Annex 1: The IEA ETP Model and Scenarios

The vision for this roadmap is based on the modelling carried out for the IEA Energy Technology Perspectives (ETP) publication, 2017 (IEA 2017). This presented three scenarios with different energy technology and policy pathways for a low carbon energy system in the period to 2060. (Box A1.1).

Box A1.1: ETP Scenarios

The ETP model comprises four interlinked technology rich modules that cover the energy supply, buildings, industry and transport sectors. Depending on the sector the modelling framework includes 28 to 39 world regions or countries. ETP 2017 covers the period to 2060, expanding the analysis beyond the 2050 timeframe of earlier ETP publications.

The ETP scenarios are constructed using a combination of forecasting to reflect known trends in the near term and “backcasting” to develop plausible pathways to a desired long term outcome. The scenarios should not be considered as predictions but as analyses of the impacts and trade-offs of different technology choices and policy targets, thereby providing a quantitative approach to support decision making in the energy sector. The ETP scenarios are complementary to those explored in the IEA World Energy Outlook (WEO).

The Reference Technology Scenario (RTS) takes into account today’s commitments by countries to limit emissions and improve energy efficiency including the Nationally Determined Contributions (NDCs) pledged under the Paris Agreement. By factoring in these commitments and recent trends the RTS already represents a major shift from a historical “Business as Usual” approach with no meaningful climate policy response.

The RTS requires the significant changes in policy and technologies linked to the NDCs to be fully executed in the period to 2060 as well as substantial additional cuts in emissions thereafter, so is in itself an ambitious scenario. These efforts would result in an average temperature increase of 2.7°C by 2060 at which point temperatures are unlikely to have stabilised and would continue to rise.

The 2DS Scenario (2DS) lays out an energy system pathway and a CO\(_2\) emissions trajectory consistent with at least a 50% chance of limiting the average global temperature increase to 2°C by 2100. Annual energy sector emissions are reduced by 70% from today’s levels by 2060 with cumulative emissions of around 1 170 gigatonnes of CO\(_2\) (GtCO\(_2\)) between 2015 and 2100 (including additional industrial process emissions). To stay within this range, CO\(_2\) emissions from fuel combustion and industrial processes must continue to decline after 2060 and carbon neutrality in the energy system must be reached by 2100.

The Beyond 2°C Scenario (B2DS) explores how far deployment of technologies that are already available or in the innovation pipeline could take us beyond the 2DS. Technology improvements and deployment are pushed to their maximum practicable limits across the energy system in order to achieve net zero emissions by 2060 and to stay at net zero or below thereafter, without requiring unforeseen technology breakthroughs or limiting economic growth. This “technology push” approach results in cumulative emissions from the energy sector of around 750 GtCO\(_2\) between 2015 and 2100 which is consistent with a 50% chance of limiting average global temperature increases to 1.75°C. Energy sector emissions reach net zero around 2060, supported by negative emissions through the deployment of bioenergy with carbon capture and storage (BECCS). The B2DS falls within the Paris Agreement range of ambition, but does not purport to define a specific temperature target for “well-below” 2°C.

References

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 29 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency’s aims include the following objectives:

- Secure member countries’ access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

IEA member countries:
- Australia
- Austria
- Belgium
- Canada
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Ireland
- Italy
- Japan
- Korea
- Luxembourg
- Netherlands
- New Zealand
- Norway
- Poland
- Portugal
- Slovak Republic
- Spain
- Sweden
- Switzerland
- Turkey
- United Kingdom
- United States
- The European Commission also participates in the work of the IEA.