OGSS 20:

What are the energy security implications of recent declines in both APEC and global spare petroleum refining capacity?

Purpose:

This 20th issue of the APEC Oil and Gas Security Studies (OGSS) series provides a comprehensive analysis of the challenges facing the petroleum refining sector, particularly within APEC. It examines historical trends, current dynamics, and future projections surrounding petroleum refinery capacity, consumption patterns, and supply security. A key observation is the narrowing gap between petroleum refinery capacity and petroleum product consumption, signaling a potential shortfall in the investment needed for petroleum refinery capacity expansion. Short-term projections within this decade indicate increased global petroleum product consumption driven by economic growth and industrial expansion across various regions. However, long-term scenarios of consumption diverge considerably, presenting complex challenges in decision-making on refinery capacity investments. Additionally, this report outlines diverse risk profiles across APEC sub-regions, ranging from economies heavily reliant on imports of petroleum products to those with robust domestic production capabilities. These differences highlight the necessity for proactive strategies and tailored policy measures by each economy to enhance the security of petroleum product supply in light of investment uncertainty.

Outline:

There are 5 sections in this report. Section 1 provides an introduction. In section 2, the analysis delves into the consumption trends of petroleum products and refinery capacity spanning from 1965 to 2022, capturing pivotal global events such as the Covid-19 pandemic. Furthermore, it examines the impact of recent trends in spare refinery capacity on petroleum product crack spreads. Section 3 highlights future challenges in the global and APEC contexts regarding petroleum products supply security, examining the investment needed in the oil refinery sector to meet growing demand across different outlook scenarios from different reputable institutes. This section also underscores the anticipated hurdles stemming from global shifting patterns of petroleum product consumption. The subsequent sections focus on specific assessments of APEC sub-regions. Section 4 evaluates the supply security of petroleum products. Session 5 delves into refinery utilization rates, providing insights into operational efficiencies and future supply capabilities. Finally, Section 6 concludes with recommended measures for APEC economies' governments to consider to enhance energy security, advocating for individual and collective efforts, including petroleum product stockpiling.

Key Findings:

1) Spare refining capacity has been declining in APEC and the rest of the world for 40 years.

As petroleum products maintain their pivotal roles in the global energy transition, it becomes increasingly evident that recent global refinery capacity has failed to match the rising consumption levels. This discrepancy is underscored by the declining global refining capacity relative to consumption, raising concerns regarding supply security. This situation is examined in Section 2-1.

2) Low spare refining capacity increases petroleum product price volatility and degrades energy security.

The impacts of the global refinery capacity constraints preceding and during the Ukraine crisis are underscored in Section 2-2. Notably, the average 'crack spreads'—the differentials between spot product prices and crude oil prices—of diesel and gasoline in the US Gulf Coast during 2022-2023 surged nearly fourfold compared to historical averages. A parallel trend was observed in the Singapore market, where crack spreads for diesel and gasoline similarly reflected the influence of constrained global refinery capacity during this timeframe.

3) Uncertainty about long term petroleum product demand increases the riskiness of additional refinery investments.

OPEC, IEA, and APERC 8th Outlook-REF anticipated growth in petroleum product consumption, at least in the near term. Specifically, OPEC expects continued growth extending to 2045, whereas projections from IEA show a rapid decline and APERC anticipates a moderate decline. These different outlooks, as examined in Section 3-1, reflect uncertainty and risk to ongoing and anticipated investment in oil refinery infrastructure which typically requires substantial upfront capital requirements and long lead time of secured and stable returns to justify their viability.

4) If petroleum product demand increases in the near term, creating spare refining capacity will require substantial capital investments.

To increase global refinery capacity in accordance with both the near-term projection from IEA and longer term from OPEC, net additional capacity of 5.2 mb/d and 18.3 mb/d need to be built and in operation by 2028 and 2045, respectively. This required investment is challenging given current uncertainties regarding future consumption trajectories, compounded by high interest rates and other investment hurdles. Section 3-2 provides a comprehensive analysis of these requisite investments in refinery capacity.

5) Changes in the relative consumption shares of different petroleum products exacerbate those security risks.

Economic growth and recent decarbonization initiatives have resulted in changes in consumption shares of petroleum products. Section 3-3 provides an in-dept assessment of these changes. Consumption of gasoline, for example, is declining in many economies relative to diesel use as a result of increased electrical vehicles. Conversely, consumption of jet fuel is expected to increase due to growing GDP and increased air transportation activity. These changes underscore potential petroleum product supply risks, as refineries are often constrained to specific product lines. Addressing these shifts may necessitate significant investments to adapt production processes, a decision that is difficult given the uncertain outlook for petroleum product demand.