Long-term Energy Scenario for the Clean Energy Transition

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IEA

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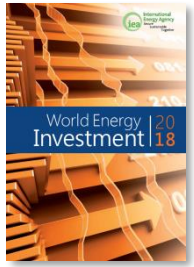
IEA Energy Modelling & Policy Activities

Statistics and trends

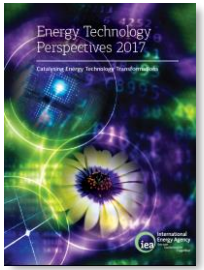
- Where are we today?

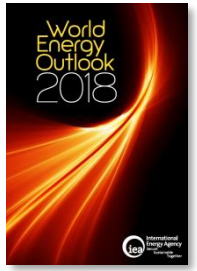
www.iea.org/tcep/



Scenarios and Modelling

- Where are we going and where do we need to go?





Technology Roadmaps

- How do we get there?

iea Energy Technology Network
Technology Collaboration Programmes

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IEA energy modelling and scenarios

- **Forecasts (next 5 years)** : Market Report series
- **Market- and policy-based scenarios (out to 2040)**: World Energy Outlook
- **Technology-focused scenarios (out to 2060)**: Energy Technology Perspectives
- **System Integration:** Analysis of flexibility resources/market design for vRE

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IEA long-term models

World Energy Model (WEM)

- Simulation model
  - Scenarios based on policies
  - Detailed sectoral and regional energy balances
- Time horizon to 2040
  - Annual resolution
- Regional resolution: global
  - End-use and transformation sectors: 25 regions
  - Supply sectors: 120 regions
- Three main modules:
  - Final energy consumption
  - Energy transformation
  - Supply and trade

Energy Technology Perspectives (ETP) Model

- Combination of sectoral models (simulation and optimisation)
  - Scenario analyses focussing on technologies
  - Detailed sectoral and regional energy balances
- Time horizon to 2060
  - Five-year steps
- Regional resolution: global
  - 28-39 regions (depending on sector)
- Four main models:
  - Buildings
  - Transport (Mobility Model - MoMo)

  Spreadsheet-based simulation models
  - Industry
  - Power and fuel transformation

  TIMES optimisation models

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IEA and the Sustainable Development Goals

- The *World Energy Outlook* had been tracking annual country-by-country progress towards SDG 7.1 (electricity and clean cooking access) since 2002
  - *Energy Access Outlook* special report, including latest country-by-country data on electricity & clean cooking access, as well as outlook for SDG 7.1
- IEA is global custodian agency for tracking progress towards SDG 7.2 (renewable energy) and 7.3 (energy efficiency)
- Playing a key role in the run-up to review of SDG 7 by the United Nations at the High-level Political Forum on Sustainable Development in July 2018
- Co-leads the Global Tracking Framework report, which provides an assessment of progress towards achieving the three SDG 7 targets
- *WEO-2017* presented the Sustainable Development Scenario, a new benchmark scenario achieving energy SDGs – energy access, air pollution & climate change

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IEA Technology Roadmaps: Mapping how to we get there…

www.iea.org/technologyroadmaps

2009 2010 2011 2012 2013 2014 2015 2017

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Tracking Clean Energy Progress 2018

Power

- Renewable power
  - Solar PV
  - Onshore wind
  - Offshore wind
  - Hydropower
  - Bioenergy
  - Geothermal
  - Concentrating solar power
  - Ocean
- Nuclear power
- Natural gas-fired power
- Coal-fired power
- CCS in power

Industry

- Cement
- Chemicals
- Steel
- Aluminum
- Pulp and paper
- CCS in industry

Transport

- Electric vehicles
- International shipping
- Fuel economy
- Trucks
- Transport biofuels
- Aviation
- Rail

Buildings

- Building envelope
- Heating
- Cooling
- Lighting
- Appliances & equipment
- Data centres and networks

Energy Integration

- Energy storage
- Smart grids
- Demand response
- Digitalization
- Hydrogen
- Renewable heat

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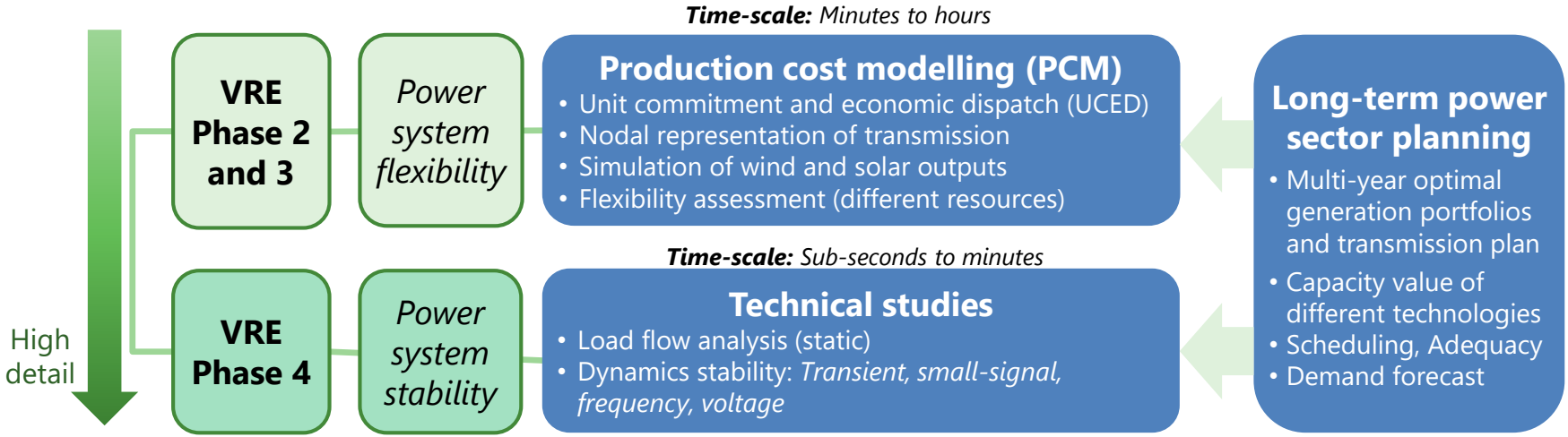
Integrated power system modelling studies with VRE



- Integrated power sector modelling is important to assess system flexibility
  - Understand the operational and economic impacts.
- With increasing VRE, there is a need to prioritise and integrate existing power sector modelling
  - Linking the modelling tools to the timescale and VRE phases (and penetration)
- These are the current modelling efforts at the IEA - a number of grid integration case studies
  - Linking and integrating different models (WEM, ETP and PCM) and sector coupling

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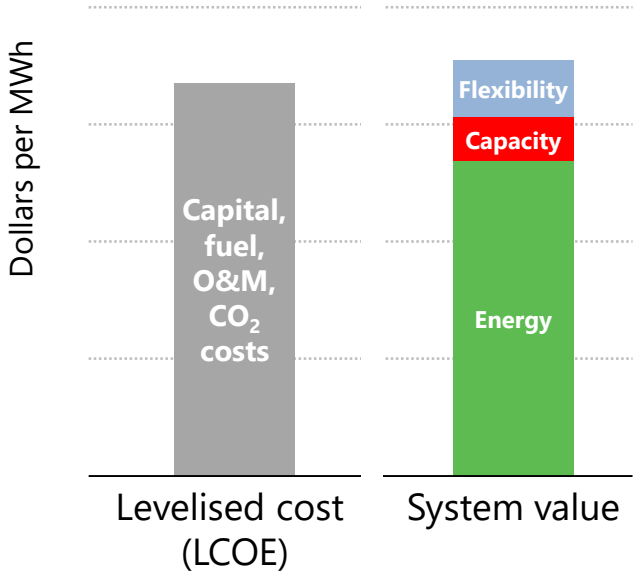
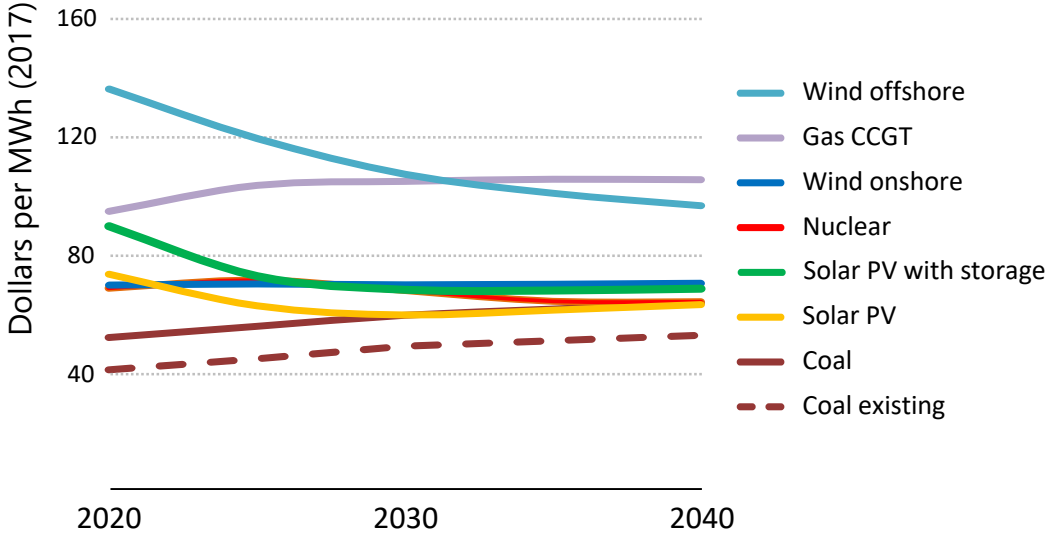
Looking beyond the levelised cost of electricity

Technology costs and value



Value-adjusted LCOEs (VALCOEs) in China



Costs remain an important indicator of competitiveness, but better metrics are needed to reflect the changing nature and needs of power systems

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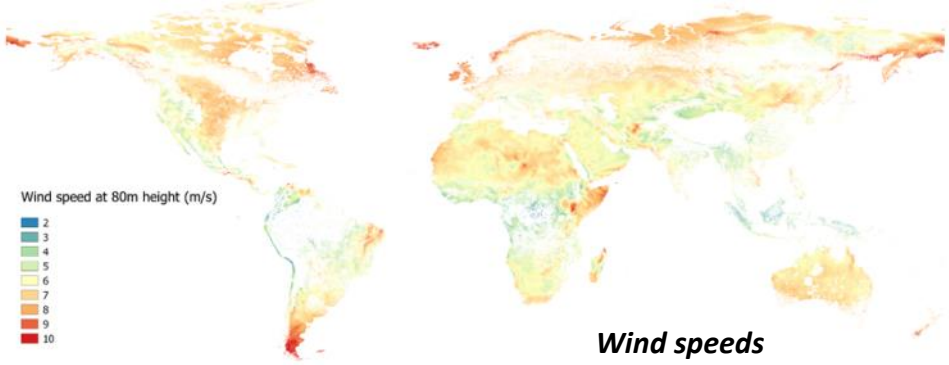
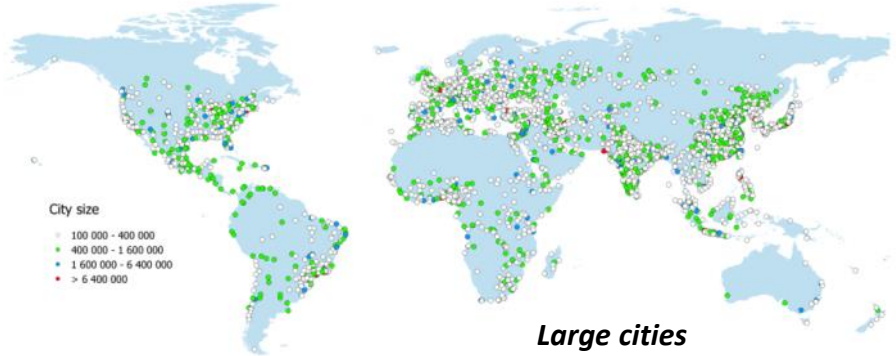
Spatial analysis of renewable potentials: Example onshore wind

- Analysis of onshore wind potential

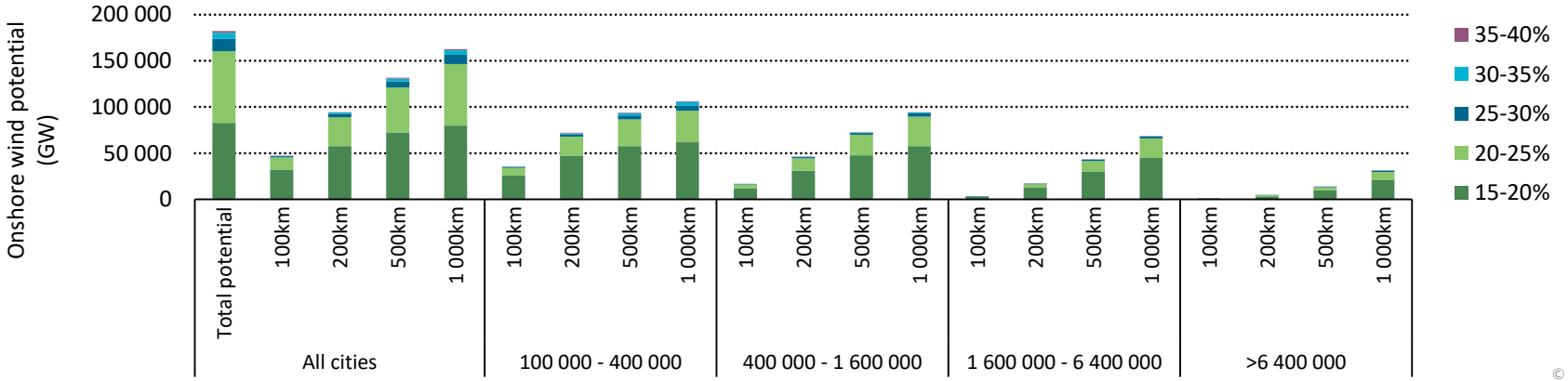


Wind speeds



Large cities

- Onshore wind potential differentiated by capacity factor, distance to cities and population size



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IEA activities on capacity-building for energy modelling

- IEA Energy and Energy Efficiency Training Weeks since 2011 with participants mainly from emerging and developing countries

- Bilateral collaboration on energy modelling training and model reviews with national ministries and research centres (e.g. China, EC, South Africa, Mexico)

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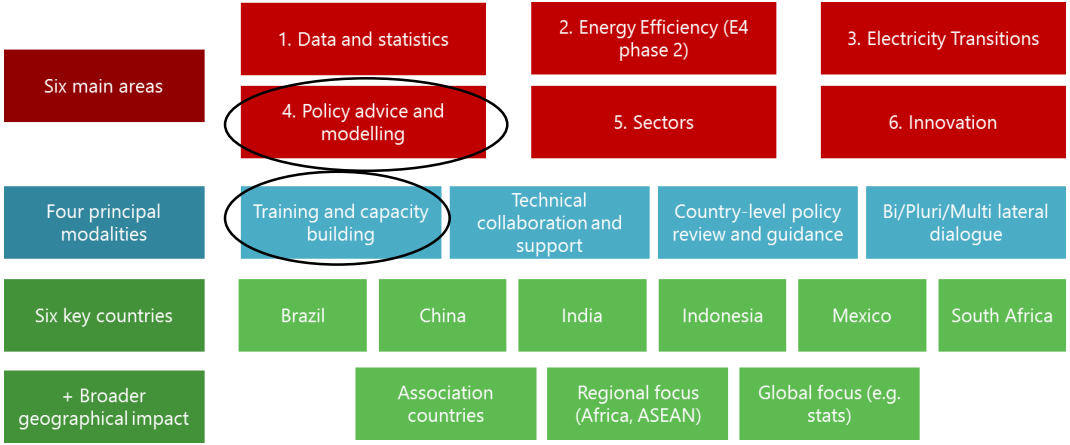
Clean Energy Transitions Programme (CETP)

In November 2017, 13 IEA members launched the CETP: a multi-year initiative enhancing IEA capabilities to support countries' clean energy transitions.

Overview of the CETP



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Conclusions

- Use of long-term scenarios:
  - Global scenarios to inform policy makers on the gap between where we are heading and where we would like to go
  - Additional tools to complement scenarios: tracking current progress and roadmaps

- Improving scenarios:
  - Model and scenario development goes hand-in-hand with improving data and statistics
  - Integrated long-term models to understand short-term issues (VRE integration)
  - Understanding consumer behaviour (digitalisation)

- Capacity-building for model-based scenario development
  - Model development a long-term process and investment, continuity important
  - Not only the results, but also the process of developing a scenario can be valuable, having the potential of bringing together different stakeholders to discuss future strategies for the energy sector

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www.internationalenergyworkshop.org

The 38th International Energy Workshop
will be hosted by the IEA in Paris on June 3-5th, 2019.

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