Appendix B  Methodology

Figure B1: Forecasting process

1. Global economic conditions
   - GDP growth (IMF)
   - Other macroeconomic forecasts: Industrial production, monetary conditions etc. (World Bank, OECD, Oxford Economics, other)

2. Demand
   - Energy demand (IEA)
   - Demand by sector
   - Urban population growth (UN)
   - Technological change
   - Technical assumptions
   - Government plans and policies
   - Research papers, company reports

3. Supply
   - Surplus/Deficit Stock changes
     - Company surveys (internal)
     - Company reports (annual and quarterly reports, presentations and industry intelligence)
     - Mine production and capacity, reserves, quality, mining and transport costs, margins (AME Group)
     - Technical assumptions
     - Government policies (royalties, taxes, subsidies, environmental regulations, output restrictions etc.)

4. Surplus/Deficit Stock changes
   - Margin and cost curves (AME Group)
   - Statistical models (internal)
   - Consensus forecasts
   - Supply and demand dynamics

5. Price
   - Australian production
     - Australian export unit values
     - Australian export volumes
     - Australian export values

6. Key outputs

Notes: Numbers refer to accompanying explanatory text in the Appendix. This is a stylised visual representation of the conceptual forecasting framework used by the OCE. It is not an exhaustive depiction of the methodology and data sources used, and the exact approach varies by commodity. Sources in parenthesis where relevant.

Source: Department of Industry, Innovation and Science (2018)
B.1 Forecasting methodology

The Office of the Chief Economist (OCE) forecasts prices, export volumes and export values for Australia’s resource and energy commodities (see Appendix A for the list of these commodities). The forecasts for commodity prices and Australia’s resources and energy exports are underpinned by the OCE’s outlook for world demand and supply.

The OCE’s forecasts are supported by supply and demand models, economic analyses, and an assessment of data and information available at the time. This appendix describes the forecasting process outlined in Figure B1, and the general principles and methodology underpinning the OCE’s forecasts. The exact approach to forecasting varies across the commodities, depending on the characteristics of the market, the time horizon being considered (see Appendix A for a discussion of time horizons), and data availability. Specific examples are discussed where relevant.

Global economic conditions

The forecasting process begins with establishing the outlook for global economic conditions. The OCE does not construct its own macroeconomic forecasts but instead, draws on reputable, public sources, such as the IMF, World Bank and OECD. However, economic conditions sometimes change noticeably between forecast releases, so adjustments to these forecasts may be made if a sharp deterioration or improvement is anticipated from assessing a range of leading economic indicators and more recent data.

Demand (consumption and imports)

The importance of different drivers of demand depends on the time horizon being considered. In the short term, economic growth and industrial production growth are the key leading/coincident indicators of demand for resource and energy commodities. And steel production is actually a short term leading indicator of the world industrial production cycle (see Figure B2).

In the medium to long term, other drivers such as urban population growth, industrialisation pathways, technological change, substitution effects, changing preferences and government policies play an increasingly important role in determining the scale and pace of growth in commodities consumption.

For metals, the OCE’s analysis also considers demand by sector, including construction, transport, machinery and appliances. For energy commodities, the OCE uses the IEA energy demand forecasts in the Medium Term Market Reports, supplemented by the World Energy Outlook as a key inputs in determining consumption.

Structural relationships provide additional useful information, and related commodities are not forecast independently of each other. For example, the forecast for iron ore and metallurgical coal consumption relies on the forecast for steel production and production processes.
Supply (production and exports)
In the short term, production forecasts are driven by guidance from company reports and presentations, industry intelligence, and mine-level data from a private data provider. Production is assumed to be relatively fixed in the short-term, but factors such as changes to capacity utilisation, and identified new developments and expansions, are taken into account.

In the medium to long term, commodity production is assumed to respond to changes in price from market imbalances (as a result of changes to consumption), such that the market reverts to equilibrium. After a forecast for total world production is established, production by country is determined by examining mining and transport costs, and other non-economic factors, such as government policy.

World trade and stock changes
Exports and imports are forecast for the bulk commodities (iron ore, metallurgical coal, thermal coal, and gas). While consumption, production and trade are interconnected, it is seaborne trade that typically determines world benchmark prices. The distinction between trade and consumption/production is substantial enough for bulk commodities such that exports and imports are forecast for these commodities at the country or regional level.

For storable commodities, stock changes are mechanically derived after consumption and production forecasts are determined.

Commodity prices
In the short term, changes to commodity prices are driven by mismatches in demand and supply, and broader political, economic and financial conditions. The approach used to forecast prices in the short-term depends on the nature of the market and the availability of data, and includes an assessment of the supply and demand dynamics and statistical models.

In the medium term, supply is assumed to respond to changes in price to follow demand. The price should theoretically trend toward the level that covers the costs of the last unit of production needed to meet demand.

The OCE uses margin curves — where data is available — to forecast prices, and makes adjustments to the data to reflect reality — some producers will continue to produce even if they are uneconomic (for example, if they are state-owned or vertically integrated with downstream processing facilities). This method requires two inputs: demand forecasts, and assumptions regarding the loss-making share of production.

Where margin and cost data is not available, other information and methods that are used to forecast prices includes:

- consensus forecasts
- supply and demand dynamics
- statistical models
- other assumptions and structural relationships (for example, the price forecast for Australian LNG is largely determined by the oil-linked contract price, which is in turn driven by the OCE’s oil price forecast).

Box B1: Reconciliation and Balancing
Forecasts for consumption, production, trade and stock changes are reconciled and balanced at the country, regional and world level to ensure internal consistency over the medium term. This is facilitated by the use of the following system of identities:

1. Net exports by country = Production by country – Consumption by country – Change in stocks
2. World trade = Sum of exports by country = Sum of imports by country
3. Sum of net exports by country = 0
4. World production = Sum of production by country
5. World consumption = Sum of consumption by country
6. World production = World consumption + Change in stocks
Australia’s production, export volumes and export values

The OCE forecasts Australia’s production volumes at the mine or facility level, which is then aggregated and reported at the national level. In the short term, production forecasts are underpinned by guidance from company reports, presentations, and announcements, and data and intelligence provided directly from company representatives. In the medium term, production forecasts are guided by long-term production targets from company reports where available, and data on resource depletion from a private data provider.

The further into the outlook period, the more risks there are regarding projections for Australia’s production, particularly for projects that are still in the investment pipeline. Projects that have received a positive final investment decision (FID) are generally included in projections, unless the company announces a delay or cancellation. Projects that have not yet received a positive FID are not guaranteed to begin production. Whether they proceed depends on a range of factors, including the final evaluation of commercial prospects, market conditions, whether they can obtain all necessary regulatory approvals, and obtaining access to, or development of, rail and port infrastructure. In assessing the likelihood of whether a project will come online in the outlook period, the OCE considers its progress in the project development cycle, and data and analysis of mining costs and profitability from a private data provider. The OCE takes a conservative approach, and only incorporates into production forecasts those projects that are considered likely to proceed.

Export volumes are generally derived from an assumption regarding the relationship between a country’s production and consumption (usually based on a historical ratio). For LNG, export projections are underpinned by the contractual arrangements that Australian exporters have in place with buyers. Australia’s production and exports are reconciled and balanced with forecasts for the rest of the world using the system of identities outlined in Box B1. Export values are then mechanically derived from multiplying forecast export unit values (which is driven by forecast prices) by export volumes.

Box B2: Risk and uncertainty

The OCE produces point forecasts of consumption, production, price, and Australian export volumes and values, based on the information available at the time. However, actual outcomes will differ from initial point forecasts due to the effects of risk, uncertainty and unforeseeable events.

Risk refers to possible factors or events that have been identified — and on which an assessment can be made — regarding their likelihood and their impact on commodity prices. For example, a persistent risk to the price forecasts for many commodities is the possibility of government policy in China that limits domestic output due to tighter environmental regulations.

The forecasts in the Resources and Energy Quarterly attempt to account for and balance a range of upside and downside risks, and the accompanying commentary aims to describe the likelihood and impact of possible events. Where possible, analysis is undertaken to assess the sensitivity of the forecasts to different scenarios.

There are also many factors that affect commodity prices that are uncertain (that is, where it is not possible to assess their likelihood or impact) or inherently unforeseeable, including:

- unexpected changes to government policy
- geopolitical events
- changes to technology and preferences
- supply disruptions (e.g. due to an unplanned shutdown of production or port facilities because of an operational issue, extreme weather events, or industrial action)
- financial market sentiment and speculative trading (while traders tend to follow fundamentals, speculative activity in a relatively illiquid market can exaggerate price swings).

For these reasons, decision and policy makers are strongly encouraged to read the accompanying commentary in the Resources and Energy Quarterly. The commentary is fundamental to gaining an understanding of the underlying drivers to the outlook for commodity markets and Australia’s resource and energy exports, and the risks and uncertainty surrounding the forecasts.