Results

WINDENERGY TREND:**INDEX**

AN ON- AND OFFSHORE WIND ENERGY SURVEY

wind:research

WindEnergy Hamburg
The global on- & offshore expo

Hamburg Messe in cooperation with Messe Husum Congress

windenergyhamburg.com

INTRODUCTION
OVERVIEW, PARTICIPATION

The participation was high during the first period; the second period achieved an even higher participation rate amongst the market participants. Representativeness is high throughout several categories.

Survey period	Participants	100 % Completed
1. Survey 2018 (March 16 – April 19 2018)	1,187	674
2. Survey 2018 (September 25 – November 9 2018)	1,655	958
Sum	2,842	1,632

Representativeness is high throughout several categories: regions, activities in the value chain, breakdown of production, segment (on- and offshore), area of responsibility. The distribution of response rates (based on IP addresses) among countries and regions approximates the market sizes of the countries and regions with regard to onshore and offshore wind. This means that the survey can be considered as highly representative. Only China, with a relatively strong isolated market and a low response rate, is underrepresented compared with the Asia region. This statement addresses the installed capacity onshore and offshore and the importance, or rather the market shares, of the wind energy industry (turbine, tower, foundation, project development, etc.).

INTRODUCTION

TASK, METHODOLOGY, PARTICIPANTS

*WindEnergy Hamburg, the world's leading expo for onshore and offshore wind energy, has prepared—in cooperation with wind**:research**, the leading market research institute for the wind energy sector—a "mood barometer" that measures the WindEnergy trend**:index** (WEtix).*

*The **first survey period** was from March 16 to April 19, 2018, during which period the online survey had roughly 1,200 responses, of which over 700 answered all questions. The **second survey period** was from September 25 to November 9 2018. In that period the survey had roughly 1,700 responses with approx. 1,000 participants answering all questions.*

The distribution of response rates (based on IP addresses) among countries and regions approximates the market sizes of the countries and regions with regard to onshore and offshore wind. This means that the survey can be considered as highly representative. Only China, with a relatively strong isolated market and a low response rate, is underrepresented compared with the Asia region. This statement addresses the installed capacity onshore and offshore and the importance, or rather the market shares, of the wind energy industry (turbine, tower, foundation, project development, etc.).

The distribution of key activities of the participants is still mostly focused on the onshore sector – more than double the amount of mentions than in the offshore sector; around 40% of the participants are active in both market segments.

The respondents are primarily active in production, mostly in turbine production. Operation and maintenance, project development, installation, and other segments are represented as well, in proportion to market shares.

Almost ¾ of the participating companies focus on Germany and/or Europe; North America, Asia, and the rest of the world are ranked similarly.

Management is the most highly represented category, at 25%. R&D, sales, and maintenance each account for roughly 10%.

On the following charts, "Germany" may be chosen separately but is also included in the "Europe" option.

SUMMARY

KEY FINDINGS – COMPARISON 1ST AND 2ND SURVEY

The second survey, online from September to November, had an even better return rate than the first, with almost 1,650 responders, of whom more than 950 answered all questions. Key findings are:

Return rate of the autumn survey 20-30 % higher than in spring. In total more than 2,800 participants!

Considerable deterioration in the assessment of the framework conditions to date for onshore wind energy in German: from 38 to 50 % negative.

Slightly better assessment of the framework conditions for onshore wind energy in Asia.

Framework conditions offshore wind: the mood in the margins increases

- In Germany the mood is declining, but less so in offshore than in onshore
- In North America and Asia improved

Market situation onshore (2018 -2020)

- An interesting development in Germany: the extreme margins (very negative – very positive) both increased
- Otherwise little change, Asia and ROW slightly better outlook

Market situation offshore (2018 -2020)

- Similar development to that in onshore (increase of extremes), though the less favourable mood is more noticeable for Germany
- Also here less negative and more positive counts for Asia and the US which indicates an improvement
- No major change in Europe, few neutral assessments at the expense of positive ratings, unfavourable assessments did not increase

SUMMARY

KEY FINDINGS

The second survey, online from October to November, had an even better return rate than the first, with almost 1,650 responders, of which over 950 answered all questions. Key findings are:

Consolidation: high intensity of consolidation expected, development still unclear, this affects onshore a bit more than offshore.

Digitalization: Again, fringe opinions are on the rise, with more respondents expecting lower potential; but the (clear) majority with an increasing share is expecting high or very high potential.

Technology: Remarkable change: Many respondents expect new technologies to enable high to very high cost reduction, but the level decreased a bit from spring to autumn

- Lower expectations for onshore than for offshore, but still almost half of the participants with high expectations
- Offshore still high and very high expectations from 2/3 of the (over 1,000!) participants, slight shift (2 %) from very high to high.

Distribution across the supply chain: less from production, but more in almost all the other parts of the supply chain (except installation)

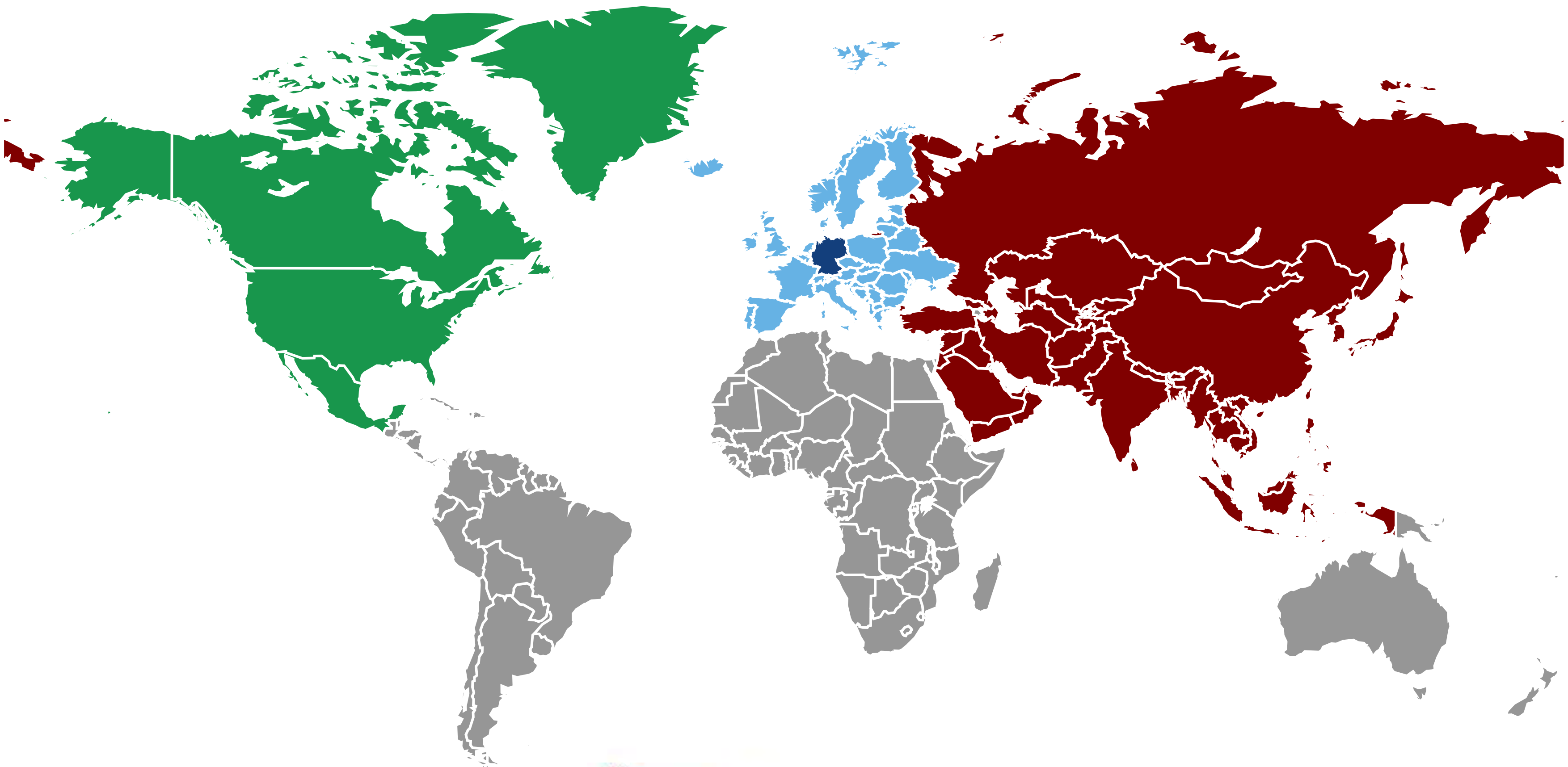
- In production basically evenly distributed across the main components (= representativeness)
- Noticeably more participation (relatively and also absolutely) from grid

Participants are less international, share of Asians and Europeans decreased

Respondent positions: Still large number of participants work in management positions (1/4), striking decrease of R&D (3 %)

MAP
OVERVIEW OF THE SURVEYED COUNTRIES

The leading on- and offshore wind nations and regions were defined for the poll. As the event took place in Germany, the team decided to list Germany separately from Europe. North America was another option to select. Rest of the World includes: Africa, Australia/Asia Pacific as well as Central and South America.

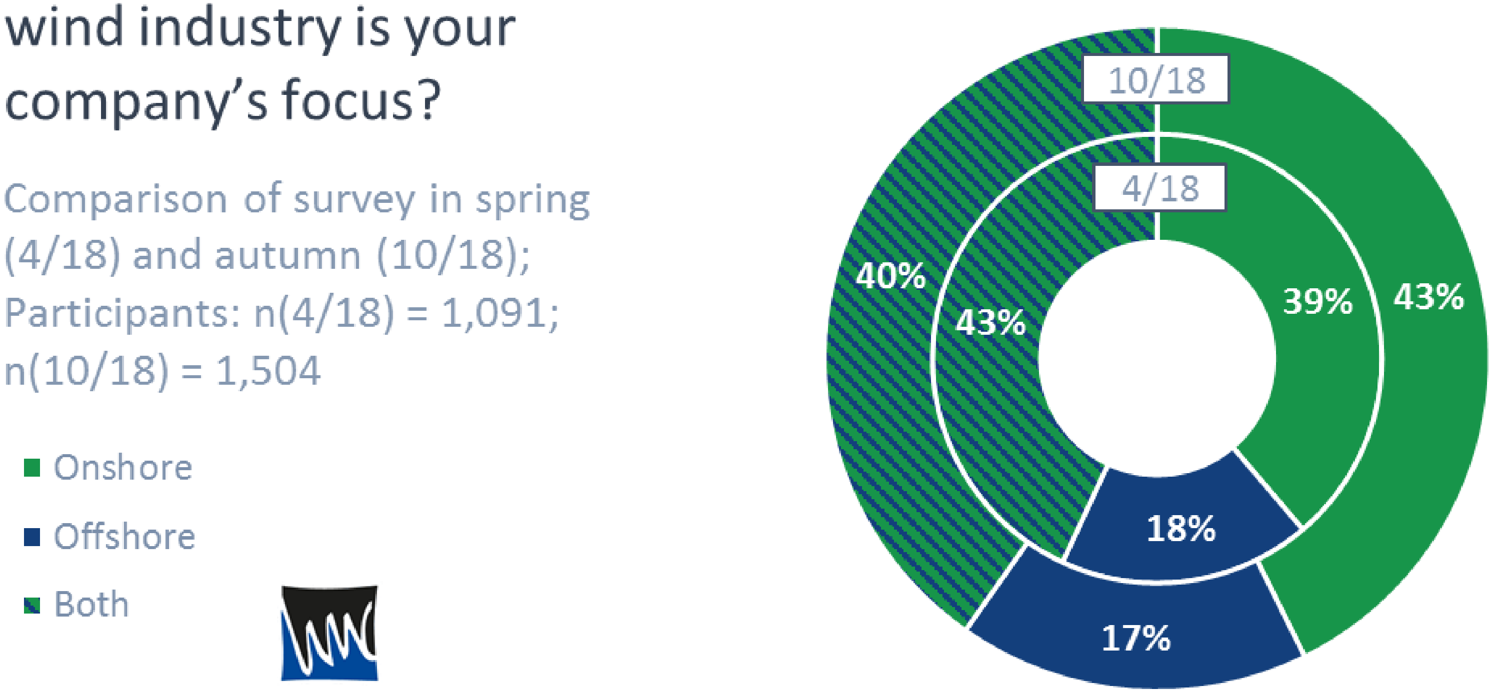


MARKET SEGMENT

Representativeness is still high; distribution is largely similar to first survey, slight change: more onshore at the expense of „both".

In which segment of the wind industry is your company's focus?

Comparison of survey in spring (4/18) and autumn (10/18);
Participants: n(4/18) = 1,091;
n(10/18) = 1,504

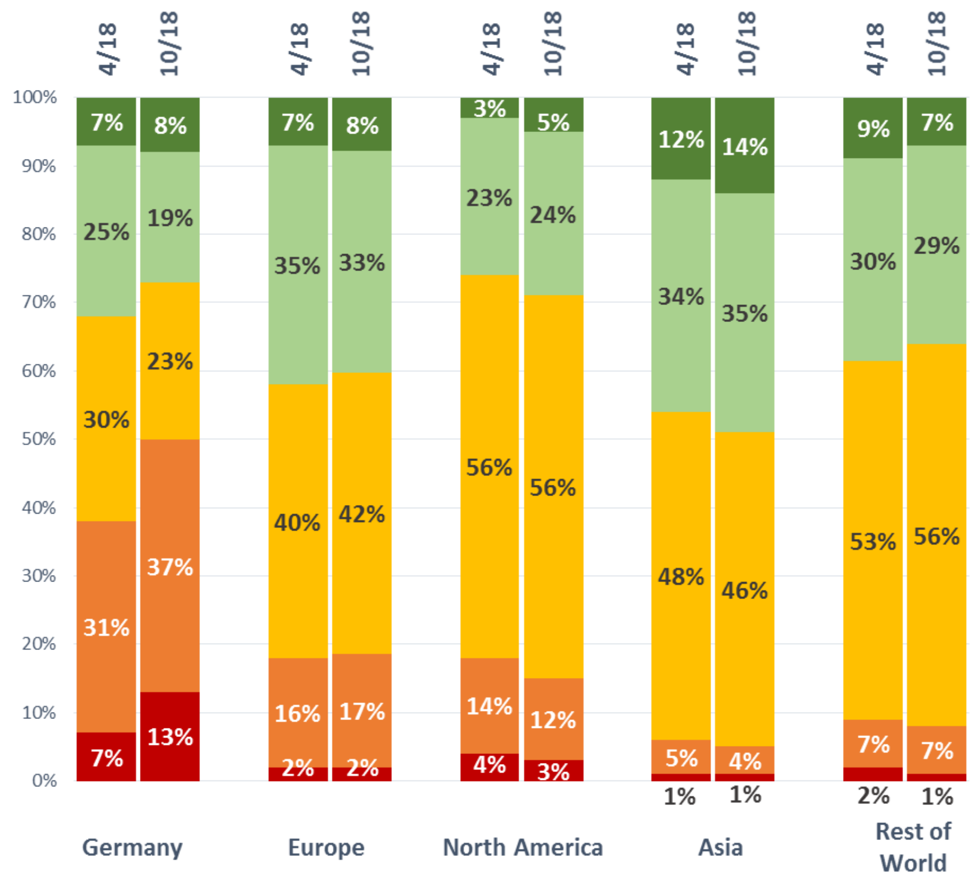


ASSESSEMENT OF THE FRAMEWORK CONDITIONS ONSHORE

Considerable decline in the assessment of the framework conditions for onshore wind energy in German: negative increased from 38% to 50%. Slightly better assessment of the framework conditions for onshore wind energy in Asia.

How do you assess the current development of the framework conditions for onshore wind energy (overall: legal, political and social)?

Comparison of survey in spring (4/18) and autumn (10/18); Participants: n(4/18) = 718; n(10/18) = 1,052



Very positive
Positive
Neutral
Negative
Very negative

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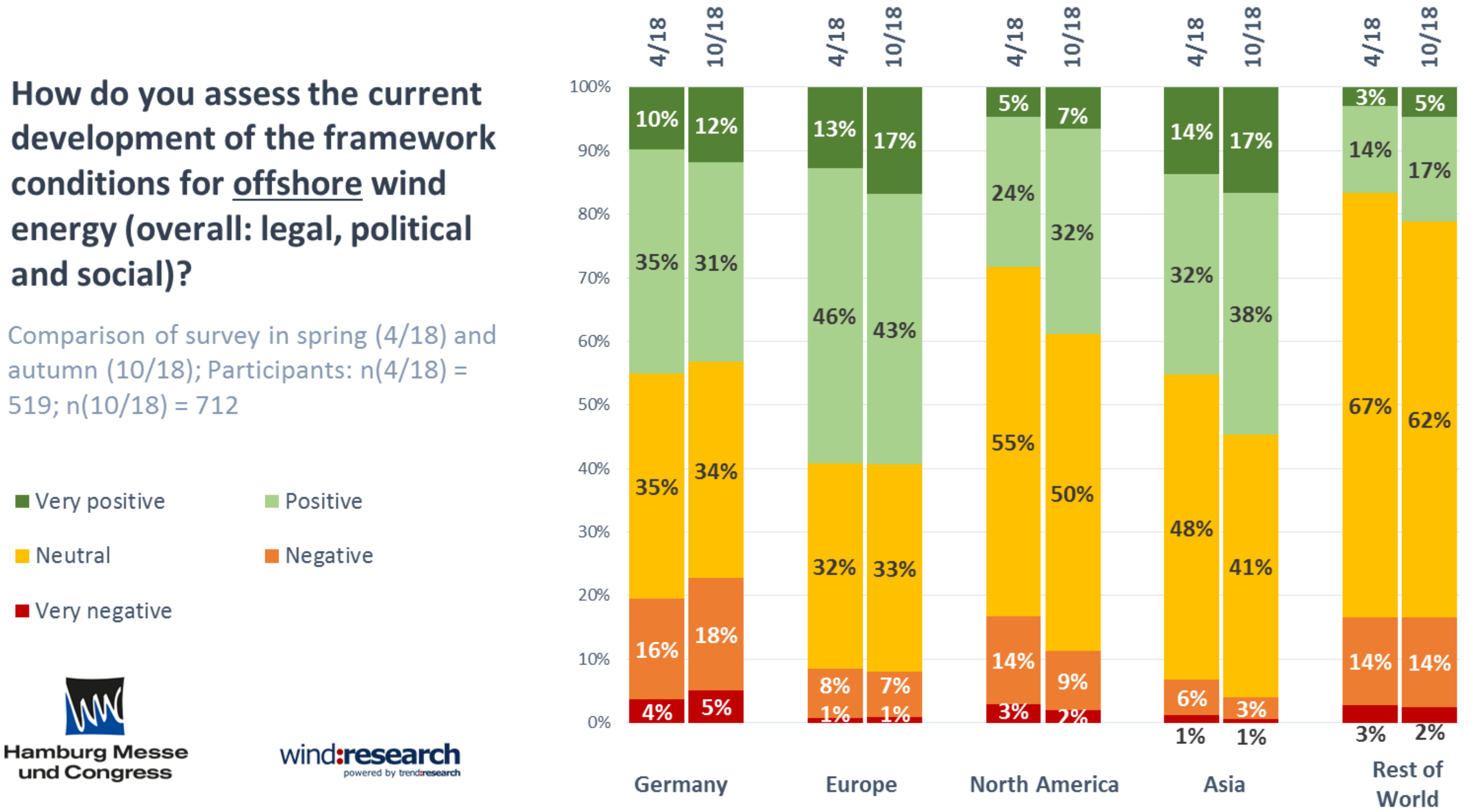
ASSESEMENT OF THE FRAMEWORK CONDITIONS OFFSHORE

Framework conditions offshore wind: the mood in the margins increases. Assessments in Germany less favourable, but not to the extent found in the onshore segment.

How do you assess the current development of the framework conditions for offshore wind energy (overall: legal, political and social)?

Comparison of survey in spring (4/18) and autumn (10/18); Participants: n(4/18) = 519; n(10/18) = 712



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ASSESSEMENT OF THE GLOBAL WIND MARKET – ONSHORE (COMPARISON 2018 – 2020)

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Market situation onshore (2018 -2020) - An interesting development in Germany: the extreme margins (very negative – very positive) both increased. Otherwise little change, Asia and ROW slightly better outlook

How do you assess the global market for the <u>onshore</u> wind industry in 2018?

Comparison of survey in spring (4/18) and autumn (10/18); Participants: n(4/18) = 648; n(10/18) = 946

- Very positive
- Positive
- Neutral
- Negative
- Very negative

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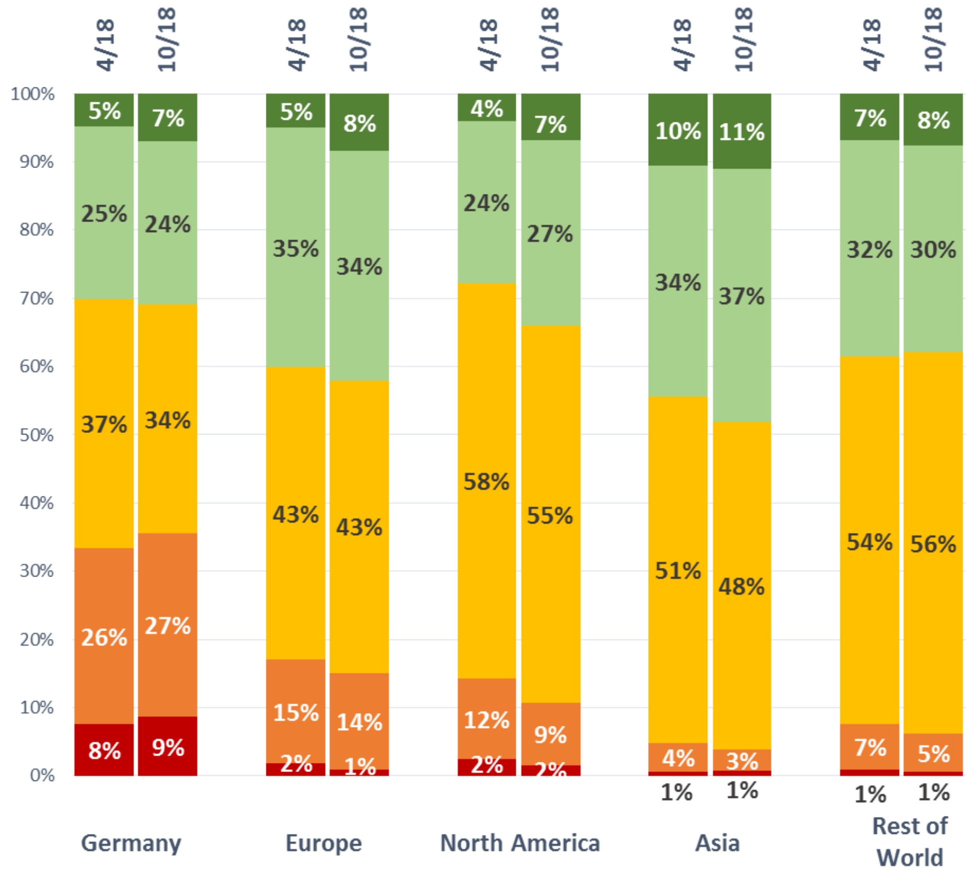

ASSESSEMENT OF THE GLOBAL WIND MARKET – OFFSHORE (COMPARISON 2018 – 2020)

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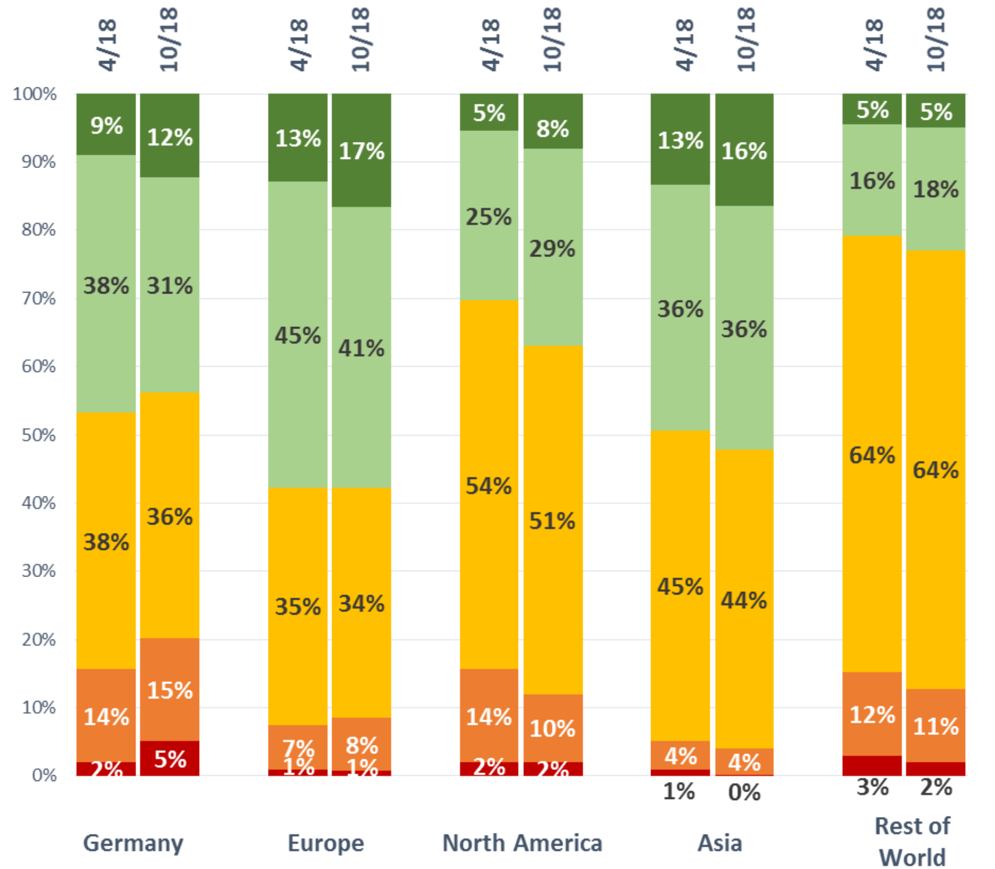
Market situation offshore (2018 -2020) - An interesting development in Germany: Increased fringe assessments (extremely negative or positive). Otherwise little change, Asia and ROW slightly better outlook

How do you assess the global market for the <u>offshore</u> wind industry in 2018?

Comparison of survey in spring (4/18) and autumn (10/18); Participants: n(4/18) = 466; n(10/18) = 633



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ASSESSEMENT OF THE GLOBAL WIND MARKET – ONSHORE (COMPARISON 2018 – 2020)

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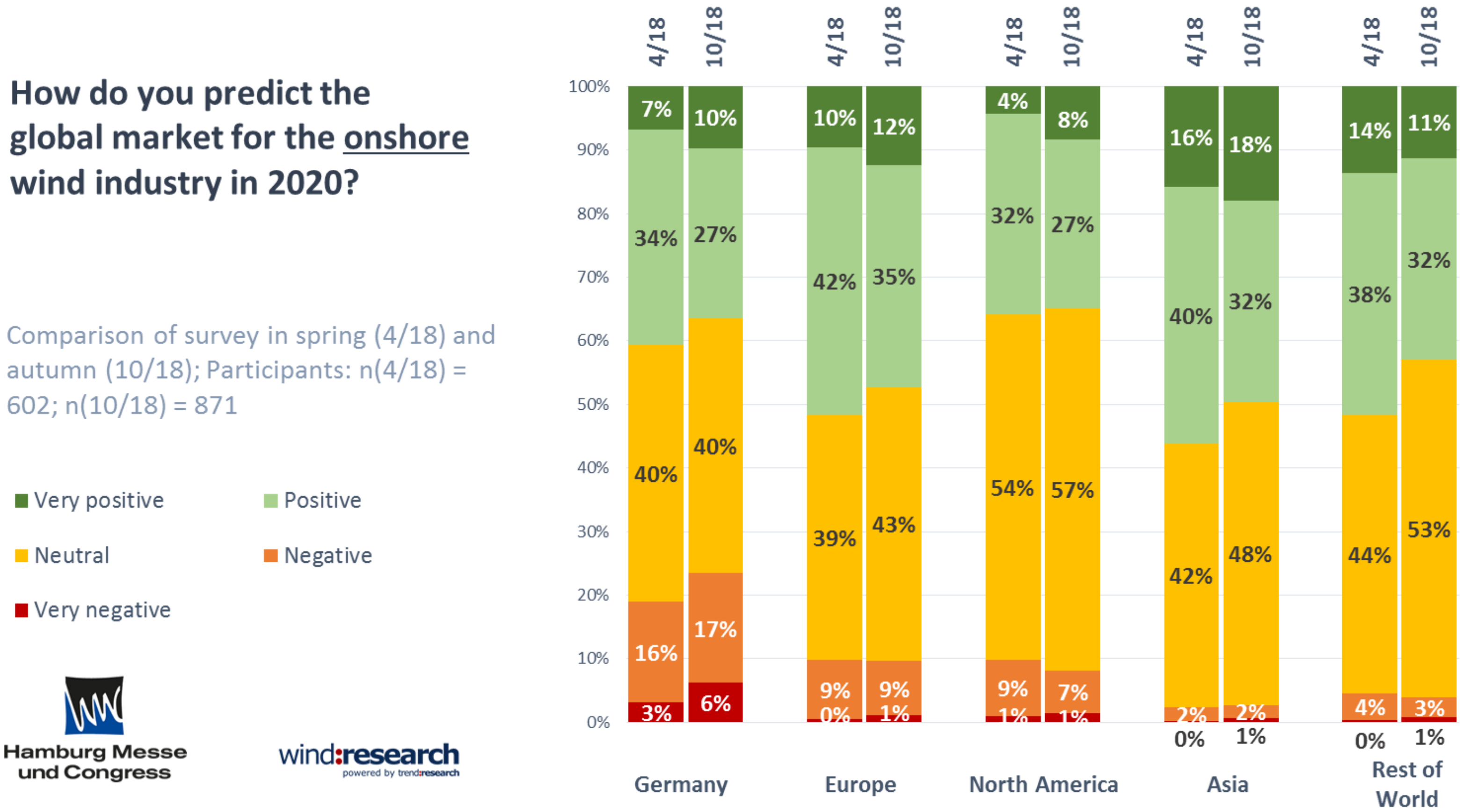
Market situation offshore (2018 -2020) - Similar development to that in onshore (increase of extremes), though the declining mood is more noticeable for Germany. Also here fewer negative and more positive counts for Asia and the US which means an improvement. No major change in Europe, and few neutral assessments at the expense of positive ones, unfavourable opinions not increased.

How do you predict the global market for the onshore wind industry in 2020?

Comparison of survey in spring (4/18) and autumn (10/18); Participants: n(4/18) = 602; n(10/18) = 871



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ASSESSEMENT OF THE GLOBAL WIND MARKET – OFFSHORE (COMPARISON 2018 – 2020)

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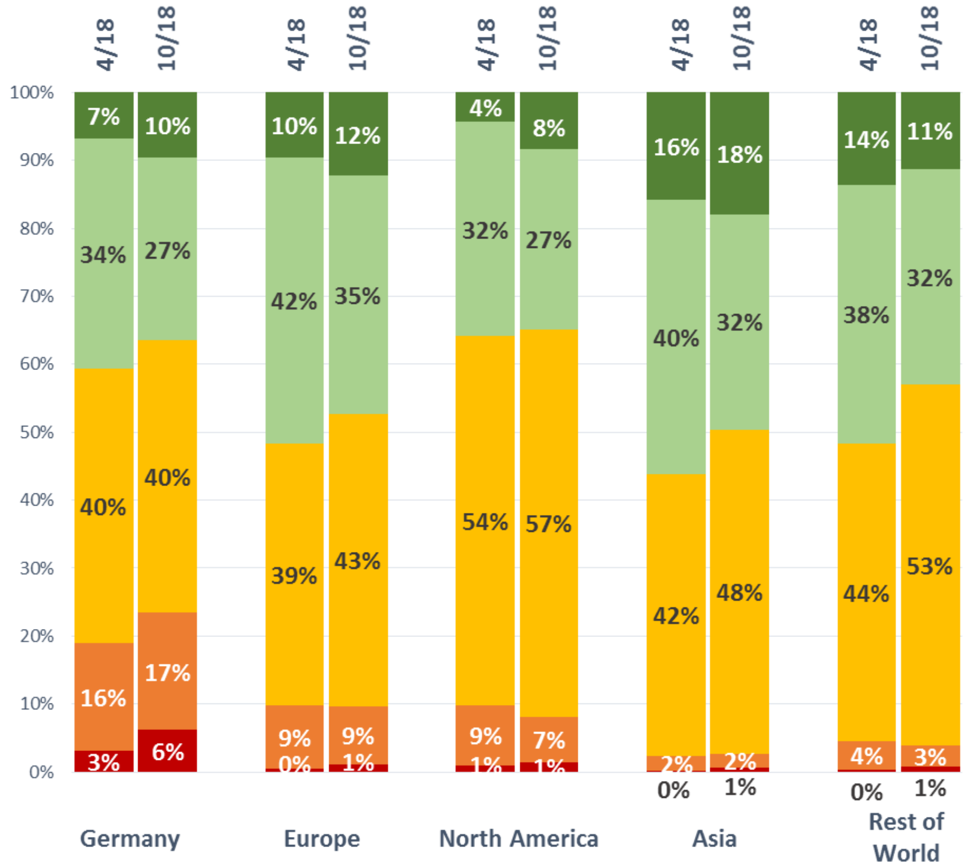
Market situation offshore (2018 -2020) - Similar development to that in onshore (increase of extremes), though the declining mood is more noticeable for Germany. Also here fewer negative and more positive counts for Asia and the US which means an improvement. No major change in Europe, and few neutral assessments at the expense of positive ones, unfavourable opinions not increased.

How do you predict the global market for the offshore wind industry in 2020?

Comparison of survey in spring (4/18) and autumn (10/18); Participants: n(4/18) = 431; n(10/18) = 573

- Very positive
- Positive
- Neutral
- Negative
- Very negative



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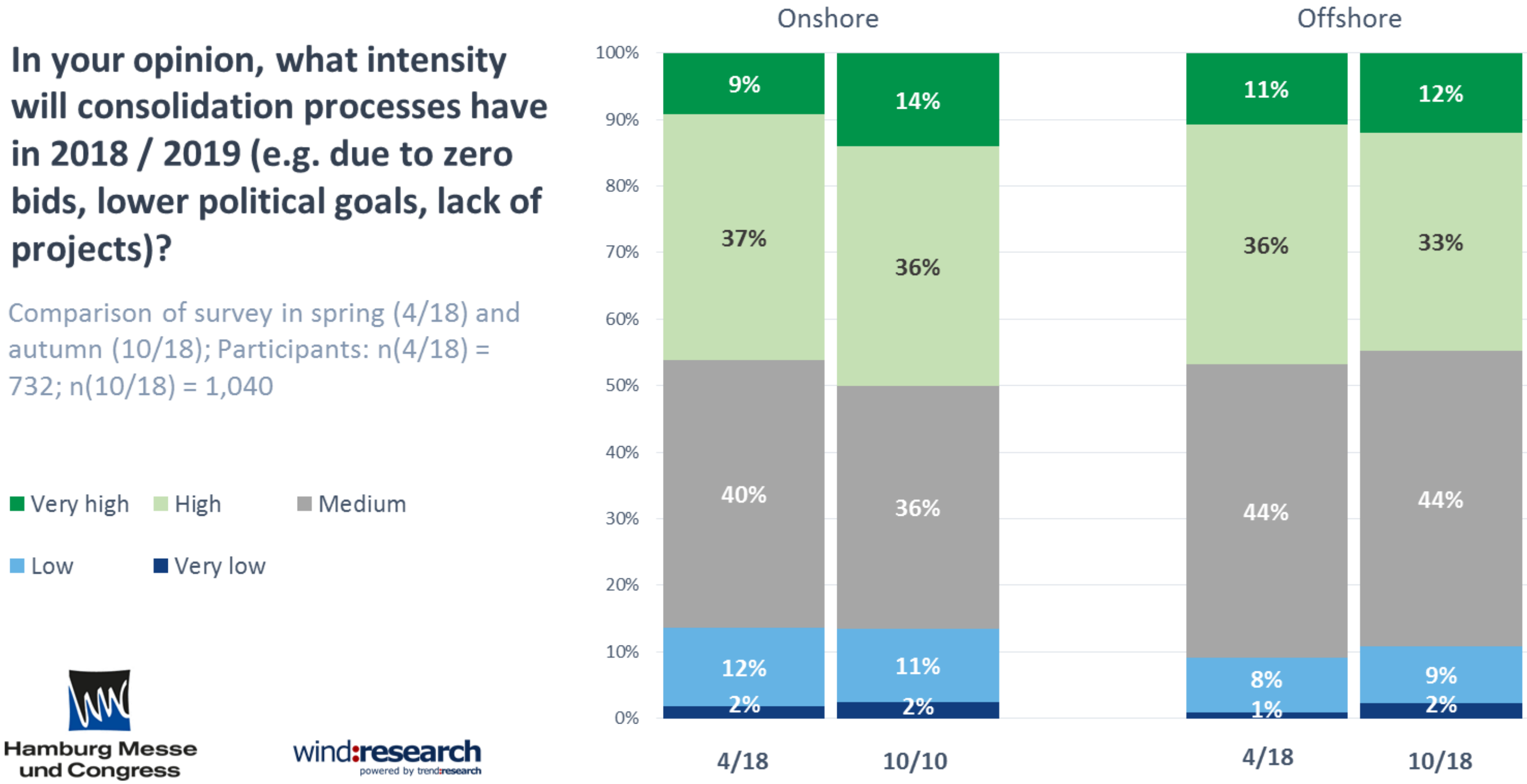
INTENSITY OF CONSOLIDATION PROCESSES

Consolidation: high intensity of consolidation expected, development still unclear, this affects onshore a bit more than offshore.

In your opinion, what intensity will consolidation processes have in 2018 / 2019 (e.g. due to zero bids, lower political goals, lack of projects)?

Comparison of survey in spring (4/18) and autumn (10/18); Participants: n(4/18) = 732; n(10/18) = 1,040



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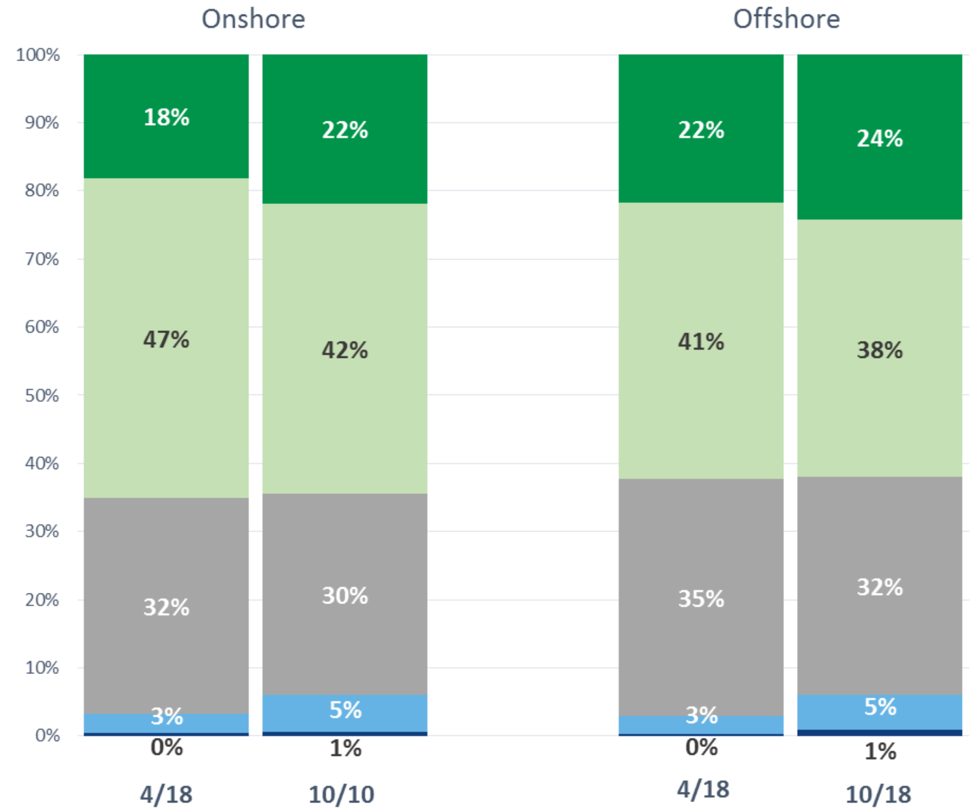
OPTIMIZATION THROUGH DIGITALIZATION

Digitalization: Here again extreme opinions increase: more are expecting lower potentials; but the (clear) majority with an increasing share is expecting high or very high potentials.

How do you assess further optimization potentials through digitalization (e.g. automation of wind farms, sector coupling, smart grids)?

Comparison of survey in spring (4/18) and autumn (10/18); Participants: n(4/18) = 720; n(10/18) = 1,019

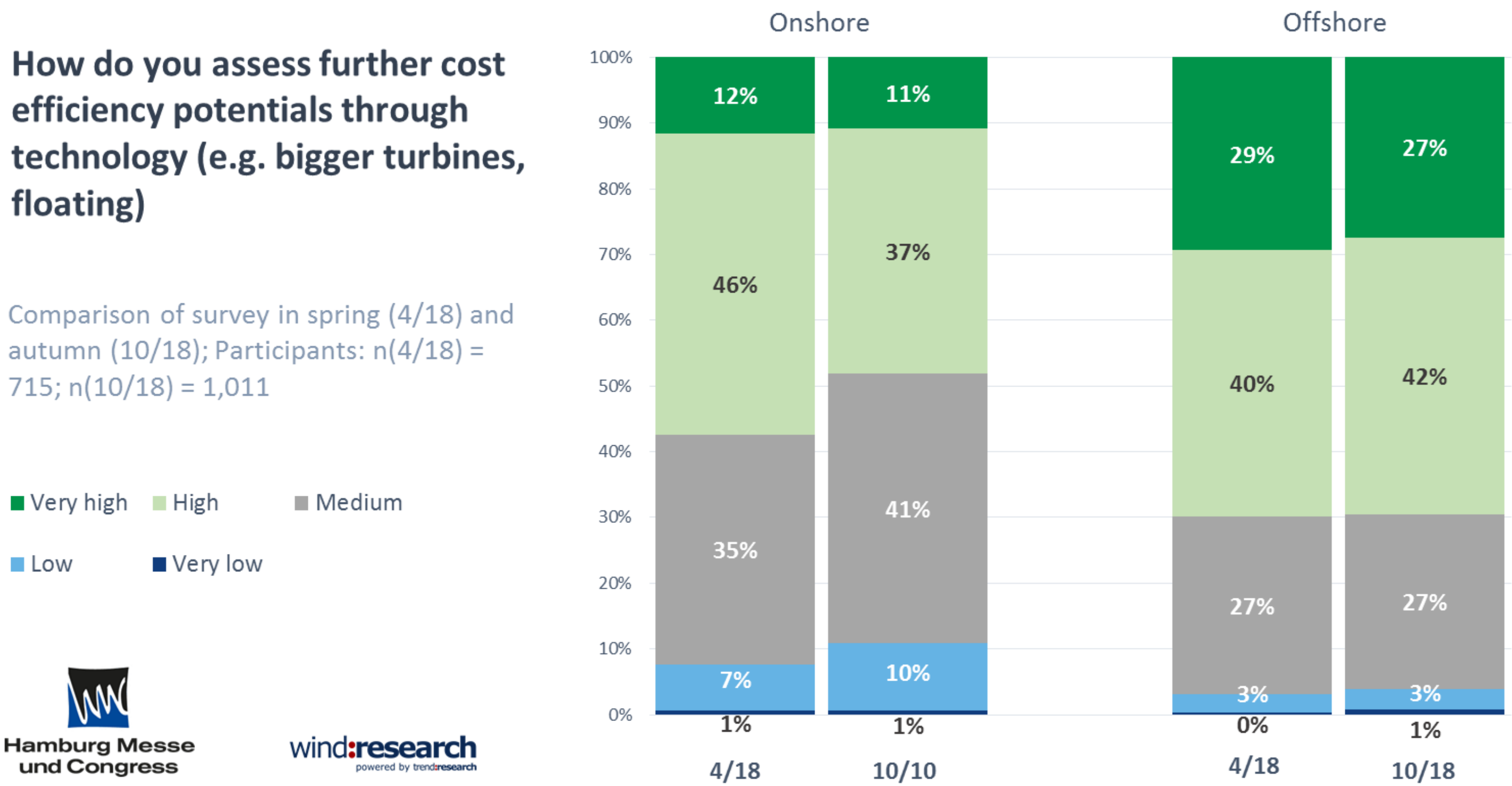


COST REDUCTION THROUGH NEW TECHNOLOGIES

Technology: high level of change - many are expecting high up to very high cost reduction potentials because of new technologies, but the level decreased a bit from spring to autumn. Onshore lower expectations than offshore, but still almost half of the participants with high expectations. Offshore still high and very high expectations from 2/3 of the (over 1,000!) participants, slight shift (2 %) from very high to high.

How do you assess further cost efficiency potentials through technology (e.g. bigger turbines, floating)

Comparison of survey in spring (4/18) and autumn (10/18); Participants: n(4/18) = 715; n(10/18) = 1,011



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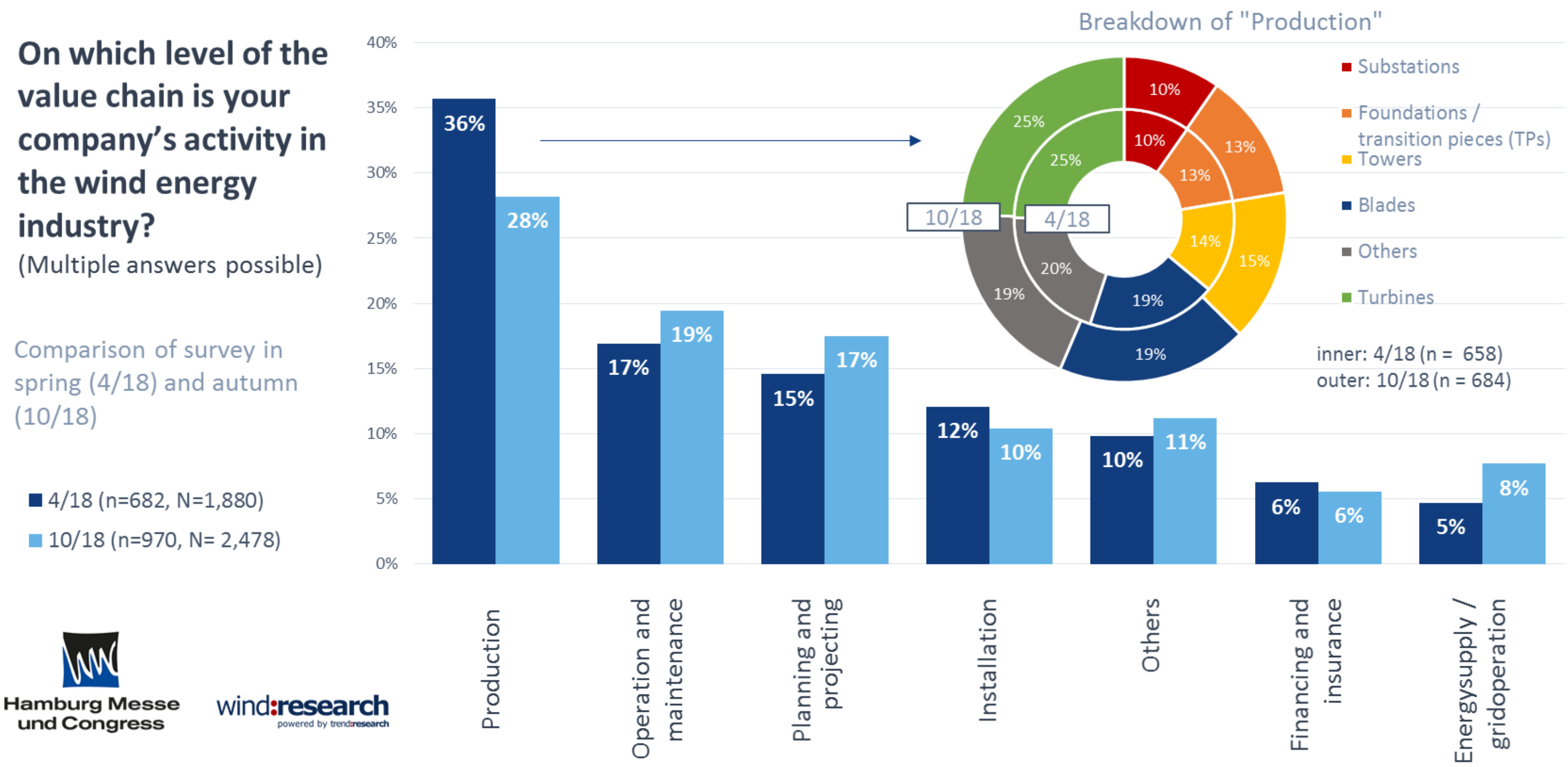
VALUE CHAIN ACTIVITES

Distribution across the supply chain: less from production, but more in almost all the other parts of the supply chain (except installation). In production basically even distributed across the main components (= representativeness). Noticeably more participation (relatively and also absolute) from grid.

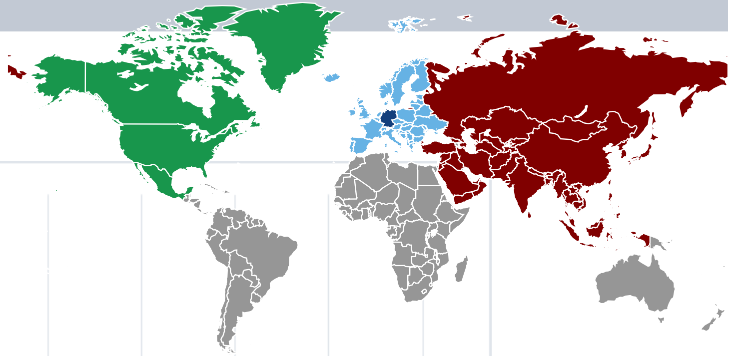
On which level of the value chain is your company's activity in the wind energy industry?
(Multiple answers possible)

Comparison of survey in spring (4/18) and autumn (10/18)



REGIONAL FOCUS

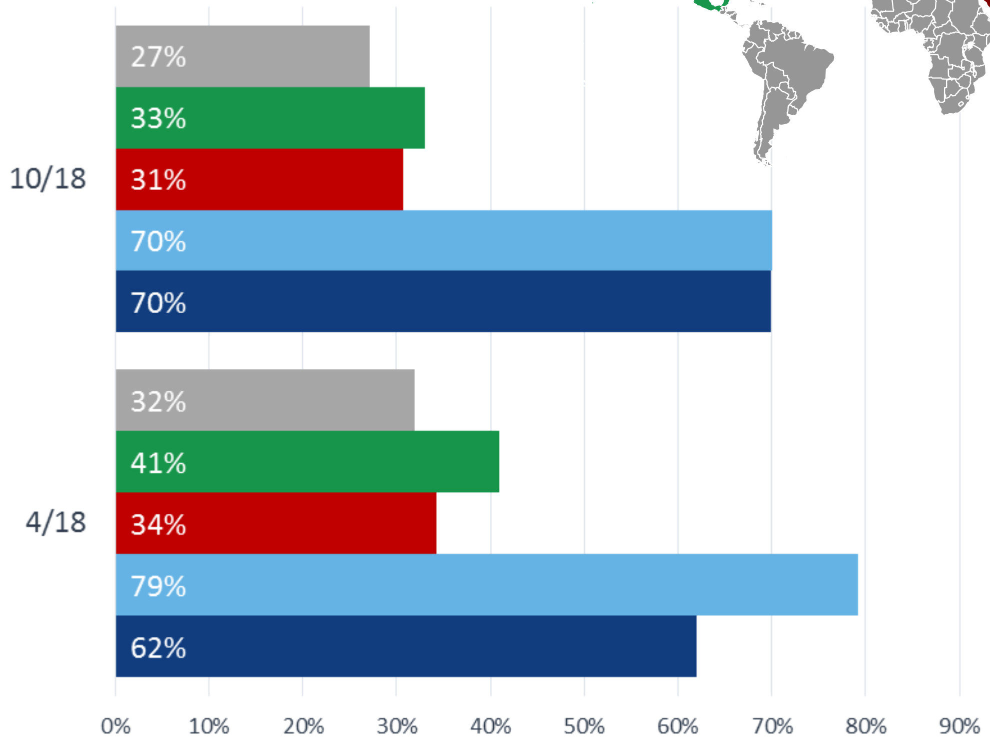
Participants are less international in total, since the number of german experts who participated in the second survey increased. The share of Asians and Europeans decreased.



On which countries is your company's focus?

(Multiple answers possible)

Comparison of survey in spring (4/18) and autumn (10/18); Participants:
n(4/18) = 681; N(4/18) = 1,690;
n(10/18) = 962; N(10/18) = 2,220



- Rest of the world
- North America
- Asia
- Europe (incl. Germany)
- Germany

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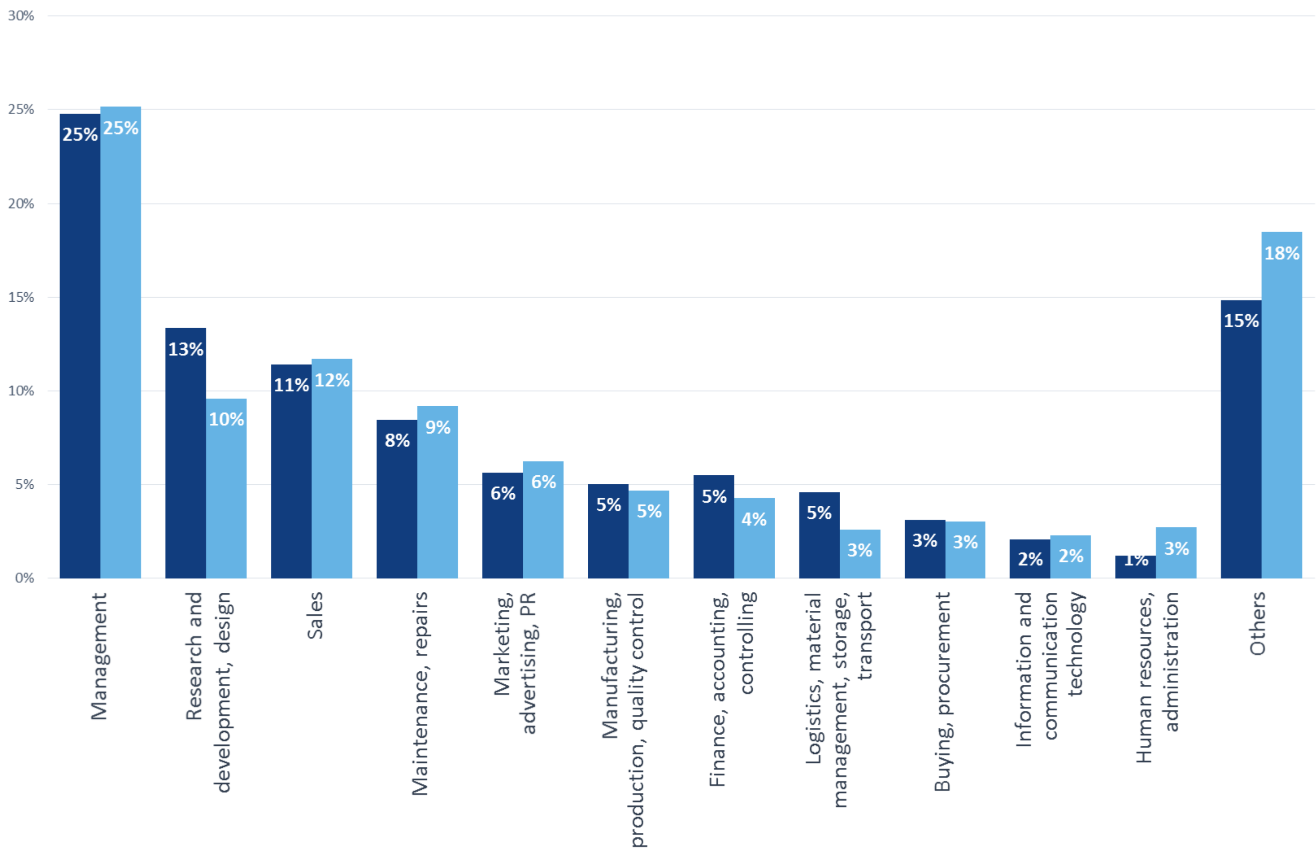
RESPONSIBILITIES OF THE PARTICIPANTS

Respondent positions: Still large number of participants work in management positions (1/4), striking decrease of R&D (3 %)

What is your area of responsibility?

Comparison of survey in spring (4/18) and autumn (10/18)



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