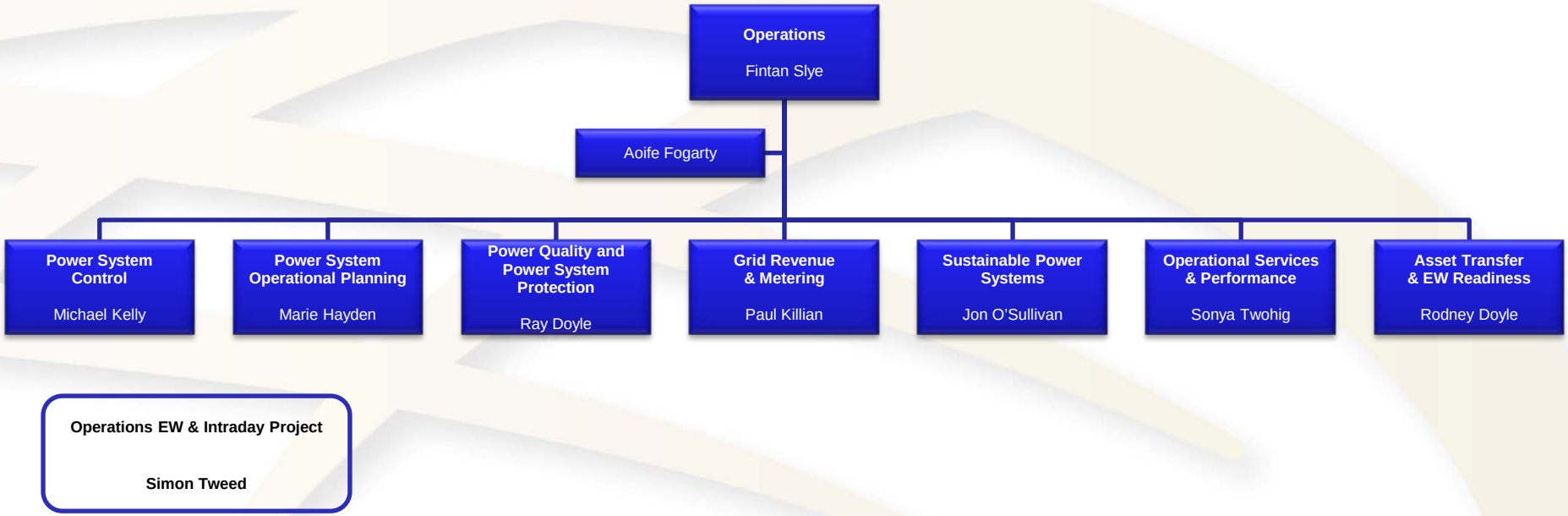
TUoS / AS Presentations

# Overview of Ancillary Services & Other System Charges

**18th May 2011**

**Dave Carroll**

# Operations Overview



# OSP Responsibilities

## AS, OSC, Performance Monitoring & Grid Code

- AS Policy, Design & Rates
- Grid Code
- OSC Policy, Design & Rates
- Performance Monitoring

## Testing & Commissioning

- Conventional
- Wind
- Test Pack Development
- DSO Agreement / Processes
- RTU specification

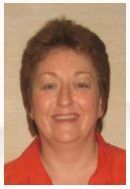
## DSM & SEM

- CPM
- DBC
- DSM
  - WPDRS
- STAR/IL
- T&SC Compliance
- T&SC Modifications
- VTOD

# OSP Responsibilities

Sonya Twohig
(Manager)

## AS, OSC, Performance Monitoring & Grid Code



Anne Trotter
(Team Lead)

Dave Carroll

Arlene Chawke

## Testing & Commissioning

Miriam Ryan
(Team Lead)

Oisin Goulding

Daniel Joyce

Karl O' Keeffe

## DSM & SEM

Gill Nolan
(Team Lead)

Sean Connolly

Siobhán Mc Hugh

# Grid Revenue and Metering (GRM)

Grid Revenue and Metering (GRM) are responsible for the settlement of Ancillary Services Payments and Other System Charges.

| | |
|---|---|
| GRM Manager: | Paul Killian |
| Senior Controllers: | Brendan Finnegan & Keith Cusack |
| Analyst: | John O'Dea |

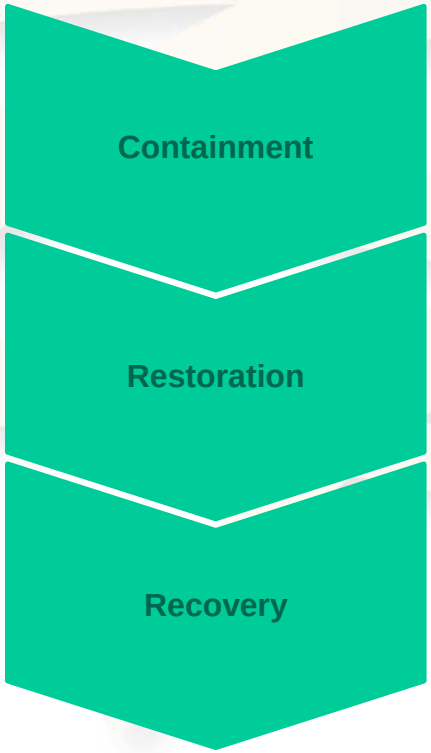
**Reserve**

**Ancillary Services**

# Reserve

# Ancillary Services

Based on worst credible single contingency – Largest In-Feed (LIF)




| | Timescale | Requirement |
|---|---|---|
| Primary OR **(POR)** | 5 – 15 s | 75% of LIF |
| Secondary OR **(SOR)** | 15 – 90 s | 75% of LIF |
| Tertiary 1 OR **TOR1** | 90 s – 5 min | 100% of LIF |
| Tertiary 2 OR **(TOR2)** | 5 min – 20 min | 100% of LIF |
| Replacement **(RR)** | 20 min – 4 hr | 100% of LIF |

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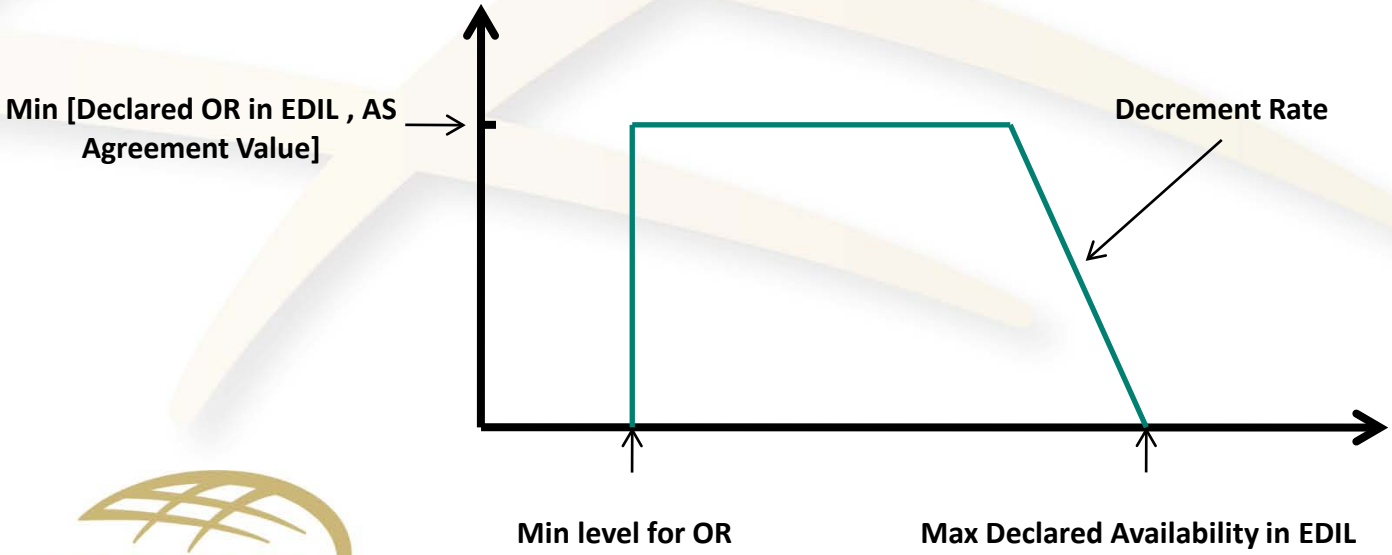
# Reserve

# Ancillary Services

For any category of reserve if output of generating unit >= contracted minimum OR level then:

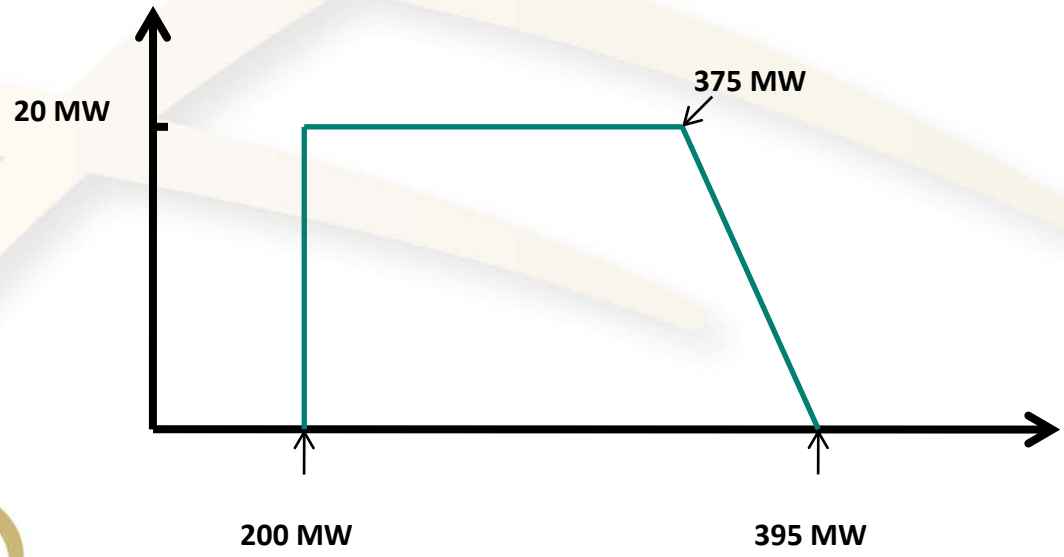
$$\text{OR Payment}_{TP} = \text{Availability} * \text{Rate} * \text{Scaling Factor}$$

Availability = average position on reserve curve during TP



Example - Dave Carroll Generating Co Ltd

- 400 MW CCGT (declared available for 395 MW due to ambients)
- 20 MW POR
- Min OR level of 200 MW for POR
- Dec Rate of -1

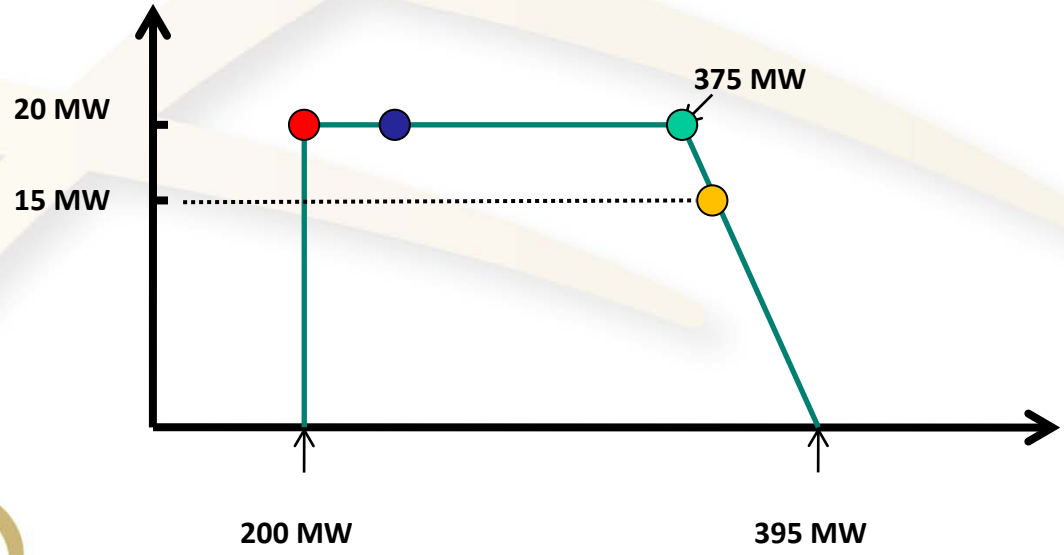


# Reserve

# Ancillary Services

Example - Dave Carroll Generating Co Ltd

- Exporting 200 MW - 20 MW POR available
- Exporting 250 MW - 20 MW POR available
- Exporting 375 MW - 20 MW POR available
- Exporting 380 MW - 15 MW POR available (395 MW – 380 MW)



# Reserve

# Ancillary Services

For any category of reserve if output of generating unit >= contracted minimum OR level then:

$$\text{OR Payment}_{TP} = \text{Availability} * \text{Rate} * \text{Scaling Factor}$$

| Category | EDIL | Rate (€/MWh) |
|---|---|---|
| Primary OR | POR | 2.22 |
| Secondary OR | SOR | 2.13 |
| Tertiary 1 OR | TOR1 | 1.76 |
| Tertiary 2 OR | TOR2 | 0.88 |
| Replacement Sync'd | RR | 0.20 |
| Replacement Desync'd | RR | 0.51 |

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For any category of reserve if output of generating unit >= contracted minimum OR level then:

$$\text{OR Payment}_{TP} = \text{Availability} * \text{Rate} * \text{Scaling Factor}$$

$$\frac{\text{Declared OR} + \text{Contracted OR}}{2 * \text{Contracted OR}}$$

- Important to ensure that Declared RP = Contracted RP

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## Reserve

## Ancillary Services

- In the event of frequency incident < 49.5 Hz then if there is a reserve shortfall:

| OR Charge = Shortfall * Rate * 30 days |
|---|

- Only charged for shortfall for POR, SOR & TOR1
- Monthly charge is capped at monthly payments
- Reports on all incidents are sent to generating stations 0-3 days after event

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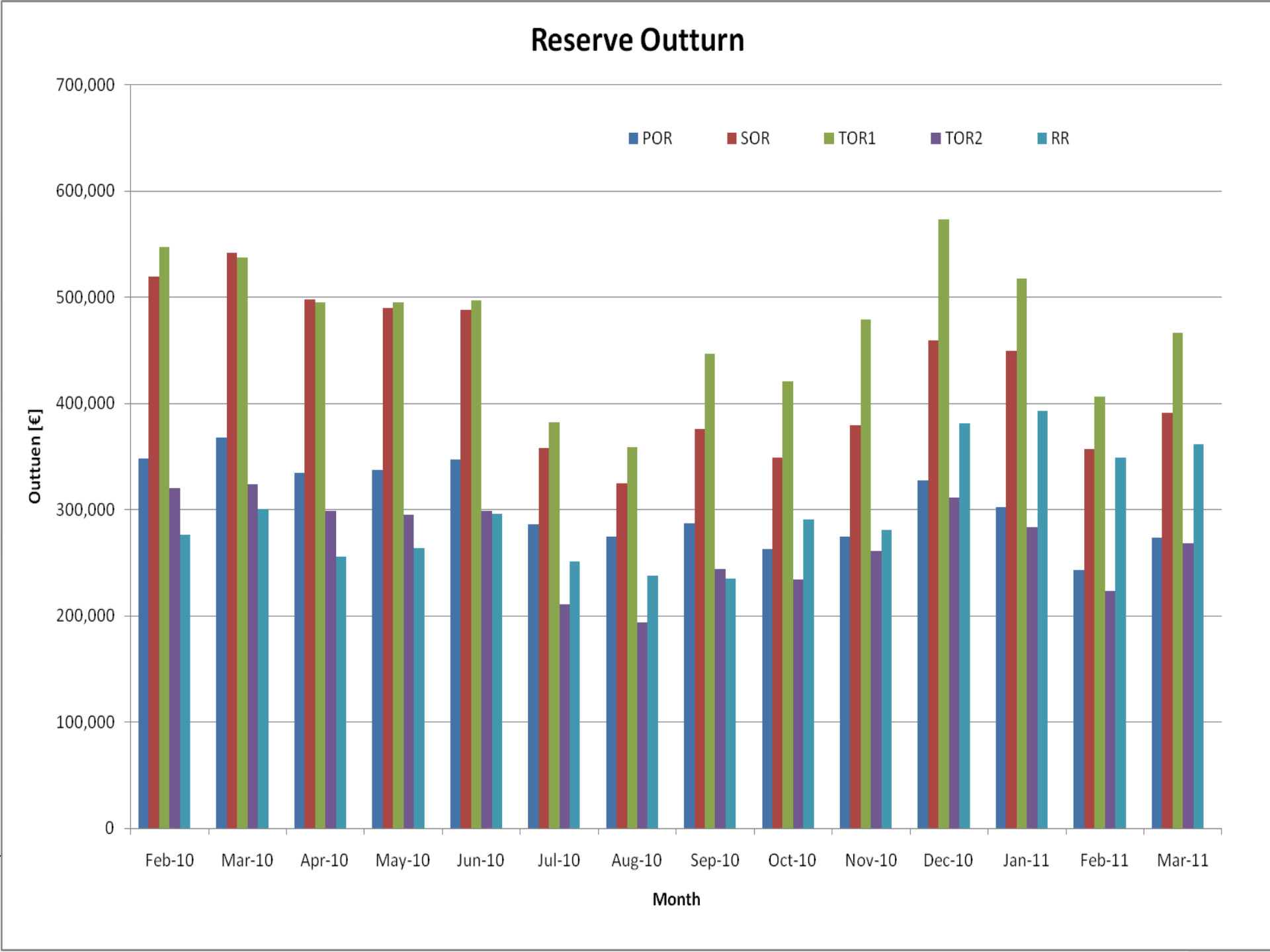
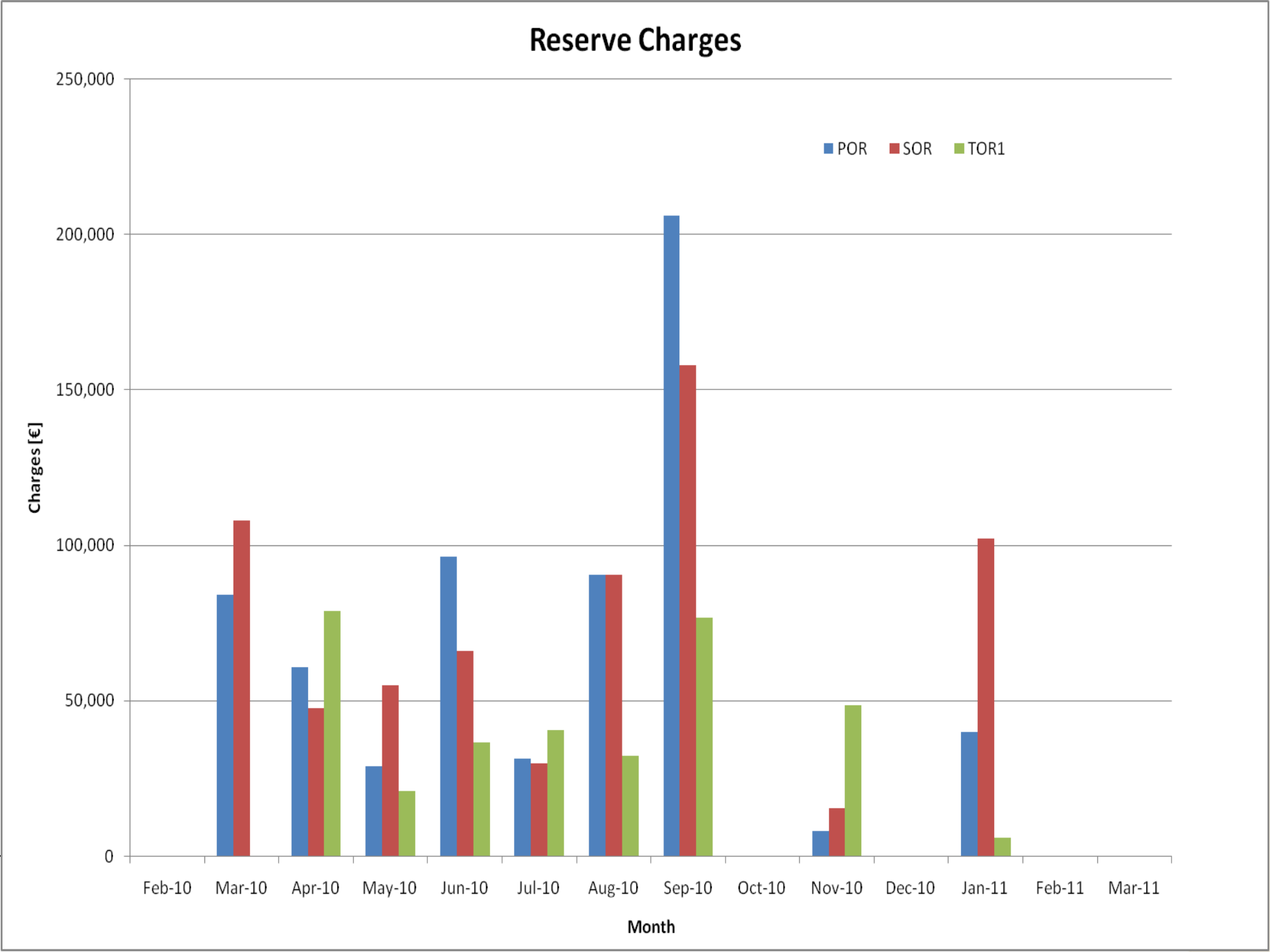

Reserve Outturn
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Outtuen [€]
POR
SOR
TOR1
TOR2
RR
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Month


Reserve Charges
250,000
200,000
150,000
100,000
50,000
0
Charges [€]
POR
SOR
TOR1
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Month

**Reactive Power**

**Ancillary Services**

# Reactive Power - Conventional Ancillary Services

For any category of reactive power if output of generating unit >= contracted synchronising load then:

$$\text{RP Payment}_{TP} = \text{Declared} * \text{Rate} * \text{Scaling Factor} * \text{AVR}$$

Declared = minimum [declared RP in EDIL , AS Agreement Value]

# Reactive Power - Conventional Ancillary Services

For any category of reactive power if output of generating unit >= contracted synchronising load then:

$$\text{RP Payment}_{TP} = \text{Declared} * \text{Rate} * \text{Scaling Factor} * \text{AVR}$$

| Category | EDIL | Rate (€/MVAr) |
|---|---|---|
| RP Leading | MDLD | 0.13 |
| RP Lagging | MDLG | 0.13 |

IF AVR declared 'YES' in EDIL then payment is doubled

# Reactive Power - Conventional Ancillary Services

For any category of reactive power if output of generating unit >= contracted synchronising load then:

$$\text{RP Payment}_{TP} = \text{Declared} * \text{Rate} * \text{Scaling Factor} * \text{AVR}$$

$$\frac{\text{Declared RP} + \text{Contracted RP}}{2 * \text{Contracted RP}}$$

- Important to ensure that Declared RP = Contracted RP
- Declared & Contracted RP value based on capability at max output

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# Reactive Power - Windfarms Ancillary Services

Reactive Power Payments for windfarms based on windfarm specific capability curve:

$$RP\ Payment_{TP} =$$

$$(RP\ Leading\ Capability * RP\ Leading\ Rate * AVR\ Status) +$$

$$(RP\ Lagging\ Capability * RP\ Lagging\ Rate * AVR\ Status)$$

- provide a varying RP capability range at varying active power output.
- automatically & continuously vary RP output in order to regulate system voltage.
- receive a voltage regulation set-point and respond to any changes in voltage set point.
- maintain a reactive power output consistent with the voltage regulation setpoint at varying active power output (within the constraints of the reactive power characteristic curve

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# Reactive Power - Windfarms

# Ancillary Services

| Wind Farm Output | | Grid Code | |
|---|---|---|---|
| % Max MW | MW Output | RP Leading | RP Lagging |
| [%] | [MW] | [MVAr] | [MVAr] |
| 0% | 0 | 0.0 | 0.0 |
| 3% | 1 | 0.7 | 0.7 |
| 7% | 2 | 1.3 | 1.3 |
| 10% | 3 | 2.0 | 2.0 |
| 13% | 4 | 2.6 | 2.6 |
| 17% | 5 | 3.3 | 3.3 |
| 20% | 6 | 3.9 | 3.9 |
| 23% | 7 | 4.6 | 4.6 |
| 27% | 8 | 5.3 | 5.3 |
| 30% | 9 | 5.9 | 5.9 |
| 33% | 10 | 6.6 | 6.6 |
| 37% | 11 | 7.2 | 7.2 |
| 40% | 12 | 7.9 | 7.9 |
| 43% | 13 | 8.5 | 8.5 |
| 47% | 14 | 9.2 | 9.2 |
| 50% | 15 | 9.9 | 9.9 |
| 53% | 16 | 9.9 | 9.9 |
| 57% | 17 | 9.9 | 9.9 |
| 60% | 18 | 9.9 | 9.9 |
| 63% | 19 | 9.9 | 9.9 |
| 67% | 20 | 9.9 | 9.9 |
| 70% | 21 | 9.9 | 9.9 |
| 73% | 22 | 9.9 | 9.9 |
| 77% | 23 | 9.9 | 9.9 |
| 80% | 24 | 9.9 | 9.9 |
| 83% | 25 | 9.9 | 9.9 |
| 87% | 26 | 9.9 | 9.9 |
| 90% | 27 | 9.9 | 9.9 |
| 93% | 28 | 9.9 | 9.9 |
| 97% | 29 | 9.9 | 9.9 |
| 100% | 30 | 9.9 | 9.9 |

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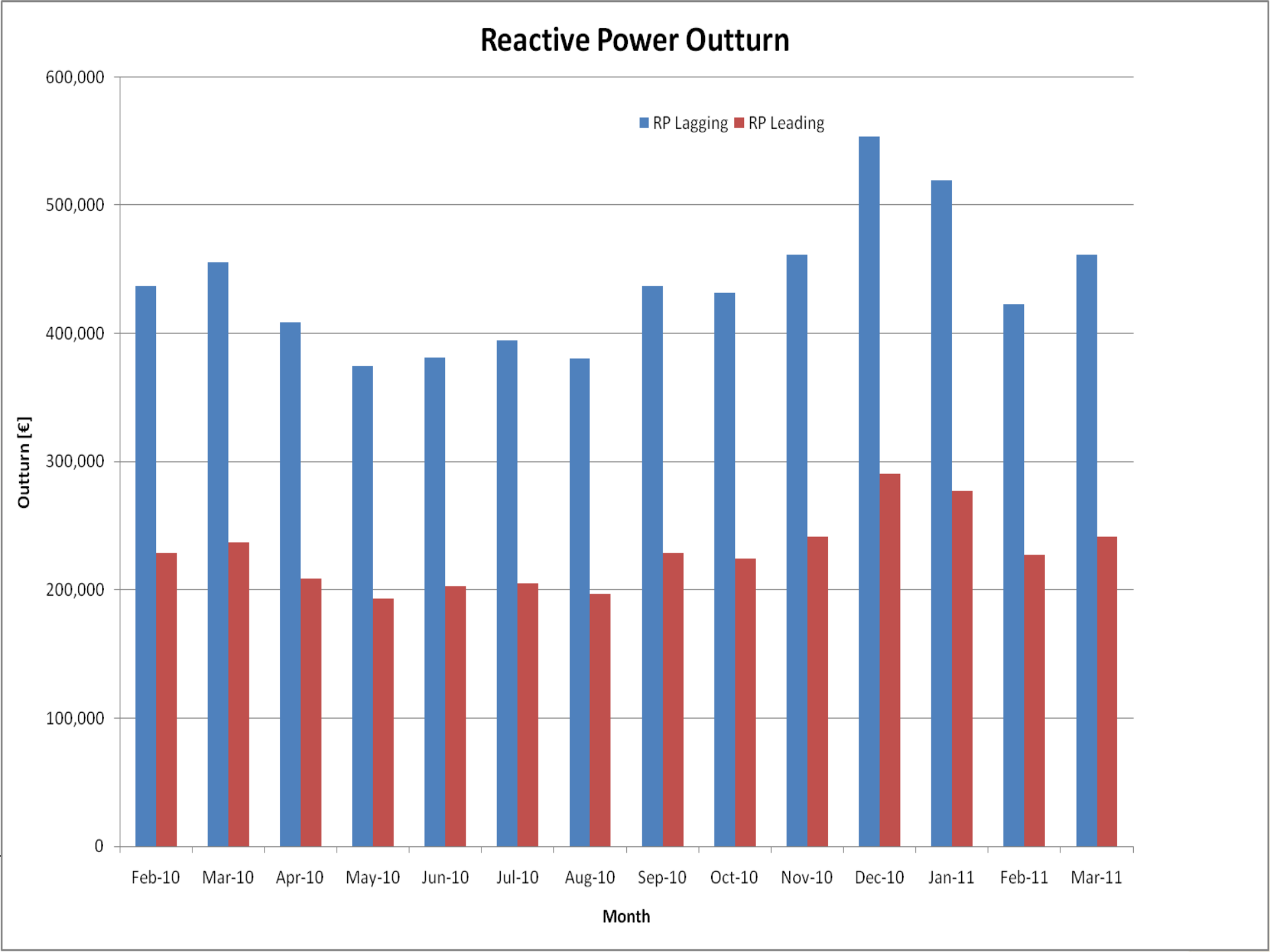
Reactive Power Outturn
600,000
500,000
400,000
300,000
200,000
100,000
0
Outturn [€]
RP Lagging
RP Leading
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Month

**Black Start**

**Ancillary Services**

# Black Start

## Ancillary Services

BS payments made to generating stations which have been contracted through the AS Agreement:

$$\text{BS Payment}_{TP} = \text{Capability} * \text{Rate}$$

Capability = Declared *BLST* in EDIL = Yes or No

Rate:

| Station | Rate (€/h) |
|---|---|
| Cushaling Power Ltd | 42.26 |
| ESB Aghada | 64.71 |
| ESB Ardnacrusha | 22.84 |
| ESB Erne | 22.04 |
| ESB Lee | 9.82 |
| ESB Liffey | 8.02 |
| ESB Turlough Hill | 81.63 |

**Trips**

**Other System Charges**

# Trips

# Other System Charges

- Three types of trip charges:
  - Direct Trip Trip > 15 MW/s
  - Fast Wind Down 3 MW/s > Trip < 15 MW/s
  - Slow Wind Down 1 MW/s > Trip < 3 MW/s

$$\text{Trip Charge} = \text{Trip Rate} * e^{(\text{Trip Constant} * (\text{MW Loss} - \text{Trip Threshold}))}$$

| Parameter | Rate |
|---|---|
| Direct Trip Charge Rate | €4,000 |
| Fast Wind Down Charge Rate | €3,000 |
| Slow Wind Down Charge Rate | €2,000 |
| Direct Trip Constant | 0.01 |
| Fast Wind Down Constant | 0.009 |
| Slow Wind Down Constant | 0.008 |
| Trip MW Loss Threshold | 100 MW |

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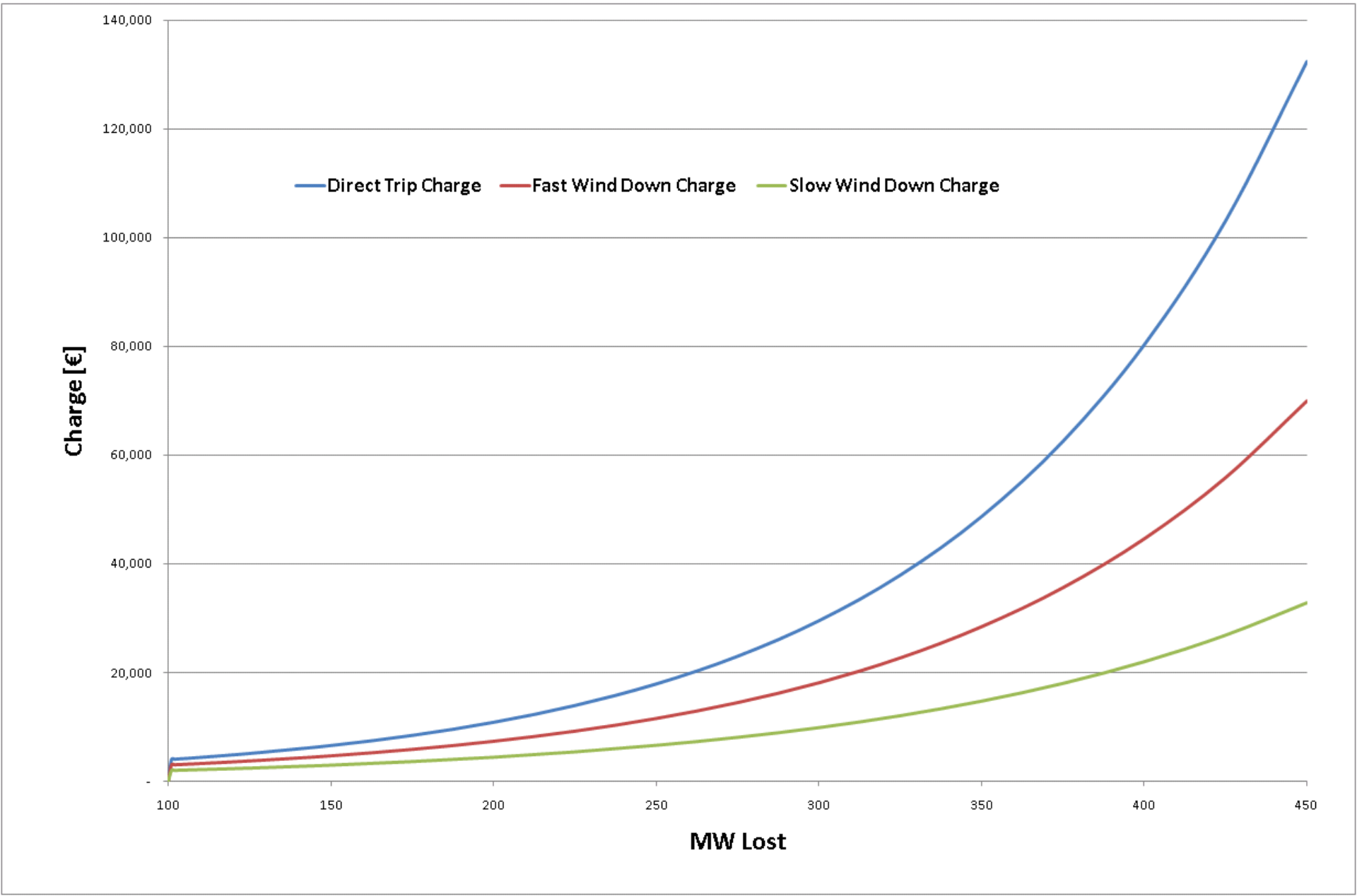
# Trips

# Other System Charges



| | Feb-10 | Mar-10 | Apr-10 | May-10 | Jun-10 | Jul-10 | Aug-10 | Sep-10 |
|---|---|---|---|---|---|---|---|---|
| Direct Trips [Number] | 3 | 2 | 1 | 4 | 1 | 4 | 3 | 2 |
| Fast Wind downs [Number] | 0 | 2 | 0 | 1 | 0 | 0 | 2 | 5 |
| Slow Wind downs [Number] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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SNDs

Other System Charges

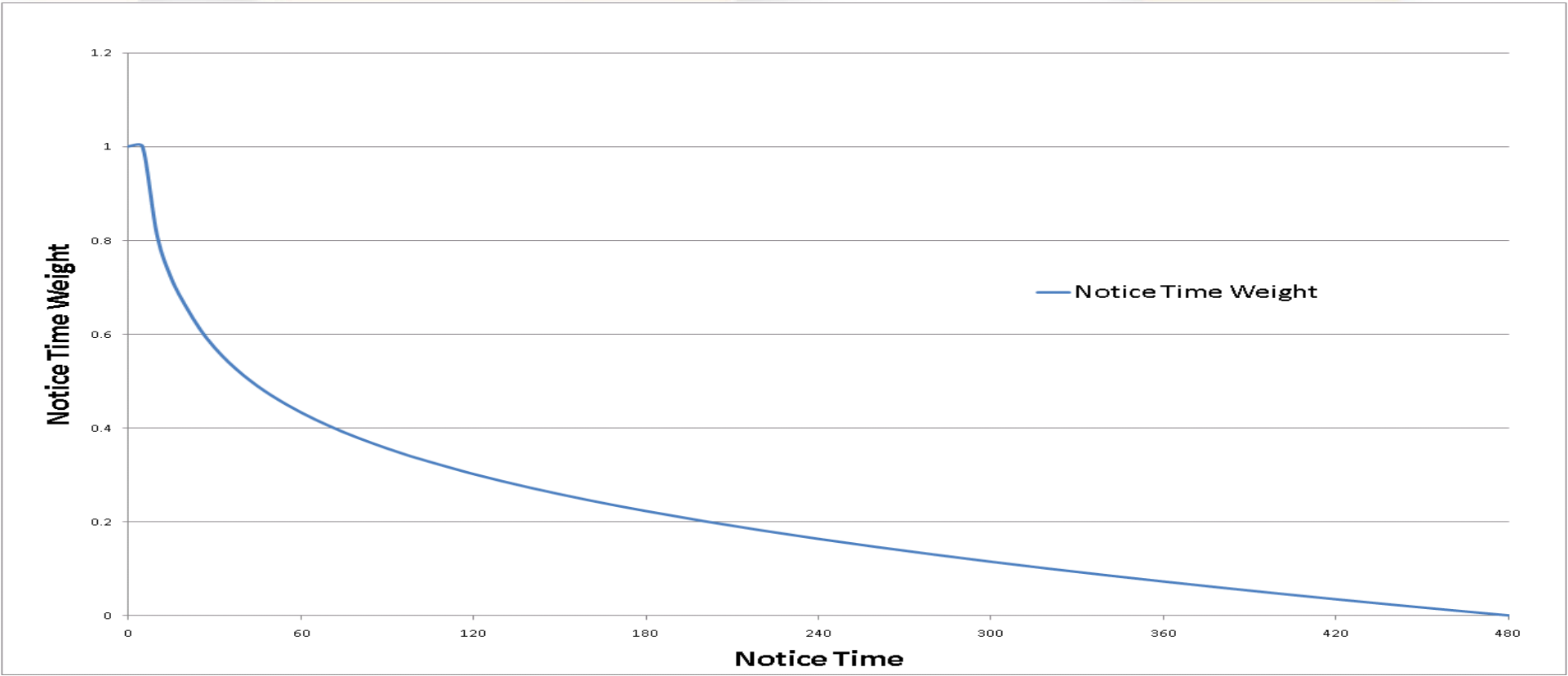
# SNDs

# Other System Charges

- Charge for <u>downward</u> declaration of availability
- Declarations must exceed 15 MW in 1 hour for charge to occur
- No charge if > 8 hrs notice given

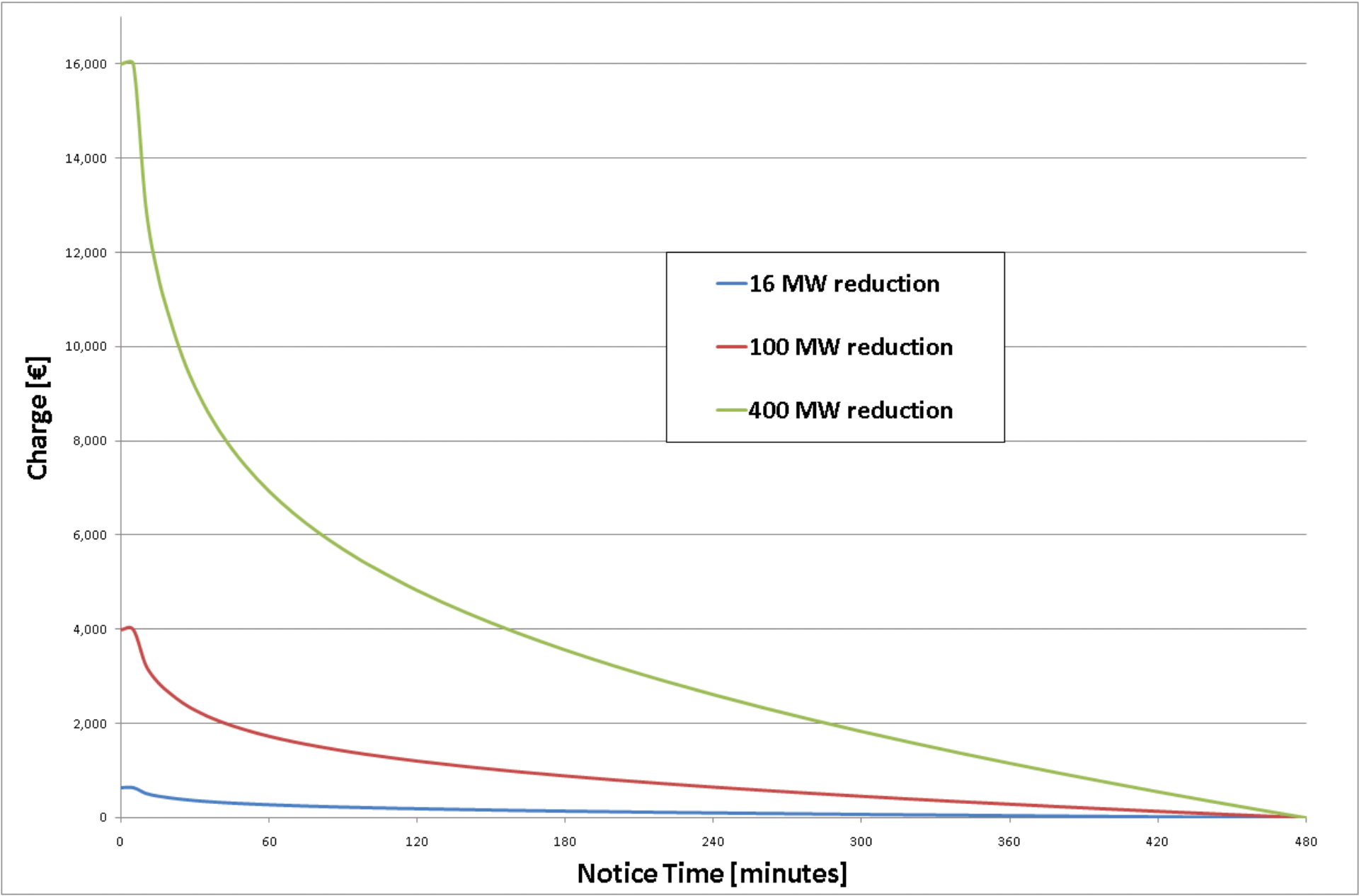
€40 / MW

SND Charge = MW Reduction* Rate * Notice Time Weight



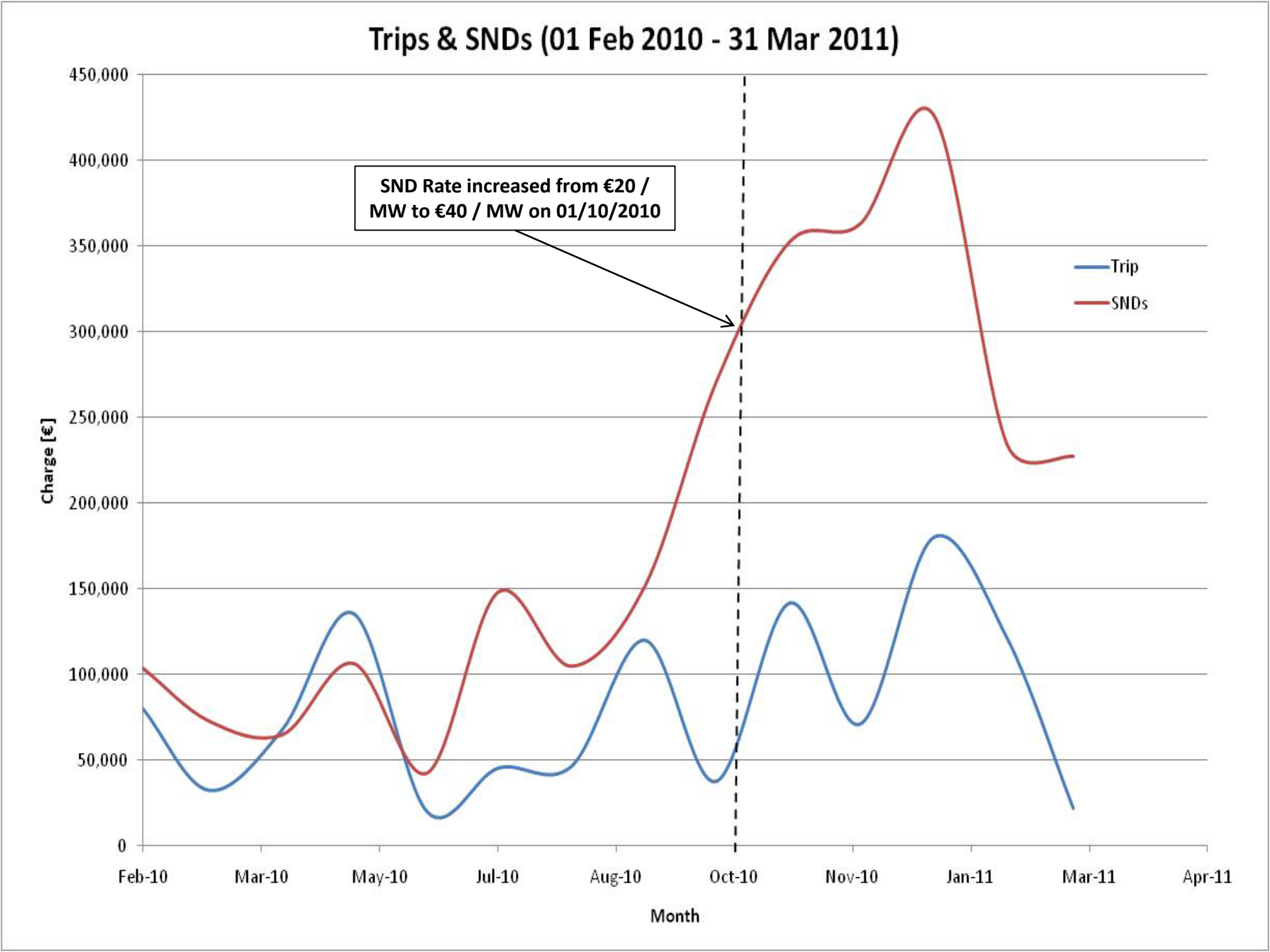
# SNDs

# Other System Charges



## SNDs

## Other System Charges


Trips & SNDs (01 Feb 2010 - 31 Mar 2011)
SND Rate increased from €20 / MW to €40 / MW on 01/10/2010
Trip
SNDs
Charge [€]
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Feb-10
Mar-10
May-10
Jul-10
Aug-10
Oct-10
Nov-10
Jan-11
Mar-11
Apr-11
Month

GPIs

Other System Charges

## GPIs

## Other System Charges

- Declaration Based GPIs:
  - Reserve — €0.12 / MWh
  - Reactive Power — €0.29 / MWh
  - Governor Droop — €0.29 / MWh
  - Maximum Starts per 24 hours — €0.60 / MWh
  - Minimum Generation — €1.18 / MWh
  - Minimum On Time — €0.60 / MWh
- TP Charge applies if declared capability does not meet minimum Grid Code requirements
- GPI charge is doubled if < 8 hours notice given

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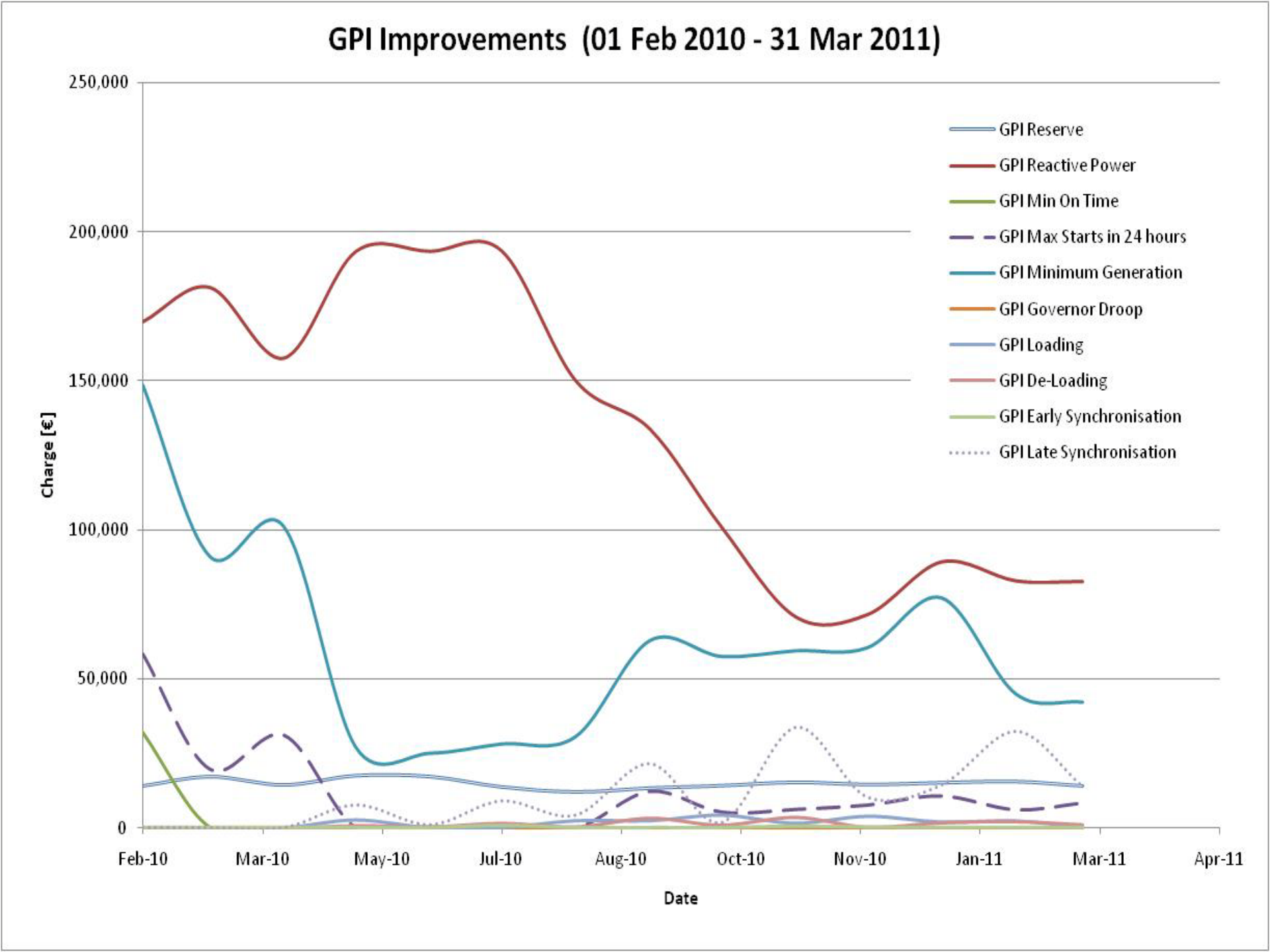
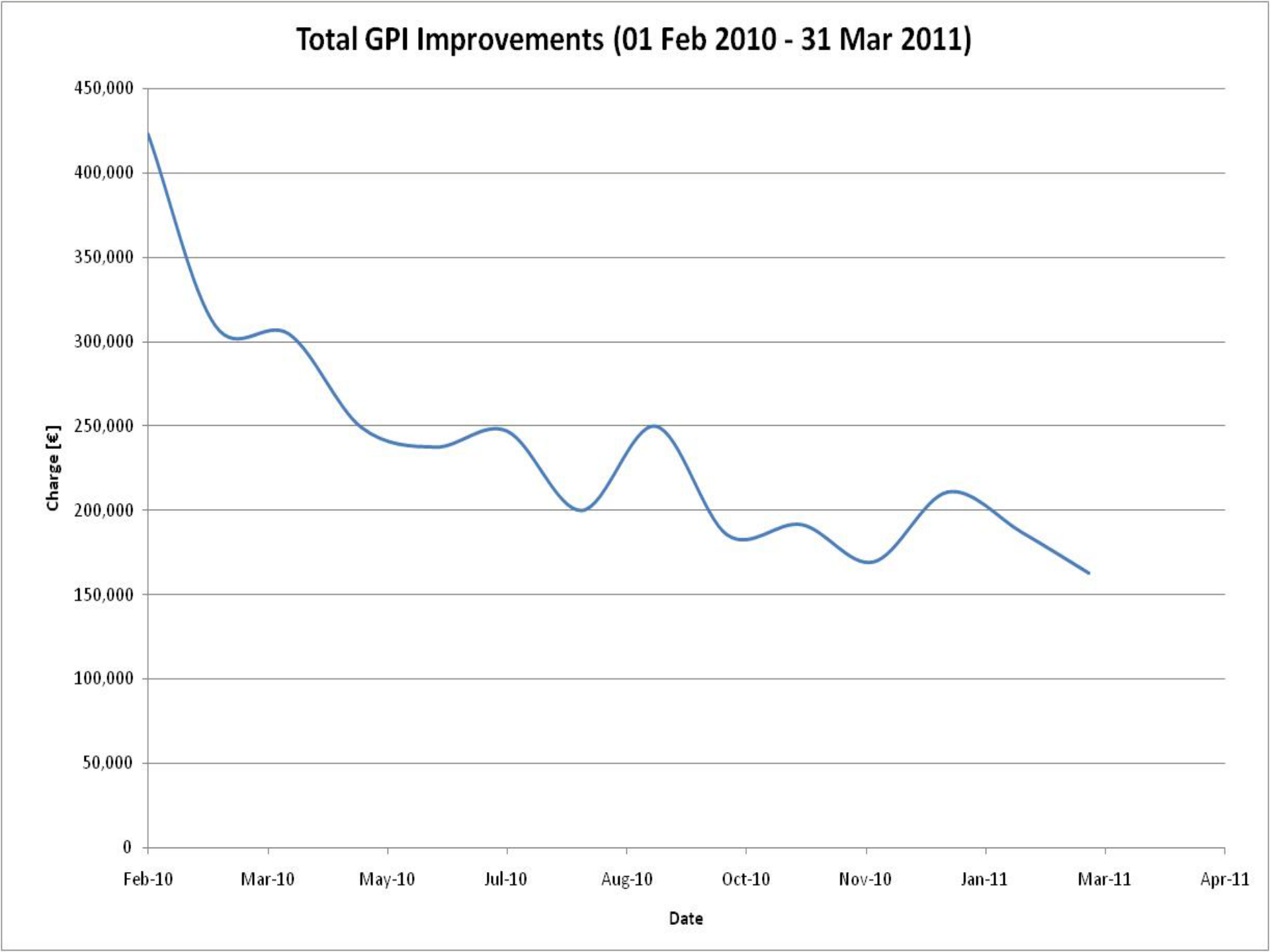
## GPIs

## Other System Charges

- Event Based GPIs:
  - Loading €0.59 / MWh
  - De-Loading €0.59 / MWh
  - Early Synchronisation €2.65 / MWh
  - Late Synchronisation €26.47 / MWh

- Charge applies if performance does not meet minimum Grid Code requirements for event


GPI Improvements (01 Feb 2010 - 31 Mar 2011)
250,000
200,000
150,000
100,000
50,000
0
Charge [€]
Feb-10
Mar-10
May-10
Jul-10
Aug-10
Oct-10
Nov-10
Jan-11
Mar-11
Apr-11
Date
GPI Reserve
GPI Reactive Power
GPI Min On Time
GPI Max Starts in 24 hours
GPI Minimum Generation
GPI Governor Droop
GPI Loading
GPI De-Loading
GPI Early Synchronisation
GPI Late Synchronisation


Total GPI Improvements (01 Feb 2010 - 31 Mar 2011)
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Charge [€]
Feb-10
Mar-10
May-10
Jul-10
Aug-10
Oct-10
Nov-10
Jan-11
Mar-11
Apr-11
Date

# AS Consultation 2011/2012

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# AS Consultation 2011/2012

- Proposed that rates remain unchanged

- New services:
  - Reduced Time to Synchronise
  - Flexible Multimode
  - Lower Min Gen
  - Synchronous Compensation

Reduced Time to Synchronise

- Improvement from Grid Code minimum requirement:
  - Hot 3 hrs
  - Warm 8 hrs
  - Cold 12 hrs
- Utilisation based payment
- Incremental Cost + Incentive Payment

Flexible Multimode

- Capability to switch from CCGT to OCGT and vice-versa
- Utilisation based payment
- Incremental  Cost + Incentive Payment

Lower Minimum Generation

- Min Gen improvement on Grid Code requirements
- Lower min gen with services (OR & RP) more beneficial
- Benefits to both TSO and Generator
- Should TSOs incentivise?

Synchronous Compensation

- Provide RP while generating zero active power (importing)
- Payment:
  - harmonised RP rate
  - incremental energy and maintenance cost
  - start-up cost thru' market

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# OSC

# Consultation 2011/2012

# OSC Consultation 2011/2012

- Proposed that rates and constants remain unchanged apart from*:
  - SNDs (€40/MW -> €70/MW)
  - Max Starts per 24 hrs (€0.60/MWh -> €1.00/MWh)
  - Min On Time (€0.60/MWh -> €1.00/MWh)
- New GPI:
  - Secondary Fuel Capability
- Design Refinements
  - Loading & De-Loading
  - GPI Double Charging

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* Decision made as part of RA Decision Paper in Jan 10

Secondary Fuel GPI

- If a generating unit is available on its primary fuel and not on its secondary fuel, cannot start up on its secondary fuel or cannot change fuel on load then a trading based charge is levied depending on its requirements.

**CLOSING DATE FOR AS & OSC NEXT FRIDAY – 27th MAY**

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# Future AS/OSC

# Future AS/OSC

• SEM Committee requested the TSOs to provide a considered position on the implications that Facilitation of Renewables Study had on the secure and efficient operation of the power system

• Sustainable Power Systems (SPS) led by Jono Sullivan will be shortly be sending this report to the SEM Committee for consideration

•SPS will also be making industry presentations on this shortly

# Questions?

AS/OSC queries: David.Carroll@EirGrid.com

Settlement Queries: ASQueries@EirGrid.com

AS/OSC Information:
http://www.eirgrid.com/operations/ancillaryservices/asothersystemcharges/

AS/OSC Consultation:

http://www.eirgrid.com/operations/ancillaryservices/consultationsworkshops/

Presentation available at:

http://www.eirgrid.com/customers/workshopsandconferences/

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