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REmap

Wind and Solar PV – what we need by 2050

Presenters:
Elisa Asmelash, REmap team | Gayathri Prakash, REmap team | Maisarah Kadir, REMap team

TUESDAY, 7 JANUARY 2020 • 10:00 – 10:30 CET

REmap - IRENA's Vision of the global energy transformation

- REmap is part of **Center of Excellence for Energy Transformation** work programme**,** with the objective to empower effective policy and decision-making with our knowledge and analysis on RE-based transformation
- REmap - shows **feasible**, **cost-effective** pathways to increase **low-carbon energy transformation** in the world's energy mix with a **2030 / 2050** horizon using a **bottom-up approach.**
- Identifies alternative **RE technology options for end-use sectors** (i.e. power, transport, industry, buildings)
- Based on **country engagement** – In cooperation with **70 countries** with more than **50 publications** and **datasets**
- Assesses **policy** and **investment** implications and **benefits** (economic, social, environmental)

Areas of implementation:

Global

- Design of technology pathways and **RE and EE options** in all sectors
- Assessment of **investment** and **benefits** at a global level

Regional

- Assessment of **technology options** and **regional disaggregation**
- Identification of key technologies and trends, and **cross-country opportunities**

Country

- **Insights for policy and decision makers** for areas in which action is needed at a country level
- **Output :** REmap / Renewable Readiness Assessment (RRA)

Thematic

- Provide **detailed technical and economic analysis** on specific topics (i.e. RE investments, stranded assets, district heating and cooling, **wind, solar,** etc.)

For more information on REmap and its publication, please visit irena.org/remap

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Methodology

Technology options to accelerate renewables deployment cost-effectively

Reference Case

What is the outlook of renewables with current / planned policies by 2030 / 2050?
Based on national energy plans and current policies and under consideration (both renewables and non-RE)

REmap Options

What is the additional potential of renewables beyond the Reference Case?
Additional potential of renewables beyond the Reference Case for an **accelerated RE transformation**

REmap Case

Reference Case + REmap Options

- Resource availability
- Access to finance
- Human resource needs and supply
- Manufacturing capacity
- Policy environment
- Age of existing capital stock
- Costs of technologies in 2030 / 2050

Cost-Benefit Analysis

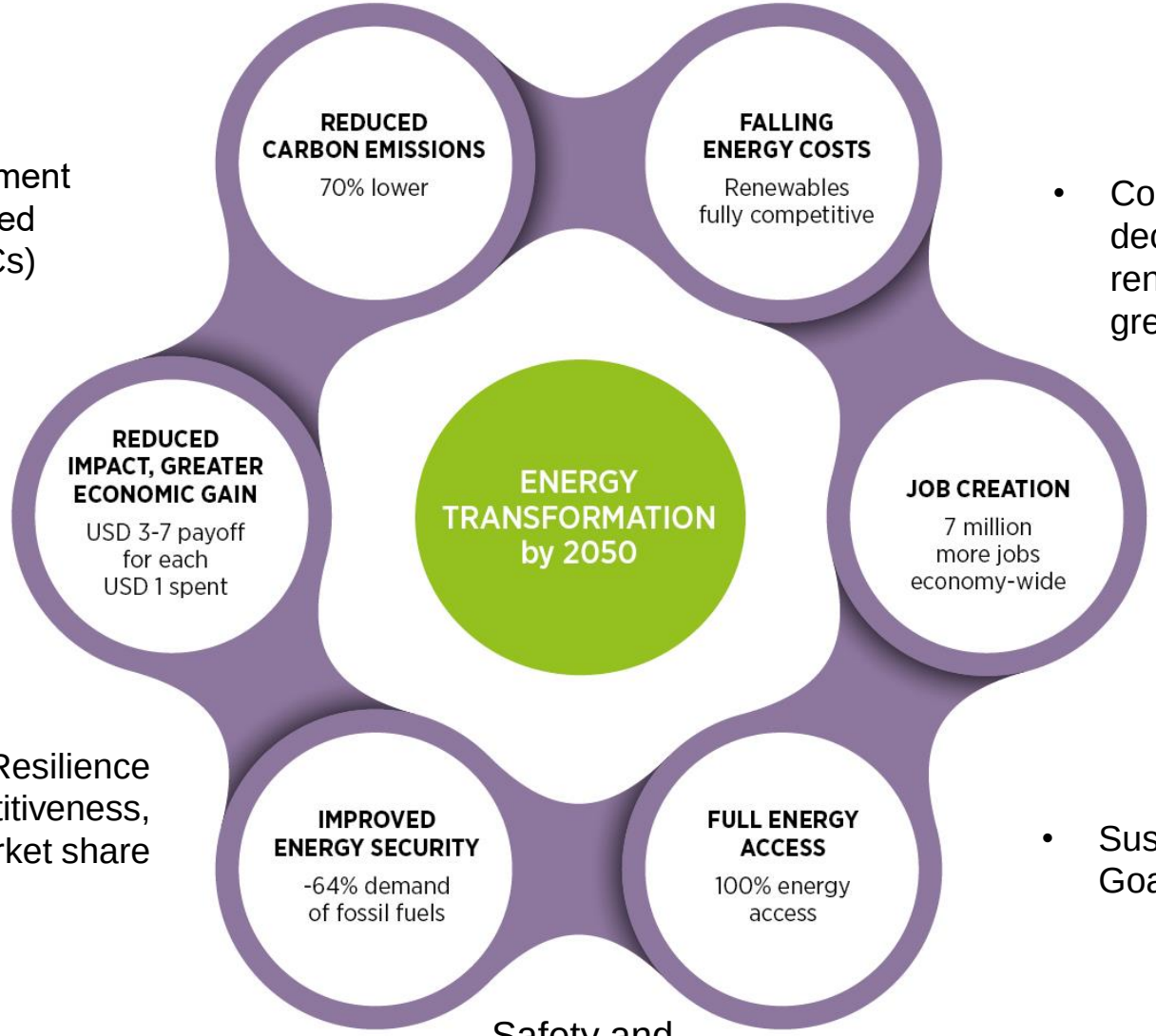
What are the costs and benefits (i.e. investments, system costs, avoided externalities, stranded assets) **and policy implications of the REmap Case?**

Pressing needs and attractive opportunities are driving the ongoing energy transformation

•Paris Climate Agreement
•National Determined Contributions (NDCs)

•Local pollution, per capita emissions, floods

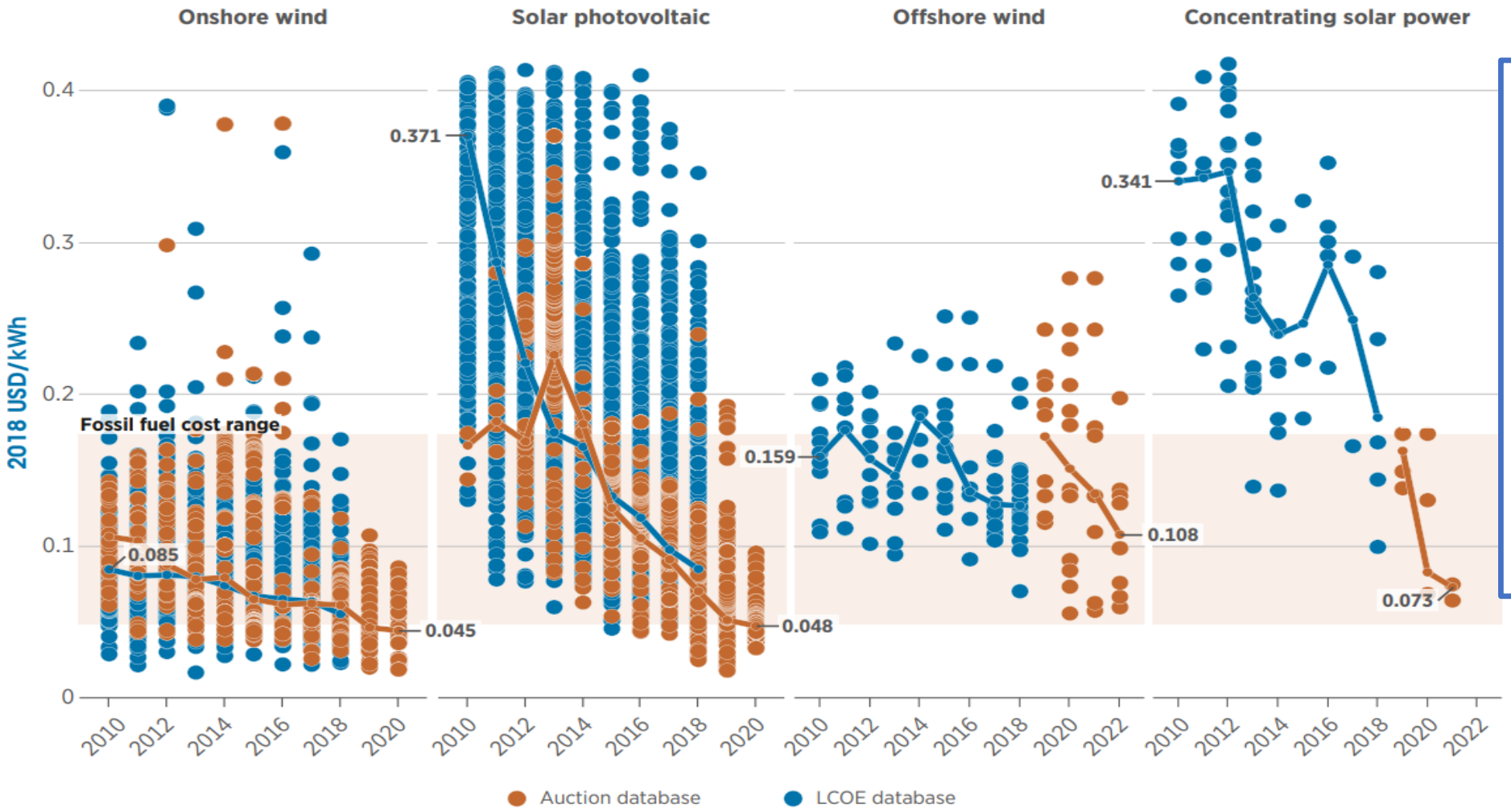
- Safety and Resilience
- Economy competitiveness, and exports market share



Safety and resiliency

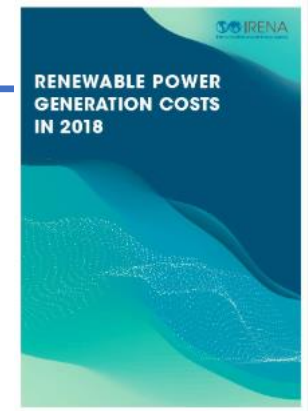
- Competitiveness, decreasing costs of renewables, fostering green growth
- Income and quality jobs
- Sustainable Development Goals (SDGs)

Wind and Solar PV - The strong business case: falling costs



IRENA costing database of 15,000 large scale RE power projects and 1.5 million rooftop PV systems

Covering half of all existing and planned RE capacity



Source: Renewable Power Generation Cost in 2018 (IRENA, 2019)

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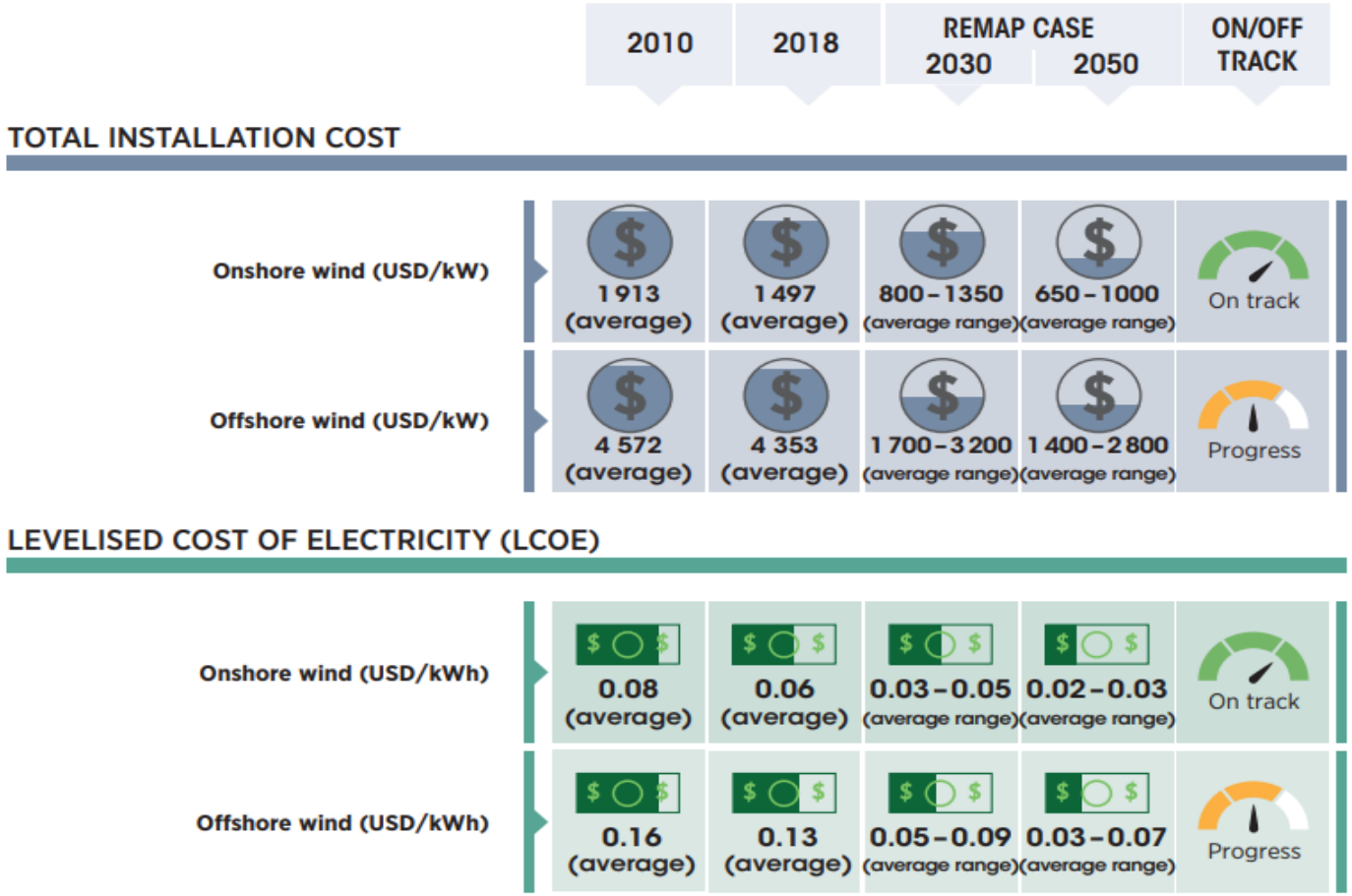
As costs continue to fall, wind project competitiveness and market share will grow



- **The LCOE for onshore wind is already competitive compared to all fossil fuel generation sources and is set to decline further as installed costs and performance continue to improve**
- **Offshore wind would be competitive in other markets across the world by 2030, falling in the low range of costs for fossil fuels (coal and gas)**

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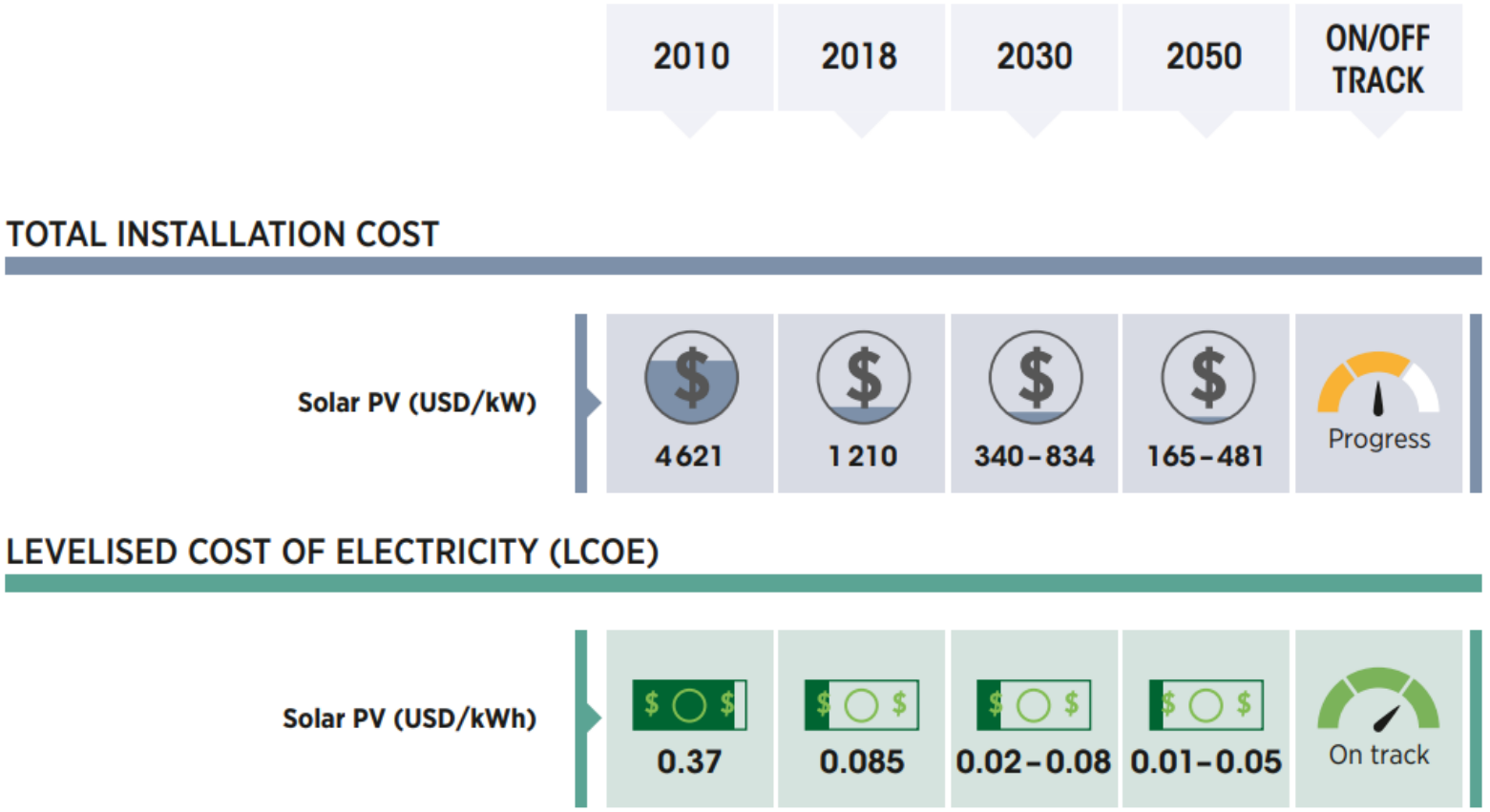
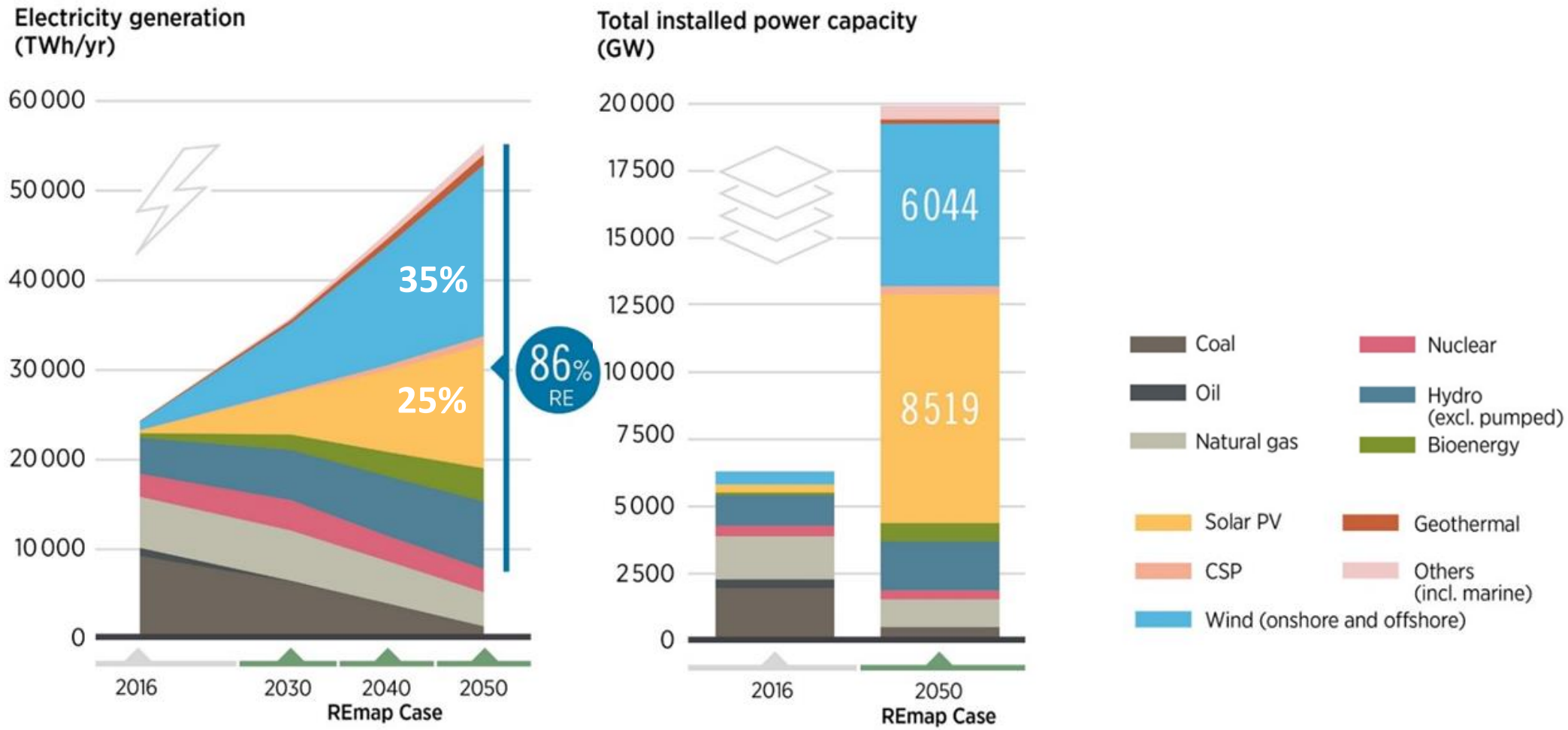
As costs continue to fall, solar PV projects will make good business sense and increase market shares



The LCOE for solar PV is already competitive compared to all fossil fuel generation sources and is set to decline further as installed costs and performance continue to improve

Note: Costs reflect utility-scale projects

Wind and solar PV would be prominent generation sources by 2050.



- **Wind power supply would need to increase from 6% in 2018 to 35% of total electricity needs by 2050.**
  - **Solar PV generation share would need to increase from 2% in 2018 to 25% by 2050.**

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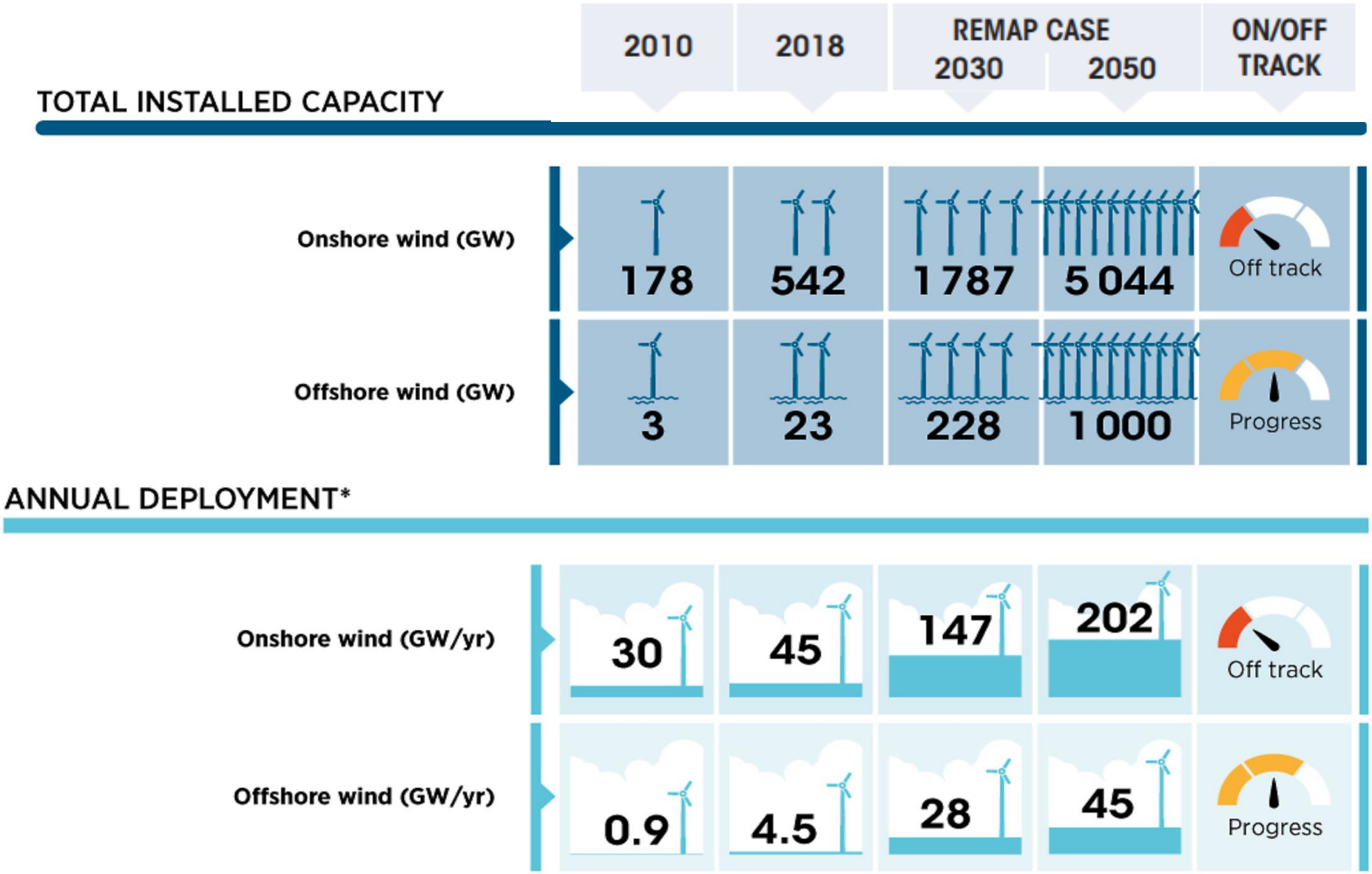
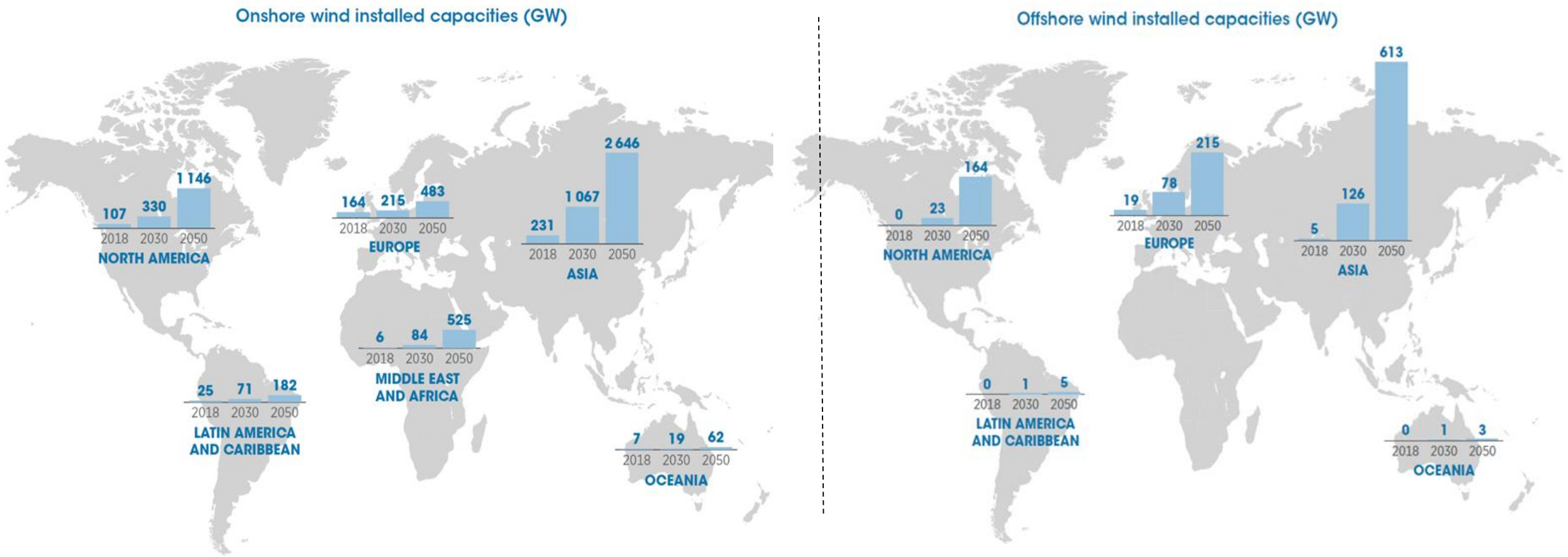
Wind capacities would need to be significantly scaled-up in coming decades.



Asia would largely drive the pace of wind capacity installations



- **Asia (mostly China and India) would continue to dominate the onshore wind power industry, with more than half of global installations by 2050, followed by North America (23%) and Europe (10%).**
- For offshore wind**, Asia would take the lead in the coming decades with more than 60% of global installations by 2050**, followed by Europe (22%) and North America (16%).
- **Floating offshore is potentially a game-changing technology** that multiplies the global offshore wind potential covering 5-15% of global offshore capacities by 2050.

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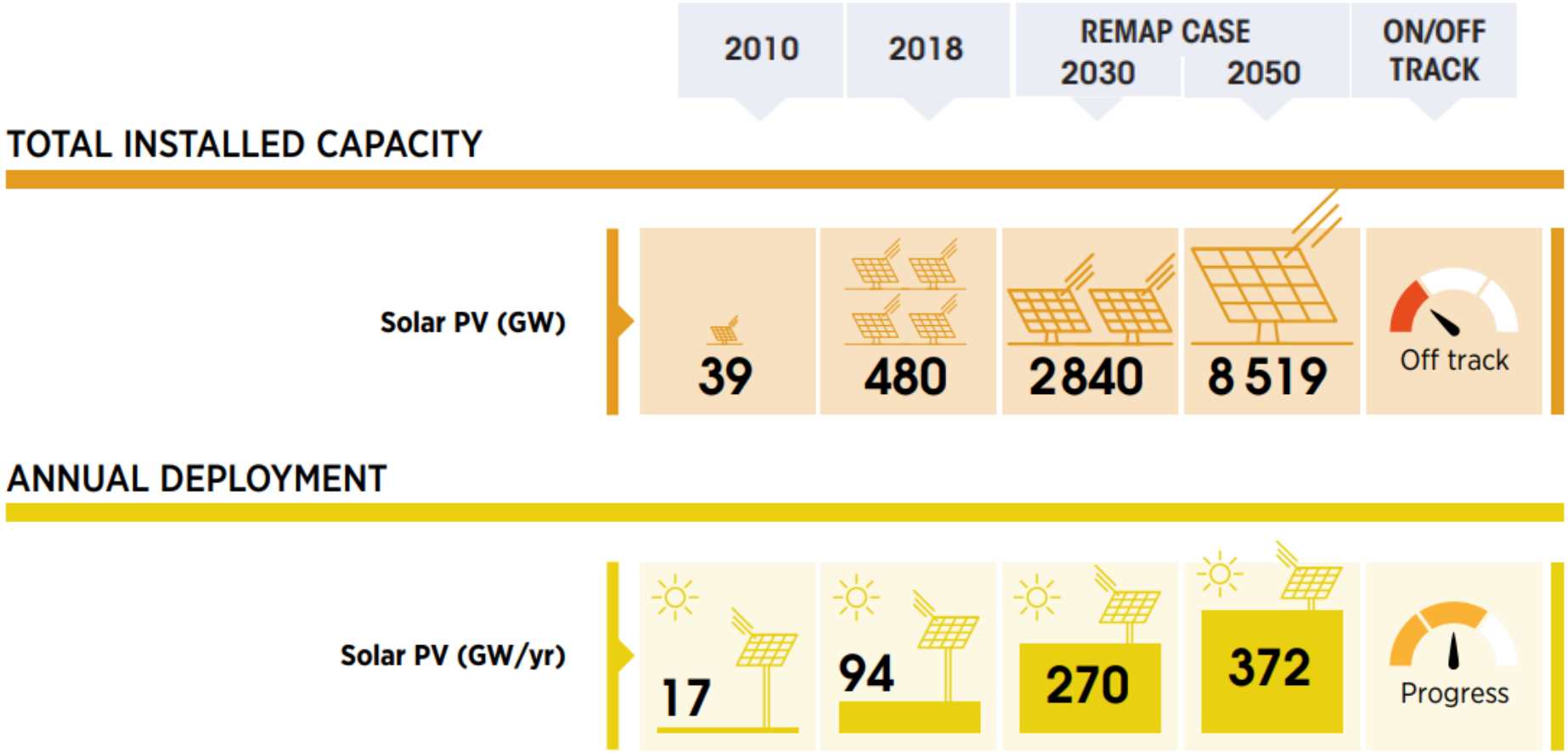
Solar PV capacities would need to be significantly scaled-up in coming decades.



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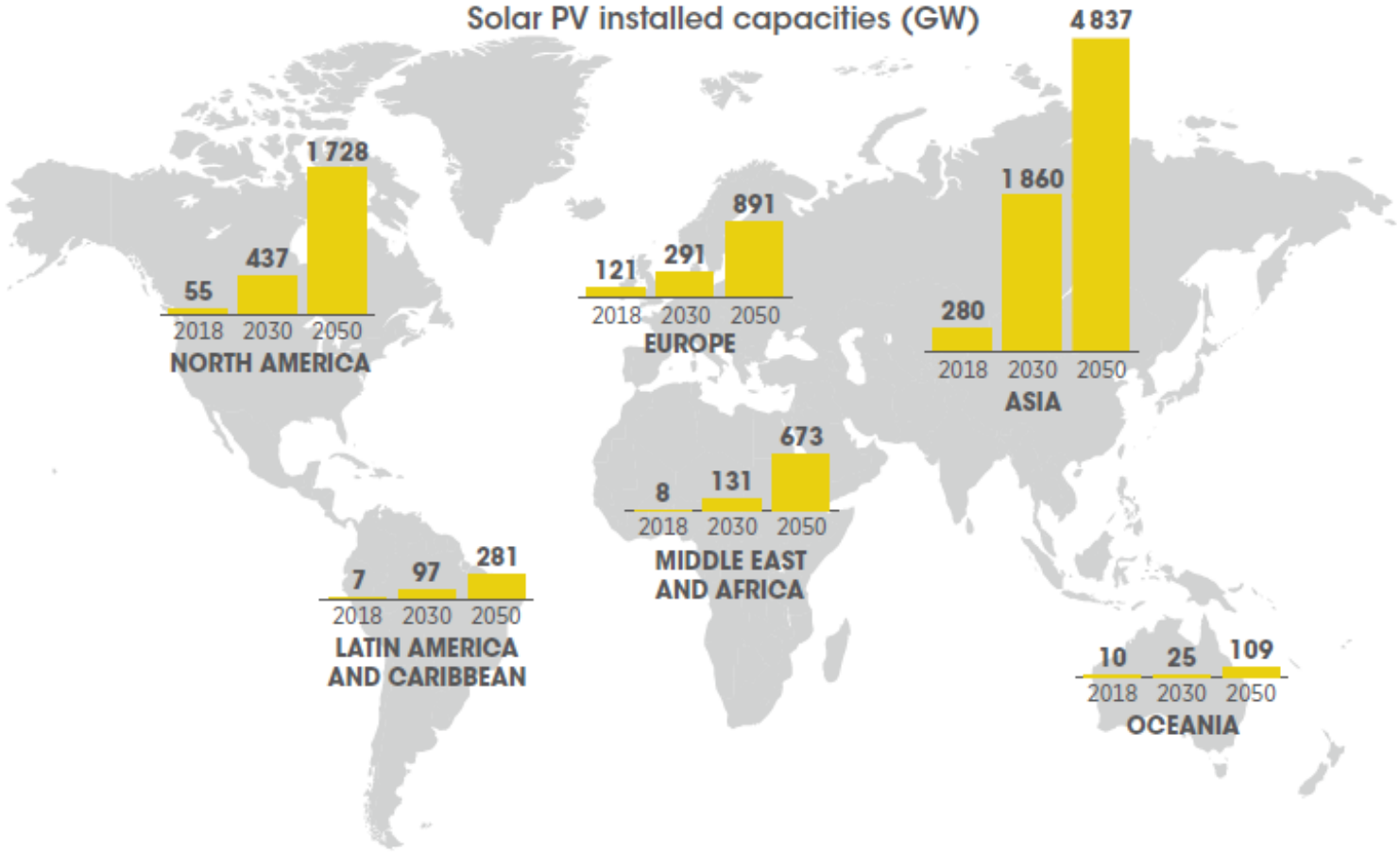
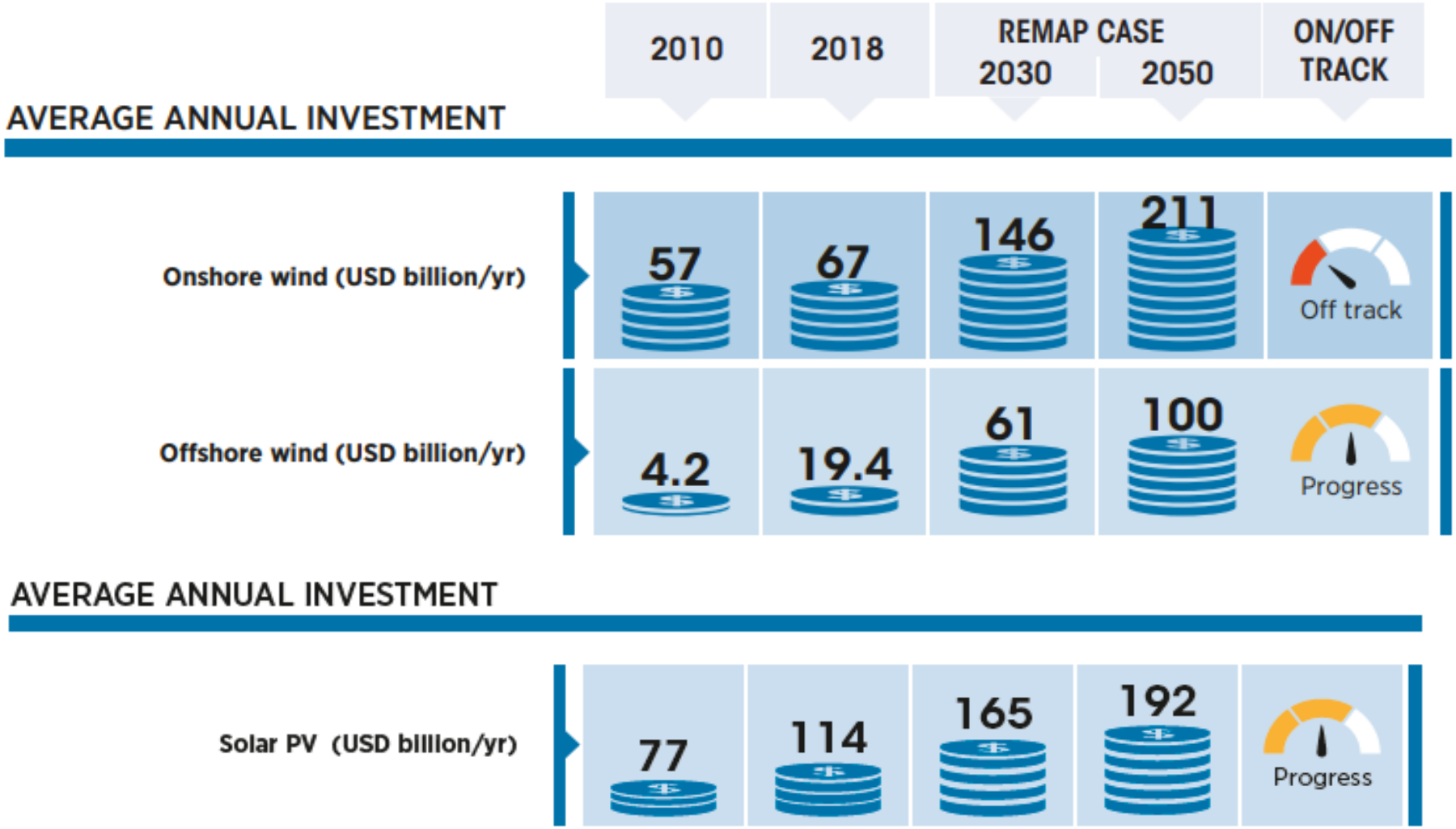
Asia would largely drive the pace of solar PV capacity installations



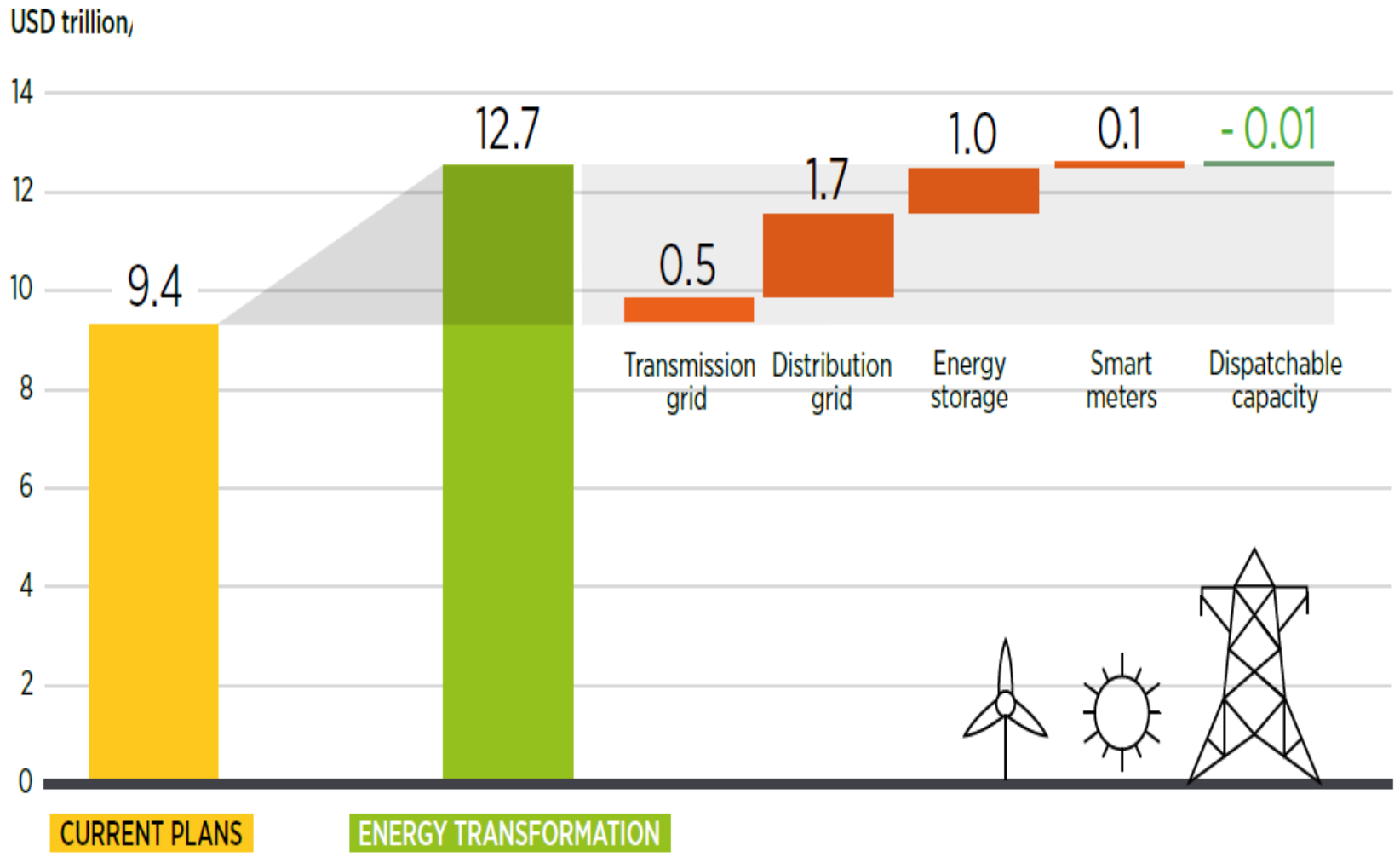
- **Asia (mostly China) is poised to dominate the solar PV installations, with more than half of global installations by 2050, followed by North America (20%) and Europe (10%).**
- Even though installed capacity may remain highest in Asia, North America and Europe, market growth seems likely to shift to other regions, with **large markets also expected to emerge in South America and Africa.**

Scaling up annual investments is crucial.



Note: Figures include new and replacement of retiring capacity investments

Additional investments needed to integrate high shares of wind and solar PV generation



To prepare future power grids to integrate rising shares of wind power we need:

- **Technological solutions**
  - Deployment of adequate system flexibility measures (e.g., storage)
  - Extension and reinforcement of power grids)
- **Enabling market conditions and innovative business models**

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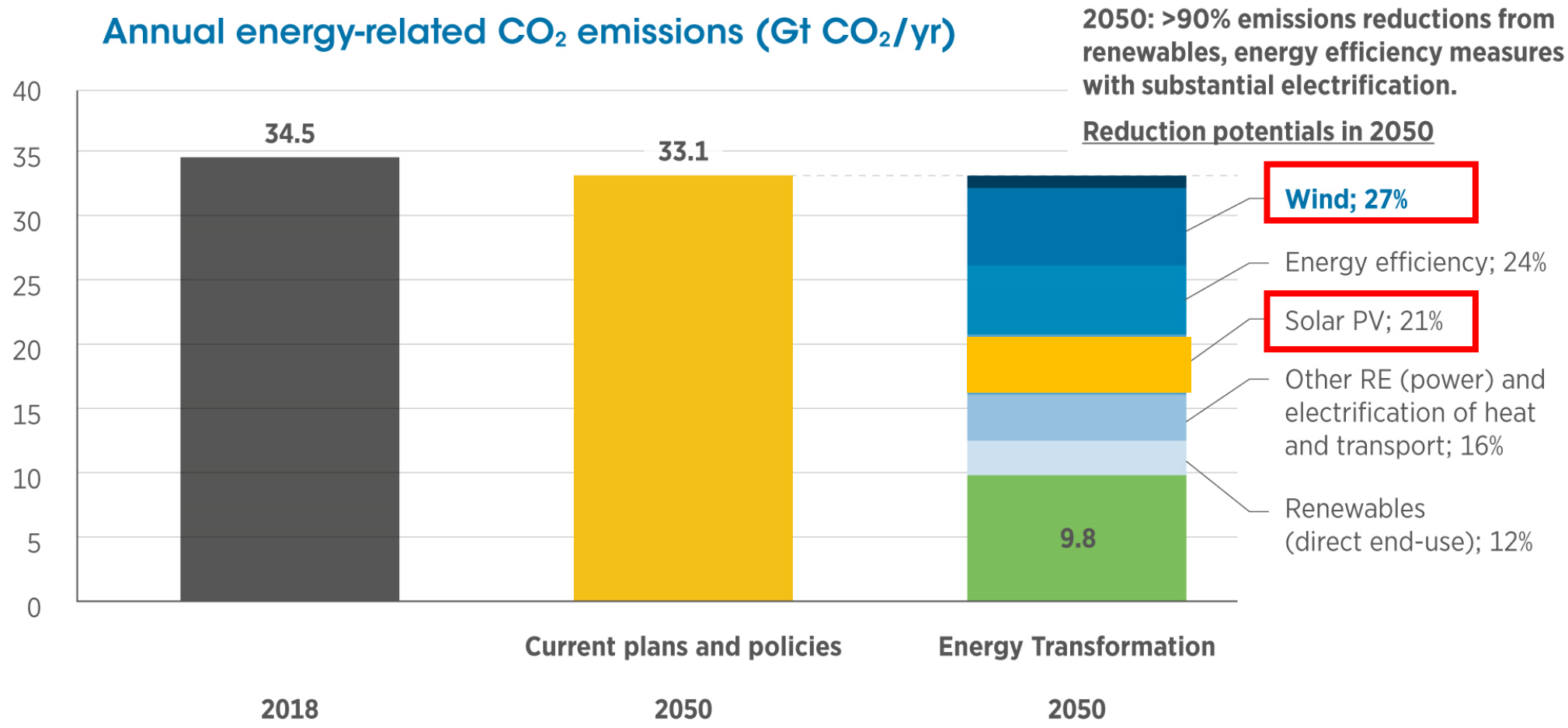
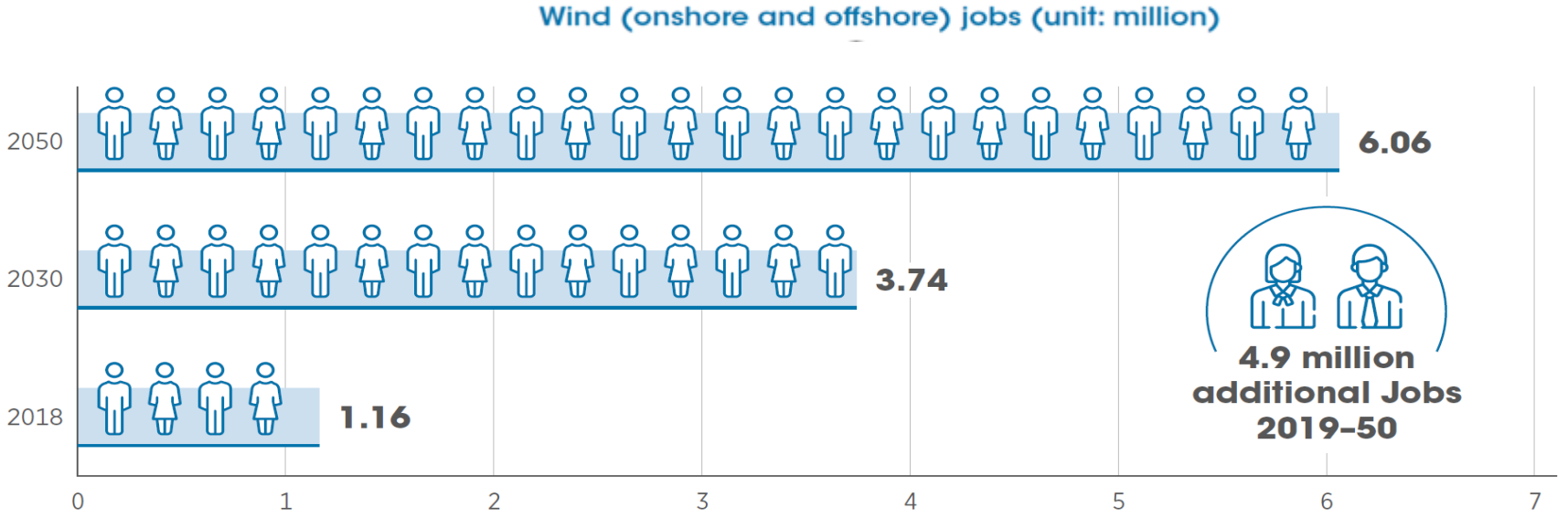
Wind and Solar PV would contribute to largest emissions reduction needs

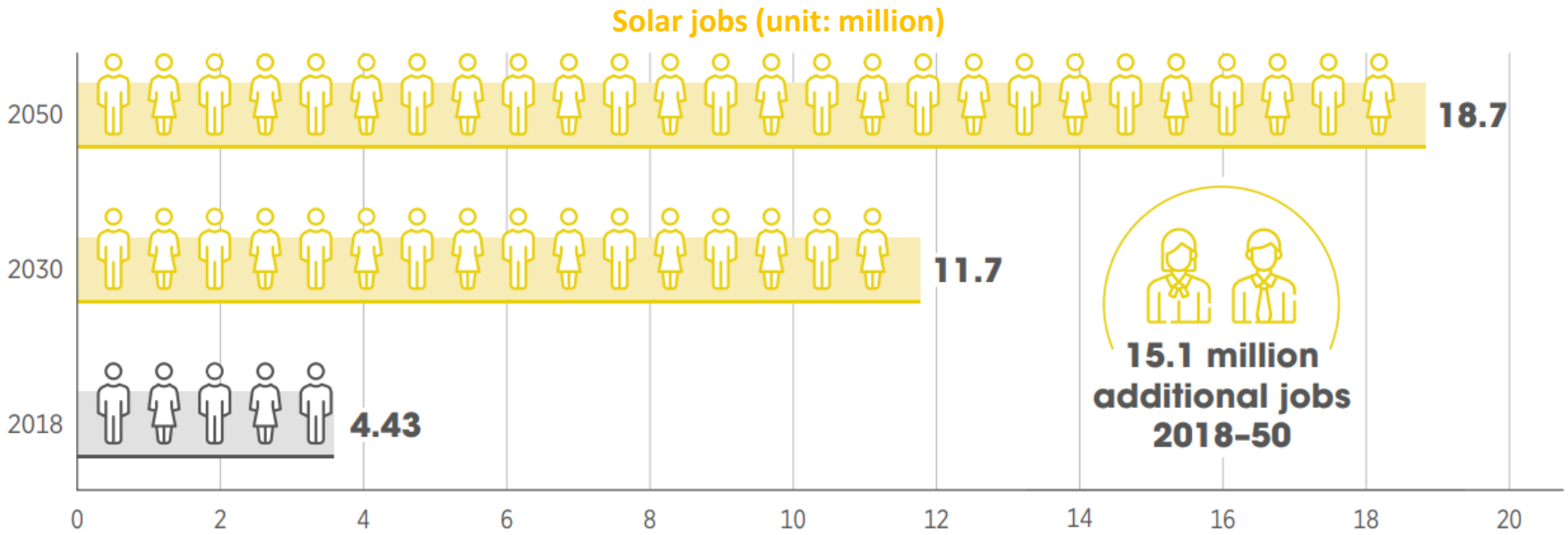


Accelerated deployment of wind and solar PV power generation when coupled with deep electrification would contribute to close to half of **total emissions reductions needed** (more than 11 gigatonnes of CO2) in 2050.

Impact: The global wind and solar PV industry would have an enhanced role as job motor



The number of jobs in the wind industry would increase more than five-fold from 1.16 million by 2018 to more than 6 million by 2050.



Employment in the solar industry will rise reaching 18.7 million in 2050, five times more than the 2018 jobs total (4.43 million)

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Wind: Key Challenges

TECHNOLOGICAL BARRIERS

- Grid connection and intergration challanges
- Lack of supporting infrastructure
- Concerns about technology maturity an performance
- Harsh offshore natural conditions

REGULATORY, POLICY AND SOCIAL BARRIERS

- Complex/outdated regulatory frameworks
- Insufficient financial policy support
- Lack of relevant standards and quality control measures
- Lack of skilled professionals and experience
- Lack of long-term & stable policy targets and well-coordinated policy mix
- Transportation of wind turbine components (ex: blades)

ECONOMIC AND MARKET BARRIERS

- High initial cost of capital and long payback periods
- Limited financing channels
- Immature offshore supply chains
- Evolving policies with impact on remuneration
- Carbon emissions and local air pollutants are not priced of fully priced

ENVIRONMENTAL BARRIES

- Impacts on marine life and species
- Visual impact
- Flicker
- Radar interfence
- Noise
- Land area usage
- Public opposition – NIMBY (Not in my back yard"

Grid access, public acceptance, planning procedures and planning uncertainties, economies of scale, access to finance, subsidies for traditional energy are among the key barriers.

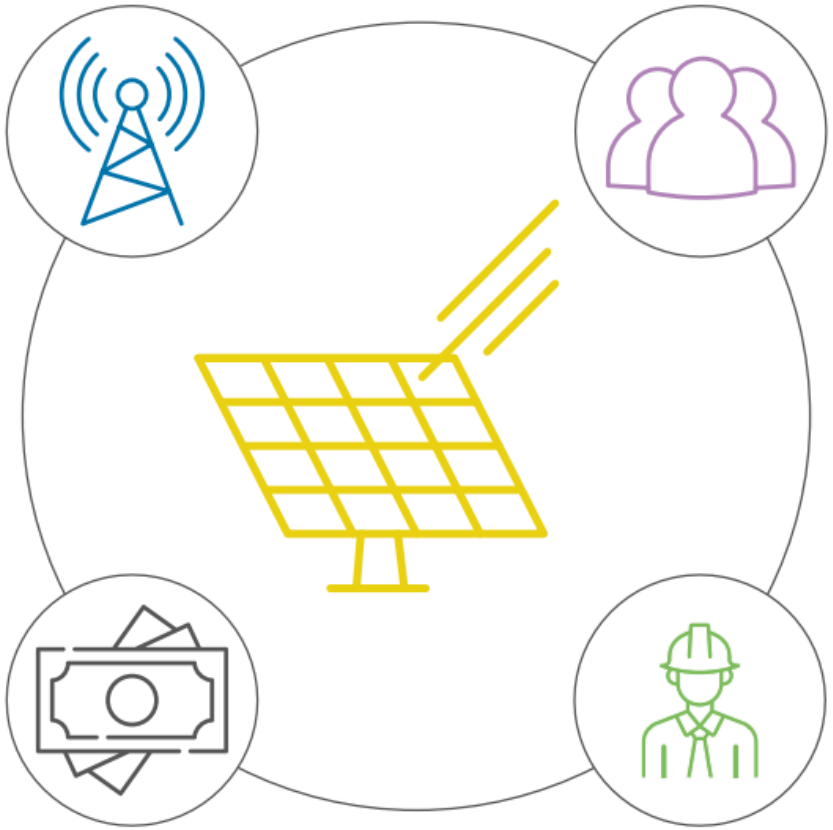
Solar PV: Key Challenges

TECHNOLOGICAL BARRIERS

- Grid-connection and integration challenges
- Grid-flexibility challenges
- Lack of capacity/skilled labour
- Architectural and space barriers

POLICY BARRIERS

- Complex/outdated regulatory framework
- Lack of long-term and stable policy targets and well-coordinated policy mix
- Lack of quality control measures
- Concerns about technology maturity and performance



MARKET AND ECONOMIC BARRIERS

- Long payback periods
- Carbon emissions and local air pollutants are not priced or fully priced
- Low wholesale power prices in countries with low levels of irradiation

REGULATORY, POLITICAL AND SOCIAL BARRIERS

- Lack of consumer information on performance, costs competitiveness and economics of solar PV
- Lack of relevant standards an quality control measures
- Lack of skilled professionals and experience

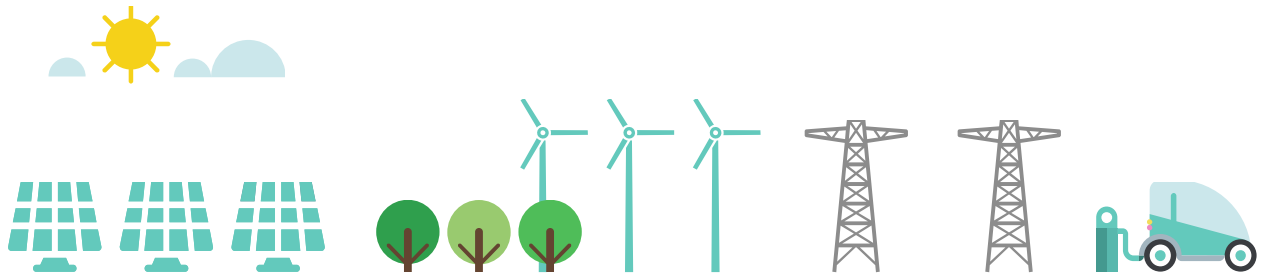
Grid integration and grid flexibility, economies of scale, access to finance, lack of standards and quality measures, consumer awareness are among the key barriers.

Major takeaways

1. **The energy transformation is both technically feasible and economically attractive, and its benefits significantly outweigh its costs.**

2. **Unlocking the massive potential of wind and solar PV is crucial to achieve the Paris Climate targets.**

3. **Together, we can shape a sustainable and more prosperous energy future - IT'S POSSIBLE!**



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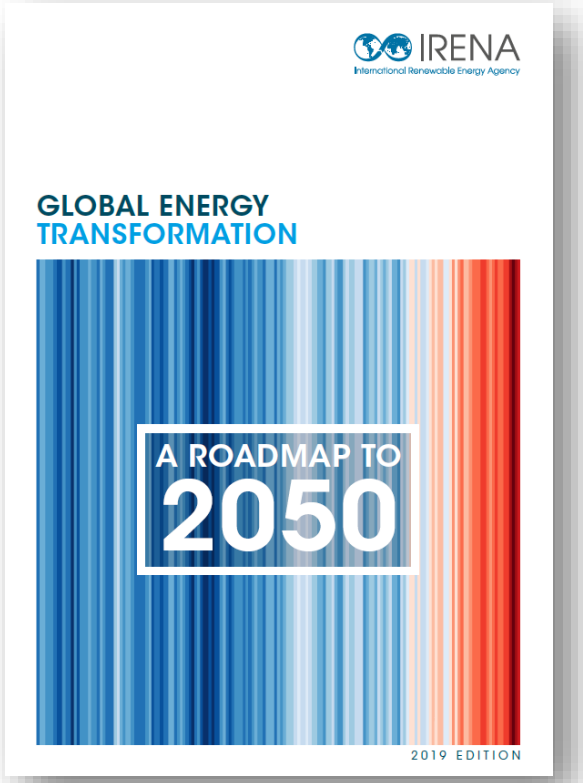
Related publications



Global Energy Transformation: A Roadmap to 2050
2019 edition

Global Energy Transformation: Future of Wind
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Global Energy Transformation: Future of Solar Photovoltaic
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