SEM committee

SINGLE ELECTRICITY MARKET COMMITTEE

DS3 System Services

Procurement Design

SEM Committee Consultation

9 July 2014

SEM-14-059

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1 Executive Summary

The System Services work stream is a key part of the DS3 programme. System services are required in order to deliver enhanced performance from generation, emerging technologies and demand response. This enhanced performance, in conjunction with the other DS3 deliverables, will allow the TSO to securely operate the electricity system with up to 75% of demand being met by non-synchronous (predominantly wind) generation. Increasing the System Non-Synchronous Penetration (SNSP) limit to 75% is necessary to meet Government targets of 40% of demand being met by renewable generation in both Ireland and Northern Ireland.

The analysis and proposals set out in this paper build upon a substantial body of work arising out of the Facilitation of Renewables studies in 2010. The SEM Committee would like to take this opportunity to acknowledge the significant and innovative work by the TSOs in preparing this suite of recommendations. The SEM Committee also acknowledges the significant input from the public and the industry through consultation and public fora to date.

In May 2013 the TSOs after conducting a number of public consultations submitted recommendations on the implementation of a new System Services framework to the SEM Committee. Following a review of these recommendations the SEM Committee consulted on its proposed approach, and subsequently issued a decision paper in December 2013. The SEM Committee approved the technical definitions of the proposed System Services but was of the view that further economic analysis was required in relation to the financial aspects of the recommendations.

This paper presents the results of this economic analysis. Alongside this paper, the SEM Committee is also publishing the TSOs' report on the demand analysis and a report from IPA Energy and Water Economics which covers the supply analysis and recommendations in relation to the procurement design for system services.

The demand analysis carried out by the TSOs indicates an estimated production cost saving of €241m of which €177m are consumer savings. These savings indicate a benefit to the all island consumer associated with higher levels of renewable electricity penetration and reduced levels of curtailment. The supply analysis estimates an annualised cost of €70m – €84m. The analysis suggests that revenues from System Services should deliver a societal benefit, optimise capacity and energy payments to the most efficient and flexible plant and systematically increase the consumer's share of the DS3 savings. This will depend to some extent on the procurement mechanism for System Services.

Through the procurement analysis the SEM Committee has considered five separate options for the procurement of system services.

1. Regulated Tariffs
2. System Services Pot
3. Regulated Competition
4. Split Auction
5. Multiple Bid Auction

To evaluate the options the SEM Committee assessed them each against a set of criteria:

- Consumer interest
- Investment
- Curtailment
- Renewable targets

The SEM Committee, in accordance with its statutory duties, has a preference for a competitive approach that will maximise the benefits to consumers. Furthermore the interactions between the revenue streams in the energy trading arrangements, system services, and the capacity remuneration mechanism should be designed to reward and incentivise those units which are most efficient and valuable to the system. The SEM Committee is cognisant of the potential issues of market dominance in system services, and invites comments on this issue. In this context it is possible that Regulated Tariffs may be used for system services that the competitive approach has failed to deliver.

The SEM Committee is minded to adopt Option 5, the Multiple Bid Auction, as the procurement mechanism for system services. The key features of this approach are:

- Mandatory, sealed, pay-as-cleared, instantaneous auction
- Multiple, mutually exclusive bids permitted
- Each bid includes price and capability for each service, provides a set of mutually exclusive outcomes for the auction
- TSO determines demand curve based on range of outcomes
- Least-cost outcome is selected, results in individual uniform prices for each service
- Units decide contract length when bidding, existing capability of unit must be included as a bid and fixed one-year contract for existing capability.

The payment basis for the system services under this option are proposed to be:

Service	Payment Basis	Service	Payment Basis
SIR	Availability	DRR	Availability
FFR	Availability	Op Reserve	Dispatch
FPFAPR	Availability	RRS/RRD	Dispatch
SRP	Availability	Ramping	Dispatch

The full details of the economic analysis are set out in this paper and in the supporting documentation. It is proposed to hold an industry workshop on 29th July 2014 in Dundalk, full details will be published in due course. Responses are requested on the SEM Committee's analysis by **17.00 Friday 22nd August 2014**.

2 Introduction

On 15th May 2013 EirGrid and SONI (the "TSOs") formally submitted their Recommendation Paper regarding DS3 System Services to the SEM Committee. This paper was published for information on 24th May 2013. This concluded an extensive period of consultation with industry by the TSOs on their proposals to redesign the Ancillary Services arrangements in order to meet the needs of the system in 2020. The SEM Committee would like to take this opportunity to acknowledge the significant and innovative work by the TSOs in preparing this suite of recommendations. The SEM Committee also acknowledges the significant input from the public and the industry through consultation and public fora to date.

Following a review of the TSOs Recommendations the SEM Committee issued a consultation paper (SEM-13-060) on 3rd September 2013 setting out its view that it was minded to approve the technical definitions of the proposed new system services and that it would be conducting further economic analysis on the commercial recommendations made by the TSOs. On 20th December 2013 the SEM Committee issued its Decision paper (SEM-13-098) on the technical definitions of the system services. SEM-13-098 also set out the SEM Committee's approach to its economic analysis. The SEM Committee subsequently, on 22nd January 2014, published for information advice received from Pöyry Management Consulting (SEM-14-007).

This Consultation paper outlines the results of the SEM Committee's economic analysis and sets out the procurement options arising from those results, its preferred approach and requests the views of industry.

2.1 Background

The TSOs formally commenced the DS3 Project in September 2011, following a review by the Regulatory Authorities of the TSOs' Report on Ensuring a Secure, Reliable and Efficient Power System in July 2011. This followed a request by the SEM Committee for the TSOs to put in place a programme of work to solve the challenges which would occur with operating the electricity system in a secure manner as levels of wind penetration increase. These issues had been identified by the TSOs in the Facilitation of Renewables Study, a large body of work which concluded in 2010.

One of the key work streams in the DS3 programme is the Review of System Services (or Ancillary Services). The aim of the system services review is to put in place the correct structure, level and type of service in order to ensure that the system can operate securely with higher levels of intermittent wind penetration (up to 75% instantaneous penetration). The TSOs have statutory responsibilities in Ireland and Northern Ireland in relation to the economic purchase of services necessary to support the secure operation of the system. The SEM Committee at present approves the policy, rates and overall all-island monies for harmonised ancillary services as the cost is included in transmission charges and recovered from demand customers.[1]

[1] SEM Committee paper on HAS and OSC are available here

The TSOs have published three consultation papers and a Recommendations Paper on the System Services Review[2]. The TSOs also published a report carried out by DNV KEMA into system services in international markets[3]. In addition to this the TSOs held a public workshop on their recommendations paper on 26th June 2013.

To date the TSOs have been responsible for the consultation process with industry. At the June 2013 meeting of the SEM Committee the TSOs presented their recommendations to the SEM Committee. The Regulatory Authorities' advisors at that time, Pöyry, also presented their review of the Recommendations Paper. Following these discussions the SEM Committee decided to publish the consultation paper SEM-13-060 which;

- set out the Committee's thinking on the TSOs' recommendations and how the Committee planned to proceed with the project; and

- invited comments on the Committee's initial conclusions on the technical aspects of the recommendations and, more specifically, on the services to be included in the project.

Following receipt of responses from industry on 11th October, 2013 the Regulatory Authorities held an industry workshop on 14th October, 2013 in Dundalk. At this workshop the Regulatory Authorities presented an overview of the comments received and opened the floor for a discussion with industry on each of the products. At this workshop the Regulatory Authorities also outlined their initial views on their approach to the economic analysis to be conducted. Comments were invited from industry on this approach. In order to assist with its supply side analysis the Regulatory Authorities also issued a call for evidence following the workshop inviting providers (existing and potential) to make submissions regarding the capability of units to provide the proposed system services, timeline for any necessary works and an indication (non-binding) of the associated investment and operational costs. The closing date for submissions was the 15th November, 2013. There was a limited response to this call for evidence coming generally from potential market entrants who provided detailed submissions. Therefore, the conclusions that can be drawn from the responses are limited, particularly as regards existing units. However in general respondents indicated that clarity around contract length was required urgently before investment decisions could be made. Respondents also outlined that it was difficult to provide cost information to the SEM Committee as plant designs could vary depending on the level of remuneration available for each individual service.

On 20th December, the SEM Committee published its Decision paper on the Technical Definitions of the DS3 System Services. This paper also outlined the SEM Committee's approach to the economic analysis:

- Demand side analysis to determine the value of the system services and the volumes likely to be required;
- Supply side analysis to determine the size and structure of revenues required to realised the necessary investment in system services; and

[2] TSO papers are available here
[3] KEMA Report available here

- Analysis on the options for procurement mechanisms.

On 22nd January 2014, the SEM Committee published for information advice received from Pöyry Management Consulting. This advice formed an input into the Regulatory Authorities analysis of procurement mechanisms. The demand analysis was carried out by the TSOs and was submitted to the Regulatory Authorities on 7th March 2014, while the supply analysis was separately commissioned by the Regulatory Authorities. The results of the economic analysis are discussed in this paper.

2.2 Related Documents

- Pöyry Advice on Procurement Options (January 2014)
- SEMC Decision Paper (December 2013)
- SEMC Consultation Paper (September 2013)
- TSO Recommendations paper (May 2013)
- Third TSO Consultation paper (December 2012)
- Second TSO Consultation paper (June 2012)
- First TSO Consultation paper (December 2011)
- Secure, Reliable and Efficient Power System (July 2011)
- Facilitation of Renewables Study (June 2010)

2.3 Responding to this Consultation

Responses to this paper are requested by **17.00 Friday 22nd August, 2014**. Comments should be sent to Robert O'Rourke (rorourke@cer.ie) at the CER or Andrew McCorriston (Andrew.mccorriston@uregni.gov.uk) at the Utility Regulator. Following a review of the responses to this paper the SEM Committee will publish its decision on the proposals set out in this paper by the end of 2014. The SEM Committee will publish all responses to the consultation paper alongside its decision paper on system services.

3 Economic Analysis: Supply Analysis

As part of the economic analysis undertaken by the Regulatory Authorities, the SEM Committee commissioned IPA Energy and Water Economics ('IPA') to carry out a supply-side analysis in order to assist in informing the SEM Committee's deliberations. This analysis consisted of a review of the DNV KEMA capital cost study commissioned by the TSOs and carried out in 2012, a review of industry submissions in relation to capital costs for system service provision, and further desk top research. The purpose of this analysis was to establish the likely capital costs of providing the required system services and the nature of the units likely to provide the services. Accordingly while the demand analysis (outlined in Section 4) examined the value to the system of system services the supply analysis examines the cost to the system.

The full supply analysis is contained in the IPA report published with this paper. In summary, there is limited available information worldwide on the costs of the enhancements envisaged under DS3. This to some extent reflects the fact that the SEM is at the forefront of the transition of the traditional electricity system to one with a large penetration of intermittent, asynchronous renewable energy. IPA's review of the report prepared by DNV KEMA concludes that the figures outlined in the DNV KEMA report are reasonable and can be considered a robust approximation of the capital costs associated with system service provision. Taking the KEMA results and the IPA analysis together a capital cost range of €70m-€84m per annum[4] is suggested by IPA. It is noted that the analysis does not cover operational costs. This range reflects the fact that IPA's analysis found some differences in costs, for example the costs for a new OCGT in the KEMA study were higher than suggested in IPA's analysis.[5]

Table 1: Generation Capital Costs[6]

Technology	Capacity [MW]	Normalised build cost (€)	Total add enhanced costs (€)	Enhancements as % of normalised build cost
CCGT-New	450	360,000,000	13,446,172	3.7
CCGT-Existing	450	360,000,000	54,690,497	15.2
OCGT-New	50	32,500,000	3,699,440	11.4
OCGT-Existing	50	32,500,000	7,163,575	22.0
Thermal (Coal)	650	845,000,000	53,663,920	6.4
Wind	2	4,200,000	325,600 - 480,000	8 - 11.4

[4] Over 20 year lifetime and a 6.6% WACC
[5] See Table 7 of the IPA Report
[6] IPA Report, source: KEMA Study

These costs are however not spread evenly across all providers. The analysis suggests that new builds have significantly lower incremental costs than the incremental costs of retrofitting existing units. A further consideration in the difference between new and existing units is that new units will most likely have a longer commercial life than existing units, potentially resulting in investments for existing units being recovered over a shorter timeframe increasing the annual costs further. Notwithstanding this the cost of providing system services through investment in generation are significantly less than the cost of providing services through network investments.

Table 2: Grid Solutions Capital Cost[7]

Technology	Capacity	Normalised build cost	Auxiliary equipment
Flywheel	20 MVAR	14,000,000	478,000 – 1,328,000
STATCOM	50 MVAR	4,500,000	928,000
Synchronous Condenser	75 MVA	2,000,000	2,726,500
Batteries (sodium-sulphur, NaS)	40 MW	90,000,000	3,170,000
Batteries (Li-ion)	40 MW	30,000,000	3,170,000

A range of technologies can provide system services; for the most part the providers are likely to be CCGTs, OCGTs, interconnectors, pumped storage, and wind. The bulk of services are likely to come from CCGTs and OCGTs. It is noted that with the exception of the new CCGT at Great Island, the GCS (Generation Capacity Statement) 2014-2023 does not anticipate significant new conventional generation capacity although significant new wind connections are expected up to 2020. This suggests that while there is scope for new wind to make incremental investments, the majority of services will be provided from enhanced units already on the system. However, it is noted that there are several potential new entrants with units that could provide a range of system services.

The most notable result of the supply analysis is the level of uncertainty surrounding the costs of provision and the technologies that will provide the services. Therefore the SEM Committee considers that the procurement mechanism should be as technology neutral as reasonable, and incentivise the most cost-effective technology to deliver best value for consumers. Given the wide variation in the costs and value of system services in addition to the variation in costs between providers, the SEM Committee is of the view that the procurement design should provide a degree of price flexibility to ensure firstly that customers capture as much of the value associated with system services as possible and secondly that the relative pricing of the services best incentivises those units able to most efficiently provide the services required by the system.

[7] Grid Solutions Capital Cost, IPA Report, Source: KEMA Study

These issues are explored further in the analysis below and in the discussion of the procurement options.

In summary, the SEM Committee is satisfied that the estimated total capital cost of providing all of the required system services in 2020 would be in the range of €500m – €600m (annualised over a 20 year period at a 6.6% WACC to €70m – €84m). Further details on this can be found in IPA's supply side analysis. While it may be considered preferable, in terms of the consumer interest, that the revenues paid be as close as possible to the cost of providing the services the SEM Committee must also be cognisant of the need to put in place appropriate economic signals, taking all revenue streams into account, to ensure the units of most value to the system are incentivised to enter (and remain on) the system. Accordingly, in designing the procurement mechanism for system services the SEM Committee must balance the short and long term interests of consumers.

4 Economic Analysis: Demand Analysis

4.1 Introduction

This section provides an overview of the demand side analysis carried out by the TSOs and draws out some key conclusions from the results. The purpose of the demand side analysis is to provide an estimate of the value of system services to the industry generally, in the form of production cost savings, and to the consumer in direct savings. The full analysis is set out in the TSOs' report published with this paper.

4.2 Background

On 3rd September 2013 SEM-13-060 was published, in which the SEM Committee expressed its view that further economic analysis was required on the TSO recommendations and indicated its intention to carry out such an analysis.

At the September 2013 meeting of the SEM Committee the high level terms of reference for this analysis was approved by the Committee. The proposed approach to the economic analysis was presented to industry at a DS3 workshop held in Dundalk on 14th October 2013, where industry was invited to submit comments to the RAs. Throughout this period the RAs, their advisors (Pöyry), and the TSOs were engaging with regard to establishing the appropriate assumptions and scenarios to model. The modelling requirements were agreed with the TSO and the SEM Committee approved the modelling assumptions at its November 2013 meeting. Accordingly, the TSOs were requested to provide a report to the SEM Committed in March 2014. At the December SEM Committee meeting EirGrid attended the SEM Committee to confirm a common understanding of the work to be delivered.

The TSOs submitted their analysis on 7th March 2014 and presented their results to the SEM Committee at the March meeting. The SEM Committee acknowledges the work carried out by the TSOs to deliver this report against a tight timeframe.

4.3 Assumptions

The full set of assumptions are set out in the TSO Report which has been published alongside this paper. The assumptions requested by the SEM Committee have generally resulted in a lower estimated value. The key assumptions were:

- Revised demand figures based on GCS 2014-2023 representing approximately a 10% reduction from the original forecast.
- More efficient use of the interconnector was assumed and so the arbitrage threshold was significantly reduced resulting in higher exports, particularly at times of high wind.

- As Rate of Change of Frequency (RoCoF) is assumed to be resolved, the base-case SNSP[8] was assumed as a 60% limit as opposed to the current 50% limit (the limit set in the TSOs original modelling).

A suite of scenarios was requested, reflecting different levels of installed wind at various SNSP[9] limits. Therefore the results show the trends for all outputs associated with increasing either installed wind or SNSP, all things being equal.

Table 3: **Demand Side Modelling Scenarios**

Wind Scenario	Future wind uptake[10]	Installed wind (MW)	**SNSP Scenario**	Operational constraints
Low wind	25%	3,474	**50%**	BAU[11]
Base case	50%	4,572	**60%**	BAU, RoCoF Resolved
High wind	75%	5,670	**70%**	EOC[12], partial
Very high wind	100%	6,768	**75%**	EOC, full

4.4 Outputs

A key difference between the original TSO modelling and this revised modelling is that the SEM Committee requested that the consumer impact be calculated. Accordingly, SMP (System Marginal Price) reductions, DBC (Dispatch Balancing Costs) reductions and the reduction in capacity payments associated with higher wind penetration have been estimated. This provides a sense of the distribution of the benefits of higher levels of wind on the system which is facilitated and provided for by system services. This can be seen as a proxy for the benefits of system services, in that the benefits would not accrue if system services were not provided. However, it should be noted that these estimates have been made on the basis of the current SEM design and may therefore be overstated or understated (this is discussed further below). Furthermore, additional consumer costs associated with failing to implement DS3 have not been factored in (e.g. emissions, EU penalties associated with missed targets, etc.) – these could amount to costs on the public far in excess of the anticipated DS3 payments.

The outputs of the modelling are:

	Outputs	**Resolution**
***Ex ante* market**	*Interconnector flows (required for constrained runs)*	*Hourly*
Dispatch	Total Production Cost (€) Generation dispatch (GWh) Generation production cost (€)	Yearly total, by jurisdiction Yearly total, by generator Yearly total, by generator

[8] System Non Synchronous Penetration, the amount of asynchronous generation (e.g. wind) that can be simultaneously accommodated on the system at any given time.
[9] System Non-Synchronous Penetration
[10] This refers to the percentage of wind currently contracted (Ireland) or forecast (Northern Ireland) that is assumed to actually connect to the system.
[11] BAU: Business as usual
[12] EOC: Enhanced operational capability (i.e. DS3 fully implemented)

	Wind curtailment (GWh and % of available energy) Wind percentage of demand (% of TER)	Yearly total, by jurisdiction Yearly total, by jurisdiction
***Ex post* market**	SMP (€) Generator Energy Revenues (€) Generator (market) production cost (€) Infra-marginal Rent (€) Constraint costs (€)	Hourly Yearly total, by generator Yearly total, by generator Yearly total, by generator Yearly total
Post-processing	Load-weighted SMP (€) Wholesale energy cost (€) RES percentage (% of TER) CO_2 emissions (tonnes)	Single value (for year) Yearly total, by jurisdiction Yearly total, by jurisdiction Yearly total, by jurisdiction
Post-processing with further analysis	System Service Volumes System Service Payments (€) CPM impact (€) Total Consumer Cost = Energy + CPM + Constraints	Yearly total, by service prov. Yearly total, by service prov. Single value (for year) Single value (for year)

4.5 Sensitivities in Demand Analysis

4.5.1 Early implementation

This scenario estimates the impact of the installation of wind farms ahead of the required network reinforcements. To assess this, the North-South line was assumed to be delayed. This results in increases in curtailment levels and production cost increases of around €20m-€30m (relative to the timely construction of infrastructure).

4.5.2 Improved technical capabilities

This scenario assumes materially improved technical performance from the existing generation portfolio. This results in decreases in curtailment levels and production cost savings of about €25m. Compared with the counterfactual[13] (3,500MW of wind, 60% SNSP), the production cost savings increase to €266m per annum.

4.5.3 Introducing a carbon floor in SEM

This scenario assumes a carbon floor equal to that in Great Britain. The purpose of this scenario is to assess the impact of a reduction in the tendency of the interconnector to export. The results are an increase in savings relative to the counterfactual (assuming equalised carbon prices in both scenarios) of close to €13m (i.e. total savings of €254m).[14] Therefore, these results suggest that the savings from System Services are robust in the eventuality of the interconnector failing to export to the extent expected.

[13] RoCoF Resolved, SNSP limit of 60% and 3,500MW of installed wind.
[14] That is comparing RR 3500 (carbon floor) with EOC 4600 (carbon floor)

4.6 Results

The following are the key results from the TSOs' analysis:

- **Base Case:** The base case that was considered to be appropriate was a scenario that assumes an SNSP of 60% (RoCoF resolved) and a low level of wind connections at 3,500MW. The results of this scenario indicate a curtailment level of 4.8%[15] and the RES-E targets are missed. This is the appropriate base case because at curtailment levels above this level it is unlikely that more wind will be financeable and be able to connect. Essentially this is assumed to be the maximum level of wind that will connect in the absence of system services.

- **End Point:** The TSOs propose that scenario EOC, 4600 (full enhanced operational capability and medium wind) represents the full delivery of DS3 (the "end point scenario"). This scenario has an SNSP of 75%, which indicates that all required system services have been provided and the lowest possible level of wind connections (4,600 MW) to achieve 40% RES are connected. This scenario has wind curtailment of 1.4% and RES-E targets achieved.

- **Production Cost savings:** Comparing the Base Case to the End Point scenario, there is an estimated saving in production costs of €241 million between these two scenarios. The production cost savings represent the difference in production costs between the two scenarios, i.e. the cost of generating electricity in each scenario. It is noted that production cost savings accrue to the industry generally (put simply the same quantity of MWhs costs less to produce). These savings will be distributed between consumers and producers. As production costs fall, the price of energy can be expected to fall. However, as generators' costs are also lower they can expect higher profits (some generators will now of course be out-of-merit and will earn no profit). Therefore, identifying production cost savings tells us that there is a benefit to society as a whole but this does not necessarily imply that customers are receiving all (or even most) of this societal benefit. For this we must examine the difference in wholesale costs.

- **Wholesale costs:** Wholesale costs are lower by €177 million between the two scenarios, which represents an estimate of the consumer saving from achieving 75% SNSP. The wholesale costs include the SMP and DBC.[16] Therefore, of the annual €241m of production savings customers capture €177m and generators €64m.

- **Other scenarios:** The results indicate a small number of other credible scenarios, which have low levels of curtailment, achieve (or nearly achieve the RES-E targets and deliver savings to consumers) – e.g. scenarios wind 4600MW, SNSP 70%, wind 5600MW, SNSP 70% and wind 5600MW, SNSP 75%. Comparing the base case against the scenario of 4600MW and 70% SNSP produces a production cost saving of €231m. Therefore it appears that even if the target SNSP limit of 75% cannot be reached considerable savings can still be expected.

[15] It is considered that curtailment levels of approximately 5% are required to ensure wind farms are financially viable. Of course some wind farms will require lower curtailment levels and others will be able to tolerate higher levels,
[16] System Marginal Price and Dispatch Balancing Costs

Table 4: Curtailment Levels Results				
Scenario	**SNSP Levels**			
	50%	**60%**	**70%**	**75%**
Low wind	8.5	4.8 (base case)	1.5	0.7
Base Case	15.6	11.2	2.8	1.4 (end point)
High Wind	23.0	18.8	6.0	3.5
Very High Wind	30.0	25.9	11.3	7.8

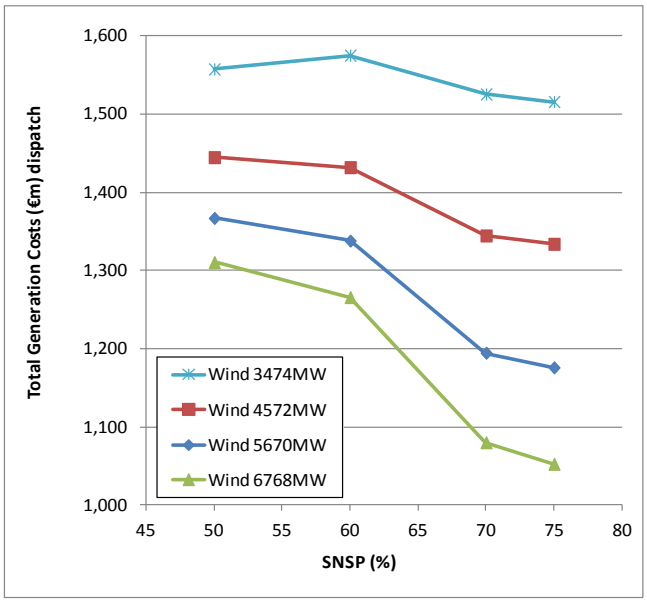
Table 5: Summary of Results (Demand Side Modelling)				
Scenario	**RES-E**	**Curtailment**	**Production Savings**	**Consumer Savings**
Low Wind; RoCoF 3.5 GW; 60%	30.1%	4.8%	0	0
Med Wind; Partial DS3 4.6 GW; 70%	39.7%	2.8%	231	157
Med Wind; Full DS3 4.6 GW; 75%	40.1%	1.4%	241	177
High Wind; Full DS3 5.7 GW; 75%	48.7%	3.5%	399	144

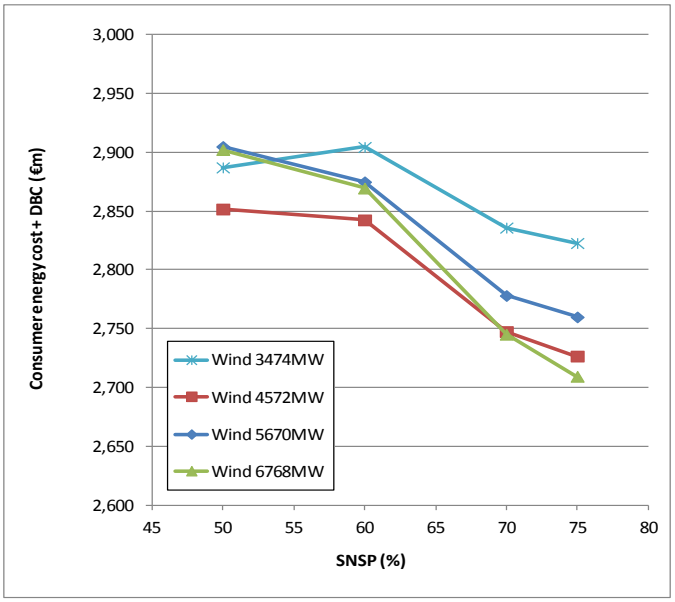
4.7 Interpreting the Results

4.7.1 Trends

The trends found in the results are for the most part intuitive. In summary:

- For a given level of installed wind, increasing the SNSP limit lowers production and consumer costs. Curtailment levels also fall as more wind can be utilised on the system when it is available.
- For a given SNSP limit increasing the level of installed wind lowers production costs while the level of wind curtailment rises. Curtailment levels increase significantly as the level of wind penetration increases in the low SNSP cases. In reality it is expected that as curtailment levels increase above 5%, the actual level of wind connecting would be affected. However the relationship between consumer costs and installed wind is less clear.





Therefore, it can be seen that increasing the SNSP clearly results in benefits for the consumer and the industry as a whole. The relationship with the installed level of wind is less clear. As the level of wind increases, production costs savings in all cases increase and consumer costs savings generally increase. For low wind the consumer savings are €81m, base case €177m, high wind €144m and very high wind €195m. As production cost savings are increasing in all cases this implies that inframarginal rent[17] taken by inframarginal generators increases between the base case and the high wind scenario (both in absolute terms and relative to consumer savings). The total inframarginal rent is approximately the difference between the production cost savings and the consumer savings and will accrue disproportionately to the generators with the lowest short run marginal cost.

However, arguably the level of wind that will actually install is largely outside of the SEM Committee's control. External forces, predominantly out of market support schemes such as REFIT and ROCS, will heavily determine the level of wind which will install in the coming years to 2020. Accordingly, if the level of wind is considered fixed the best outcome for the consumer, and the industry in general, is the full implementation of System Services and an increase in the SNSP limit to 75% (assuming efficient expenditure). However, it is noted that failure to meet the 75% target will still result in benefits (albeit somewhat smaller benefits), should it transpire that is it only possible to operate the system at a 70% SNSP limit for example.

4.7.2 Energy Profits and Prices

As noted above the modelled savings arising from increased instantaneous penetration of wind, facilitated by System Services are €241m in production costs, of which €177m are consumer savings. This implies a societal gain due to a more economically efficient industry. Relative to the

[17] Inframarginal Rent, or profit, is the difference between a unit's short run costs and those of the price setting marginal unit. The design of the energy trading arrangements in the SEM is such that units must make sufficient inframarginal rent to cover long run costs.

counterfactual base case, estimated energy is estimated to be 5% cheaper[18] for consumers and IMR[19] for generators from the market are 6% higher. Albeit that this implies marginal units will be out of merit more often. Notwithstanding the legal duty to minimise curtailment, it can be viewed that this scenario would satisfy the SEM Committee's principal objective to protect the interests of the consumer and also its legal duty to have regard to the industry's ability to finance its licenced activities.

This increase in inframarginal rent for generators should improve the financial sustainability of the industry and therefore also deliver benefits to consumers in the form of increased security of supply and installed flexible generation capacity, as an industry where reasonable profits can be obtained encourages new efficient entry which should in turn increase competitive pressures in the market. However it is important to note that as the inframarginal rent is a feature of the energy market, it will not be targeted at the providers of System Services and so will not reduce the required payments for System Services. In other words, increased inframarginal rent for generators, facilitated by system services will not in itself pay for those system services. The TSOs' results are based on the current SEM bidding rules, uplift payments and the capacity mechanism (and not on the I-SEM market design and rules). To the extent that there could be an interaction between a generator's energy bids and its System Service revenue it may result in lower overall costs to the consumer (all things being equal). Where System Service payments are dependent on the generator exporting energy at the time there will be an incentive on the generator to discount its energy bid by the opportunity cost of the system service payment – this will lower the SMP.

The interaction with the current Capacity Payment Mechanism (CPM) is limited to the revenues earned by the Best New Entrant (BNE). However, volume based Capacity Remuneration Mechanism (CRM) such as a reliability option, will likely incentivise generators to lower their capacity bids by an amount equivalent to their System Service revenue. In other words there is less "missing money" for those generators providing system services.

This suggests that revenues from System Services should deliver a societal benefit, optimise capacity and energy payments to the most efficient and flexible plant and systematically increase the consumer's share of the DS3 savings. This will depend to some extent on the procurement mechanism for System Services. The interactions between System Services, CRM and the preferred I-SEM high level design are discussed in Section 8.7.

4.8 Conclusion

In conclusion the SEM Committee considers that the demand analysis shows that there is a societal benefit to the implementation of system services. This benefit increases as more wind is connected but also as more wind is utilised, through a higher SNSP. The scenarios chosen as the base case and end point by the TSOs appear to the SEM Committee to be reasonable, notwithstanding the fact that the TSO's analysis indicates other scenarios which will also deliver benefits to consumers and the market and may also achieve the 2020 targets whilst lowering

[18] Load weighted SMP falls from €72.58 to €68.93
[19] Inframarginal rent increases from €1,459m to €1,543m

curtailment levels. The SEM Committee, in considering its approach to the procurement of system services, is minded however to not select a scenario which it believes should be pursued, but rather to put in place a procurement approach which should deliver the optimum outcome for consumers and service providers and thereby achieve the objectives of DS3. This approach does not focus on strictly aiming for the achievement of a 75% SNSP but rather focuses on delivering the desired outcomes from a higher SNSP (lower curtailment etc.).

5 Economic Analysis: Procurement Analysis

This section looks at various issues which need to be considered in the procurement of the approved system services. While Section 7 outlines the options for the actual mechanism for procurement, this section considers issues that must be addressed by all the options. In SEM-13-060 the SEM Committee stated its view that further economic analysis of the TSO Recommendations for System Services was required and requested that the Regulatory Authorities investigate market based procurement approaches. As part of this analysis the Regulatory Authorities commissioned Pöyry to prepare procurement options as an input into the procurement analysis being undertaken by the Regulatory Authorities. The advice received by the SEM Committee was published in January 2014 (SEM-14-007). The SEM Committee's subsequent advisors, IPA, were also requested to propose procurement options. This advice is contained in the IPA report published alongside this paper. Accordingly, the procurement analysis builds upon the work of the TSOs, both the May 2013 Recommendations Paper and the March 2014 Report, and the advice received from Pöyry and IPA.

5.1 Payment Nature: Capability, Availability and Dispatch

A key issue is to determine what, broadly speaking, should be paid for – that providers have certain capabilities or that services are delivered at a given time? Different services will be more or less suited to each approach. The services can each be paid for in roughly three ways:

- Dispatch (i.e. only when "used")
- Availability (i.e. only when the unit could have been "used")
- Capability (i.e. units which are technically capable of providing the service)

It should be noted in the analysis below that the SEM Committee has adopted a slightly different approach than the TSOs in the consideration of the payment basis of the services. The TSOs considered several combinations of utilisation, dispatch-dependent, and capability based payments. Utilisation payments, applicable only where the TSO "used" the service, were ultimately not included in the TSOs' Recommendations (post consultation) on the grounds that the revenues would be too uncertain (i.e. a provider would be unsure of when the service would be "used").. This utilisation payment is comparable to what is referred to in this paper as dispatch based payments. In the TSOs' Recommendations dispatch-based payments referred to payments made depending on a unit's dispatch position regardless of whether or not the TSOs made use of the service(s). This is comparable to what is referred to in this paper as availability based payments, although availability here includes a unit's market position as well as its actual dispatch. The term capability based payments in this paper is consistent with the TSOs' Recommendations. The SEM Committee has adopted this approach to the terminology for the payment basis to provide further clarity on the different bases for payments.

Dispatch-based payments have the advantage that only those units which the system actually needs/ uses are paid. This ensures that units that support the system are remunerated, services that are required most are remunerated most frequently and it is more likely that the most efficient and reliable units will be rewarded most (by virtue of being more capable/efficient and

available more of the time it is more likely those units will be dispatched more). It is most suited to services which have variable demand and require some action on the part of the unit to provide the service (e.g. reserve products). The difficulty with this approach is the uncertainty of the payments because it is entirely dependent on TSO dispatch decisions. It is also likely to be unsuited to products that are infrequently, or unpredictably, used and are integral to the technical design of the unit. In other words the unit provides a service by simply being there but the actual need for the service only occurs infrequently (if there is a fault for example).

Capability-based payments will incentivise investment by providing a predictable revenue stream. This approach will be particularly suited to services associated with the inherent design of the units as discussed above. The difficulty with this approach is that it is not targeted at the most useful units on the system and so may not send the right signals for units to be available when needed. Another implication is that the per unit rates will be lower, all things being equal, than the dispatch-based approach because the same amount of money is being spread over a greater number of units. Therefore, for the same installed capacity of a given service, the total payments might need to be higher than if dispatch based.

The availability-based approach can be considered to be somewhere in between the above approaches. Payments would be made when a provider was “available” to provide the service – whether or not this availability is actually realised. Relative to capability based payments, availability based payments reflect a level of performance and reliability. However compared against dispatch based payments the TSO will be paying for services it did not need at that time (because if they were needed they would have been dispatched). However, it could be argued that this is a fairer basis on which to base payments as it is less dependent on the decisions taken in the control room on a given day (in a system services context). Therefore availability based payments create greater certainty than dispatch based but less than capability based. On the other hand it provides greater consumer protection (i.e. not paying for unused services) than capability based, but less than dispatch based.

A further consideration is the interaction with the energy market. Capability payments will not interact as System Service payments would occur regardless of whether or not the provider was in the energy market or if the unit was constrained on/off. Dispatch and availability payments are more likely to interact with the energy market, as in both cases whether or not the provider is exporting energy will impact on its ability to provide certain services. Depending on the bidding rules in I-SEM, rational bidders would include the opportunity cost of system service revenues in their energy bid. Such behaviour would tend to reduce the energy bids for those services which are only realisable when exporting. It is important to note in this context that the system services dispatch occurs “after” the market dispatch i.e. the market sets the schedule of generators first before this schedule is amended for actual physical dispatch required to take account of operational and security constraints.

The most appropriate approach will depend on the service, the chosen procurement design for System Services and the issues discussed below. Therefore it is proposed that a nuanced approach is adopted where different services will be remunerated on a dispatch, availability, or capability basis depending on the characteristics of that service. It is noted that the TSO Recommendation also proposed a mix of capability and dispatch payments depending on the

service in question, as did Pöyry and IPA. Section 7.7 outlines the proposed approach for each of the different services.

5.2 Variable or Fixed Pricing

A second important consideration is whether a service should be remunerated through a clear and stable fixed price or whether the price should vary depending on certain factors e.g. requirement, time. The value or necessity of a given service will vary given the system conditions at any moment in time. This therefore raises the question of whether prices should be permitted to respond dynamically to these fluctuations in system requirements, with a service being priced higher at times of relative scarcity and lower at times of relative surplus. The benefit of this approach is that the correct economic signals will be sent to providers. This should incentivise availability at times when the TSO most needs services and provide the most efficient overall allocation of resources. However, there is considerable complexity to this approach. There is considerable difficulty in estimating the value of individual services on an annual basis. This complexity increases if estimated close to real time. In addition to the complexity there is considerable uncertainty introduced for providers who will not be able to predict with any accuracy what the system conditions will be on the day. The issues of complexity and volatility can be mitigated if values are calculated ex-ante and corrected ex-post. The values could also be smoothed between years. This would however reduce the strength of the economic signals.

A fixed price across all trading periods avoids this complexity and provides a stable investment signal. However it also reduces the efficient economic signals and may therefore result in an inefficient allocation of resources. It is also possible that it will result in higher prices for consumers or indeed in too low a price being fixed. This is because the procurement mechanism will have to incentivise enough units to provide services in sufficient quantities to cover all eventualities at all times i.e. both at times of surplus and scarcity.

The SEM Committee considers that a dynamic valuation of system services may be a preferable approach to system services in the longer term, once there is a more liquid system services market and providers have the ability to respond to the economic signals. However it is not desirable at this stage. Firstly, certainty for providers is considered to be an important element of the new system services regime and a variable price would introduce significant revenue uncertainty. Secondly, it is not clear at this time that the economic signals would drive behaviour as there currently is not sufficient liquidity in the provision of system services[20]. This is due to the fact that some providers will be making investments and such investment decisions will be unlikely to be influenced by short term price signals. Thirdly the valuations themselves and by extension the economic signals, are unlikely to be accurate. It will be necessary for the TSOs to develop operational policies in light of their experience operating the system under very different conditions than they do today. These operational policies will inform the real-time requirements for system services.

However, the SEM Committee considers that there may be merit in providing for a variation of value according to system needs once there is greater certainty around the volumes of services

[20] The IPA Report notes high levels of market concentration in the system services market.

being provided and greater operational experience in utilising the new services. Therefore the SEM Committee may, at a later date, investigate how short term price signals might be sent to providers.

5.3 Locational Pricing

Another factor which needs to be considered is whether a locational signal should be included in pricing for the different system services. Some of the services are locational in nature, for example the voltage control services, and so they will provide greater value to the system in areas where reactive power is scarce. Therefore a uniform price across the island will not deliver efficient signals to the market – the price will be too high in some locations and too low in others. For this reason the SEM Committee considers that locational based pricing of some system services is desirable in principle. However, other matters must be taken into consideration. As outlined in the IPA Report the degree of market concentration is very high which creates significant market power concerns. This concentration necessarily further increases when the market is divided by service and by geographic location. It will also be the case that where locational pricing would be most useful in attracting investment – areas of scarcity – will also be areas with the greatest market power issues. This means that a locational market-based approach will not be viable at this time and would likely result in increased costs to the consumer. That said, the SEM Committee sees merit in locational pricing given the efficiency of the economic signal which it produces; however it is considered at this point that the market power concerns would dilute this economic signal.

Therefore the SEM Committee proposes that the TSOs procure services on a system wide basis. However there may be the possibility of introducing a regulated locational factor which is applied to the price of the relevant system service. This is discussed further below.

5.4 Contract Length

The SEM Committee is critically aware of the importance of the appropriate contract length to investors. Contracts for system services must be of an appropriate period to encourage and facilitate investors to make their decisions to invest in system services, while not “closing off” the market for an overly lengthy period of time and risking a loss of innovation as technology develops. To determine the appropriate contract length, consideration must be given to whether or not an investment must be made to provide the service. System services may be provided by:

- units with existing capability;
- existing units retrofitting;
- new units; and
- demand side capability and innovation.

Each of these providers will have a different requirement in terms of contract length. It is anticipated that new or retrofitting units will have a preference for long-term contracts as this will provide certainty and facilitate project finance. Longer contract lengths may also deliver lower prices due to providers securing more advantageous financing arrangements. Financing arrangements will also vary between providers due to technology differences. Existing units will

not have any investment requirements and so contract length will obviously not be a barrier to their participation in the system services market.

Shorter contract lengths should, all things being equal, ensure more cost-reflective prices and greater protection to the consumer from overpaying or underpaying (i.e. prices being too low to attract the investment needed to secure consumer savings). Any forecast on the required volumes will be different to the actual requirement and therefore shorter contract lengths allow for corrections in the required volumes to be made closer to the time. As opposed to longer term contracts which result in forecasting errors being fixed into the procurement of services with limited ability to correct for changed circumstances. Market entry will also impact on the divergence between the forecasted and actual requirement. As more efficient providers enter the market, the price for services should fall but long term contracts will limit the ability of the consumer to benefit from this increased efficiency.

Accordingly the procurement mechanism should provide sufficient certainty to ensure the required investment is made but should be flexible enough to ensure consumers benefit from the entry of more efficient providers. This issue is discussed in the next section in relation to each procurement option.

5.5 Market Power

The SEM Committee, in designing the appropriate procurement mechanism for system services, is also conscious of the fact that the SEM remains a small market with a relatively low number of participants. This increases the risk of market power. The SEM Committee notes that in the energy trading market, market-power mitigation measures have been required to address the potential difficulties that arise from having one or more dominant participants in the market. This issue of dominance is potentially exacerbated in the system services market as services are heterogeneous, the providers are differentiated and there is a much more limited pool of units from which to procure a given service than in the energy market. As the IPA Report shows the system services market is highly concentrated which raises the risk of predatory or price-inflated bidding strategies. This is a particular concern for the competitive procurement options.

To mitigate market power, it is considered that all units would be required to offer their full technical capability to the TSO and would not be able to withhold services they are capable of providing from the market. This can be verified from the performance and testing data available to the TSOs. Procurement on a system wide basis, as discussed above, would further mitigate market power.

For the competitive options, involving providers submitting bids to provide the services, (discussed in Section 7) bidding rules and market monitoring would have to be introduced. The auction will also have to be designed to limit the exercise of market power. These issues are discussed further in the discussion on the individual procurement options. This will not be an issue for the regulated approaches.

5.6 Variations in Quality

As discussed above, the services provided by units will not be perfectly homogenous. Units will differ in performance, location, number (and volume) of services provided simultaneously, and the time and system conditions during which the service is activated.

However, any market wide procurement mechanism, particularly one that is technology neutral, must to a large extent treat the individual services as if they were homogenous (it is noted that the services have been defined with this in mind). It is noted that, in order to address this problem, the TSOs Recommendation Paper suggested various scalars in its recommended tariff design. Proposed were a performance scalar, a rate scalar, and a product scalar.

The SEM Committee proposes to adopt the TSOs proposed performance scalar for all of the procurement options. The TSOs proposed that the applicable tariff for a given system service would be reduced for unreliable performance by the unit. The price would be set by the procurement mechanism (any of the options set out in this paper) and would then have the performance scalar applied to it. The scalar would be set equal to one for reliability above 90% and reduce on a sliding scale down to zero for reliability below 50%. The SEM Committee considers that it is important that any mechanism incentivises generator performance and that the consumer is not required to pay for a service that is not delivered.

The product scalar was proposed by the TSOs in order to incentivise the provision of additional capability for some products. The SEM Committee agrees with the objectives of this scalar. However, this scalar is not compatible with all of the options (see Section 7 for a full description of the options). The SEM Committee proposes to include it in the design of Option 1 (Regulated Tariff) and Option 2 (Fixed Pot) but not for the other options. Option 3 (Regulated Competition) has an element of TSO discretion built into the tender evaluation process and therefore the cost-effectiveness of the bid could be considered by the TSO without requiring the scalar. Option 5 (Competitive Multiple Bid Auction) allows units to bid in multiple offers, therefore units could include an offer to provide the additional enhancement and the bid would be accepted if it is cost-effective (they could also include an offer without the additional enhancement). For Option 4 (Competitive Split Auction) a variant of the product scalar is proposed, this is discussed further in the IPA report.

The rate scalar was proposed by the TSOs in order to ensure that capability based payments were higher to those units that were more likely to be running – and of use to the system. This scalar retained the benefit of certainty associated with the capability payment but mitigated the risk that the payments would go to units which rarely actually provided the service to the system. An issue with the rate scalar as proposed is that it is referenced against the Best New Entrant ("BNE") as determined by the current Capacity Payment Mechanism. However, as discussed in the I-SEM High Level Draft Decision (SEM-14-045) the SEM Committee intends to adopt a Capacity Reliability Mechanism based on reliability options. This new CRM design would not necessarily require the design of a theoretical BNE, but may require a reference plant. This is not necessarily problematic, either a BNE reference could be developed periodically or a reference plant could be used. However, where an availability based payment as opposed to capability

based is used the rate scalar is no longer required because an availability based payment provides some of the same benefits of the rate scalar.

Lastly there is the issue of variations in value due to locational scarcity and prevailing system conditions. As discussed above it is not considered practical by the SEM Committee to procure services on a locational or real-time basis. However, the SEM Committee considers that there is merit in incentivising the provision of services in locations and at times of persistent scarcity. Therefore the SEM Committee is proposing the application of a scarcity scalar. Similar to the performance scalar this would be applied to the price set by the chosen procurement mechanism. It would have a minimum value of one in areas where there was no scarcity but would be greater than one, but less than two, in areas of scarcity. The scalar would be of the form: 1+ [(Requirement – Availability)/Requirement)]. The “requirement” would be set by the TSO on the basis of the volume required in that location plus the volume of the single largest provider in that area, the volume and the geographical boundaries would be defined by the TSO and revised periodically. The “availability” would refer to the volume of the service realisable by the TSO in that area. Both variables in this scalar would be calculated ex-post based on the actual requirements of the system. It is noted that providers will not be able to reliably predict the value of this scalar in advance. However, as the value is never less than one, there is no risk to the unit. If there is persistent scarcity the market will observe this and if the provision of the service is economic without the scalar, the market will tend to choose to provide the service at times and in locations of scarcity. All things being equal, the interaction with the energy market and CRM implies that this scalar will increase the revenues of those units most needed by the system relative to other units on the system. Furthermore, the interaction with the TSO incentives discussed below will tend to incentivise the TSO to procure network solutions in areas of scarcity where they are cost-effective.

6 Economic Analysis: The Services

6.1 Introduction

This section examines each service individually to assess the appropriate payment basis for each service, the nature of the service and informs the evaluation of the procurement designs. SEM-13-098 set out 14 services that would be included in the new system services framework.

New Services		Existing Services	
SIR	Synchronous Inertial Response	**SRP**	Steady-state reactive power
FFR	Fast Frequency Response	**POR**	Primary Operating Reserve
DRR	Dynamic Reactive Response	**SOR**	Secondary Operating Reserve
RM1	Ramping Margin 1 Hour	**TOR1**	Tertiary Operating Reserve 1
RM3	Ramping Margin 3 Hour	**TOR2**	Tertiary Operating Reserve 2
RM8	Ramping Margin 8 Hour	**RRD**	Replacement Reserve (De-Synchronised)
FPFAPR	Fast Post-Fault Active Power Recovery	**RRS**	Replacement Reserve (Synchronised)

Broadly speaking these can be considered in terms of the time the service must be delivered in, this is represented graphically in the figures below. Full descriptions of the services can be found in SEM-13-098.

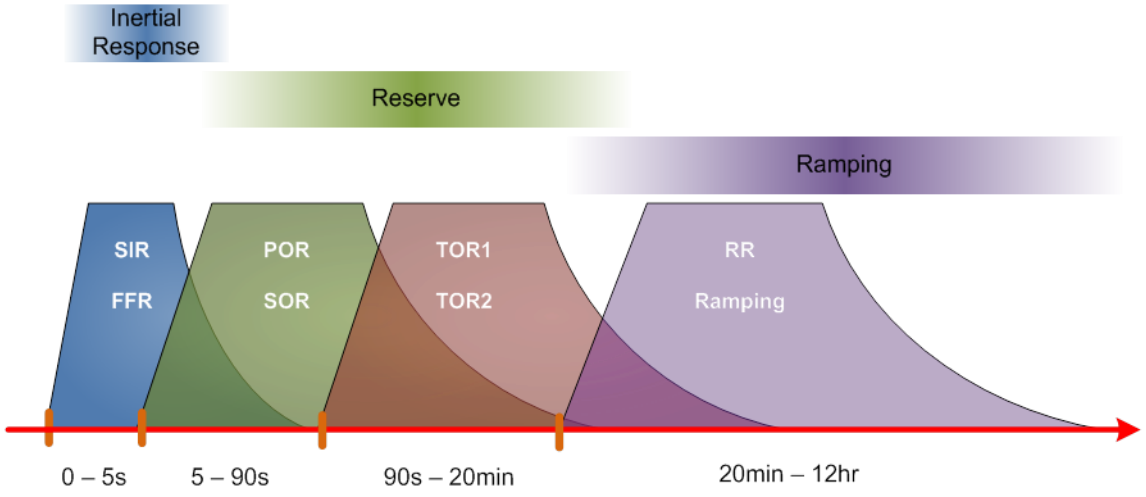


Figure 1: Frequency Control Services (Source: EirGrid)

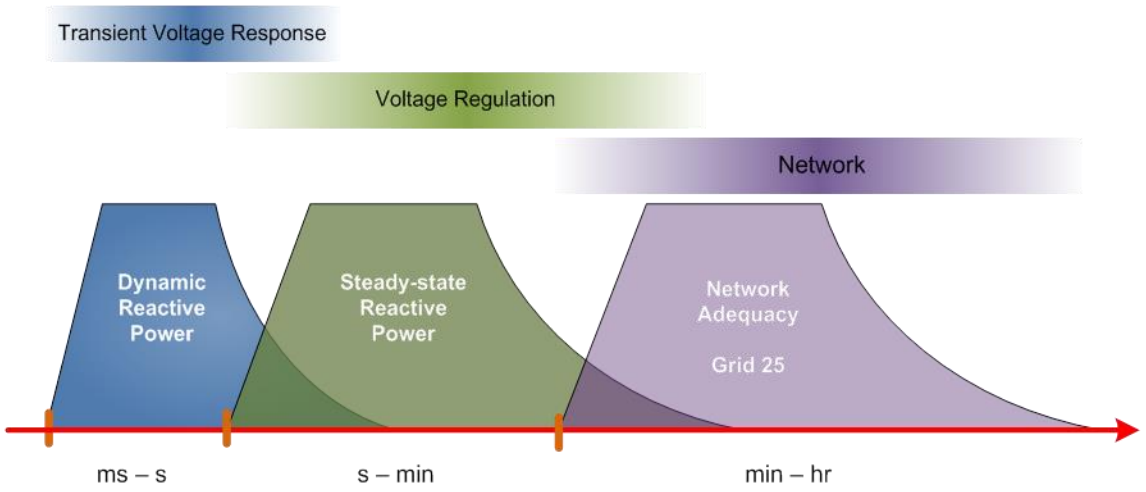


Figure 2: Voltage Control Services (Source: EirGrid)

6.2 Synchronous Inertial Response (SIR)

The SIR response is provided automatically when there is a frequency imbalance. Therefore a unit cannot actively deliver or withhold this service; if the unit is available (i.e. on the system) and there is a frequency imbalance it will provide the service. The value comes from the unit making this service available to the TSO. **Therefore it is considered that either a capability or availability payment is most appropriate for this service.**

The system's need for SIR will be somewhat similar to its need for reserve and will depend on considerations such as the largest in-feed and likely RoCoF in the event of a fault. It is likely to be more valuable at night and at times of high wind (i.e. at times of low inertia). Therefore it would, in principle, be appropriate to value SIR differently depending on real-time system conditions (or expected/usual conditions at a given time-of-day/time-of-year). However, in practice this is not considered viable, at least in the initial stages of the system services.

The ability to provide this service will generally be determined at a plant's design stage with little scope for retrofitting, although existing units may be able to improve their minimum load and hence their SIR volume. It is expected that conventional units will mainly be the providers of this service, although it is possible that there may be some scope for alternative technologies to provide SIR. Therefore, this service will likely be provided by existing units in addition to enhanced units and new units.

6.3 Fast Frequency Response (FFR)

The response will be automatic when there is a frequency disturbance. Unlike SIR, units will not need to be synchronous but, with some exceptions, will need to be exporting in order to be available to provide the service. FFR will likely require control systems to be installed to provide this service and units may potentially have to operate at an inefficient level to do this. **Therefore a dispatch, capacity or availability payment would be appropriate.** However, an availability or dispatch payment may be more appropriate than a capability payment as a unit's technical

capability may not match its operational capability on the day. It is noted that the TSOs recommended that FFR be paid on a dispatch-dependent basis (that is paid when the unit is exporting).

The system's need for this service is driven by mostly the same requirements as for SIR and are somewhat interchangeable after minimum amounts of each are provided. Therefore the value of FFR will vary depending on system conditions but will not be the same as SIR (i.e. because at times of high wind some wind may provide this service but are not likely to provide SIR). Therefore it would, in principle, be appropriate to value FFR differently depending on real-time system conditions (or expected/usual conditions at a given time-of-day/time-of-year). However in practice this is not considered viable, at least in the initial stages of the system services.

Conventional and wind units would be able to provide this service. Additional control systems that are not likely to be standard may need to be installed and so retrofitting is possible. Therefore it is likely that a wide variety of existing or planned units will be able to provide this service.

6.4 Fast Post Fault Active Power Recovery

This service is provided automatically in the event of a fault – if the unit is capable. Synchronous units can inherently provide this service and wind farms can provide it with investment. By definition the unit must be exporting at the time in order to provide this service. **Therefore a capability or availability payment is most appropriate.**

The need for this service will vary depending on the amount of synchronous units on the system and the volume of wind (i.e. at times of low inertia on the system). Accordingly the value of this service will vary depending on system conditions.

Investment will be required from wind farms; conventional units will be able to provide this service without investment. The level of payment would need to be sufficient to cover the incremental cost for a (new) wind farm to provide the FPFAPR, given the volume of wind expected to connect it is reasonable to assume that there would not be a dependency on existing units to retrofit nor to incentivise investment in projects that did not already have a sufficient business case without system services.

6.5 Operating Reserve (POR, SOR, TOR1, TOR2)

The operating reserve products (primary, secondary and tertiary) are all existing products and are standard ancillary service products in most electricity systems. They are also likely to be covered under the Balancing Network Code and so may have to be offered to other European systems under the enduring or transitional arrangements. Therefore it is possible that a market-based mechanism for the reserve products will be a legal requirement. The reserve requirement is a well-established TSO policy and will be formalised on a European basis through the Load Frequency Control & Reserve Network Code. Therefore the reserve requirement, given system conditions, is clear. **It is most appropriate to pay for reserve on a dispatch or availability basis** as the value comes from the energy being available and ready to export at short notice when it is needed, being capable but not available will not fulfil the TSO's reserve requirements.

Under the Grid Code all units must be capable of providing reserve and must offer it to the TSO – this is not the case in all European markets where, in some markets, generators may choose whether to offer reserve. Given the size of the SEM system this obligation is important both from a system security perspective and in terms of market power (even one unit withholding reserve at a time of scarcity could artificially inflate the cost of reserve). It should be noted that while all synchronous units can (and must) provide reserve, wind generators may also be able to do so at times of wind (it is understood that the TSOs are investigating this possibility). Given the commercial mechanisms of support payments, it will always be more profitable for a wind generator to export. However, providing reserve may offer alternative revenue for wind farms no longer under a subsidy or to curtailed wind farms.

Given the nature of reserve, it is considered that all of the reserve products could be paid on a dispatch basis, and that the long-term investment or retrofitting costs are not as significant a consideration for operating reserve as for some of the other services.

6.6 Replacement Reserve (RRS, RRD)

Replacement reserve is required to replace the reserves provided by POR, SOR and TOR. Therefore its value follows directly from the TSO's reserve policy and will be determined by how much reserve is required and how likely that reserve is likely to be called on. It is also possible that RRS & RRD will be covered by the Balancing Network Code. Replacement reserve can be provided either when synchronised to the system (RRS) or when not synchronised (RRD). **Therefore a dispatch based payment might be more appropriate for RRS but RRD might reasonably be paid on a capability, availability or dispatch basis**.

As discussed above the reserve requirement and its value will change depending on system conditions and on market conditions (balancing market). Therefore its value will vary over time.

RRD is likely to be more valuable than RRS because units providing RRD will not need to be on the system prior to being called to export. In other words units providing RRD can provide reserve without increasing curtailment. However, the ability to provide RRD, as opposed to RRS, will be inherent to the design of the plant. An efficient procurement mechanism should provide the economic signals to find the right balance between the supply of RRS and RRD. Existing and enhanced conventional units will be able to provide these services although wind is unlikely to be able to reliably provide replacement reserve.

6.7 Ramping Margin (RM1; RM3; RM8)

The need for the Ramping products will depend on the reserve requirements and the wind forecasts. For example if wind is forecast to drop off in a few hours the TSO will want to have generation ready to replace that output without using up reserves. However, the TSO will have to develop a Ramping Policy as the ramping service is new and does not have well established principles to draw upon. **This service could be appropriately paid on a dispatch, availability or a capability basis.** While this service will be dispatched by the TSO there may be a rationale for paying on a capability basis as the enhanced capability of the generation portfolio should

result in a more efficient balancing market where the TSO could activate the required ramping margin.

Similar to the reserve products the ramping requirement and value will vary according to system and market conditions.

Units will need to be flexible in order to provide these products. A unit that can provide RM1 will likely be able to provide RM1, RM3, and RM8. But a unit that can provide RM8 will not necessarily be able to provide the other two. Peaking units will be able to provide these services and base load can (possibly requiring retrofitting or additional cost during construction). It is not clear what the current fleet's ramping capability is and therefore it is not clear how much new investment is required (either in terms of retrofitting or new build).

6.8 Dynamic Reactive Response (DRR)

This service will be provided automatically by connected generators in the event of a voltage dip (due to a fault). **Therefore the service will not be dispatchable and so a capability or availability payment may be appropriate for this service.**

The reactive response requirement itself is stable what varies is the ability of generation to provide that response. Generally speaking as more wind is on the system the volume of available reactive response becomes scarce. Therefore DRR is (generally) more valuable at times of high wind but the value is related to the scarcity of the service at a given time. Value also varies with location of this scarcity; however the TSOs have not recommended a locational element due to the complexity of defining locational value and because at times of high wind the requirement will likely be over a large geographic spread and unlikely to be localised (i.e. it is needed where the generation is).

Conventional generation should be able to provide the service inherently. This service (and SRP) will incentivise lower minimum load for conventional units helping increase SNSP. Wind farms can install a power converter or new developments may be able to make incremental investment decisions at the design phase. Therefore both existing and new or retrofitted units will provide this service.

6.9 Steady-State Reactive Power (SRP)

This service is required at times of normal system operation and is dispatched by the TSO. **The TSOs recommended that this service be paid on a capability basis to reduce the investor uncertainty although it is noted that a dispatch or availability payment would also be appropriate.**

Demand and generation-mix drives the requirement for reactive power. The reactive power requirement of the system cycles throughout the day. At times of increased demand units may be requested to provide lagging MVars or at times of light loading on the lines (e.g. at night) might be requested to provide leading MVars. Reactive power is also locational in nature. Therefore

payment could vary with time of day and location. Although as discussed above this may be overly complex and introduce market-power concerns.

Similar to DRR, conventional units will be able to provide this but will be incentivised to lower their minimum load. Wind farms can also provide reactive power. Therefore existing units will be able to provide this service in addition to enhanced units.

6.10 Summary

System Services	
Voltage control (DRP, SRP)	Reserve (POR, SOR, TOR1, TOR2, RRS, RRD)
Inertial Response (SIR, FFR, FPFAPR)	Ramping Margin (RM1, RM3, RM8)

From examining each of the services individually it is clear that the procurement design must overcome some complex interdependencies between the services. From the point of view of the TSO, the requirement of a service (and hence the value to the consumer) cannot be reasonably separated from the value provided by another service. In other words a single service in isolation is of little, if any, value to the system. Furthermore the relative values of the services will vary according to system conditions and the relative provision of other services. This results in an inherent uncertainty around any forecast of required volumes and the resulting relative values of system services. This “demand-side” uncertainty is compounded by the “supply-side” uncertainty. Until the new system services framework is in operation the future volume of services cannot be accurately predicted, and as the generation portfolio changes this will naturally change the requirement for services. While there is considerable complexity here it is noted that there are several DS3 work streams which are focused on the operational challenges of an SNSP of 75%. The SEM Committee therefore expects that the TSOs will develop suitable operational policies; however, for such policies to be effective it will be necessary that the TSO has the operational flexibility to use its discretion to dispatch units in response to real-time system conditions. The SEM Committee has been cognisant of this in its evaluation of the options for the procurement design.

From the providers perspective several services can be made available at the same time as an inherent feature of the unit’s operation. Separately, different investment decisions will also provide different groups of services. How these services are grouped (either operationally or in terms of investment decisions) may of course be different depending on the technology concerned, Further discussion on the technologies providing various services is contained in the IPA Report.

From the market perspective some services also interact differently. The inertial response services (SIR, FFR, FPFAPR) and the voltage control services (DRR, SRP) can generally only be utilised by the TSO when the unit is exporting power. Therefore units in the market can provide these services and earn both energy revenue and system services revenue. Depending

on whether or not payments are made on a capability basis and the new I-SEM bidding rules, units may alter their bids in order to optimise their overall revenue. On the other hand the reserve[21] services can only be provided by units which are (at least partially) out of the market – a unit cannot simultaneously export a MWh and provide that MWh to the TSO as reserve.

Accordingly, the procurement design must take into account the need for the TSO to have a degree of flexibility in dispatching services according to its operational policies and system needs, the operation of generators, the investment decisions of providers of different technology types, and the impact on the energy trading market. Section 7 addresses these issues in the discussions of the procurement options.

[21] Operating reserve, replacement reserve, and ramping margin

7 Procurement Design Options

The SEM Committee has developed five options for procurement of the approved system services for consideration:

- Option 1: Regulated Tariff
- Option 2: System Services Pot
- Option 3: Regulated-Competition
- Option 4: Competitive Split Auction
- Option 5: Competitive Multiple Bid Auction

This section of the paper outlines these five options and assesses them against the criteria discussed below. The SEM Committee's preferred option is discussed in Section 8.

7.1 Assessment Criteria

The SEM Committee has taken the following criteria into consideration when evaluating the options below. A summary of the assessment of the options against the criteria is set out in Section 8.

Criteria:

- Consumer Interest
  - Efficient cost
  - Protected from over-payment
  - Net payments do not exceed total value
- Investment
  - Certainty for investors
  - Entry signals
  - Exit signals
  - Incentivises efficient providers
- Curtailment
  - Minimises curtailment
- Renewables Targets
  - Contributes to meeting the 2020 renewable targets efficiently.

The SEM Committee considers that these criteria adequately capture the objectives of the DS3 System Services work stream. Member States and by extension, the Regulatory Authorities have a legal duty to *"ensure that appropriate grid and market-related operational measures are taken in order to minimize the curtailment of electricity produced from renewable energy sources"* under Article 16 of Directive 2009/28/EC. The SEM Committee considers that System Services represents such measures and that it is therefore appropriate to include this as a criterion when assessing the design option. However, the appropriateness of such measures must be balanced against the interests of consumers (the SEM Committee's principal objective in legislation). The costs imposed on consumers, the protection from costs arising from unexpected events and the

extent to which minimising curtailment provides a consumer benefit are therefore important criteria. Furthermore protecting the consumer interest is the SEM Committee's principal objective under legislation.

Ensuring costs are kept low for consumers must be balanced against the needs of investors and that revenue streams are sufficient and certain enough to secure financing of necessary new projects and the required retrofitting of existing units. In essence if the procurement design does not provide sufficient revenues, consumers will not enjoy the savings associated with reduced curtailment (but may still be paying the costs of procuring the lower than required volumes).

The next section examines in detail each of the five procurement options which the SEM Committee has considered and assesses these options against the criteria outlined above. This section should be read in conjunction with the IPA report which also examines procurement mechanisms for system services and makes a number of conclusions and recommendations in this area.

7.2 Option 1: Regulated Tariff

7.2.1 Overview

- Individual tariff set for each service, paid to all providers of that service
- Tariffs fixed for five years and revised every five year period
- Contracts issued by TSO on an ad hoc basis
- Contracts reviewed every five years

This option is somewhat aligned to the TSO Recommendations of May 2013. The basic features of the TSO Recommendation would apply. For example, a regulated tariff is published for each service. Rates could be determined in advance for each product based on the value of that service relative to the combined value of all the other services or indeed based on a cost-plus approach for the provision of the service. Providers would then contract with the TSO at those pre-determined rates. The dispatch and capability basis of the payments would be as proposed by the TSO. The scalars (product, performance and rate) would also apply as proposed by the TSO. It is noted that such design details could be amended in the detailed design of system services.

The key differences of this option compared to the TSO Recommendations are in relation to the total expenditure permitted and the contract lengths. The SEM Committee would set a total allowance for the TSOs procurement of System Services. Once this level of expenditure had been reached in aggregate the TSO would not be permitted to enter into any further System Services contracts except with the prior approval of the SEM Committee. Such approval would be considered on a case-by-case basis and granted only under exceptional circumstances and where a strong business case can be provided by the TSOs, such as a potential security of supply issue. It is considered that this alteration provides protection for the consumer in the event that there is an overinvestment in System Services.

Regarding the contract length, the contracts and the rate would be for a fixed length of five years. So while the rates would be recalculated every five years, contracts signed mid-way through the review period would guarantee the prevailing rate for a period of five years (i.e. into the next review period). It is considered that this alteration provides additional certainty for providers while maintaining the flexibility of the five-year review.

7.2.2 Contract Allocation

Units (existing or new) would apply to the TSO for a system services contract. The TSO would assess the capability of the unit and the needs of the system. If after this assessment the TSO considered the services provided by the unit were required it would offer a system services contract. Units would be guaranteed contracts for services provided up to the Grid Code standard but contracts for enhanced performance would be issued at the TSO's discretion. These contracts would be for periods of five years and would be renewable (at the new rate) upon expiry. Therefore the TSO would only offer contracts when there is a predicted or actual shortage of certain services and would stop issuing contracts when there was a surplus of services.

7.2.3 Pricing Methodology

Prices would be set on a five-year cycle. The tariffs would be set based on the cost plus regulated return required by a BNE providing a range of services. The relative value of each service would then be estimated according to the proposed method in the TSO Recommendations paper, and tariffs derived with reference to those service values. The scalars as discussed above in Section 5 would be applied to the tariffs.

Therefore the prices of individual services would change once every five years and would l change in response to the changing nature of the system. As the system requirement for services changes, the relative value of services would be expected to change and accordingly the individual prices would also change. It should be noted that the value referred to here is the total value to the system, not the incremental value. Therefore, the tariffs would not respond directly to the volume of services on the system (i.e. prices would not increase in response to scarcity nor decrease in response to over supply by the market). Other factors such as the input assumptions for the BNE, demand, interconnector use and level of connected wind would have a greater impact on the tariffs.

7.2.4 Contract length & Frequency of Procurement

As discussed above, the contracts would be issued for five years and be allocated by the TSO on an ad hoc basis (i.e. initiated by the unit and at the discretion of the TSO). Existing units would be eligible to apply for another contract when their current contract expires. While detailed procedures would be needed, it is envisaged that in the absence of a material change existing units would be entitled to a renewal of their contract (at the new tariff rates).

7.2.5 Volume Methodology

Given the contract allocation process, there will be less of a need for explicit forecasts of volumes than for options 3, 4 and 5. The assessment will be carried out on a case-by-case basis by the TSO for new build and retrofitting units. Therefore locational issues, as well as system issues will be taken into account in the TSO's consideration as to whether to offer a contract for enhanced capability (i.e. above the minimum Grid Code standards).

7.2.6 Participation Procedures

This framework is relatively straightforward; all units with a contract will be paid the regulated tariff on either a capability or dispatch basis (depending on the service)

7.2.7 Assessment against SEM Committee Criteria

This section outlines an assessment of Option 1 – Regulated Tariff against the SEM Committee's criteria outlined above. In the assessment column, the option is scored on a low, medium or high basis, with high reflecting if the option closely meets the SEM Committee's criterion.

Criteria	Option 1: Regulated Tariff	Assessment
Consumer Interest • Efficient cost • Protected from over-payment • Payments do not exceed total value	There is no price-discovery therefore the regulated price is unlikely to be the efficient price. The cap on total expenditure protects the consumer but this does not ensure that at an individual product level there will not be over or under investment. The rates will be sensitive to the assumptions and therefore it is possible that the true value (if lower than the assumptions) will be exceeded.	Medium
Investment • Certainty for investors • Entry signals • Exit signals • Incentivises efficient providers	Investors are unlikely to have sufficient certainty with five year contracts (prices) to make substantial investments. Because the rates are fixed every five years, the signals will be "lumpy" and may not adequately price scarcity or oversupply. Because prices will not reflect market forces there are no efficient exit signals. Efficient providers will be incentivised through the performance and rate scalars.	Low

Curtailment • Minimises curtailment	Because new investment may not be encouraged under this option and the difficulty in pricing scarcity it is considered that this option may not deliver the required services efficiently and so might not reduce curtailment in an efficient manner beneficial to consumers.	Medium
Renewable Targets • Contributes to meeting the 2020 renewable targets efficiently	The first rate setting process is most likely to be the least correct. The first rate setting process will also determine the commercial case for providing the services required to meet the target. The second rate review will occur after 2020. Therefore there is a significant risk that this option will not deliver the investment required to meet the 2020 targets.	Low

7.3 Option 2: System Services Pot

7.3.1 Overview

- Price based mechanism
- System Services "pot" distributed between the services
- Further distributed between all 12 months, then between each trading period
- All available units receive proportion of pot for that trading period
- No long-term contracts

This approach is an adaptation of the current (SEM 2007 – 2015) CPM methodology. A pot would be calculated by the SEM Committee based on the total estimated value of system services. This pot would then be subdivided into 14 separate pots (one for each service) and distributed across each trading period in the year. The relative size of each pot would be calculated using the TSOs proposed methodology, that is, modelling the differential between the total value with the service and the total value without that service. All units available (or dispatched depending on the service) in those trading periods would receive a portion of the pot proportionate to their relative service volume.

7.3.2 Contract Allocation

All units meeting the minimum technical standards associated with each service would be eligible to provide (and receive payment for) those services.

7.3.3 Pricing Methodology

The SEM Committee would determine the total annual pot each year. This could be in respect of the following year or, to increase certainty, could be in respect of a year several years in

advance. This annual pot would then be subdivided into 14 pots using the same methodology as set out in the TSO Recommendations paper to determine the relative values of the services. These 14 pots would then be distributed across each month, and then each trading period of that month. This would be based on the TSOs assessment of the requirement in each month and each trading period. However, it is acknowledged that such ex-ante forecasts are likely to be inaccurate until operational experience has been built up over a number of years. Therefore it may be preferable, at least initially, to adopt a relatively even distribution of the pots within months.

The per unit prices for a service will therefore be determined by the total pot in any given trading period and the volume of the service available to the TSO in that period. Accordingly the prices will continually fluctuate between trading periods according to the demand (estimated ex-ante) and supply (calculated ex-post).

7.3.4 Contract length & Frequency of Procurement

The nature of this option is that there are no long-term contracts i.e. a unit becomes eligible once it can prove the technical capability to provide the service. If a unit is available/dispatched it is paid, otherwise it is not paid. In this way all units are guaranteed payment, if available, but as the total market payments are fixed the customer is not exposed to payments under long-term contracts.

7.3.5 Volume Methodology

The TSO would not explicitly forecast the volumes required as there would be no limit on the procured volumes. However, in order to determine the appropriate distribution of the pots, the TSO would be required to estimate the required volumes prior to setting the individual pots.

7.3.6 Participation Procedures

This option is relatively straightforward as there is limited scope for manipulation by market participants. Units would be required to declare, and make available, their technical capability.

6.3.7 Assessment against SEM Committee Criteria

This section outlines an assessment of Option 2 – System Services Pot against the SEM Committee's criteria outlined above.

Criteria	Option 2: System Services Pot	Assessment
Consumer Interest • Efficient cost • Protected from over-payment • Payments do not exceed total value	Under this option the entire allowance is paid out. Therefore, customers will not benefit from efficiencies which lower the cost of providing services. However, the structure of the payments are such that customers will never pay more than the total allowance, which can be set at a level that ensures the value to consumers is greater than the cost. Furthermore, the interaction with the CRM and energy market must be considered. The system services revenues may reduce the cost of CRM and the SMP as they would only be received when the unit is available. Therefore the net cost to the consumer may be lower than suggested by the total allowance. Although it should be noted that, given the difficulty in estimating system service revenues in advance, the interaction between the revenue streams might not be as strong as under the other options.	Low

Investment • Certainty for investors • Entry signals • Exit signals • Incentivises efficient providers	The design of this procurement mechanism results in price fluctuations between trading periods and it is possible that these fluctuations will be volatile. It will be difficult for providers to forecast long-term revenues with any accuracy. Particularly as high prices in a given service or set of trading periods will potentially drive entry, thus reducing prices. Therefore it is considered that this option is unlikely to provide the level of certainty necessary to finance significant investments. This price volatility is however, key to this option as it provides entry and exit signals. The fluctuation in unit prices will also more accurately reflect the efficient relative price of the individual services. This is useful as the value-based allocation of the pots will not reflect the supply and demand equilibrium. Providers will be incentivised to increase efficiency as the lower a unit's cost the greater will be its inframarginal rent. It will also encourage units to provide additional volume to the TSO as this will increase the portion of the pot they receive (while lowering the clearing price).	Low
Curtailment • Minimises curtailment	This option should encourage units to be available to the TSO at the times the TSO most needs them. This should ensure that the market will tend to provide the services necessary to reduce curtailment. However, the ex-ante determination of the pot will not match the wind profile over the year. Therefore forecast demand and actual demand for system services will not match up. A further consideration is the risk that the investment will not be forthcoming due to the price uncertainty.	Medium

Renewable Targets • Contributes to meeting the 2020 renewable targets efficiently	The investment uncertainty under this option increases the risk that the services required to minimise curtailment, and so meet the renewables targets, may not be provided. The design of this mechanism also means that the total expenditure will not reduce as the cost of provision decreases. While the SEM Committee could reduce the annual pot should costs fall to account for this, this possibility itself further increases the investment uncertainty.	Low

7.4 Option 3: Regulated Competition

7.4.1 Overview

- Services arranged in four groups
- Voluntary, pay-as-bid tender process for groups 1, 3, 4
- Voluntary, pay-as-cleared, intraday auctions for ramping
- Long-term contracts for groups 1, 3, 4, short-term for group 2

This approach is discussed in detail in SEM-14-007 (Procurement Options for System Services). The approach is to split the services into groups in order to allow for different procurement mechanisms for the services. The groups are based on the broad characteristics of each service (e.g. capability or dispatch based, capital intensive investment or more operational costs, etc.). They are:

Group 1: Grid Stability	Group 2: Ramping	Group 3: Fast Reserve	Group 4: Slow Reserve
• SIR • FFR • DRR • FPFAPR • SRP	• RM1 • RM3 • RM8	• POR • SOR • TOR1 • TOR2	• RRD • RRS

For group 1 (“grid stability services”), group 3 (“fast reserve services”) and group 4 (“slow reserve services”) the contracts would be long-term (5-10 years) and awarded on the basis of pay-as-bid tenders. The contracts would be awarded until the monetary cap was reached. This cap would be approved by the SEM Committee as part of the detailed design for system services if this option were to be implemented.

For group 2 (“ramping services”) the contracts would be short-term (within day) and awarded on the basis of pay-as-cleared bids. The volumes would be set in real time by the TSO. Secondary trading would also be permitted and units would be required to “balance” their position.

The benefit of this approach is that by splitting the services into groups a more granular approach can be taken to the services. For example the sizes of the pots can be adjusted over time to incentivise entry of investment in one group without increasing the payments to the other groups. The competitive approach to the ramping services should allow an efficient cost-reflective price to be set. The tendering process should also provide for price-discovery in groups 1, 3 & 4. Therefore the market may deliver more quantity for the same price as the above two options. This information could be used in subsequent years to refine the value cap on the pots.

7.4.2 Contract Allocation

For groups 1, 3 and 4 contracts would be allocated in the same way as under Option 1 (Regulated tariff). The TSO would assess the requirement for the unit (or proposal for enhanced capability from an existing unit) and would offer a long-term contract (5-10 years). All of these units would then receive capability payments for the length of the contract. Units would be required to reapply for a contract after their existing contract expired. The TSO would stop issuing contracts when it had reached its budget allowance set by the SEM Committee. Detailed rules would be required to set out how the TSO would compare and evaluate complex tenders to ensure non-discriminatory treatment of generators and technology.

For group 2 (ramping margin), all units meeting the minimum technical standard would be eligible to provide ramping services however, services would be procured on a short term basis within-day (possibly several times a day).

7.4.3 Pricing Methodology

Groups 1, 3 and 4 would be priced in a voluntary pay-as-bid auction. The tender would be evaluated based on its capability relative to the needs of the system as discussed in section 7.4.2. If the TSO determined that the proposed services were required then the unit would be paid its bid price on a capability basis for the contracted volume for the length of the contract.

Group 2 services would be subject to dynamic pricing through voluntary auctions and secondary trading. The ramping margin services would be priced on a pay-as-cleared basis according to the TSO's real time ramping requirement.

7.4.4 Contract length & Frequency of Procurement

As noted above, groups 1, 3, and 4 will be procured on an ad hoc basis for contract lengths of up to 10 years. Group 2 will be procured in within day according to the needs of the system.

7.4.5 Volume Methodology

As with Option 1 volumes will not need to be explicitly forecasted. Group 2 services will be procured on a short term basis and so volumes need not be determined in advance. The remaining services will be offered contracts based on the TSO's discretion on a case-by-case basis. The cut-off point for issuing contracts will be determined by the allowed budget, not a pre-determined volume limit. Therefore there is no requirement for the TSO to forecast volumes under this procurement design.

7.4.6 Participation Procedures

The detailed design of the ramping margin market would need to be developed along with bidding rules. It is noted that this could be a relatively complex market given its size. For the other services the tendering process would need to be closely regulated to ensure that the pay-as-bid tenders reflected the true cost of provision. This is a particular concern given the market power issues discussed in the previous section and the voluntary nature of the auctions. Principles for the TSO's evaluation of complex bids would also need to be established and monitored by the RAs.

7.4.7 Assessment against SEM Committee Criteria

This section outlines an assessment of Option 3 – Regulated Competition against the SEM Committee's criteria outlined above

Criteria	Option 3: Regulated Competition	Assessment
Consumer Interest • Efficient cost • Protected from over-payment • Payments do not exceed total value	This option contains a method of price discovery which is absent from the first two options. Therefore it can be assumed that the expenditure on system services will more closely match the efficient costs than options 1 and 2. However, as most of the services will be procured on a pay-as-bid, capability basis under long-term contracts there is a significant risk that consumers will be locked into expensive contracts. Given the competition issues in the system services market a pay-as-bid approach further increases the risk that providers will overinflate their bids. While the cap on total expenditure will ensure that the exposure to the consumer is limited it does not ensure that all the required services will be procured which means the savings associated with System Services may not materialise. This could occur if the bid prices of initial tenders were high relative to volumes provided, thereby reducing the available budget.	Low

Investment • Certainty for investors • Entry signals • Exit signals • Incentivises efficient providers	Four separate procurement processes may increase the complexity of the bidding process for investors. Given that investment decisions will not necessarily fit neatly within each group regarding the services that will be provided/enhanced, investors may need to anticipate the outcome of the auctions in the other groups. This means that the process of constructing bids may be quite complex and careful attention would have to be paid to the sequencing of the auctions. However, successful units would have a very high level of certainty and the return on investment could be much more accurately be predicted than the other options. The ramping market should provide entry signals to efficient providers but on its own is unlikely to incentivise investment, particularly as the revenues would be so uncertain. The nature of the other markets means that they will be quite opaque to new entrants, and therefore will not provide signals. The TSO could mitigate this by publishing its estimated volume requirements. It is also possible that the certainty associated with a successful bid will incentivise investors to make speculative enquiries. There are no exit signals for any of the services, except for the ramping margin services. The use of performance scalar will incentivise efficiency in the same way as under Option 1. As the prices are fixed for the length of the contract providers could increase profits by lowering costs. These savings would not be passed on to consumers directly but might indirectly reduce CRM bids (energy bids are unlikely to be impacted as payment is on a capability basis).	High
Curtailment • Minimises curtailment	The increased certainty around the contract-length and payment on a capability basis might suggest that investment under this option is more likely. This should ensure that there are sufficient services to minimise curtailment however the payments are capability based. Therefore units will not have an incentive to be available to the system to provide the services. The TSO may need to constrain such units on.	Medium

Renewable Targets • Contributes to meeting the 2020 renewable targets efficiently	While the higher level of investor certainty may ensure the necessary provision of services it is possible that the costs will be higher than under the other options due to the auction design and market power issues.	Medium

7.5 Option 4: Competitive Split Auction

7.5.1 Overview

- Services arranged in four groups
- Two distinct auctions for each group long-term and annual
- Mandatory, sealed, pay-as-cleared auction for annual contracts
- Only operational costs recovered in annual auction
- Voluntary, pay-as-bid auction for long-term contracts to cover capital costs
- Only new investments can participate in long-term contracts

This option builds upon the recommended auction design set out in the IPA Report. Services are divided into four groups and auctioned in one, five and ten year auctions. The one year auction is a mandatory, pay-as-cleared, sealed bid auction design where bids are based on short run costs. The five and ten year auction is a voluntary, pay-as-bid, sealed bid auction design based on long-term costs (short-run costs are recovered in the annual auction).

The groups are as per Option 3, Regulated Competition.

Group 1: Grid Stability	Group 2: Ramping	Group 3: Fast Reserve	Group 4: Slow Reserve
• SIR • FFR • DRR • FPFAPR • SRP	• RM1 • RM3 • RM8	• POR • SOR • TOR1 • TOR2	• RRD • RRS

7.5.2 Contract Allocation

Contacts would be awarded on a group and contract length basis. So for example all winning tenders in the Group 1 one-year auction would be awarded a contract to provide all Group 1 services that the unit was capable of delivering for the following year. The unit would not be guaranteed a contract for the next year; it would have to go through the auction process again.

The long-term contracts would be awarded for five or ten years in the relevant group(s), however this contract would only cover long-term costs, the unit would still be required to participate in the annual auctions to be eligible deliver the services and receive the clearing price.

7.5.3 Pricing Methodology

For the annual auction a single uniform price would be set for all services within a given group on a pay-as-cleared basis. This results in four prices, one for each group, paid out for all services provided by those winning annual contracts. By grouping the services in this manner providers can optimise their bids to take account of the short-run costs of providing each service with a given group of services. As prices are set on a pay as cleared basis those units which are most efficient will earn inframarginal rent, incentivising the most efficient providers of the service. Also the inframarginal rent may impact on the provider's capacity and energy bidding strategies, providing relatively greater revenue to those units the system requires most.

The long-term auctions would be awarded on a pay-as-bid basis for the long-run costs associated with investments from new or retrofitted units. While the pay-as-bid approach is more problematic in a highly concentrated market it is considered appropriate here due to the possibly wide variation in cost and capability from each unit. It is noted that a methodology would need to be developed to compare and assess complex bids against one another.

7.5.4 Contract length & Frequency of Procurement

All providers would be required to participate in the annual auctions which set the short-run costs. It is in this auction that the TSO actually contracts for the services, and therefore services would be procured on an annual basis. It may be possible to increase the frequency of the auctions for some of the products as the process becomes bedded down.

By splitting the auctions for short-run and long-run costs, this allows providers to maintain an amount of certainty as they are guaranteed their long-run costs through the pay-as-bid auction even though their revenue from the annual auction will vary each year.

7.5.5 Volume Methodology

The estimation of the required volumes is a complex process which is sensitive to assumptions. However, an auction process typically requires the volumes to be known in advance in order to determine the cut-off price. For the annual auction it is considered that the TSO should be able to develop reasonable estimates of the volumes they will require for the following year. However, several years in advance such estimates become increasingly unreliable particularly as network conditions change and new units connect to the system. There will therefore be a significant element of judgement on the part of the TSO as to whether (or how many) long-term contracts should be issued. This is however the same difficulty that arises under option one, Regulated Tariffs, proposed by the TSO and therefore it is considered that the TSO should be in a position to manage this process.

For this option it is proposed that the TSO would publish its estimated volume requirement for next year, and its outturn requirement for last year on an annual basis prior to the annual auction. The volume requirement in the long-term auctions would be assessed on a case-by-case basis during the assessment of the complex bid.

7.5.6 Participation Procedures

The annual auction would be mandatory for all existing units and bidding would be subject to regulatory oversight. Bidding rules (a BCOP) would be developed as part of the implementation phase to ensure that only short-run costs were included. It is not envisaged that fuel costs be included in bids, fuel costs would be recovered through the energy price or constraint payments. All providers would be required to submit their technical data and availability to the TSO at the day-ahead stage or at such other times as set out in the detailed procedures.

The voluntary long-term auctions would also require bidding rules and strong regulatory oversight, particularly in light of the market power concerns.

7.5.7 Assessment against SEM Committee Criteria

This section outlines an assessment of Option 4 – Competitive Split Auction against the SEM Committee's criteria outlined above.

Criteria	Option 4: Competitive Split Auction	Assessment
Consumer Interest • Efficient cost • Protected from over-payment • Payments do not exceed total value	The annual mandatory, pay-as-cleared auctions should efficiently price the provision of existing services. The voluntary auctions for new/enhanced capability carry a greater risk to the consumer due to the pay-as-bid design, similarly to Option 3. Accordingly the allocation of long-term contracts would have to be carefully monitored by the Regulatory Authorities. However, the pricing of the services in groups means that the individual products will not be appropriately priced. While there is some risk to the consumer regarding overpayment on the long-term contracts this is lower than the risk associated with option 3. It is also noted that over time the annual auction will become the main route through which the TSO will procure system services, as new entry and refurbishments are unlikely to be a regular occurrence in the market. The use of an expenditure cap will limit the	Medium

	exposure to the customer and the use of a market-based mechanism will increase the possibility that efficiency savings will be passed on to consumers.	
Investment • Certainty for investors • Entry signals • Exit signals • Incentivises efficient providers	The auction design ensures that an investor will be guaranteed its fixed costs under a long-term contract and creates the possibility of inframarginal rents in the annual auction. The annual auction, while not providing guaranteed revenue, may reduce investor risk to some extent as annual bids can be adjusted in response to changes in short-run costs. The annual auction, and the possibility for inframarginal rents, should provide price signals for efficient providers. And the long-term contracts will facilitate market entry by limiting investor risk. However, the price signals will only incentivise entry into a particular group of services. Therefore market entry will not necessarily be focused on those individual services where there is scarcity. The annual auction should provide exit signals to inefficient providers as they will tend to be excluded by more efficient providers with lower bids. The long-term contracts will soften this exit signal considerably, at least for the duration of the contract. The design of the annual auction will incentivise the most efficient providers.	High
Curtailment • Minimises curtailment	The design of this option should ensure that required investment is incentivised and that the TSO should be able to procure the necessary services efficiently. A potential issue is the lack price signals for the individual products, this may distort the incentives and result in the TSO having less of a service than it requires to most efficiently reduce curtailment.	Medium
Renewable Targets • Contributes to meeting the 2020 renewable targets efficiently	As this option provides more investor certainty than Options 1 and 2 it is considered that this option is more likely to ensure the necessary investment is made and that accordingly the system has the enhanced capability necessary to meet the 2020 targets.	Medium

7.6 Option 5: Competitive Multiple Bid Auction

7.6.1 Overview

- Mandatory, sealed, pay-as-cleared, instantaneous auction
- Multiple, mutually exclusive bids permitted
- Each bid includes price and capability for each service, provides a set of mutually exclusive outcomes for the auction
- TSO determines demand curve based on range of outcomes
- Least-cost outcome is selected, results in individual uniform prices for each service
- Units decide contract length when bidding, existing capability of unit must be included as a bid and fixed one-year contract for existing capability.

This is a competitive approach that lets the market optimise the price and quantity of the services. The auction design is a single, uniform price, sealed bid auction for all the services. Providers submit bundled bids for all each of their investment decisions. Therefore each bid would include a price, quantity and contract length for every service the provider is willing to offer. Multiple (but mutually exclusive) bids would be permitted. This allows the generator to reflect the interdependent relationship between the services through their bids and to allow the market to price the risk premium on shorter-term contracts. Therefore the bidding process would result in each unit submitting multiple mutually exclusive bundles of bids which, when all the bundles are combined, provides a range of outcomes for the market. Each possible outcome would have an individual clearing price for each service. After technically unviable potential outcomes (from the TSOs perspective) were eliminated the least-cost overall outcome could then be selected. The clearing price for each service would be paid to all in-merit units. This option provides the TSO with a significant amount of information and permits the TSO to optimise during the tender selection process.

7.6.2 Contract Allocation

Contracts would be allocated to all successful tenders on the basis of the specified contract length in the provider's bid for that service. Therefore different providers will have different contract lengths and, potentially, for different services. As the contract lengths are determined by the bidders themselves, and contracts allocated in order of price, the market will determine which units and which products require long-term contracts. Existing units would be required to submit one bid-bundle which reflected their current capability and would be required to specify a contract length of one year (they would also be able to submit additional bids for enhanced capability and longer contract lengths). Similarly to Option 4 (Split Auctions) this annual requirement would ensure that long-term contracts would only be issued when investment was required. Furthermore over time short-term contracts will make up an increasing share of the contracts as the long-term contracts end and the, now existing, units would be required to bid for annual contracts.

7.6.3 Pricing Methodology

This auction design is a version of a Vickrey auction with the addition of multiple-mutually-exclusive bids. However the unique feature of this auction is that the services are priced individually but the result is determined by the least-cost overall outcome.

It is considered that this design mitigates market power issues while providing market-based pricing for each service. The mandatory bidding, sealed bid, pay-as-cleared elements in particular are necessary to mitigate market power. The various issues with alternative auction designs are discussed in the IPA Report published alongside this paper. The dispatch based services would be paid on a pay-as-cleared basis too, but the clearing price would be set each trading period based on the auction results (i.e. there would not be real-time bidding for dispatch-based services).

As discussed earlier, market power is a particular issue for competitive procurement of system services. Therefore the SEM Committee considers that all existing units be required to submit bids reflecting their current technical capabilities for a contract duration of one year. Existing units would also have the option of submitting additional bids reflecting enhanced capability and longer contract periods. This would ensure that the evaluation of the auction would include the current status-quo as a possible outcome. Accordingly if the existing portfolio could meet the TSOs' requirements no long-term contracts would be entered into and prices would not have to facilitate investment costs. Furthermore it will ensure that where the retrofitting of an existing unit is not cost-effective from a system perspective that bid will be rejected and the retrofit will not take place. But other cost-effective retrofits would proceed if required.

Aside from market power issues, the sealed bid element is also important given the nature of the services and the design of the auction. This process permits all bids for all products to be entered simultaneously and evaluated comprehensively with all the available information. The amount of information available to the TSO is therefore maximised, facilitating the optimal procurement of services over the long run, while the information revealed to participants is limited to the clearing prices. It is expected that this process should encourage rational bidding as participants' investment options will not be made known to the rest of the market. It is further noted that it is a logistical necessity that sealed bids be used in order to allow an assessment of multiple bids across all fourteen services.

There are two key differences between the pricing methodology of Options 4 and 5. Option 5 (Multiple Bid Auction) results in an individual price for each service, whereas Option 4 (Split Auctions) results in a uniform price for all services within a given group. The second difference is that Option 4 uses a pay-as-bid approach for long-term costs whereas Option 5 uses a uniform pay-as-cleared approach, regardless of the contract length.

A consideration here is the role of inframarginal rent for long-term contracts. A pay-as-cleared price will result in more inframarginal rent accruing to those technologies which are most efficiently providing the set of services most needed by the system. This should encourage the entry (or delay the exit) of the types of unit the system requires while providing units of marginal value limited inframarginal rent. Over time the auctions will dynamically reward those

technologies of most value at that time without a preferred technology having to be explicitly selected. A pay-as-bid approach will not (or at least should not) result in inframarginal rent being earned. When this pay-as-cleared element of the auction is considered in the context of the interaction with the CRM and energy market this dynamic becomes more pronounced. Units earning inframarginal rent in the system services market will require less capacity revenue, all things equal, and so will bid less in the capacity process. In the energy market their opportunity costs will be higher (for those services that can be provided when exporting) and so (bidding rules permitting) they will reduce their energy bids accordingly. Therefore it can be seen that this approach to the system services auction, relative to a pay-as-bid approach, will tend to increase the revenues to units most needed by the system and will tend to reduce the revenues accruing to those units least needed by the system.

7.6.4 Contract length & Frequency of Procurement

By permitting multiple mutually-exclusive bids and requiring that one of those bids includes current capability the cost of investment/retrofitting can be assessed relative to the existing provision of services. Accordingly long term contracts will be offered for those services where they are part of the most cost-effective overall outcome. Auctions will be run annually, however units with long-term contracts issued in a previous auction will not be included for those services still covered by the long-term contract. The contract-price would remain fixed for the duration of the contract (adjusted only for inflation).

Therefore under this option the contract lengths for different units and different services will vary. Allowing this differentiated approach avoids prejudging the investment or technology profile of providers and permits the system services contract framework to adapt over time as the needs of the system change.

7.6.5 Volume Methodology

The distinctive feature of this option relative to the other options is that bidders are permitted to submit multiple mutually-exclusive bids. The intention of this element of the auction is that it simplifies the bidding process for the providers and optimises the final outcome of the auction without an explicit volume allocation for each service being required in advance.

It is acknowledged that providers will have investment decisions to make, either how to design a plant in the case of new entrants or whether (and how) to retrofit in the case of existing units. The nature of these investments varies by technology and different investments will result in different volumes of services. This creates complex bidding strategies and price distortions if multiple simultaneous auctions are carried out (i.e. each service is auctioned separately). But it would also be complex for the TSO to assign volumes to the services individually given the interactions between the services.

Investors' requirement for volumes is reduced because a provider can construct a rational set of bids on the basis of the expected costs in the knowledge that the bid will only be accepted if the clearing price in each service is sufficient to recover the associated costs. Indeed because the

full range of outcomes are available to the TSO the interactions between the services can be more accurately assessed based on the possible capability of the new generation portfolio.

7.6.6 Participation Procedures

While the design of this auction is somewhat less susceptible to manipulation than Options 3 and 4 clear bidding rules would still be required and the auction process monitored. The bidding process is straightforward and auction outcome is clear. However, the bid selection process is more complex than the other options and relies on a robust TSO process for selecting the optimal outcome. This process would require further engagement with the industry. It is noted that the selection process for the other options, while less structured, will still rely on the TSO's discretion.

7.6.7 Assessment against SEM Committee Criteria

This section outlines an assessment of Option 5 – Competitive Multiple Bid Auction against the SEM Committee's criteria outlined above.

Criteria	Option 5: Competitive Multiple Bid Auction	Assessment
Consumer Interest • Efficient cost • Protected from over-payment • Payments do not exceed total value	This auction should provide an efficient price for each service which will adjust in response to market forces. The design of this auction should reduce the risk of manipulation of the bidding process and the risk is lower than in the auctions set out in option 3 and 4. However, this design also means that in years where investment is required prices will be higher than under the other options. It is also possible that the long-term contracts will be priced higher under this option. However, it should be noted that payments under this option will be more closely interact with total generator revenues and that therefore the net cost to the consumer may be lower and drive efficiency over time. As with the other options a cap on total expenditure will protect customers from overpayment. Although it is possible that the net saving will be greater than the other options.	Medium-High
Investment • Certainty for investors • Entry signals	The ability to submit multiple bids increases investor certainty as it allows the provider to appropriately group the services and to determine which services and investment decisions require	High

• Exit signals • Incentivises efficient providers	long-term contracts. This option will provide clear entry signals due to the possibility of inframarginal rent. Because the services are individually priced, the entry signals will be strongest for the providers/technology that can most efficiently provide the services most required by the system. This means that while the procurement is technology neutral, it will favour the optimal technology – which will change over time. As with the options 3 and 4, allowing long-term contracts will (by design) reduce exit signals. Those with short-term contracts will face exit signals. However, a further consideration is that due to the interaction with revenues from energy and capacity the entry of new more efficient will tend to lower the revenues accruing to less efficient units, all things equal. This effect is likely small but over the long run will reinforce the exit signals in the energy and capacity markets.	
Curtailment • Minimises curtailment	As this option provides investor certainty and provides incentives to provide, and make available, the services most needed by the TSO it is considered that this option will facilitate a reduction in curtailment.	High
Renewable Targets • Contributes to meeting the 2020 renewable targets efficiently	This option should facilitate the investment and reduction in curtailment necessary to meet the 2020 targets. The market based approach should also ensure this is achieved at an efficient cost.	Medium

7.7 Payment Basis for Services

This section examines the basis on which system services payments for each service would be made under each of the five options. This builds upon the discussion on payment basis outlined in Section 5 and the description of the different options outlined in Section 7. The basis on which services are paid will determine the revenue certainty for the generator and the incentives for the generator to ensure delivery of the service at the times it is required. As discussed above the nature of the service has an impact on the appropriate payment basis. However, the overall procurement design also has an impact. Therefore the decision on the appropriate payment basis must be made taking both the service itself and the procurement mechanism into account.

It is also noted that the payment basis set out below are not the only possibilities and respondents are invited to comment on the appropriate payment basis. The table (Table 6) below sets out the SEM Committee's proposed payment basis for each service and procurement option.

Table 6 – System Services payment basis

Service	Regulated Tariff	Fixed Pot	Regulated Competition	Spilt Auctions	Multiple Bid Auctions
SIR	Capability	Availability	Capability	Capability	Availability
FFR	Availability	Availability	Capability	Availability	Availability
FPFAPR	Capability	Availability	Capability	Capability	Availability
SRP	Capability	Availability	Capability	Capability	Availability
DRR	Capability	Availability	Capability	Capability	Availability
Op Reserve	Dispatch	Dispatch	Capability	Dispatch	Dispatch
RRS/RRD	Dispatch	Dispatch/ Availability	Capability	Dispatch	Dispatch
Ramping	Dispatch	Dispatch	Dispatch	Dispatch	Dispatch

7.7.1 Option 1: Regulated Tariff

Under Option 1 (Regulated Tariff) capability based payments would entail paying all units the relevant regulated tariff for the volume the unit was capable of delivering. Subject to the application of scalars, this tariff would be made regardless of the volumes actually delivered to the system. For dispatch based services units would be paid the relevant tariff for the volume actually dispatched by the TSO.

7.7.2 Option 2: Fixed Pot

Under Option 2 (Fixed Pot) services would be paid on either an availability or dispatch basis. For availability based services the total volume available to the TSO (or realisable by the TSO), whether or not the unit was actually dispatched, would be eligible for a payment proportionate to

their contribution to the total available volume at that time. What is considered available will differ between the services, SIR for example will require the unit to be synchronised while RRD will not. Units in the market schedule (for physical contract nomination) but constrained down will be eligible for payment and will not be negatively affected by the actions of the TSO. Conversely if a unit which would have been considered unavailable is dispatched by the TSO that unit will receive payment for those services it actually provided or was available to provide as a result of the TSO's dispatch decision. For dispatch based services the pot would be spread amongst the total volume dispatched by the TSO at that time.

7.7.3 Option 3: Regulated Competition

Under Option 3 (Regulated Competition) all services, except ramping, would receive their bid price for their total capability regardless of volumes actually delivered. Ramping would be paid on a dispatch basis in so far as units would be paid the clearing price resulting from a within day auction.

7.7.4 Option 4: Competitive Split Auction

Under Option 4 (Competitive Split Auction) short-term costs would be recovered through the annual auction. It is this auction that would l determine the units providing system services, fixed investment costs are recovered separately under long-term contracts. For the capability based services all units successful in the annual auction would receive the clearing price for the volume they are capable of providing, regardless of the volumes actually provided. The dispatch based services would also be priced in the annual auction, however, the clearing price would be set each trading period using the bids from the annual auction of the units dispatched.

7.7.5 Option 5: Competitive Multiple Bid Auction

Under Option 5 (Competitive Multiple Bid Auction) payments will be made on an availability or dispatch basis. As with Option 2 payments will only be made when the service is realisable by the TSO for availability based services. Units in the market schedule (for physical contract nomination) but constrained down will be eligible for payment and will not be negatively affected by the actions of the TSO. Conversely if a unit which would have been considered unavailable is dispatched by the TSO that unit will receive payment for those services it actually provided or was available to provide as a result of the TSO's dispatch decision. The price will be the clearing price of the auction. For the dispatch based services, as with Option 4, the clearing price will be set by the marginal unit dispatched, based on the bids submitted in the annual auction.

8 Preferred Option

8.1 Introduction

The previous sections have set out the designs of the five procurement mechanisms which the SEM Committee is considering for system services. These mechanisms can broadly be described as regulated options and competitive options and represent a spectrum of approaches open to the SEM Committee. The SEM Committee has also outlined the characteristics of the approved services, the payment basis for each service and how each of the different services would interact with each of the different options. In this analysis, it is clear that the problem to be solved is complex with certain services perhaps best suited to one option with other services best suited to an alternative. Indeed the interaction between services themselves and the fact that investment decisions will influence the abundance or scarcity of services, adds further to the complexity of choosing the appropriate option for system services.

Therefore in order to develop its thinking to deliver a preferred option to stakeholders, the SEM Committee has carried out further analysis in this section against the SEM Committee decision making criteria. This section outlines both a quantitative analysis (high level) and a qualitative analysis against the decision making criteria and concludes with the SEM Committee's minded to approach for the procurement of system services. Comparisons of Procurement Options against the SEM Committee Criteria

In Section 7, the SEM Committee outlined its analysis of the five procurement options against its decision making criteria. Below is a table (Table 7) presenting a high level assessment and comparison of the five options against the four criteria. The scoring set out in the table is illustrative and high level; the criteria are also not weighted. The SEM Committee believes that this is a fair approach given the complex nature of the different services and the fact that each of the criteria reflects an important consideration for the SEM Committee. Each option has been scored individually against each criterion using a high, medium or low score (with high reflecting that the option meets the criterion to a high degree). Secondly each of the procurement options have then been ranked on a scale of 1 to 5 against each criterion, with 1 reflecting the procurement option which most closely meets this criterion and 5 reflecting the options which least meets the criterion. To adequately compare and evaluate the options a more detailed qualitative assessment is also required. This is presented in the sections below Table 6.

That said, it can be seen from the table that the Regulated Tariff option scores much better than the other regulated option, the System Services Pot. Also the Multiple Bid Auction scores better than the other competitive options. While Option 1 scores slightly worse than options 3 and 4, the scores are comparable and it must be noted that a regulated approach is distinctly different in that many of the risks associated with the competitive approaches are not present.

Table 7: Summary of Assessment of Options Against Criteria				
Option	**Consumer Interest**	**Investment**	**Curtailment**	**RES Targets**
Option 1 **Regulated Tariff**	2nd (Medium)	4th (Low)	3rd (Medium)	4th (Low)
Option 2 **System Services Pot**	4th (Low)	5th (Low)	5th (Medium)	5th (Low)
Option 3 **Regulated Competition**	5th (Low)	1st (High)	4th (Medium)	1st (Medium)
Option 4 **Competitive Split Auction**	3rd (Medium)	3rd (High)	2nd (Medium)	3rd (Medium)
Option 5 **Competitive Multiple Bid Auction**	1st (Medium-High)	2nd (High)	1st (High)	2nd (Medium)

8.2 Criteria 1: Consumer interest

Table 8: Consumer Interest – Comparison of Options

Consumer Interest		• **Efficient cost** • **Protected from over-payment** • **Payments do not exceed total value**		
Option 5 **Competitive Multiple Bid Auction**	**Option 1** **Regulated Tariff**	**Option 4** **Competitive Split Auction**	**Option 2** **System Services Pot**	**Option 3** **Regulated Competition**
Medium-High	Medium	Medium	Low	Low

Of the options above, the SEM Committee considers that the Multiple Bid Auction performs best in terms of the consumer interest. That is because an individual price is set for each service on a competitive basis, this should result in prices reflecting the marginal value of each service. This sends appropriate market signals and allows the customer to share in gains in efficiency.

The Regulated Tariff also prices the services individually therefore, there is the opportunity to adjust the prices to reflect the estimated relative value of the services. However, as there is no price discovery, it is unlikely that the regulated price will equal the efficient price for a given service.

Option 2 also provides for individual pricing of the services and should ensure that the relative pricing reflects the relative scarcity or surplus of a given service. This should provide a more efficient per-unit pricing than the regulated tariff but the payment structure ensures that the entire pot is paid out and that therefore the customer does not benefit from efficiencies.

Option 4 will facilitate lower overall costs than option 2, assuming competitive pressures lower prices but does create a risk of over-payment through the pay-as-bid long-term contracts and mispricing of individual services due to the single price per group approach.

Option 3, Regulated Competition, is considered to perform worst in terms of consumer interest as there is the greatest risk under this option of participants using market power potentially leading to higher costs. These costs would also be locked in under long term contracts. On consumer interest grounds the SEM Committee does not favour Option 3 as an option.

Therefore, on consumer interest grounds the SEM Committee considers option 5, Multiple Bid Auctions, to be preferable assuming a sufficiently competitive market. It is considered that option 1, Regulated Tariffs, provides reasonable protection to the consumer and while it does not allow for price discovery it is suitable where a more competitive process is not viable.

8.3 Criteria 2: Investment

Table 9: Investment – Comparison of Options

Investment			• **Certainty for investors** • **Entry signals** • **Exit signals** • **Incentivises efficient providers**	
Option 3 **Regulated Competition**	**Option 5** **Competitive Multiple Bid Auction**	**Option 4** **Competitive Split Auction**	**Option 1** **Regulated Tariff**	**Option 2** **System Services Pot**
High	High	High	Low	Low

Regulated Competition is considered to deliver the greatest certainty for investors as contracts will be issued on a long-term basis, payments made on a capability basis and prices set through a tender process. Therefore this option gives good certainty to investors and should encourage market entry. However, it does not provide exit signals and will not necessarily incentivise more efficient providers over less efficient providers. Furthermore, this option is not favoured on consumer interest grounds as discussed above.

The regulated options, Regulated Tariff and System Services Pot, are considered to provide low levels of investor certainty. In the case of Regulated Tariffs, the prices are known for a period of five years, which does give a level of certainty and is arguably easier for providers to construct a business case around than a more competitively determined price. However, given that prices will change every five years as a result of a regulatory process, and not a market process, some providers may find it difficult to construct an investment case given the price uncertainty beyond five years. Option 1 also does not provide efficient entry or exit signals, while the prices set every five years can be set higher or lower for this purpose, the prices will not react dynamically to changes in the market and will rely on regulatory intervention at each review period.

The System Services Pot does provide for entry and exit signals as the unit-price for a given service will react to levels of scarcity and surplus in the market. Accordingly those providers who can most efficiently provide the most needed services will earn higher profits than those that do not. However, this mechanism relies on a high level of price volatility between trading periods that will be difficult for providers to forecast, particularly in the initial years of operation. Option 2 may be more appropriate in circumstances where the market for system services was well established and so would be more likely to have more predictable prices. Therefore, given the level of investment uncertainty present in option 2, the SEM Committee proposes to rule it out as a possible procurement mechanism.

Option 4, Split Auctions, and Option 5, Multiple Bid Auctions allow for greater investor certainty than Option 1 as they provide for long-term contracts. It is considered that this will facilitate providers being able to secure more favourable financing arrangements than under circumstances where they did not have long-term price certainty. The two auction processes are slightly different; Option 5 is an instantaneous auction with individual prices whereas Option 4 is four sequential auctions with group pricing. Investment decisions should be easier under option 5 as a provider's range of investment decisions can be submitted as mutually exclusive bids and do not need to be finalised until the outcome of the auction is known. Bidders will also not be required to forecast the outcome of subsequent auctions when preparing their bids. Furthermore, single service providers or providers whose investment decisions depend on remuneration for services spread across the pre-defined groups will be better accommodated in an instantaneous auction design.

Therefore, Option 3 having not being favoured, the SEM Committee considers that Option 5 presents the most preferable arrangements as regards investment.

8.4 Criteria 3: Curtailment

Table 10: Curtailment – Comparison of Options

Curtailment			• **Minimises curtailment**	
Option 5 **Competitive Multiple Bid Auction**	**Option 4** **Competitive Split Auction**	**Option 1** **Regulated Tariff**	**Option 1** **Regulated Competition**	**Option 2** **System Services Pot**
High	Medium	Medium	Medium	Medium

Efficiently minimising curtailment requires the TSO to have access to the appropriate units given system conditions. The auction process for Option 5 allows the TSOs to evaluate each bid compared to all other possible outcomes. Therefore the TSO can optimise the investment though the auction process in order to minimise curtailment at least cost. This optimisation is not possible with the other options. The payment structure under option 5 also incentivises units to ensure they are available to the TSO before the TSO takes non-energy balancing actions. This should tend to produce a market dispatch that provides (or makes available) system services to the TSO, minimising the interventions required by the TSO.

The other options are considered to be largely comparable in their ability to make the services that are on the system available to the TSO although it should be noted that the capability based payments in option 3 will not incentivise units to be available at a particular time. Option 2, while

it does incentivise availability, provides the least control for the TSO to determine which units should be providing system services.

Therefore, the SEM Committee considers that Option 5 has the greatest likelihood of efficiently reducing curtailment.

8.5 Criteria 4: Renewable Targets

Table 11: Renewables Targets – Comparison of Options

Renewable Targets			• **Contributes to meeting the 2020 renewable targets efficiently**	
Option 3 **Regulated Competition**	**Option 5** **Competitive Multiple Bid Auction**	**Option 4** **Competitive Split Auction**	**Option 2** **Regulated Tariff**	**Option 2** **System Services Pot**
Med	Med	Med	Low	Low

Contributing to meeting the 2020 targets is of course dependent on reducing curtailment and on securing the necessary investment, but it depends on ensuring sufficient services are in place and operational before 2020 such that curtailment levels are sufficiently low to allow for the construction and generation of renewable energy. It is noted that there are significant uncertainties in this regard. It cannot be guaranteed, under any of the options, that sufficient investment will be offered at a reasonable cost to the consumer.

It is considered that the competitive options (options 3, 4 and 5) perform better here as providers have access to long-term contracts and will not be exposed to below cost prices (i.e. if the market price is too low their bid will not be accepted), whereas, under the Regulated Tariff option prices may fall below cost after the review period. There is a risk that some investors will wait until the regulatory process has gone through at least one cycle before committing substantial investment. If this were to happen, it is likely that sufficient investment would not have taken place prior to 2020. Accordingly options 3, 4 and 5 are seen as preferable against this criterion. Out of these options, option 5 provides additional control and flexibility for investors and so is likely to be marginally more preferable than options 3 and 4 against this criterion.

8.6 Summary

Based on this analysis, Option 5 (Competitive Multiple Bid Auctions) emerges as the preferred option for the SEM Committee, most closely aligning with the SEM Committee's decision making criteria. However this analysis assumes that there is sufficient competition for service provision to ensure that the beneficial features of Option 5 can be gained. Therefore in order to guard

against losing some of the positive features of Option 5, it is important that the SEM Committee's analysis considers other issues which may influence the SEM Committee's decision. These issues are outlined in Section 8.7 below.

8.7 Other Issues

8.7.1 Market Power Mitigation

Market power is a key consideration given the high level of concentration in the SEM and the possibility that there is an equivalent and possibly greater scope for participants to exercise market power in the system services markets. IPA has carried out some analysis into market concentrations in system services as part of this report to the SEM Committee (Section 6). Therefore given these concerns, it is important that the procurement option which is favoured considers mechanisms to control or mitigate against market power. The design of the Multiple Bid auction contains features aimed at limiting this market power risk. For example requiring all existing generators to submit a bid reflecting their existing capability in addition to (as opposed being replaced by) bids relating to enhanced capability following investment ensures that units cannot withhold capability from the market. However, it is considered that additional measures will have to be taken to further mitigate the risk of market power. These measures will be put in place during the detailed design phase of system services (if this option is implemented).

It is proposed that a bidding code of practice would be developed and applied to all units participating in the system services auctions. It is envisaged that all bids would be cost based and subject to monitoring through the SEM Committee's Market Monitoring Unit.

It is further proposed that the number of long-term contracts be limited to increase the competition for those contracts. It is proposed that the number of long-term contracts (more than five years) cannot be any greater than the number of offers minus one. Therefore, if the least cost outcome in the auction contained 10 successful bids for contracts of between 5-10 years, only nine could be accepted. This may result in lower volumes being procured than may be optimal but it will put downward pressure on prices and will incentivise providers to bid competitively (or else risk being the service provider who does not get a contract). Also, over time it is expected that the need for high levels of investment will fall, requiring less entry of new providers and that revenue streams (energy, system services and capacity) will become more predictable reducing the need for long-term contracts.

Where the auction fails to produce a viable result, or sufficient quantities, for one or more services, the additional volume of those services will be remunerated through a regulated tariff. It is not possible ex-ante to definitively estimate which services lack sufficient competition to produce a viable auction result.

8.7.2 TSO Incentives

The IPA Report recommends that the Regulatory Authorities implement an incentive mechanism on the TSOs' purchase of system services. The SEM Committee considers that this recommendation has merit and is of the view that such an incentive mechanism would reduce

procurement costs and deliver better value for consumers. As the operator of the system, the TSO has both the technical knowledge and the operational capability to understand and make the trade-offs between various system services under different circumstances and the cost-effectiveness of targeted network solutions.

However, incentives placed on the TSOs are best designed in the context of their overall revenue allowance. Therefore the SEM Committee does not propose to develop an incentive mechanism in this paper but recommends that the Regulatory Authorities consider the development of appropriate incentives around system services that delivers value for the consumer. These incentives may, at the discretion of the Regulatory Authorities be considered as part of the detailed design of system services.

8.7.3 Interaction with Energy and Capacity Markets

In principle the SEM Committee considers that the three revenue streams (energy, system services and capacity) should collectively work together to provide the appropriate incentives to the market for entry and exit. Therefore it is important not only that there is no double payments between revenue streams but also that the total revenues should incentivise the type of generation most needed by the system.

The SEM Committee has considered the potential interactions with the proposed high level design of the I-SEM energy trading arrangements and capacity remuneration mechanism. The SEM Committee is of the view that there are limited interactions between the possible System Service procurement mechanisms and the proposed I-SEM high level design. It is noted that there will be interactions at the detailed design phase but that this does not preclude any of the options under consideration in this paper.

To the extent that there is any interaction between the energy trading arrangements and system service payments depends mainly on the payment basis of the service. Services that are paid on a capability basis will have no interaction because a provider's payments under its system services contracts do not affect its activity in the energy market. For availability based payments there is a greater possibility of interaction. This is because a provider's market position will affect that provider's ability to potentially deliver the service. Dispatch based payments also have the possibility of interaction because whether a provider is dispatched (in either the energy market or for non-energy reasons by the TSO) will directly impact their eligibility for system services payment. The need to be either in the market or out of the market to receive system service payments may influence a provider's bidding strategy in the energy trading arrangements.

Table 12 Potential Interactions with the Energy Market				
Service	**Regulated Tariff**		**Multiple Bid Auctions**	
SIR	Capability	No interaction	Availability	Some interaction
FFR	Availability	Some interaction	Availability	Some interaction
FPFAPR	Capability	No interaction	Availability	Some interaction
SRP	Capability	No interaction	Availability	Some interaction
DRR	Capability	No interaction	Availability	Some interaction
Op Reserve	Dispatch	Some interaction	Dispatch	Some interaction
RRS/RRD	Dispatch	Some interaction	Dispatch	Some interaction
Ramping	Dispatch	Some interaction	Dispatch	Some interaction

Interaction between the system service and energy markets is mitigated firstly by the timeframes in which the prices are set. The system services pricing under the preferred options (Option 5, Multiple Bid Auctions, and Option 1, Regulated Tariffs) occurs well in advance of the day-ahead nominations in the proposed energy trading arrangements. Therefore all participants will have full knowledge of system service prices before submitting bids to the day-ahead, intraday and balancing markets. This removes the possibility of changes in energy prices between timeframes due to changes in the prices of system services and accordingly simplifies any potential interactions.

However, it is likely that providers will adjust their bids in the energy market to maximise total revenue in that trading period. Therefore, it can be expected that providers will include the opportunity cost of system service revenues into their bids. This should produce physical nominations that include the market's valuation of system services and make available to the system the most economically efficient providers.

Any deviation from the market nominations due to the TSO dispatching providers for system service reasons will be non-energy actions by the TSO. Such units will be treated on a pay-as-bid basis for energy in the balancing market and separately receive the appropriate system service payments. Therefore there should not be any particular distortion in the balancing market due to TSO actions regarding system services. There will be further consideration of TSO non-energy actions in the detailed design phase of I-SEM, a particular concern may be local market power issues in the balancing market (even assuming the system service price is set efficiently there is still a possibility that providers could game their energy bids in the expectation they will be dispatched for non-energy reasons). The bidding rules for the energy trading markets and the

interaction with system services will also require careful consideration during the detailed design phase of both.

The interaction with the capacity mechanism is slightly different in that it is the capability based payments that are likely to interact most, and dispatch based the least. This is because capability based payments give the greatest revenue certainty. Therefore, when a unit is estimating its revenues from energy and system services to determine its level of "missing money" there is considerably more certainty surrounding capability based payments. This should, all things equal, reduce capacity payments. Availability and dispatch should also reduce the required capacity revenues. While there is less certainty for providers, it should be possible to estimate availability based revenues with at least the same accuracy as energy revenue. Similarly dispatch based revenues could also be estimated although perhaps with less accuracy than availability based payments.

The SEM Committee wishes to minimise the possibility of the consumer paying twice for the same capacity. Therefore the SEM Committee is of the view that the system services auction should take place before the proposed capacity auction. This will facilitate providers of system services taking their system service revenues into account when participating in the proposed capacity auction. If sufficient capacity is being made available through energy and system service revenues then this should reduce the need for the consumer to pay for capacity.

Table 13 Potential Interactions with the Capacity Remuneration Mechanism (CRM)

Service	Regulated Tariff		Multiple Bid Auctions	
SIR	Capability	Greater interaction	Availability	Interaction
FFR	Availability	Interaction	Availability	Interaction
FPFAPR	Capability	Greater interaction	Availability	Interaction
SRP	Capability	Greater interaction	Availability	Interaction
DRR	Capability	Greater interaction	Availability	Interaction
Op Reserve	Dispatch	Less interaction	Dispatch	Less interaction
RRS/RRD	Dispatch	Less interaction	Dispatch	Less interaction
Ramping	Dispatch	Less interaction	Dispatch	Less interaction

In relation to Option 5, Multiple Bid Auctions, there is likely to be some interaction between the revenues earned through system services and the energy market and CRM. Providers may be incentivised to include the opportunity cost into their energy bids. For the CRM, providers will be able to estimate their system services revenue (with greater accuracy for availability based

payments than for dispatch based) and may therefore require less revenue from the CRM. As providers gain more experience in the I-SEM and system services market their ability to improve the accuracy of their forecast, it is likely to increase strengthening the interaction with the capacity mechanism (further reducing the risk of double payment). In relation to Option 1, Regulated Tariffs, interaction with the energy market will be confined to the dispatch based services. The interaction with the CRM will be greatest for the capability based services and lower for the dispatch based services.

8.7.4 Interaction with EU Network Codes

The relevant Network Codes which may have market and DS3 system services impact are the Load Frequency Control and Reserves (LFCR) Network Code and the Balancing Network Code (BNC). The LFCR is one of the Grid Operation codes and sets out the reserve requirements for the system, amongst other things. The reserve requirements set out in the LFCR are different for the Irish and GB systems than they are for the Continental or Nordic systems. There are restrictions on the sharing of reserves between synchronous areas with some forms of reserve sharing prohibited. However, these reserves may be shared between the Irish and GB systems. The LFCR forms the technical basis for the BNC. The BNC is one of the market codes and provides for the common procurement of balancing services.

The impact on System Services is unclear. The differing requirements under the LFCR places technical limitations on the common products that may be offered and while there may be a requirement for the TSO to offer common products it is not clear yet what the nature of this requirement will be. It is also possible that the initial procurement of the services by the TSO may not be affected by the requirement to offer these services to other systems. It is also important to note that not all the services will be affected. In particular the inertial response and voltage control products cannot be shared. It may be possible to offer the reserve products between systems but it is not clear that it will necessarily be required. The ramping products are not explicitly covered but it could be argued that ramping is a form of reserve.

These two codes have not been finalised yet and both are still open to change. LFCR has received a positive recommendation from ACER and has been submitted to the European Commission. It is expected to commence the comitology process later this year, probably concluding in 2015.

The BNC recently received a negative opinion from ACER. ENTSOE are now revising the BNC and will resubmit it to ACER. It will then be submitted to the European Commission with the ACER recommendation and opinion. The BNC will then enter the Comitology process. There will then, based on the current draft, be a further six-year implementation period.

Of all the services it is most likely that the replacement reserve services will be required to be procured on a cross-border basis. This should be possible under the various options albeit that these services may be procured differently. Option 1 does not provide for market based procurement and therefore it would be necessary to procure reserves outside the regulated tariff framework. This may complicate the periodic valuation process. Option 2 would be open to cross-border providers without any substantial change to the procurement mechanism although

the ex-post pricing may conflict with the European process. Option 3 would require a fundamental change to the procurement of reserves. However, as this option is based around the grouping of the services it would be possible to alter the procurement process for one group of services without impacting on the other groups of services. Option 4 could allow cross-border providers to take part in the annual auction process for the reserve group of services and receive payment when dispatched. There would be no significant alteration to the procurement mechanism required. Option 5 would similarly facilitate cross-border provision of reserve. Under both options 4 and 5 it would also be possible to run auctions more frequently than annually for the reserve products without significantly altering the overall procurement design.

9 SEM Committee Proposed Position

9.1 Introduction

In this section, the SEM Committee sets out its preferred option, at this stage, for the procurement of system services. The preferred approach outlined in this section has been arrived at following careful consideration of the quantitative and qualitative analysis outlined by the SEM Committee in the previous sections. It has considered the nature of the services themselves and the SEM Committee's criteria for selection of the most appropriate procurement mechanism for system services. In addition, the SEM Committee has considered the advice received from its consultants IPA, previous advice received from Pöyry and the views of the System Operators, expressed in their recommendations to the SEM Committee in May 2013.

9.2 SEM Committee Proposed Position

The SEM Committee has a preference for a competitive market-based solution for the procurement of system services, all things being equal. In this context the SEM Committee's statutory principal objective is noted:

> the SEM Committee in carrying out its functions under section 8A(4), is to protect the interests of consumers of electricity in [Ireland] and Northern Ireland supplied by authorised persons, ***wherever appropriate by promoting effective competition*** between persons engaged in, or in commercial activities connected with, the sale or purchase of electricity through the Single Electricity Market.[emphasis added]

Therefore it is the view of the SEM Committee that a market based approach to the procurement of system services should be favoured over a regulated approach, where concerns around market concentration or market power can be dealt with effectively and without adding undue complexity. However, where it is apparent that a market based solution will either fail to deliver the level of services required at an efficient price or where the level of market concentration demand significant regulatory oversight and input, the SEM Committee is of the view that a regulated approach should be taken for the procurement of system services.

Of the competitive options outlined in this paper (Option 3, Regulated Competition, Option 4 Split Auctions, Option 5 Multiple bid auctions) the SEM Committee's preference is for Option 5. Given the level of market concentration in system services and the consequent risk of market power it is considered that Option 3 (Regulated Competition) is the least viable of the market based solutions. Comparing Options 4 and 5, it is considered that Option 5 is preferable for a number of reasons. The format of the auctions in option 4 create complexity for providers bidding across several groups, while the pay-as-bid element of the long-term contracts may also increase the overall costs to consumers where there is a risk of the exercise of market power.

The design of Option 5 permits a market based approach to the appropriate grouping of services and will result in individual prices for each service, whereas Option 4 would produce four separate prices, one for each group, which is an additional level of complexity. Therefore the

Multiple Bid Auction will tend to produce a set of prices that best reflects the value of the marginal unit and will incentivise technology that can most efficiently provide the services most needed by the system. It will also be relatively easy to include new services into this framework as the need arises.

Based on the analysis set out in Section 8, the SEM Committee is of the view that of the regulated options, (that is Option 1 Regulated Tariffs and Option 2 System Services Pot), Option 1 is preferable as it provides greater certainty for investors and protection to consumers than Option 2. The SEM Committee also notes that where risks to the consumer in the competitive market options, associated with market power concerns are deemed to be excessive, the regulated approaches, in particular Option 1 can be considered to effectively mitigate this risk for consumers. On balance, where the market power risk to the consumer is excessive, a regulated approach should therefore be taken.

Therefore the SEM Committee is now minded to implement option 5 (Multiple Bid Auctions) as the procurement mechanism for system services. This approach should be considered the "starting point" for system services procurement. However, for those services that are highly concentrated and so lack sufficient competition a regulated tariff (Option 1) will be introduced. Where Option 1 is being implemented, the SEM Committee will ensure that the operational cost of service providers in providing the service to the system is recovered through the regulated tariff, along with an efficient rate of return in order to provide appropriate remuneration to service providers. Where a regulated tariff is required, the SEM Committee is minded to set this tariff based on a theoretical Best New Entrant ("BNE") plant/ service provider. The BNE calculation will be conducted by the Regulatory Authorities, with the assistance and input of the TSOs and will aim to establish the costs for the most efficient new provider of the services in question. This will set a pot of money for the provision of the services, against which a tariff will be set, using the TSO's modelled requirement for the appropriate volume of the service which it requires in any year. The SEM Committee will consider whether the Regulated Tariff should be set annually or whether it can be set on a three or five year basis. The SEM Committee welcomes views from respondents on this design. The mechanism may otherwise be as set out in Option 1.

In summary, the SEM Committee is proposing that Option 5 (Multiple Bid Auctions) will be implemented for the procurement of system services. Where the auction fails to deliver the required volume of services it is proposed to implement Regulated Tariffs for those services.

10 Request for Comments

10.1 Responses to this Paper

Responses to this paper are requested by **17.00 Friday 22nd August, 2014**. Following a review of the responses to this paper the SEM Committee will publish its decision on the proposals set out in this paper by the end of the year.

Responses should be sent, preferably by email, to Robert O'Rourke (rorourke@cer.ie) and Andrew McCorriston (Andrew.mccorriston@uregni.gov.uk). Please note that the SEM Committee intends to publish all responses unless marked confidential.[22]

10.2 Consultation Questions

The SEM Committee requests that respondents structure their responses as set out below. Given the complexity of the issues discussed in this paper and the anticipated detail of responses this will greatly facilitate the Regulatory Authorities in reviewing and comparing the issues raised by respondents.

1. Summary

It is requested that respondents provide a summary of their position and any general comments on the system services review and the economic analysis

2. Demand and Supply Side analysis

Respondents are asked to provide views on the approach to the demand and supply analysis, the results and the interpretation of those results

3. Procurement Designs

Do you agree with the criteria and analysis used by the SEM Committee to evaluate the options?

4. Procurement Options
   a. Do you agree with the design of the procurement options? Are there any different design elements or procurement options that the SEM Committee should consider?
   b. Do you agree with the SEM Committee's analysis of the procurement options?
   c. Which option do you prefer?

5. Option 5: Multiple Bid Auctions
   a. Do you agree which the SEM Committee's proposal to adopt this option and only to fall back on Option 1 (Regulated Tariffs) where the auction fails to deliver the required volume of services?

[22] While the SEM Committee does not intend to publish responses marked confidential please note that both Regulatory Authorities are subject to Freedom of Information legislation.

b. Are there any specific issues the SEM Committee should consider regarding the auction design?
c. Do you agree that market power mitigation measures are required?
d. Are the SEM Committee's proposals regarding market power sufficient? Should alternative or additional measures be considered?
e. Are there any specific requirements that the SEM Committee should include in the bidding rules?

6. Payment basis for the services

Do you agree with the proposed payment basis for each service/option?

7. Interaction with I-SEM
   a. Do you agree with the SEM Committee's views on the interaction with the energy market?
   b. Do you have any views on the potential interactions and the appropriate measures to address these interactions?

8. Other Issues

Are there any other issues not raised in this paper the SEM Committee should consider?

11 Conclusion

In SEM-13-098 the SEM Committee stated that it was of the view that the evidence provided from the results of the TSO's Facilitation of Renewables Studies (2010) and the Report on Ensuring a Secure, Reliable and Efficient Power System (2011) indicate that new and enhanced system services will be required to enable the TSOs to continue to operate the system in a secure and reliable manner as levels of wind generation on the system increase.

The SEM Committee considered, in SEM-13-098, that there is a need for new system services, in particular services that will reward flexibility and assist in the delivery of the 40% renewable targets in Ireland and Northern Ireland. The SEM Committee remains of this view.

Having reviewed the demand analysis from the TSO, the IPA report and the Regulatory Authorities' own analysis the SEM Committee concludes that there is a significant societal benefit to the introduction of system services, and is of the view that the procurement design should ensure that this results in direct benefits for consumers. The investment costs associated with generation based solutions are significantly lower than for network based solutions. Therefore the SEM Committee considers it appropriate that system services be procured from the market. The estimated investment costs associated with generation are also noticeably lower than the anticipated benefits. However, there is considerable uncertainty around the costs of investment and the nature of the technologies that will provide the services. For these reasons, in addition to its statutory obligations, the SEM Committee has a preference for a market-based procurement mechanism for System Services.

Five options were developed for consideration by the SEM Committee:

1. Regulated Tariff
2. System Services Pot
3. Regulated Competition
4. Split Auction
5. Multiple Bid Auction

Option 2, System Services Pot, was not favoured on the grounds of investment certainty. Option 3, Regulated Competition, was not favoured on the grounds of consumer interest. Of Options 4 and 5, the Multiple Bid Auction is preferred on the basis of the analysis presented in this paper. Option 1, Regulated Tariff, is considered to have merit and may be appropriate where there is insufficient competition for certain services.

The SEM Committee is minded to implement a Multiple Bid Auction design with the possibility of using a regulated tariff for those services that the auction could not provide.

12 Next Steps

The Regulatory Authorities will hold an industry workshop on **29th July 2014** in Dundalk. The details of this workshop will be published in the coming weeks. The consultation period for this paper will close at **17.00 on Friday 22nd August 2014**. The Regulatory Authorities will then review the responses and will be available to meet bilaterally during the first week in September with respondents who request such a meeting. The schedule for these meetings will be communicated to respondents following the close of the consultation period.

System services will be discussed by the SEM Committee at its October meeting and a decision will be published by the end of 2014. The implementation phase will commence following the publication of the SEM Committee's decision on system services. The SEM Committee will decide on and publish more information on the detailed design phase of system services (in discussion with the TSOs) alongside its final decision paper on the high level design of system services.