

Investing in Bridging Fuels: The Unit Commitment Problem of Public vs. Private Ventures

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Greece is gradually being transformed into an important energy hub of Southeast Europe supported by the development of big power and gas infrastructure projects and the introduction of the Target Model. Moreover, the continuing privatization process in the domestic energy market and the establishment of the Hellenic Energy Exchange are anticipated to enhance cross-border electricity trading and foster competition. The decision to completely decarbonize the Greek electricity sector until 2023, provides an additional incentive for a significant growth of natural gas as share of Greece's total electricity generation. Those radical changes in the electricity market assist the investment in new Combined Cycle Gas Turbines (CCGT) units that are currently under way.

This paper contributes to the growing literature on individual case studies by presenting an extensive comparison between public and private natural gas-fired units in managing the unit commitment problem in Greece. The aforementioned developments signal the importance to analyze and compare the efficiency of the existing public and private gas-fired power plants in Greece and derive important policy implications. By utilizing a unique hourly dataset, which spans from 2015 until 2019, we seek to identify which of the two groups under examination achieved to minimize imbalance costs, and in parallel, maximize profits. To our knowledge, none of the previous studies from the existing literature have analyzed this subject under this scope since our approach is the first to implement the well-known Cash Flows at Risk (CFaR) and Risk Weighted Returns (RWR) methodologies.

The first empirical finding, considering the period under examination, reveals that public units significantly outperformed compared to private units. Even though private units achieved greater revenues in absolute values due to the increased generation, when relative efficiency which accounts for the actual generation is included, public firms demonstrated superior results. In parallel, private units are obliged to pay higher imbalance costs compared to public units. However, following natural gas market liberalization in 2018, we observe a significant increase in terms of private units' efficiency. The second empirical finding of our study indicates an increase of efficiency throughout the years for both public and private units, yet the latter group achieved it at a considerably greater pace. The growth projections of our main profitability indicator (Index1), provide a clear indication that, following 2019, private units are anticipated to dominate over public ones.

The above findings derive important implications for both policymakers and market participants. First, the dominance of public units reveal that the role of PPC should be revised during the decarbonization period, since it is irrational to impose a share reduction in an efficient company that mainly uses CCGTs units compared to lignite ones. Second, we identify room for improvement in terms of private CCGTs units during their daily operation, given that higher operational efficiency

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throughout the bidding procedure is translated into increased social welfare via a reduction of the system marginal price and profit maximization.