I-SEM CRM
Consultation Paper Workshop

Product Design

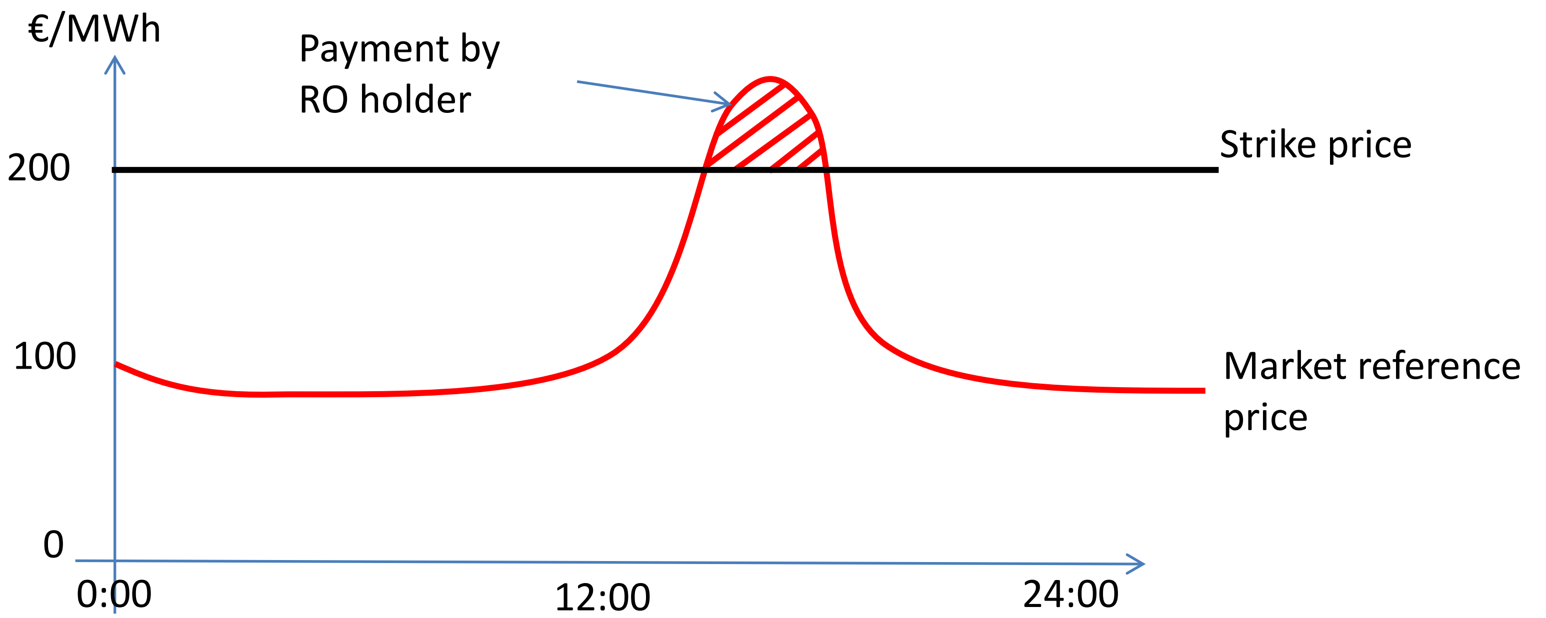
Dundalk, 31 July 2015

Commission for Energy Regulation
An Coimisiún um Rialáil Fuinnimh

Utility Regulator
ELECTRICITY GAS WATER

Overview of Reliability Option

- Reliability Option is a one-way CfD. Capacity providers:
  - Paid an option fee, determined by auction
  - Make difference payments of (Reference price – Strike price) when Reference Price > Strike Price



Worked Example

Assumptions

- Capacity auction clearing price of €20/kW per annum, equates to €2.28/MWh
- The Strike Price is €200/MWh; and
- The Market Reference Price is:
  - Scenario A: €100/MWh;
  - Scenario B: €300/MWh.

	Scenario A	Scenario B
Generator energy market income	100.00	300.00
Capacity option fee	2.28	2.28
Generator RO difference payment	0.00	-100.00
Total capacity market income	2.28	-97.72
Total generator revenue / supplier payment	102.28	202.28

Key features to be determined

- Strike price and strike price indexing
- Scarcity pricing
- Market reference price
- Load following or not?
- Performance incentive mechanism

Strike Price and indexing options

Fixed Price	e.g. € 250 / MWh		
Variable (indexed) Price	Strike Price = the heat rate x fuel cost of the Peak Energy Rents (PER) Proxy Unit. Use of a spot gas / oil price for fuel cost	Proxy unit is **actual** peak plant on system	
		Proxy unit is **hypothetical** peak plant	Grandfathered
			Periodically reviewed

Reference markets

Three key markets defined by Energy Trading Arrangement (ETA) workstream

Day Ahead Market (DAM):

- Majority of physical energy traded via the DAM
- Primary coupled market (to the wider European Internal Market)
- Liquid market and transparent price for forward contracting

Intra-day Market (IDM):

- Continuously traded
- EU Target Model provides that intra-day regional auctions may also be implemented, but not a given

Balancing Market (BM):

- ETA workstream is still consulting on the details of the BM price formation
- Will be a single marginal imbalance price for energy actions, which can be used as MRP

11 am D-1

11am D-1 to [1] hour before start of settlement period

[1] hour before start of settlement period to settlement period end

Scarcity pricing (1)

- Increased focus on scarcity pricing

EC, "Launching the public consultation process on a new energy market design" (Summer package), published 15 July 2015

In some markets, the large-scale shift towards capital-intensive electricity production from wind and sun with marginal costs close to zero has led to prolonged periods of low spot prices as well as reduced running hours of conventional generation. In such a situation, ***an essential condition for electricity markets sending the right price signals for investment in adequate capacity is to allow prices to reflect scarcity during demand peaks****, and for investors to have confidence in this translating into long-term price signals*.

- Recent Ofgem reforms introducing scarcity pricing into the GB Balancing Mechanism
- A number of markets in the US have administrative scarcity pricing
- I-SEM scarcity pricing considered in conjunction with Reliability Option – Reliability Options provide a hedge to Suppliers under scarcity conditions

Scarcity pricing: Evidence from GB pre cash-out reform?

Argument that SEM BCoP prevents prices reflecting scarcity. However consider GB in 2012-2014:

- Highest GB DAM price was £262.50/MWh;
- Only 37 of 52,000 GB SBPs were in excess of £200/MWh, highest SBP = £430/MWh.
- National Grid issued a Notice of Insufficient Margin in February 2012- highest System Buy Price was only £264/MWh;
- More instances of high prices in the SEM during this period, despite absence of BCoP in GB

No. Of half hours 2012-2014

£/MWh	GB Day Ahead	GB BM System Buy Price	SEM Ex Ante Day Ahead estimate	SEM Actual Ex Post
>£150/MWh	20	196	643	598
>£200/MWh	11	37	259	287
>£300/MWh	0	8	40	74
>£400/MWh	0	2	8	20
>£500/MWh	0	0	0	10

Maximum price in any half hour

	GB Day Ahead	GB BM System Buy Price	SEM Ex Ante Day Ahead estimate	SEM Actual Ex Post
Max price £/MWh	£262.50	£429.10	£484.63	£878.90

Potential form of scarcity price

Two key options for administered scarcity price:

- **BNE Cost based**: Annualised cost of an additional hypothetical best new entrant divided by average scarcity hours per year
- **Value of Lost Load (VOLL) based**: The VoLL is an estimate of the maximum value that consumers would have been prepared to pay for continuity of supply and is a measure of the opportunity cost of unserved load
  - Pure VoLL (if load actually lost)
  - VoLL x Loss of Load Probability (if reserve reduced)

Should result in a similar result, if the security standard is set using appropriate cost benefit techniques.

Market reference price options

- Option 1: BM price
  - Option 1a: BM price without scarcity pricing;
  - Option 1b: BM price with scarcity pricing
- Option 2: 100% Intra-day market price;
- Option 3: 100% DAM price;
- Option 4: Multiple reference market option:
  - Option 4a: A blended price option;
  - Option 4b: A split market price option. Any volumes sold in DAM settled at DAM price, remaining unsold RO volume settled against BM price*

*could extend to include IDM price component

Blended vs split market reference price
Worked examples

Common assumptions

- Capacity provider sells 90% of 10MW RO volume into DAM, 10% into BM
- DAM Price = €150/MWh, BM Price = €250/MWh
- Strike Price = €200/MWh

Blended price example

- MRP = 90% x 150 + 10% x 250 = €160/MWh
- Reference Price is less than Strike price so, no difference payment

Split price example

- 9MW settled at reference price of €150 /MWh (so no difference payment)
- 1 MW settled at reference payment of €250/MWh
- So total difference payment = 1x (250 – 200) = €50

Key factors driving choice of MRP

- **Security of supply:** Should incentivise availability at times of system stress
- **EU Internal Market: Optimisation of interconnector trading**, including at Day Ahead stage
- **Efficiency: Accessibility**. The MRP should be accessible (i.e. achievable) by capacity providers
- **Competition: Promotion of wider liquidity objectives**, including for DAM- but could this be achieved via mandated DAM bidding for RO holders

MRP Option Evaluation (1)

Option	Pros	Cons
Option 1a: BM price	• More likely to reflect system stress than DAM or IDM	• Capacity provider basis risk on DAM volume • Reduced net volume in DAM? • Limited incentives on marginal BM price setting generator
Option 1b: BM with Scarcity Price	• Strongly incentivises availability at times of system stress	• Capacity provider basis risk • Reduced net volume in DAM? • High risk for capacity provider if it fails to deliver (but capped)
Option 2: 100% Intra-day price	• Closer to real time than DAM	• Does not reflect real time events • Uncertainty about liquidity • Lack of price accessibility unless intra-day auctions implemented

MRP Option Evaluation (2)

Option	Pros	Cons
Option 3: 100% DAM price	• Price robust and accessible • Promotes efficient day-ahead EUPHEMIA scheduling • Consistent with existing approach to CfDs and FTRs	• Weaker at incentivising availability during real time system stress • Would not provide hedge for BM scarcity prices
Option 4a: Blended price	• Mitigates capacity provider basis risk • Could be implemented with scarcity pricing in BM.	• Weak at incentivising availability at times of system stress • Creates complexity for hedging strategies?
Option 4b: Split market price	• Right incentives on non-marginal capacity • Mitigates capacity provider basis risk • Could be implemented with scarcity pricing in BM.	• Creates complexity for hedging strategies?

Load following

- If scarcity occurs outside a peak demand period (e.g. due to forced outages, wind), then RO payments could exceed Supplier compensation requirements

- Load following adjusts payments appropriately

  (Actual demand + Operating Reserve Requirement – Capacity provided by plant without an RO commitment) / Volume of RO sold

Load following
Worked example

Peak demand requirement	6,000	MW
Reserve requirement	0	MW
Reliability Option volume	6,000	MW
Demand at system stress incident	5,000	MW
Strike Price	200	€/MWh
Market Reference Price	5,200	€/MWh
RO holder difference payment	5,000	€/MWh

	Scenario A: no-load following	Scenario B: load following
Volume on which RO difference payments made (MW)	6,000	5,000
Supplier volumes (MW)	5,000	5,000
Capacity provider RO difference payment (€)	30,000,000	25,000,000
RO difference payment / MWh of supplier volume (€/MWh)	6,000	5,000
Net supplier payment / MWh (€/MWh)	- 800	200

Performance incentives

- In theory, the basic RO alone provides strong financial incentives to be generating when the options are exercised
- Initial CRMs in the US and in Colombia paid little attention to explicit incentives based on physical performance, but have evolved
- Examples included in the consultation document
- **Scarcity pricing in energy market introduces strong incentives to be available at times of system stress- need to consider combined effect**
- Caps and floors on incentives to be considered

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Eligibility

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Key issues

Focus of today's discussion

- Plant receiving support under other mechanisms
- Treatment of non-firm transmission access generation
- Mandatory vs discretionary bidding for existing plant
- Adjustment for non-CRM bidding generation
- Demand side participation
- De-rating approaches
- Treatment of aggregation

Other issues discussed in consultation document

- Renewables not receiving support- included
- Storage and energy limited plant- RAs will work with the System Operator (SO) to define the minimum requirements and de-rating factors
- Pre-qualification- requirements to be determined

Plant receiving support under other mechanisms

Affected plant:	**Key issues:**
• Supported renewables • Peat in Ireland 380 MW • GUA plant in Northern Ireland 595 MW, expire in Sept 2018 • Longer term ancillary service contracts	• Potential over-compensation (net additionality of capacity revenue varies by scheme) • Payment from Ireland / NI specific PSO or All-Island capacity revenue

Supported plant- Options

- **Option 1: All supported generators ineligible** as in GB;
- **Option 2: All existing supported generators** who have been **eligible** for SEM capacity payments are eligible, but future generators will be ineligible.
- **Option 3: All supported generators eligible**.
- **Option 4**: **Scheme by scheme specific treatment** subject to judgment of whether eligibility leads to over compensation

Evaluation of supported generation options (for renewables)

	Pros	Cons
Option 1: All ineligible	Lowest cost to consumers (ROC generators)	Suppliers not fully hedged
	Lowest distortion on cross-border trade and location of generation?	Change in treatment for existing supported generation
	Avoids some performance monitoring*	
Option 2: Existing eligible, future ineligible	Low perceptions of regulatory risk	Suppliers not fully hedged
	Lower distortion on cross-border trade and location of generation?	Could result in over-compensation, depending on support scheme
	Avoids some performance monitoring*	Avoids some performance monitoring*
Option 3: All eligible	Economically efficient provision of capacity	Could result in over-compensation, depending on support scheme
	Consistent with long term vision	
	Existing position capacity payment eligibility	Requires performance monitoring of lots of small generators*
	Suppliers better hedged	

* depending on performance monitoring regime

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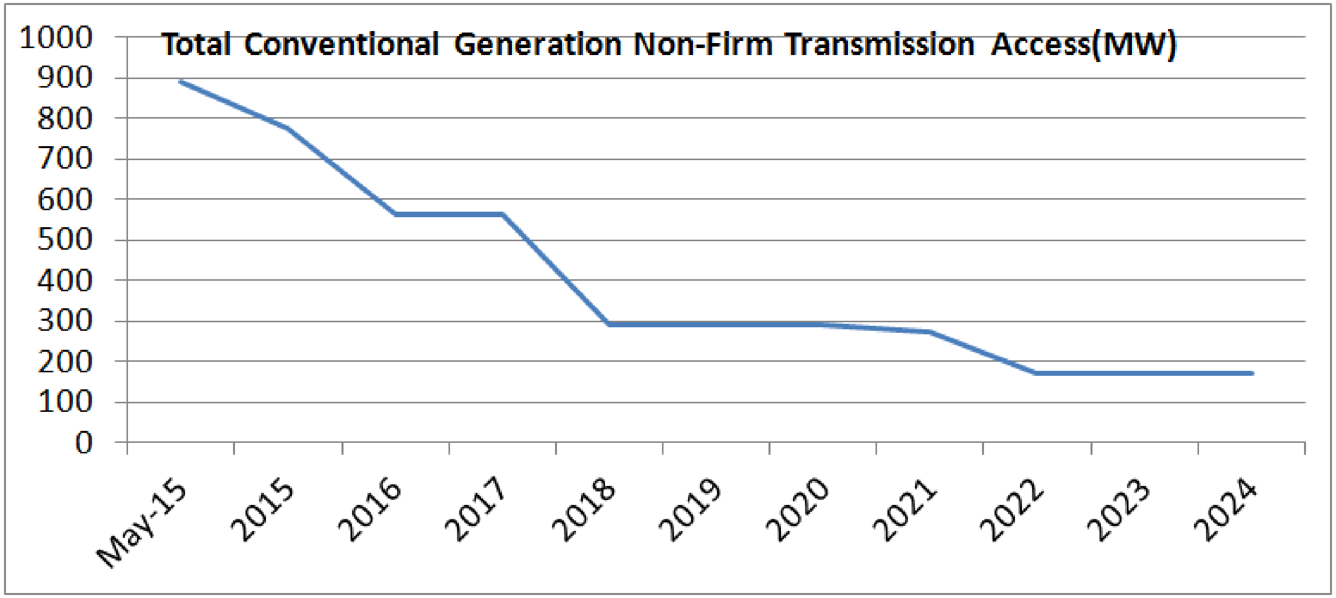
Treatment of non-firm transmission access generation

- **Option1: Eligible to bid, subject to the same de-rating factors** as firm generators of the same technology
- **Option 2: Eligible to bid, subject to additional de-rating** (for transmission access, as well as technology specific)
- **Option 3: Ineligible to bid**



Over 500 MW of affected capacity in 2017, reducing to around 300MW in 2018 to 2021

Mandatory vs voluntary bidding and adjusting capacity requirement

Mandatory vs discretionary

- May choose to make bidding into CRM auction mandatory for eligible generators, to prevent abuse of potential market power
- But could partially address via reducing amount purchased

Adjusting the CRM requirement

- Need to adjust capacity requirement for ineligible or discretionary opted out plant
  - Need to know "opted-out" plant before auction
  - Additional rules to prevent early withdrawal from auction

Demand side participation

- **Keen to incentivise wide range of demand side participation**:
  - End consumers who have the capability to reduce demand at times of systems stress.
  - Generation capacity which does not have the capability to export to the grid, but has the capability to reduce the end consumers' net demand from the grid
  - Generation capacity to reduce on-site end consumers' net demand, and to export surplus to grid

- **Incentives should reflect system benefits delivered**....

Demand side participation options (for reduced demand, not grid exports)

	Option 1	Option 2	Option 3
Additional energy payment	No	Yes	No
Exempt from RO difference payments	No	No	Yes

Demand side participant
Worked example- end consumer on tariff

- 1MW of RO
- Option fee = €5/MW/h
- Strike price = €200/MWh
- Reduces consumption from 3MW to 2MW, when called
- Pays a Supplier €80/MWh for metered consumption

DSU does not participate in CRM

Option	Consumption	Capacity payment	Difference payment	Energy payment for load reduction	Energy payment to Supplier	Net payment
all options	3	0	0	0	-240	-240

DSU participates in CRM: Demand reduction not called

Option	Consumption	Capacity payment	Difference payment	Energy payment for load reduction	Energy payment to Supplier	Net payment
all options	3	5	0	0	-240	-235

DSU participates in CRM : Market price = €300/MWh, demand reduction called

Option	Consumption	Capacity payment	Difference payment	Energy payment for load reduction	Energy payment to Supplier	Net payment
1	2	5	-100	0	-160	-255
2	2	5	-100	300	-160	45
3	2	5	0	0	-160	-155

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Demand side participant
Worked example- end consumer on “Pool price contract”

- DSU X has a “Pool price contract” with a Supplier based on metered demand

DSU does not participate in CRM- Pool price = €300/MWh						
Option	Consumption	Capacity payment	Difference payment	Energy payment for load reduction	Energy payment to Supplier	Net payment
all options	3	0	0	0	-900	-900

DSU participates in CRM : Market price = €300/MWh, demand reduction called						
Option	Consumption	Capacity payment	Difference payment	Energy payment for load reduction	Energy payment to Supplier	Net payment
1	2	5	-100	0	-600	-695
2	2	5	-100	300	-600	-395
3	2	5	0	0	-600	-595

- Potential double reward for reducing consumption, under Option 2?

De-rating: Key issues

- Generic de-rating factor by technology or plant specific;
- Historic vs. projection approach;
- Marginal vs. Average contribution; and
- Grandfathering.