ACTIVITY P7
LINE OF ACTION B.

Edict articles about the amount of money a clean power station would cost.

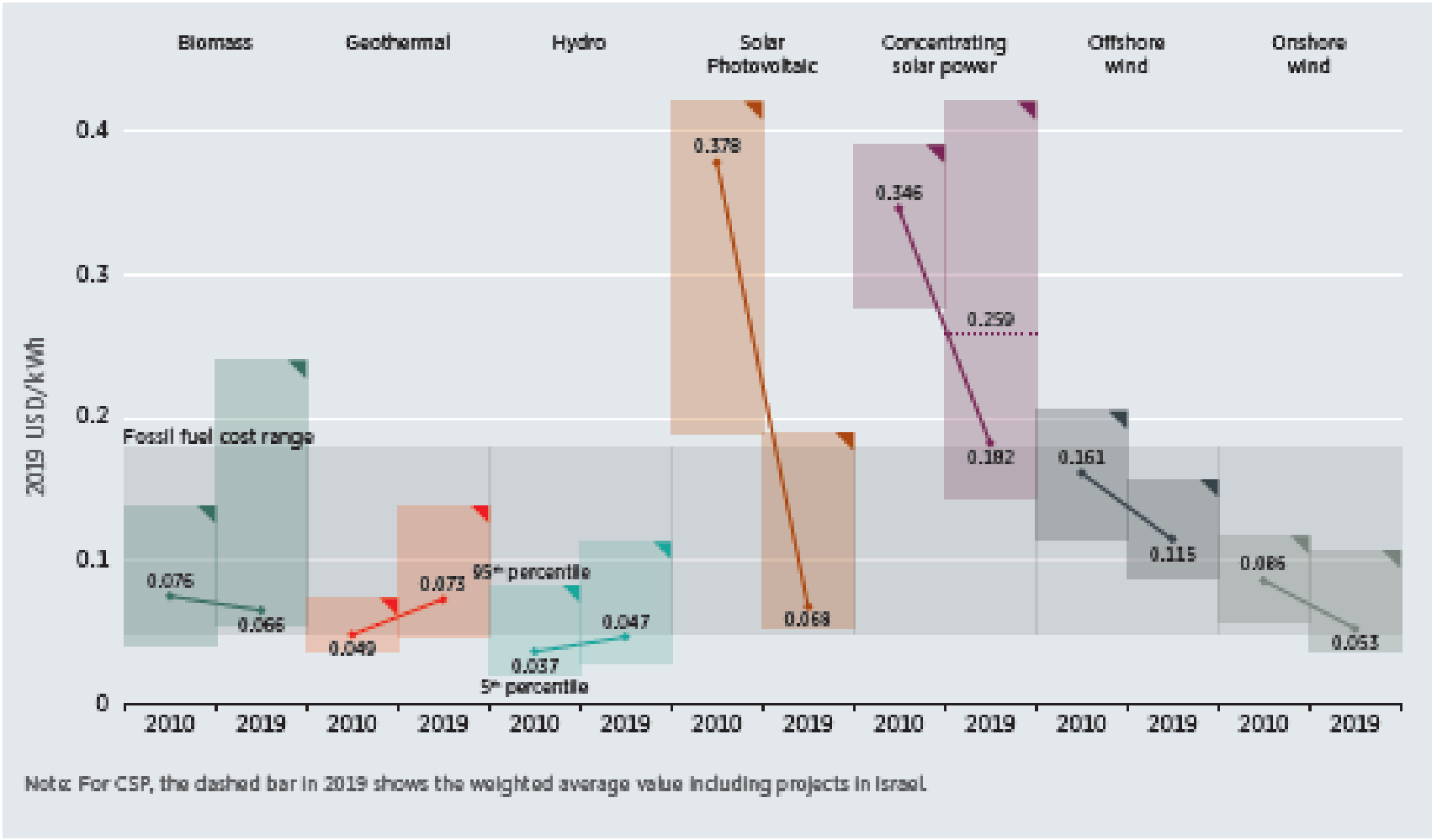
Labor market study in the field of renewable energies.

IES "EL BROCENSE"
CÁCERES (SPAIN)

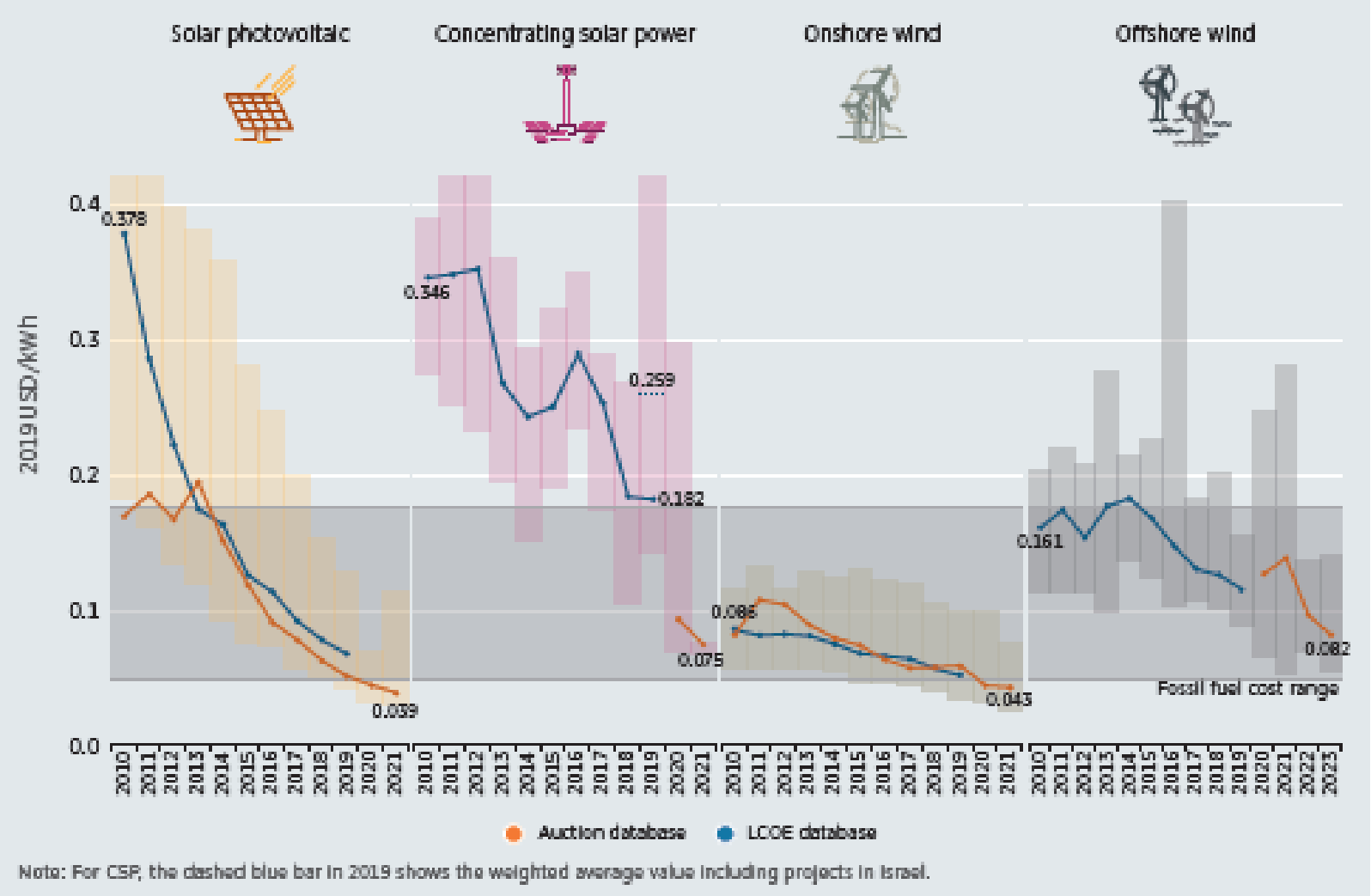
COST TRENDS, 2010-2019

- Electricity costs from renewables have fallen sharply over the past decade, driven by improving technologies, economies of scale.
- As a result, renewable power generation technologies have become the least-cost option for new capacity in almost all parts of the world.

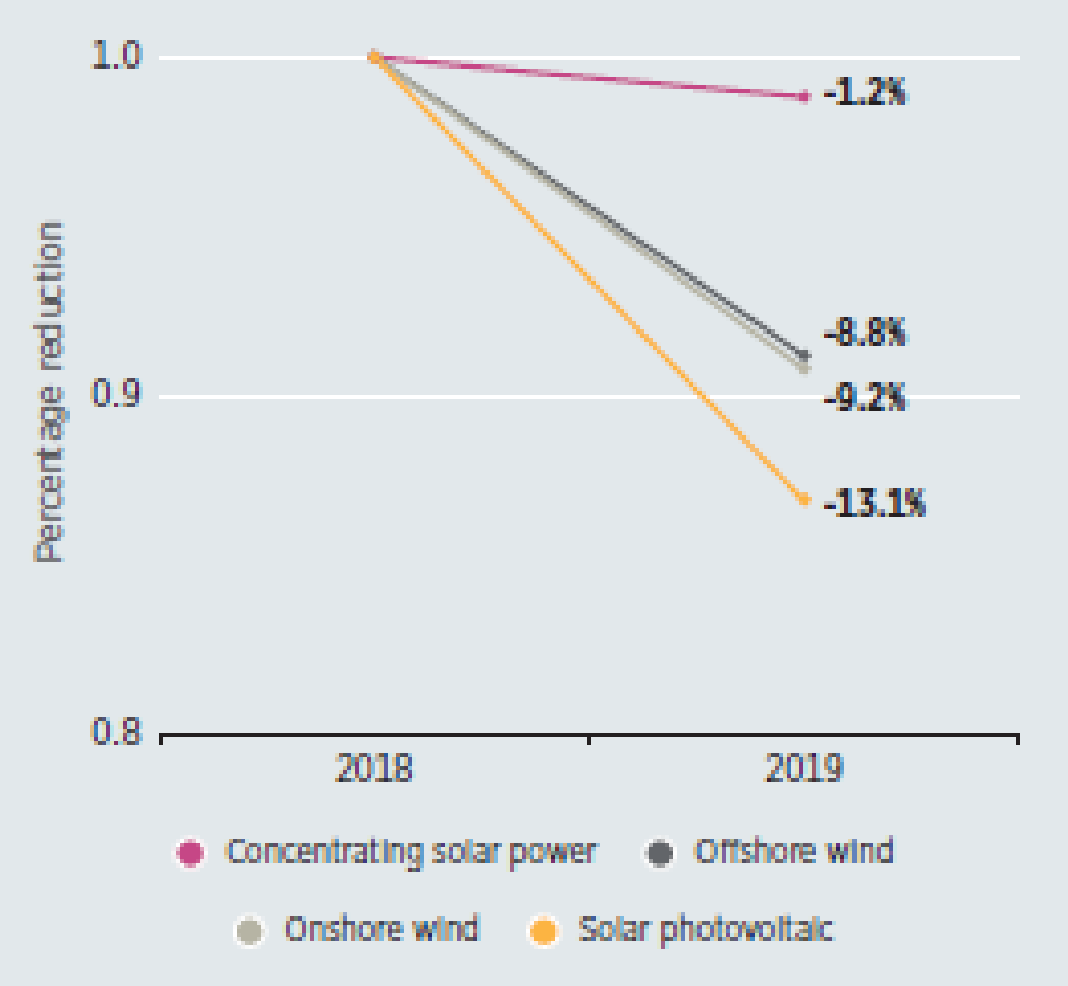
Global weighted average levelised cost of electricity from utility-scale renewable power generation technologies, 2010 and 2019



Global weighted average LCOE and Auction/PPA prices for CSP, onshore and offshore wind, and solar PV, 2010 to 2023

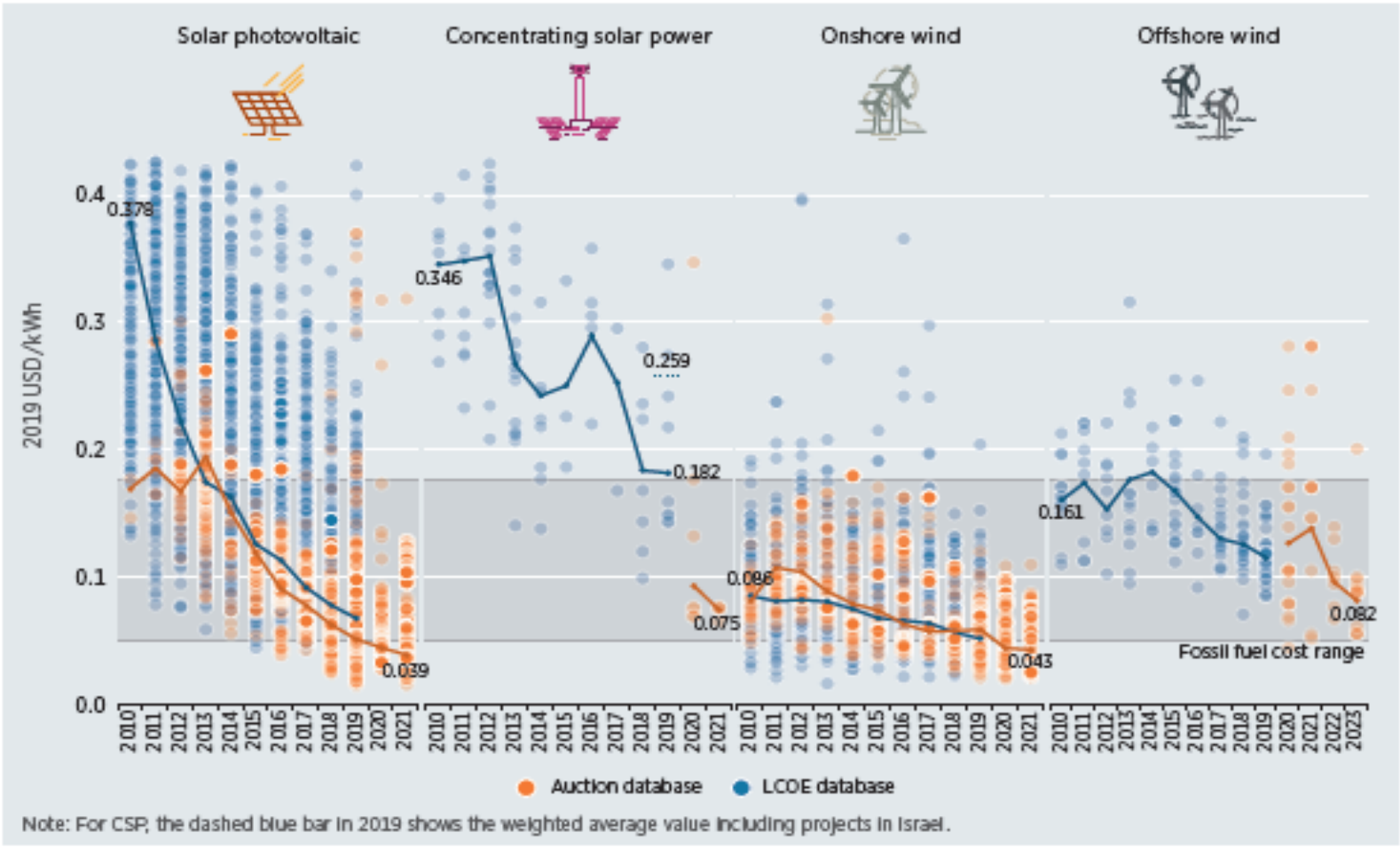


Global LCOE from newly commissioned utility-scale renewable power



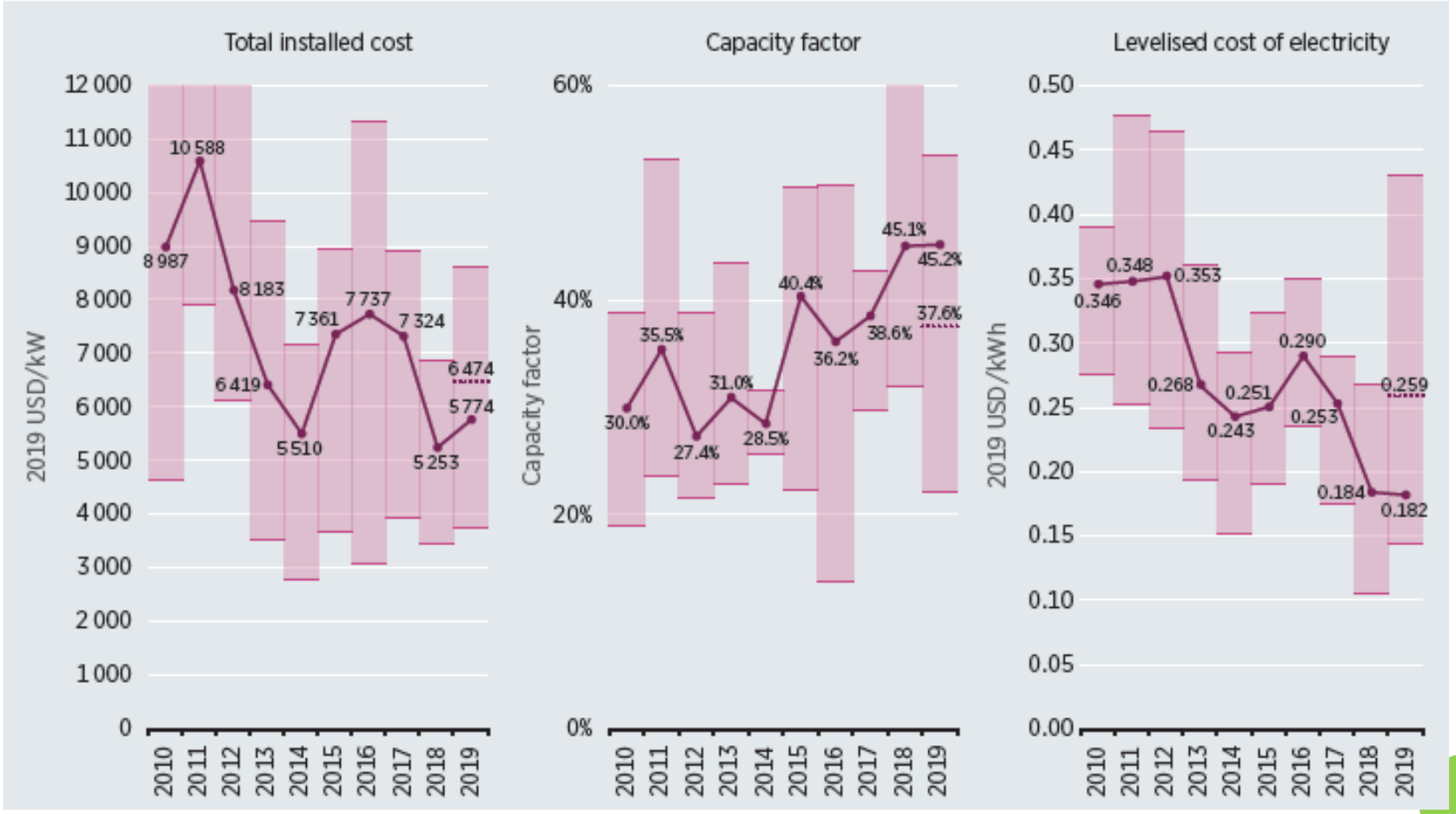
- *Over half of newly commissioned utility-scale renewable power generation capacity in 2019 produced electricity at lower costs than the cheapest new source of fossil fuel-fired power.*

The LCOE and PPA/Auction prices by project for solar PV, onshore wind, offshore wind and CSP, 2010-2023



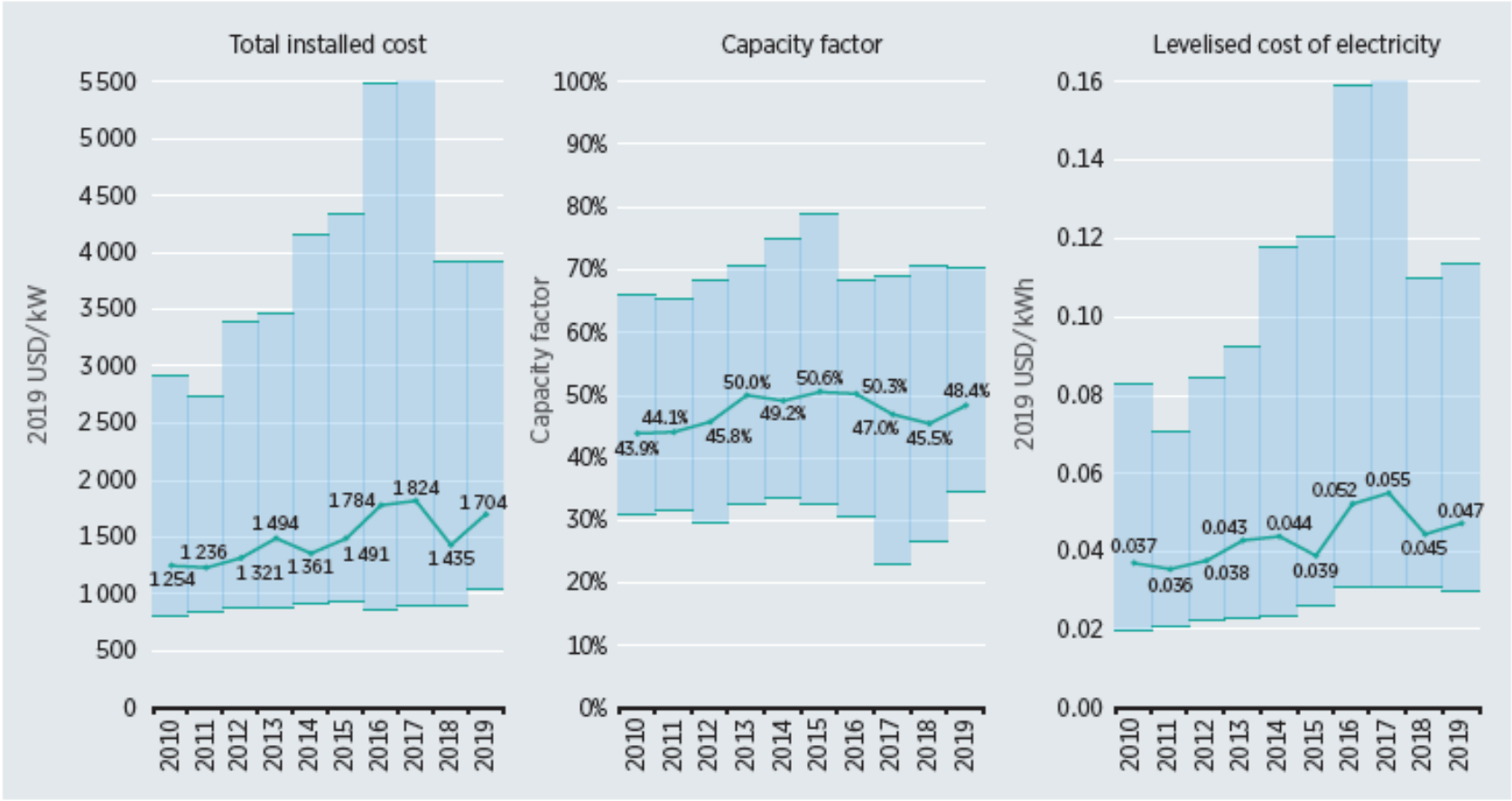
Note: For CSP, the dashed blue bar in 2019 shows the weighted average value including projects in Israel.

Global weighted average total installed costs, capacity factors and LCOE for CSP, 2010-2019

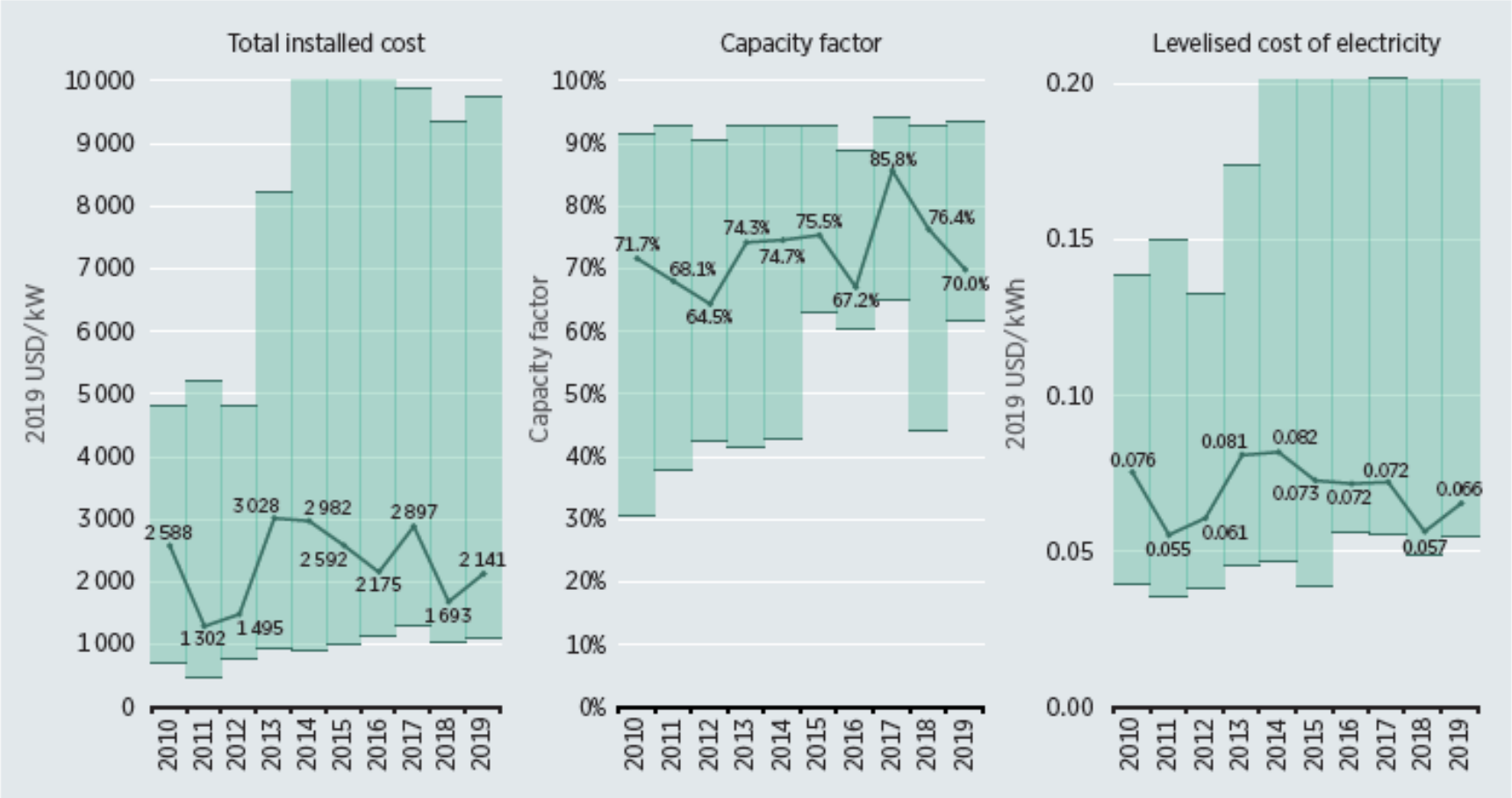


Concentrating solar power (CSP)

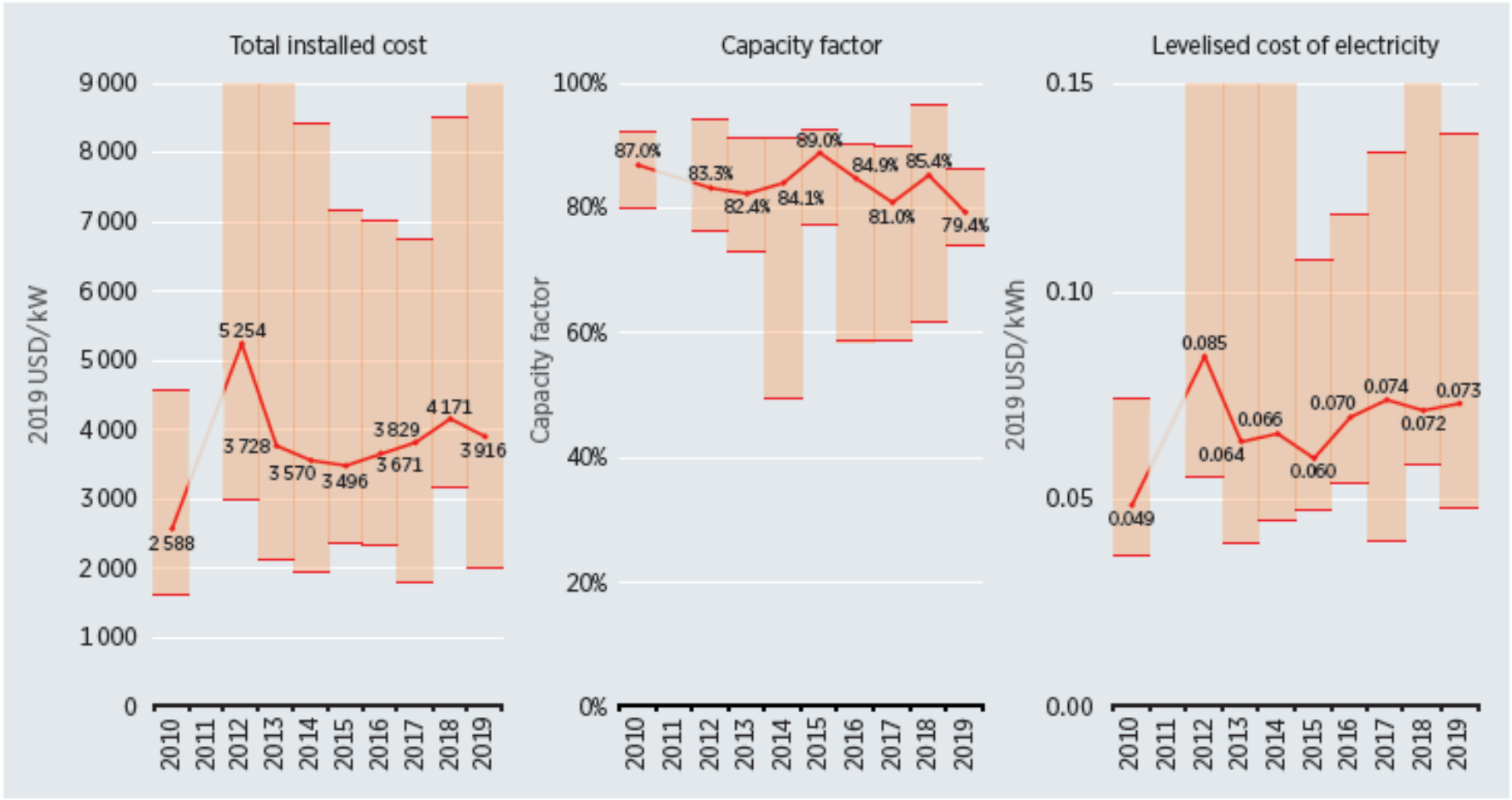
Global weighted average total installed costs, capacity factors and LCOE for hydropower, 2010-2019



Global weighted average total installed costs, capacity factors and LCOE for bioenergy power, 2010-2019

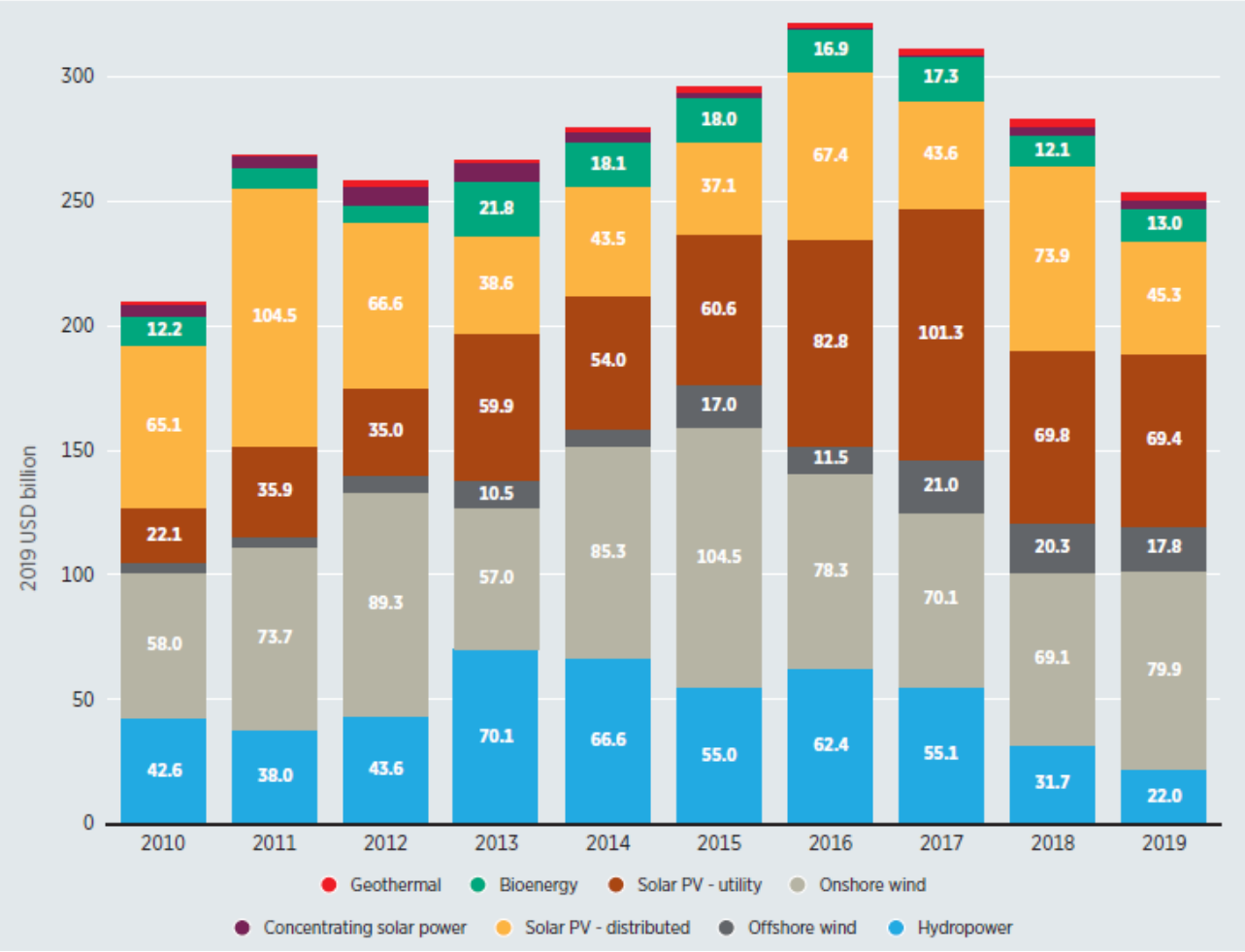


Global weighted average total installed costs, capacity factors and LCOE for geothermal power, 2010-2019

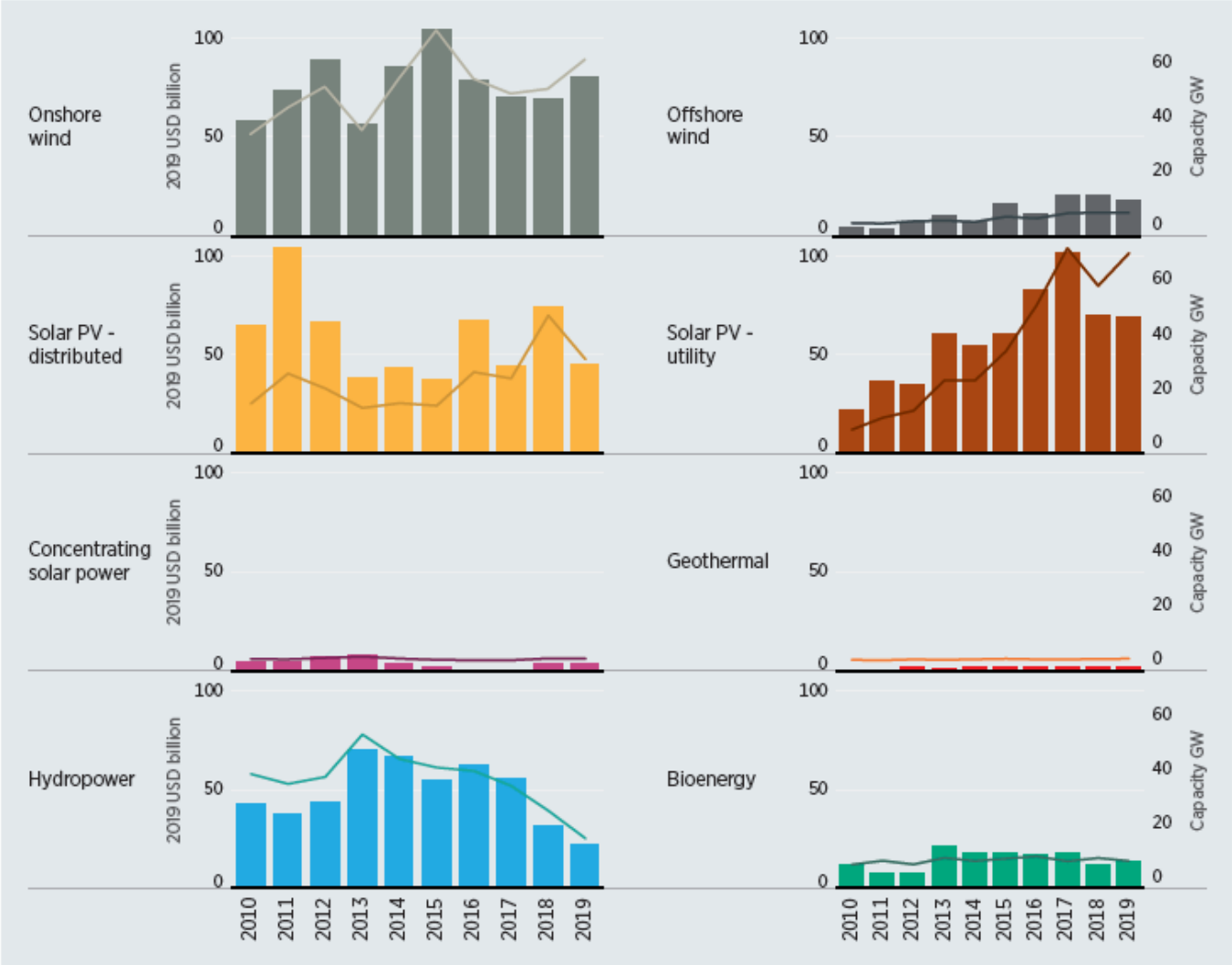


INVESTMENT TRENDS

The figure shows the trends in the value of investment of new renewable capacity added by year.



The figure shows the trends in investment by technology (bars) and the associated annual new capacity deployment (lines).



Energy subsidies: Evolution in the global energy transformation to 2050

- New IRENA estimates suggest renewables subsidies have been overestimated.
- The new analysis dispels the myth that the energy transition would entail a massive growth in subsidies.
- The reality is the opposite: the energy transition can reduce total subsidies in the energy sector .
- IRENA estimates that in 2017, the world's total, direct energy sector subsidies amounted to at least USD 634 billion.
- Subsidies to fossil fuels accounted for around 70% (USD 447 billion) of this total.

Labor market study in the field of renewable energies

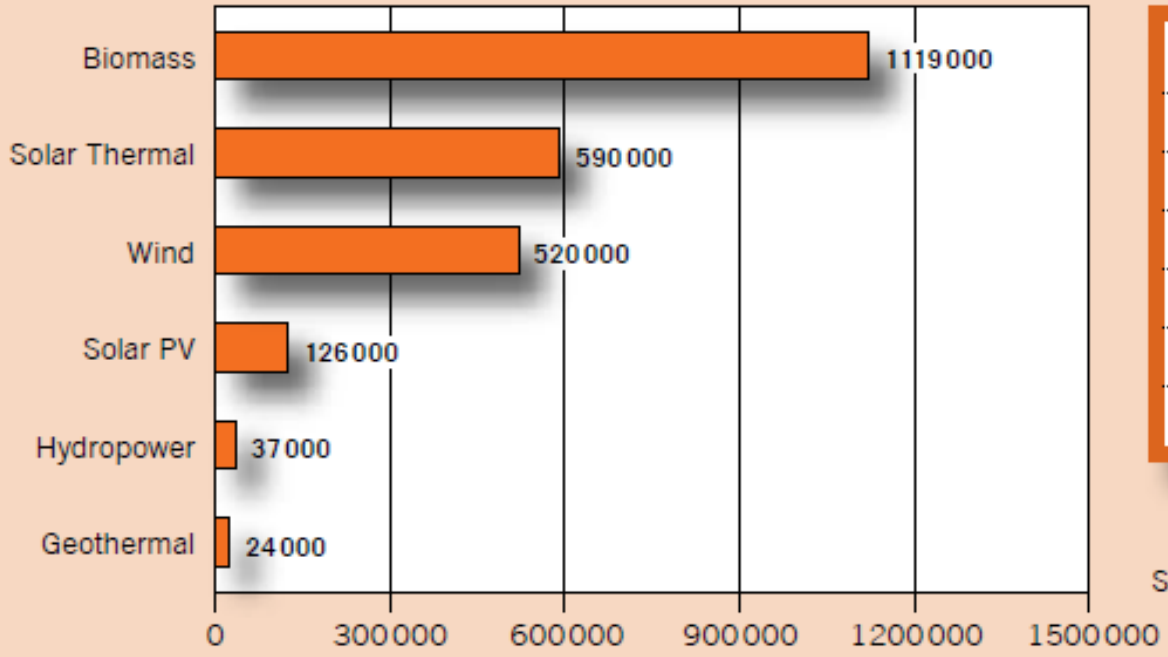
Why renewable energy is important

- Investment in renewable energy offers considerable scope for generating employment opportunities.
- There is substantial employment potential associated with project development, construction and installation for all renewable energy technologies.

Where the jobs are – and where the jobs will be

- Next figure shows the estimated direct employment figures for the seven countries with the largest workforces engaged in the sector. It demonstrates the dominant role played by four countries, China, Brazil, the US and Germany.
- The figure also shows that the biofuels industry is currently the most important sub-sector of renewable energy in terms of employment.

Employment in renewable energy by technology in selected countries



China	1120000
Brazil	500000
USA	406600
Germany	278000
Spain	80940
Denmark	21000
India	10000

Source: UNEP, 2011.

Occupations in selected renewable energy sub-sectors by value chain

Value chain elements	Occupations
Equipment Manufacture and Distribution (Wind energy)	•R&D Engineers (computer, electrical, environmental, mechanical, wind power design) • Software Engineers • Modellers (prototype testing) •Industrial Mechanics • Manufacturing Engineers • Manufacturing Technicians • Manufacturing Operators • Manufacturing Quality Assurance Experts Certifiers • Logistics Professionals • Logistics Operators • Equipment Transporters • Procurement Professionals • Marketing Specialists • Sales Personnel

Value chain elements	Occupations
Project Development (Solar energy)	•Project Designers (Engineers) • Architects (H) (small projects) • Atmospheric Scientists and Meteorologists • Resource Assessment Specialists and Site Evaluators • Environmental Consultant • Lawyers • Debt Financier Representatives • Developers/Facilitators • Land Development Advisor • Land Use Negotiator • Lobbyist • Mediator • Environmental and Social NGO •Representatives • Public Relations Officer • Procurement Professionals • Resource Assessment Specialists

Value chain elements	Occupations
Construction and Installation (Hydropower)	Engineers (civil, mechanical, electrical) (H) c Project Managers (H) c Skilled Construction Workers (Heavy Machinery Operators, Welders, Pipe-fitters etc.), (M) c Construction Labourers (L) c Business Developers (H) c Commissioning Engineer (Electrical) (H) c Transportation Workers
Operation and Maintenance (Geothermal energy)	Plant managers (H) c Measurement and Control Engineers (H) c Welders (M) c Pipe Fitters (M) c Plumbers (M) c Machinists (M) c Electricians (M) c Construction Equipment Operator (M) c HVAC technicians

Value chain elements	Occupations
Biomass production (Bioenergy)	•Agricultural Scientists • Biomass Production Managers • Plant Breeders & Foresters • Agricultural / Forestry Workers • Transportation workers
Cross-cutting/ Enabling Activities (all sub-sectors)	• Policy Makers and Government Office Workers • Trade Association and Professional Society Staff • Educators & Trainers • Management • Administration • Publishers and Science Writers • Insurer Representatives • IT Professionals • Human Resources Professionals • Other Financial Professionals (Accountants, Auditors and Financers) • Health and Safety consultants • Sales and Marketing Specialists • Clients

Principal occupations difficult to fill per sub-sector

Sub-sector	Occupations
Wind energy	Project developers; service technicians; data analysts; electrical, computer, mechanical and construction engineers
Solar energy	PV and solar thermal system installers and maintainers; building inspectors
Hydropower	Electrical and operations and maintenance engineers; technicians; tradespersons; sustainability specialists
Geothermal	Trainers; geothermal engineers
Bioenergy	R&D and design engineers; service technician; trainers

The way forward

- Smooth transitions to renewable energy by pacing investment.
- Coordinate renewable energy policy and investment with skills provision.
- Anticipate skill needs.
- Enhance quality of employment in renewable energy.
- Develop a strategy for corporate social responsibility.
- Encourage international collaboration between providers of education and training

REFERENCES

- Bowen A, Kuralbayeva K, Tipoe EL. Characterising Green Employment: The impacts of 'greening' on workforce composition. Energy Econ 2018.

- Energy Procedia (2019). Analysis of labour market needs for engineers with enhanced knowledge in renewable energy in some European and Latin-American Countries

- IRENA (2020), *Renewable power generation costs in 2019, International Renewable Energy Agency, Abu Dhabi.*

- IRENA (2016), *The power to change: Solar and wind cost reduction potential to 2025, International Renewable Energy Agency, Abu Dhabi*

- Lunz, B. *et al. (2016), "Evaluating the value of concentrated solar power in electricity systems with fluctuating energy sources", AIP Conference Proceedings 1734, 160010, https://doi.org/10.1063/1.4949251.*

- Turchi, C. (2017), *Concentrating solar power: Current cost and future directions, National Renewable Energy Laboratory, Boulder, CO, http://atainsights.com/wp-content/uploads/2017/05/Craig-PPT.pdf.*