

# **Facilitation of Renewables REFIT, Grid Code and SEM**

14<sup>th</sup> November 2008

Jonathan O'Sullivan

EirGrid Operational Policy and Performance

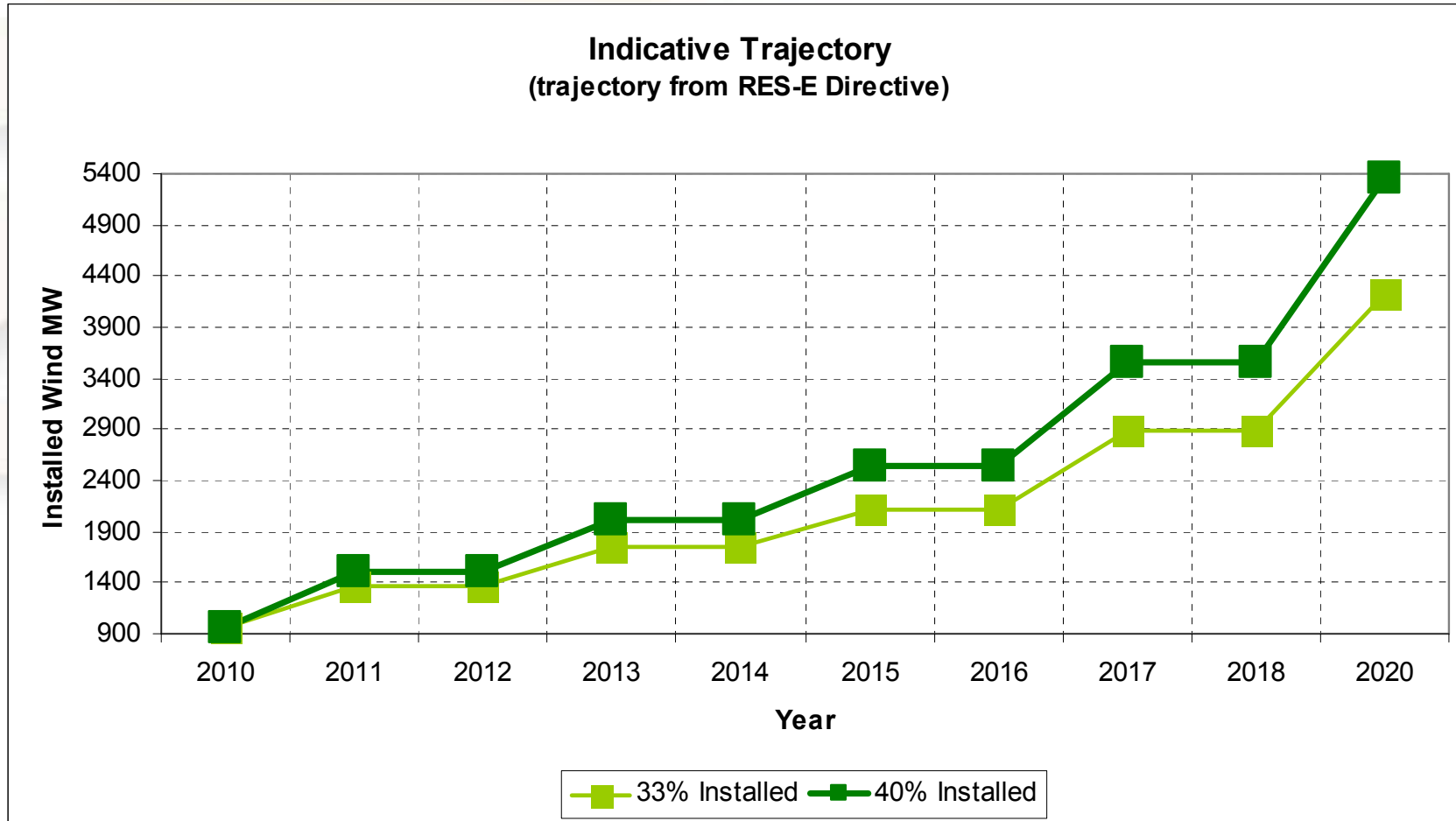


# The Challenge: Government Targets



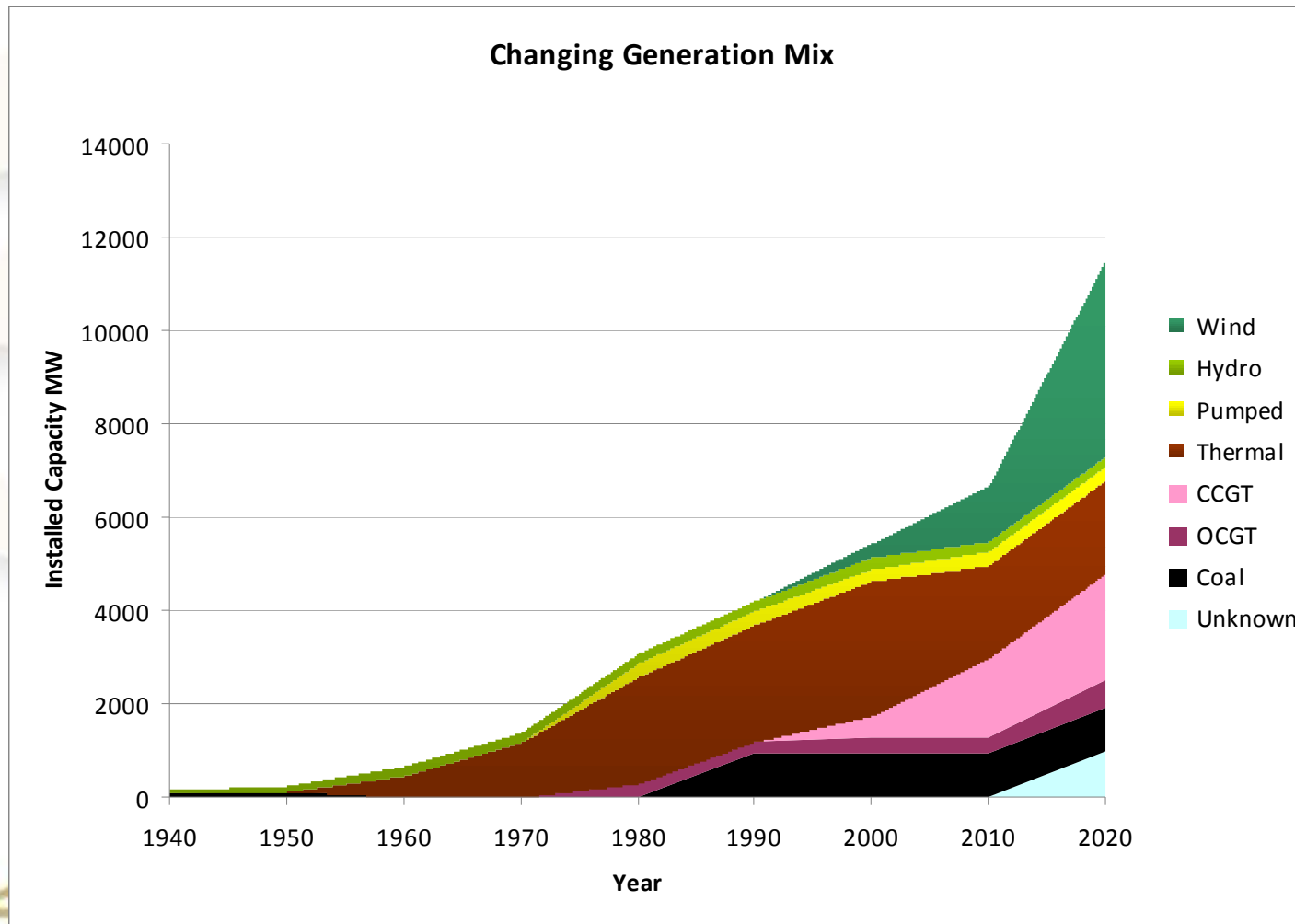
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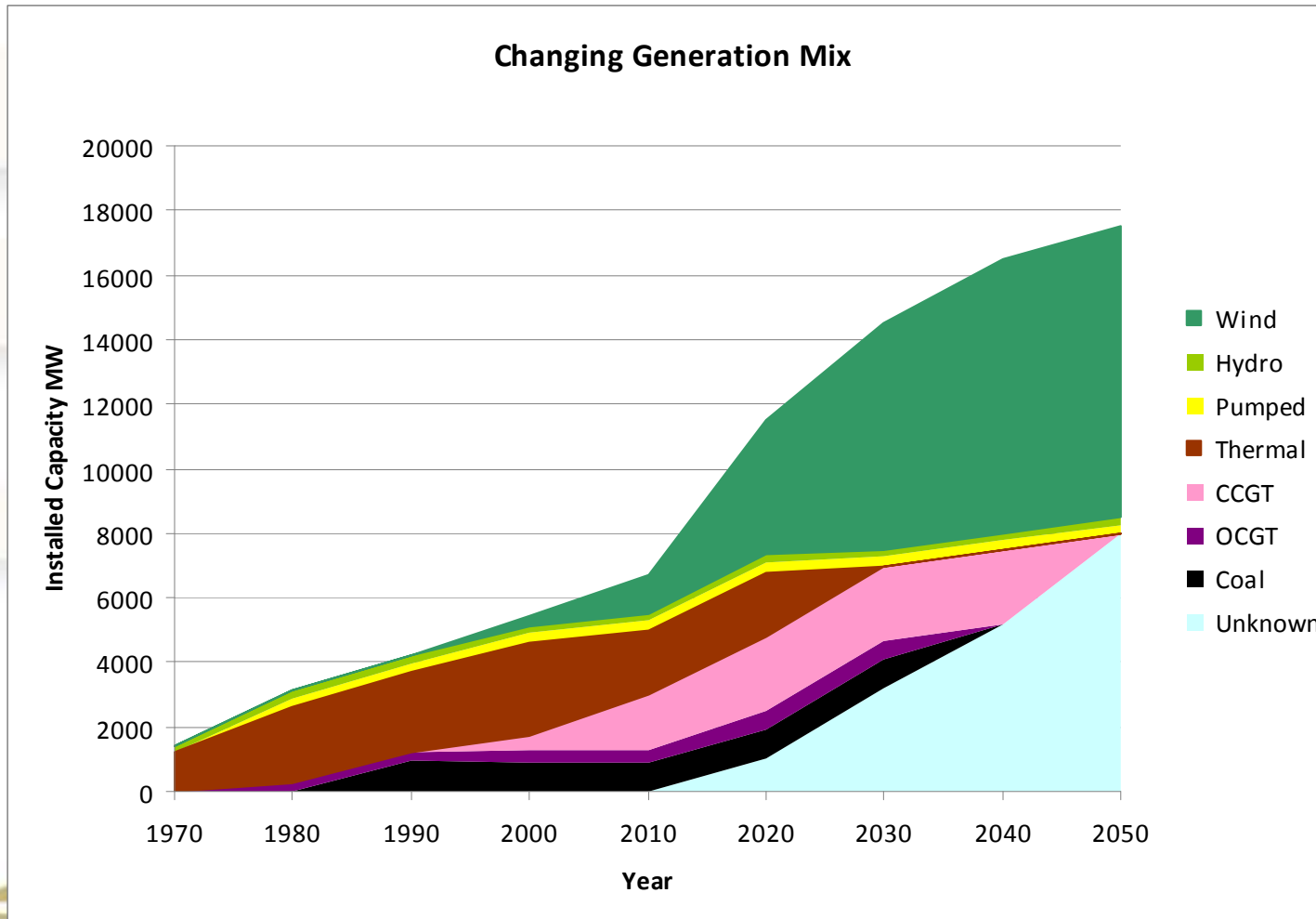
# The Challenge: The Rest of the Portfolio



**EIRGRID**

Source: O'Riordan and the Government white paper with assumptions on load factor and hydro contribution

# The Next Frontier: Beyond 2020



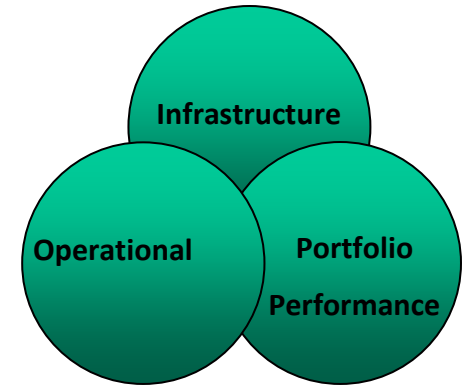
Source: O'Riordan, Government White paper and assumptions on plant life length

# Making it all work by 2020 and beyond

- Infrastructure
  - Issues that have to be overcome, that act as barriers to generators, network customers, operators and owners in identifying potential projects, understanding their possible returns and constructing their assets in a timely and cost efficient manner
- Operational
  - Issues that need to be understood and managed that impact safe, secure and reliable operation of the power system
    - In the short to medium term as transition to a system with more renewable power
    - In the long term when significant generation from renewable
- Portfolio Performance
  - Issues that need to be overcome to ensure that the necessary mix of generation and demand flexibility capability is provided and continues to behave and be controllable in line with system requirements



# Issues: Infrastructure



## Issues

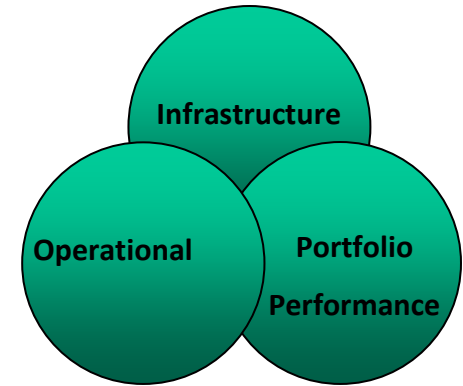
- Issuing connection offers
- Identifying infrastructure requirements
- Building it on time
- Connecting generation

## Actions/Controls

- Implementation of the **Gate 3 process** and beyond
- Design and implement a mechanism for the **strategic development of the power system** which has involvement and buy in from all sectors of the industry **GRID25**
- **Planning Permission** and necessary consents
- **Effective project management** backed up by required study and analysis
- Ensuring **adequate resources and processes** to deliver connections on time



# Issues: Operational



## Issues

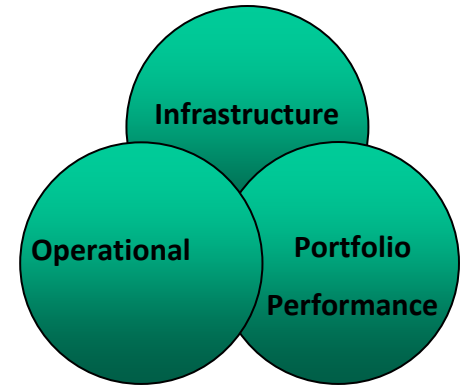
- Increasing Complexity
  - Increased decision making
  - Increased use of infrastructure
  - Exploring new operational territory
- Variability
  - Increasing wind penetration
  - Changing demand profile
  - Changing dynamic characteristics
  - Frequency and voltage control
- Uncertainty
  - Wind production uncertainty
  - Demand uncertainty
    - SMART Metering
    - Transport

## Actions/Controls

- **More Tools**
  - WSAT
  - Operational Policy
- **Develop and Learn**
  - Best Practice, Learn from others
  - Training, studies and simulation
- **Flexibility**
  - All island grid study follow on
- **Changing Controls**
  - AGC
  - Reactive power strategy
  - Grid study follow on
  - Dynamic line ratings
- **Prediction**
  - ANEMOS, SAFEWIND
  - Improved demand prediction
  - SMART Metering



# Issues: Portfolio Performance



## Issues

- Compliance and monitoring
- Supporting standards for a changing power system
- Identifying the properties of a portfolio capable of supporting renewable targets
- Incentivising and supporting the necessary flexibility

## Actions/Controls

- Develop a **performance monitoring framework** to ensure all users of the Grid are and remain compliant
- **Develop the Grid Code** to enshrine principles to deal with the changing nature of the power system
- **All Island Grid Study Follow On** will quantify levels of flexibility required to support target levels of renewable energy
- **Develop a holistic policy** for the basic financial structures: Energy, Capacity, Ancillary Services and UoS to deliver this necessary portfolio of users



# Key Success Factors to 2020 and beyond

- **Infrastructure**
  - Build the necessary infrastructure, networks and interconnection, for the long term needs
- **Operational**
  - Manage the system with increasing complexity
  - Understand the core drivers for flexibility and variability and develop new operational paradigm to successfully manage
- **Portfolio Performance**
  - Develop and implement a consistent approach across the design (and level) of the market mechanisms to incentivise the correct behaviour and mix of users of the power system

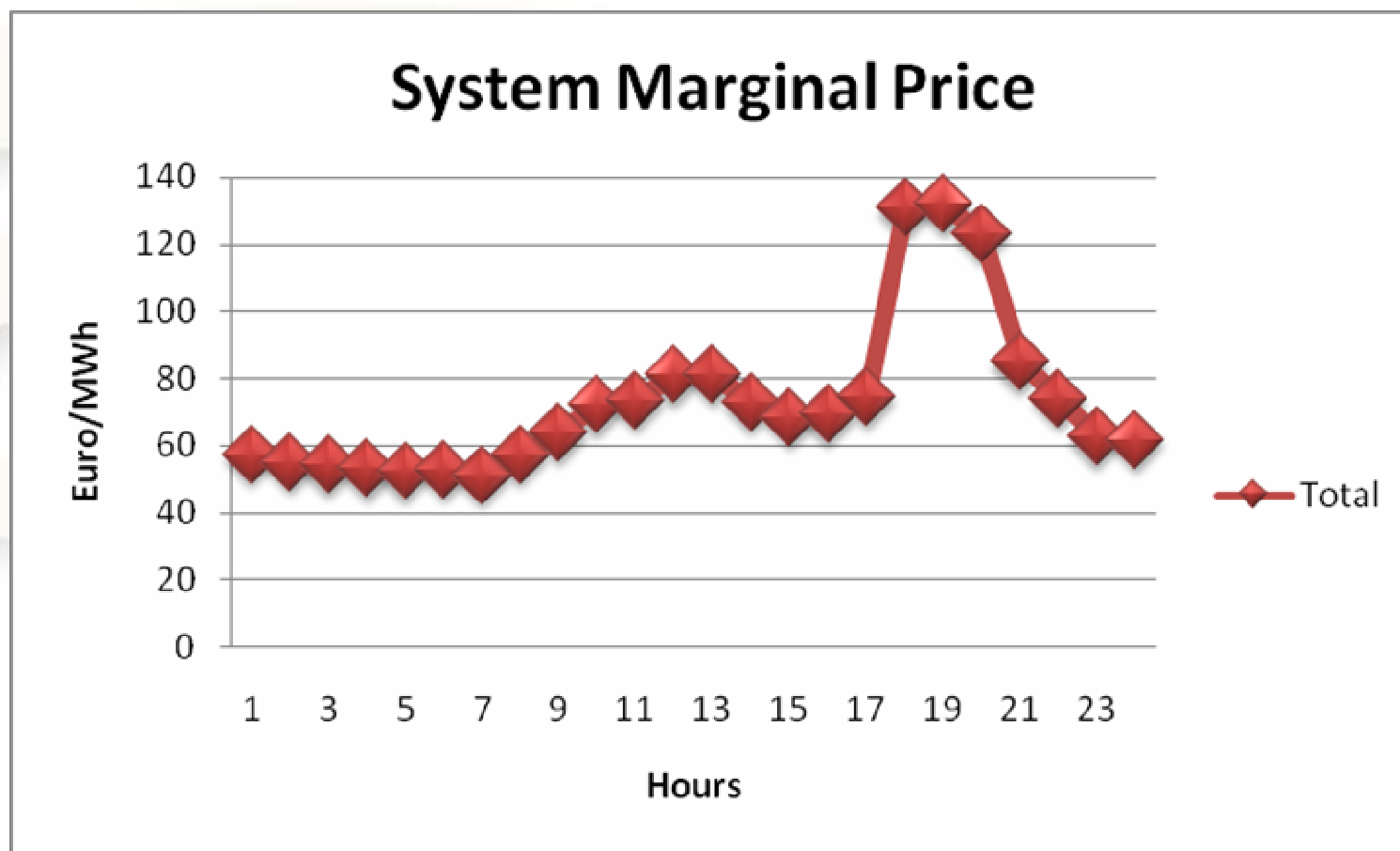


# Portfolio Performance

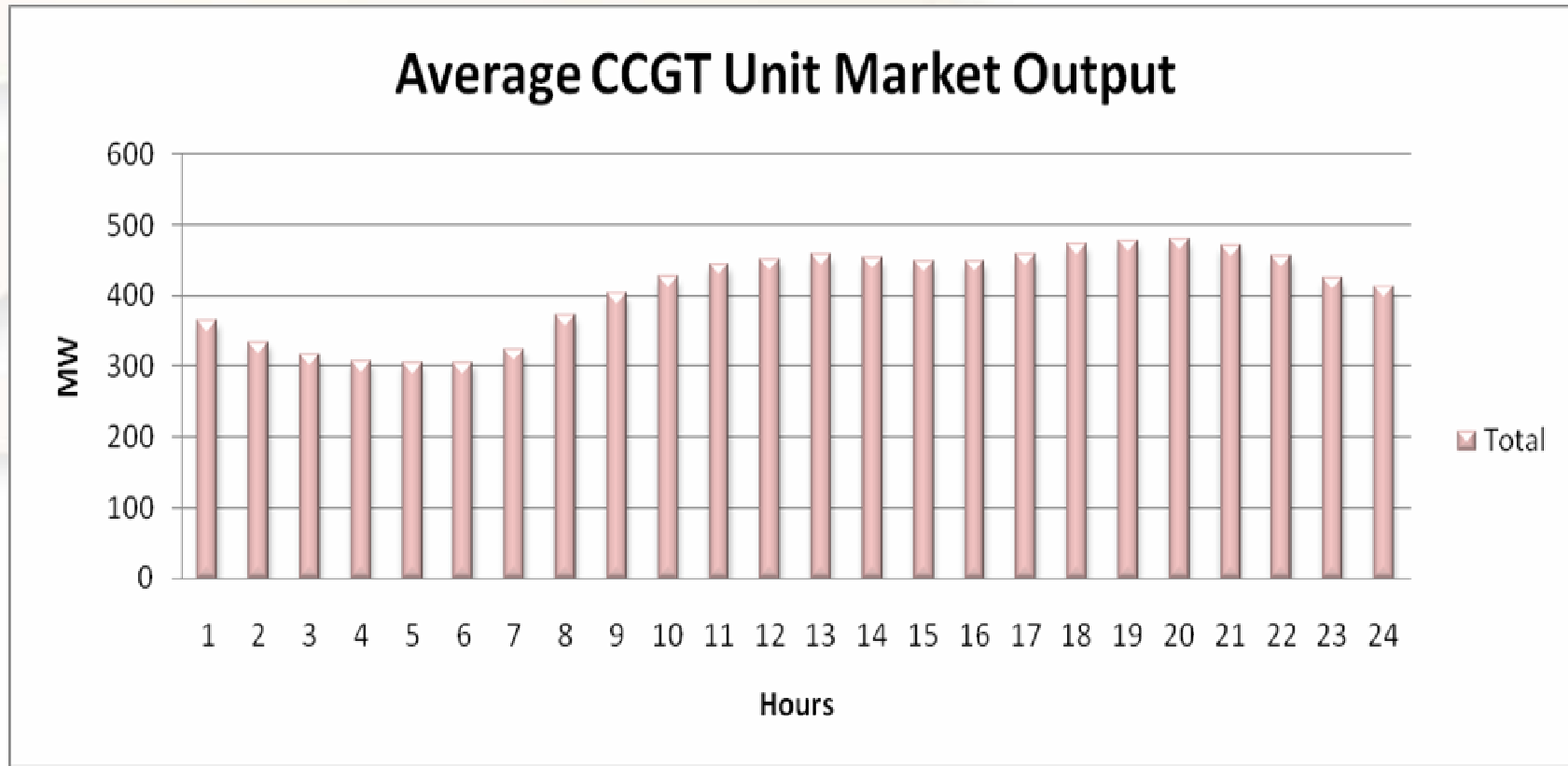
- Incentivisation of new plant
  - Single Electricity Market (SEM)
    - Energy
    - Capacity
  - Renewable Feed In Tariff (REFIT)
- Standards of Performance
  - Grid Code
    - Grid Code Compliance Testing
    - Performance Monitoring



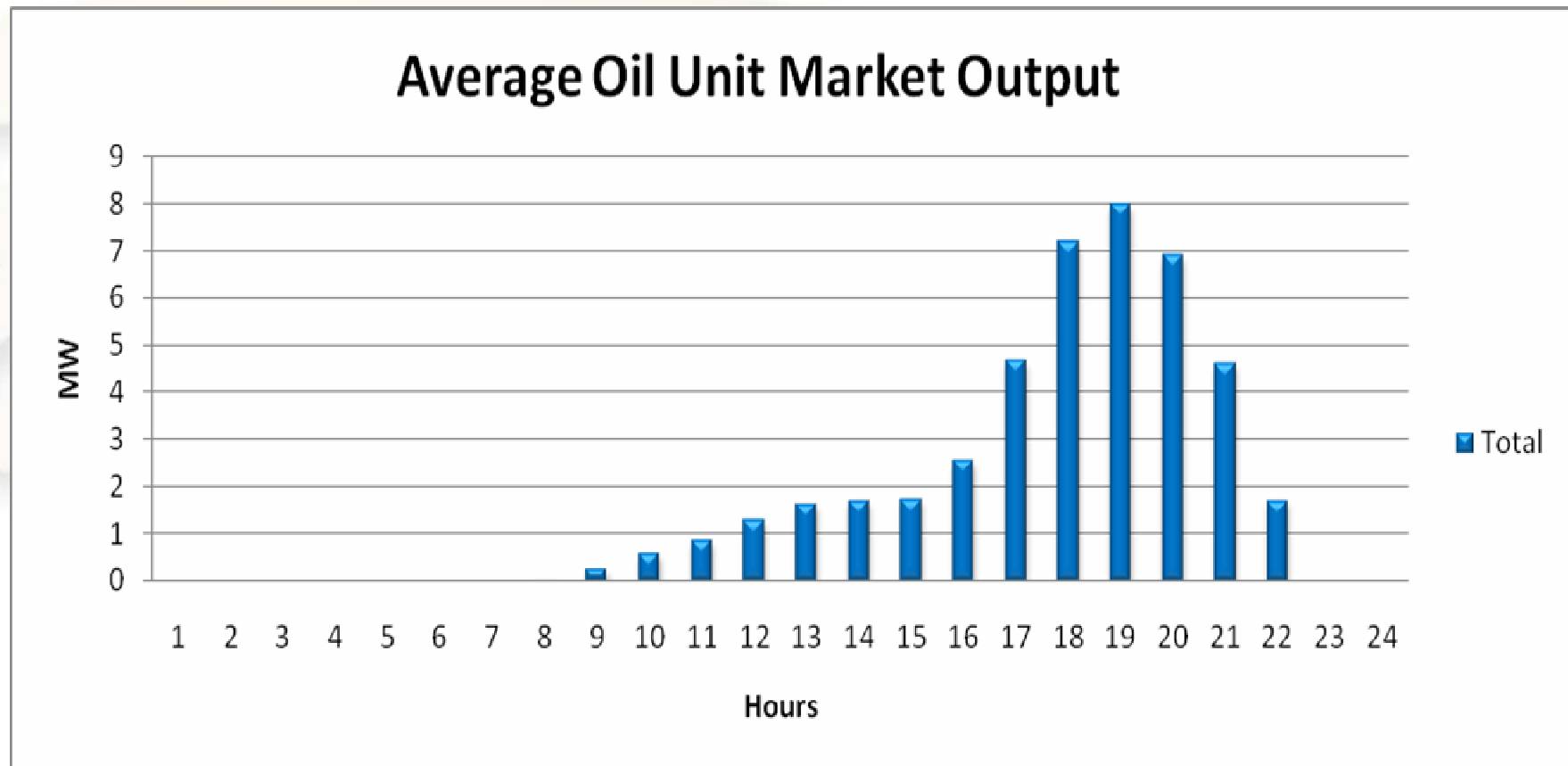
## Average System Marginal Price in the SEM



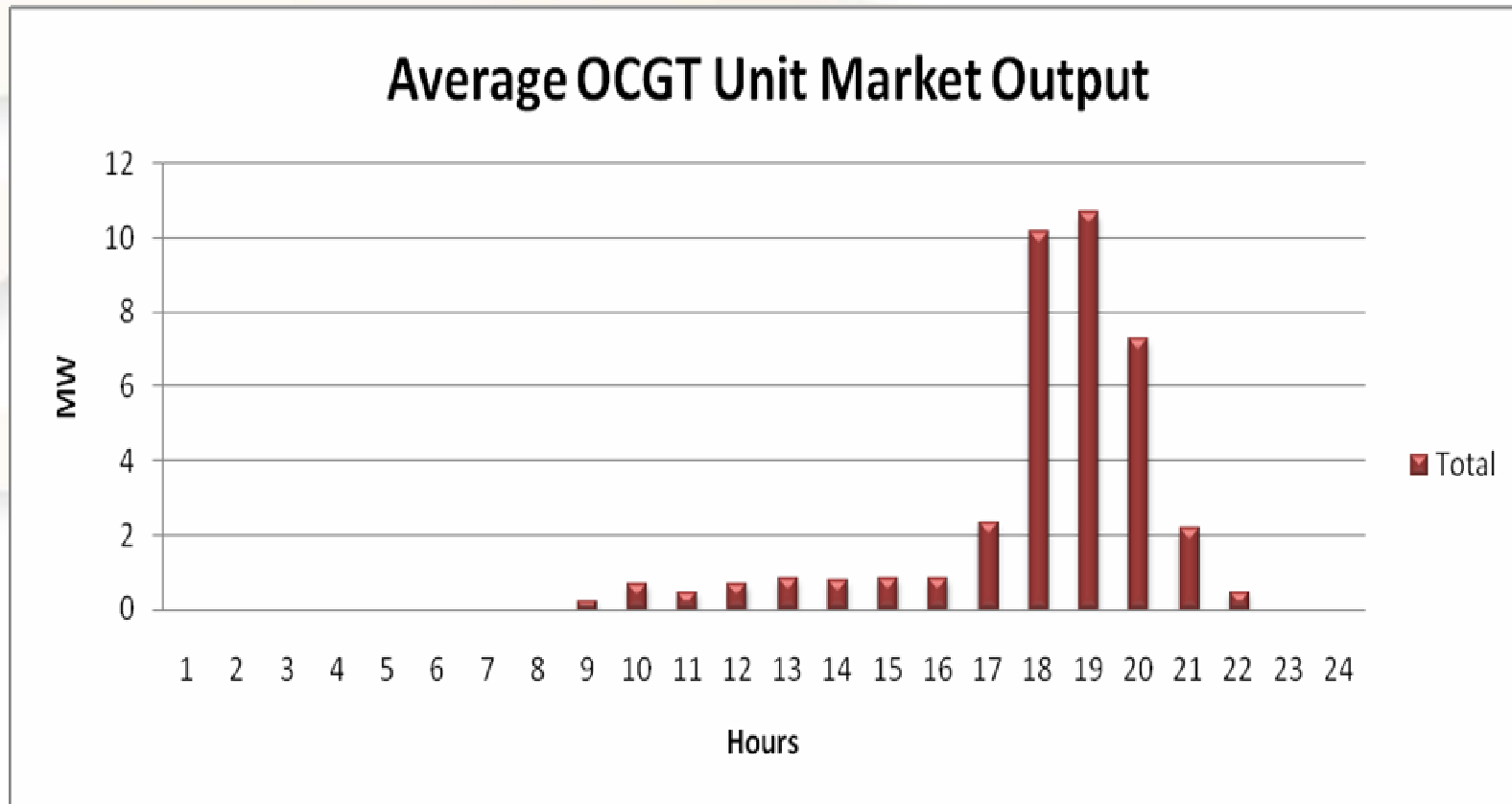
# Average Market Schedule for CCGT in SEM



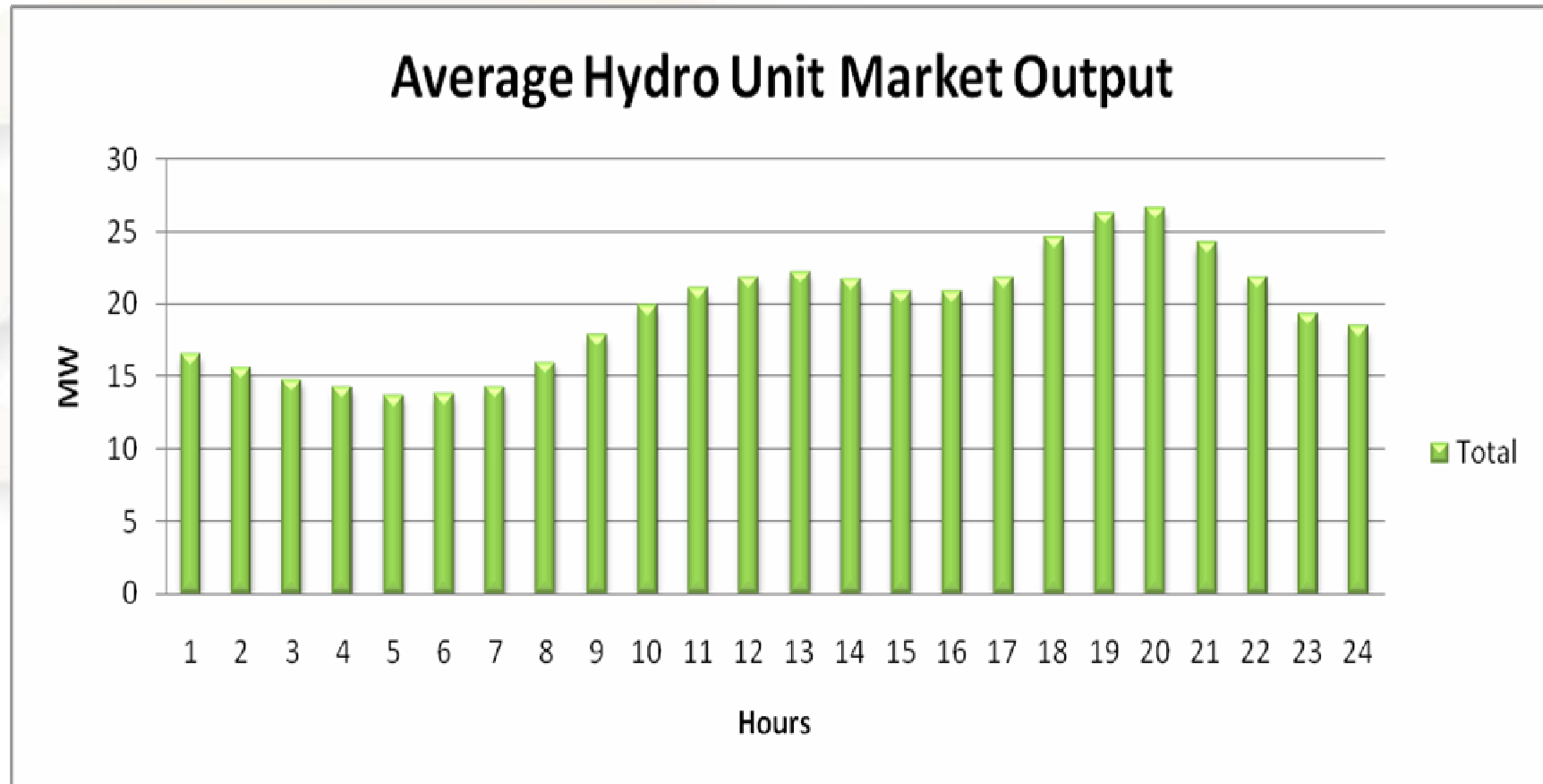
# Average Market Schedule for Oil Units in SEM



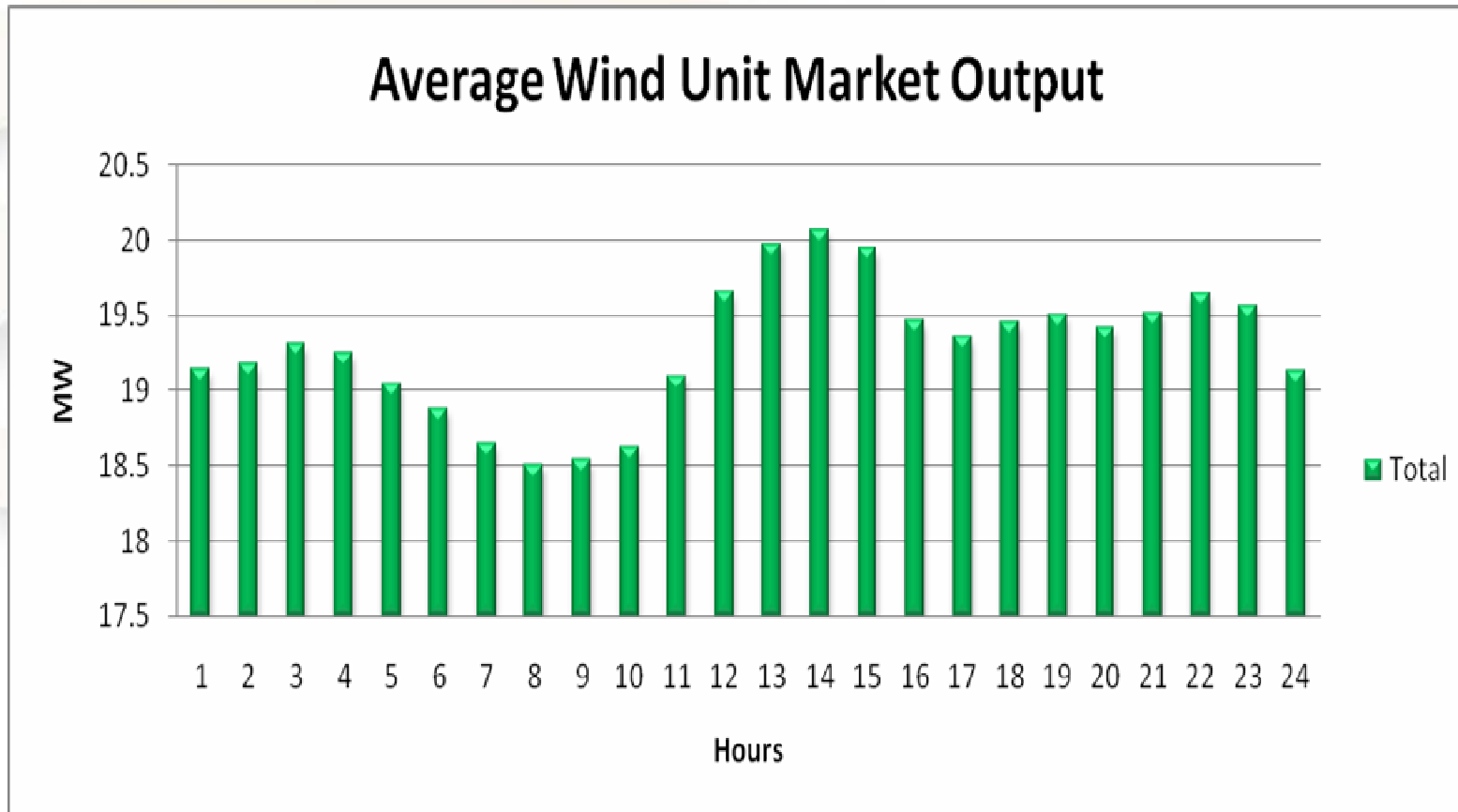
# Average Market Schedule for OCGT in SEM



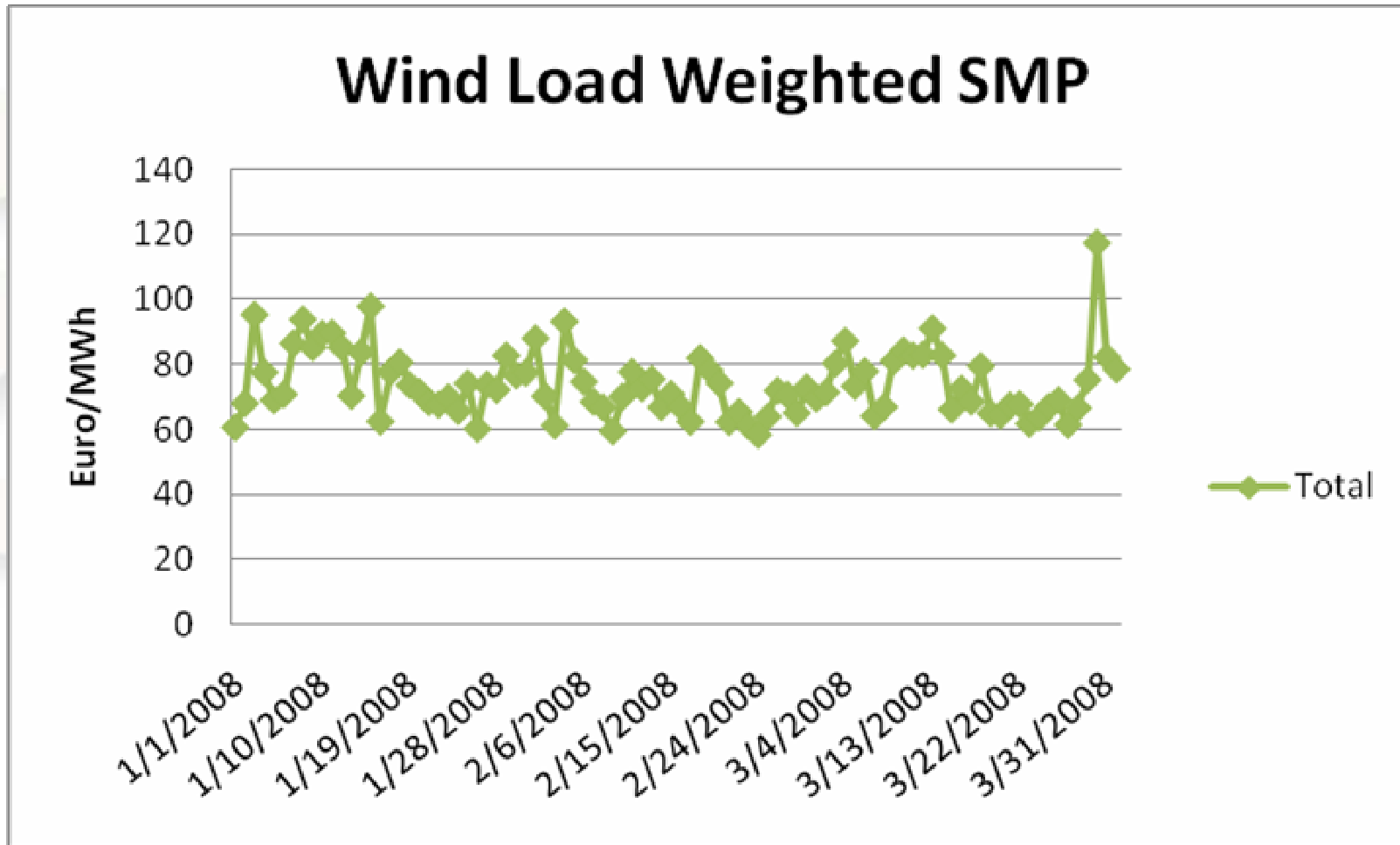
# Average Market Schedule for Hydro in SEM



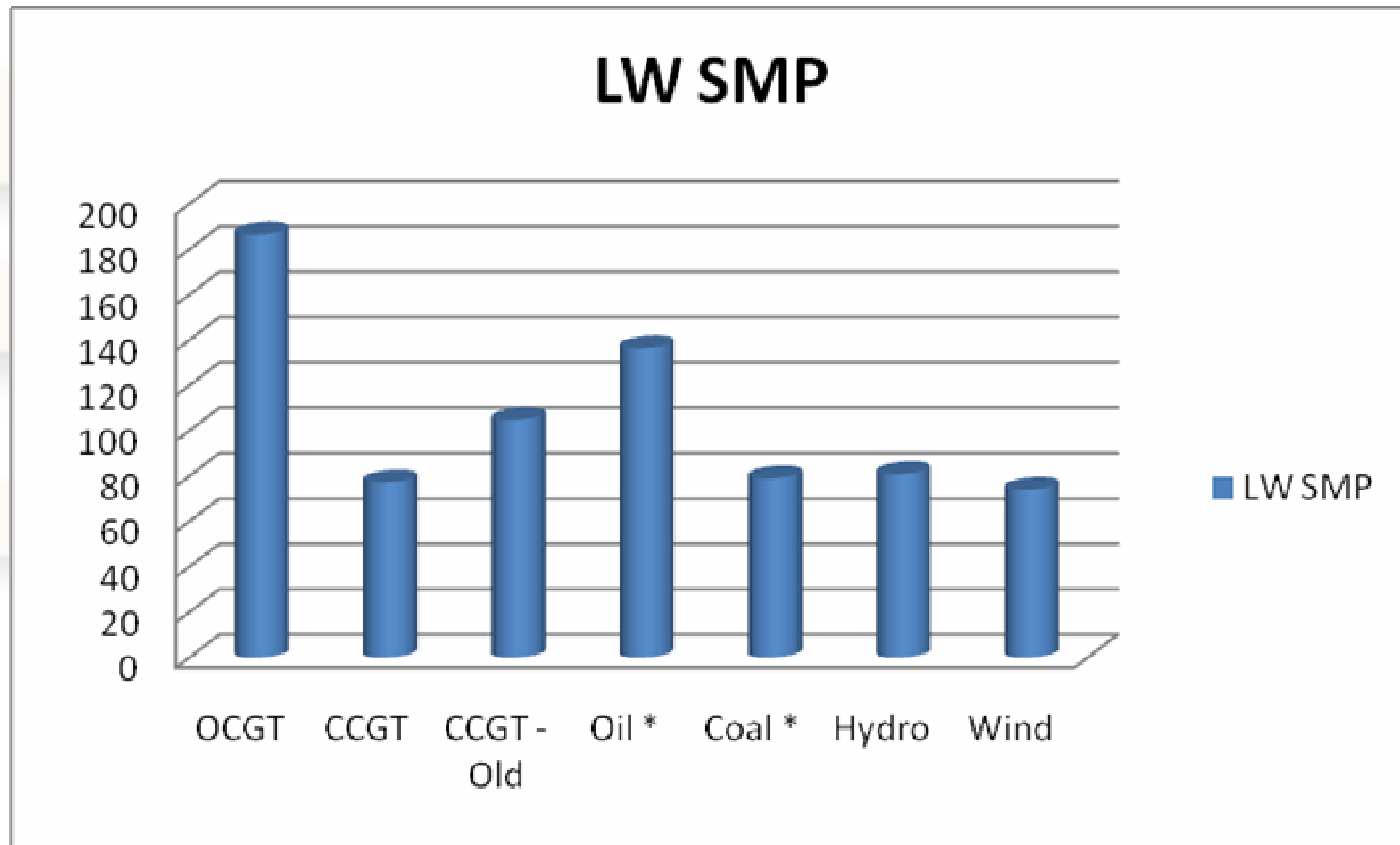
# Average Market Schedule for Wind in SEM



# Average Load Weighted Price for Wind in SEM



# Average Load Weighted Price by Type in SEM



# Inframarginal Rent in the SEM energy market

Plant Type	Revenue	Costs	Profit	Percentage
CCGT	806,000,000	526,000,000	280,000,000	53%
CCGT - Old	26,500,000	20,300,000	6,200,000	30%
OCGT	5,800,000	4,800,000	1,000,000	21%
Once Through	3,300,000	2,900,000	400,000	12%
Reheat	382,000,000	296,000,000	86,000,000	29%
Hydro	36,200,000	N/A	36,200,000	N/A
Wind*	90,000,000	N/A	90,000,000	N/A



\* based on the bid offers submitted to SEM and the market schedule for Dec 2007 to May 2008

# Payments from Capacity Mechanism in SEM

Plant Type	Capacity Payment	Average Price
CCGT	€ 62,044,340	€ 9.2
Natural Gas	€ 4,628,558	€ 7.8
Hydro	€ 3,900,260	€ 8.3
OCGT	€ 12,190,369	€ 8.0
Coal / Oil	€ 63,760,035	€ 7.3
Reheat	€ 55,373,056	€ 7.7
Wind	€ 6,170,379	€ 4.1 ** 11



\* based on the bid offers submitted to SEM and the market schedule for Jan 2008 to Mar 2008

# SEM Incentives Overview

- Wind
  - Energy Price approx Euro 74 /MWh per MWh of output
    - (based on Jan, Feb, Mar 2008)
  - Capacity Payment approx Euro 11 /MW produced by a windfarm
- Are the market prices bankable?
  - Are they high enough for on shore wind?
  - How long do they need to be to appease investors?
  - Are support mechanisms required indefinitely?



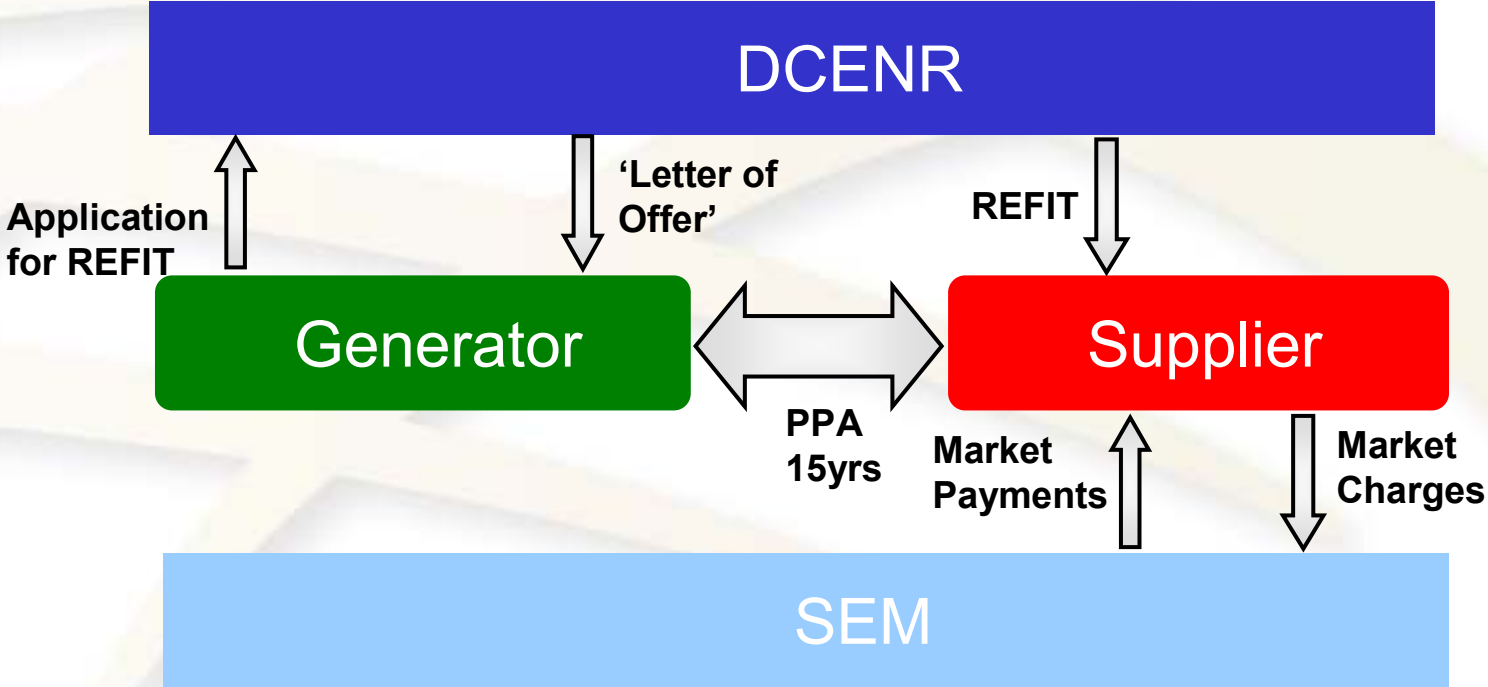
# Project Developer - Investment Decision

- Project Risk
  - Connection offer
  - Planning permission
  - Turbine contract
- Operational Risk
  - Warranty
  - Insurance
- Revenue Risk
  - Tradable volume
  - Price

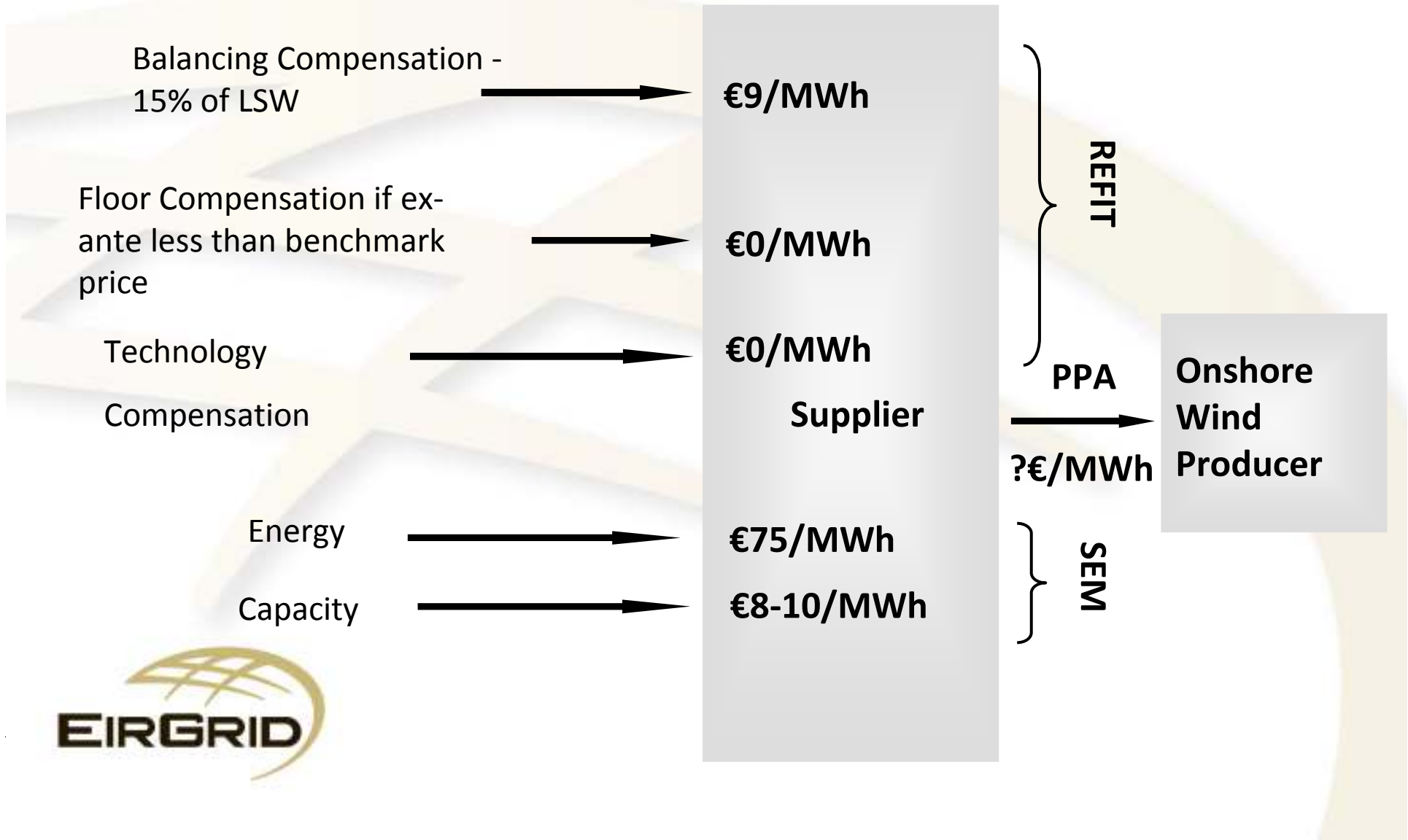
Revenue	Costs
Energy Market Payments	Capital Costs
Capacity Market Payments	Operation & Maintenance Costs
Ancillary Service Payments	Fuel Costs
Power Purchase Agreement (PPA) Contract for Difference (CFD)	



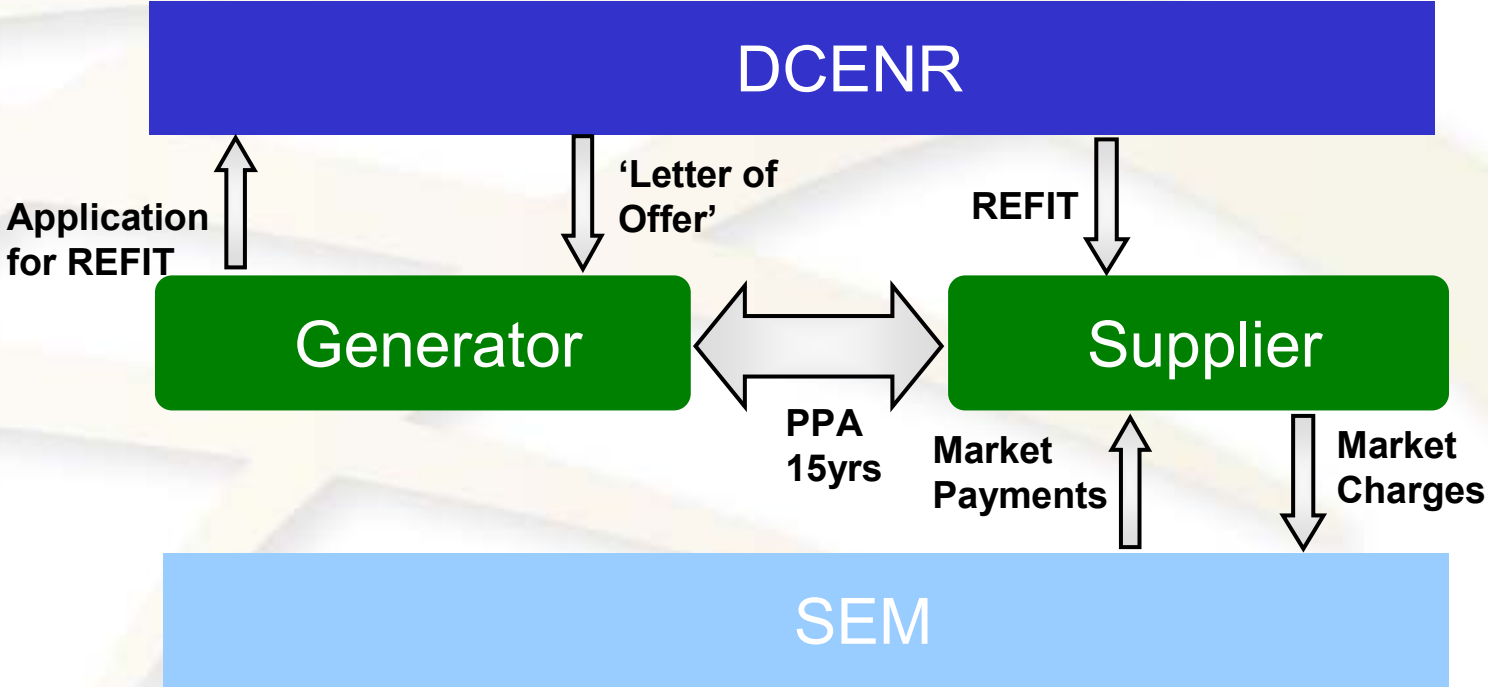
# REFIT and SEM: Generator and Supplier Separate



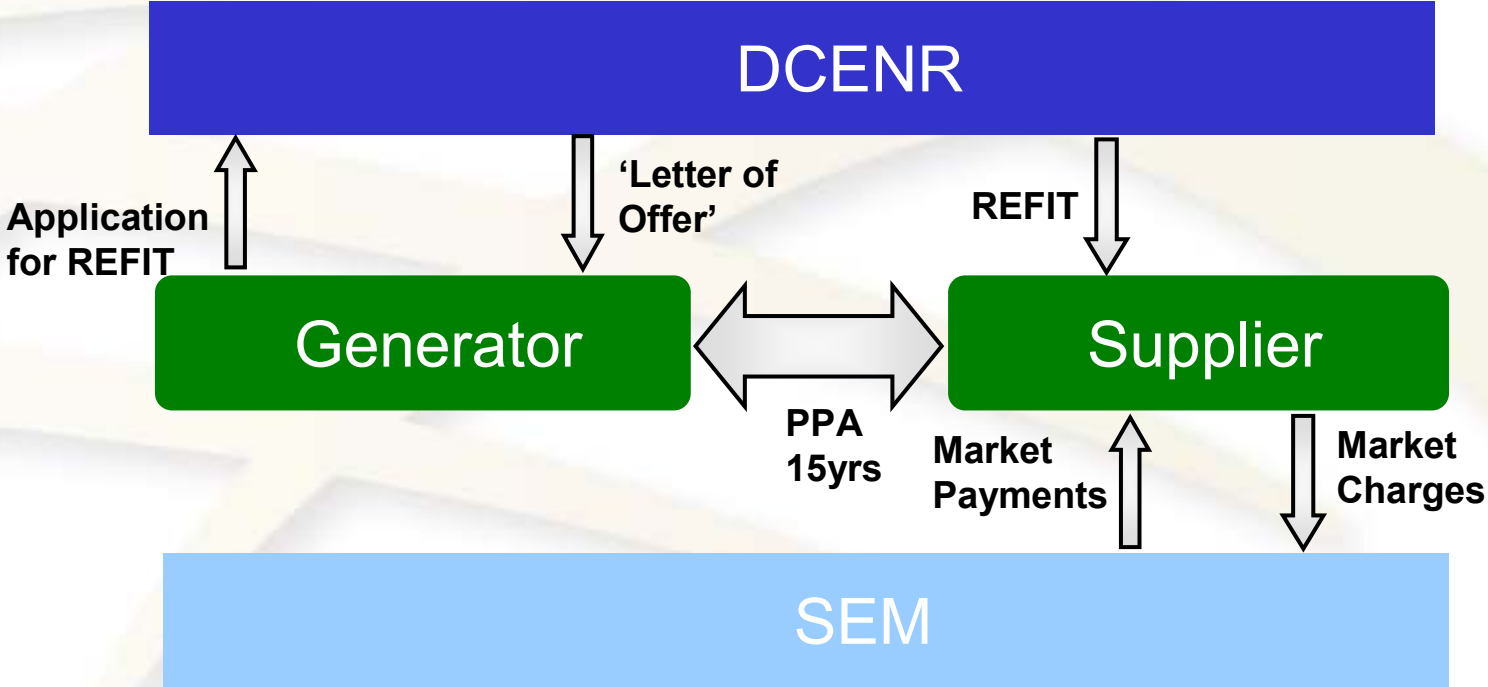
# Theoretical Value of Onshore Wind



# REFIT and SEM: Generator and Supplier Same Company



# REFIT and SEM: Non-Market Participant Below De-Minimus



# Possible Constructs for a Generator Trading Electricity

	Generator and Supplier Separate	Generator and Supplier same Company	Generator Only	Non-market participant
SEM Administration	Basic on Gen	Basic on Gen Difficult for Supplier	Basic on Gen	Basic on Gen
Payments	PPA strike price	PPA strike price	SMP and Capacity	PPA strike price
Ability to negotiate PPA	Poor	Excellent	N/A	Poor
Ability to get REFIT	Poor (Linked to PPA)	Excellent	N/A	Poor



# Difference between Generator and Supplier Payments and Charges

Generator	Supplier
Energy Market Payments	Energy Market Charges
Constraints	Capacity Market Charges
TUoS or DUoS *	Market Operator Charge
Ancillary Service payments	Imperfections Charge
	Transmission Use of System
	Distribution Use of System
	PSO Levy
	CER Levy
Minimum Collateral Cover	Significant Collateral Cover
Self billing invoice weekly but can receive invoices for re-settlement daily (unlikely)	Charged weekly but can receive invoices for re-settlement and collateral calls daily (likely)
No daily collateral calls	



# Entering SEM as a Supplier to get REFIT

- Be aware of your obligations!
- Are you sure you want the hassle!!
- Know before you sign up!!!



# Becoming an active participant (Supplier or Generator)

- Need a license
  - CER
  
- Need a connection (Generator)
  - Connection Agreement
  - Contestability – Connection provider (ESB Networks)
  
- Need a Use of System Agreement (Supplier)
  - ESB Networks/EirGrid
  
- Need Metering and Signals
  - ESB Networks/EirGrid
  
- Need to Register as a Party and Participant
  - SEMO



## Agreements needed as a generator: Participating in the SEM

Controllable	Connected	Installs Metering	Reads Meters	Connection Agreement	Code	Use of System
No	Distribution	ESB Net	MRSO	ESB Networks	Dist Code*	ESB
Yes	Distribution	ESB Net	MRSO/EirGrid	ESB Networks	Dist Code*	ESB
No	Transmission	ESB Tel	EirGrid	EirGrid	Grid Code*	EirGrid
Yes	Transmission	ESB Tel	EirGrid	EirGrid	Grid Code*	EirGrid



controllable windfarms need metering, availability and dispatch instructions consistent with wind grid code

\* Licensed entities can be bound to clauses in either Code where it is applicable

# SEM Becoming a participant – Registration

**60 days**

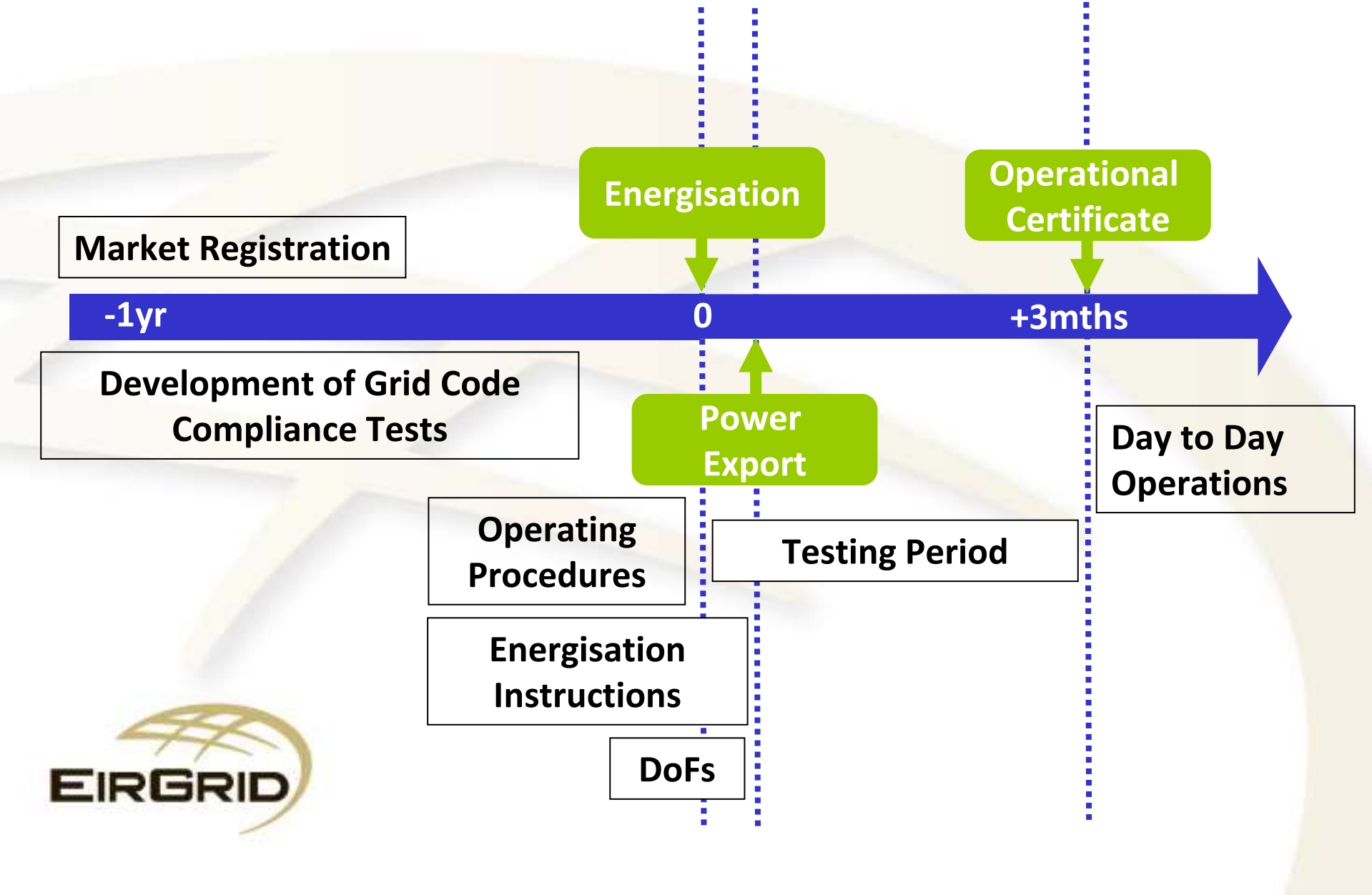


# Standards of Performance

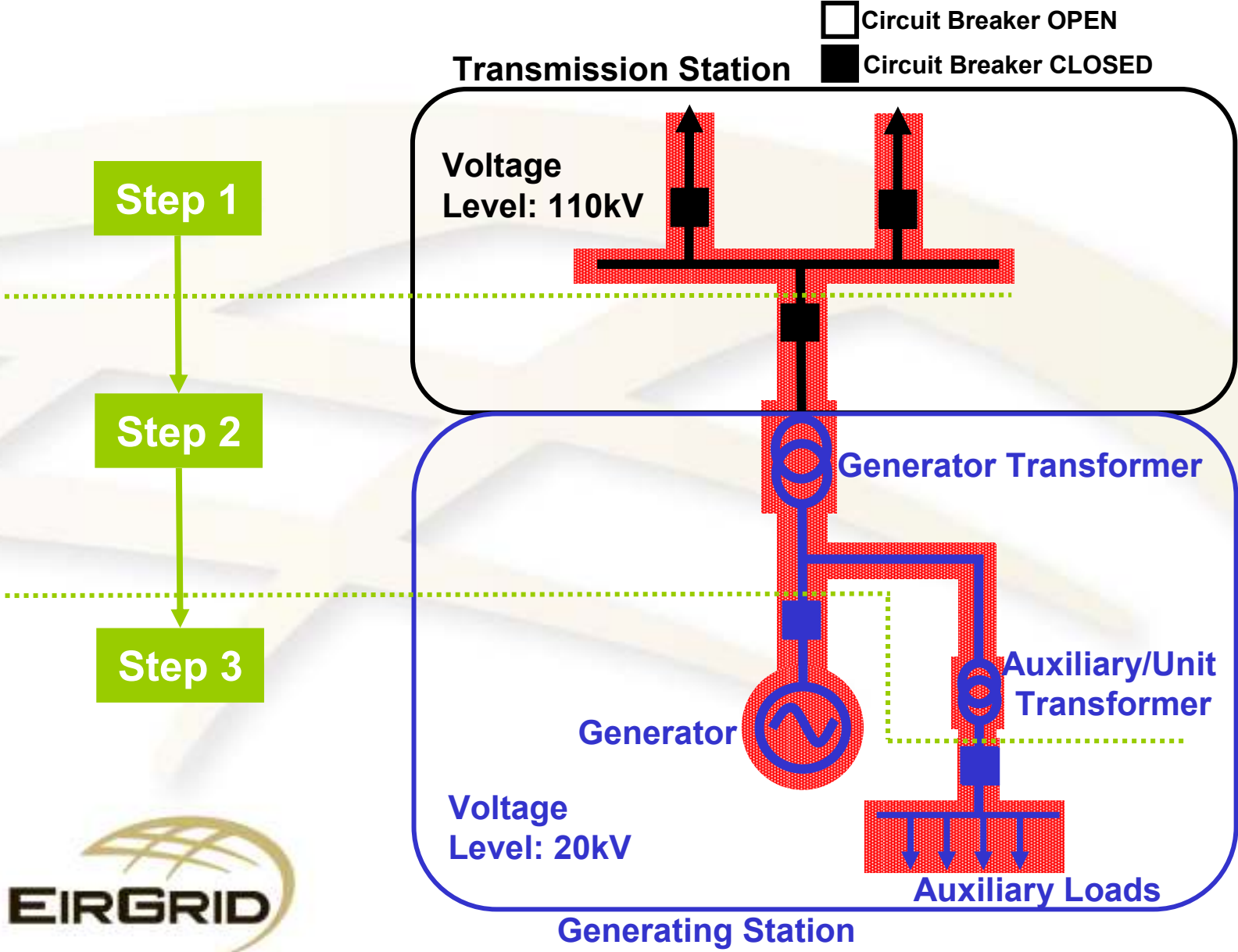
- Transmission Connected
  - Grid Code
- Distribution Connected
  - Distribution Code



# Indicative Commissioning Timelines



# Energisation



# Energisation

## Declaration of Fitness (DoF):

- A statement that a defined item of equipment is fit to be entered into service, i.e. energised.
- Customer must nominate a competent person to 'DoF'.

## Energisation Instructions:

- The step by step switching procedure for making equipment 'live';
- Issued by EirGrid to ESB Networks and Customer as appropriate.

## Operating Instructions:

- The operating procedures by which the Transmission-Customer interface is managed;
- Issued by EirGrid to ESB Networks and Customer.

# Test List

**PHASE A**

Tests 1 to 31:

- Provision of technical data
- Checking of protection settings
- Operating procedures in place
- Declaration of Fitness for Generator Transformer

**Energise Generator Transformer**

**PHASE B**

Tests 32 to 44:

- Interlocking checks
- Generator-Transmission alarms and intertrips
- No load AVR and Governor tests
- Synchronisation tests

**Synchronise Generator**

**PHASE C**

Tests 45 to 70:

- Minimum Load, Registered Capacity, Ramp Rates
- Operating Reserve and Reactive Power capabilities
- Accurate provision of SCADA

**Is the Generator Grid Code Compliant?**

## Testing - Windfarms

- Prior to export of power from the windfarm it is essential that EirGrid has Active Power (MW) control of the windfarm.
- Grid Code requirements extend to many windfarms connected on the distribution system – these are also tested by EirGrid.



# Operational Certificate

- The Operational Certificate is issued by EirGrid on successful completion of Grid Code Compliance testing.
- With an Operational Certificate:
  - under the terms of the customer’s Connection Agreement, the **MEC Capacity Bond** can be released and, if applicable, **‘Firm Access’** applied;
  - under the terms of the Ancillary Service Agreement receive **Ancillary Service payments**;
  - a windfarm has satisfied all obligations to be considered a **Variable Price Taker** and may receive **Constraint Payments**;
  - a conventional unit may be considered no longer under test and may receive **Constraint Payments**.



# Grid Code Derogations

- All generators should comply with the Grid Code.
- Operational Certificate dependant on Grid Code compliance.
- However, customers may apply for derogations from particular requirements of the Grid Code.
- Derogation requests are assessed by EirGrid who make recommendations to the CER.
- The CER decides...rejection of a derogation means that the generator must fix the problem and re-test the generator.

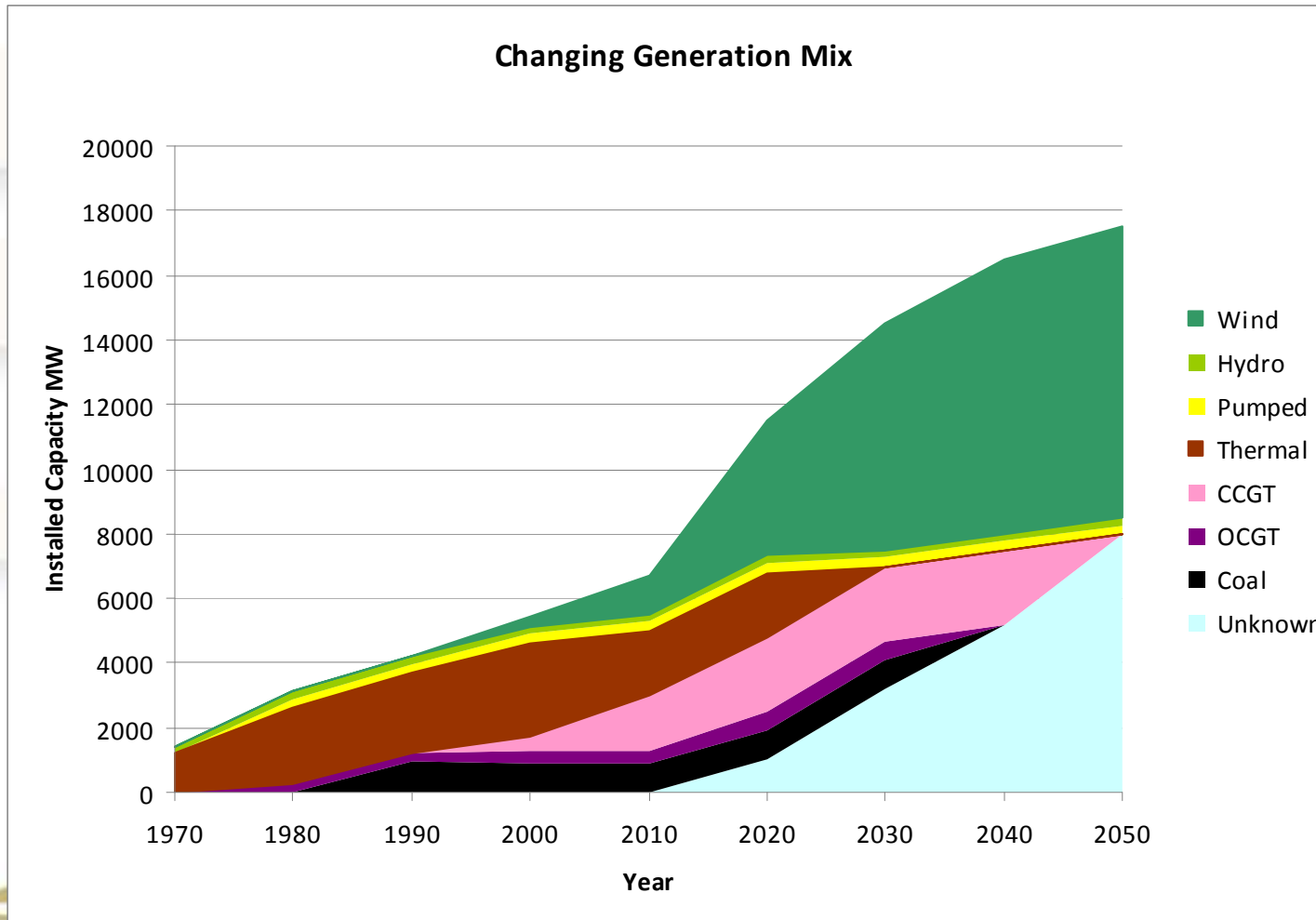


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# Questions and Answers

