% of integrators reached a yearly sales volume exceeding 1,098 MWp (91.56 kWp/month)

Important

The average company (with 11 employees) shouldn't prioritize completing 3 sales/month, but should focus on reaching **a sales volume of 91.56 kWp/month.**

Important

Despite the difficulties, the numbers show that a larger proportion of companies in this segment can reach *breakeven*, considering that **73.53%** of these companies employ 11 persons or less.

Source: Greener

Greener Insights

Greener
PESQUISA | ESTRATÉGIA | INOVAÇÃO

Greener Insights

- Even with the rapid risein sales of solar modules and PV projects of various types, solar PV's share of electricity generation in Brazil is still very low, not reaching even 1% in any single State. For now, Distributed Generation electricity is still having a negligible impact on the Brazilian grid and on business models of electricity distributors.
- Growth is now happening very fast indeed: in the first 6 months of 2018, the DG solar PV sector already sold 38% more new capacity than in the whole of the year 2017. The last years were already showing rapid growth, but this year should surpass those figures.
- For systems up to 8 kWp there was a reduction in the average price of PV kits, as opposed to the increase in the second half of 2017. On the other hand, these last 6 months shows a slight increase in prices for all PV kit sizes above 8kWp, mostly due to the sharp rise in value of the US Dollar.
- Despite the average price rises for photovoltaic kits, end customers paid less for their PV installations, which shows that integrators are accepting lower margins to try to secure projects, establish a track record, and gain market share.

Source: Greener

Greener Insights

Al though the State of São Paulo has the largest number of companies active in the sector, the prices there are still above the national average, for residential, commercial and industrial systems. This is partly due to the higher costing SP (real estate, labour) but also due to heavy competition between integrators.

Based on our simulation for a small-project integrator which only deals with projects below 12 kWp, it becomes clear that for many companies in this segment the market is currently unsustainable. Average sales volumes for companies in this segment don't allow them to pay their fixed costs. It may be necessary to invest in a trained salesperson to increase sales conversion rates and raise sales growth, or to reduce the fixed cost base.

In the case of a solar integrator which is mostly active in the middle market /commercial segment, we see that the average number of monthly project sales already exceeds the number required to break even, therefore this segment already appears to be profitable.

The average payback period for residential systems is in the range of 5 to 6 years, and for commercial systems (Low Tension Grid) it is as low as 4 to 5 years. For industrial systems, average payback is around 7 years. Even with the scale benefits and lower prices that are inherent to larger industrial PV systems, the much lower Medium Tension grid price means payback periods are extended.

Source: Greener

Sponsor Information

Inverter Manufacturers

www.fronius.com.br

sac@fronius.com

Fronius is in Brazil since 20 years, supplying high technology in Soldering, Solar Energy and Battery Charging.

www.sungrowpower.com

latam@cn.sungrowpower.com

Sungrow is a global leader in inverter solutions for renewable energy projects with more than 68GW capacity installed around the world as of June 2018

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Canadian Solar is among the world's top 5 solar panel manufacturers, considered tier 1 in technology and quality, and market leader in the Brazilian DG solar market.

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www.trinasolar.com

daniel.pansarella@trinasolar.com

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Sponsor Information

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www.romagnole.com.br

comercial@romagnole.com.br

For more than 56 years, Romagnole has produced quality products for the electrical energy sector and the company offers a full line of products for mounting solar PV systems.

POLITEC
Soluções Eficientes em Aço

www.politec.eng.br

vendas@politec.eng.br

With a successful track record for more than 30 years, Politec supplies mounting structures for ground-based PV systems, solar trackers, and car ports, with currently 30MW installed and annual capacity of up to 200MWp.

Sponsor Information

Other Parts and Service Suppliers

PORTAL solar

www.portalsolar.com.br

contatol@portalsolar.com.br

The first and largest solar energy market place in Brazil. All the best brands, distributors and prices in the same place.

SOLAR group

www.solargroup.com.br

contato@solargroup.com.br

Solar Group works on new solutions for mounting solar PV systems in order to optimize them for common Brazilian roof types and reduce the time needed for installations.

Sponsor Information

Distributors

www.aldo.com.br

solar@aldo.com.br

ALDO has 35 years' experience and is well known for its logístics and efficiency. The company is active in 3 different segments: solar, drones and IT.

www.genyx.com.br

comercial@genyx.com.br

Genyx specializes in the import and distribution of photovoltaic equipment, in partnership with professional integrators, and offering support to find the best technical solution for each project.

Sponsor Information

RENOVIGI
ENERGIA SOLAR

www.renovigi.com.br

contato@renovigi.com.br

ovigi is committed to providing high tech solutions
nd is active in all parts of Brazil with world class
ducts. Aside from the high quality of the products
offer, the company distinguishes itself through
excellent technical support.

Distributors

phb Solar

www.energiasolarphb.com.br

contato@phb.com.br

Always in front, PHB Solar is a 100% Brazilian company, showing leadership and technical competence, and developing solutions for all types of Distributed Generation .

SICES Solar energia do futuro

www.sicesbrasil.com.br

comercial@sicesbrasil.com.br

Leading company in the field of distributed energy generation, supplying complete Photovoltaic Systems of varying sizes for connection to the electricity grid

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Strategic Market Study
Distributed Generation Photovoltaic Market
2nd Semester 2018

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