WELCOME TO SOLAR DAY

REC

BELLONA

RIGHT HERE IN COPENHAGEN

Winery with 228 REC solar panels installed in Barbaresco, Italy. Annual capacity 54 000 kWh
26 tons of CO_2 saved annually

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Agenda

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- ➔ Why is solar attractive?
- ➔ Current status
- ➔ What the solar industry can deliver
- ➔ What will be required to achieve our targets

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WHY IS SOLAR ATTRACTIVE?

RIGHT HERE IN CALIFORNIA

Residential home with 61 REC solar panels installed in Monterey, California. Annual capacity: 19 435 kWh
13.1 tons of CO_2 saved annually

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The world needs more energy

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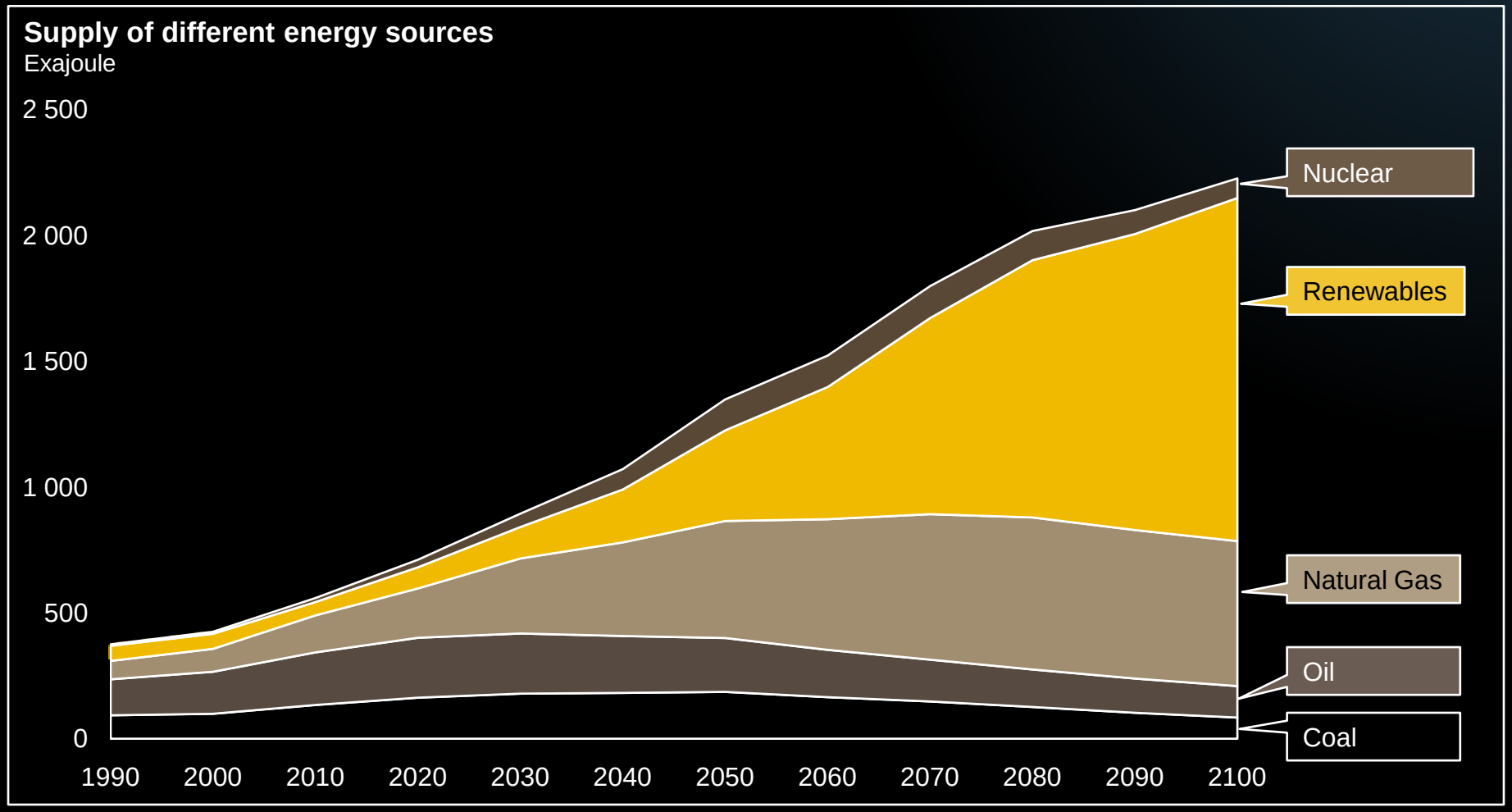

Source: The Intergovernmental Panel on Climate Change (IPCC), SRES (Special Report on Emission Scenarios), Alt. 1
Definition: exajoule (EJ) is a unit of energy, 10^{18} joules, often used as unit of measure for world annual energy use

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The sun supplies “virtually” unlimited energy

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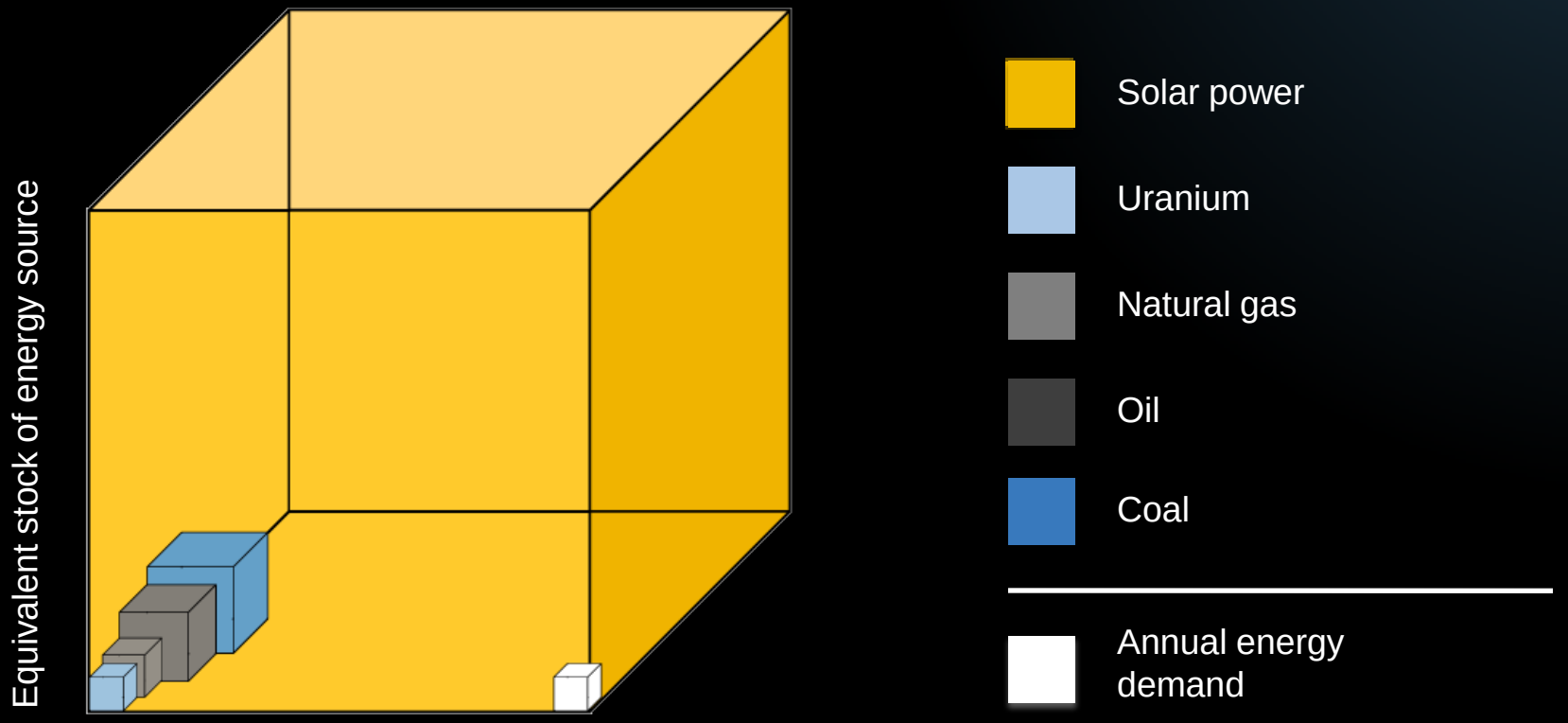

Fact: There is more energy delivered by the sun in one hour than what is consumed by the world’s population in one year

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The CO_2 emission from solar energy is very low

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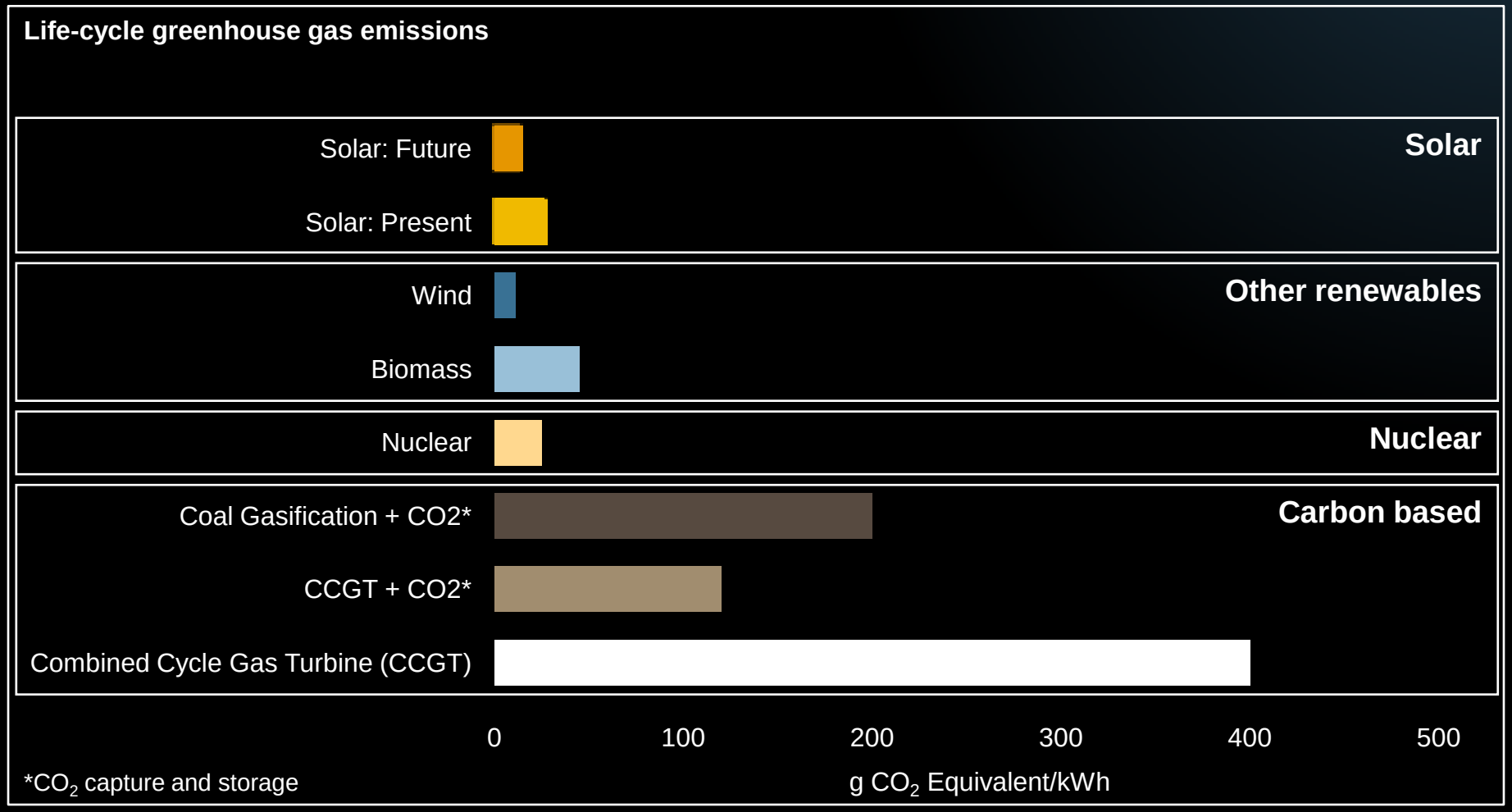

Source: Annual Energy Review, U.S. Energy Information Administration

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Solar energy payback time

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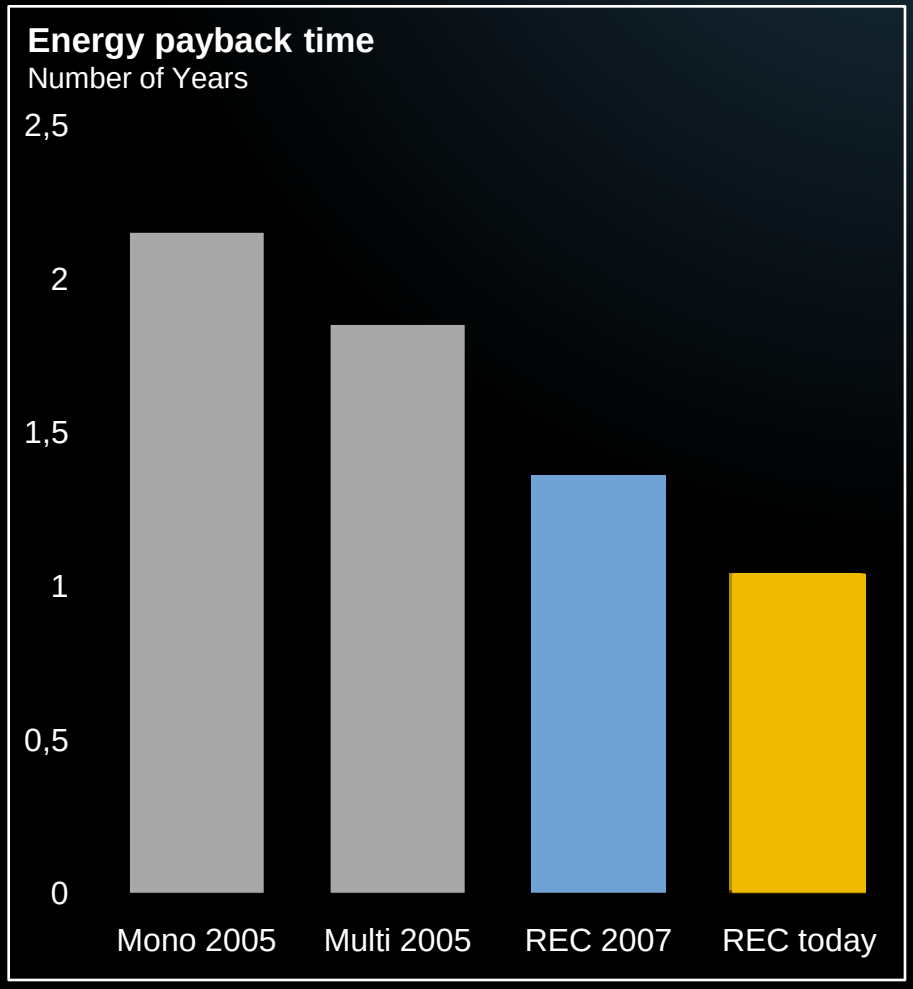
- Payback time of around one year
  - Energy payback is the time it takes a solar panel to generate the same amount of energy that was used to produce it
- For the remaining 24 years of its guaranteed lifetime, a solar panel will be ‘energy positive’



Source: Alsema et al. (EU Crystal Clear project), 21st European PV Conference, Dresden, 2006

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Solar energy produced at point of consumption

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DISTRIBUTION

Power plant	High voltage grid	Transformer	Low voltage grid	Customer

- The price of electricity includes generation cost as well as transmission cost
- Solar energy has the advantage that it can be produced near, or at the point of consumption
- Price comparisons should therefore be determined at the point of use

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Majority of the world's population lives within the sunbelt

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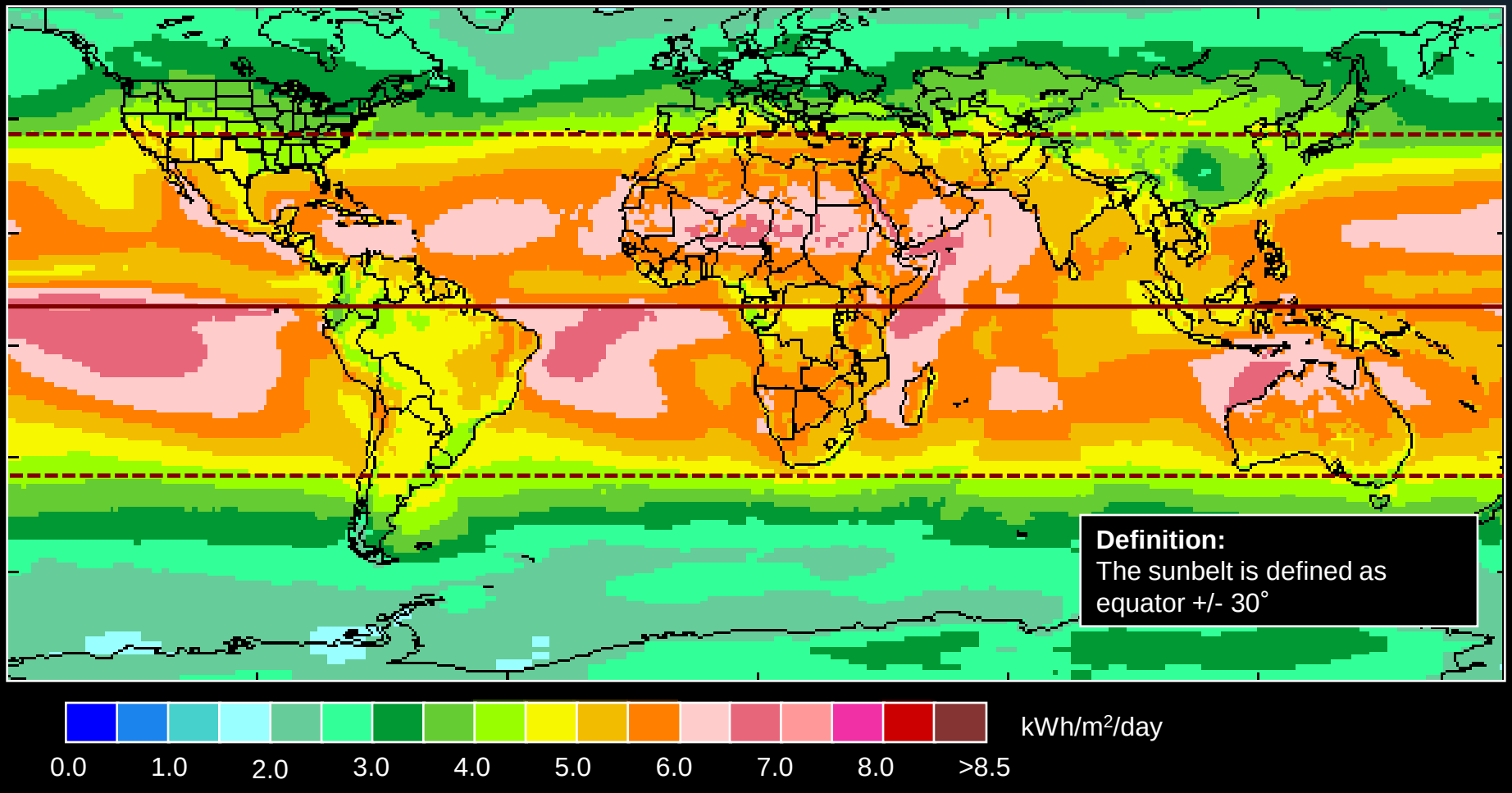

Source: NASA Surface meteorology

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The concept of grid parity

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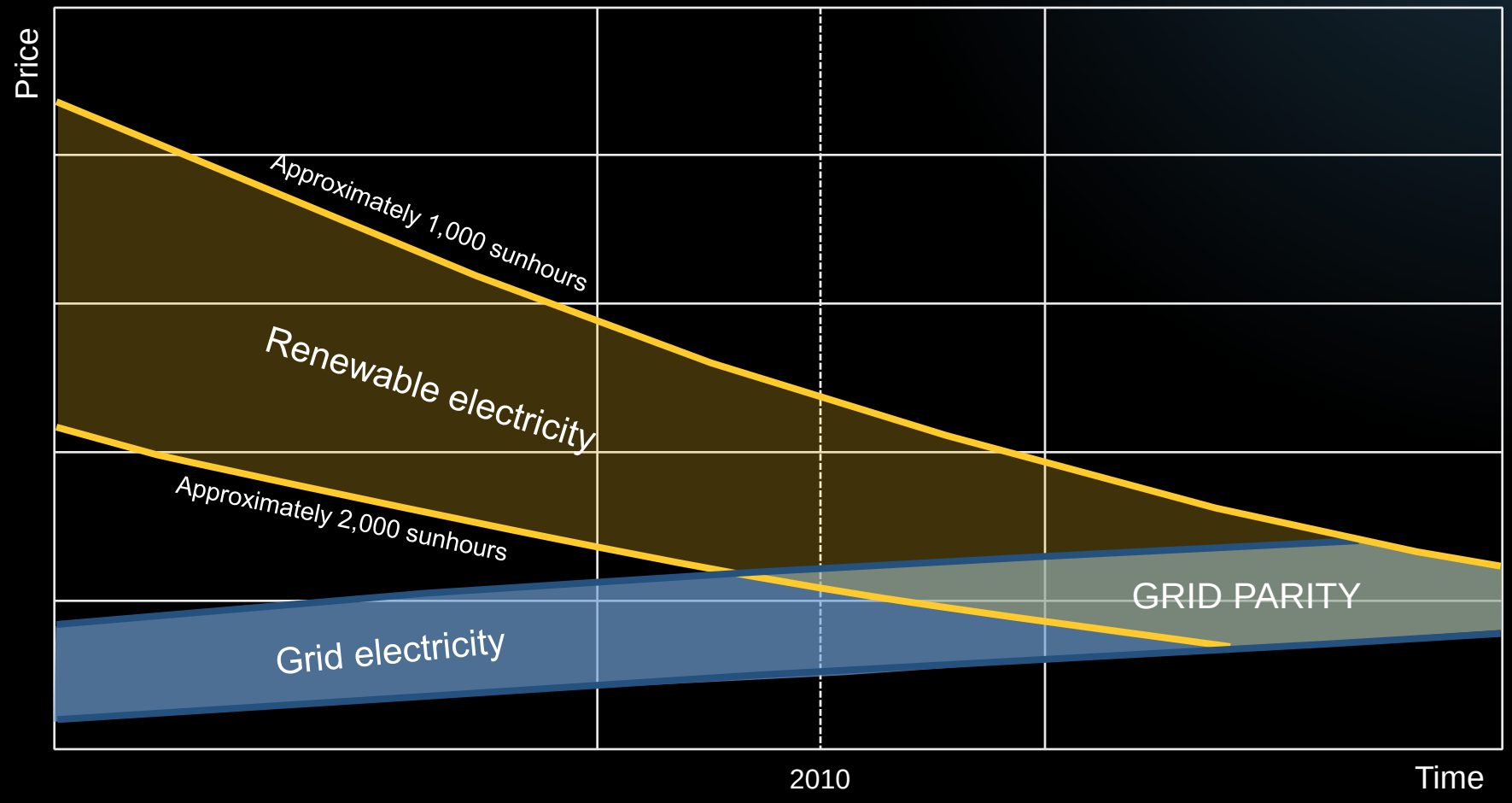

Source: BP Solar

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CURRENT SOLAR STATUS

RIGHT HERE IN HAMBURG

Residential home with 32 REC solar panels installed in Hamburg, Germany. Annual capacity: 6 200 kWh
4 tons of CO_2 saved annually

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Grid parity status

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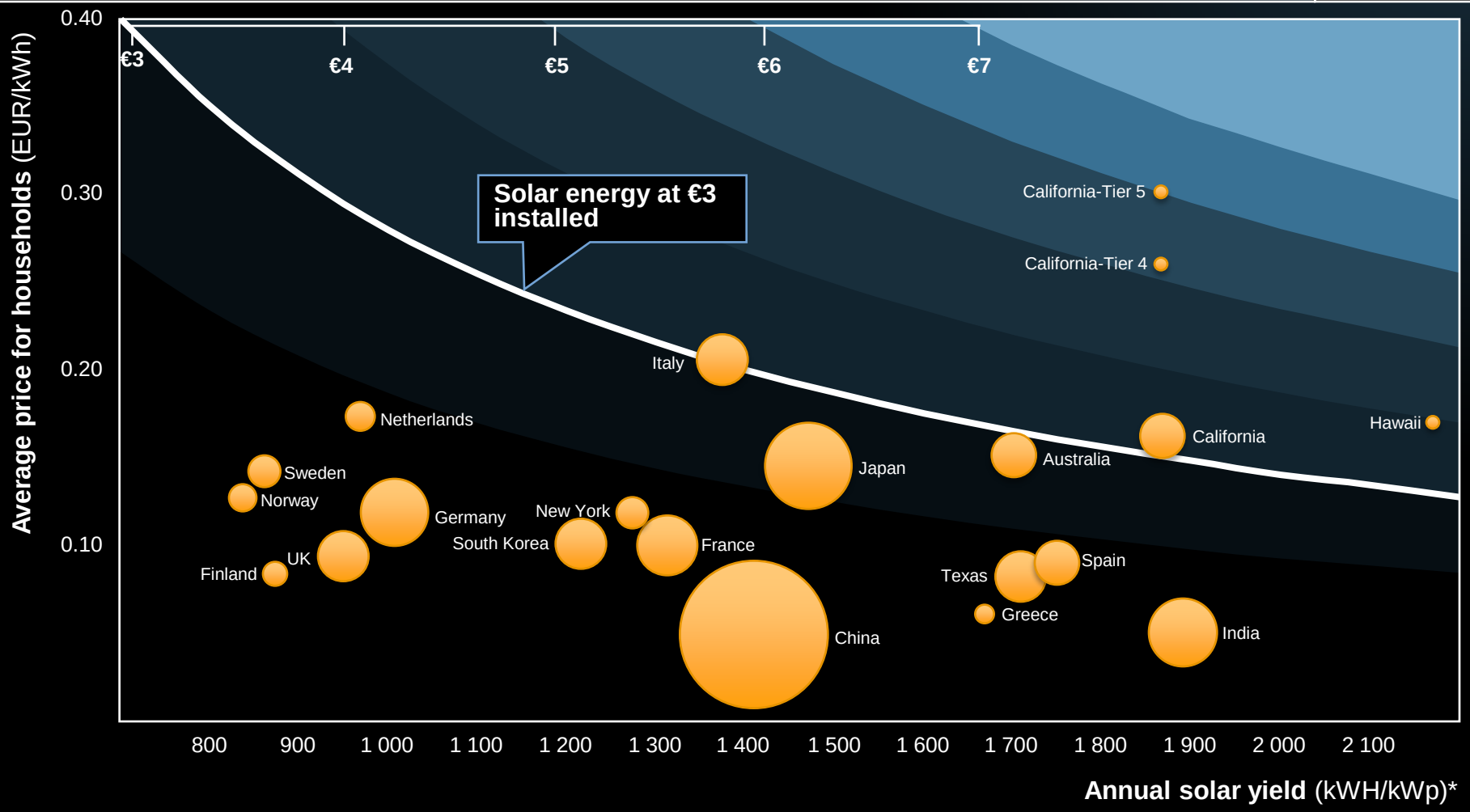

*Amount generated by a south-facing 1kWp module in 1 year (function of solar intensity)

Source: Eurostat; PV Policy group; PG&E; CIA country files; Public policy Institute New York; McKinsey&Company, REC

Assumptions: 2007 electricity prices

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Current status in key solar markets

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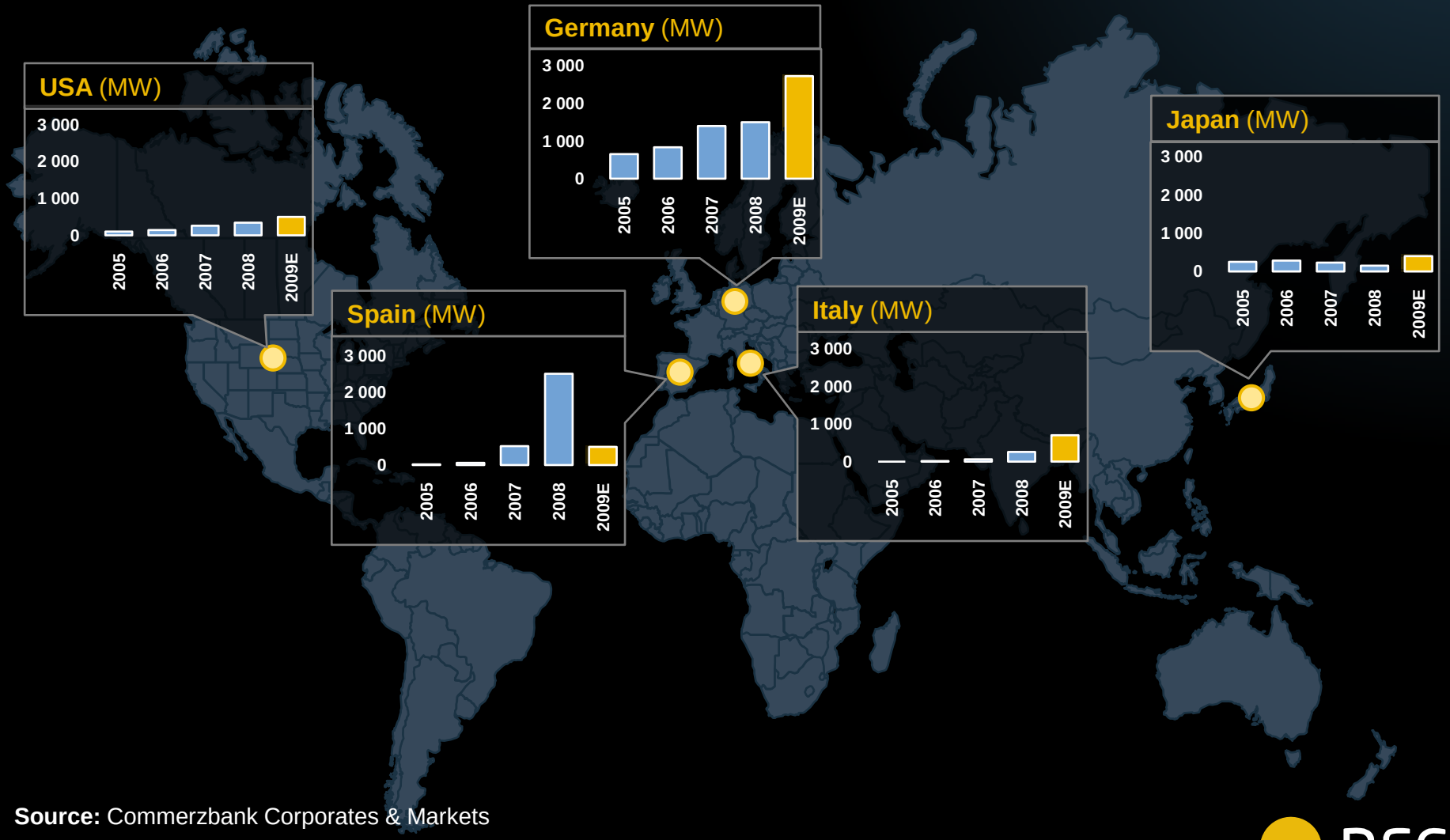

Source: Commerzbank Corporates & Markets

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Comparison between Germany and the USA

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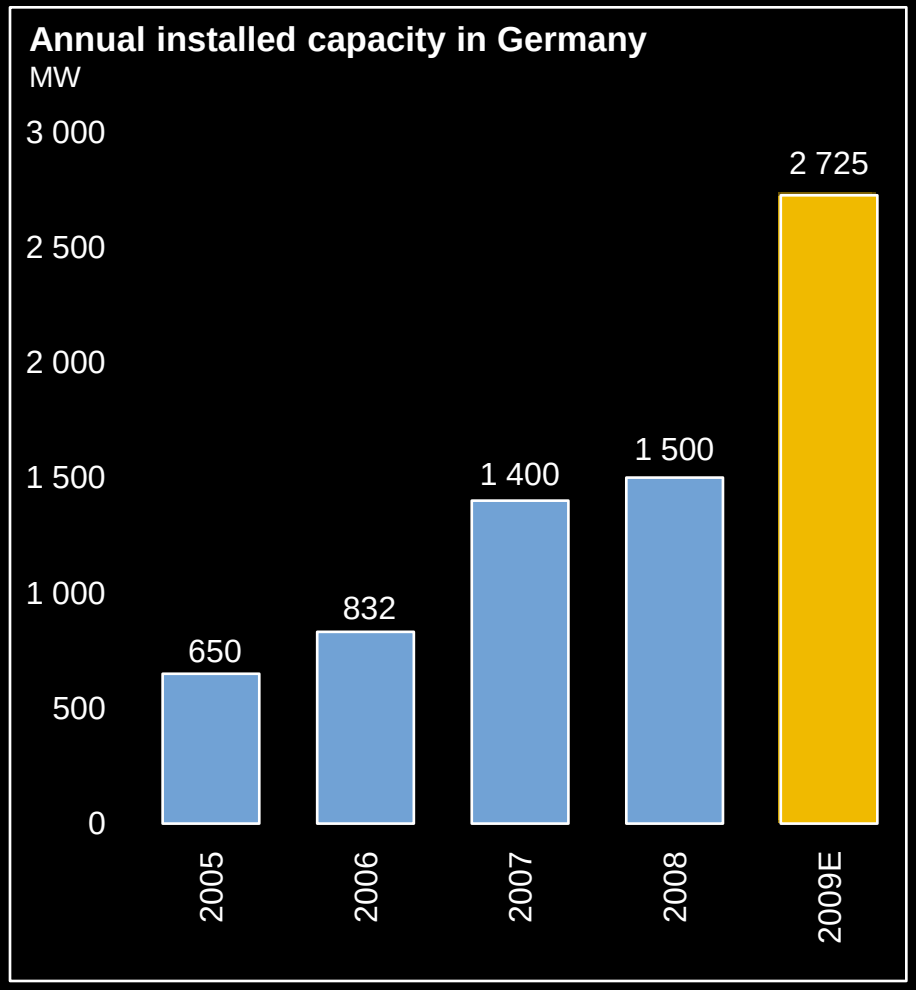

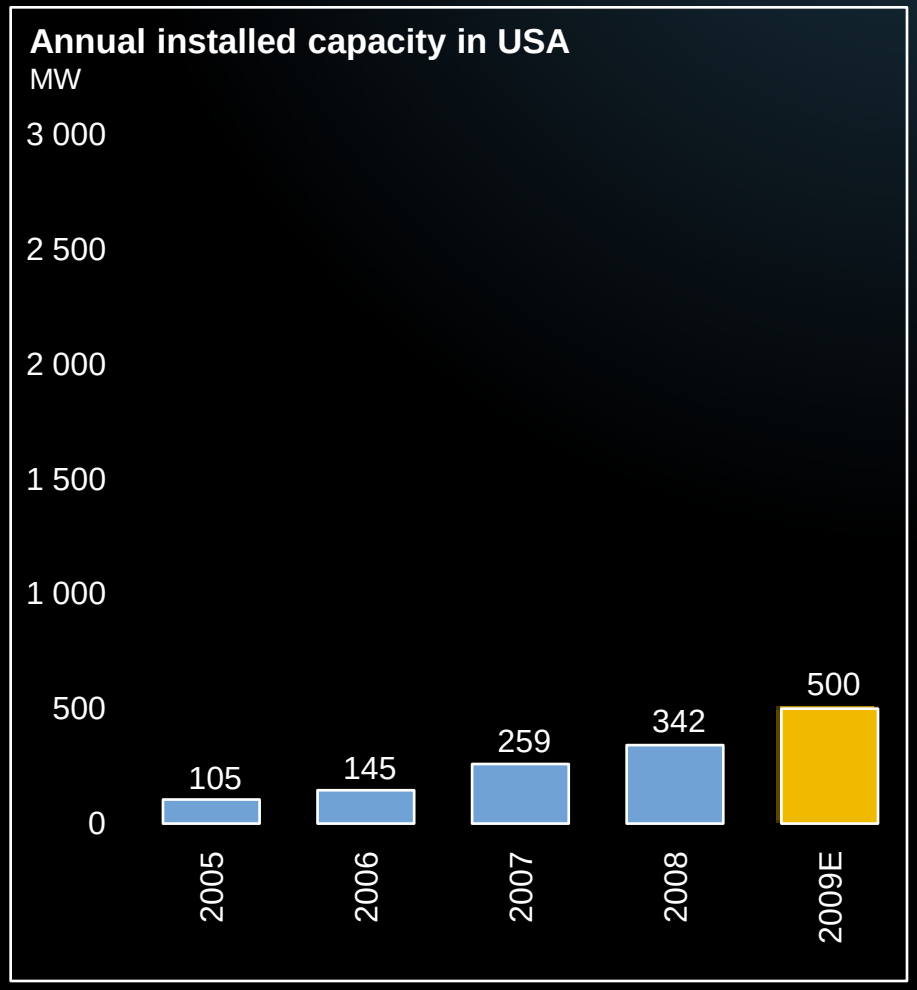

Source: Commerzbank Corporates & Markets

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Lessons learnt

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Successful markets

➔ **Targets and policies**
- Long-term targets and clear policies

➔ **Incentives**
- Facilitated access to grid
- Easy to understand
- Cost-efficient

➔ **Bureaucracy**
- Efficient, straight forward paperwork

Less successful markets

➔ **Targets and policies**
- Unclear targets and policies

➔ **Incentives**
- Lack of rules for grid connection
- Complex incentive scheme
- Costly and inefficient

➔ **Bureaucracy**
- Difficult and time consuming paperwork

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WHAT THE INDUSTRY CAN ACHIEVE

RIGHT HERE IN GADENDORF

Pig farm with 434 REC panels installed in Gadendorf, Germany. Annual capacity 78 000 kWh
51 tons of CO_2 saved annually

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Set for 2020 ”Solar Photovoltaic Electricity: A mainstream power source in Europe by 2020”, EPIA	Renewable Energy Corporation

“PV electricity can provide up to 12% of the EU electricity demand by 2020, from less than 1% today, provided the right conditions are created by EU policy makers, national governments and energy industry stakeholders, including the PV sector”

A 12% market share for PV is a demanding, but achievable and desirable objective, not only for Europe but for the world as a whole

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Exeptional growth in installed capacity

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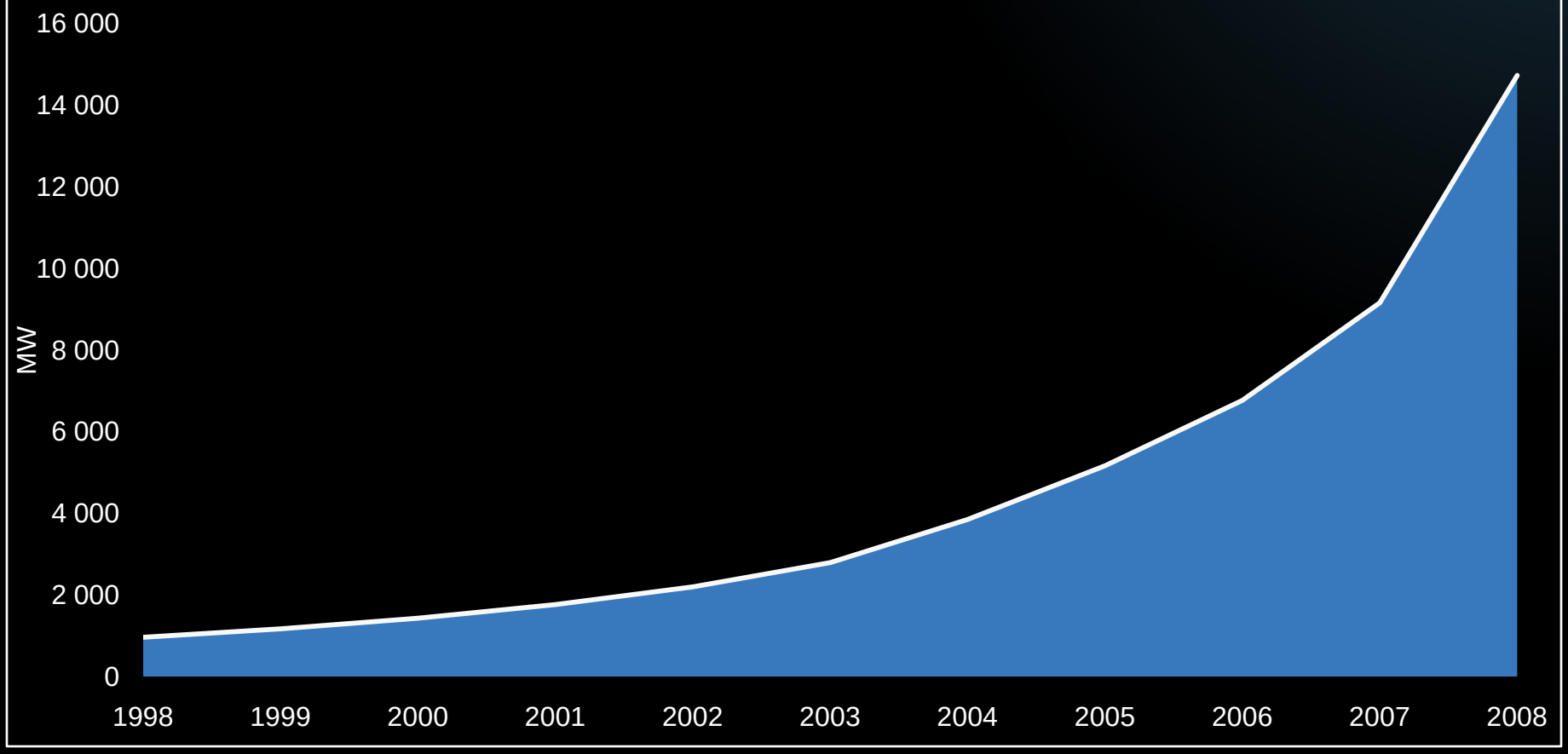
Historical development of Global cumulative PV power installed



Source: Global market outlook for photovoltaics until 2013, EPIA

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The cost of solar energy is consistently decreasing

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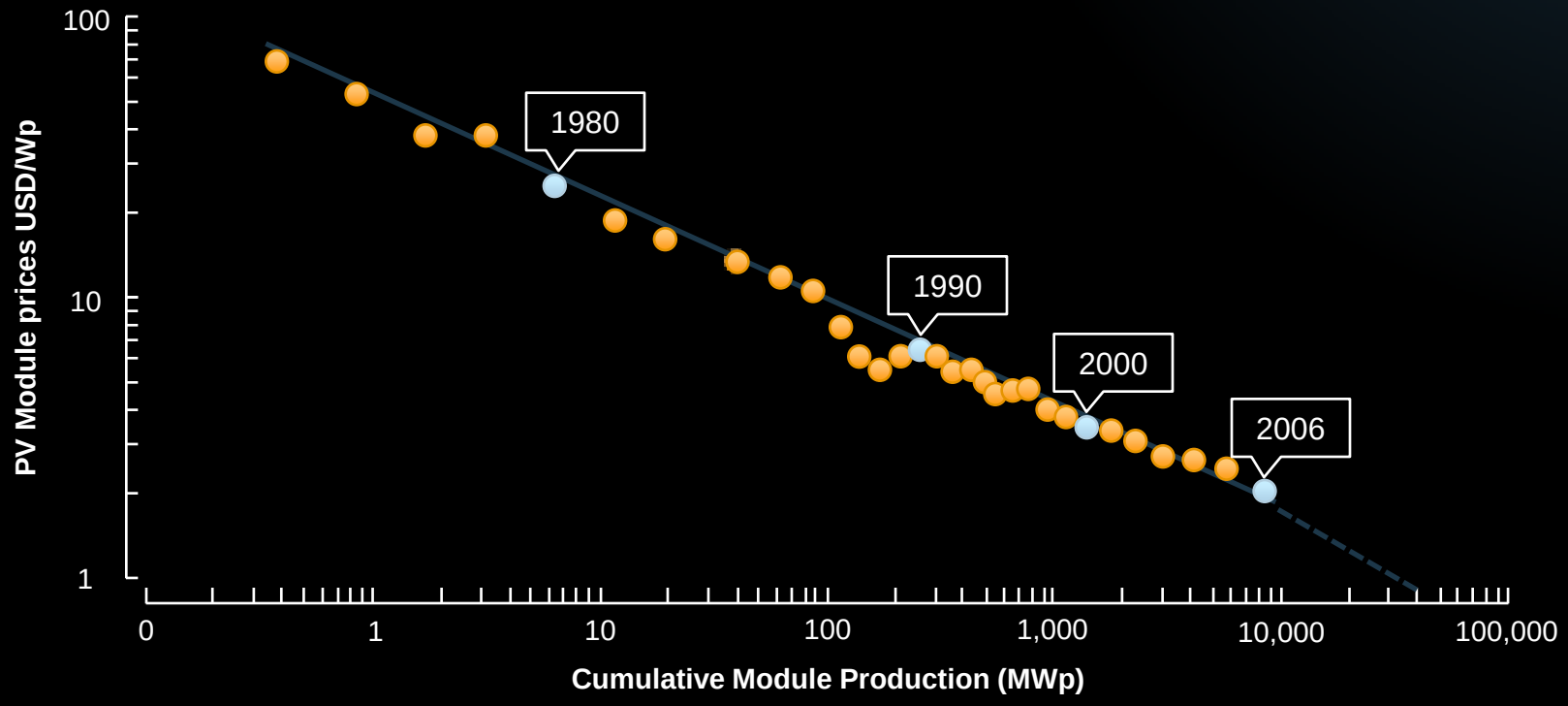
Historical module learning curve



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WHAT WILL BE REQUIRED TO ACHIEVE OUR TARGETS

RIGHT HERE IN ALICANTE

REC panels installed in a power plant in Alicante, Spain. System size of 8 MW, powering 4 896 households

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Recommendations

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➔ Targets and policies
- Provide long-term targets and supporting policies
- Build confidence for investments in manufacturing and deployment

➔ Incentives
- Implement effective and cost-efficient incentive schemes
- Decrease over time to foster further innovation
- Prioritize simplification over economic generosity

➔ Industrial development
- The industry must continue to bring down cost to achieve grid parity both through cost effectiveness and development of technology

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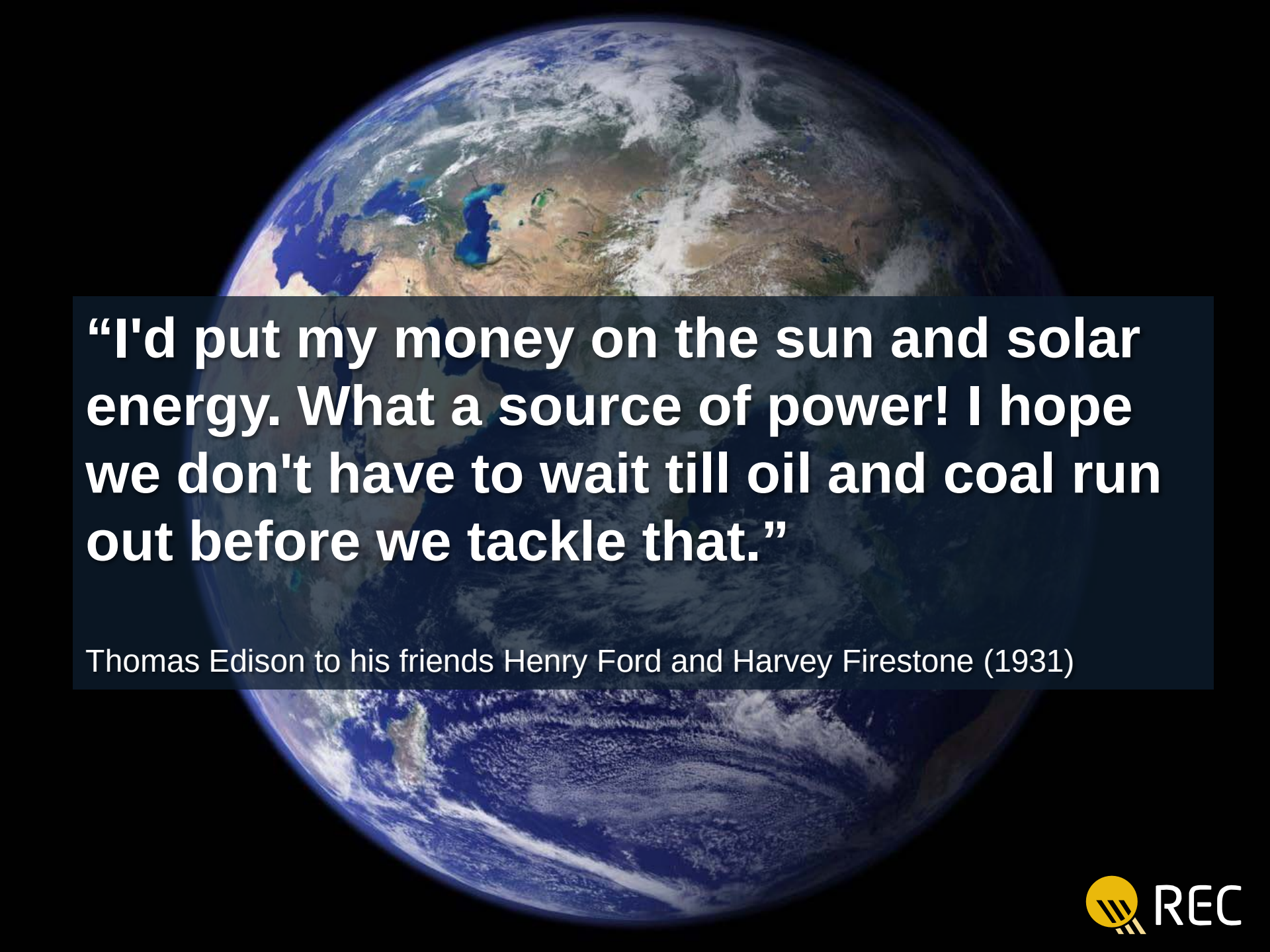

“I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait till oil and coal run out before we tackle that.”

Thomas Edison to his friends Henry Ford and Harvey Firestone (1931)

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