



**REVIEW OF THE VESTING CONTRACT LEVEL AND PERIOD WEIGHTING FACTORS FOR THE  
PERIOD 1 JANUARY 2011 TO 31 DECEMBER 2012**

**DRAFT DETERMINATION PAPER**

Closing date for submissions of comments and feedback: 24 September 2010

**Note: There will be no extension of deadline beyond 24 September 2010, 5 pm**

**13 SEPTEMBER 2010**

ENERGY MARKET AUTHORITY  
991G Alexandra Road  
#01-29 Singapore 238164  
[www.ema.gov.sg](http://www.ema.gov.sg)

**Disclaimer:**

The information in this Paper is not to be treated by any person as any kind of advice. The Energy Market Authority shall not be liable for any damage or loss suffered as a result of the use of or reliance on the information given in this Paper.

## **Contents**

1. INTRODUCTION .....	1
2. CONSULTATION PROCESS .....	2
3. REVIEW OF THE VESTING CONTRACT LEVEL AND PERIOD WEIGHTING FACTORS FOR THE PERIOD 1 JANUARY 2011 TO 31 DECEMBER 2012 .....	3
4. MECHANICS OF VESTING CONTRACTS .....	4

**REVIEW OF THE VESTING CONTRACT LEVEL AND PERIOD WEIGHTING FACTORS FOR THE  
PERIOD 1 JANUARY 2011 TO 31 DECEMBER 2012**

**DRAFT DETERMINATION PAPER**

**1. INTRODUCTION**

1.1. The Energy Market Authority (“EMA”) implemented vesting contracts on 1 January 2004. The objective of the vesting regime is to control the exercise of market power by the generation companies (“gencos”) and promote efficiency and competition in the electricity market. The vesting contracts commit the gencos to sell a specified amount of electricity (viz, the vesting contract level) at a specified price (viz. the vesting contract price). Such contracts control market power by removing the incentives for the gencos to exercise their market power to withhold their generating capacity to push up spot prices in the wholesale market.

1.2. The vesting contract level is set to effectively control market power based on projected supply and demand. At its last review, EMA had determined that the vesting contract level required is 55% for the period 1 January 2009 to 31 December 2010. EMA conducts a biennial review of the vesting contract level and period weighting factors in accordance with the procedures found in the document “EMA’s Procedures for Calculating the Components of the Vesting Contracts (Version 1.6)” (“Vesting Contract Procedures”). EMA has appointed PA Consulting Group Pte Ltd (“PA Consulting”) to assist in the review of the vesting contract level and period weighting factors for the period 1 January 2011 to 31 December 2012.

1.3. This report summarises EMA’s determination of the vesting contract level and period weighting factors for the period **1 January 2011 to 31 December 2012** taking into consideration the recommendations of its consultant, PA Consulting.

## 2. CONSULTATION PROCESS

1.4. EMA invites comments and feedback to the draft determination paper and PA Consulting's draft report. Please submit all written feedback to Ms Rachel Su Huifen (su\_huifen@ema.gov.sg) or Ms Leow Rui Ping (leow\_rui\_ping@ema.gov.sg) by 24 September 2010 (5pm).

1.5. Alternatively, you may send the submissions by post/fax to:

Market Development and Surveillance Department  
Regulation Division  
Energy Market Authority  
991G Alexandra Road, #01-29  
Singapore 119975  
Fax: (65) 6 835 8020

1.6. Please note that any anonymous submissions will not be considered. EMA reserves the right to make public all or parts of any written submissions made in response to this Consultation Paper and to disclose the identity of the source. Any part of the submission, which is considered by respondents to be confidential, should be clearly marked and placed as an annex. EMA will take this into account regarding disclosure of the information submitted.

1.7. The timeline for the consultation process is shown in Table 1 below:

Table 1: Consultation Process

Date	Event
13 September 2010	EMA publishes Draft Determination paper and PA Consulting's Draft Report
15 September 2010	Plenary session (Industry and Consumers) with PA Consulting
24 September 2010 (5pm)	Due date for submission of comments on the Draft Determination paper and PA Consulting's Draft Report
1 October 2010	EMA circulates to the industry PA Consulting's Final Report and response to industry's comments EMA makes its Final Determination to the industry

### **3. REVIEW OF THE VESTING CONTRACT LEVEL AND PERIOD WEIGHTING FACTORS FOR THE PERIOD 1 JANUARY 2011 TO 31 DECEMBER 2012**

3.1 The Cournot Gaming Model is used to simulate non-collusive interactions among the generators (gencos) and determine the vesting contract level to effectively control their market power. Specifically, the model estimates the level of vesting contract coverage required to remove generators' incentives to withhold capacity to drive up the market price above the long run marginal cost of a combined cycle gas turbine. The mechanics of how vesting contracts work to control market power is illustrated in [Section 4](#).

3.2 [Table 1](#) shows the vesting contract level and period weighting factors that will be adopted by EMA for 1 January 2011 to 31 December 2012 after careful assessment of the Consultant's recommendations. The vesting level would be the same for 2012 as for 2011, until the commercial operation of both Senoko Energy's repowered CCGT unit and the Tuas Tembusu complex, upon which the vesting level would be reduced to 50%. A more balanced approach with respect to the period weighting factors is taken for this review, specifically to take an intermediate step between the current differential period weighting factor regime and unity period weighting factor.

**Table 1: Vesting Contract Level for 1 January 2011 to 31 December 2012**

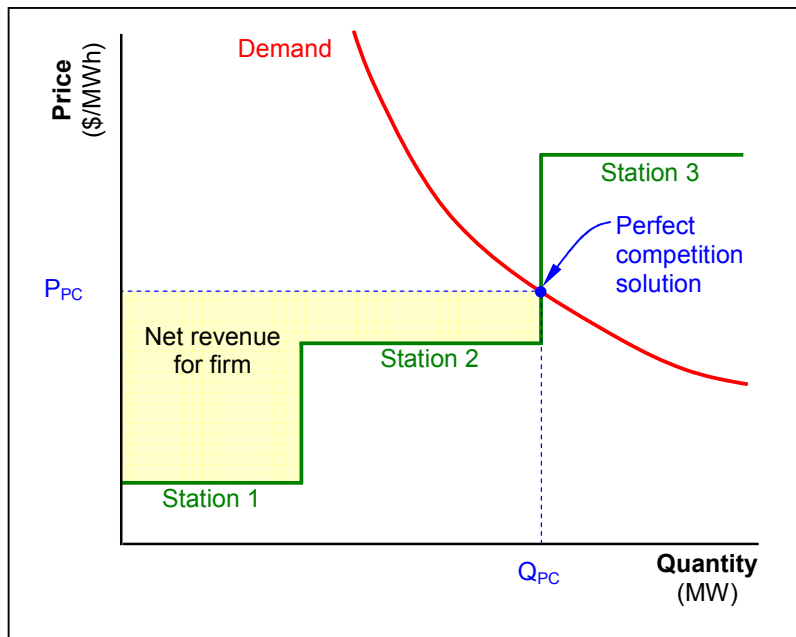
Year	Vesting Contract Level	Period Weighting factors		
		Peak	Shoulder	Off-Peak
1 January 2011 to 31 December 2011	60%	1.10	1.00	0.90
1 January 2012 to 31 December 2012	50%	1.10	1.00	0.90

#### 4. MECHANICS OF VESTING CONTRACTS

4.1 A genco has the incentive to withhold some of its capacity to drive up the market price if the loss in revenue due to the reduction in quantity sold is less than the increase in revenue due to the higher market price.<sup>1</sup>

4.2 To illustrate, Figure 1 shows the perfect competition solution for a genco facing the residual demand curve. The genco has three generating units available: Station 1 has a low SRMC, Station 2 has a moderate SRMC, and Station 3 has a high SRMC. Faced with the residual demand curve, the genco in a perfectly competitive market will operate Stations 1 and 2 at full capacity and not run Station 3. The demand curve intersects a vertical section of the supply curve, implying that a demand bid is effectively marginal. The spot market price will be at the perfectly competitive level  $P_{PC}$ . The genco receives net revenue equal to the shaded area, which represents the difference between its revenue ( $Q_{PC} \times P_{PC}$ ) and its SRMC (the area under the supply curve).

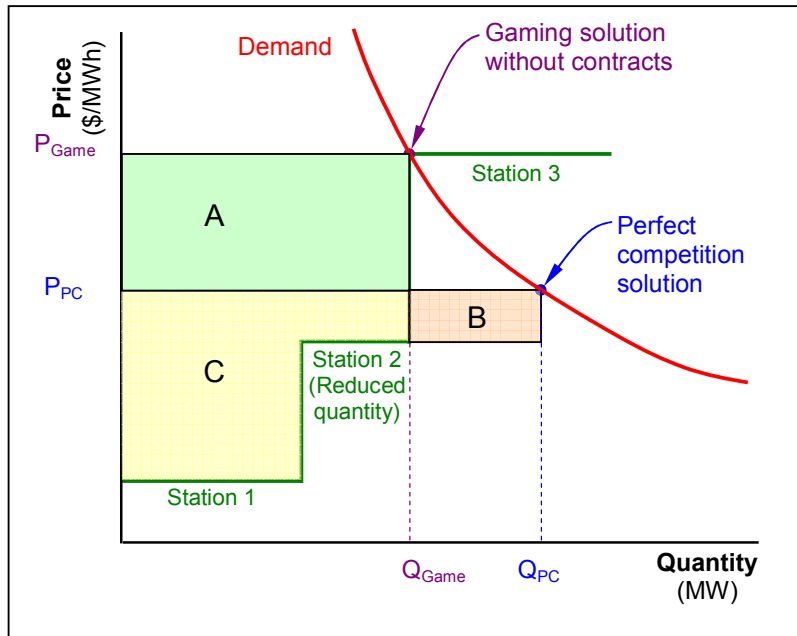
**Figure 1: Perfect Competition Solution**



4.3 Suppose the genco has some market power such that it can withhold some of Station 2's capacity to make Station 3 marginal and hence receive a higher price. As shown in Figure 2, the offered quantity from Station 2 is reduced, and Station 3 is setting the market price  $P_{Game}$ . Overall, the genco sells less but at a higher spot price. The genco forgoes net revenue equal to area B, but gains net revenue equal to area A (with area C representing net revenue it was already receiving). In this example, the genco is receiving higher net revenue in total since area A is larger than area B, and therefore has the incentive to reduce its output ( $Q_{Game}$ ) to increase the spot price ( $P_{Game}$ ) until area A is equal to area B.

<sup>1</sup> A genco can withhold capacity either physically (by declining to offer capacity) or financially (by offering capacity at an increased price). The two methods of exercising market power are equivalent.

**Figure 2: Gaming solution without vesting contracts**



4.4 Vesting contracts can reduce the genco's incentive to withhold capacity by decreasing its exposure to the spot price. Figure 3 illustrates the situation in which the genco has quantity  $Q_K$  under vesting contracts: it receives the vesting price for this quantity regardless of the spot price. The size of area A is therefore reduced by area D. In this example, the increase in net revenue (area A) is less than the net revenue lost (area B) from withholding capacity. Consequently, the genco will not withhold so much of Station 2's capacity: it will increase its output  $Q_{Game}$  (and hence lower the spot price  $P_{Game}$ ) until area A is again equal to area B. Clearly, increasing the vested quantity  $Q_K$  will result in a spot price  $P_{Game}$  closer to the Perfect Competition level.

**Figure 3: Gaming solution with vesting contracts**

