

Report



The Italian Gas Market

to

Enemalta

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IPA Energy+Water Economics

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TABLE OF CONTENTS

TABLE OF CONTENTS	3
LIST OF FIGURES	4
1. THE ITALIAN GAS MARKET	5
2. COMPARISON WITH OTHER MAJOR GAS HUBS	7
3. DESIGNING PRICE SCENARIOS	9
3.1. Historical relationship between NBP, BAFA, Brent, HFO, Gasoil and PSV prices	10
3.2. Constructing a predictor of the PSV price	12
4. CONCLUSIONS AND DISCUSSION	15

LIST OF FIGURES

Figure 1 - Italian Gas Infrastructure	5
Figure 2 - Hub Operators' Data. Hub volume development excluding NBP.....	7
Figure 3 - European Gas Prices in 2009.....	8
Figure 4 - PSV Price vs Other Markers in 2004-2009 (Nominal \$/MMBtu HHV)	9
Figure 5 - Historical Price Relationship NBP vs PSV (2004 – 2009).....	10
Figure 6 - Historical Price Relationship BAFA vs PSV (2004 – 2009).....	10
Figure 7 - Historical Price Relationship Brent vs PSV (2004 – 2009).....	11
Figure 8 - Historical Price Relationship Gasoil vs PSV (2004 – 2009).....	11
Figure 9 - Historical Price Relationship HFO vs PSV (2004 – 2009).....	12
Figure 10 - PSV Price Scenario (USD / MMBtu Real).....	13
Figure 11 - PSV Price Scenario (USD / MMBtu Nominal)	14

1. THE ITALIAN GAS MARKET

Enemalta Corporation (“Enemalta” or “the Client”) hired IPA Energy + Water Economics (“IPA”) to undertake a study on the “Optimisation of Investment Options in Power Generation in Malta”. Whilst this study was undertaken, Enemalta requested that the scope of the study be extended to provide a brief analysis of PSV¹ gas prices in Italy.

The Italian gas market is the third largest in Europe after the UK and Germany. 40% of Italy’s energy demand is met through gas with the power sector being particularly dependent as 54% of power is generated using gas. Italy only produces 10% of the gas it consumes, leaving it heavily dependent on gas imports. There are currently 7 primary entry points into which gas is imported into Italy: five pipelines and two LNG regasification terminals.

Figure 1 - Italian Gas Infrastructure



The boundaries and names shown and the designations used on maps included in this publication do not imply official endorsement or acceptance by the IEA.

Source: IEA

The gas market is dominated by the company ENI, largely because their dominance in Italy’s import capacity and their control (via subsidiaries) of transmission, storage and distribution in

¹ Punto di Scambio Virtuale (PSV), a.k.a the Italian Gas Hub, the Virtual Exchange Point

the Italian gas market. ENI currently executes approximately 70% of Italy's gas imports and produce 85% of Italy's domestic gas. ENI buys most of its gas via long-term gas contracts that are linked to the price of oil. There is very little transparency in the price of gas under these contracts.

In a bid to increase competition within the gas market and to improve liquidity of the Italian Gas Trading Hub, the Italian Anti-trust Authority and the Electricity and Gas Regulator in Italy decided in 2004 to force ENI to release over a period of four years a total of 9.2bcm of its contracted imported gas to the Italian wholesale market, along with the associated transport capacity. The gas was released and sold on the Italian Virtual Exchange Point (PSV) at a price determined by a formula prescribed by the regulator.

In 2007, the regulator once again forced ENI to release more gas to be sold on the PSV. This time ENI were forced to release 4 bcm in a two year period from October 2007 to September 2009. The released gas was sold on the PSV at a price based on the following formula:

$$P_m = P_{m-1} + \Delta P_m \quad [c€/GJ]$$

Where

$$\Delta P_m = 315,092 * 0.95 * (I_m - I_{m-1})$$

$$I_m = 0.41 * (\text{GasoilPricem}/21,914) + 0.46 * (\text{HFOPricem}/14,107) + 0.13 * (\text{OilPricem}/18,250)$$

P_m = Price of gas in current month
 P_{m-1} = Price of gas in previous month
 GasoilPricem = Price of gasoil in current month
 HFOPricem = Price of HFO in current month
 OilPricem = Price of oil in current month

The monthly released gas price was hence linked to the historic price of gas and to the relative changes in the price of gasoil, HFO and oil. The price the released gas was sold at was therefore not based on supply and demand fundamentals. Given that it was mainly just the released gas that was sold on the PSV, historic PSV prices reflected regulated gas prices rather than “market prices”.

Last year, in July 2009, the Italian regulator introduced another obligation on ENI to sell a further 5 bcm of gas via the PSV in the thermal year 2009/2010. This time however, the regulator did not formulate a price for the gas and declared that it would release the gas by means of an auction, with a minimum price level set by the Ministry of Economic Development. While traders welcomed that the price was not linked to the oil price, the minimum price set was more than €5/MWh higher than the price at the TTF hub (€19.08MWh for Gas year '09). Ideally, this price should have reflected the “average European prices” and the “cost of purchasing of the seller”.

The gas release was not met by much enthusiasm in the market with 75% of the gas remaining unsold and only a marginal reduction in price. This was primarily due to a general lack of demand for gas induced by the recent recession, extraordinarily high minimum price given the market conditions and the general risk of commodity price changes.

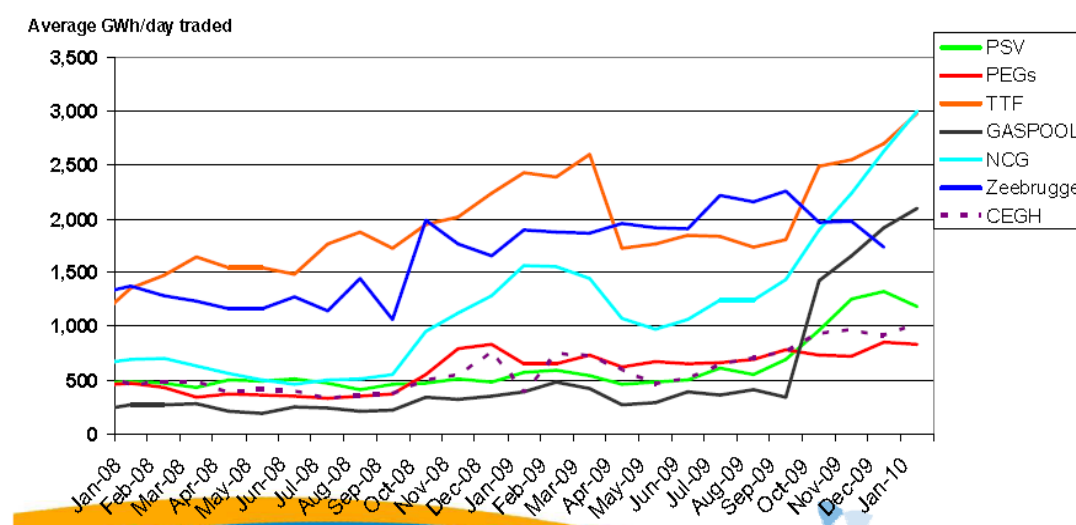
Other measures taken by the Italian authorities to improve the liquidity of the gas market included requiring producers with large concession licenses to auction on the PSV the equivalent volume of gas they previously would have paid as state royalties. Similarly, in

2008 a decree came into force, obliging holders of new import contracts to offer a certain percentage of their gas volumes for sale on the PSV.

2. COMPARISON WITH OTHER MAJOR GAS HUBS

Despite the measures taken by Italian authorities described in the preceding section, trading volumes on the PSV remained low compared to other trading hubs in Europe, even though there was a notable increase in volumes traded during the last year, with traded volumes increasing from 15.6 bcm in 2008 to 23.5 bcm in 2009.

Figure 2 - Hub Operators' Data. Hub volume development excluding NBP



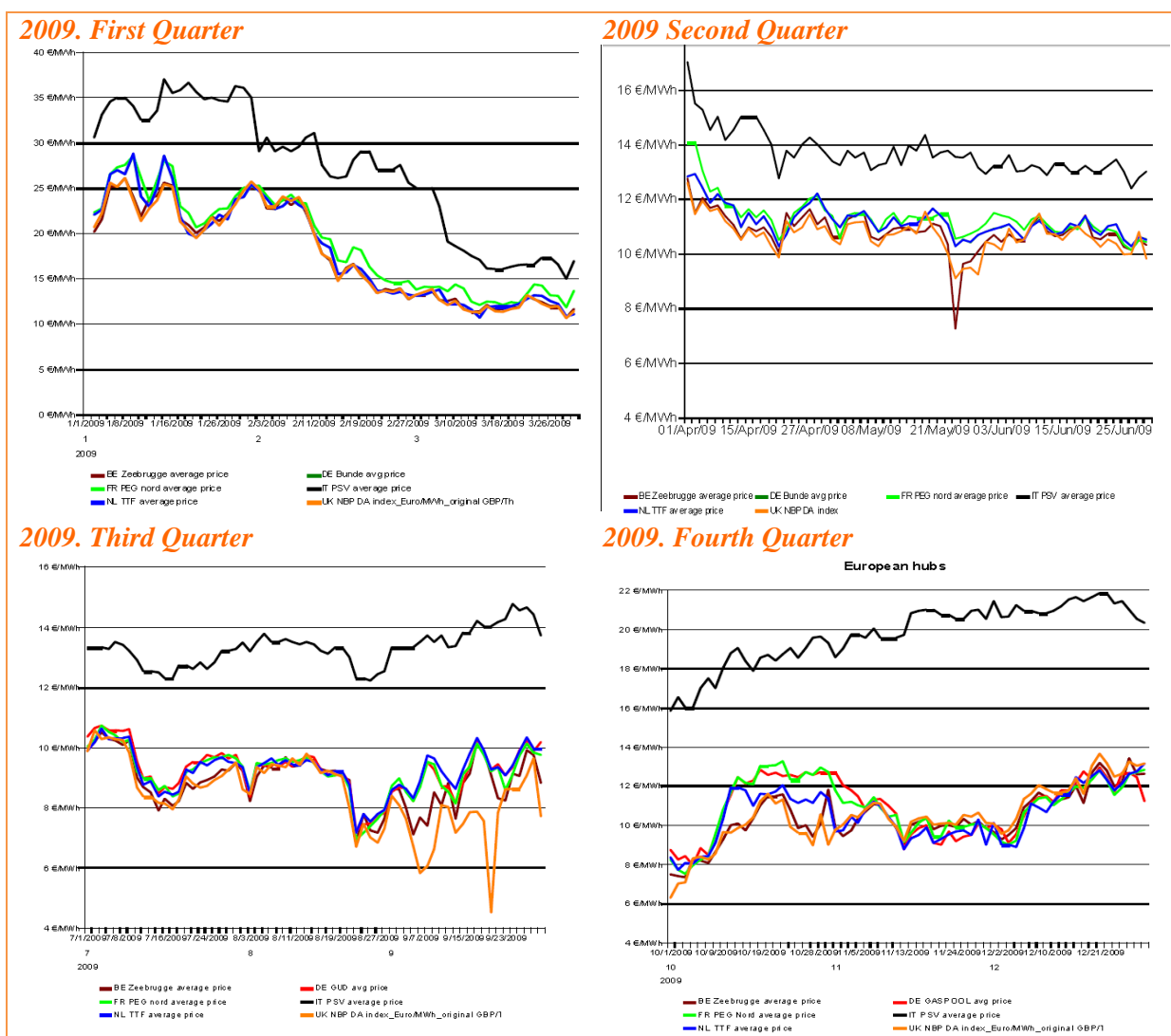
Source: ICIS Heren

Bringing gas to the PSV is a major problem for new entrants because most of the pipeline capacity is booked on existing contracts with Italian incumbents. This segregates the Italian system from the other major trading hubs of Europe².

As a result of this disconnect with the other gas trading hubs of Europe, the price of gas traded on the PSV was significantly higher than other gas prices in Europe in 2009, as shown in the following diagrams.

² Notice that the NCG (German) hub has recently seen a large increase in trading volumes. In part this was due to a substantial reduction in grid fees and transportation charges in October 2009 and was also aided by E.ON putting 54% of its contracted import capacity on the market in December 2009.

Figure 3 - European Gas Prices in 2009³



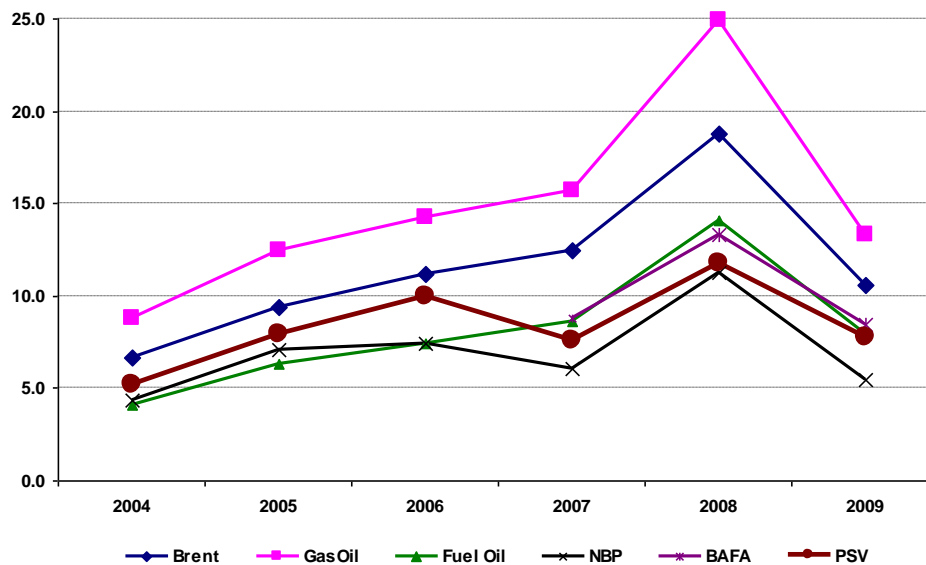
Source: European Commission DG for Energy

These charts show that PSV prices in 2009 carried a premium of between €3/MWh and €12/MWh (first week of December) compared to prices at Central and West European Hubs. It also shows that while price movements in the other main European hubs were quite well aligned with each other, PSV prices often followed different trends, largely due to the fact that Italian gas prices are not driven by demand and supply considerations but rather by regulations enforced on the market by the gas regulator.

If we take a look at PSV prices versus some major markers as well as prices of liquid fuels on an annual basis over 2004-2009, we observe that the spreads between the PSV price and other fuels have not been very stable. This is shown in Figure 4 overleaf.

³ European Commission DG for Energy does not specify whether these prices are quoted in Lower Heating Value (LHV) or Higher Heating Value (HHV) terms. Comparison with other sources indicates that they are likely to be in LHV terms, however this has not been verified. Generally, price per unit of energy quoted in LHV terms is c.11% lower than that in HHV terms.

Figure 4 - PSV Price vs Other Markers in 2004-2009 (Nominal \$/MMBtu HHV)



Source: IPA

We also observe that PSV price has a reasonably stable correlation with NBP price in terms of year-on-year directional movement. PSV price also appears to correlate well with the BAFA, the index that tracks the average of imported German gas prices. However, there are few data points at hand for the BAFA and this observation must be viewed with caution.

Based on the market review in Section 1 and comparative price analysis in Section 2 above, we reach the following conclusions:

1. PSV price is reasonably correlated with other commodity price markers, notably the NBP price, however, the correlation has not been very stable.
2. PSV price appears to be persistently higher than gas prices at other major European Hubs, however, this can change in the future, if market forces determine the PSV price.

3. DESIGNING PRICE SCENARIOS

Conclusions of the preceding section highlight the challenges behind predicting future PSV gas prices. Historical commodity prices are not likely to be robust indicators of future PSV prices in the longer term. A combination of historical price trends and strong assumptions regarding the pricing structure for PSV are necessary to obtain long-term price scenarios. A simple framework that allows the generation of numerous deterministic price scenarios would be more useful than “price forecasts” that would be unreliable.

In order to construct such a framework we make following (strong) assumptions:

- ASSUMPTION 1: Relationship between PSV price and other markers will be stable;
- ASSUMPTION 2: PSV price will eventually be determined by market forces;
- ASSUMPTION 3: PSV price will eventually converge (from above) to the other major hub prices in Europe, which will track each other fairly closely

Supported by these assumptions, we can build a basic model to characterise the relationship between PSV price and prices of other commodities. We first examine the historical relationship between PSV price, BAFA price, NBP price, Brent price, HFO price, and Gasoil price via univariate linear regressions depicted in figures 5 to 9 below.

3.1. Historical relationship between NBP, BAFA, Brent, HFO, Gasoil and PSV prices

Figure 5 - Historical Price Relationship NBP vs PSV (2004 – 2009)

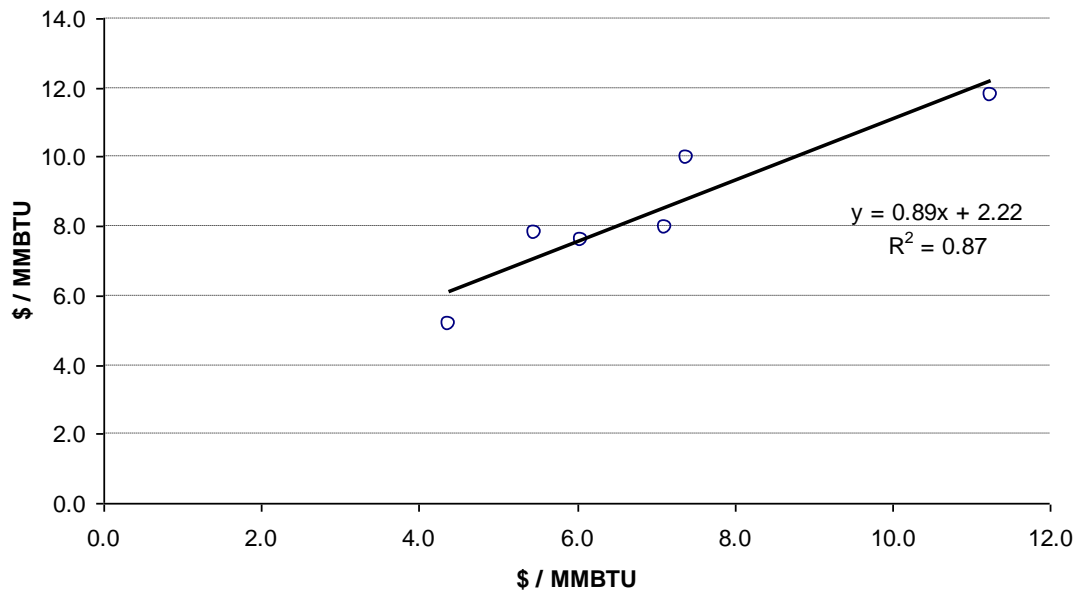


Figure 6 - Historical Price Relationship BAFA vs PSV (2004 – 2009)

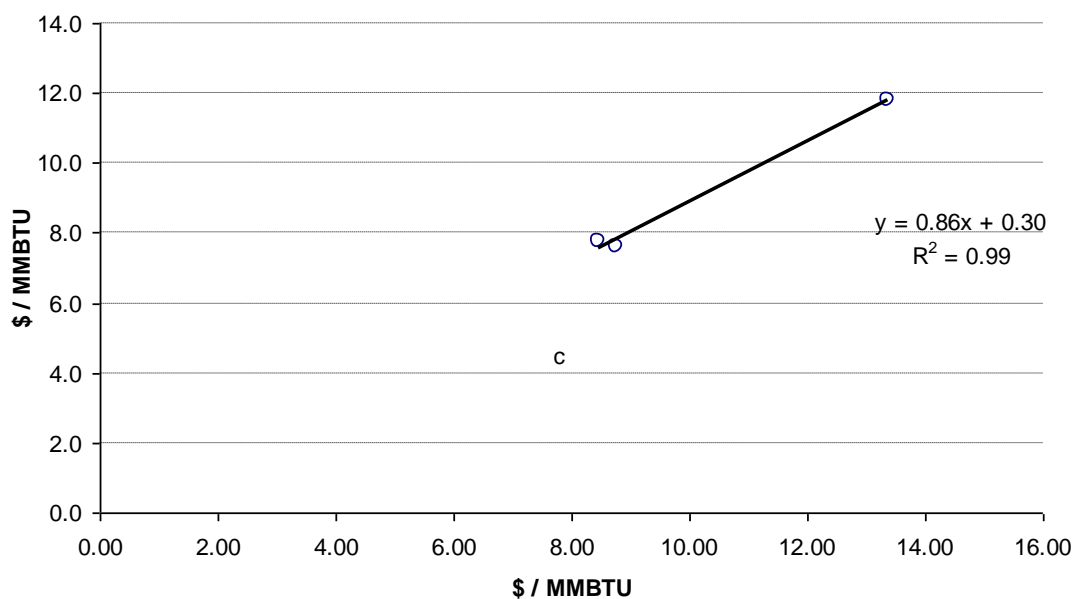


Figure 7 - Historical Price Relationship Brent vs PSV (2004 – 2009)

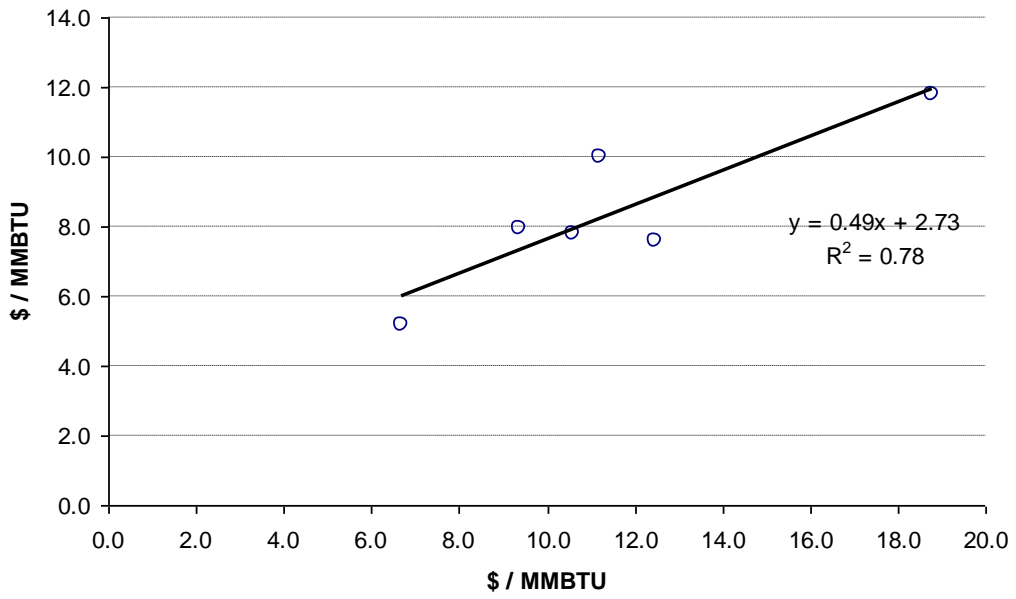


Figure 8 - Historical Price Relationship Gasoil vs PSV (2004 – 2009)

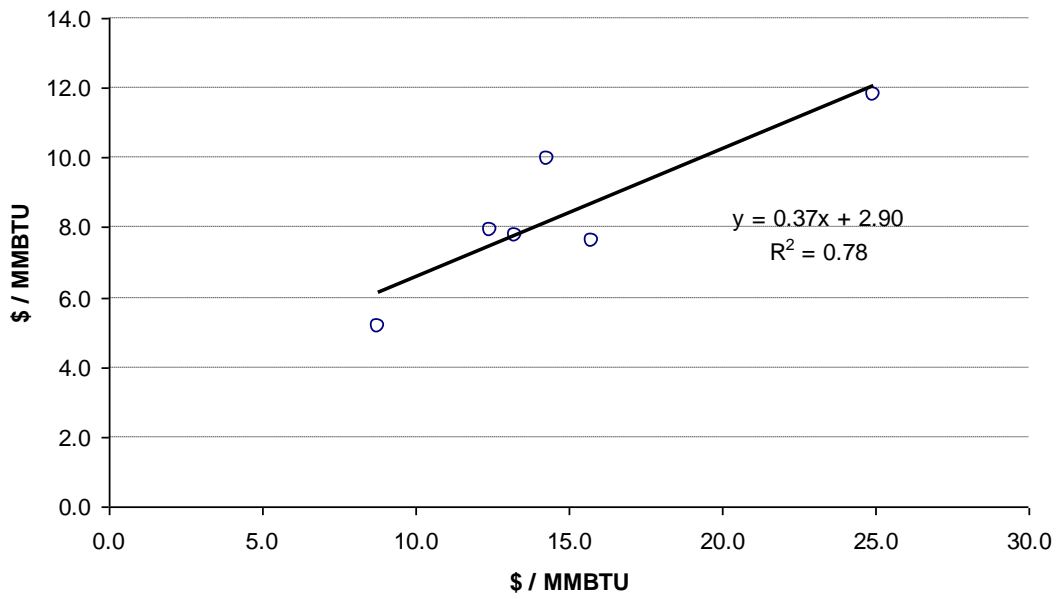
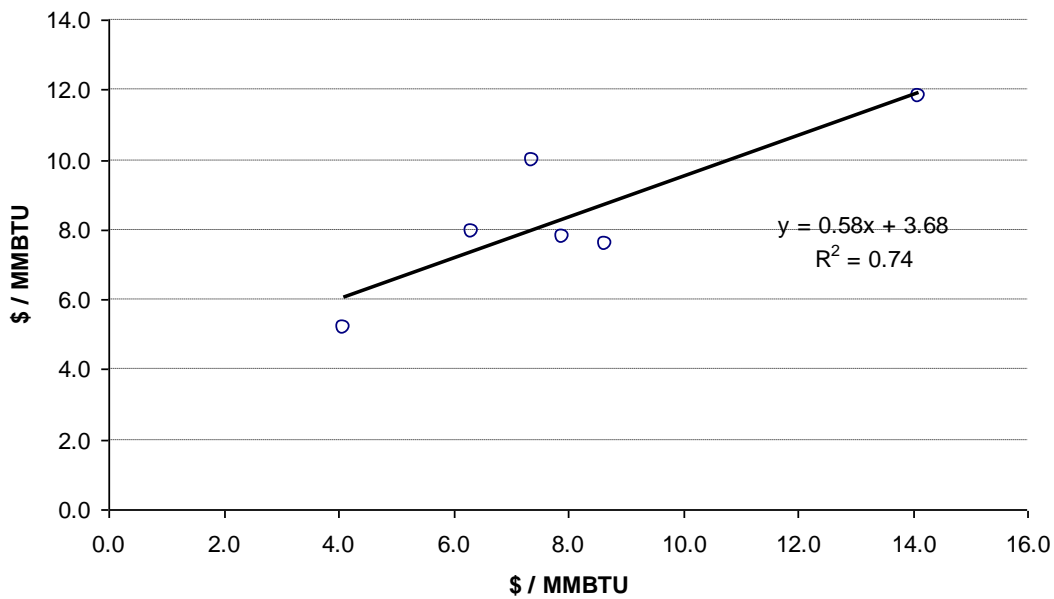


Figure 9 - Historical Price Relationship HFO vs PSV (2004 – 2009)



3.2. Constructing a predictor of the PSV price

Looking at univariate regressions, we observe that in the past, NBP was probably the best predictor of the PSV price, attaining a good fit and high (.90) R^2 value. Whilst BAFA has a higher R^2 , the regression is based on much fewer data points and hence disregarded as a predictor. After identifying the predictor, we entertain ASSUMPTION 1 above, taking for granted that the PSV price will be determined by the following formula in the future, in the absence of any other influence on PSV price:

$$\text{Estimate of PSV price in Year X (\$ / MMBtu)} = 0.89 * \text{NBP price in Year X (\$ / MMBTU)} + 2.22$$

Based on this formula, the actual PSV price in Year X would be the Estimate of PSV Price in Year X plus a *random shock* (positive or negative in any given year, but zero on average).

With this formula at hand, we can entertain ASSUMPTION 2 and 3, which collectively imply that PSV price will converge to the NBP price, differing only by a small margin in any given year, caused by local demand or supply shocks.

Mathematically, this translates into the coefficient 0.89 approaching 1 and constant term 2.22 approaching 0⁴. We need to make further assumptions about how fast the coefficient and the constant term approach zero in order to in order to calibrate the formula to reflect the commercial scenario where PSV prices are determined by market forces and the PSV price will be very close to that in other major European hubs. This is extremely difficult to estimate, being dependent on changes in the regulatory regime and numerous constraints including limitations due to existing contractual arrangements.

Therefore, we built a simple mathematical model that would allow the user to specify the NBP price projection, projection of exchange rates between euro, USD and GBP, projection

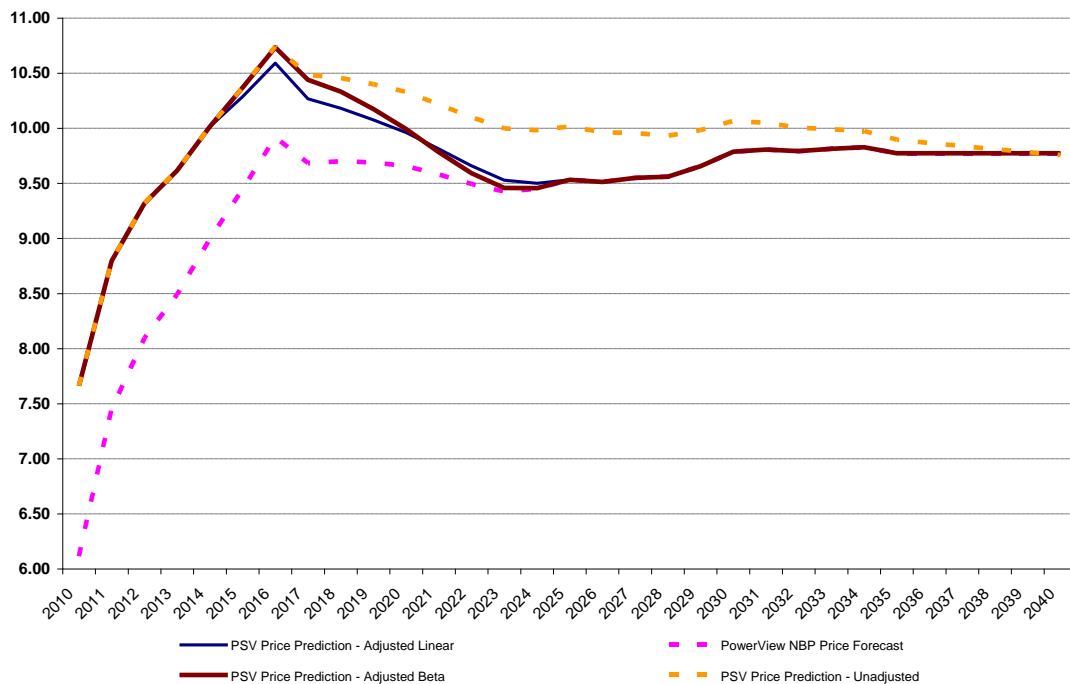
⁴ If this number is different from zero, [positive] or [negative], it would signify a systemic long-term price [premium] or [discount] to the NBP price

of inflation rate in the Eurozone, the year the user believes PSV prices will start approaching the NBP price, and the year the user believes PSV prices will finally approach the NBP price. We use a slowly varying mathematical function to model the adjustment process⁵. Using this pricing tool we have run a hypothetical scenario with IPA’s latest PowerView forecast for the NBP price and the following parameters over 2010 - 2040:

- Model Starting Year: 2010
- US Inflation Rate: 2.5% per annum
- GBP / US Real Exchange Rate: 0.64
- Year PSV Starts Approaching NBP: 2015
- Year PSV Approaches NBP: 2025
- Alpha parameter for the adjustment function: 3
- Beta parameter for the adjustment function: 3

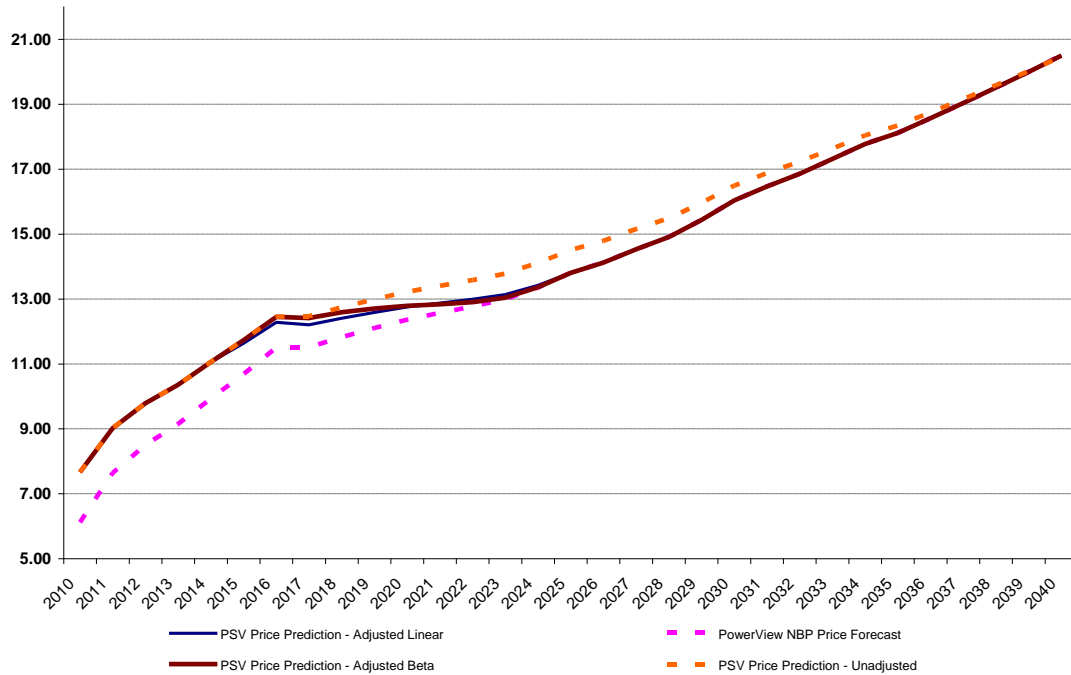
The results are presented in the figures below:

Figure 10 - PSV Price Scenario (USD / MMBtu Real)



⁵ We use two different methods to model this function. The first model is a Linear Model, where both the coefficient and the constant term approach one and zero respectively at the same rate. The second model is based on the well-known Incomplete Beta function, which changes at a variable rate. The Incomplete Beta function has two parameters, alpha and beta, which must also be chosen by the user. There is no preset rule as to what values should be used in such an application. We chose 3 for both alpha and beta.

Figure 11 - PSV Price Scenario (USD / MMBtu Nominal)



Figures above show that both in the nominal and real terms, the Adjusted PSV Prediction start approaching the NBP price in 2015 and approaches the NBP price in 2025 as per the requirements stated in the inputs. The approach is smooth and progresses without wild oscillation. The prediction tool can therefore be used to generate hypothetical price series, considering a mix of assumptions based on the user's view on the market at a given time.

4. CONCLUSIONS AND DISCUSSION

In this Report, we have analysed the state of the Italian gas market and the underlying drivers of the PSV gas price. In particular, we focussed on comparing PSV price to that of other major European gas hubs as well as liquid fuel prices, basing our assessment on limited historical data. We highlighted that due to various issues, regulatory pricing regime being the major one, PSV prices are difficult to predict based on the analysis of fundamentals and statistical relationships in the past.

We understand that Enemalta wishes to consider the impact of price indexation to PSV price, in case of gas importation into Malta in the form of liquefied or piped natural gas. Given the lack of liquidity and transparency as to what the future pricing regime would be, we do not think that the PSV price would serve as a reasonable index to price natural gas in a potential gas supply arrangement, certainly undesirable by Enemalta as PSV price appears to be much higher than that in other major hubs in Europe.

Nonetheless, we designed an assessment tool⁶ for Enemalta that would allow the combination of expert opinion and information embedded in historical trends to generate hypothetical PSV price scenarios. The assessment tool designed relies on strong assumptions. It is therefore subject to various limitations. Hence, any price scenario generated with this assessment tool should be viewed and used with extreme caution.

⁶ Provided to Enemalta separately.