

A proposal for Rate of Change of Frequency Remuneration Mechanism Consultation 2015

22nd December 2015



EXECUTIVE SUMMARY

EirGrid and SONI have a responsibility to enable increased levels of renewable sources, such as wind and solar, to generate on the power system of Ireland and Northern Ireland. We must deliver this whilst also ensuring secure electricity supply and reducing energy costs for consumers. The Delivering a Secure Sustainable Electricity System (DS3) programme aims to address the challenges of integrating renewable generation on the power system. One of the key projects within DS3 is to resolve increased rate of change of frequency (RoCoF) that may arise on the system following large system disturbances.

Analysis has indicated that high RoCoF events could threaten the security of the power system during times of high system non-synchronous penetration (SNSP). To resolve this issue, EirGrid and SONI proposed increased RoCoF standards for generators connected to the power system. We have also engaged with the Distribution System Operators (DSOs) to change protection settings to allow for the higher standard. We believe that an increased RoCoF standard will reduce the level of curtailment for wind farms and will deliver significant savings to consumers through lower wholesale energy prices.

In April and May 2014, the Commission for Energy Regulation (CER) and Utility Regulator (UR) respectively decided in principle to introduce a Rate-of-Change-of-Frequency (RoCoF) Grid Code standard of 1 Hz/s for Ireland and 2 Hz/s for Northern Ireland (calculated over 500 ms)¹. The Grid Code modifications will only come into effect following confirmation from us that, from a system security perspective, they can be implemented. To determine this, the CER and UR directed that industry implementation projects comprising three strands be established in each jurisdiction. These three strands are as follows:

1. Generator Studies Project
2. TSO-DSO Implementation Project
3. Alternative Solutions Project

As part of the Generator Studies Project, we have been requested, by the SEM Committee, to investigate a remuneration mechanism for the generators.

We would like to clarify that following discussion with the RAs in November 2015, the remuneration mechanism will be a standalone scheme separate to the existing Harmonised Ancillary Services arrangement.

The purpose of this consultation, as part of the Generator Studies Project, is to obtain views on the proposal for Rate of Change of Frequency remuneration mechanism namely:

¹ Commission for Energy Regulation Decision paper: "Rate of Change of Frequency (RoCoF) modification to the Grid Code" CER/14/081
Utility Regulatory Decision Paper: "Rate of Change of Frequency modification to the Grid Code"

- The remuneration mechanism process which describes a generic sequence of events from study submission, testing, RoCoF contract award to processing payment.
- The remuneration mechanism methodology: the methodology is designed to complement the RoCoF GPI in Other System Charges where it utilised a modified version of the GPI equation described in section 3.2

$$c = 1500 \times d \times e$$

The RoCoF level in the proposed equation is set to 1 Hz/s across the island.

- Early completion incentive: an additional incentive payment for units which submit their completed study report ahead of 1st June 2016 with payments calculated from 1st March 2016.
- The remuneration scheme will expire on 28th February 2018.
- The RAs have clarified that only generators on the RoCoF categorization list will be eligible to participate in this remuneration mechanism.

Following this consultation we will prepare a recommendation to Regulatory Authorities and we anticipate that a decision for the mechanism and the implementation date will be made by the Regulatory Authorities. It is our expectation to introduce a RoCoF recovery mechanism in line with the RAs' final decision.

Table of Contents

EXECUTIVE SUMMARY	2
1. INTRODUCTION.....	5
2. INSTRUCTIONS FOR RESPONSE	6
3. REMUNERATION MECHANISM PROPOSAL	6
3.1 The remuneration mechanism process.....	7
Generic example 3.1.1: Unit submits completed RoCoF study report with no issues (1)	8
Generic example 3.1.2: Unit submits completed RoCoF study report which identifies that upgrades are required (2)	9
Generic example 3.1.3: Unit submits completed RoCoF study report with major issues identified (3)	9
3.2 The remuneration mechanism methodology.....	9
Example 3.2.1: a 400MW unit submitting their study report on 1 st June 2016.....	11
Example 3.2.2: a 400MW unit submitting their study report on 1 st December 2017	12
3.3 Early completion incentive for period 1 st March 2016 to 31 st May 2016.....	12
Example 3.3.1: a 400MW unit submitting their study report before 1 st March 2016	13
<i>Initial condition</i>	13
3.4 Duration of the remuneration scheme.....	16
3.5 Eligibility	16
3.6 Contact information following final decision by the Regulatory Authority.....	17
4. SUMMARY AND NEXT STEPS.....	17
ABBREVIATIONS	18

1. INTRODUCTION

EirGrid and SONI have a responsibility to enable increased levels of renewable sources, such as wind and solar, to generate on the power system of Ireland and Northern Ireland. We must deliver this whilst also ensuring secure electricity supply and reducing energy costs for consumers. The Delivering a Secure Sustainable Electricity System (DS3) programme aims to address the challenges of integrating renewable generation on the power system. One of the key projects within DS3 is to resolve increased rate of change of frequency (RoCoF) that may arise on the system following large system disturbances.

Analysis has indicated that high RoCoF events could threaten the security of the power system during times of high system non-synchronous penetration (SNSP). To resolve this issue, EirGrid and SONI proposed increased RoCoF standards for generators connected to the power system. We have also engaged with the Distribution System Operators (DSOs) to change protection settings to allow for the higher standard. We believe that an increased RoCoF standard will reduce the level of curtailment for wind farms and will deliver significant savings to consumers through lower wholesale energy prices.

In April and May 2014, the Commission for Energy Regulation (CER) and Utility Regulator (UR) respectively decided in principle to introduce a Rate-of-Change-of-Frequency (RoCoF) Grid Code standard of 1 Hz/s for Ireland and 2 Hz/s for Northern Ireland (calculated over 500 ms)². The Grid Code modifications will only come into effect following confirmation from us that, from a system security perspective, they can be implemented. To determine this, the CER and UR directed that industry implementation projects comprising three strands be established in each jurisdiction. These three strands are as follows:

1. Generator Studies Project
2. TSO-DSO Implementation Project
3. Alternative Solutions Project

As part of the Generator Studies Project, we have been requested, by the SEM Committee, to investigate a remuneration mechanism for the generators. The mechanism aims to incentivise timely completion of the project. Earlier completion of the project is of benefit and this is reflected in the remuneration mechanism.

The purpose of this consultation is to obtain views on the proposal for Rate of Change of Frequency remuneration scheme.

Following this consultation we will prepare a recommendation to Regulatory Authorities and we anticipate that a decision for the mechanism and the implementation date will be made by the Regulatory Authorities. It is our

² Commission for Energy Regulation Decision paper: "Rate of Change of Frequency (RoCoF) modification to the Grid Code" CER/14/081
Utility Regulatory Decision Paper: "Rate of Change of Frequency modification to the Grid Code"

expectation to introduce a RoCoF recovery mechanism in line with the RAs' final decision.

2. INSTRUCTIONS FOR RESPONSE

Respondents to this consultation paper are kindly requested to provide responses, views and comments on the proposals in this document. Responses should be sent to Amanda.Kelly@Eirgrid.com, Vivienne.Price@soni.ltd.uk or AS@Eirgrid.com.

Closing date is 5pm Monday 08th February, 2016

It would be helpful if comments were aligned with the sections of this consultation document. It would also be helpful if responses were not confidential. If confidentiality is required, this should be made clear in the response. Please note that, in any event, all responses will be provided to the Regulatory Authorities (RAs).

3. REMUNERATION MECHANISM PROPOSAL

The RAs' RoCoF modification to the Grid Code decision papers recommend that the SEM Committee request us to consider and propose the introduction of a remuneration mechanism which may include a new Harmonised Ancillary Service (HAS) rate for RoCoF.

In early 2015, as part of the Generator Studies Project, we have been requested, by the SEM Committee, to investigate a remuneration mechanism for the generators.

We presented a proposal to the RAs in June 2015 that would meet the needs of the remuneration mechanism for the generators. The proposed RoCoF remuneration scheme is envisaged to complement a Generator Performance Incentive (GPI) for RoCoF capability as defined in the RAs decision paper.

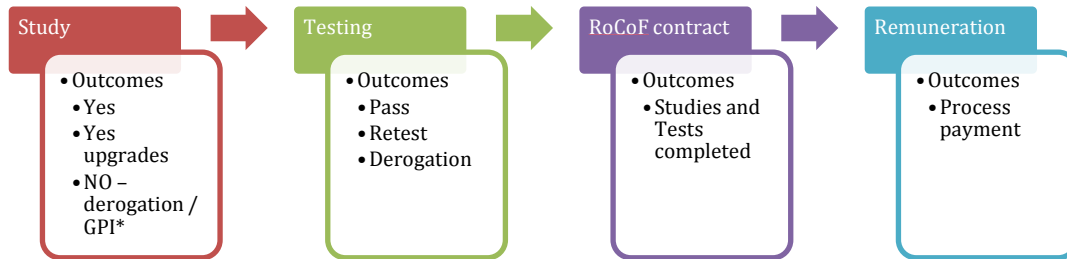
Subsequently, in September 2015, the RAs have provided their preliminary view in regard to the various options presented on our proposal. Furthermore we have received clarification in regard to eligibility from the RAs in November 2015.

The remuneration mechanism will be a standalone scheme separate to the existing Harmonised Ancillary Services arrangement.

We are now proposing the remuneration mechanism described in this section and would welcome participants' views on the merits of our proposal.

3.1 The remuneration mechanism process

The structure of the remuneration process proposed to be as follows:



* The GPI will exist in the Other System Charges and is indirectly linked to this process. The RoCoF GPI will be implemented in accordance with the decision set out in the CER/UR RoCoF decision paper³. The RAs have instructed us, as part of the decision, that, any GPI applied for late study submission will be non-refundable.

Diagram 3.1.1: Remuneration mechanism process

We would like participant to note that the RoCoF GPI is a Grid Code Compliance incentive under Other System Charges. It will be featured in the Other System Charges consultation TY 2016-2017 and the process described in this section refers to the remuneration mechanism only.

Please further note that any generators that need to prove compliance under Grid Code testing for RoCoF would be considered as under test in SEM. As a result, the relevant Tariff A rate for that year will apply. This is consistent with our formal response to RAs on new testing tariffs in 2015. The testing tariff will be featured in the relevant testing tariff consultation.

³ Commission for Energy Regulation Decision paper: "Rate of Change of Frequency (RoCoF) modification to the Grid Code" CER/14/081

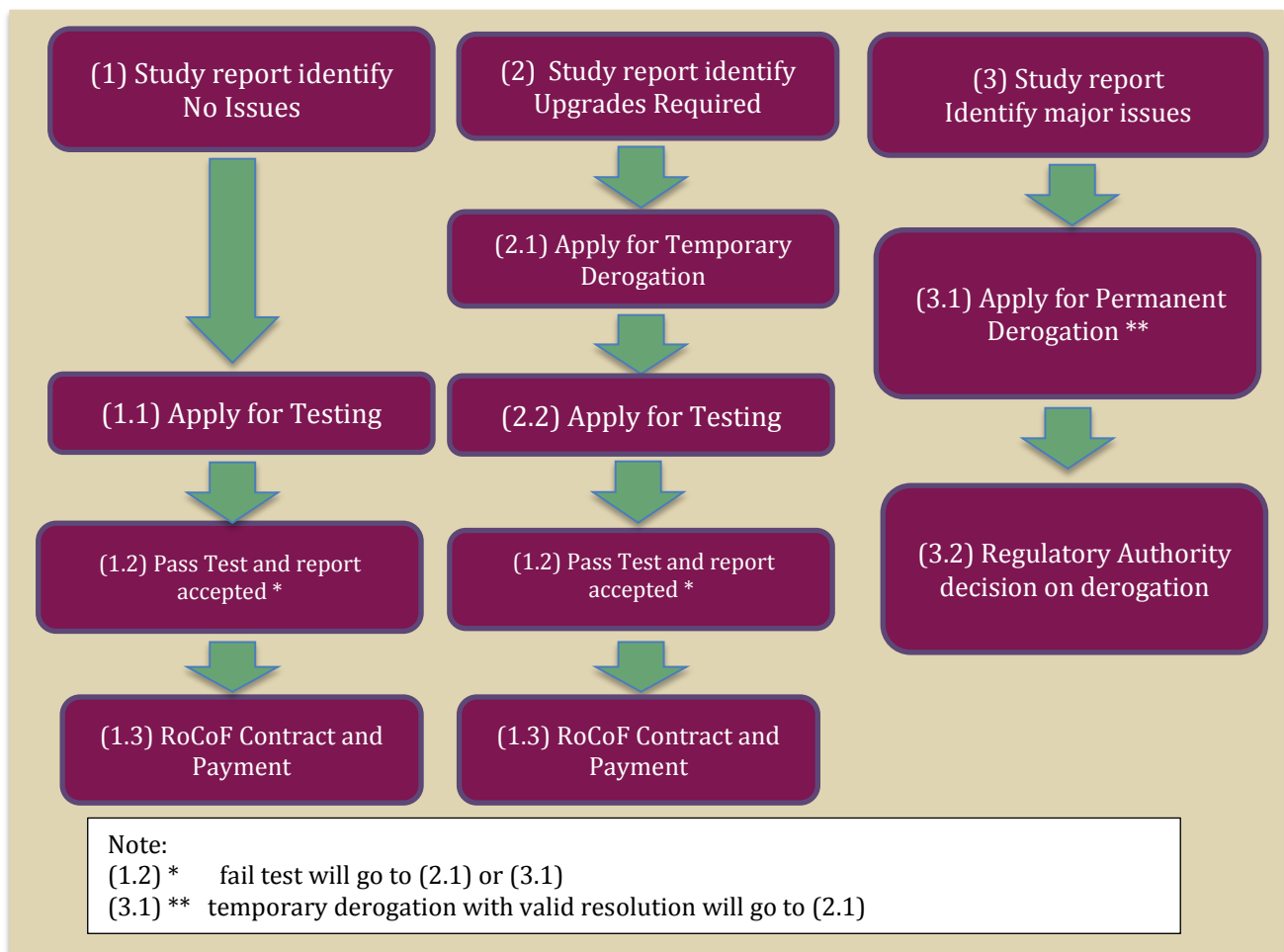


Diagram 3.1.2: High level overview of the remuneration mechanism process

The Diagram 3.1.2 above describes a generic sequence of events. The following three examples (3.1.1, 3.1.2 and 3.1.3) aim to provide more detail regarding the associated steps. Eligible generators should approach us with any queries on this process regarding their unit following final decision of the scheme as approved by the RAs. In relation to the RoCoF GPI in OSC, a more detailed description of the GPI process as per the RAs decision will be featured in the Other System consultation TY 2017-2018.

Generic example 3.1.1: Unit submits completed RoCoF study report with no issues (1)

- The RoCoF study report identifies no issues
- We validate the report and revert with our findings
- The unit applies for testing, normal testing request process applies (1.1)
- Unit submits the test report, normal process applies (1.2)

- Result of the test
 - i. Pass: it will receive a RoCoF contract and payment (1.3)
 - ii. Fail: it will go to (2.1) or (3.1)

Generic example 3.1.2: Unit submits completed RoCoF study report which identifies that upgrades are required (2)

- The RoCoF study report identifies an upgrade is needed
- Unit applies for temporary derogation (2.1)
- Unit applies for testing, normal testing request process applies (2.2)
- Unit submits the test report, normal process applies
- Result of the test
 - i. Pass: it will proceed to 1.3
 - ii. Fail: it will go to (2.1) or (3.1)

Generic example 3.1.3: Unit submits completed RoCoF study report with major issues identified (3)

- The report identifies major issues
- Unit applies for permanent derogation (3.1)
- or
- Go to (2.1) with resolution
- Await Regulatory Authority decision on derogation (3.2)

3.2 The remuneration mechanism methodology

The proposed remuneration mechanism methodology is designed to complement the RoCoF GPI calculation. The payments are to be based on a similar methodology used in the RAs’ RoCoF decision papers and utilises a modified version of the equation set out in the decision papers. The modified equation for RoCoF incentive payments is shown below:

$$c = 1500 \times d \times e$$

Where:

- c is the daily payment;
- d is a scalar associated with the size of the unit;
- e is a scalar associated the expiration of the defined generator study period which commenced on November 21st 2014; and
- 1500 is the monetary value.

It is assumed that the remuneration mechanism comes into effect after the expiration of the category one generators' deadline (21st May 2016). The remuneration mechanism can be scaled in a similar fashion to the GPI so that the day rate decreases in each six month period.

It is therefore assumed that the remuneration mechanism comes into effect on 1st June 2016 and runs until 28th February 2018. Scalar e is set to 100% for the period 1st June 2016 to 30th November 2016. The second six month period will then run from 1st December 2016 until 31st May 2017 with scalar e set to 75% and so on.

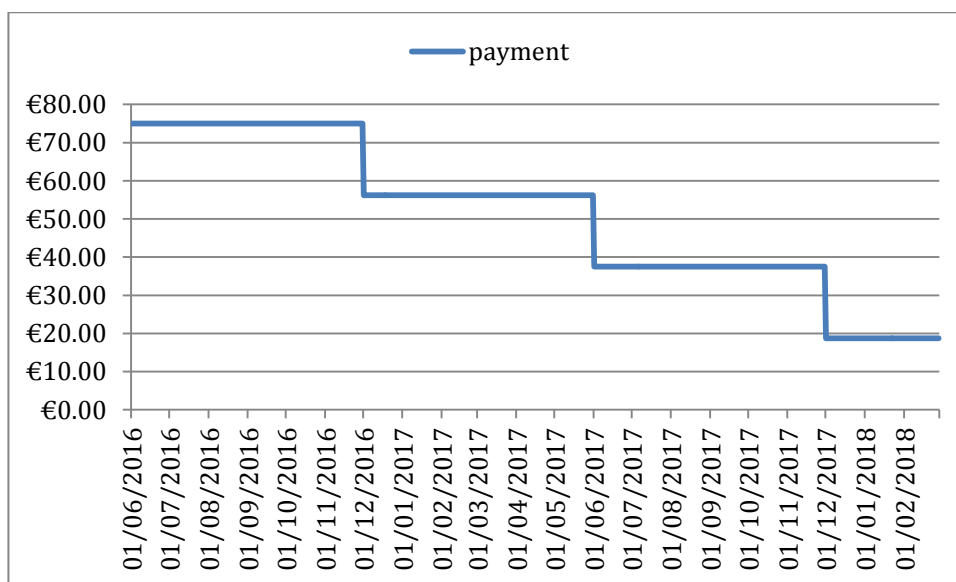


Diagram 3.1.3: Illustration of the daily rate decreases over the period of the scheme for a 400 MW unit

As discussed above, the proposed payments are based on the GPI methodology used in the RAs RoCoF decision papers and utilises a modified version of the equation.

The daily rates apply in accordance with the unit's registered capacity.

Table 3.2.1 below shows daily payments using the proposed equation
 $c = 1500 \times d \times e$

Registered Capacity (MW)	d	1 st Jun 2016 to 30 th Nov 2016 e = 100%	1 st Dec 2016 to 31 st May 2017 e = 75%	1 st Jun 2017 to 30 th Nov 2017 e=50%	1 st Dec 2017 to 28 th Feb 2018 e=25%
>= 400	1	€ 1,500.00	€ 1,125.00	€ 750.00	€ 375.00
>= 300	0.75	€ 1,125.00	€ 843.75	€ 562.50	€ 281.25
>= 200	0.5	€ 750.00	€ 562.50	€ 375.00	€ 187.50
>=100	0.25	€ 375.00	€ 281.25	€ 187.50	€ 93.75
>=50	0.15	€ 225.00	€ 168.75	€ 112.50	€ 56.25
<50	0.05	€ 75.00	€ 56.25	€ 37.50	€ 18.75

Table 3.2.1: Daily rate over the duration of the scheme

Registered Capacity (MW)	Maximum payment per unit for the full duration of the scheme from 1 st June 2016
>= 400	€ 650,250.00
>= 300	€ 487,687.50
>= 200	€ 325,125.00
>=100	€ 162,562.50
>=50	€ 97,537.50
<50	€ 32,512.50

Table 3.2.2: Maximum payment per unit for each category over the duration of the scheme

Please note that the examples described in section 3 are for illustrative purposes only. Eligible generators should approach us with any queries regarding their unit following final decision of the scheme as approved by the RAs.

Example 3.2.1: a 400MW unit submitting their study report on 1st June 2016

Initial condition

- A 400MW unit submits their study on 1st June 2016. It subsequently passes the Grid Code Compliance test on 1st September 2016.

Payment structure

- The unit will receive payment dated from the date of study submission (1st June 2016)
- From 1st June 2016 to 31st November 2016, the daily rate €1500 will apply
- From 1st December 2016 to 31st May 2017, the daily rate will reduce to €1125
- From 1st June 2017 to 31st November 2017, the daily rate will reduce to €750
- From 1st December 2017 to 28th February 2018, the daily rate will reduce to €375 and the scheme ends after this period

Conclusion

- The unit will received a total payment of €650,250 from the scheme

Please note that the unit will not receive any payment until it has successfully passed Grid Code Compliance testing. In this example, the unit would receive payment after 1st September 2016 when the test report has been agreed and awarded a pass status by us.

Example 3.2.2: a 400MW unit submitting their study report on 1st December 2017

Initial condition

- A 400MW unit submits their study on 1st December 2017. It subsequently passes the Grid Code Compliance test on 1st March 2018.

Payment structure

- The unit will receive payment dated from the date of study submission (1st December 2017)
- From 1st December 2017 to 28th February 2018, the daily rate will reduce to €375 and the scheme ends after this period

Conclusion

- The unit will received a total payment of €33,750 from the scheme

Please note that the unit will not receive any payment until it has successfully passed Grid Code Compliance testing. In this example, the unit would receive payment after 1st March 2018 when the test report has been agreed and awarded a pass status by us.

3.3 Early completion incentive for period 1st March 2016 to 31st May 2016

In November 2015, the RAs have asked us to consider an incentive for early completion of the RoCoF study.

With reference to the equation described in section 3.1, we propose that any unit that submits a complete RoCoF study ahead of 1st June 2016 will be eligible for an additional incentive payment for a period of time starting on 1st March 2016 with the e scalar set to 125% from the same equation.

From 1st March 2016 to 31st May 2016, a generator would receive an additional incentive payment. This is the maximum payment available from the scheme and the payment for submission earlier than 1st March 2016 will be the same as that received for submission on 1st March 2016.

Registered Capacity (MW)	1 st March 2016 to 31 st May 2016 e = 125%
>= 400	€ 1,875.00
>= 300	€ 1,406.25
>= 200	€ 937.50
>=100	€ 468.75
>=50	€ 281.25
<50	€ 93.75

Table 3.3.1: Additional incentive payment daily rate for early completion

Registered Capacity (MW)	Maximum payment per unit for the full duration of the scheme from 1 st March 2016 to 31 st May 2016
>= 400	€ 172,500.00
>= 300	€ 129,375.00
>= 200	€ 86,250.00
>=100	€ 43,125.00
>=50	€ 25,875.00
<50	€ 8,625.00

Table 3.3.2: Maximum payment per unit for each category incentivized for early completion

Registered Capacity (MW)	Maximum payment per unit for the full duration of the scheme from 1 st March 2016 to 28 th February 2018
>= 400	€ 822,750.00
>= 300	€ 617,062.50
>= 200	€ 411,375.00
>=100	€ 205,687.50
>=50	€ 123,412.50
<50	€ 41,137.50

Table 3.3.3: Maximum payment per unit for each category over the scheme including the incentives

Example 3.3.1: a 400MW unit submitting their study report before 1st March 2016

Initial condition

- A 400MW unit submitted their study on or before 1st March 2016 and subsequently passed the Grid Code Compliance test on 1st July 2016.

The early completion incentive

- The unit will receive an additional incentive payment of €1,875 daily from 1st March 2016 to 31st May 2016 i.e. a maximum payment of €172,500 for this quarter.

Payment Structure as described in section 3.2fi

- Then it will follow the same structure proposed in section 3.2
- From 1st June 2016 to 31st November 2016, the daily rate €1,500 will apply
- From 1st December 2016 to 31st May 2017, the daily rate will reduce to €1125
- From 1st June 2017 to 31st November 2017, the daily rate will reduce to €750
- From 1st December 2017 to 28th February 2018, the daily rate will reduce to €375 and the scheme ends after this period

Conclusion

- The unit will received a total payment of €822,750 from the scheme

Please note that the unit will not receive any payment until it has successfully passed Grid Code Compliance testing. In this example, the unit would receive payment after 1st July 2016 when the test report has been agreed and awarded a pass status by us.

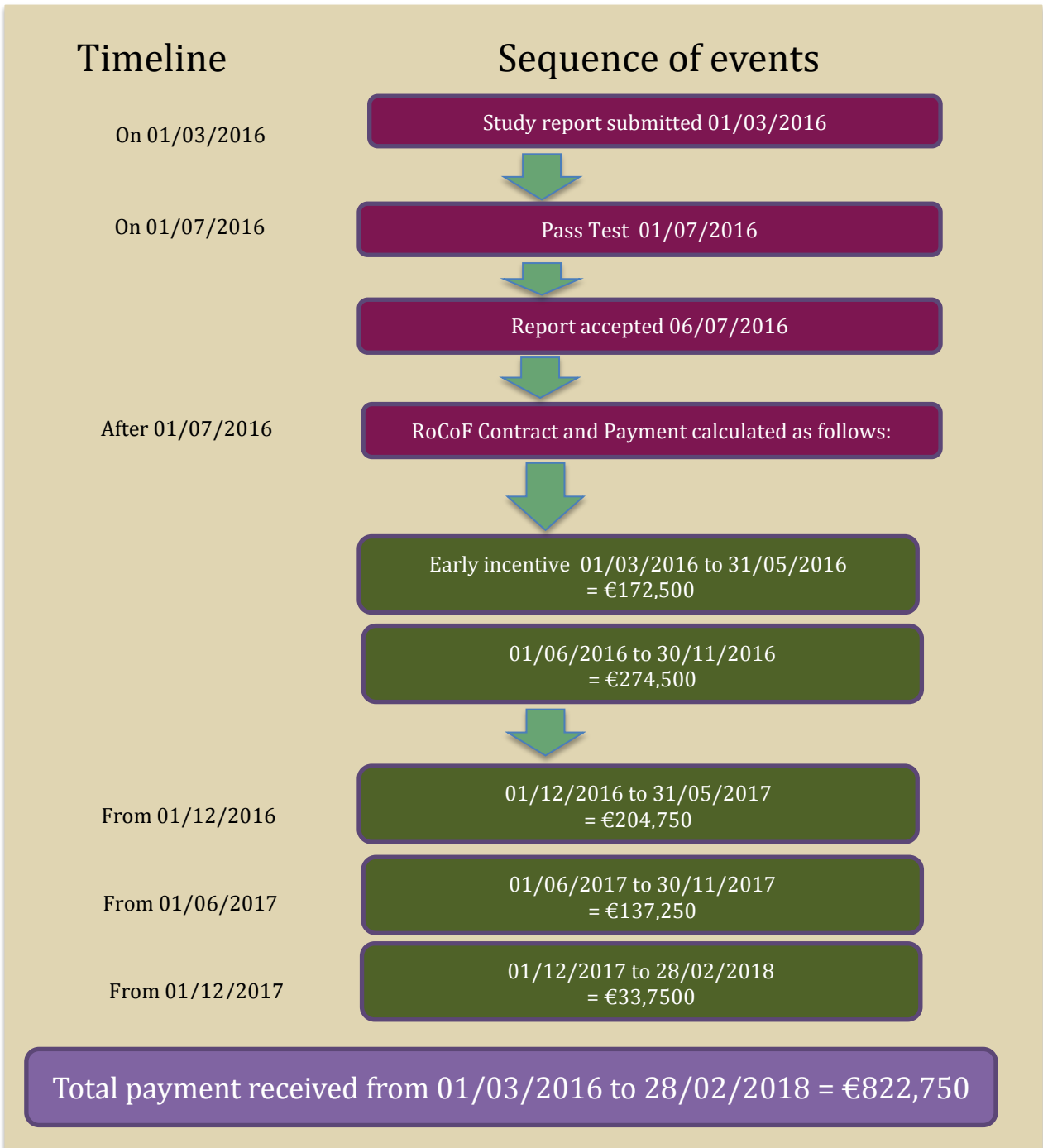


Diagram 3.3.1: Illustration of the process described in example 3.3.1

3.4 Duration of the remuneration scheme

In line with the CER RoCoF decision paper⁴, the scheme will run for a limited period of time.

As described in section 3.2, we are proposing to start the remuneration payments at a full amount and reduce the rate over the period of the project. The proposal in section 3.3 aims to incentivize early completion of the project.

In both cases, the incentive will ‘expire’ after the completion of the project timeline on 28th February 2018. This implies that the scheme will commence on 1st March 2016 and conclude on 28th February 2018 for early submissions. The regular scheme for on-time submission will commence on 1st June 2016 will end on 28th February 2018.

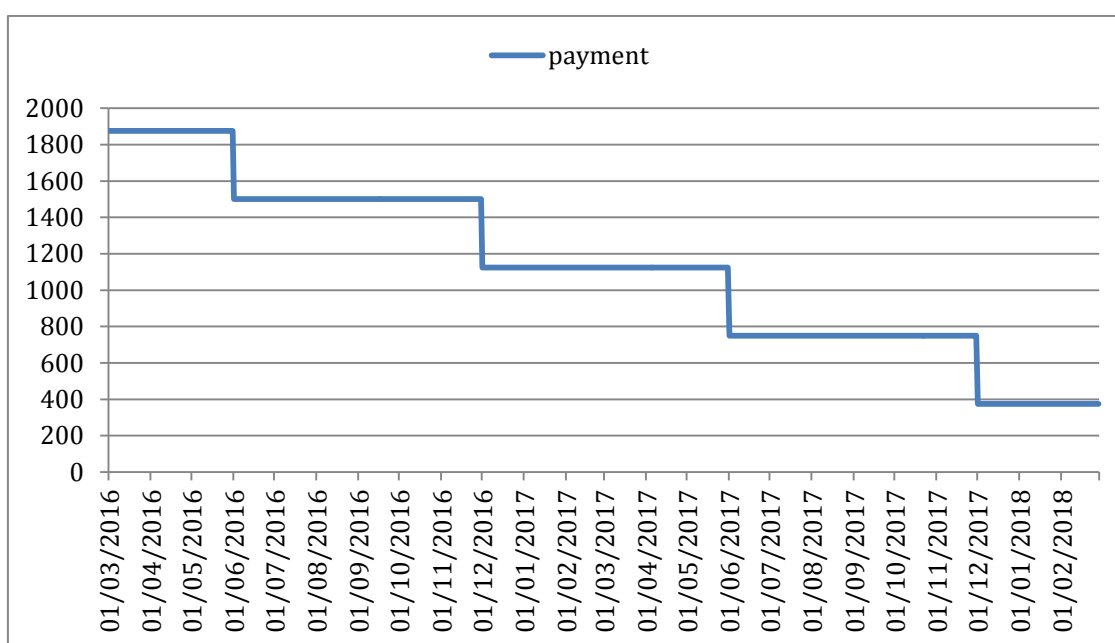


Diagram 3.4.1: An Illustration of the daily rate remain constant during incentive period and decreases over the duration of the scheme for a 400MW unit

3.5 Eligibility

As stated in the CER RoCoF decision paper, “the CER acknowledges that in addition to the cost associated with the studies there will be operational costs associated with higher RoCoF events. Such cost may not be recoverable through energy bids. Accordingly the CER and the Utility Regulator in Northern Ireland will recommend that the SEM Committee request the TSOs to consider and propose the introduction of remuneration mechanism which may include a new Harmonised Ancillary

⁴ <http://www.cer.ie/docs/000260/CER14081%20ROCOF%20Decision%20Paper%20-%20FINAL%20FOR%20PUBLICATION.pdf>

Services (HAS) rate for RoCoF. It is envisaged that all generators demonstrating compliance with the 1Hz/s standard would be eligible for a period of time.”

In November 2015, the RAs clarified that only generators included on the RoCoF categorisation list will be eligible to participate in this remuneration mechanism. Please note that exempt units from the category list will not receive any payment.

Eligible generators will be awarded a RoCoF contract by EirGrid and SONI as set out in the proposed process as described in section 3.2. The remuneration package will be implemented in line with the RAs’ final decision.

3.6 Contact information following final decision by the Regulatory Authority

Following the final decision of the scheme approved by the RAs. Eligible generators should contact us with any queries regarding their unit. Please email AS@eirgrid.com.

4. SUMMARY AND NEXT STEPS

Comments are invited from interested parties on this consultation paper and should be aligned with the sections and sub-sections of this document. If confidentiality is required, this should be made explicit in the response as the comments will be published on our websites⁵. Please note that, in any event, all responses will be provided to the RAs.

The closing date for responses is **5pm Monday 08th February, 2016**.

- We will consider the comments received on the consultation paper and make recommendations to the RAs based on these;
- The RAs will approve/reject the recommendations proposed by us in light of the responses received; and
- We will implement in accordance with the RAs decision paper.

⁵ www.eirgrid.com and www.soni.ltd.uk

ABBREVIATIONS

AS	Ancillary Service
CER	Commission for Energy Regulation
DSO	Distribution System Operator
HAS	Harmonised Ancillary Services
GPI	Generator Performance Incentive
RA	Regulatory Authority
RoCoF	Rate of Change of Frequency
SEM	Single Electricity Market
SONI	System Operator Northern Ireland
TSO	Transmission System Operator
TY	Tariff Year
UR	Utility regulator Northern Ireland