# Module 1: Introduction to the NEM

This module aims to:

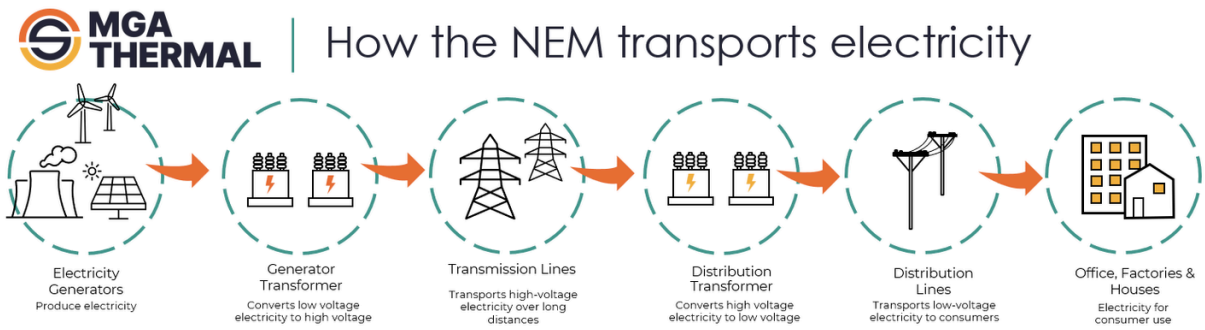
- provide an introduction and overview of the National Electricity Market (NEM).
- describe the NEM principles and structure.
- describe the role and history of AEMO as it relates to the NEM.

## The Electricity System

> - NEM: National Electricity Market
> - End-users: 20 million
> - Range: 5000 km
> - Electricity Bill: $10 billion per year

Longest interconnected power systems - from Port Douglas to Port Lincoln and Hobart

## Production and Transportation




A transformer converts electricity produced at a power station from low to high voltage to enable its efficient transport on the transmission network. When the electricity arrives at the location where it is required, a substation transformer changes the high voltage electricity to low voltage for distribution.

Distribution lines then carry low voltage electricity to consumers who access it through the power outlets in homes, offices and factories.

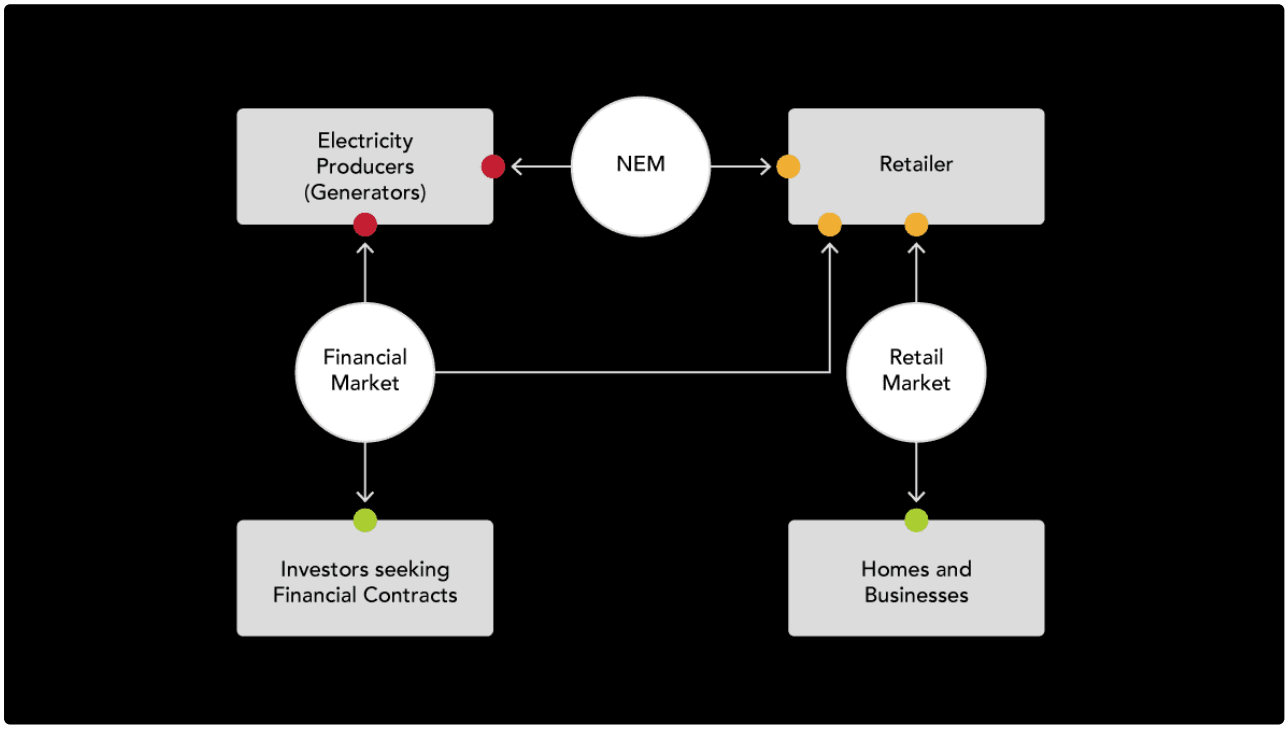
Australia has since privatised a lot of the electricity generation via privately funded investments to NEM.

## Units of Measurement

| Unit | Usage | Additional Info. |
|---|---|---|
| Volts (V) | Amount of energy delivered per unit of charge. | Like the pressure in a pipe containing water |

| Unit | Usage | Additional Info. |
|---|---|---|
| Currents and Amps (A) | Flow rate of electrical charge (current). | The rate of water as it passes through the pipe. |
| Joules (J) | Fundamental unit of energy | Typically used to measure gas usage. (J/s or MJ/hr) |
| Watts (W) | Unit of Power; J/s | The rate an appliance converts electrical energy to another form of energy. |

# Electricity Markets




- **NEM**: Wholesale market exchanging b/w **generators** and retailers.
- **Retail Market**: Electricity retailers selling energy they have purchased wholesale (via NEM) to homes and businesses.
- **Financial Market**: Contracts set up b/w **generators, retailers and investors** as an insurance policy to reduce risk of financial exposure due to electricity price volatility. i.e. lock in a firm price for electricity over a given time.

# AEMO

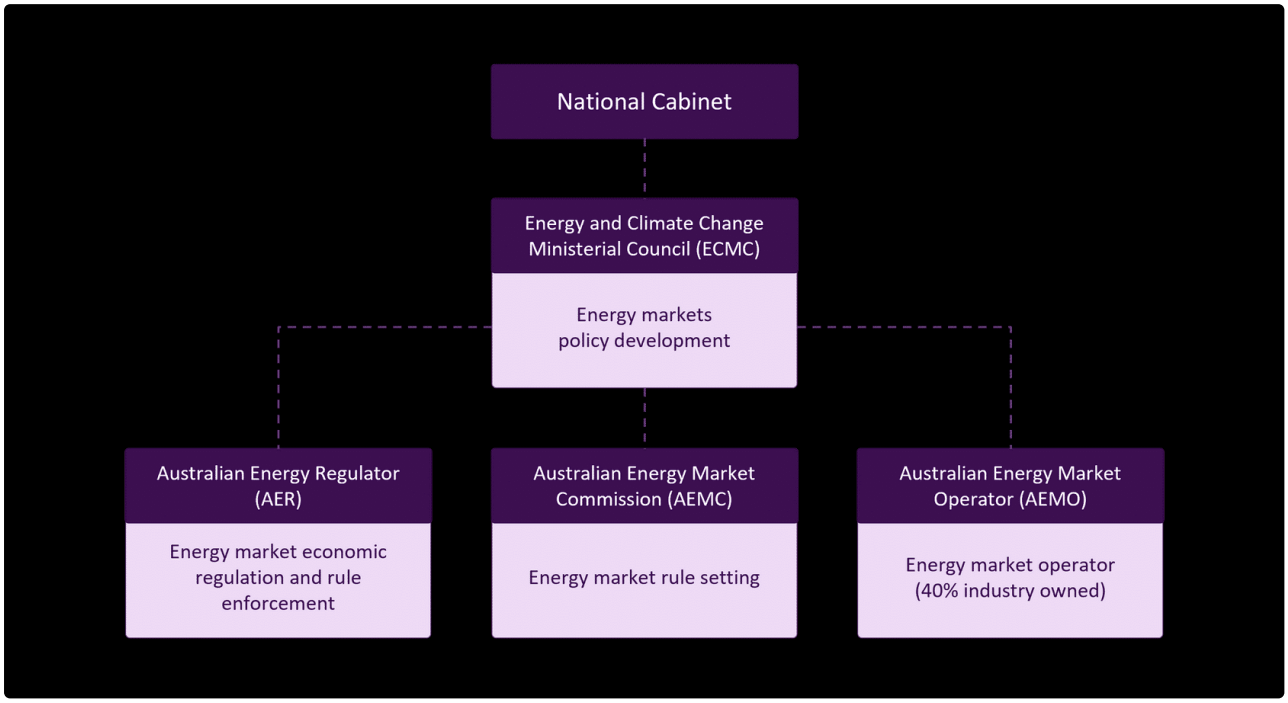
> AEMO: Australian Energy Market Operator

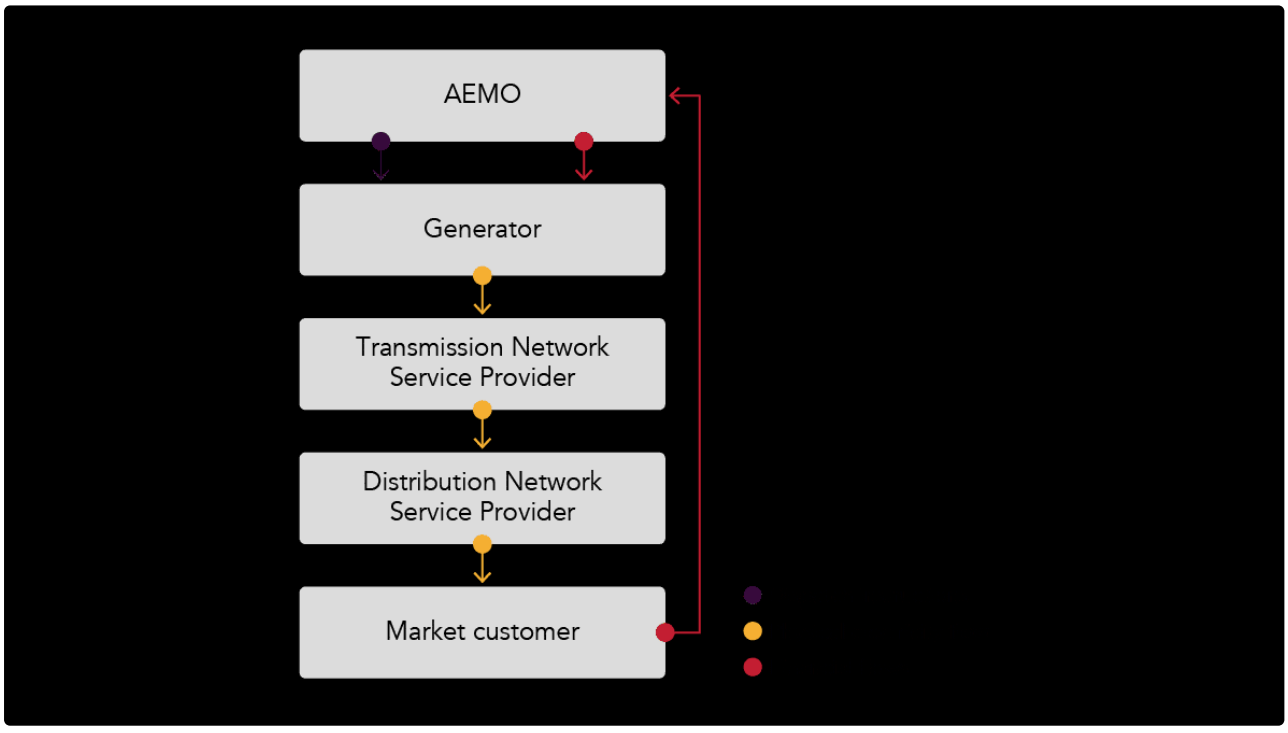
AEMO's primary responsibility is to balance the demand and supply of electricity by dispatching the generation necessary to meet demand.

AEMO manages the NEM and the power system from two control centres in different states. Both centres operate around the clock, and are equipped with identical communication and information technology systems.
The entire NEM, or individual regions within it, can be operated from either or both centres.

AEMO works alongside AER and AEMC

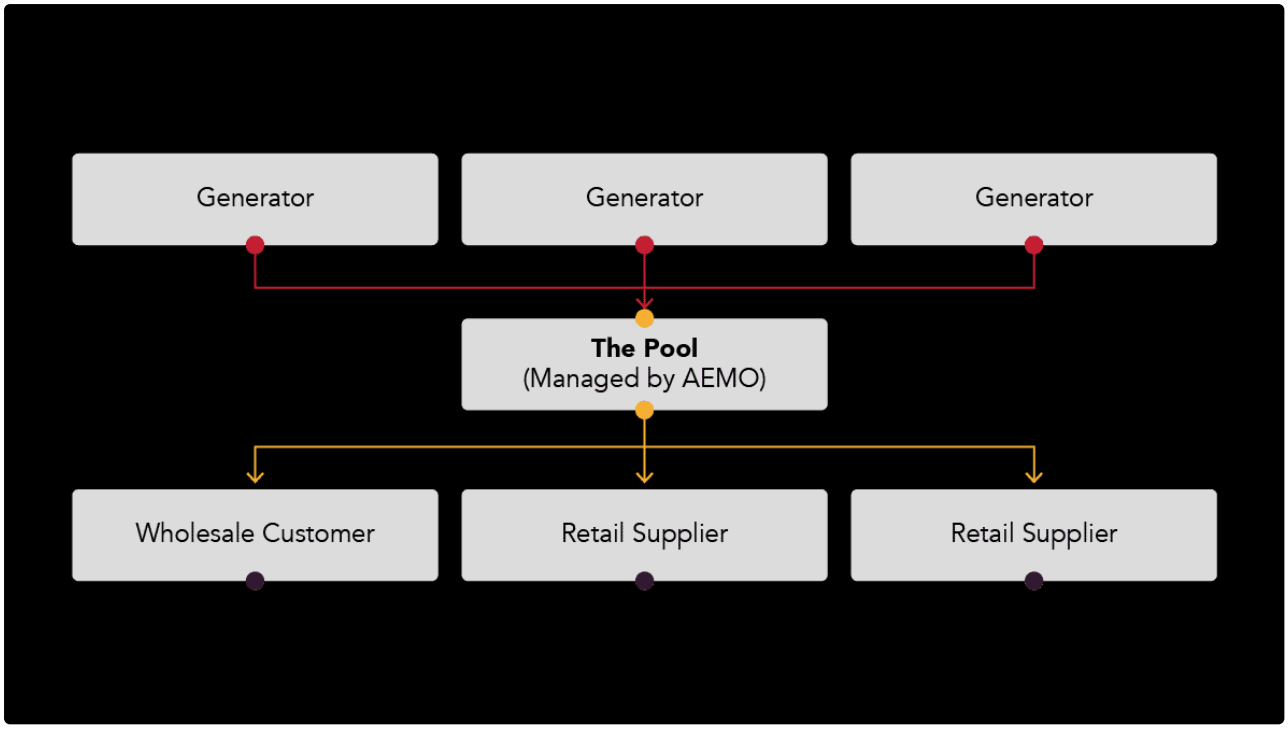
- **AER**: Australian Energy Regulator - oversees economic regulation and compliance with laws and rules, reports on bidding behaviour and regulates transmission and distribution networks.
- **AEMC**: Australian Energy Market Commission - makes rules governing the regulation of energy market.




NEM is the longest interconnected power system in the world. With 40 generating companies of ~300 generating units operated by 5 transmission companies to 15 electricity retailers.

Electricity cannot be stored and so you cannot determine which generator produced what. NEM uses a pool where all outputs from generators are centralised to ensure demand,




# Trading

Wholesale trading is conducted as a spot market where supply and demand are instantly matched in real-time.

The AEMO calculates the spot price every 5 minutes based on forecasted demands and actual demands.

# Retail Market

Electricity purchased from the NEM pool is transported via power systems to homes and businesses.

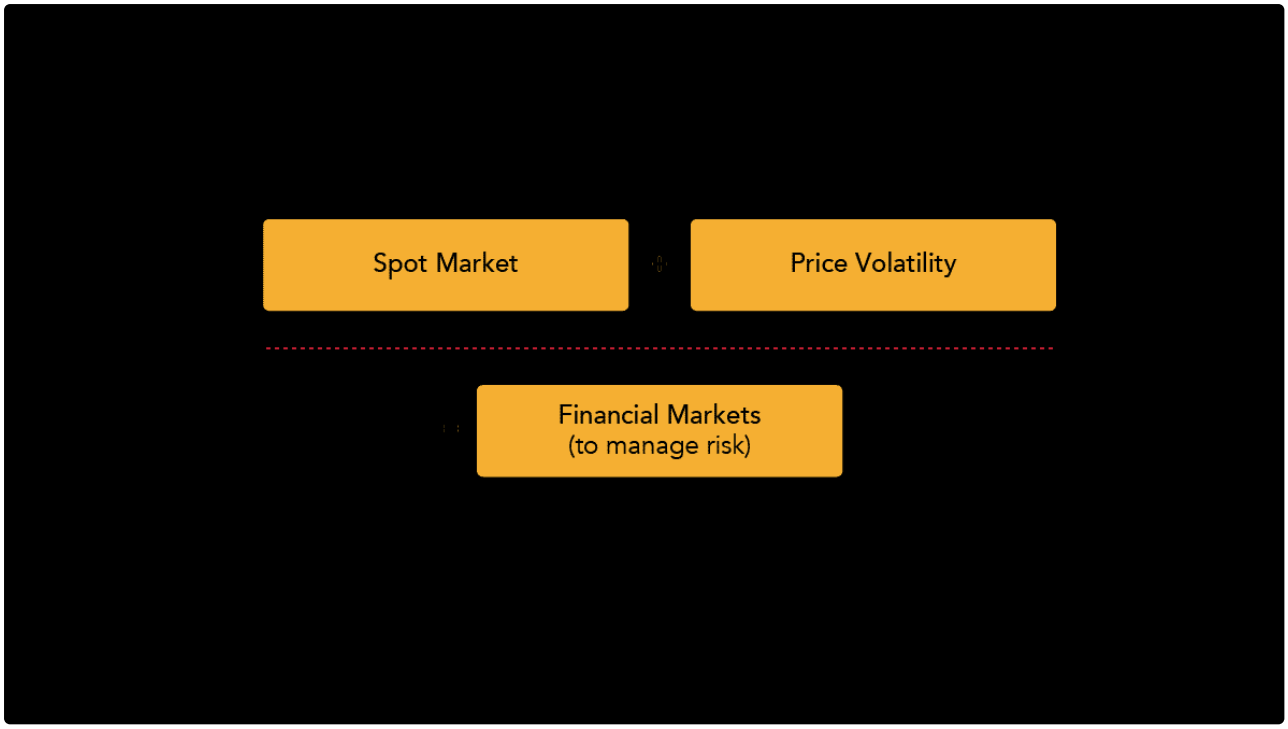
Cost is determined by spot price. Where the customer typically have contracts to cover for fluctuations in spot price. The final bill takes into account cost of transmission and distribution network.

Consumers have the right to choose their own supplier.

# Financial Market

Fluctuating spot prices for electricity causes risks for parties that trade in NEM's spot market. Generators won't compensate low prices and retailer's don't want to pay high price. Hence, the financial market uses hedge contracts to reduce risks, allowing safety from price volatility.

**Hedge Contracts**: Agreements b/w generators and market customers, not controlled by NEM or AEMO. Used to prevent financial risks from volatility in spot price.


Spot Market
Price Volatility
Financial Markets
(to manage risk)