

Why International Energy Agency scenarios should not be misinterpreted as forecasts

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The International Energy Agency's annual energy report, the World Energy Outlook (WEO), is a leading source for medium to long-term energy market modelling, which is widely used as an authoritative source by politicians, industry and the media. However, the scenarios within these reports are regularly misunderstood and misused, both accidentally and deliberately.

Under the Paris Agreement, Australia and a host of other countries, have committed to limit global warming to well below 2°C and pursue limiting warming to 1.5°C above pre-industrial levels.¹

It is therefore important, in Australia's fraught climate and energy debate, to understand the limits of the IEA scenarios, and the implications of each scenario within them, for global warming and what this means for Australia's national interest.

IEA scenarios and what they represent

The IEA has been a leading source of energy market research for over 40 years. Established in 1974, in the wake of the 1973 oil crisis, 23 countries in the Organisation for Economic Cooperation and Development (OECD) founded the IEA to produce and share information about future energy trends.

In its annual WEO, the IEA consistently presents three core scenarios examining the implications for the energy sector of:

- + currently operating energy policies (Current Policies Scenario);
- + current policies and announced policy intentions (New Policies Scenario); and
- + deep emissions reductions across the energy sector based on a 50 per cent chance of avoiding 2°C warming (450 Scenario, based on limiting CO₂ to 450 parts per million in the atmosphere).

Despite repeated warnings by the IEA that they do not represent forecasts, the New Policies Scenario in particular is often presented as the most likely future of energy. This is despite the fact that it assumes no changes in policies over the next 25 years. Scenarios have also consistently underestimated renewable energy growth, particularly wind and solar.

Box 1: IEA scenarios

The three central scenarios in the latest WEO 2016² look out to 2040:

Current Policies Scenario

As the IEA states, "The Current Policies Scenario depicts a path for the global energy system shorn of the implementation of any new policies or measures beyond those already supported by specific implementing measures in place as of mid-2016."³ This scenario incorporates no new policies and does not account for the emissions reduction targets, or adopted policies and measures central to the Paris Agreement.

Implications for:

- + Renewables: generating 29 per cent of electricity by 2040 (23 per cent in 2014).
- + Coal: generating 36 per cent of electricity by 2040 (41 per cent in 2014).
- + Warming: ~6°C

New Policies Scenario

The New Policies Scenario reflects existing commitments of governments to decarbonise their respective energy sectors, particularly countries' Nationally Determined Contributions (NDCs) central to the Paris Agreement. The IEA explains, "Its starting point is the policies and measures that are already in place, but it also takes into account, in full or in part, the aims, targets and intentions that have been announced, even if these have yet to be enshrined in legislation or the means for their implementation are still taking shape."⁴ The New Policies Scenario assumes that no further policies will be implemented over the next 25 years.

Implications for:

- + Emissions: 0.5 per cent increase per year; emissions do not peak in this scenario.
- + Renewables: generating 37 per cent of electricity by 2040.
- + Coal: generating 28 per cent of electricity by 2040; thermal coal use slows but does not peak until 2030.
- + Warming: 2.7°C.

450 Scenario

The objective of this scenario is “limiting the average global temperature increase in 2100 to 2 degrees Celsius above pre-industrial levels”.⁵ This scenario relies more heavily on renewables, particularly wind and solar, to achieve the necessary emissions reductions. The IEA state that the probability of limiting the global temperature rise in 2100 to 2°C under the 450 Scenario is 50 per cent. It is not fully consistent with the Paris objectives.

Implications for:

- + Renewables: generating 58 per cent of electricity.
- + Coal: generating 7 per cent of electricity by 2040, and 70 per cent of that coal has CCS.
- + Warming: 50 per cent chance of avoiding 2°C.

The IEA’s WEO 2016 recognises that its 450 Scenario is outside the warming goals of the Paris Agreement envelope, and flagged extra policies that might assist. The IEA is developing full scenarios for its 2017 report, but did consider “elements” of a “well below 2°C” pathway and a “1.5°C” pathway.

In separate research the IEA has pointed out that the 450 Scenario requires developed countries to phase out coal stations (unless they have CCS) by 2035.⁶

Misuse of IEA scenarios

The IEA has highlighted that its scenarios illustrate policy pathways, and should not be considered forecasts. This was outlined explicitly in WEO 2015⁷:

“The projections in the New Policies Scenario signal to policy-makers and other stakeholders the direction in which today’s policy ambitions are likely to take the energy sector. This does not, however, make this scenario a forecast – a point that needs constantly to be kept in mind.”

In WEO 2016⁸ the IEA pointed out that its scenarios are formulated to highlight the need for policies:

“[The New Policies Scenario] provides a well founded basis for expectations about the future and thereby also serves as an invitation for improvement: if the outcomes described are sub-optimal or, even, unacceptable, then policies and other conditions and factors need to change.”

Yet scenarios are regularly used as forecasts of the future, and are often misused to justify organisations’ agendas.

The Minerals Council has repeatedly misused IEA scenarios in this way. This is an excerpt from a report⁹ released this month:

“According to the IEA’s World Energy Outlook 2016, coal will generate more electricity in 2040 than all new renewable technologies (excluding hydro) combined.”

Here the Minerals Council is citing the New Policies Scenario, which assumes that no further policies will be implemented over the next 25 years while the world remains on course for almost 3°C of warming. The Mineral Council’s new advertising campaign also does this.¹⁰ In both, the Minerals Council ignores the 450 Scenario in which global coal demand drops sharply. Under this scenario, coal will generate only 7 per cent of energy supply, compared with renewables (58%) (Figure 1).

Figure 1: World electricity generation by IEA scenario in 2040.¹¹

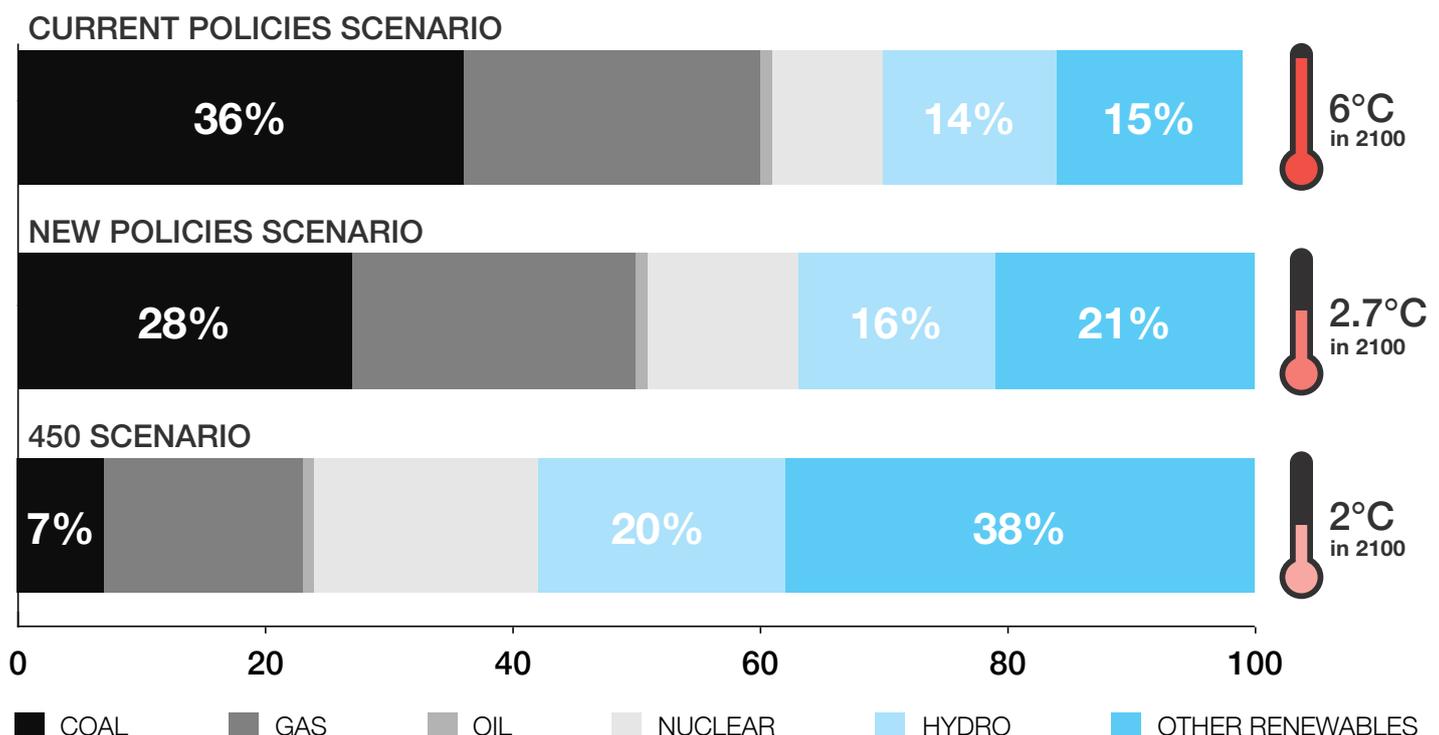
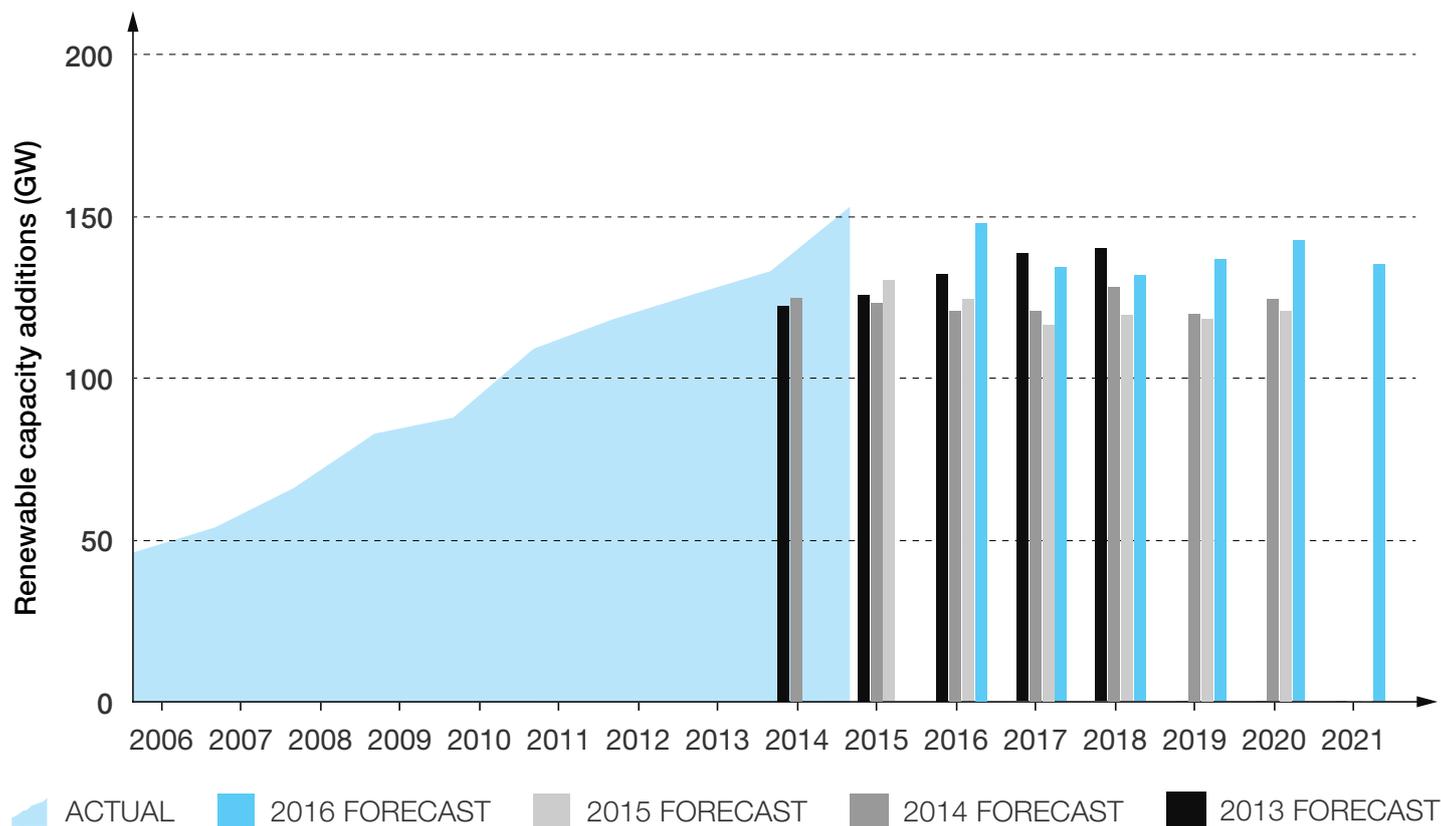


Figure 2: IEA forecasts of additions of renewable energy capacity.¹²



Underestimating renewables

Although WEO 2016 is the most bullish on renewable energy that the IEA has been to date, the IEA's conservative approach to renewable energy has seen it repeatedly underestimate renewable energy uptake. For years, the IEA projections have continued to play catch-up with the rapid growth and plummeting costs of renewables.

The IEA also releases medium-term market reports (MTMR) for a range of energy technologies. The latest renewable energy MTMR contains what the IEA describes as a "significant" increase in the growth forecast for renewables.¹³ However, Carbon Brief analysis¹⁴ notes that the IEA expects renewables growth to be flat (Figure 2):

"A record \$286bn was invested in renewables in 2015, with the money buying a record 153GW of new capacity. Yet, as in previous forecasts, the IEA once again expects the rising trend in renewable additions to come to an end. After the record 153GW in 2015, it sees 148GW of new renewable capacity being added in 2016, 134GW in 2017 and 131GW in 2018."

Australia's national interest

The implications of each of the IEA scenarios on global temperature rise, and the associated climate-related impacts on Australia, vary significantly. The government's national interest assessment supporting ratification of the Paris Agreement noted global climate action was important because of the economic, security and environmental costs of climate change to Australia.¹⁵ The Climate Institute commissioned Climate Analytics to examine the impacts on Australia of limiting global temperature rise to 1.5 or 2°C and the implications for Australia's national interest.¹⁶

The research found that even warming of 1.5°C will have significant impacts. 1.5°C of warming means that currently rare climate related extremes including extreme heatwaves, unusual dry spells, extreme rainfall, massive global coral bleaching events would become the new normal.

If global warming were to reach 2°C, the climate system would move into uncharted territory.

At 2°C: virtually all tropical coral reefs will be severely degraded impacting natural systems, regional economies and food supply; extreme heatwaves will be much more severe and frequent than current experience impacting both health and productivity; water availability will decline across most of Australia (up to 40 per cent in some scenarios), limiting agricultural productivity and increasing bushfire risk, and; around half a metre of sea level rise will be locked in by the end of the century, driving long-term impacts on coastal infrastructure, settlements and ecosystems (Table 1).

The impacts and costs increase exponentially beyond 2°C warming.

The probability of avoiding 2°C in the 450 Scenario is a 50/50 chance. And the IEA's New Policies Scenario puts Australia, and the rest of the world well into uncharted territory, with current international commitments projected to lead to warming of around 2.7°C by 2100.

For more extensive analysis on the implications of current warming, and future warming on Australia see The Climate Institute's Climate Policy Credibility Assessment.

Table 1: Estimated impacts of climate change for 1.5-2°C scenarios.¹⁷

Impact	1.5°C	2°C	Implications
Coral reefs	Severe impacts; some potential for limited adaptation remains	Virtually all tropical coral reefs will be severely degraded	Major impacts on natural systems, regional economies and food supply
Heat extremes	The annual mean length of heatwaves extends by around 13 days in the south and central Australia, and around a month in the north	Extreme heatwaves are more severe than current experience; length of heatwaves extends by around 20 days in the south and central Australia, and around two months in the north	Impacts on human health as well as labour productivity
Water availability	Declines (~10 per cent) across most of Australia (more severe in west); up to 30 per cent reductions in some scenarios	Greater declines across southern Australia. Up to 40 per cent reductions in some scenarios	Combined with temperature changes, impacts on agricultural productivity, water supplies, and bushfire risk
Sea level rise	~40cms to 2100; 2-3 metre multi-century commitment	~50cms to 2100; up to 7 metre multi-millennial commitment	Long-term impacts on coastal infrastructure and settlements; regional displacement of low-lying communities

Endnotes

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