

RENEWABLES 2017

GLOBAL STATUS REPORT



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REN21 Renewables 2017 Global Status Report

→ The report features:

- Global Overview
- Market & Industry Trends
- Distributed Renewable Energy for Energy Access
- Investment Flows
- Policy Landscape
- NEW: Enabling Technologies and Energy Systems Integration
- Energy Efficiency
- Feature: Deconstructing Baseload



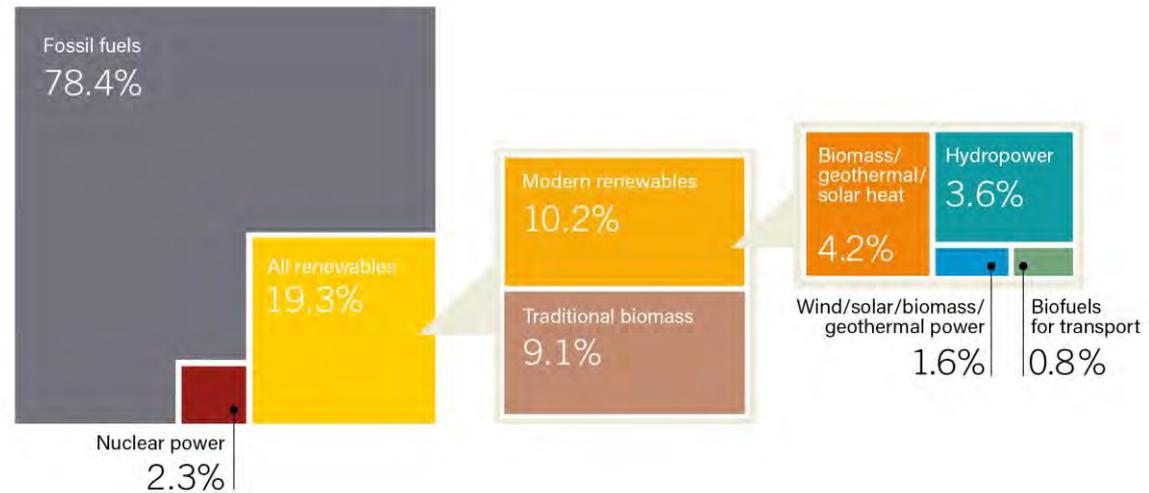
In 2016 investors were able to acquire more renewable energy capacity for less money.³

- **Newly installed renewable power capacity set new records** in 2016, with 161 gigawatts (GW) added, increasing the global total by almost 9% relative to 2015.
- For the fifth consecutive year, **investment in new renewable power capacity** was roughly **double the investment in fossil fuel generating capacity**, reaching USD 249.8 billion.
- 2016 was the **third year in a row where global CO₂ emissions** from the energy sector remained stable despite a 3% growth in the global economy and an increased demand for energy.

Renewable Energy in the World

As of 2015, renewable energy provided an estimated **19.3%** of global final energy consumption

Estimated Renewable Energy Share of Total Final Energy Consumption, 2015



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Renewable Energy Policy Landscape

- **176** countries had renewable energy **targets**
- **126** countries had power policies
- **68** countries had transport policies
- **21** countries had heating and cooling policies

Number of Renewable Energy Regulatory Incentives and Mandates, by Type, 2014-2016



Note: Figure does not show all policy types in use. In many cases countries have enacted additional fiscal incentives or public finance mechanisms to support renewable energy. Heating and cooling policies do not include renewable heat FITs (i.e., in the United Kingdom). Countries are considered to have policies when at least one national or state/provincial-level policy is in place. A country is counted a single time if it has one or more national and/or state/provincial-level policies. Some transport policies include both biodiesel and ethanol; in this case, the policy is counted once in each category (biodiesel and ethanol). Tendering policies are presented in a given year if a jurisdiction has held at least one tender during that year.

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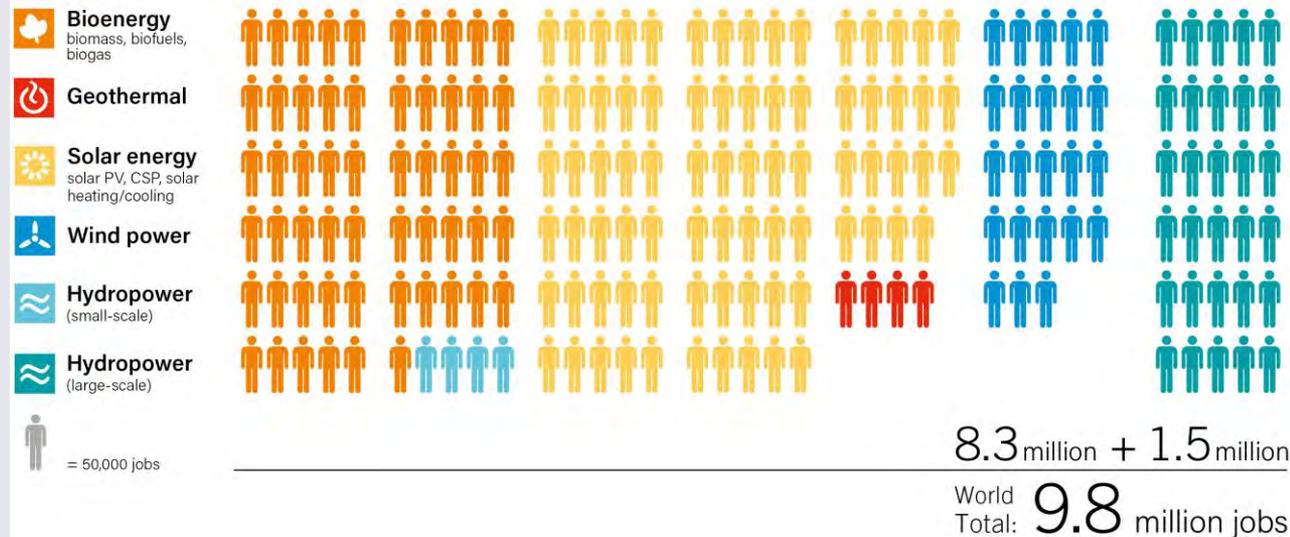
Source: REN21 Policy Database.

Jobs in Renewable Energy

The renewable energy sector employed

9.8 million people in 2016 - a **1.1%** increase over 2015

Jobs in Renewable Energy



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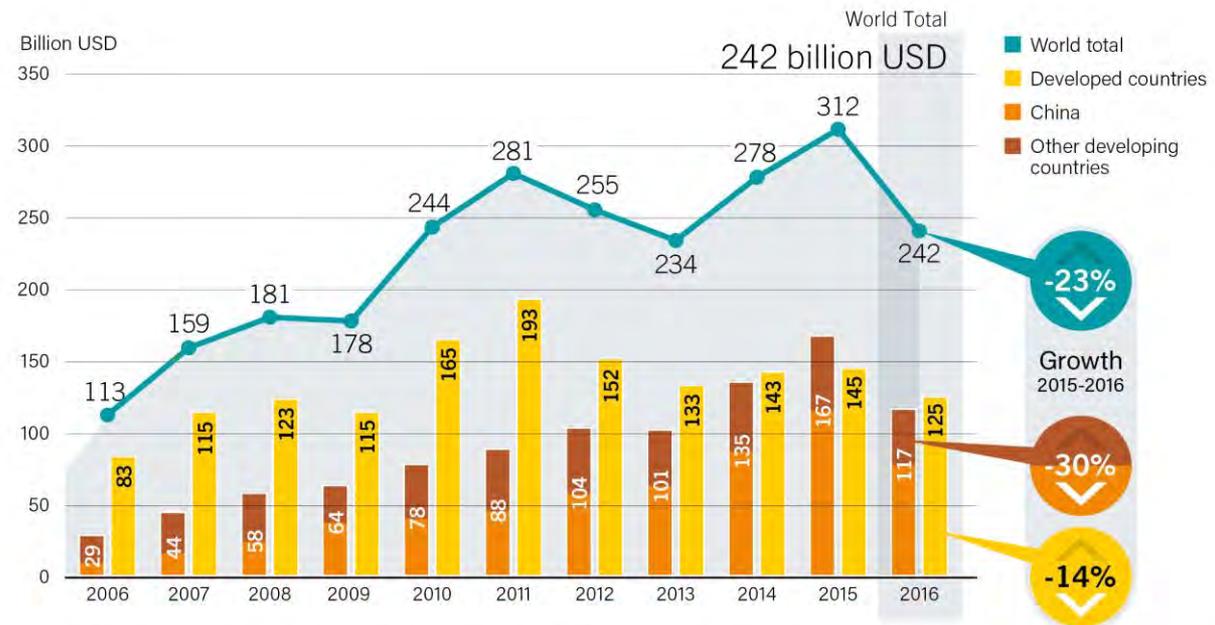
Source: IRENA.

Global Investment in Renewable Energy

Global new investment in renewables was **USD 241.6 billion** in 2016

For the fifth consecutive year, investment in new renewable power capacity was roughly **double** that in fossil fuel capacity.

Global New Investment in Renewable Power and Fuels, Developed, Emerging and Developing Countries, 2006-2016



Note: Figure does not include investment in hydropower projects larger than 50 MW. Investment totals have been rounded to nearest billion.

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Source: BNEF.

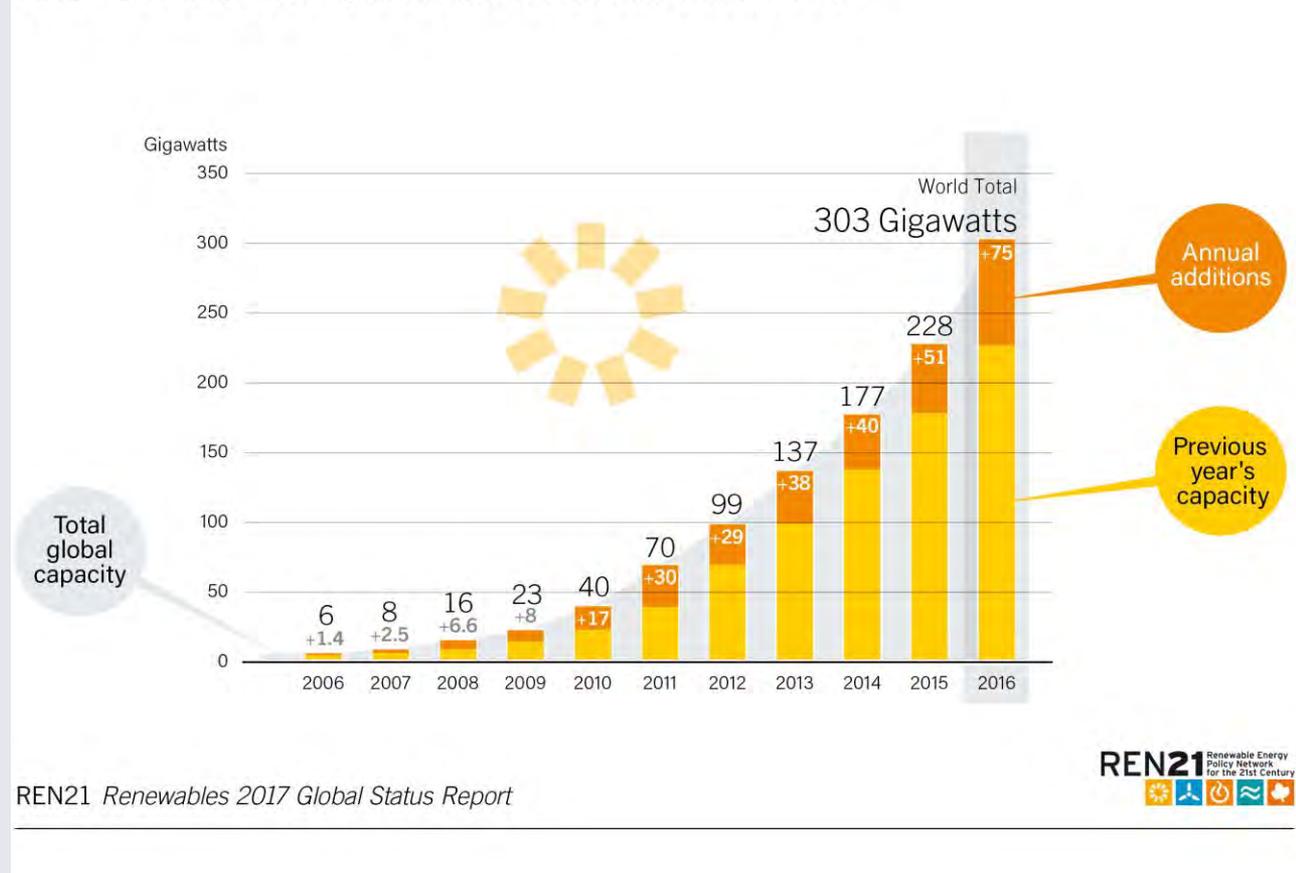
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Solar PV

75 GW of solar PV capacity was added worldwide bringing the global solar PV capacity totaled **303 GW**

In 2016 approx. 8.6 GW of solar PV was installed in Japan, bringing the country's total to 42.8 GW

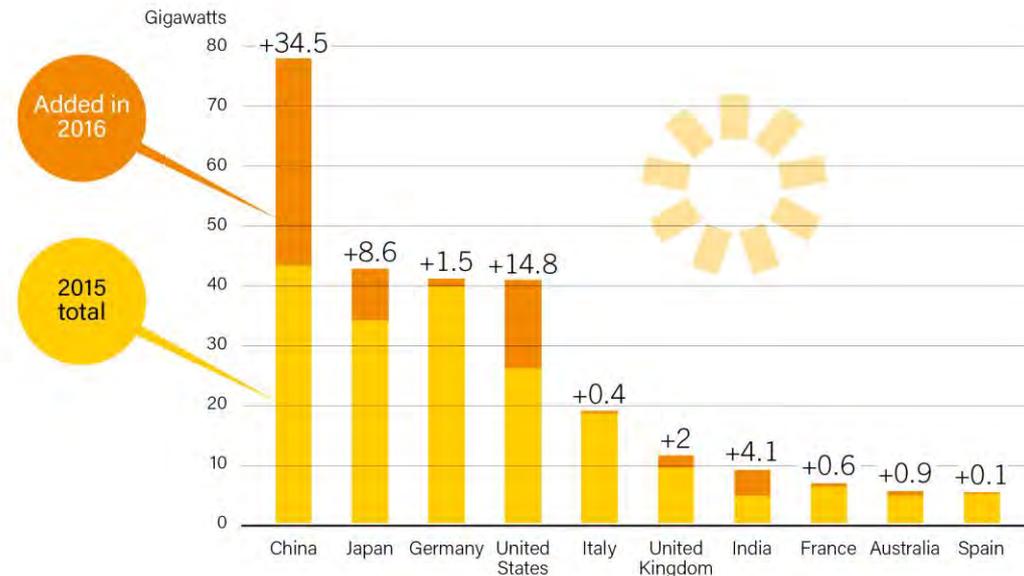
Solar PV Global Capacity and Annual Additions, 2006-2016



Solar PV

China added **34.5 GW** (up 126% over 2015), increasing its total solar PV capacity 45% to **77.4 GW**, far more than that of any other country

Solar PV Capacity and Additions, Top 10 Countries, 2016



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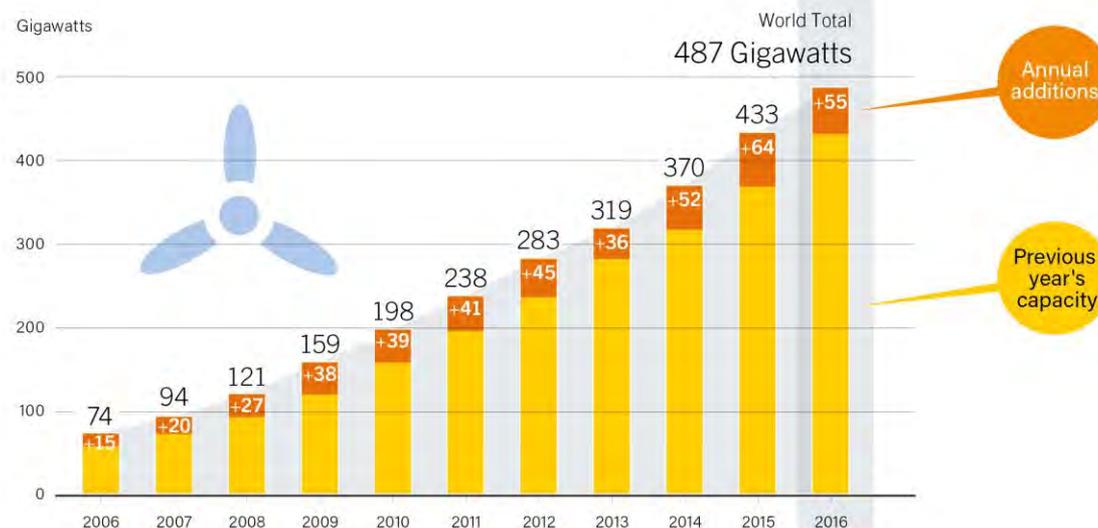
Wind Power

55 GW of wind power capacity added

Global total increased 12% to **487 GW**

2016 saw Japan add about 0.2 GW of capacity, pushing Asia's total above 203 GW.

Wind Power Global Capacity and Annual Additions, 2006-2016



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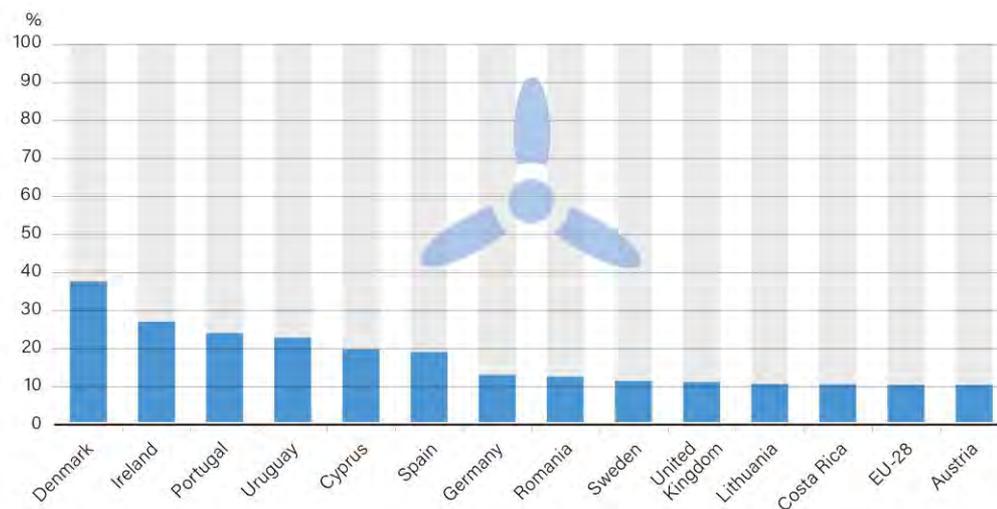
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Wind Power

At least **24** countries met **5%** or more of their annual electricity demand with wind power

Enough global capacity to meet **4%** of total electricity consumption

Share of Electricity Demand Met by Wind Power, Selected Countries with over 10% and EU-28, 2016

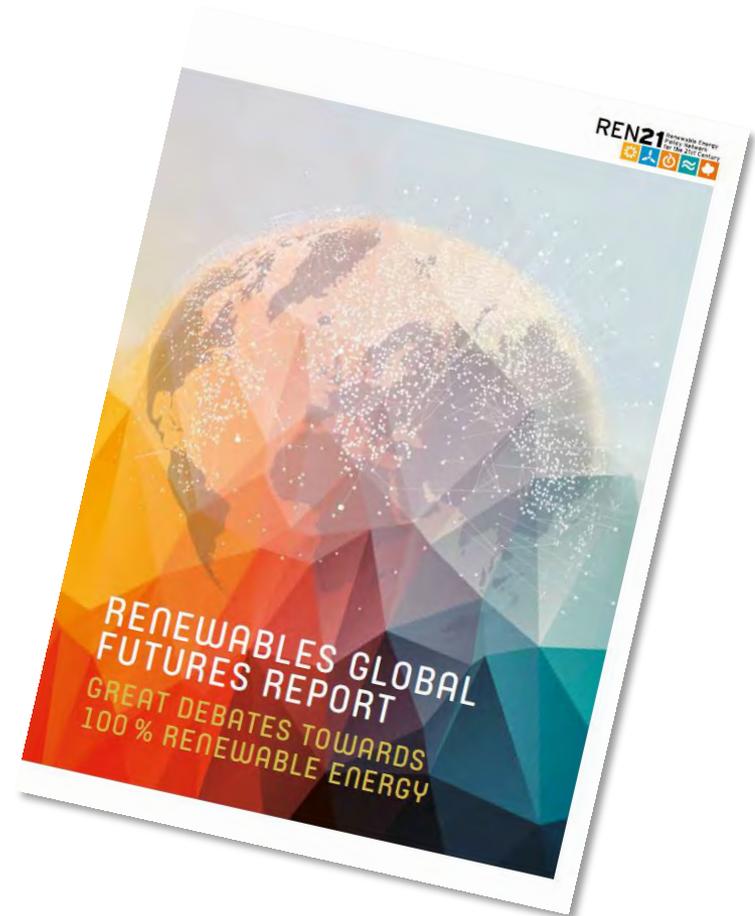


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100% Renewables: Pipe dream or reality?

- 114 experts interviewed
- Conservative , moderate, progressive perspectives
- Giving their opinion on:
 - feasibility of 100% renewable energy future
 - macro-economic impact of such a future
- All regions of the world represented
- Not prescriptive but a starting point for debate
- 12 Great Debates



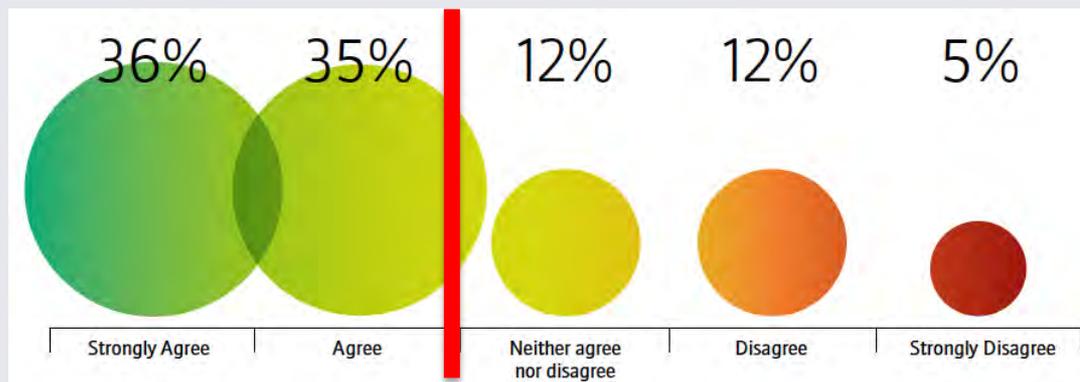
Overview of the Results – the 12 Great Debates

1. 100% Renewables: A logical consequence of the Paris Agreement?
2. Global Energy Demand Development: Efficiency on a global level?
3. Renewable Power Generation: The winner takes all?
4. The Future of Heating: Thermal or electrical applications?
5. Renewables for Transport: Electrification versus biofuels?
6. Interconnection of Sectors: System thinking required
7. Storage: Supporter or competitor of the power grid?
8. Technology versus Costs: Which should come first?
9. Scaling-up Investments and Work Force: 100% renewables for socio-economic change
10. Utilities of the Future: What will they look like?
11. Mega Cities: Mega possibilities
12. Energy Access Enabled Through Renewables: How to speed up connections?

1. 100% Renewables: A logical consequence of the Paris Agreement?

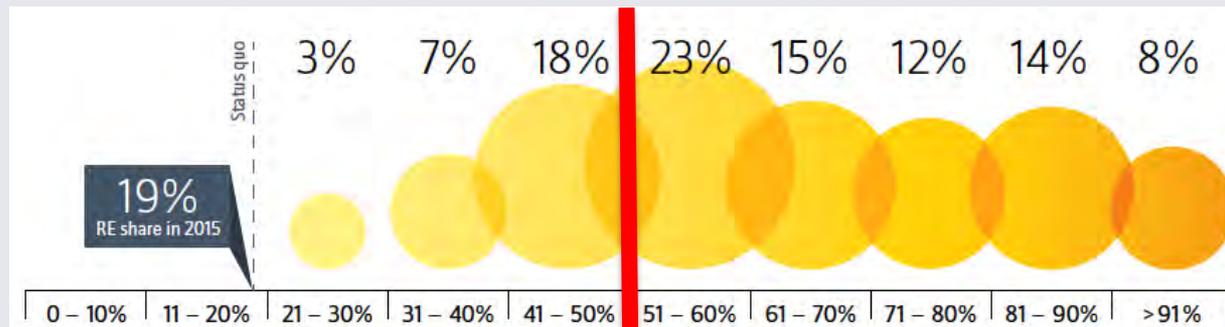
“Is the transition to 100% renewables on a global level feasible and realistic?”

71% agree with this statement



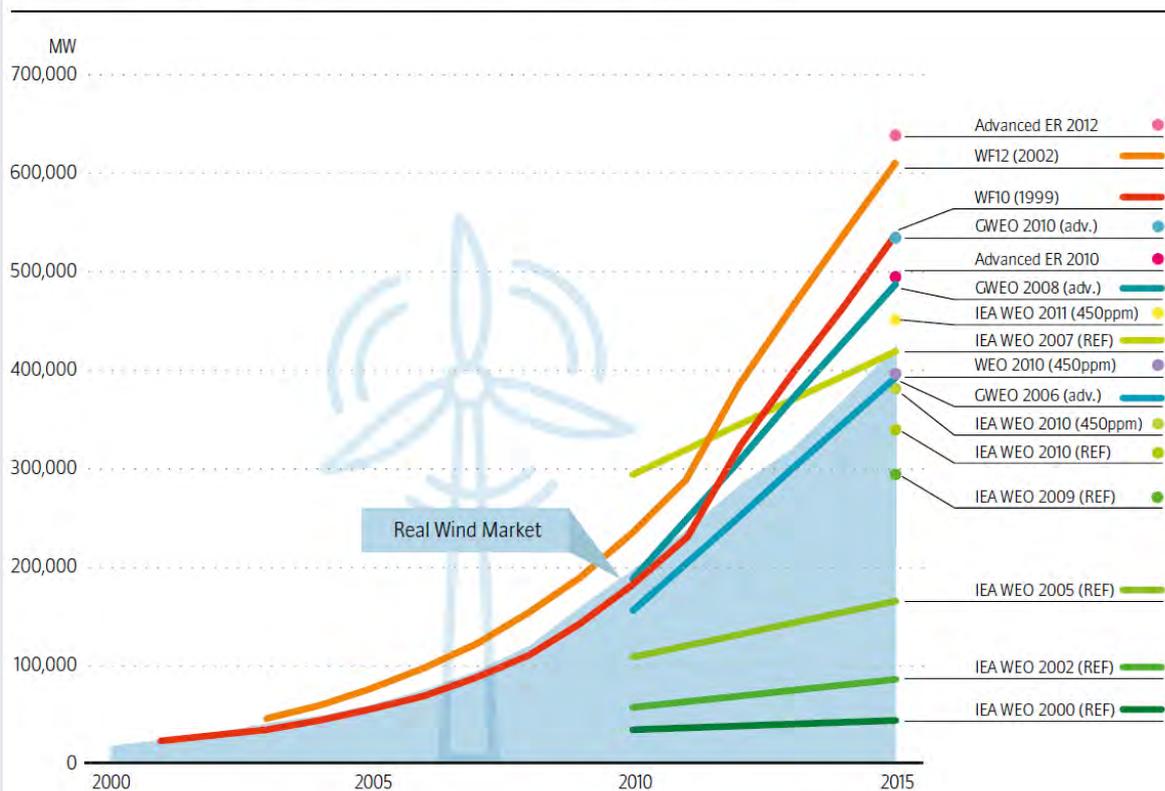
What will be the share of global renewable final energy consumption by 2050?

72% of the experts expect RE share will double or even triple with the next 3 decades.



Historic projections fall short - wind

Figure 16: Wind power projections versus real market developments

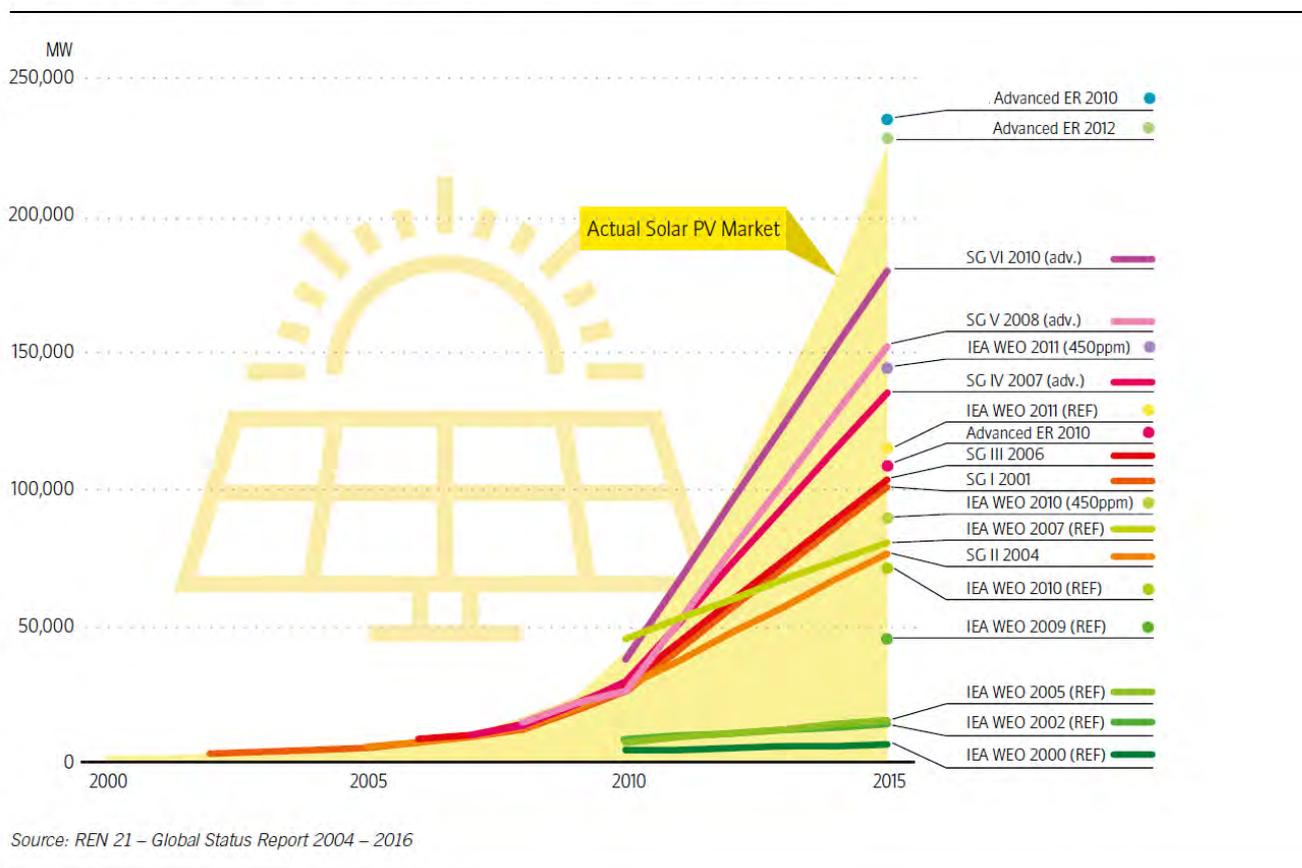


Source: Data compilation by Dr. Sven Teske, UTS/ISF

REF: Reference Scenario

Historic projections fall short – solar PV

Figure 17: Solar photovoltaic projections versus real market developments

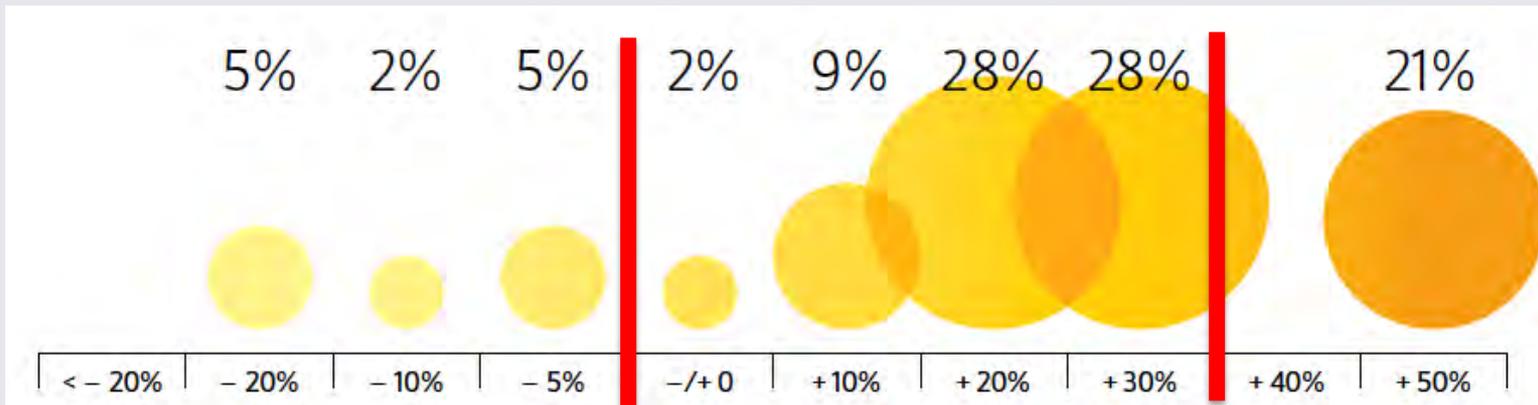


2. Global Energy Demand Development: Efficiency on a global level?

To what extent will global final energy demand increase or decrease by 2050?
(Compared to 2015 in %)

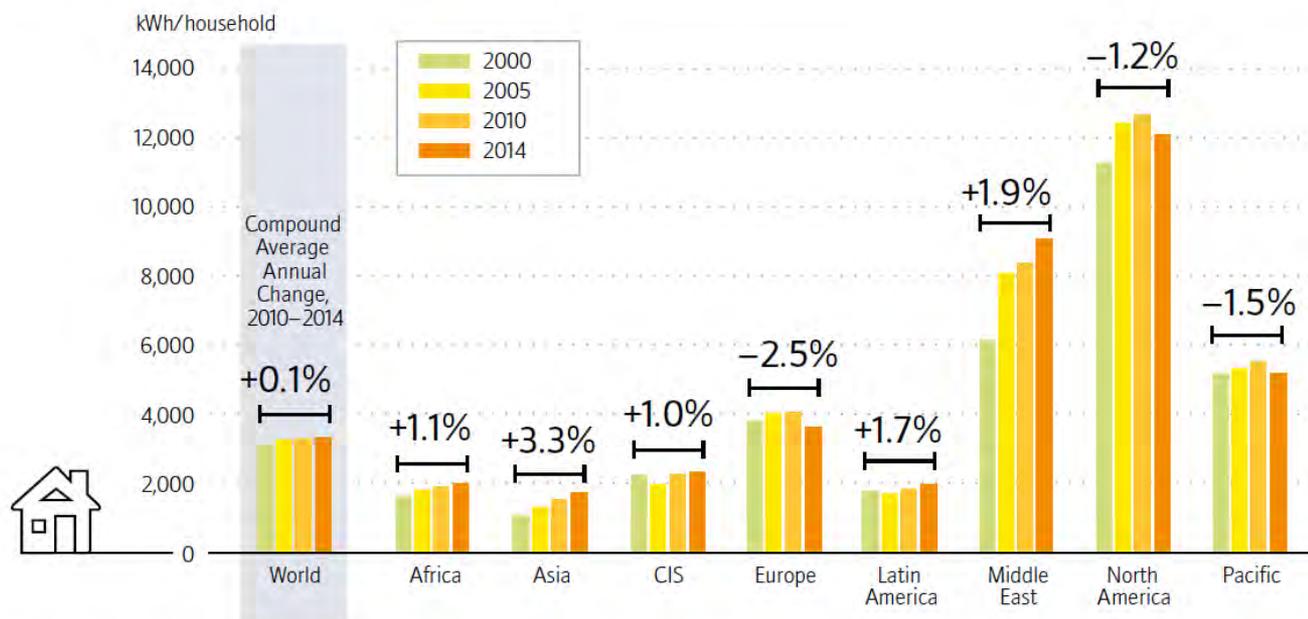
14% believe energy demand will not grow any further

65% expect the energy demand will increase by about 1/3 by 2050.



Progress in energy efficiency –household level

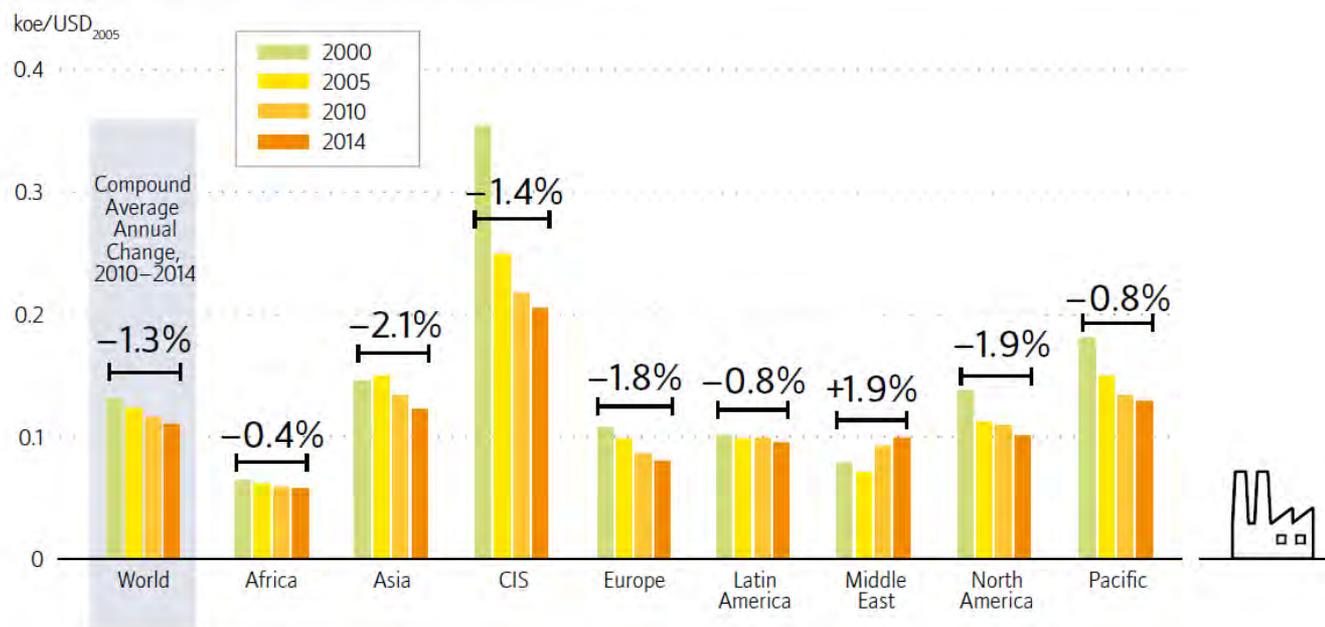
Figure 8: Average electricity consumption per electrified household, selected regions and world, 2000, 2005, 2010 and 2014



Source: REN 21, Renewables 2016 Global Status Report

Progress in energy intensity – industry level

Figure 10: Energy intensity in industry, selected regions and world, 2000, 2005, 2010 and 2014

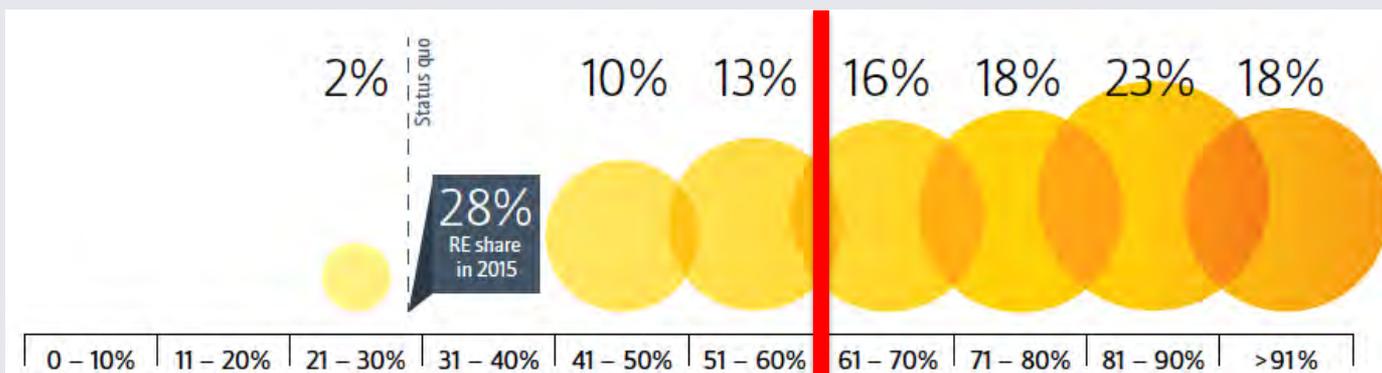


Source: REN 21, Renewables 2016 Global Status Report

3. Renewable Power Generation: The winner takes all?

What will be the estimated development of global renewable power generation share by 2050?

65% expect that renewable power generation will more than double within 30 years

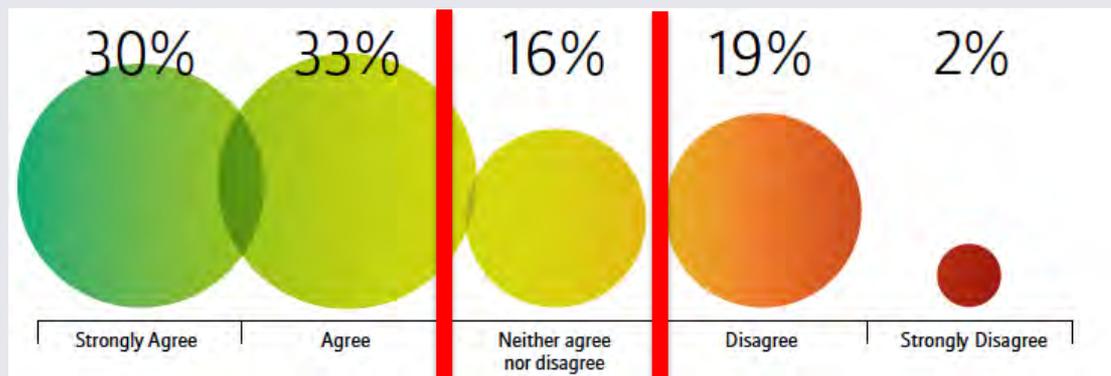


3. Renewable Power Generation: The winner takes all?

Will decentralised power generation dominate over centralised generation by 2050?

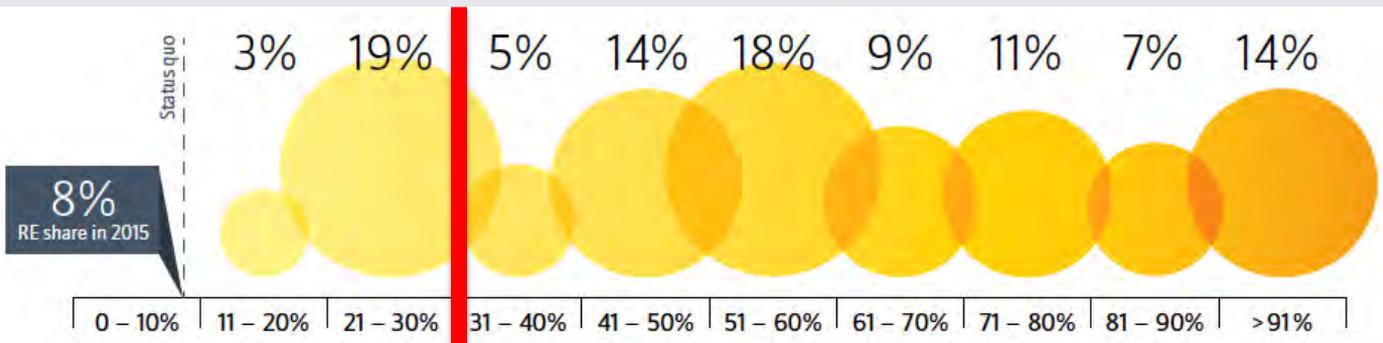
63% expect decentralised generation to dominate over centralised plants

21% disagree



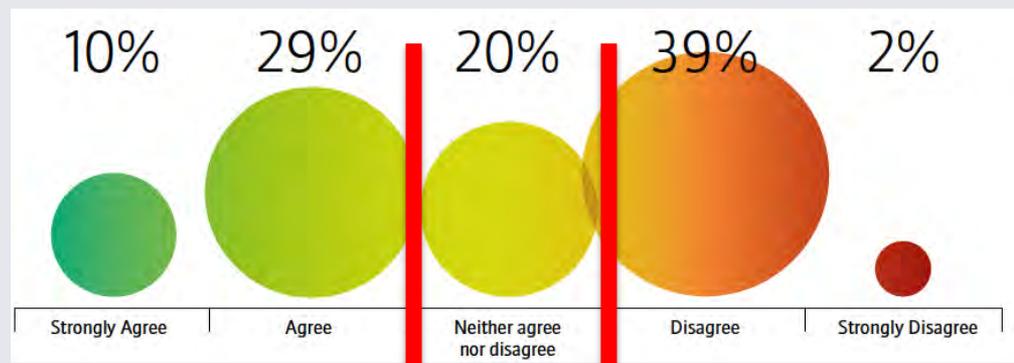
4. The Future of Heating: Thermal or electrical application?

What will be the share of global renewable heating energy consumption by 2050?
78% expect the renewable heating share at least to triple within the next 30 years



“The electrification of the heating sector will continue and will lead to an almost complete electrification.”

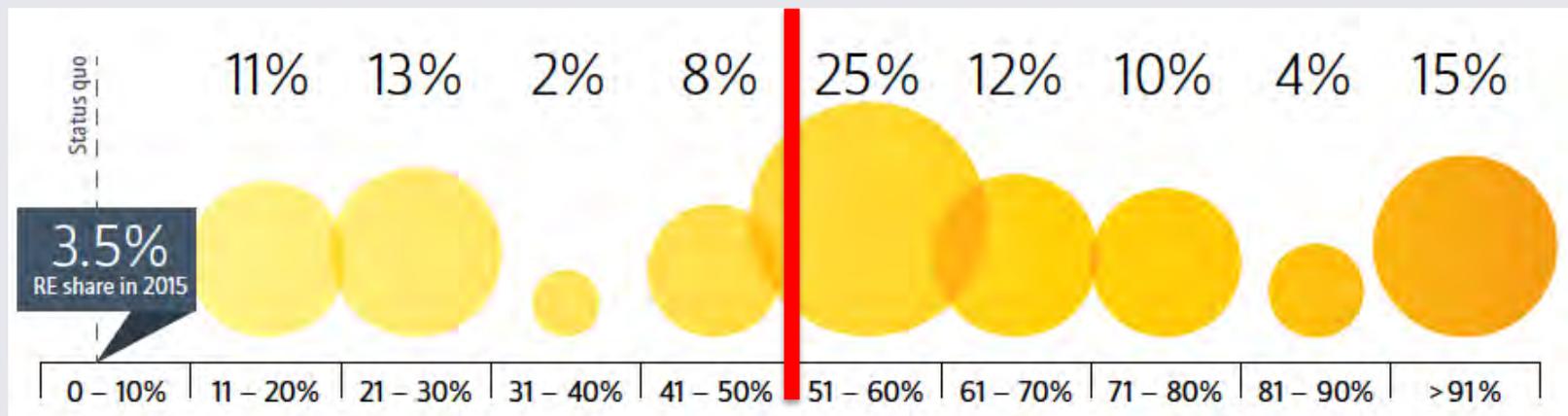
39% agree
 41 % disagree
 20% undecided
 >> the race is still wide open



5. Renewables for Transport: Electrification versus biofuels

What will be the share of global renewable transport energy consumption by 2050?

2/3 of all interviewed experts expect the renewable energy share to grow by a factor of 14 by 2050.



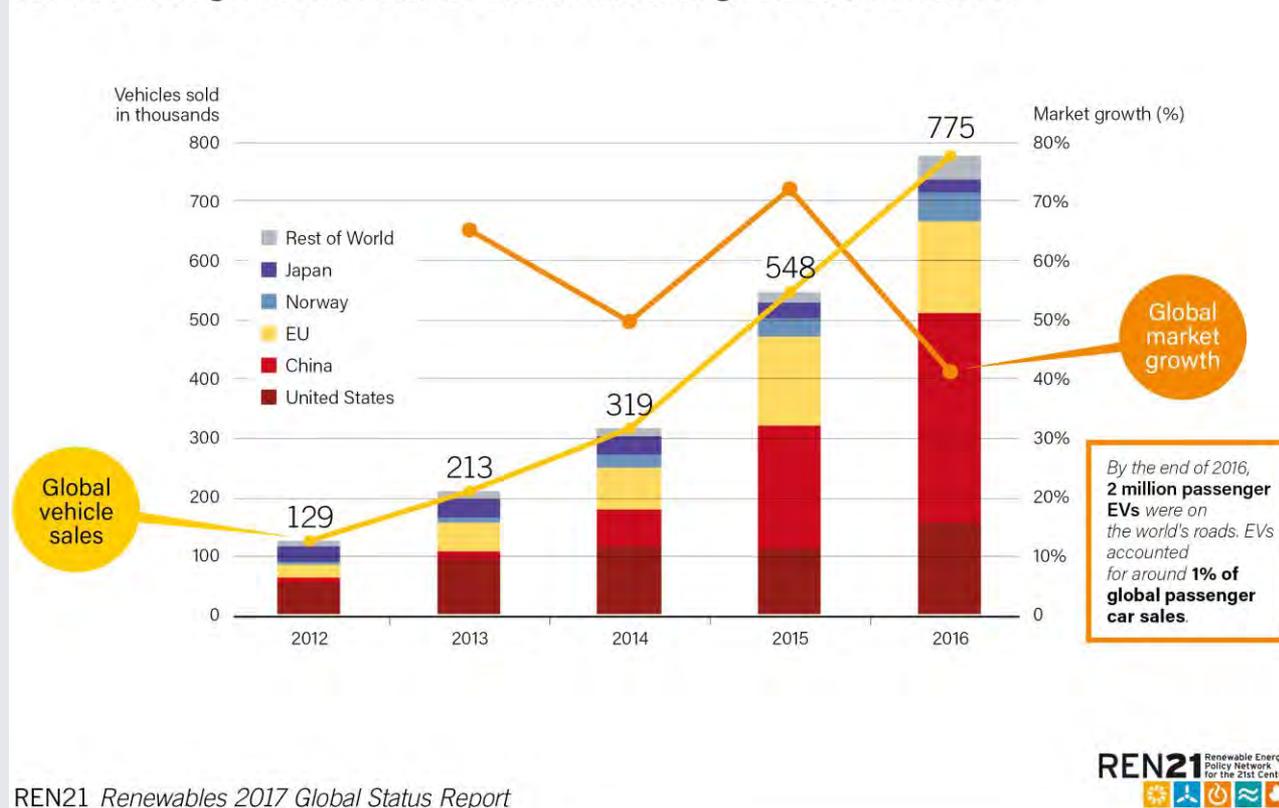
Global Passenger Electric Vehicle Market Evolution

Global sales of EVs reached **775,000 units**

More than **2 million passenger EVs** were on the world's roads by year's end (1% of the light vehicle market)

So far, little linking of renewable energy and electric mobility

Global Passenger Electric Vehicle Market (Including PHEVs), 2012-2016

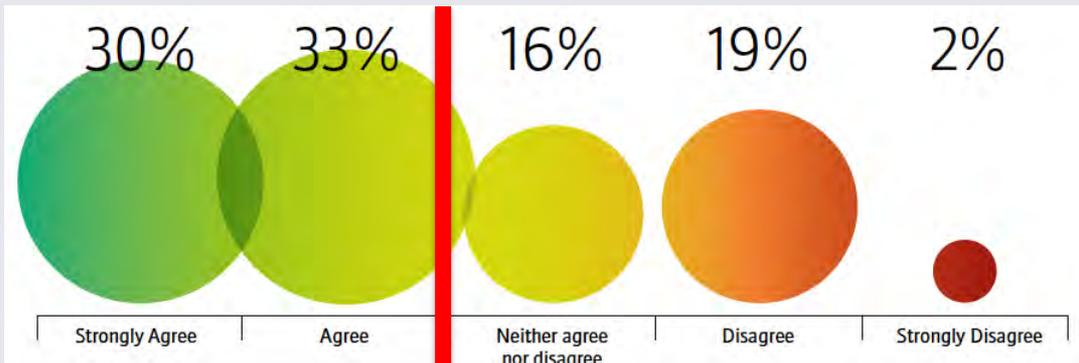


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6. Interconnection of Sectors: System thinking required

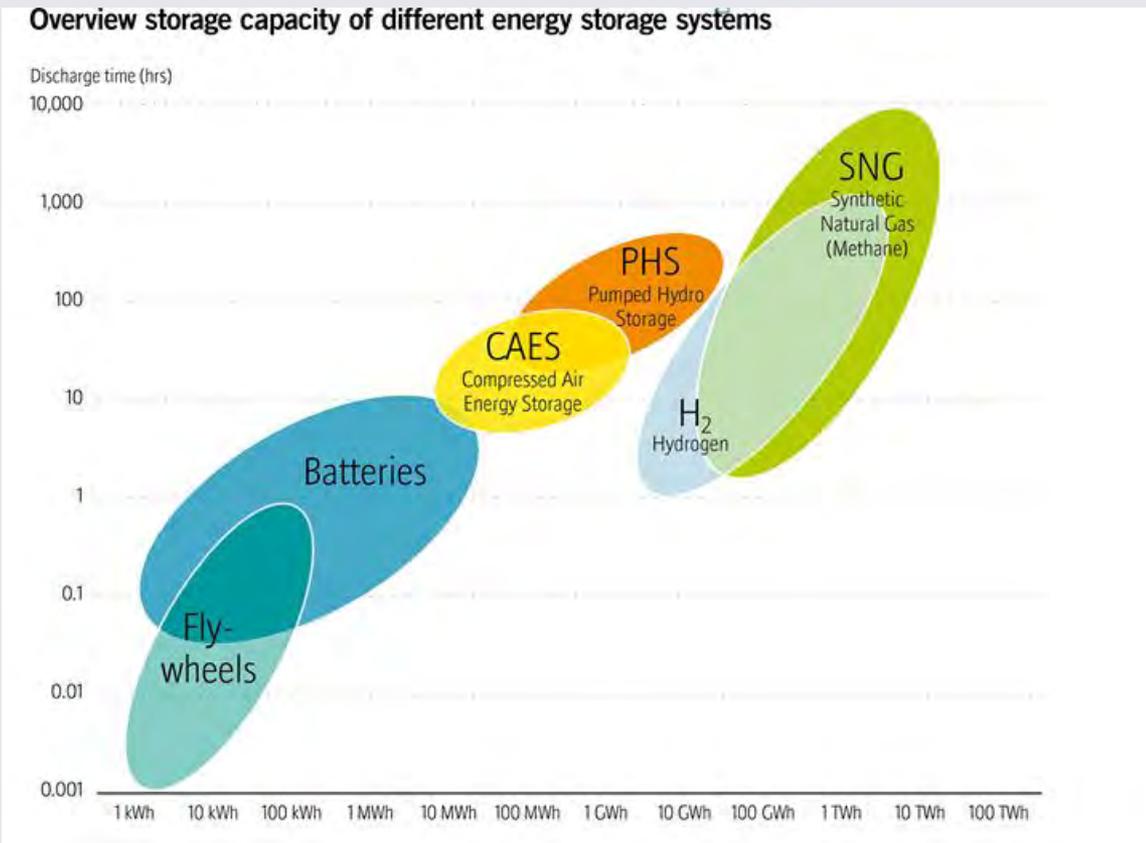
Demand and supply management in “smart homes” will be encouraged by price signals via different time dependent tariffs.

63% see price signals as the preferred mechanism for demand and supply management



7. Storage: Supporter or competitor of the power grid?

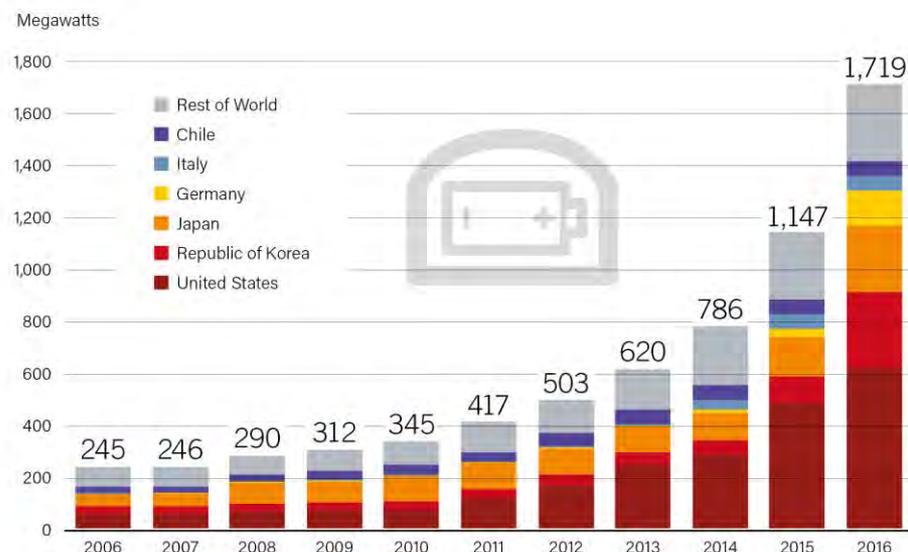
Various storage technologies for various purposes. There is no “on-size-fits-all” application.



Enabling Technologies and Energy Systems Integration

Grid-connected battery storage grew by **50%** in 2016

Global Grid-Connected Stationary Battery Storage Capacity, by Country, 2006-2016



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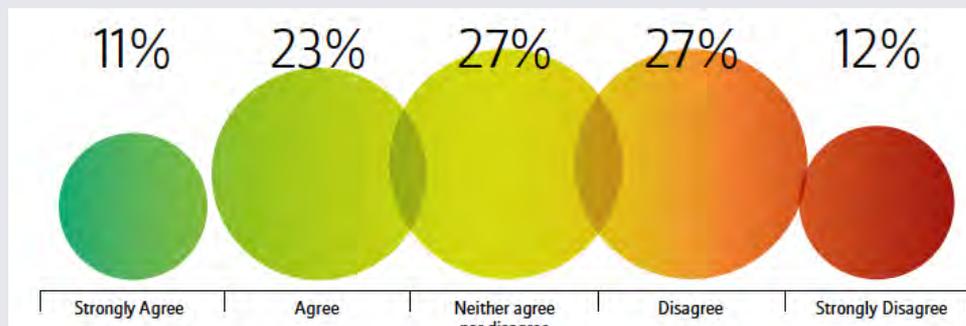
RENEWABLES GLOBAL FUTURES REPORT
GREAT DEBATES TOWARDS 100% RENEWABLE ENERGY



8. Technology versus Costs: Which should come first?

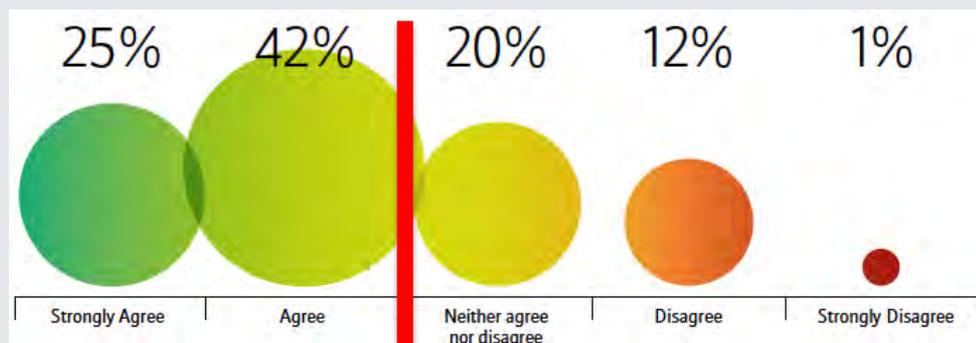
“In the coming decades, the price of oil per barrel over USD 100 per barrel is almost certain.”

High certainty about the uncertainty of fossil fuel prices



“The cost for renewables will continue to fall and will out-pace all fossil fuels within the next 10 years.”

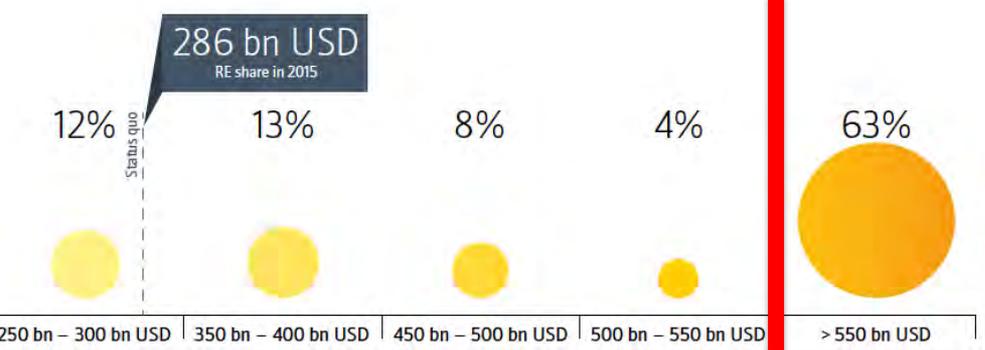
67% agreement that renewables will outpace fossil fuels within the next 10 years.



9. Scaling-up Investments and Work Force: 100% renewables for socio-economic change

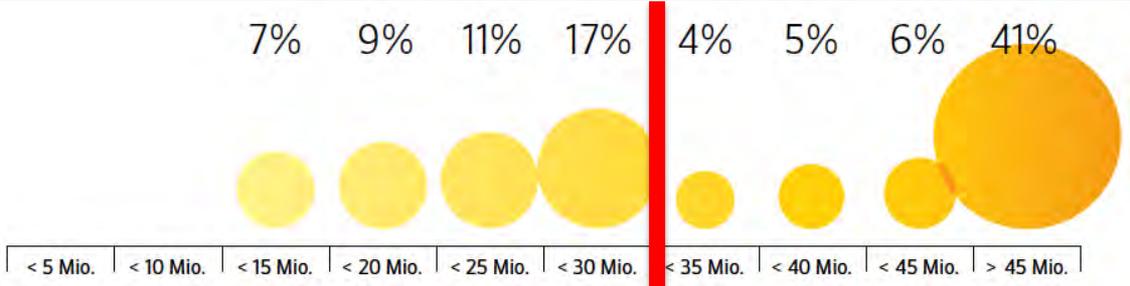
What will the annual global investment volume in renewable energy be by 2050?

63% believe that the RE investment volume will at least double



How many people will be employed in this sector by 2050? (9.8 million in 2016)

56% expect the workforce to quadruple by 2050



10. Utilities of the Future: What will they look like?

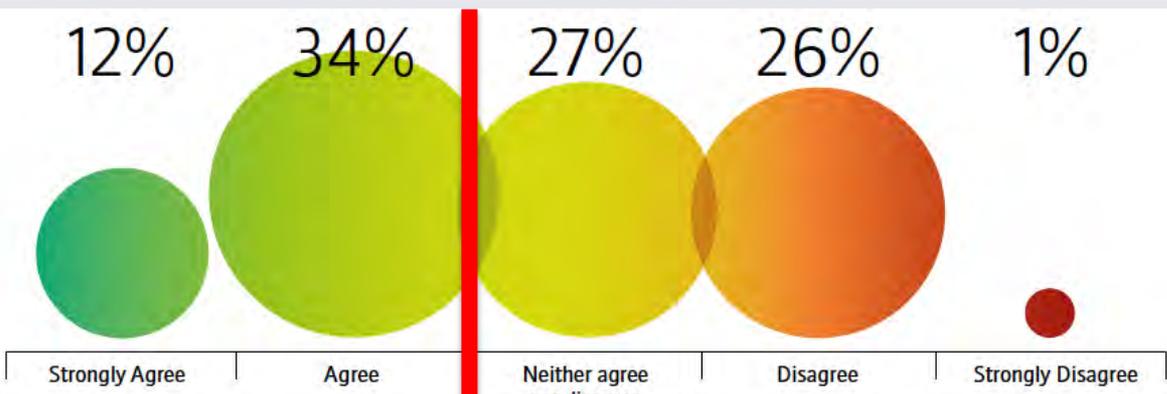
- It is clear that future utilities will have little in common with today's utilities, and that business models will need to change.
- But how will a future energy market be designed?
- What are the necessary policy schemes to create a sustainable and long term framework that provides the necessary policy certainty, which in turn creates a stable climate for investment in energy efficiency and renewables?

The future business concept and the future of storage technologies, may be the “Holy Grail” of the energy industry.

11. Mega Cities: Mega possibilities

“Decentralised energy technologies will play a significant role even in space-constrained megacities and will supply the majority of the power demand by 2050.”

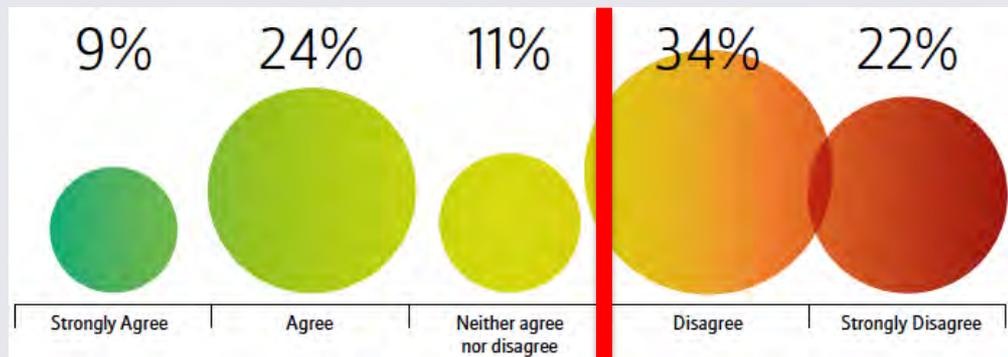
Almost half of all experts (46%) agree that renewable generation can play a role even in space constrained megacities.



12. Energy Access Enabled Through Renewables: How to speed up connections?

“Decentralised renewable energy technologies will not be enough to give access to energy for all, meaning that large-scale conventional power plants are still required to provide energy access for all.”

56% believe that renewables can supply enough energy for developing countries



Conclusions

- **Record installed capacity, however progress not fast enough to reach Paris Agreement goals**
- More than 70% of the experts interviewed consider a global transition to 100% renewable energy to be both feasible and realistic.
- There is an overwhelming consensus that renewable power will dominate in the future.
- Numerous companies, regions, islands and cities have set 100% renewable energy targets.
- Policy matters: system approach needed for linking power, heating and cooling as well as transport sector.



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