



Quick Guide to the I-SEM

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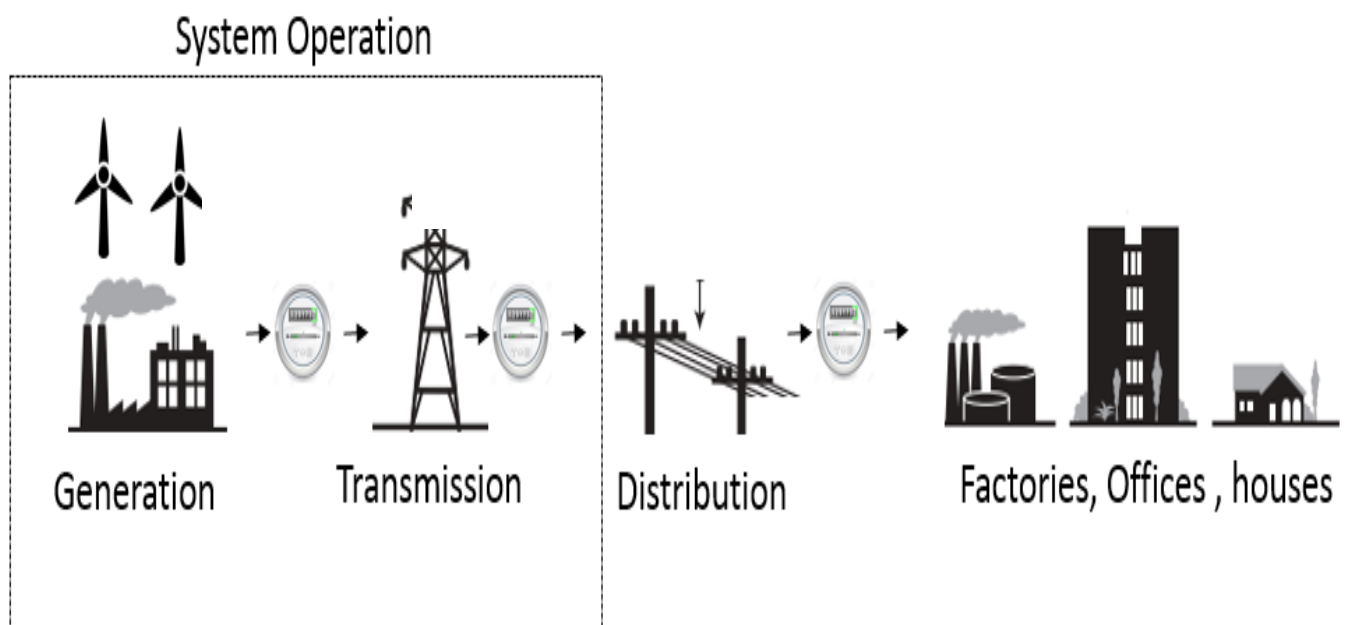
1 BACKGROUND

The Electricity Industry: the basics

The electricity industry is organised to supply homes and businesses with power.

The key parts of this industry are shown below. **Generators** make the power, the transmission system transports the power from the generating centres and the distribution system then sends the power to homes and businesses. **Suppliers** then supply and bill consumers for their consumption of that power.

An overview of the electricity industry



Power stations (e.g. Moneypoint/ Coolkeeragh) and other generators (e.g. windfarms) who produce electricity

The transmission system operator (Eirgid/ SONI) ensures enough electricity is available to meet demand and this is transported by the transmission and distribution network (which is maintained by NIE Networks/ ESB) to homes and businesses

Suppliers (e.g. Power NI, Electric Ireland) who sell and bill consumers for electricity

Wholesale electricity markets – how they work

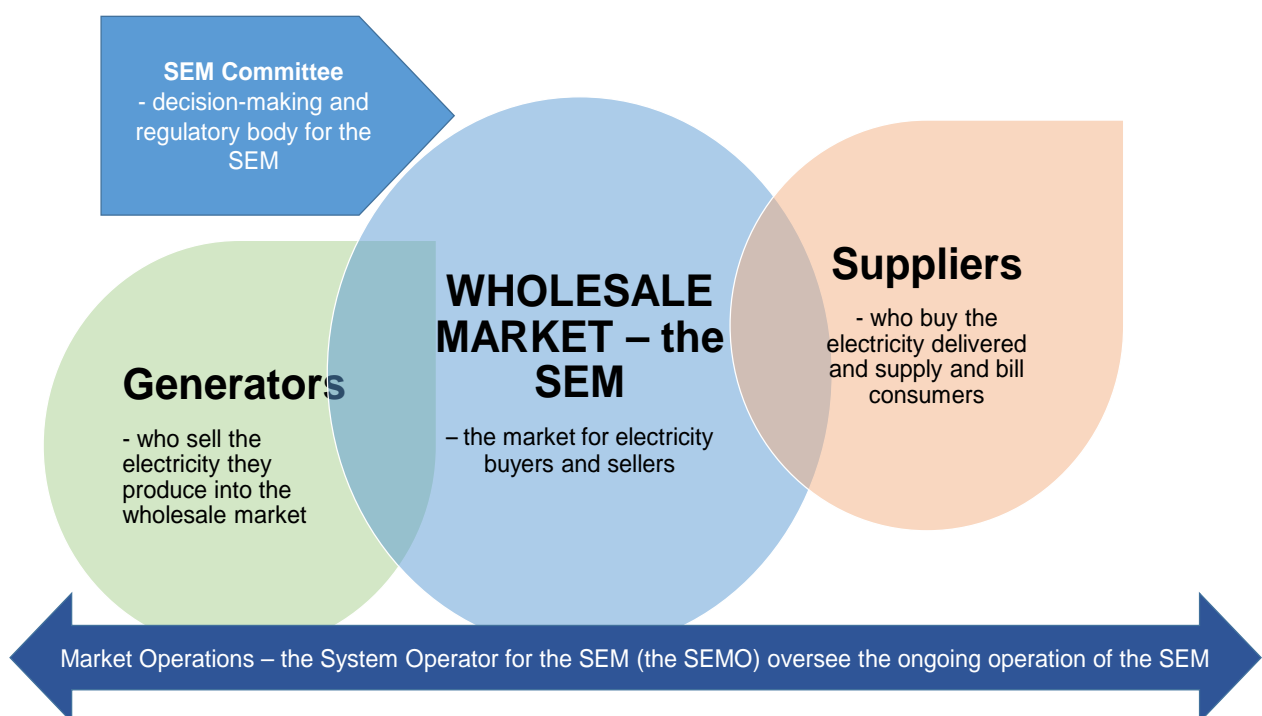
While electricity is traded just like any other commodity, it has certain characteristics that requires specific trading arrangements:

1. while electricity as a commodity is something that we need in our daily lives, and for which there is a demand for, it can't be easily stored (unlike things like food or water).
2. as electricity can't be easily stored, and there is a variable demand for it, there must be a way to balance supply with the demand
3. you can't replace electricity easily, so you need to ensure a stable supply because there is a continual demand.

The **wholesale electricity market** is where generators and suppliers meet to trade electricity that is then sold onto household and business consumers. Importantly, the wholesale market involves the trading of electricity for resale – it is not directly sold to the final consumer. This is distinct from the retail market where suppliers are responsible for the selling, metering, billing and collection of payments to customers.

To make sure that wholesale electricity markets work well and fairly, arrangements are needed to cover market decision-making and day-to-day operations.

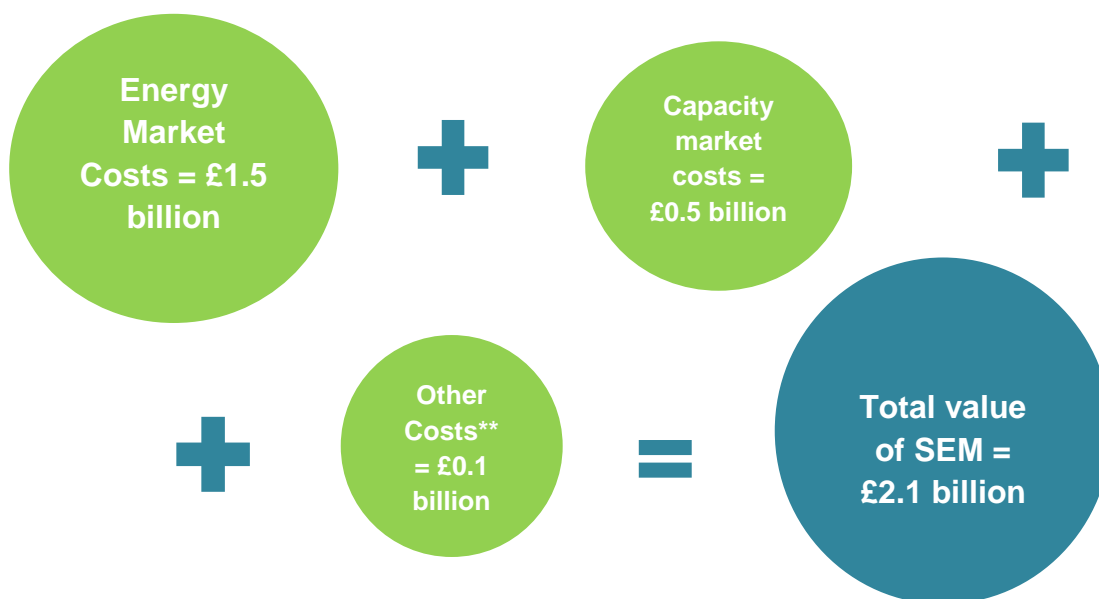
How a wholesale electricity market, the Single Electricity Market (the SEM), works



The Single Electricity Market (the SEM)

The current wholesale electricity market is called the Single Electricity Market (the SEM), the wholesale market on the island of Ireland, was set up in 2007. It combined what were two separate markets, for the Republic of Ireland and Northern Ireland, into one all-island wholesale electricity market. The SEM is a central pool through which generators and suppliers trade electricity on the island of Ireland. It has an overall value of over £2 billion made up of various cost elements (see below) and can vary on a yearly basis.

Value of the Single Electricity Market^{1*}



The key ways the SEM works are:

- ✓ generators submit bids (for capacity and selling price) to the SEMO to generate electricity for each half-hour of the following day;
- ✓ these bids are stacked in order with the least expensive generators called on to provide power until demand is met;
- ✓ the bids and demand set the energy price for each half-hour period, called the **system marginal price (SMP)**, and this price is paid to all those generators who are scheduled to produce power – some generators will not be required and so will not receive an energy payment;
- ✓ as well as this, generators also receive **capacity payments** if they are available to generate and also **constraints payments** if the power delivered by generators is different from that scheduled, due to the technical realities of operating a complex power system.

¹ *Costs are rounded to the nearest £100 million. ** Around £30 million attributable to the absence of the North-South Interconnector.

2 THE NEW MARKET – THE I-SEM

Much has changed since the SEM was introduced. In particular, there is now a more generation from renewable sources across the island. Electricity markets are now undergoing significant changes, partly to take advantage of the opportunities from the coupling of energy markets across Europe and shared ways of trading electricity. Levels of interconnection between member states and regions have never been greater and markets are looking to take advantage of these new linkages.

For these reasons the SEM is being replaced by the I-SEM which will start in May 2018. There are several key differences between the SEM and I-SEM market designs:

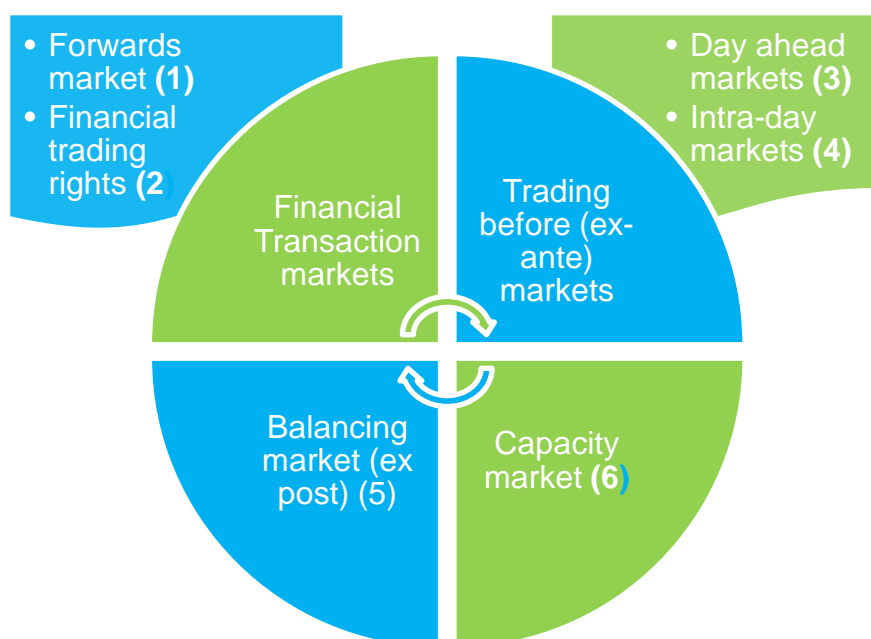
Key differences between the SEM and I-SEM		
	SEM	I-SEM
Market structure	One pool and timeframe	Different markets with different timeframes
Trading opportunities	A single opportunity for generators to submit their bids each day.	Generators and suppliers will have multiple opportunities to trade (at Day Ahead and Intra Day stages – more detail in section 3 below).
Setting the market price	All generator bids stacked up in order of merit, with the last generator (the most expensive) required to meet demand setting the price that suppliers pay. Suppliers are price takers.	Suppliers are price makers – they set limits on what they are willing to pay in each market and, where this crosses with what generators are willing to accept, this sets the market price.
Balancing supply and demand	Supply and demand are matched using an algorithm.	Generators and suppliers have to match their <i>actual</i> with their <i>traded</i> generation and usage. If their generation or usage differs, suppliers or generators are liable for these costs in the balancing market.
	SEM	I-SEM
Capacity payments to generators	The Capacity Payment Mechanism gives capacity payments to cover generators' fixed costs and are paid so long as the generator declares that it is available to run.	Generators are paid only when their output is required to meet demand and only if they can.
Trading across interconnectors with Great Britain	Capacity on interconnectors can be reserved to flow power in line with their trading approach. This may not deliver a cost-efficient flow.	Interconnection capacity allocated based on prices with electricity always flowing from the cheapest to the most expensive market.

3 HOW I-SEM WORKS

I-SEM trading options

A key principle of the I-SEM market is the flexibility that it offers. This includes those who take part, the different ways in which these market participants can trade in the market over different time periods to meet their needs and the incentives in place.

The different trading markets are shown below with an explanation of how they work.



(1) and (2) I-SEM Forward markets

The I-SEM introduces markets which allow participants to spread the risk of their financial commitments by making sure their contractual investments can be offset or spread – called hedging. This includes contracts between the generators and suppliers where there is a settlement price at the end of a period (called **contracts for differences**).

Financial Transmission rights are a type of a hedge for those who wish to protect themselves from price differences between the All-Island market and Great Britain. The differences will arise during times when the interconnection capacity between the All-Island Market and Great Britain is insufficient to harmonize the prices between the two markets.

(3) and (4) Trading for the delivery of power (ex-ante markets)

The price for each one hour of the trading day is worked out from the bids of market participants

The trading before (or ex-ante markets) allows market participants to send bids in before the delivery of the power. A **day ahead market (DAM)** allows for early bids and can be made from 19 days out up a day before trading. An algorithm, called **Euphemia** (the acronym for Pan-European Hybrid Electricity Market Integration Algorithm), is used to set the market price and the best way of distributing the power available (including across interconnectors). The **intra-day market (IDM)** allows market participants to change their bids much closer to the time on which the power is delivered. The intra-day market runs right up to one hour before trading.

(5) Balancing market

The **balancing market** ensures that energy supply equals energy demand. Unlike the other ex-ante markets, only generators bid in this market, suppliers take the price that is set. In this market the **Transmission System Operators (TSOs)** decide how demand is met by calling on generators to deliver power as needed. These actions by the TSOs are necessary to balance the supply and demand to ensure that there is enough power to keep the lights on for homes and businesses.

(6) Capacity market

This replaces the Capacity Payments Mechanism from the SEM. It provides a way of generators recovering the fixed costs of power stations. The new market will make sure there is enough capacity to reliably meet demand and that this capacity is purchased in a cheaper way than under SEM. Those who provide capacity will only be paid if their bid is successful at a capacity auction.

The overall costs of these capacity payments are spread among suppliers. Those generators that do not deliver capacity when needed (such as when there is a shortage of power to meet demand) are subject to financial penalty.

4 IMPACT ON CONSUMERS

Since the wholesale electricity market makes up around 62% of consumer bills (see below) the potential impact on households and businesses of a market that works to reduce prices is important.

Single Electricity Market – NI Context



Consumer Bills

- 4% to NIRO & PSO
- 12% to retail market
- 22% to the Network
- 62% is attributable to SEM

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For electricity consumers generally there are three main positive impacts of the I-SEM.

Firstly, because the I-SEM facilitates trading across borders and making best use of the power available from all sources on the island of Ireland, this helps security of supply.

Secondly, it will be a more competitive market than the SEM. Consumers should therefore benefit from a more competitive process for setting prices, including the use of capacity auctions.

Thirdly, our geographical location has meant that electricity prices have tended to be higher in the all-island market than in Great Britain. The better way of allocating power across our interconnector with Great Britain should place a downward pressure on prices because electricity will now flow more efficiently. Additionally, using the interconnectors more efficiently should contribute to the expansion of renewable generation as it should avoid the curtailment of wind generation at times of peak demand.

In addition, a further piece of work to complement the I-SEM, is called the **DS3 project** aims to maximise the use of renewable sources of electricity. This project is about taking technical steps to improve the ability of the power network on the island of Ireland to accommodate generation from renewables. Renewable generation has a zero fuel cost and is therefore the lowest cost generation to produce in the market.

5 I-SEM KEY BENEFITS

Overall the I-SEM aims to deliver a range of key benefits:



Glossary of Key Terms

Balancing market	This market runs between the close of the day ahead market and up to the time the power is delivered and ensures that there is enough power to meet demand.
Capacity payments	This is one type of payment made to generators who are available to generate.
Constraints payments	These are payments made to generators if the power delivered by generators is different from that scheduled, due to the technical realities of operating a complex power system.
Contracts for differences	This is where is contracts are made between the generators and suppliers where a price is agreed at the end of a period
Day ahead market	The market that allows for early trading and bids can be made from 19 days out up a day before trading.
DS3 project	The project which uses technical services to improve how the power network accommodates renewable generation.
Euphemia	A technical mechanism that is used to set the market price and the best way of distributing the power available.
Financial Transaction rights (FTRs)	This is a type of a financial hedge for those who wish to protect themselves from price differences between the All-Island market and Great Britain.
Generators	Those bodies that make the power that is eventually transported to homes and businesses.
Intra-day market	The market that allows market participants to change their bids much closer to the time (right up to one hour before trading) on which the power is delivered.
SEM Committee	The decision-making and regulatory body for the Single Electricity Market (SEM) and the I-SEM.
Suppliers	Those who supply and bill consumers for the power they use
System marginal price	The market price that is paid to generators in the wholesale electricity market.
Transmission System Operators (TSOs)	These bodies (SONI and Eirgrid) ensure that there is enough power to meet demand when needed.
Wholesale electricity market	Where generators and suppliers meet to trade electricity that is then sold onto household and business consumers