

Thailand Energy & Utilities

จีน-รัสเซีย: สัมพันธ์นี้เพียงพอจะต่อสู้อะไร?

- ราคาหุ้นบริษัทจดทะเบียนไทยที่ปรับตัวลดลงไปเมื่อเร็ว ๆ นี้เป็นโอกาสที่ดีในการสะสมหุ้นบริษัทที่มีปัจจัยพื้นฐานที่ดีและมีการเติบโตของกำไรที่มีความชัดเจนสูง
- วิธีที่เป็นไปได้ที่สหภาพยุโรปจะใช้เพื่อจัดการความเสี่ยงในด้านอุปทานก๊าซจากรัสเซียในปี 2022: ลดความต้องการก๊าซ นำเข้า LNG และนำเข้าก๊าซผ่านท่อเพิ่ม
- ตัวเต็งที่จะเป็นคู่แข่งในท่ามกลางราคาพลังงานและแนวโน้มความต้องการที่อยู่ในระดับสูงคือ IVL และ GULF

ความตึงเครียดสร้างโอกาสในการซื้อหุ้นพลังงานและสาธารณูปโภค

ในขณะที่ความตึงเครียดจากสงครามระหว่างรัสเซียและยูเครนเพิ่มขึ้นอย่างต่อเนื่อง อันมีผลให้ความเสี่ยงในด้านอุปทานสำหรับทรัพยากรหลัก (อลูมิเนียม นิกเกิล, แร่ธาตุหายาก (แพลเลเดียม), อาหาร (ข้าวสาลี ข้าวโพด), และพลังงาน (น้ำมัน ก๊าซและถ่านหิน) เพิ่มขึ้นเท่าทวีคูณ เราคิดว่าราคาหุ้นของบริษัทจดทะเบียนไทยที่ปรับตัวลดลงเมื่อไม่นานมานี้เป็นโอกาสที่ดีสำหรับนักลงทุนในการสะสมหุ้นที่มีปัจจัยพื้นฐานที่ดีและการเติบโตของกำไรในปี 2022-23 มีความชัดเจนสูง

ถ้าสหภาพยุโรปพยายามก็มีหนทางที่จะประสบความสำเร็จในการลดการพึ่งพาก๊าซจากรัสเซีย

เราได้วิเคราะห์ความเป็นไปได้ที่สหภาพยุโรปจะทดแทนอุปทานก๊าซจากรัสเซียทั้งหมดได้ในปี 2022 และสรุปว่ามีความเป็นไปได้ที่จะบรรลุเป้าหมายดังกล่าว ข้อแรกคือการนำข้อเสนอของ IEA ในการลดความต้องการก๊าซเพื่อการผลิตไฟฟ้า (ลดอุปทาน) และการบริโภค (ลดความต้องการ) มาปรับใช้อาจลดความต้องการก๊าซได้ 324-710TWh (10-20% ของความต้องการก๊าซของสหภาพยุโรปในปี 2021) ข้อสองคลึงกับ LNG ขนาด 1,900TWh (151.5mtpa) ที่ส่วนมากอยู่ในด้านตะวันตกของยุโรปยังมีอัตราการใช้งานต่ำ เพราะฉะนั้นจึงมีความสามารถในการนำเข้า LNG เหลืออีก 1,170TWh (93.3mtpa) ในปี 2022 ข้อสามความสามารถของท่อส่งก๊าซจากผู้ผลิตที่ไม่ใช่รัสเซียยังเหลืออีก 650TWh (51.8mtpa) ซึ่งสามารถใช้นำเข้าก๊าซเพิ่มผ่านท่อดังกล่าวโดยส่วนมากจะมาจากนอร์เวย์ สหราชอาณาจักร และอาเซอร์ไบจาน

จีนจะสามารถทดแทนความต้องการพลังงานของรัสเซียที่หายไปจากสหภาพยุโรปได้หรือไม่

เมื่อพิจารณาจากข้อเท็จจริงที่ว่าตลาดพลังงานที่ใหญ่ที่สุดของรัสเซียยังเป็นสหภาพยุโรป โดยรัสเซียส่งก๊าซและน้ำมันให้สหภาพยุโรป 40% และ 26% จีนไม่น่าจะสามารถทดแทนการค้าที่หายไปจากมาตรการคว่ำบาตรของสหภาพยุโรปในปี 2022 ได้ จากข้อมูลของ IEA ในปี 2021 จีนคิดเป็นเพียง 20% ของการส่งออกของรัสเซีย ซึ่งส่งออกน้ำมันส่วนมากไปยังยุโรป จากข้อมูลของ EIA ในสหรัฐ รัสเซียเป็นผู้ขายน้ำมันรายใหญ่อันดับ 2 และผู้ขายก๊าซรายใหญ่อันดับ 3 ของจีนโดยมีการส่งออกอยู่ที่ USD41.1 พันล้านและ USD4.3 พันล้านในปี 2021 ตามลำดับ เมื่อไม่นานมานี้ รัสเซียได้เปิดเผยสัญญาขายน้ำมันและก๊าซใหม่กับจีนรวมมูลค่าประมาณ USD117.5 พันล้าน นอกจากนี้การส่งออกน้ำมันและก๊าซของรัสเซียไปยังจีนได้เพิ่มอย่างต่อเนื่องถึงกว่า 9% ต่อปีมาตั้งแต่ปี 2017 อย่างไรก็ตามจากข้อมูลของ EIA การเติบโตอย่างรวดเร็วของจีนดังกล่าวยังคงคิดเป็นเพียงครึ่งหนึ่งของตลาดน้ำมันของรัสเซียที่ส่งไปยังสหภาพยุโรป

IVL และ GULF เป็นตัวเต็งที่จะเป็นคู่แข่งในสถานการณ์ราคาพลังงานที่ปรับตัวขึ้น

เราเห็นผลกระทบ 3 ประการที่มีต่อบริษัทพลังงานและสาธารณูปโภคของไทยจากราคาสินค้าโภคภัณฑ์ที่ปรับตัวขึ้น ส่วนมากเป็นการเพิ่มของต้นทุนพลังงาน (การสูญเสียเชื้อเพลิงสำหรับโรงกลั่นและต้นทุนในการแปลงสภาพสำหรับผู้ผลิตเคมี), วัตถุดิบ (ແພຟາและก๊าซ), และค่าระวางขนส่ง ในด้านรายรับความเสี่ยงจากความไม่เสถียรภาพในทางการเมืองที่สูงขึ้นอาจขยายแนวโน้มความต้องการในยุโรปและเป็นภัยต่อปริมาณขาย การวิเคราะห์ของเราระบุว่าตัวเต็งที่จะเป็นคู่แข่งในท่ามกลางราคาพลังงานและแนวโน้มความต้องการที่อยู่ในระดับสูงคือ IVL และ GULF แม้ว่าจะมีสัดส่วนกำไรจากยุโรปในระดับสูง บริษัททั้งสองมีแนวโน้มการเติบโตของกำไรที่ต่ำกว่าการเติบโตจากภายใน รวมถึงการควบรวมและซื้อกิจการ



Suwat Sinsadok, CFA, FRM, ERP

suwat.sin@fssia.com
+66 2611 3558

Siriluck Pinthusoonthorn

siriluck.pin@fssia.com
+66 2611 3562

PREPARED BY FSS INTERNATIONAL INVESTMENT ADVISORY SECURITIES CO LTD (FSSIA). ANALYST CERTIFICATION AND IMPORTANT DISCLOSURES CAN BE FOUND AT THE END OF THIS REPORT

Could Sino-Russo ties turn the sanctions tide?

As the tensions surrounding the Russia-Ukraine war have continued to escalate, effectively multiplying the supply risk for key resources (aluminium, nickel), rare earth (palladium), food (wheat, corn), and most importantly, energy (oil, gas, and coal), we think the recent share price collapse of Thai listed companies offers a great opportunity for investors to accumulate companies with solid fundamentals and highly visible earnings growth in 2022-23.

A fire broke out on the site of a Ukrainian nuclear power plant after a Russian attack on 8 Mar-22. According to the head of the International Atomic Energy Agency (IAEA), Rafael Mariano Grossi, a training centre at the Zaporizhzhia nuclear power plant, located in the immediate vicinity of the reactors, was hit by a projectile.

The nuclear power plant Zaporizhzhia is located in Southeastern Ukraine. The region is contested and is now occupied by Russia. According to the IAEA and the Ukrainian government, no increased radioactivity has been measured in the vicinity of the plant.

Exhibit 1: Key nuclear power plants in Ukraine (as of 4 Mar-22)



Source: [Statista](#)

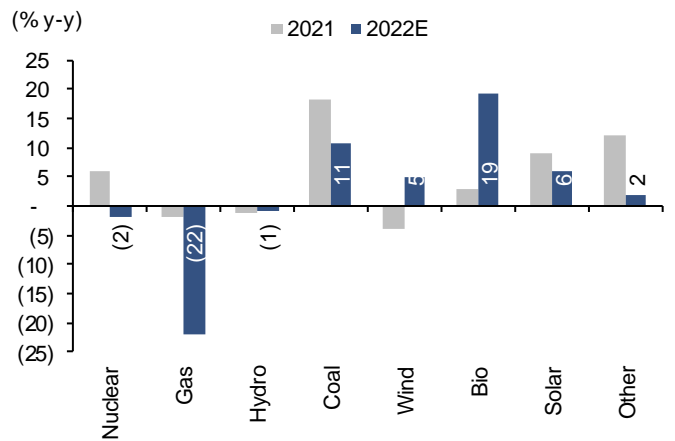
A look back at Ukraine-Russia crisis in 2014. In 2014 when Russia invaded Crimea, a former part of Ukraine which is now annexed by Russia, gas exports from Siberia to Europe had been mostly via the pipeline infrastructure in Ukraine with around 66% of Russia's total gas exports going to Europe.

Exhibit 3: Russia's major gas pipelines to Europe



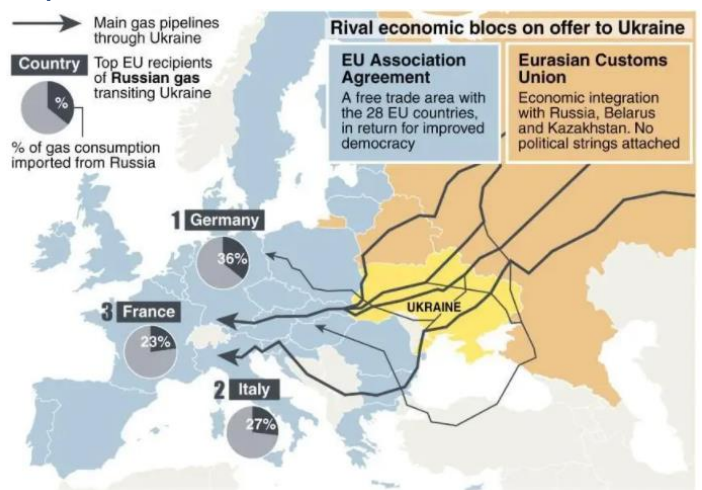
Source: [Statista](#)

Exhibit 2: Growth in European power generation by source (2021-22E)



Source: [Energy Northern](#)

Exhibit 4: Ukraine is torn (buffered) between East and West Europe



Source: [Business Insider](#)

On the other hand, Ukraine also heavily relied on Russia’s gas imports in 2014, with 58% of gas consumed in Ukraine imported from Russia. This “mutual” reliance during periods of conflict has continued to raise the tensions between Russia and Ukraine, eventually to the point that Russia decided to invade Ukraine to prevent Ukraine from becoming a member of the North Atlantic Treaty Organisation (NATO).

Exhibit 5: Ukraine’s political and cultural split



Source: Energy Information Administration (EIA)

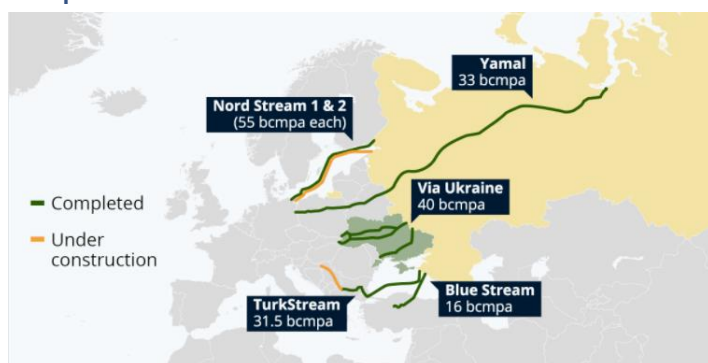
The gas pipelines linking Russia and Europe

Russian natural gas makes up around a third of all gas used in Europe, arriving on the continent via pipelines. Gas plays an important role in the energy mix of many European nations, making the question of what would happen to gas flows in the case of a standoff of Western powers and Russia over Ukraine a contentious one.

Prominent transportation routes include the Yamal pipeline running through Belarus and Poland with a capacity of 33bcm per year (bcm/yr) and the larger North Stream pipeline in the Baltic Sea which can transport 55bcm/yr, and an additional 40bcm/yr can be transported via Ukraine, according to the US Energy Information Administration (EIA).

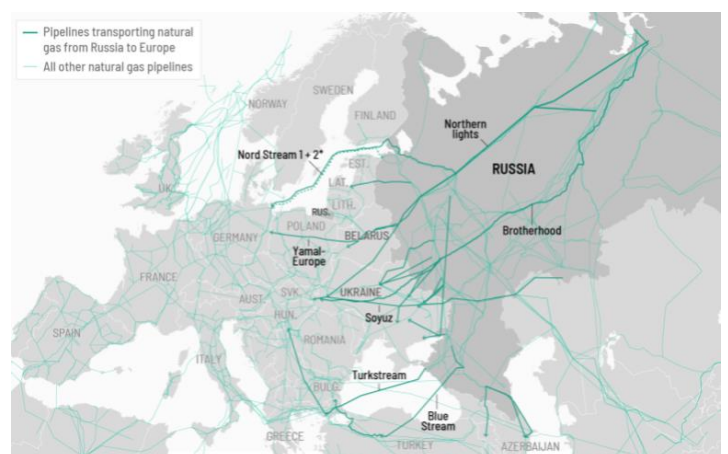
Major European economies which obtain 40% or more of their natural gas from Russia include Germany, Italy and Poland. Many smaller countries, especially in Eastern Europe and the Balkans, are even more dependent on the Russian gas supply.

Exhibit 6: Five major gas pipelines to bring Russian gas to Europe



Source: Statista

Exhibit 7: How Russian gas reaches Europe



Source: CNN

Even before the discussion about Russian energy dependency resurfaced, the Nord Stream pipeline, which ends in Germany, had become infamous. The route is supposed to double in capacity with the construction of a second pipeline – Nord Stream 2. Even before the current crisis, the project was heavily criticised for creating more energy dependence on Russia. However, experts believe that Europe is actually able to replace up to two-thirds of the gas quantity currently supplied by Russia. This could happen via increased use of pipelines from Norway, the UK and North Africa, as well as through the use of imported and regasified LNG.

How much are power sources diversified in Europe?

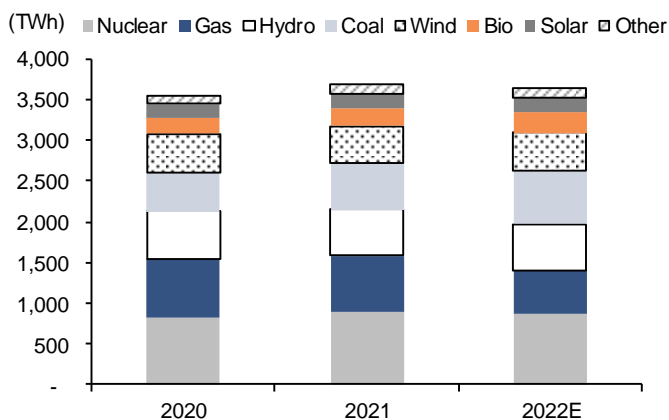
To rub salt into the wound, Russia’s recent occupation of Ukraine’s nuclear power plants further exacerbates the energy and power risks of European countries. As of 2021, the EU still generated most of the continent’s power from gas, estimated to be at least 543 terawatt-hours (TWh) in 2022, according to Energy Northern’s estimate.

Ironically, the most unloved coal-fired power generation is projected to rise by 11% y-y in 2022, with 19% y-y growth in biomass power generation, 6% y-y growth in solar, and 5% y-y in wind. Both nuclear and coal-fired power sources are either dirty (coal-fired) or dangerous (nuclear), but we think the EU has no choice but to rely on these unloved power sources, at least in the short term to ensure its power and energy security amid the uncertainty around Russia’s gas and nuclear power plant sources.

Gas remains a key strategic energy source for the EU in 2022. Undoubtedly, the EU has to depend on gas-fired power plants, estimated to account for 15% of total power generation capacity in 2022, according to the EIA, down from 20% in 2020 and 19% in 2021, as the EU diversifies away from gas-fired into more coal-fired power capacity.

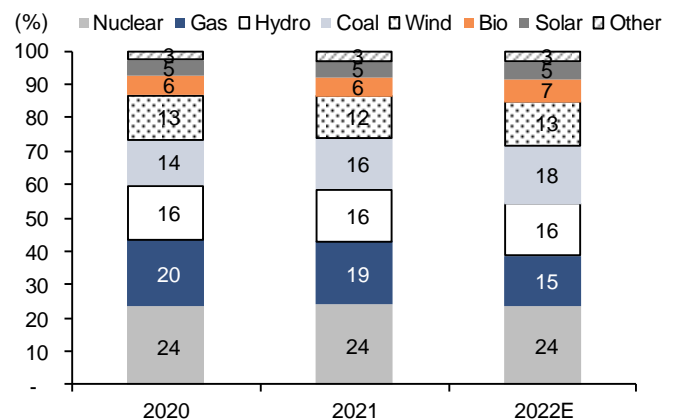
Coal-fired power is here to stay for the EU. Even after many years of strategic decarbonisation of the European power market, the EU still heavily depends on coal-fired electricity, which should rise to 18% of total capacity from 470TWh in 2021 to 579TWh in 2022, according to Rystad Energy. Gas, hydro and wind power generation dropped in 2021, increasing the pressure on other energy sources, including coal, to bridge the gap.

Exhibit 8: EU power generation breakdown by power plant type (TWh)



Source: [Energy Northern](#)

Exhibit 9: EU power generation breakdown by power plant type (%)



Source: [Energy Northern](#)

Coal-fired electricity generation has been steadily declining in Europe since 2012, but affordability, and most recently the availability – due to Russia’s gas weaponizing strategy – concerns surrounding gas, along with the availability concerns impacting nuclear, wind and hydro generation, could maintain coal’s momentum in 2022 and beyond.

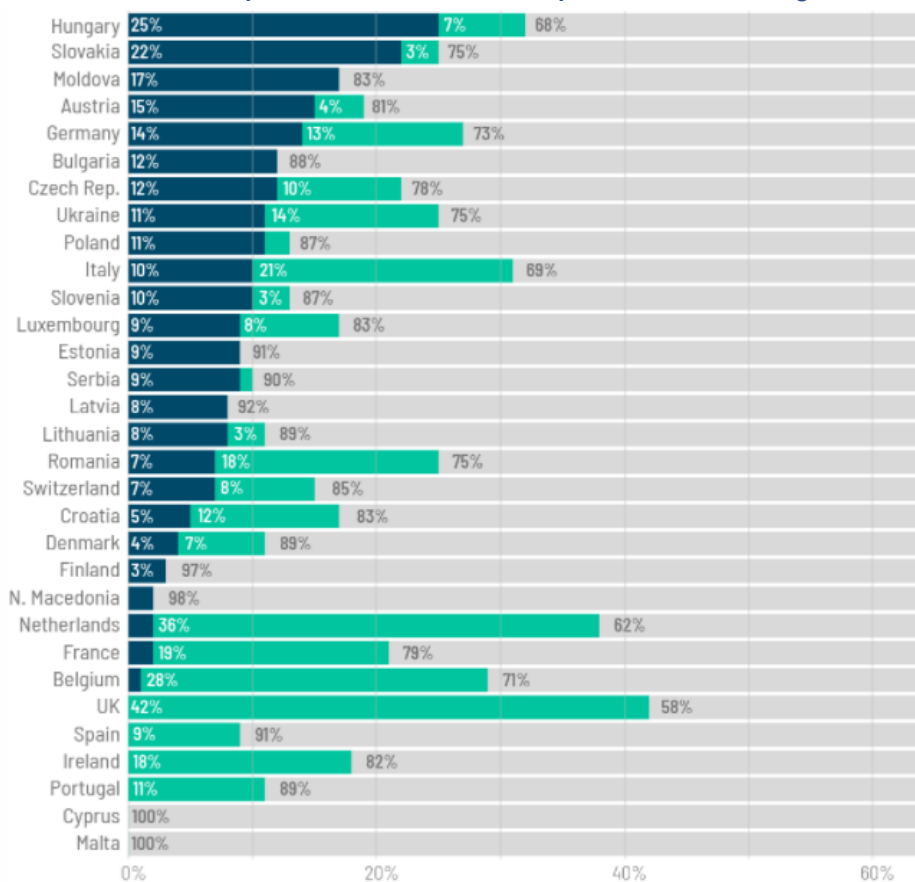
Coal’s resurgence last year was triggered by other components of the continental power mix facing new challenges, including record-high gas prices and tensions between Russia and Ukraine, which has raised questions about the long-term security of gas imports through Russian-operated pipelines.

Under the circumstance that the gas price spike is likely to persist due to the military conflict between Russia and Ukraine, coal-fired power generation could jump by an additional 11% in 2022 to 641TWh – a return to the 2018 level – to ensure that the lights stay on across the continent.

A dilemma between greener and safer energy security for Europe. European countries have been gradually decommissioning coal infrastructure over the recent years, as the power market moves towards a greener, less carbon-heavy future. However, as the regional energy crisis shows, coal remains a critical component of the power mix, especially when the reliability of other sources of energy is called into question, and that is unlikely to change in the immediate future, according to Rystad Energy.

While a military escalation in Eastern Europe would disrupt Russian gas flows – albeit the extent of which is uncertain – even without any supply disruption, record-high prices are forcing buyers to explore alternatives. Gas prices in Dec-21 hit €182 (\$207) per megawatt-hour (MWh), a record high and a staggering 900% year-over-year increase.

Exhibit 10: Which European countries are most dependent on Russian gas?



Source: [CNN](#)

Despite soaring prices, European gas demand from the power sector fell only marginally in 2021, by around 3bcm to 144bcm, as other components of the power mix faced myriad challenges. The continued reliance on gas helped catalyse the widespread energy crisis and sent consumer electricity prices skyrocketing across the continent last year.

Hydro and wind-generated power fell in 2021 for the first time, helping to support fossil fuel dependency on the back of low wind speeds and hydro dam levels in crucial producing countries. While Rystad Energy projects wind generation to increase marginally in 2022 – from 447TWh to 469TWh – hydro generation is expected to remain low.

What could happen to European energy and power markets in 2022? If gas prices remain high or the Russia-Ukraine conflict results in a significant drop in gas-fired generation in 2022, Europe has options to make up the shortfall.

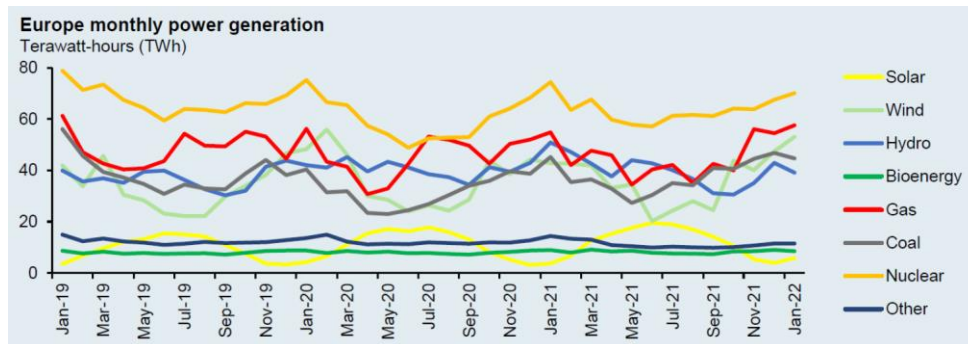
Other non-coal power sources can come to the rescue. Despite decommissioning infrastructure, coal power generation remains the most flexible option, with the possibility to increase supply by 63TWh (+2% of total power demand estimated in 2022). Bioenergy plants and liquids, which currently make up a small portion of the total power generation, could add 77TWh combined (+2%), while new wind and solar capacity that is expected to come online in 2022 could contribute an extra 33TWh (+1%), according to Rystad Energy.

Nuclear dilemma. A ray of hope in 2022 comes in the form of nuclear generation, which rose by 6% y-y in 2021 to 884TWh. Nuclear has been the largest contributor to electricity generation in Europe since 2014, but dark clouds may be on the horizon, highlighted by France's EDF recently downgrading its expected nuclear output in 2022 and 2023.

EDF dropped its output expectations for the second time in a month due to ageing reactors, scheduled maintenance and unexpected outages. France's average nuclear power of 370TWh will be slashed to between 295TWh and 315TWh in 2022 and between 300TWh and 330TWh in 2023. This is a worrying message for the market, as reduced nuclear generation would likely extend and exacerbate the European power crunch and continue to put pressure on the already tight supply situation for electricity on the continent.

Reservoir levels in hydroelectric dams across the continent are at worryingly low levels, meaning an increase in hydro-generated power in 2022 is unlikely. As a result of these limitations of other sources of power generation, gas is expected to remain the marginal supplier that can make up any shortfalls. If gas prices remain high – which looks likely – consumers may have to battle with soaring energy prices for some time to come.

Exhibit 11: Europe monthly power generation



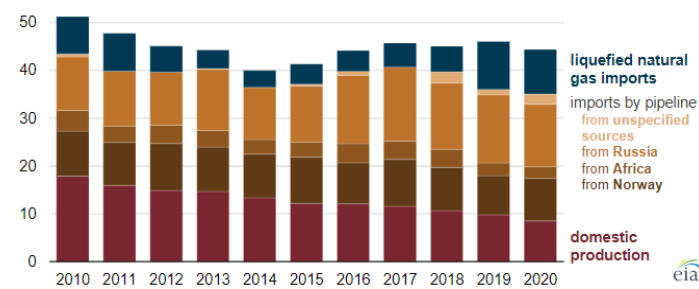
Source: Bloomberg

What if Russian gas supplies to EU are halted until summer?

As the Russian invasion of Ukraine intensifies, both the European Commission and the United States are looking at contingency plans in case of a further reduction or, in the worst-case scenario, a complete halt of Russian gas supplies to the EU.

Should this happen, could Europe replace Russian gas imports this winter and the next two winters? Whatever happens, the most efficient solution requires demand-side adjustments to reduce dependency on gas, rather than just replacing Russian gas with imports from another country.

Exhibit 12: EU and UK gas supply breakdown (2010-20) (bcfpd)



Source: EIA

At the end of 2021 a dramatic picture emerged, with Europe’s gas balance for the winter strongly dependent on Russian supplies and moderate weather conditions. Up to now, three main factors have prevented a worst-case scenario: 1) a strong increase in imports of LNG; 2) the ‘winter risk’ of exceptionally cold temperatures did not materialise in 2021; and 3) the continuation of contractual supplies by Russia, amounting to 18TWh/week.

Looking ahead, we think there are three scenarios:

Best case: gas supply shortage is avoided. If Russia and all other suppliers continue to supply at current levels, implying historically high levels of LNG imports, and natural gas demand remains in line with the 2015-21 average, then we estimate that EU-wide storage would hit a low of approximately 320TWh in Apr-22.

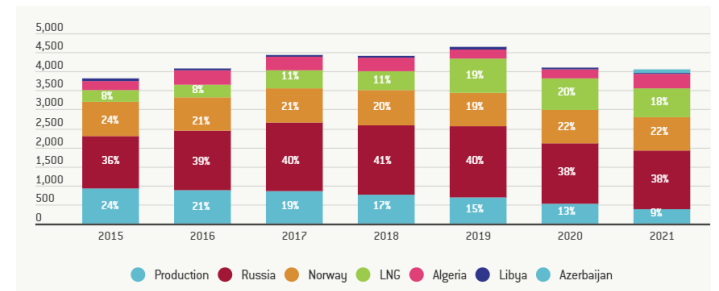
Base case: Russia cuts gas supply to Europe. If Russia cuts supplies beginning in Mar-22, we estimate that storage would reach a minimum level of 140TWh in Apr-22.

Worst case: Russia cuts supply and the demand for power is high. In this case, we estimate that EU-wide storage would be empty by the end of Jun-22.

Challenges for non-Russian gas supply in Europe. The Iberian Peninsula, for example, is a hub for LNG import terminals. As a result, the region can import 40TWh per month but can only consume 30TWh. The challenge is transporting the excess gas to the rest of Europe, given that existing pipelines permit a maximum transfer of 5TWh a month.

Gas arriving in France is odorised and typically cannot be fed into neighbouring gas systems without constraints. Gas in the northwestern European market has different qualities (domestically produced low-calorific L-gas in parts of Germany and the Netherlands vs imported high-calorific H-gas in the rest of Europe) that use different infrastructures.

Exhibit 13: Annual EU gas supply breakdown (TWh)

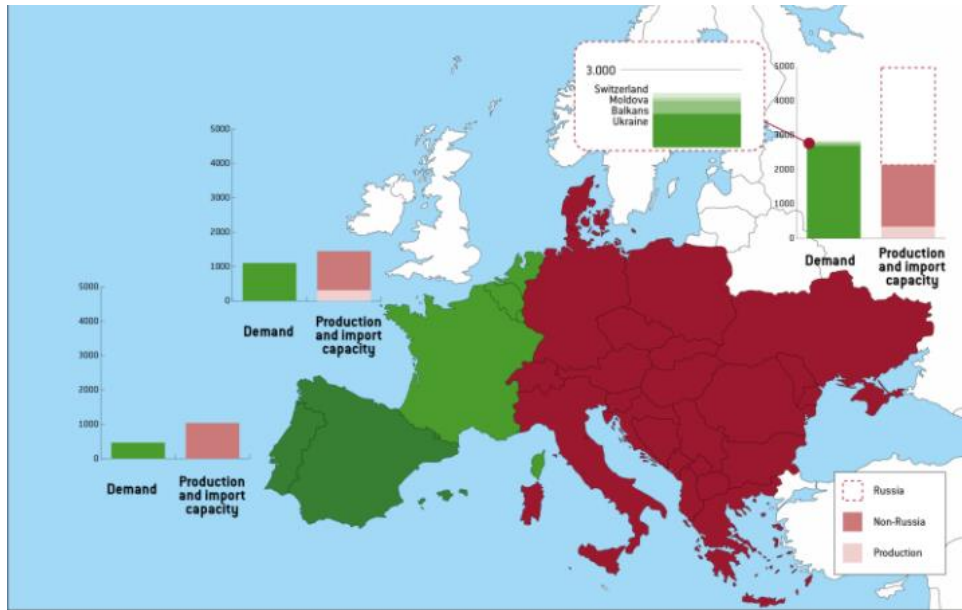


Source: EIA

Moreover, the central and eastern European pipeline system is designed to bring imports from the east to final consumers. Despite investment in reverse-flow capacities and new pipelines, if too much gas were to come from the west, pipeline bottlenecks could prevent sufficient deliveries to the easternmost parts of the EU or Ukraine.

Finally, and most importantly, what is technically feasible might not be feasible politically. Even if it were technically feasible to synchronise the depletion of storage across Europe to delay or prevent gas-supply disruptions anywhere in the EU, there is a risk that countries with better supply might be unwilling to share scarce gas resources with countries in worse situations. This risk is amplified by an inability to predict the length and severity of any shortage while, under worst-case scenarios, infrastructure constraints would already call for anticipatory movements of volumes across borders.

Exhibit 14: Direct exposure to a gas disruption from Russia differs across Europe



Source: EIA

What could the EU do now to mitigate the gas supply risk from Russia? In principle, existing infrastructure allows additional import volumes from Norway and North Africa, and additional LNG volumes, which together (17TWh/week) could displace current (low) imports from Russia (18TWh/week). But while having the infrastructure is one thing, having the gas is another.

Norway already reached its gas production ceiling. Norway's prime minister has already announced that his country is delivering as much as it can to the EU and that global LNG markets are very tight. EU domestic gas production is limited, both in the Netherlands and elsewhere. Gas stored in pipelines, LNG-tanks and on the user side might postpone gas shortages by a few days at most.

A certain volume of gas is also held permanently in underground storage to maintain adequate pressure over the winter. According to The Economist, up to 10% of this gas could be used under emergency circumstances, providing another contingency tool. Hence, without demand-side measures, a full disruption of Russian gas imports may result in some EU countries having to take emergency measures before the upcoming summer in 2022.

What if Russian gas supplies are halted for years?

While getting through a 2021-22 winter without Russian imports could be difficult, running the European economy for several years without Russian gas would be hugely challenging. While there is more time to prepare, there are also much higher volumes to displace.

Exhibit 15: Annual EU gas supply (2021)

	Annual capacity	2021 Flow	Utilisation rate
	(TWh)	(TWh)	(%)
Pipeline Flows	3,630	1,840	51
Russia	2,800	1,550	55
Poland	60	40	67
Portugal	70	60	86
Spain	700	190	27
LNG (by importing country)	2,040	1,380	68
Netherlands	140	80	57
Norway	1,100	890	81
North Africa	800	410	51
Domestic	1,080	440	62
Azerbaijan	130	80	62
Belgium	170	40	24
Croatia*	30	na	na
France	440	180	41
Greece	70	20	29
Italy	200	100	50
Lithuania	40	20	50
Total LNG	2,040	1,380	68
Total	6,750	3,660	54
<i>% LNG to gas supply</i>	<i>30.2</i>	<i>37.7</i>	

Source: EIA

In 2021, Russian natural gas exports to the EU amounted to 1,550TWh (123mt LNG) via pipeline and around 120TWh (9.6mt) via LNG. This implies that around 1,700TWh (135.5mt LNG) would have to be replaced should Russia stop its natural gas exports to Europe completely.

Quickly increasing domestic production is only possible at gas fields that have spare capacity. Technically, more gas can be extracted from the Groningen field – but getting a few dozen additional TWhs per year would require the Dutch government to loosen the moratorium that strongly constrains production to prevent earthquakes in the region.

In terms of EU natural gas imports, there appears to be significant unused capacity, mostly in France (41% utilisation rate as of Feb-22), Belgium (24%), Italy (50%), and Azerbaijan (62%).

Exhibit 16: European LNG infrastructure



Source: [European Commission](#)

Will LNG and non-Russian gas pipelines be able to rescue Europe from Russia's gas shortfall? Compared to an import capacity of around 151.5mtpa (1,900TWh), the EU only imported 58.2mt (730TWh) of LNG in 2021. Hence, Europe's regasification terminals would be able to handle 87.7mtpa (1,100TWh) of additional LNG imports into the EU.

On pipelines, in 2021 the EU had unused import capacities of 200TWh from Norway, 400TWh from North Africa and 50TWh from Azerbaijan – a total of 650TWh – leaving the EU with a spare import capacity of 1,800TWh from alternative suppliers to Russia. This could, theoretically, allow the EU to replace Russian flows entirely (amounting to 1,700TWh in 2021, of which some is LNG).

Moreover, additional capacity is available from the UK, with two connecting pipelines offering approximately another 400TWh per annum, but this would be dependent on the UK importing levels significantly above its domestic demand.

Major obstacles for EU to replace Russian gas dependency

However, using all available import capacity for LNG and gas pipelines may be too optimistic as there are a number of limiting factors:

Upstream and liquefaction capacity is limited. The main problem is that producers might be unable to scale up their gas production and/or LNG exports to Europe. Global liquefaction capacity is almost fully utilised and so are LNG vessels, significantly constraining the amount of additional LNG volumes that can be brought to the global market anytime soon.

Economic and legal issues with redirecting LNG flows. A significant share of additional LNG imports into the EU would have to come from flows currently going to Asia and the Americas. But, as a significant part of global LNG is delivered via long-term contracts, European buyers are left competing for a smaller slice of global LNG. Moreover, LNG producers might prefer not to compromise their long-term relationships with their Asian buyers to provide temporary support to Europe, as their primary market is – and will likely be even more so in the future – Asia.

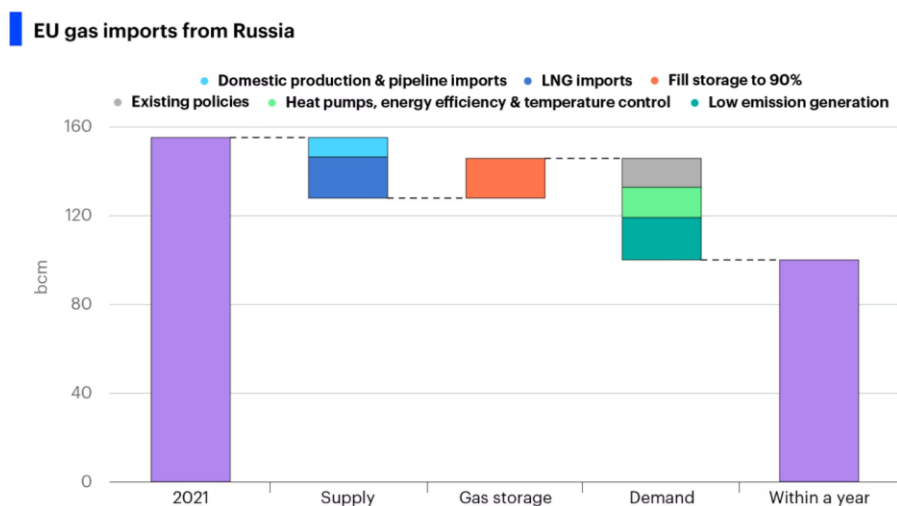
Excessively high gas prices. Additional demand, potentially up to 1,000TWh, in an already tight global LNG market (of about 5,000TWh) would place immense upside pressure on prices. This would be a major hit to the European economy, which is already suffering from high energy prices.

Second-round effects on poorer countries. Skyrocketing European natural gas prices might redirect LNG cargos away from importing countries in the developing and emerging world that could no longer afford them.

Intra-EU issues. Import infrastructure and EU gas markets were not designed for supplying all of central and eastern Europe from the west. Even if it were possible to supply the whole region, including Ukraine with LNG imports from the west, this would come at a very high price.

In summary, we think the challenges facing the EU in terms of the gas supply issue due to the Russia-Ukraine war clearly illustrates that the EU cannot simply rely on increasing supply to replace Russian natural gas volumes. Demand will have to play a role as well. Only a combination of the two can deliver a workable outcome.

Exhibit 17: IEA's 10-point plan to EU to reduce reliance on Russian gas supplies



Source: IEA

10-point plan to reduce Russia's gas supply reliance

According to the International Energy Agency (IEA), the energy body to oversee the energy market, the EU could reduce its imports of Russian natural gas by more than one-third within a year through a combination of measures that would be consistent with the European Green Deal and support energy security and affordability.

The rush to cut gas imports of 155bcm of natural gas from Russia, accounting for around 45% of EU gas imports and close to 40% of its total gas consumption in 2021, and the progress towards Europe's net zero ambitions to bring down its use and imports of gas over time, has prompted the EU to seek ways to cut its reliance on Russian gas.

The IEA's "10-Point Plan to Reduce the EU's Reliance on Russian Natural Gas" includes a range of complementary actions that can be taken in the coming months, such as turning to other suppliers, drawing on other energy sources and accelerating efforts to provide consumers, businesses and industries with the means to use clean and efficient alternatives to natural gas. The proposed measures are fully consistent with the EU's European Green Deal and its "Fit for 55" package, paving the way for further emissions reductions in the years to come.

- Do not sign any new gas supply contracts with Russia to enable greater diversification of supply.
- Replace Russian supplies with gas from alternative sources by increasing non-Russian gas supply by around 30bcm within 2022.
- Accelerate the deployment of new wind and solar projects to reduce gas use by 6bcm in 2022.
- Maximise power generation from bioenergy and nuclear to curb gas use by 13bcm in 2022.
- Speed up the replacement of gas boilers with heat pumps to reduce gas use by an additional 2bcm in 2022.
- Accelerate energy efficiency improvements in buildings and industry to reduce gas use by close to 2bcm in 2022.
- Encourage a temporary thermostat reduction of 1°C by consumers to reduce gas use by some 10bcm in 2022.
- Introduce minimum gas storage obligations to enhance resilience of the gas system by next winter.
- Enact short-term tax measures on windfall profits to shelter vulnerable electricity consumers from high prices in order to cut energy bills even when gas prices remain high.
- Step up efforts to diversify and decarbonise sources of power system flexibility, effectively loosening the strong links between gas supply and Europe's electricity security.

In short, the key actions recommended in the IEA's 10-Point Plan include not signing any new gas contracts with Russia; maximising gas supplies from other sources; accelerating the deployment of solar and wind; making the most of existing low emissions energy sources, such as nuclear and renewables; and ramping up energy efficiency measures in homes and businesses.

Taken together, these steps could reduce the EU's imports of Russian gas by more than 50bcm, or over one-third, within a year, the IEA estimates. This takes into account the need for additional refilling of European gas storage facilities in 2022. Many of the actions recommended in the plan – including stepping up energy efficiency measures, accelerating renewable deployment and expanding low emissions sources of power system flexibility – are key elements of the IEA's "Roadmap to Net Zero by 2050".

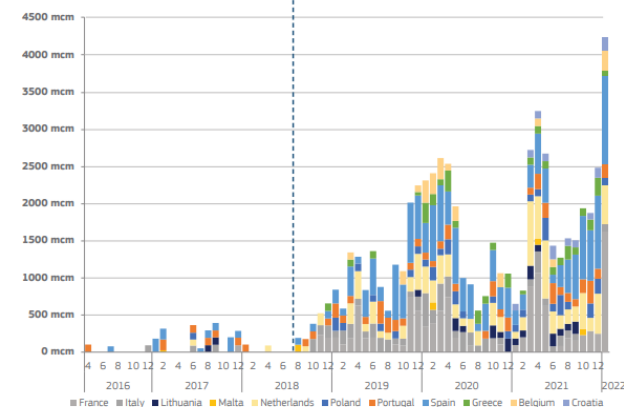
Could US be a panacea for EU's energy dilemma?

According to the report, "EU-US LNG Trade", by the European Commission (EC), dated Feb-22, LNG imports from the US have increased substantially since the first shipment in Apr-16. Data shows that in 2021 LNG exports to the EU recorded the highest volume, reaching more than 22bcm, with an estimated value of €12b. In Jan-22 imports reached the highest monthly, amounting to 4.4bcm. By Jan-22, the EU imported more than 64bcm of LNG from the US since Apr-16.

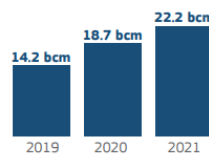
Exhibit 18: LNG exports from US to EU have jumped markedly since 2016

Steep increase of US LNG imports after the EU-US agreement in July 2018, mainly in France, Italy, Lithuania, Malta, Netherlands, Poland, Portugal, Spain, Greece, Belgium and Croatia.

Meeting between the Presidents of the European Commission and the United States



23% of US LNG exports went to the EU in 2021



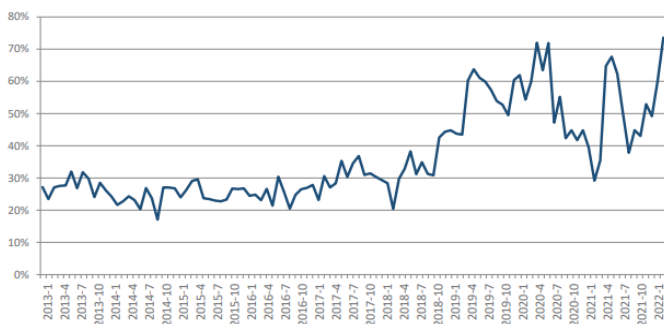
US LNG exports to the EU could increase even further in the coming years

Source: [EU-US LNG trade](#)

The increasing gas production in the US and the start of US LNG exports to the EU in 2016 have improved the security of the gas supply in Europe and globally. Europe is currently importing around 90% of the gas it needs, and this share is expected to increase in the coming years. LNG is also an important part of the EU's diversification strategy, and, as the second-biggest single gas market in the world after the US, the EU is therefore an attractive option for the US.

There is real potential for further increases in EU-US LNG trade in the coming years. Since the meeting of the American and EC presidents in 2018, US LNG exports into Europe increased by 2,418% during 2018 to Feb-22, according to the EC. A total of 64bcm of US LNG arrived in the EU since Apr-16. In Jan-22 alone, 4.4bcm of US LNG has arrived, which represents 37% of the total US LNG exports and 44% of the total EU LNG imports in Jan. US LNG, if priced competitively, can play an important role in EU gas supply, enhancing diversification and EU energy security.

Exhibit 19: Average EU utilisation rate of LNG re-gasification capacity as of Feb-22



Source: [EU-US LNG trade](#)

Exhibit 20: US vs EU gas industry comparison

US	EU
Largest gas producer in the world	World's 2nd-largest gas consumer after the US
Growing gas production	Rapidly declining domestic gas production
Increasing gas exports	Increasing gas imports to diversify away from Russian overreliance
US is significantly increasing its LNG export infrastructure	Strong LNG import infrastructure with ample spare capacity (74% utilisation rate in Jan-22)

Source: [EU-US LNG trade](#)

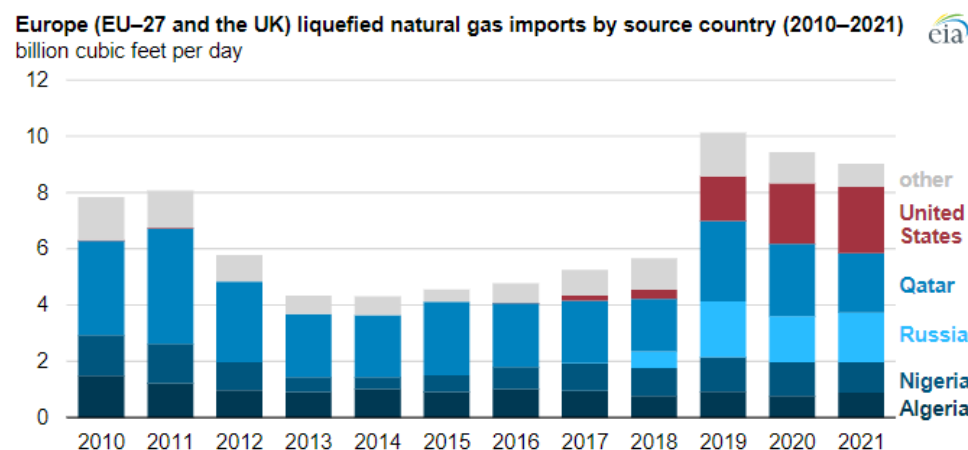
US could emerge to be the world's largest gas producer by 2023

Since 2021, the US has already gained a large share of Europe's supply of LNG at the expense of lower supplies from Qatar and Russia. Three LNG suppliers combined accounted for almost 70% of Europe's total LNG imports, according to the EIA. Indeed, the US already became Europe's largest LNG supplier in 2021, gaining a 26% market share of all LNG imported by EU member countries (EU-27) and the UK, followed by Qatar with 24% and Russia with 20%.

In Jan-22, the US supplied more than half of all LNG imports into Europe for the month, and the potential gas supply disruptions from Russia could further allow the US to export even more LNG to Europe in 2022. Exports of LNG from the US to the EU-27 and the UK rose from 3.4bcfd in Nov-21 to 6.5bcfd in Jan-22, the historically highest LNG export volume from the US shipped to Europe, according to the US Department of Energy, based on LNG shipping data. Rising US LNG exports are the result of both natural gas supply challenges in Europe and the sizable price differences between natural gas produced in the US and the current prices at European trading hubs.

According to the EIA's "Short-term Energy Outlook" report dated Feb-22, US natural gas production should increase to an average of 104.4bcfd in 2022 and then further increase to a record high of 106.6bcfd in 2023. Around 97% of production over the next two years should come from the lower 48 states (L48), excluding the Federal Offshore Gulf of Mexico (GOM). The other 3% should come from Alaska and the GOM.

Exhibit 21: Russia, Qatar, and the US supplied 70% of the LNG to Europe in 2021



Source: EIA

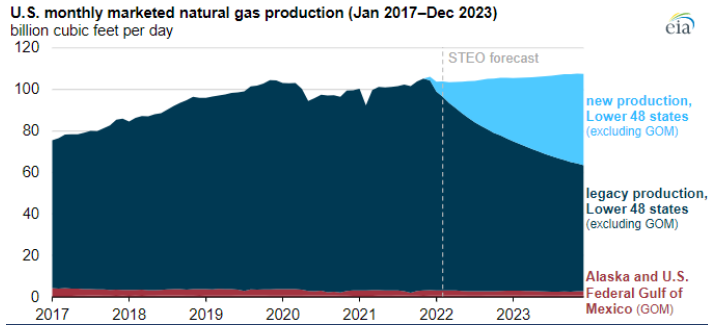
Russia is the second-largest natural gas producer worldwide after the US, accounting for one-fifth of global reserves of gas located in Russia, mainly in West Siberia and the Volga-Ural oil and gas province. Russia also ranks first among gas exporters, primarily via pipelines.

The national sector developed rapidly after the 1950s, when large gas fields were discovered in the Soviet Union, which opened opportunities for export trade. In 1989, the USSR Ministry of Gas Production was transformed into the state enterprise Gazprom, now a public joint stock company. Gazprom is the leader in gas production output worldwide, holding the monopoly on the Russian gas export market.

The EIA also estimates that the Henry Hub (HH) price will average USD3.92/mmbtu in 2022, an 8-year high, and will average USD3.60/mmbtu throughout 2023. The elevated HH prices would likely drive continued increases in US drilling activity and natural gas production.

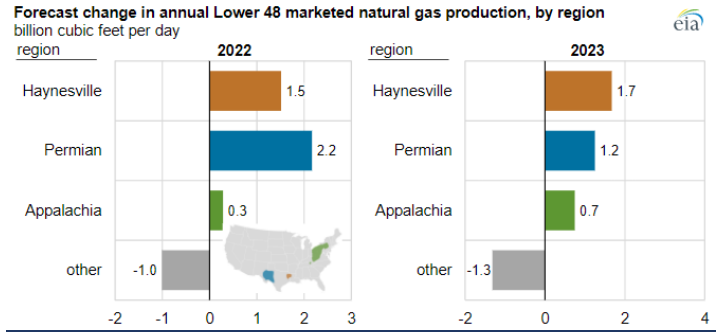
US natural gas production growth would primarily come from the Appalachian region in the northeast (Marcellus), the Permian region in western Texas and southeastern New Mexico, and the Haynesville region in Texas and Louisiana. BANPU has a total shale gas production of 800mmscfd in Appalachia and Barnett (western Texas), thereby should benefit from the higher projected gas demand in both the domestic and LNG export markets in 2022-23.

Exhibit 22: US market natural gas production forecast to rise in 2022-23



Source: EIA

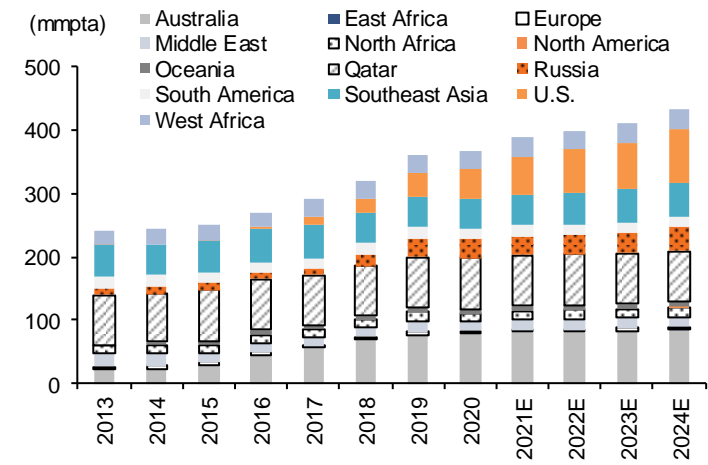
Exhibit 23: Changes in annual gas production by region



Source: EIA

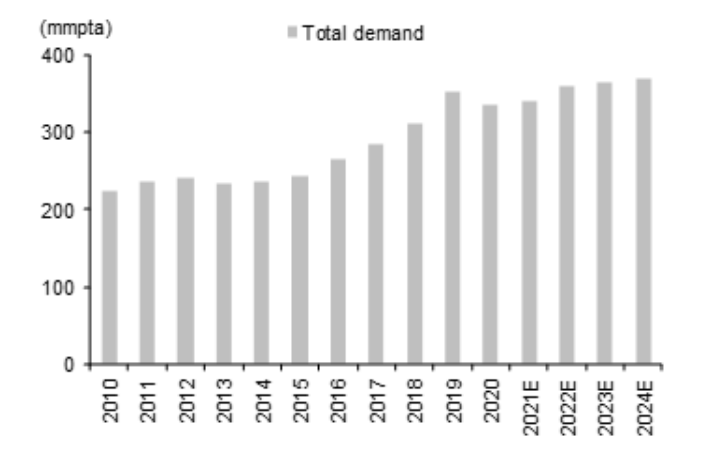
Since 2021, the US has already gained a large share of Europe’s supply of LNG at the expense of lower supplies from Qatar and Russia. Three LNG suppliers combined accounted for almost 70% of Europe’s total LNG imports, according to the EIA. Indeed, the US already became Europe’s largest LNG supplier in 2021, gaining a 26% market share of all LNG imported by EU member countries (EU-27) and the UK, followed by Qatar with 24%, and Russia with 20%.

Exhibit 24: Liquefaction capacity by country



Source: EIA

Exhibit 25: LNG demand projection



Source: EIA

The US began exporting LNG in Feb-16 and within only four years has become the world’s third-largest LNG exporter behind only Australia and Qatar. Once LNG liquefaction units at the Sabine Pass LNG and Calcasieu Pass LNG are placed in service in 2022, the US’ LNG export capacity will become the world’s largest.

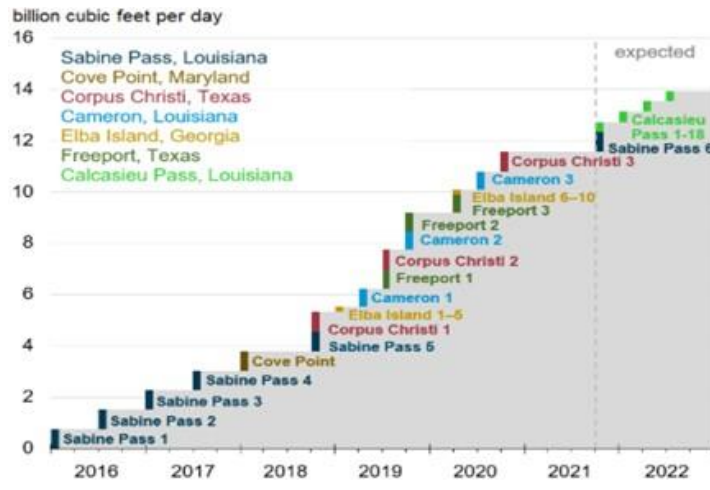
According to the EIA, the announced LNG project plans and capacity expansions will occur between Dec-21 and fall 2022:

The completion of Train 6 at the Sabine Pass LNG export facility. Train 6 will add up to 0.76bcfd of peak export capacity. Train 6 began producing LNG in late November and the first export cargo from this train is expected to be shipped before the end of this year.

Increase in LNG production at Sabine Pass and Corpus Christi LNG terminals as a result of optimising operations. The US Federal Energy Regulatory Commission (FERC) approved an increase in annual LNG production at these two facilities by a combined 261 billion cubic feet per year (bcfy) or 0.7bcfd (+11.5%) through uprates and modifications to maintenance.

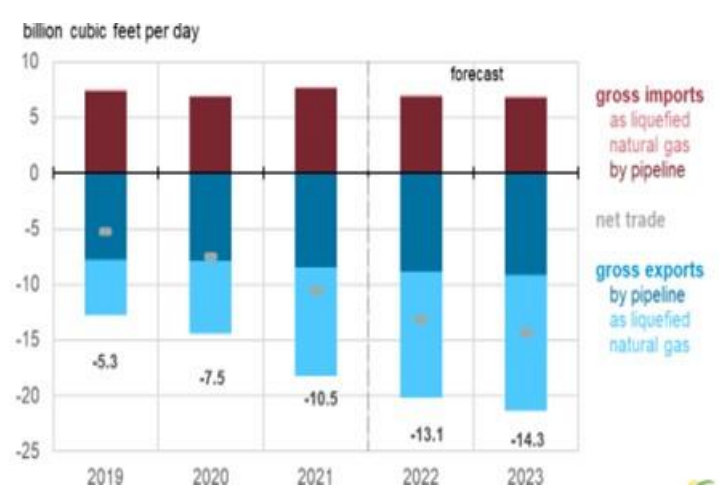
New LNG export facility Calcasieu Pass LNG in Louisiana comes online. The project consists of 9 blocks, each containing 2 mid-scale modular liquefaction units for a total of 18 liquefaction units with a combined peak capacity of 1.6bcfd. Commissioning activities at Calcasieu Pass LNG started in Nov-21, and the first LNG production is expected before the end of this year. All units are expected to be placed in service by the fourth quarter of 2022.

Exhibit 26: US LNG export capacity by project (2016-22)



Source: EIA

Exhibit 27: US annual gas trade

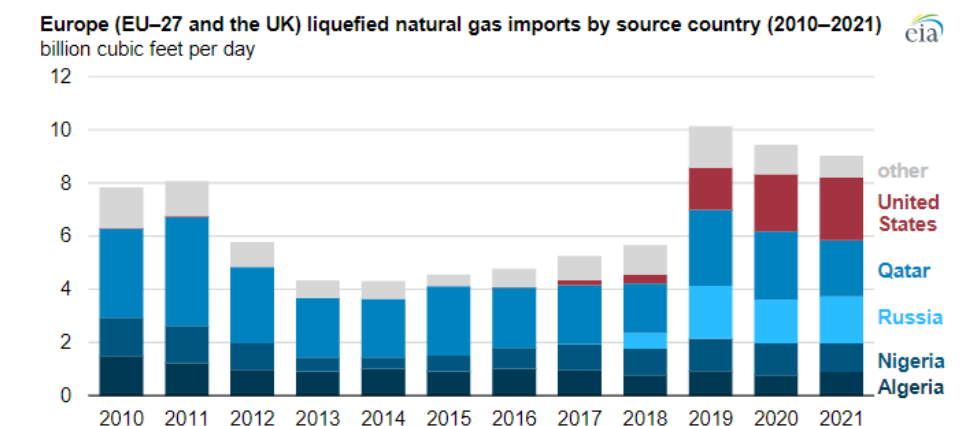


Sources: EIA, Short-term Energy Outlook, February 2022

Rising US LNG exports are the result of both natural gas supply challenges in Europe and the sizable price differences between natural gas produced in the US and the current prices at European trading hubs.

However, further transatlantic cooperation between US-EU could be further strengthened by 1) removing unnecessary US LNG licensing barriers to accelerate US exports; and 2) developing key missing infrastructures and investments in Europe to improve access to LNG.

Exhibit 28: Russia, Qatar, and the US supplied 70% of the LNG to Europe in 2021

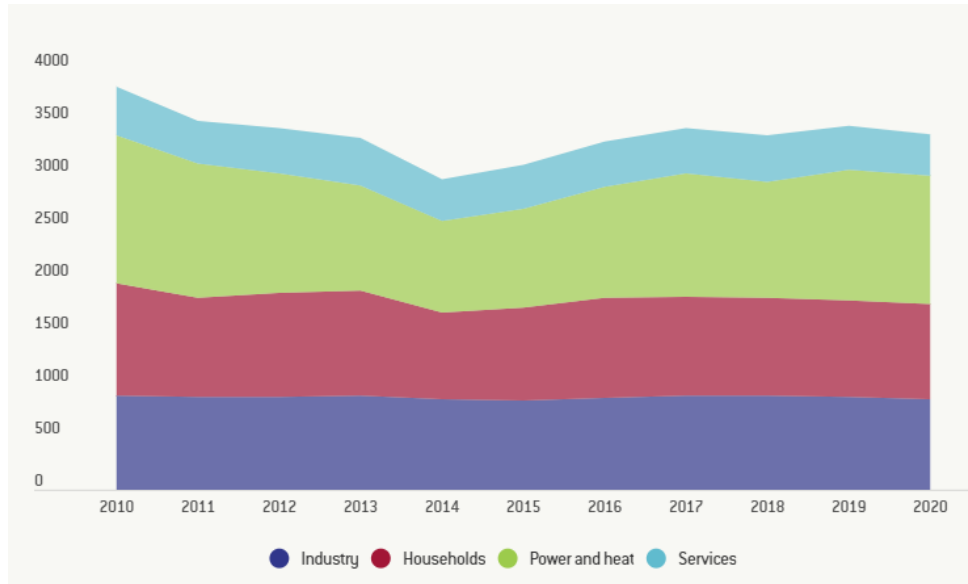


Source: EIA

How can Europe realistically curb demand?

According to the article, “Can Europe survive painlessly without Russian gas?” by Bruegel, dated 27 Jan-22, most natural gas is used for heating, in industrial processes and for producing electricity and district heat. In all three areas there is the potential to reduce demand. About 900TWh of natural gas was used in 2021 to produce electricity in the EU.

Exhibit 29: EU27 natural gas consumption by sector, 2010-20



Source: [Bruegel](#)

Switching gas to other power generation. According to Bruegel, in the short term, some gas-fired power plants could run on oil, and if we assume 10% of EU gas-fired power plants will switch to oil for their power production, the EU’s gas demand could be cut by 90TWh.

Furthermore, if the additional 100TWh capacity of coal-fired power generation that has been shut down since 2019 is reversed to become operational, the gas demand that could be saved could amount to over 200TWh.

Solar farms may also be deployed to generate 15TWh to 30TWh annually, likely replacing over 30TWh of gas demand, based on our estimate.

The delay of Germany’s plan to permanently close its nuclear power plants until the end of 2021 could further reduce an additional 120TWh of gas demand.

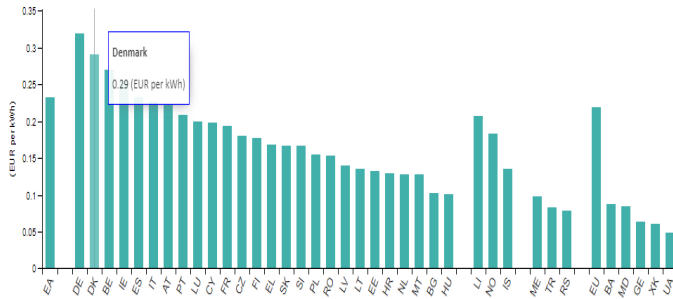
In aggregate, we estimate that at least 900TWh of gas consumption is still required in 2022, unless the current spike in electricity prices drastically reduces power consumption.

Gas demand reduction by industry. In the industry sector, the only short-term approach is demand curtailment as the manufacturers of steel, aluminium, silicon, chemicals, and fertilisers, all being energy-intensive industries, have already cut their utilisation rates in response to the high energy prices. Non-mandatory actions by the government may be required to curb the gas demand, including forcing non-critical industries to shut down and lowering heating in commercial/office buildings and homes.

In the residential and services sectors, energy efficiency could be implemented to curb the gas demand, as most buildings remain energy inefficient, but this has to be motivated financially by the government to incentivise households to invest in energy saving equipment.

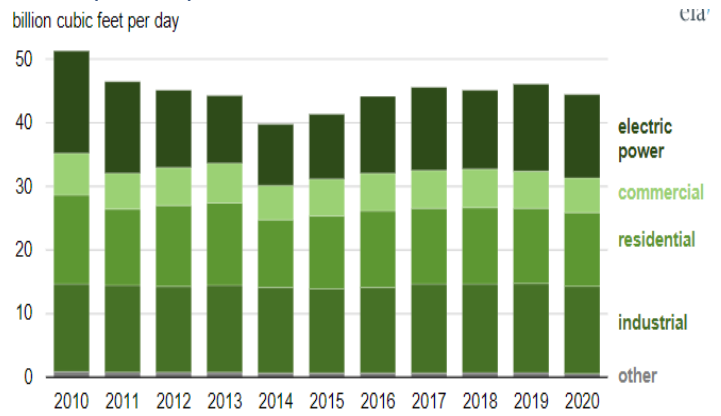
Energy conservation is another way to trim gas demand as consumers are willing to help achieve gas demand goals by lowering their electricity consumption via turning down their thermostats slightly during the winter and deploying energy efficiency improvements, which we estimate to save about 2% of the gas demand used for heating, or 30TWh.

Exhibit 30: Electricity tariff (including taxes) for household consumers, 1H21



Source: EIA

Exhibit 31: Europe (EU-27) and UK natural gas demand by sector (2010-20)



Source: EIA

Recent EU plan to reduce Russian gas dependency. On 8 Mar-22, the EU announced plans to cut its dependency on Russian gas by over 60% in 2022 and eventually end its reliance on Russian gas supplies before 2030. The plan embraces 1) switching to alternative supplies; and 2) expanding the renewable capacity at a faster rate than the original plan. This emergency plan is on top of the EU’s plan to curb carbon emissions by 30% by 2030.

The new sources of gas and LNG would come from the US and Qatar in 2022, likely to replace over one-third or around 586TWh (60bcm or 46.7mt LNG) of the gas supplied from Russia. By 2030, the increase in the use of hydrogen and biomethane could further reduce the gas demand from Russia, according to the EU’s announcement.

New wind and solar farms are planned to replace up to 195TWh (20bcm or 15.6mt LNG) in 2022, with a plan to add 480GW of wind and 420GW of solar energy by 2030, further cutting the gas demand from Russia by 1,661TWh (170bcm or 132.4mt).

Energy savings measures of 1) turning down thermostats by 1C could save an additional 97.6TWh (10bcm or 7.8mtpa) and gradually by 2030, the changes in gas boilers with 30m heat pumps could save 342TWh (35bcm or 27.2mtpa), according to the EU Commission.

The EU also plans to propose rules by Apr-22 requiring EU countries to fill their gas inventories at a minimum of 90% by 1 October every year, as the EU’s current gas inventory stands at only 27%.

Can the EU fully replace Russia's gas supply in 2022?

We have analysed the possibility of the EU fully replacing its gas supply from Russia in 2022 and concluded that it is possible to achieve. First, the implementations proposed by Bruegel and the IEA to essentially cut the gas demand for power generation (supply-side) and consumption (demand-side) could lower the gas demand by 324-710TWh.

Second, the LNG terminal capacity of 1,900TWh (151.5mtpa) located mostly on the western side of Europe, still runs at low utilisation rate, and hence has a spare capacity of 1,170TWh (93.3mtpa) to import LNG in 2022.

Third, the gas pipeline capacity from non-Russian producers still has 650TWh (51.8mtpa) of spare capacity to import more gas via pipelines, mainly from Norway, the UK, and Azerbaijan.

Exhibit 32: Analysis of EU's strategies to reduce and replace Russia's gas supply in 2022

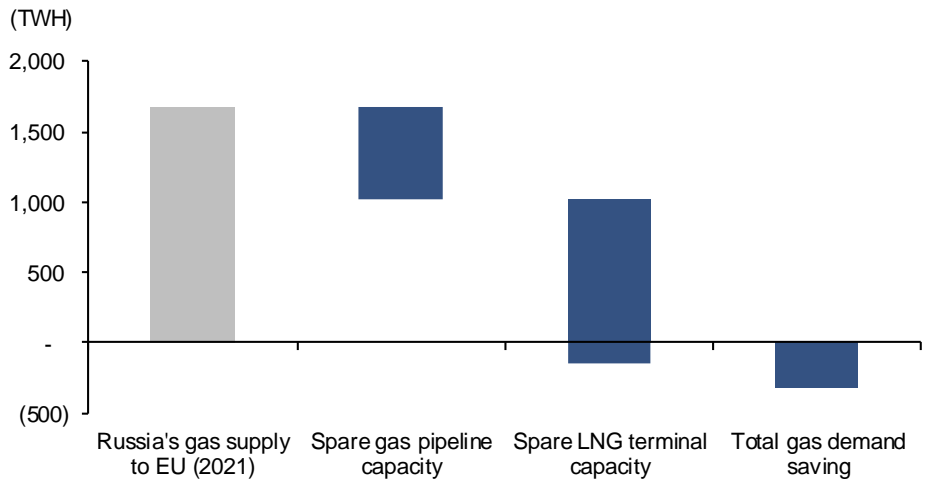
Gas demand savings proposed by Bruegel and IEA	Bruegel (TWh)	IEA (TWh)
Supply-side management	(510)	(186)
Other European gas suppliers (Norway, UK, Azerbaijan)	-	(293)
Gas-fired switching to oil (temporary)	(90)	-
Gas-fired switching to coal (re-started coal-fired)	(270)	-
Gas-fired switching to new solar and wind farms	(30)	(59)
Gas-fired switching to nuclear (by delaying shutdowns one year to end-2022)	(120)	(127)
Demand-side management	(200)	(138)
Industrial production cuts (steel, aluminium, silicon, chemicals, and fertilizers)	(170)	-
Energy conservation	(30)	(138)
Total gas demand savings	(710)	(324)
2022E gas demand-supply	Bruegel (TWh)	IEA (TWh)
Russia's gas supply via pipeline (2021)	1,550	1,550
Russia's gas supply via LNG (2021)	120	120
Total Russia's gas supply to EU (2021)	1,670	1,670
Total gas demand savings	(710)	(324)
Gas supply after savings	840	1,226
Gas supply alternatives to EU to replace Russia's gas	Bruegel (TWh)	IEA (TWh)
US LNG export in 2021	205	205
Total spare capacity (A+B)	1,820	1,820
LNG terminal capacity	1,900	1,900
2021 LNG import	730	730
Spare LNG terminal capacity (A)	1,170	1,170
Spare gas pipeline capacity (B)	650	650
Norway to EU	200	200
North Africa to EU	400	400
Azerbaijan to EU	50	50
Analysis	Bruegel (TWh)	IEA (TWh)
Russia's total gas supply to EU (2021)	1,670	1,670
Spare gas pipeline capacity	650	650
Spare LNG terminal capacity	1,170	1,170
Assuming 80% utilisation rate	1,456	1,456
Total gas demand saving	710	324
EU net gas supply	Bruegel (TWh)	IEA (TWh)
At full spare capacities (LNG and pipeline)	150	150
At 80% spare capacities (LNG and pipeline)	(214)	(214)

With gas demand reductions from supply-demand management	496	110
--	-----	-----

Sources: Bruegel; IEA; FSSIA estimates

With a total 1,670TWh (equivalent to 133.1mtpa of LNG) of gas imported from Russia in 2021, the EU is theoretically able to fully replace all gas imports from Russia by using the spare capacity of 1,820TWh (145.1mtpa). An additional buffer from the extra implementations proposed under the IEA’s “10-point Plan to Reduce the European Union’s Reliance on Russian Natural Gas” could further reduce the gas demand by maximum savings of 324TWh (25.8mtpa).

Exhibit 33: Gas demand risk could be offset by spare capacity of pipeline, LNG terminal, and gas demand savings



Source: FSSIA estimates

However, the key challenges include 1) the LNG available to be imported, as most LNG sales volumes are under the long-term contracts; 2) the LNG terminal utilisation rate could be as low as 60% due to international laws and conflicts; 3) potentially insufficient gas production increases by Norway, the UK, and Azerbaijan, to serve and fully deploy the spare capacity of the pipelines; and 4) the difficulties in achieving the proposals set forth by the IEA to achieve the gas demand reduction.

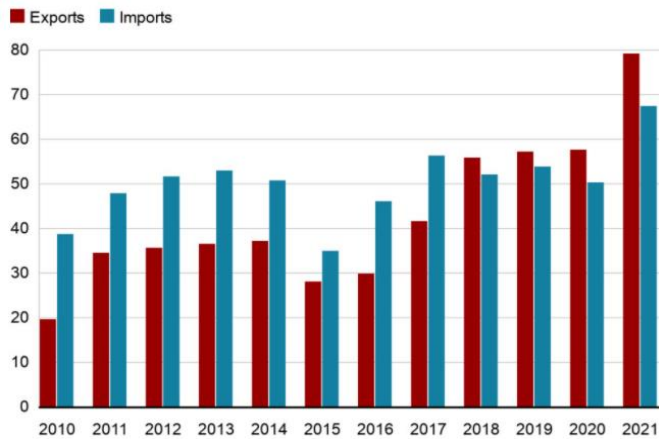
Russia's economic loss vs European energy insecurity

China could be Russia's white knight. According to the EIA, Russia's most important export partner by far is China, with a share of 16.3% of all exports to USD147b (+36% y-y) in 2021, up from 13.4% in 2020, based on China's official customs data. The Netherlands follows in second place. This is presumably due to the so-called Rotterdam effect. Rotterdam, for example, as the largest European port, appears as a destination in many trade statistics, even if the goods are merely being unloaded there and then transported up the Rhine to Germany or across the English Channel to England.

Soft commodities: from Russia with love. During President Putin's visit to Beijing in Feb-22, the two countries agreed to boost their trade to USD250b by 2024. China's customs authorities announced the lifting of all restrictions on Russian wheat and barley imports the day the assault on Ukraine started. It previously used to restrict wheat imports from certain areas of Russia because of disease concerns.

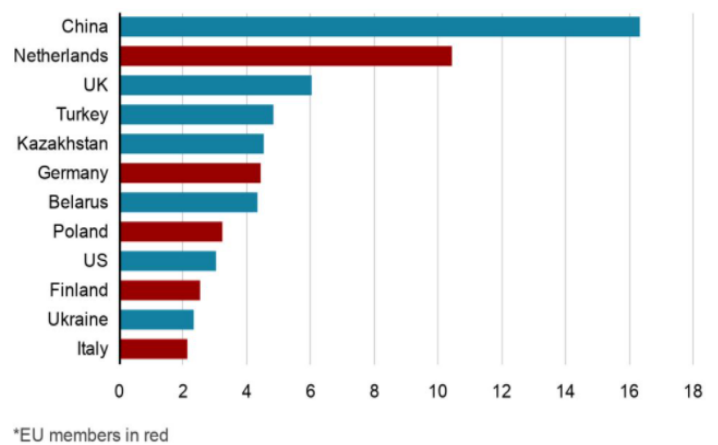
In 2021, China was the world's fourth-biggest buyer of wheat and the biggest buyer of barley, and Russia is a top producer of both grains. Apart from agricultural products, China is also currently the single biggest market for Russian energy exports such as oil, gas and coal. It is Russia's largest coal buyer, and the two countries agreed on a new deal worth more than USD20b – just a week before the Ukraine invasion.

Exhibit 34: Russia's growing trade with China



Sources: World Bank and China's official custom data

Exhibit 35: Russia's largest export destinations (% in 2021)



Sources: Observatory of Economic Complexity (OEC)

But the EU bloc remains a 2x larger buyer than China for Russia. However, as a bloc, the EU remains by far the biggest overall trading partner with Russia. In 2021, total trade between the two was worth almost twice as much as China's trade with Russia.

The most recent figures also highlight the importance of the Russia-Germany trade relationship – Russia exported mainly crude oil and natural gas worth €19.4b to Germany – this corresponds to a 59% share of all German imports from Russia. Russia also supplied metals, petroleum and coke products and coal to Germany, according to the EIA.

Other important export markets for Russia are Belarus, Turkey, South Korea, Italy and Kazakhstan. The share of Russian exports to the UK and the US, on the other hand, is only 3.1%. But given that the EU is Russia's largest trade partner accounting for around one-third of total exports, the impact of trade sanctions by the West would hit the Russian economy the hardest, with a trade stoppage on natural gas having the most serious impact.

Could China buy more Russian energy? Given that Russia's biggest energy market by far is still the EU, supplying 40% of the bloc's gas and about 26% of its oil, China is unlikely to fill up the trade gap left by EU's sanctions in 2022. For oil, the latest IEA data shows that in 2021 China accounted for just 20% of Russia's exports, with the majority of its oil going to Europe.

Russia's economy relies heavily on exporting oil and gas, and the latest sanctions by the US and some EU countries could have implications for Russian economy, in our view. In 2021, Russia was China's second-biggest oil supplier and third-biggest gas supplier, with exports reaching USD41.1b and USD4.3b respectively, according to the EIA.

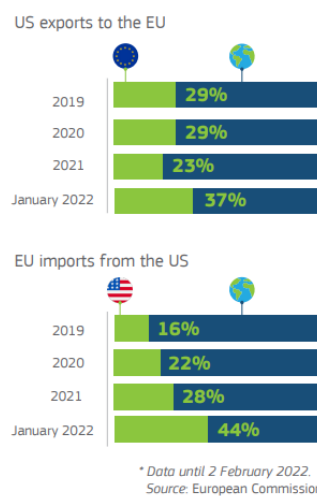
Mr Putin recently unveiled new Russian oil and gas deals with China worth an estimated USD117.5b. Russian exports of oil and gas to China have been increasing at a rate of over 9% annually since 2017, but this rapid growth for China is still only about half as big as the EU market for Russian oil, according to the EIA.

Exhibit 36: US-EU LNG vessels annually

US-EU LNG vessels per year



Surge in US-EU LNG trade



Source: [EU-US LNG trade](#)

Russia's gas market: Germany is 5x China's market. Natural gas plays a central role in the EU energy system – including in the context of the clean energy transition – accounting for 23% of energy demand. Germany, Russia's main export destination for natural gas, recently announced that it would suspend the new Nord Stream 2 gas pipeline in reaction to Russia's invasion of Ukraine.

Supplies via a new pipeline agreed between Russia and China (the Power of Siberia 2) would have only a fifth of the capacity of the Nord Stream 2 pipeline, according to the EIA, and also it is still not clear when the new gas pipeline from Siberia will come on stream. Over the longer term, China may want to boost imports of Russian gas to try to reduce its dependence on coal in order to meet targets for cutting greenhouse gases.

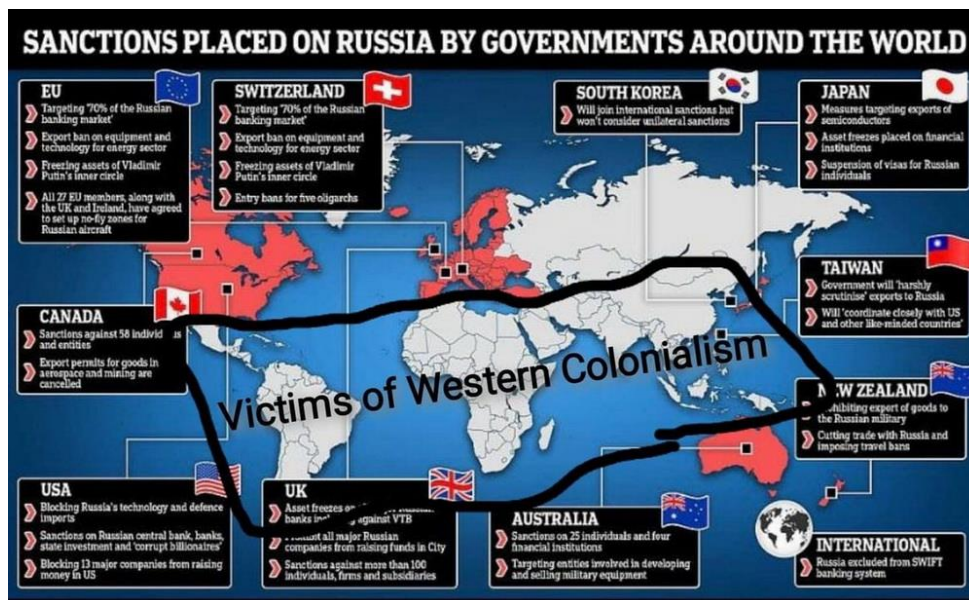
Can China's yuan replace USD for Russia?

While China clearly indicated that it will continue to have normal trade cooperation with Russia, following Russia's invasion of Ukraine, the financial sanctions by cutting off the Society for Worldwide Interbank Financial Telecommunications (SWIFT) internal payment and ban Russian banks from major international access have created difficulties for China and Russia in executing the transactions and payments.

Russia's System for Transfer of Financial Messages (STFM) remains insufficient compared to SWIFT. In recent years, both China and Russia have developed their own alternative payment systems to reduce their reliance on USD-based systems like SWIFT. Russia has its STFM while China has the Cross-Border Interbank Payment System (CIPS), and these operate in their own currencies.

As of 2021, only one Chinese bank has joined STFM, although more Russian banks and global financial institutions have connected to the Chinese system. Currently only about 17% of trade between Russia and China uses the Chinese yuan, which is up from 3.1% in 2014, according to the World Bank. And most importantly, the China-Russia energy trade remains largely in USD even though the two countries are attempting to raise RMB-based trade transactions.

Exhibit 37: Countries that imposed sanctions on Russia after the invasion of Ukraine



Source: [Thai Post](#)

Why can the yuan not challenge SWIFT yet? According to the Carnegie Moscow Center, the Russian and Chinese leaders regularly discuss increasing the use of their national currencies in bilateral payments. Moscow hopes to become less vulnerable to US sanctions this way, while Beijing, in its most recent Five-Year Plan, outlined its intention to construct and advance the security of yuan cross-border payment systems while steadily promoting the currency's internationalization.

In practice, however, these top-level statements of friendship against the USD are thwarted by the lack of practical incentives to develop financial ties. When it comes to money, it seems that the lofty ambitions of political leaders are no match for the insufficient liberalisation of the Chinese financial system and the unwieldy Russian economy beset by sanctions.

Yuan as an internal reserve: In Mar-18, Russia's central bank made global headlines when it reported that 14% of its reserves were now held in yuan. Yet the trend of increasing that proportion has reversed. In 2018–19, the yuan lost 6.4% of its value (partly because of the China-US trade dispute), while Russian reserves contracted by an estimated USD3.4b–USD4.0b, prompting Russia's central bank to reduce its yuan assets to 12.2% by the end of 2019.

Despite the International Monetary Fund (IMF) adding the Chinese national currency to its Special Drawing Rights (SDR) basket back in 2016, the latest data showed that in 4Q21, the yuan only made up about 2.25% of international reserves. Even the enormous size of China’s economy could not help increase the global profile of its national currency.

China is currently the world’s largest trader, accounting for about 13.5% of global exports and 11.4% of global imports, but the yuan accounts for only 1.7% of international settlements as of Jun-21 (vs USD at a 38.4% share and the euro’s 39%). The USD, euro, pound sterling, and the Japanese yen are all more popular than the yuan as currencies in international settlements.

Convertibility and capital flow are key. The major obstacle to the yuan currency to realistically challenge the long-dominant USD as a global major currency is its lack of convertibility. The central Bank of China (BoC) will set a daily reference rate for the yuan against the USD, which could not be converted more than 2% daily. The capital flow restriction is also another hindrance as companies owning yuan currency, particularly foreign companies, cannot freely move the yuan out of China.

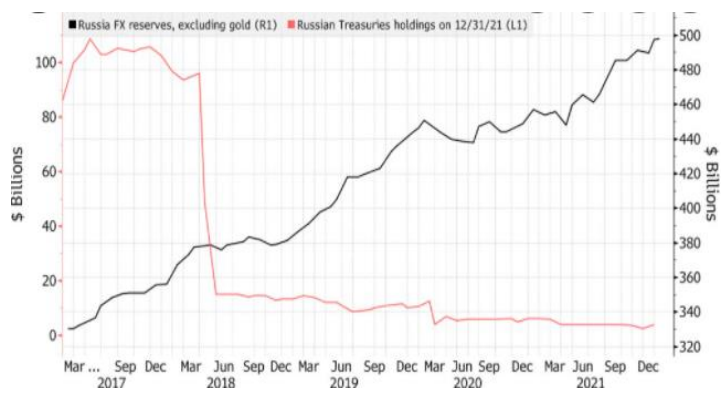
The lack of convertibility and capital flow, while facilitating the control of the economic shock impact on domestic financial markets, have essentially led to intermittent crises, which could swiftly deplete China’s reserves overnight as seen in Jan to Apr-20 when the BoC aimed to stop the yuan depreciation by selling its foreign reserves.

Exhibit 38: Number of financial messages in Russia



Source: [Econofact](#)

Exhibit 39: Russia’s USD reserve plunged significantly since 2018

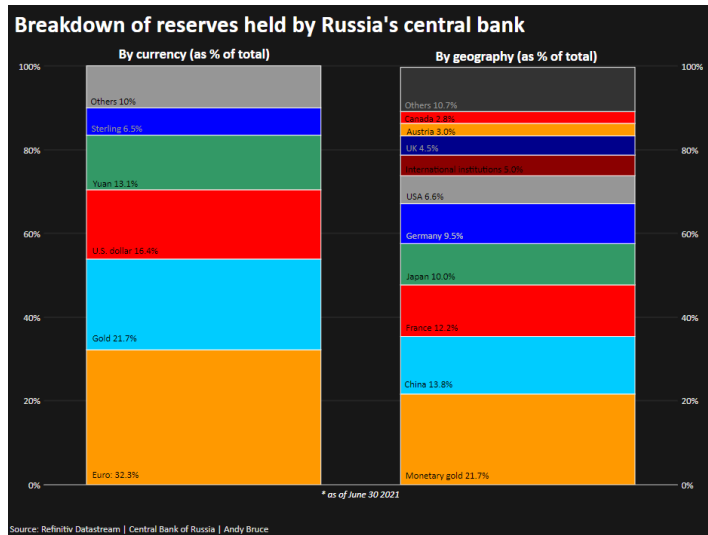


Sources: Bloomberg; US treasury

De-dollarization remains unsuccessful. In Jun-19, China and Russia signed an agreement that both countries will move to employ bilateral payments in their national currencies, essentially attempting to achieve de-dollarization. The agreement will expand the use of the yuan and the ruble for both bilateral and foreign trade contracts. But at the private sector level the currency used for payments between Russian and Chinese companies remains open. Nevertheless, the success of “de-dollarization” seems limited so far. In 2020, the ruble accounted for just 5.7% (vs 1% in 2013) of the total volume of Russian-Chinese payments, and the yuan accounted for only 6.3% (vs 2% in 2013).

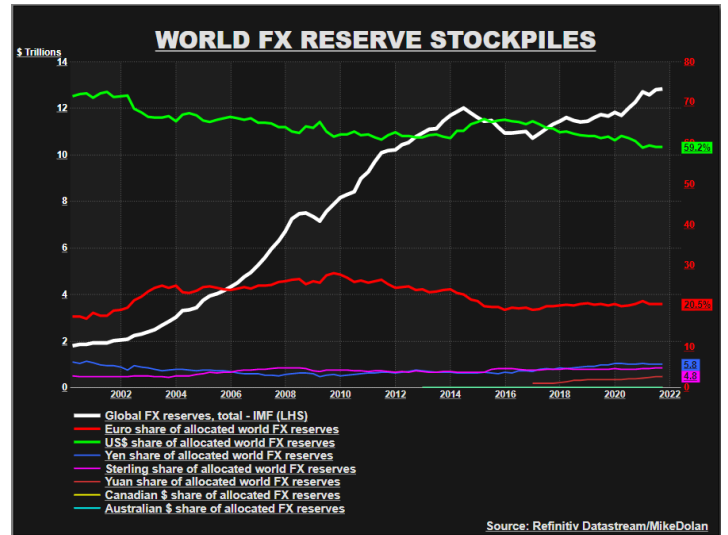
While Sino-Russian efforts to de-dollarize bilateral trade have continued to rise, most transactions were largely euro-denominated. The switch to the euro in Sino-Russian trade therefore does not mitigate the risk of Western sanctions as any Russia-China transactions via banks are likely to require USD at some point, and, therefore, be subject to secondary sanctions, as many euro-nominated cross-border payments still rely on the SWIFT international payment system.

Exhibit 40: Russia’s central bank reserve breakdown (30 Jun-21)



Source: Reuters

Exhibit 41: World foreign reserve breakdown by currency



Source: Nasdaq

What could extricate Russia and China out from SWIFT and financial sanctions?

In response to the de-dollarization, Beijing and Moscow have created their own versions of SWIFT, with China’s CIPS and Russia’s STFM. Yet, so far only one Chinese bank has joined STFM, and only twenty-three Russian banks have joined CIPS.

China’s efforts to separate itself from the Western system of SWIFT include 1) issuing the yuan-denominated “panda bond”; and 2) offering loans from Chinese development banks, with Russia as one of their biggest borrowers. According to Boston University, in 2000–20, Russian companies borrowed more than USD44b from Chinese financial institutions.

Any loans from China’s institutes to the sanctioned or likely-to-be-sanctioned Russian businesses are normally denominated in the yuan, and most of them involve Chinese companies as lenders for projects. The sanctions risk for Chinese creditors is often hedged through support from the Chinese and Russian leaders. But the support is extended only to projects that are strategically important for Russia, such as Novatek’s Yamal LNG project in the Russian Arctic.

We believe that after the severe economic sanctions against Russia by the US and its allies in response to Russia’s invasion of Ukraine, we think both China and Russia now have strong reasons to mandate and accelerate their efforts to de-dollarize and move away from SWIFT transactions.

For China, it is important to mitigate the risks of US sanctions to its payment system, possibly through the success of the yuan’s internationalization to eventually emerge as one of the world’s “core” currencies, sitting side by side with the USD and Euro.

For Russia, the mandate will be even clearer and more urgent, strategically and financially, to reduce the currency risks it faces amid economic sanctions. In practicality, for Russian and Chinese companies that should be implementing de-dollarization using the yuan and ruble as their major currencies and increasingly deploying STFM or CIPS, they are still inclined to use the most stable means of payment available to them, which both the yuan and the ruble are simply incapable of being at this time.

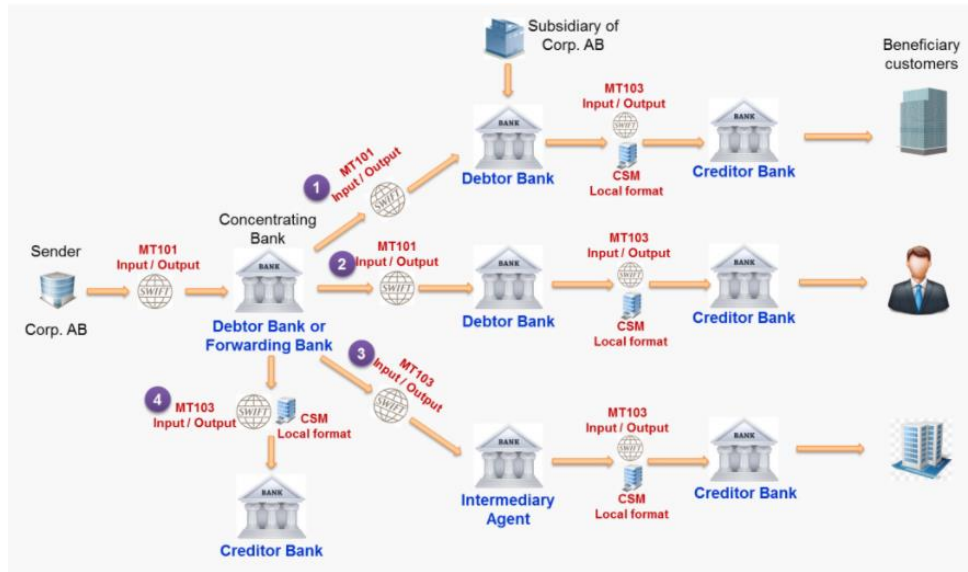
SWIFT: from financial tool to political sanction weapon

SWIFT was founded in 1973 with 239 banks in 15 countries. By 1977, it expanded to 518 institutions in 22 countries. In 2022, there are more than 11,000 institutional members hailing from more than 200 countries and territories.

In 1973, in order to simplify and accelerate settlements between banks, the SWIFT transfer system was created. It is a system in which banks around the world exchange information and data about payments. It is used by thousands of financial institutions around the world. The system provides about 1.8b messages per year.

The SWIFT translation system combines several components – its own information transmission network, software that makes it possible to connect to the network and an algorithm for assigning each participant a unique SWIFT code.

Exhibit 42: Usages of the SWIFT MT101 request for Transfer by Corporates



Source: [Paiementor](#)

It is the SWIFT bank code that makes it possible to accurately determine the sender/payee and make the transfer within the shortest possible time. The risk of error in this case is minimal, because the SWIFT code is unique for each participant in the system and contains complete information about it.

Although there are other message services like Fedwire, Ripple, and Clearing House Interbank Payments System (CHIPS), SWIFT continues to retain its dominant position in the market. Its success may be attributed to how it continually adds new message codes to transmit different financial transactions and to the security of its platform.

Though SWIFT primarily started for simple payment instructions, it now sends messages for a wide variety of actions, including security transactions, treasury transactions, trade transactions, and system transactions. In SWIFT's latest report, from Jan-22, data showed that 44.5% of SWIFT traffic is still for payment-based messages, while 50.6% represents security transactions, and the remaining traffic flows to treasury, trade, and system transactions.

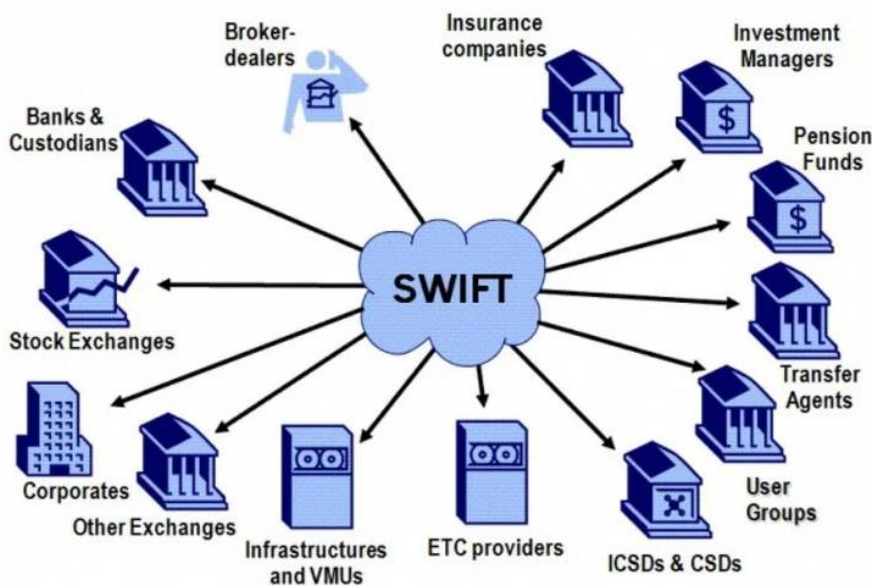
SWIFT as a key weapon for sanctions

As SWIFT is clearly a global payment system, its dominance has led it to become a significant consideration in geopolitics. In 2012, the EU sanctioned banks in Iran, disconnecting them from the SWIFT system. In Feb-22, leaders in the US and EU agreed to remove some banks in Russia from SWIFT.

Because of their reliance on SWIFT to conduct fast, seamless, secure communication, countries around the world have an incentive to remain in good standing with the organisation. SWIFT is overseen by central banks from Group of Ten (G10) countries, but it is purportedly a neutral organisation operating for the benefit of all of its members. In recent years, the possible use of SWIFT membership as a potential sanction against members has emerged multiple times. In 2012, for example, the EU passed a sanction against Iran that compelled SWIFT to disconnect sanctioned Iranian banks.

More recently, leaders from the UK, EU, US, and Canada announced that selected banks in Russia would be disconnected from SWIFT over its Feb-22 invasion of Ukraine. SWIFT has retained its dominant position in the global processing of transactional messages. It has recently forayed into other areas, such as offering reporting utilities and data for business intelligence, which indicates its willingness to remain innovative. In the short- to mid-term, SWIFT seems poised to continue dominating the market.

Exhibit 43: SWIFT payment and transfer system diagram



Source: [IHODL](#)

Energy price update post Russia's invasion of Ukraine

Immediately after Russia's announced that it had cut off of the gas supply via the Yamal-Europe pipeline, one of five Russia-Europe gas pipelines, the price of Title Transfer Facility (TTF) benchmark gas jumped by over 2x to a €340/MWh peak before declining to €230/MWh on 8 Mar-22 at 4:13 pm, Bangkok time. Similarly, the price of Intercontinental Exchange (ICE) UK natural gas futures (Mar-22) dropped to £225/MWh after hitting a peak of £350/MWh.

Exhibit 44: Dutch TTF gas futures (TGJ22)



Source: [Barchart.com](https://www.barchart.com)

Exhibit 45: ICE UK natural gas futures (Mar-22) (NFH22)

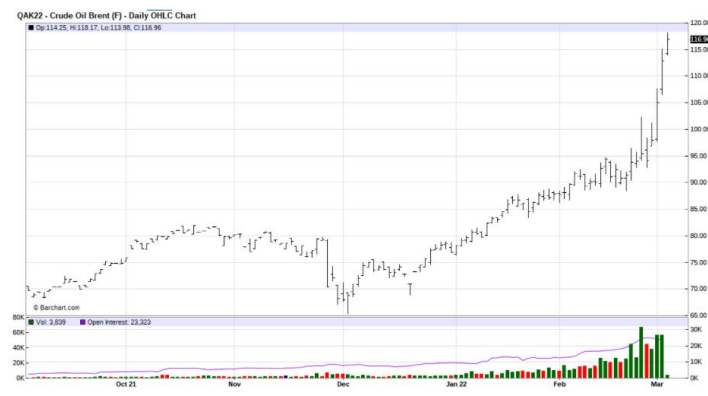


Source: [Barchart.com](https://www.barchart.com)

Global oil and gas prices have spiked in the past month, particularly after Russia invaded Ukraine on 24 Feb-22, due to market concerns over the potential supply disruptions from Russia, one of the world's top exporters of oil, gas, and coal. In particular, the oil price jumped much higher than the gas price increased due to the tight supply.

Even before the supply risk from Russia, the Brent oil price had already risen to USD95/bbl in mid-Feb-22 as a result of the consistent draws on global oil inventories, which averaged 1.8m barrel per day (mbpd) from 3Q20 through the end of 2021.

Exhibit 46: Brent oil price futures spiked to over USD120/bbl on 3 Mar-22



Source: [Barchart.com](https://www.barchart.com)

Exhibit 47: Natural gas price has remained lower than its last peak in Feb-22 even after the higher supply risk from Russia



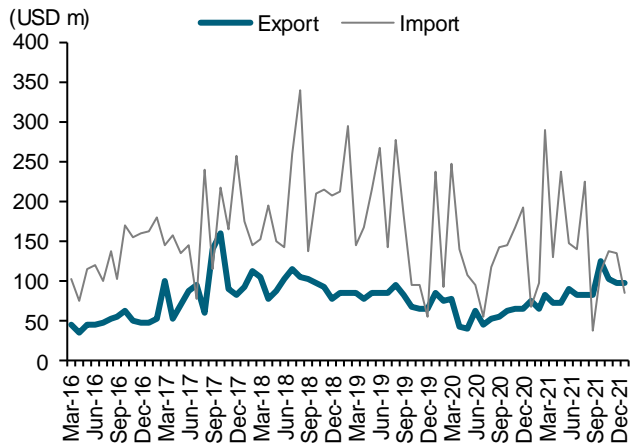
Source: [Barchart.com](https://www.barchart.com)

We believe the price risk for gas, oil, and coal in 2022 should be short-lived, as we project the Russia-Ukraine war to end within the next three months when we anticipate Russia to take control of Kiev and then begin to negotiate with Ukraine and NATO, led by the US, to settle the dispute, eventually relieving the energy supply risk.

Russia and Ukraine represent less than 1% of Thailand's exports and imports

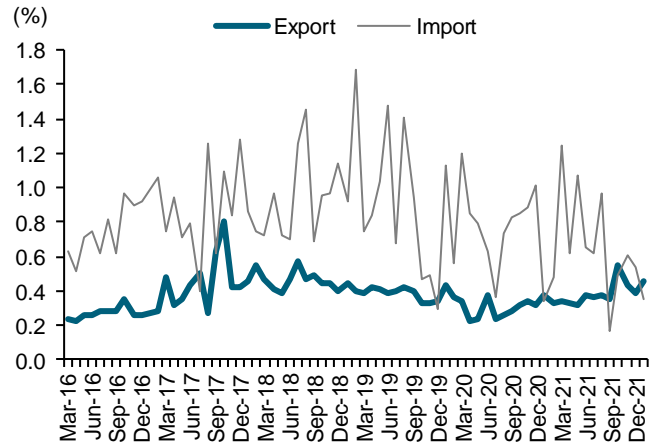
While Thailand and Russia have developed a strong relationship over the past 100 years since the 1891 visit of the then-Russian crown prince Tsarevich Nicholas Romanov, later becoming Tzar Nicholas II, the last monarch in Russia, Thailand has developed its trade with Russia at a minuscule rate in the past 100 years compared to other European and Asian countries.

Exhibit 48: Russia's proportion to Thailand's total import and export values



Source: Bank of Thailand

Exhibit 49: Russia's proportion to Thailand's total import and export values (%)



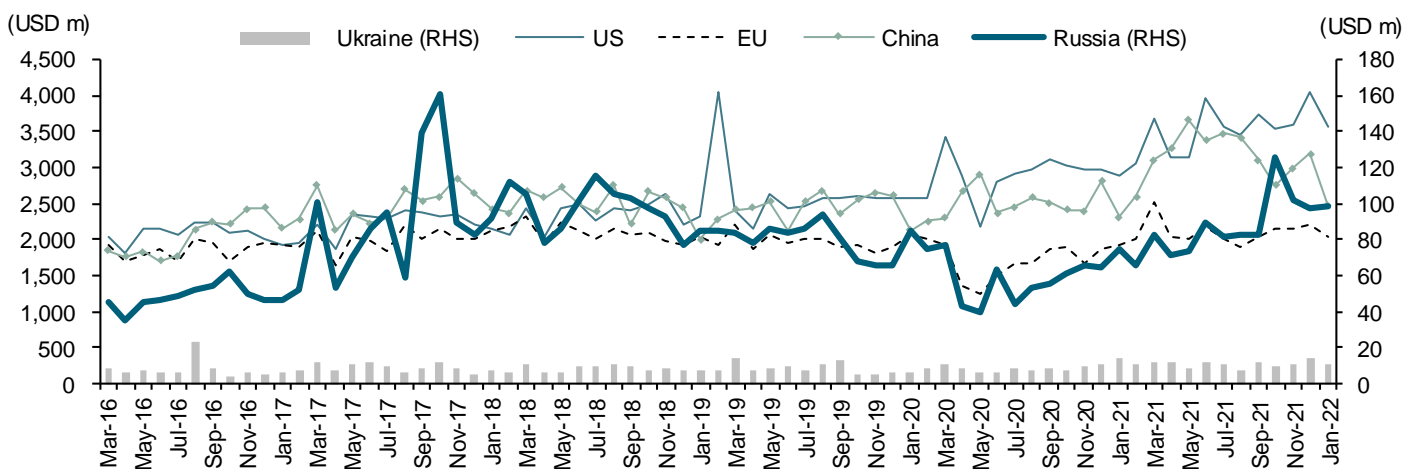
Source: Bank of Thailand

According to the Bank of Thailand, in Jan-22, Thailand had exported on average a lower than USD100m monthly export value and imported a USD150m monthly average since 2016, representing less than 1% of Thailand's total imports and exports.

Similarly, Ukraine accounts for a tiny 0.04% share of Thailand's imports and exports, given the small size of Ukraine's GDP of only USD165b vs Thailand's USD546b, Russia's USD1,705b, and the EU's USD17.1tr.

Instead, the major trade partners to Thailand include ASEAN countries (23.9%), the US (15%), China (11.5%), the EU (7.3%), India (3.8%), Hong Kong (3.6%), Middle East countries (3%), South Korea (2%), and the UK (1.3%). With this macro top-down view, we pursue a bottom-up analysis to find the potential impact from the current spike in energy prices on Thai companies in the energy and utility sectors.

Exhibit 50: Export value: US, EU, China, Russia and Ukraine



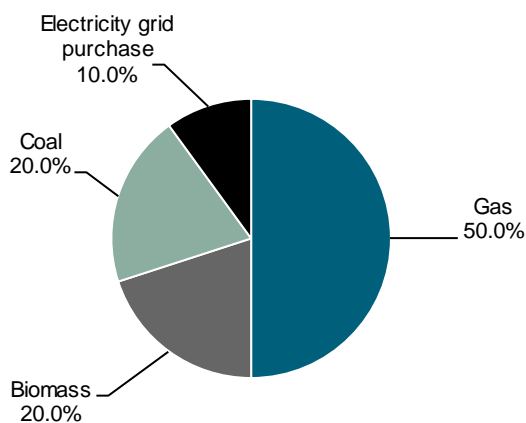
Source: Bank of Thailand

Implications for Thai companies

We see three implications for Thai energy and utility firms from the commodity price spike, mostly in the form of higher costs of energy (fuel loss for refiners and conversion cost for chemical producers), feedstock (naphtha and gas), and freight and logistics. However, on the revenue side, the impact of the rising risk from political instability that could shake the demand outlook in Europe might also negatively result in revenue and sales volume losses for those companies that export their products to the European market.

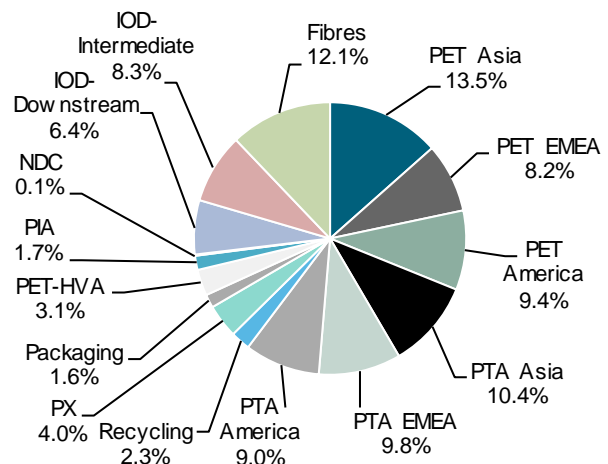
Our analysis indicates that the likely winners amid the high energy prices and rising demand outlook in 2022 are IVL and GULF, despite their high earnings exposure to Europe, thanks to their strong earnings growth outlooks from organic growth strategies and M&As.

Exhibit 51: IVL – energy cost breakdown



Sources: IVL; FSSIA estimates

Exhibit 52: IVL – capacity breakdown by product



Sources: IVL; FSSIA estimates

IVL and GULF have exposure to Europe. Among the companies under our coverage, we found that only IVL will have the highest revenue exposure to Europe given IVL has operated its plants in a number of European countries, including Netherland, Germany, Poland, France, Spain, Portugal, Italy, the UK, and Lithuania, the former Soviet Union country having a border with Russia.

However, we believe the productions in Europe should face limited disruption risk given 1) IVL sells all its productions produced in Europe within EU, a net importer market; 2) IVL has no production sites in Belarus, Russia, and Ukraine and its 6.3mtpa capacity (34% of total capacity of 18.1mtpa as of 2021) mostly in PET, PTA, fibres, and specialty chemical products that should continue to witness strong demands for packaging and clothes post the reopening of European economy ; and 3) only 0.5% of IVL's revenue is exported to Russian market.

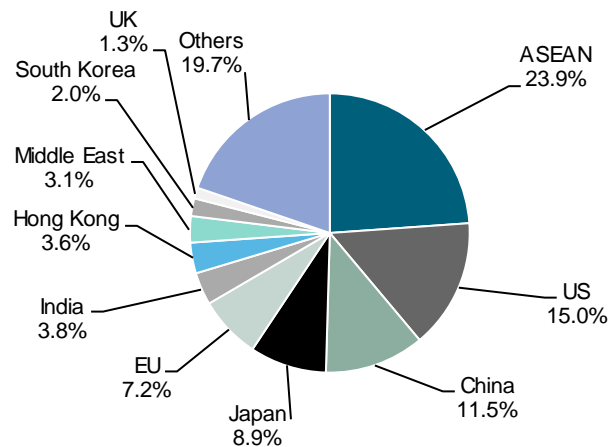
GULF has earnings exposure in Europe mostly via its 50%-stake, 465MW Borkum Riffgrund 2 (BKR2) offshore wind farm, acquired at THB19b in Jul-20. BKR2 generates THB0.6b net profit contribution to GULF, representing 5% of GULF's projected net profit of over THB10b in 2022, based on our estimate.

Exhibit 53: Revenue exposure to Russia market

	% Europe of total revenue		% Russia of total revenue	
		(%)		(%)
PTTGC		<5		<1
EPG		5		<1
IVL		23.50		0.50
GULF		10		0
GGC		5		0
SCC		<5		0
IRPC		<1		0

Sources: Companies; FSSIA estimates

Exhibit 54: Export value breakdown by market



Source: Bank of Thailand

Cost side. We think the impact of the energy price spikes will mostly results in higher costs of production, mainly the cost of energy, feedstocks, and transportation.

Feedstock cost: chemical firms face daunting hikes in feedstock cost. The most significant impact should be on feedstock costs for naphtha-based chemical producers, including SCC, PTTGC, and IRPC, given the currently weak margins of the main chemical products of aromatics (paraxylene and benzene), olefins (polyethylene (PE) and polypropylene (PP)), and butadiene (BD), all being pressured by the rising supply from China. Hence, the ability to pass through the higher feedstock costs is limited, resulting in margin squeezes for those companies.

Refinery companies, while similarly facing a higher crude oil cost, should fare much better than the chemical producers based on the more favourable industry outlook in terms of the strong demand following the global economic reopening, while the new supply remains limited in 2022. As a result, the market gross refining margins (GRMs) of Thai refiners, including TOP, SPRC, BCP, and ESSO, should see solid GRMs in 1Q22 despite the rising crude feedstock price.

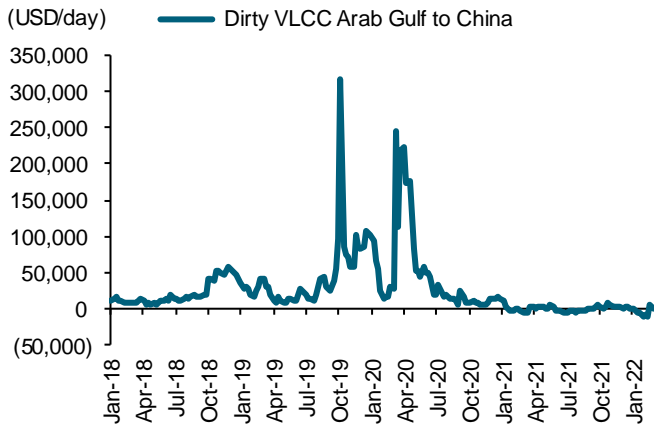
Energy cost: refinery should fare better than chemical sector. Energy cost normally accounts for 1-2% of the total cost for chemical producers like IVL, GGC and EPG with short production chains. But the chemical companies with long production chains, including PTTGC, IRPC, and SCC, should have a higher energy cost in the range of 4-8%, resulting in rising energy costs in tandem with the spike in the prices of oil, gas, and coal – the three major fuels used in the production processes for chemicals, cement, and refinery products.

Similar to their ability to pass the feedstock cost through, we think that refinery companies will be able to pass through the higher energy costs, which normally account for 3-8% of their total cost, in the form of higher GRMs. Hence, we think the rising energy prices should have a limited impact on Thai refinery companies in 2022.

Transportation cost: Since the onslaught of the Covid-19 pandemic, the global freight cost, particularly the intercontinental freight expense, has sharply risen due to the global lockdowns that effectively thwarted the ships from embarking and disembarking, leading to supply shortages for the shipping industry.

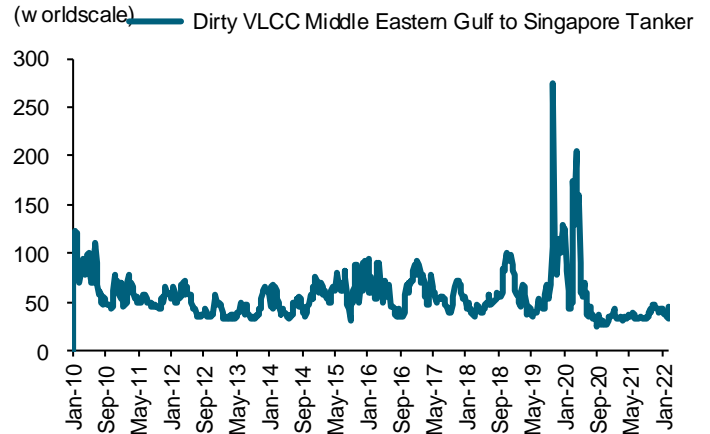
We expect the recent spikes in energy prices to further exacerbate the already high freight cost, which we think could erode the net margins and earnings of energy and chemical companies by 0.5% and 0.3%, based on our estimate.

Exhibit 55: Dirty VLCC Arab Gulf to China



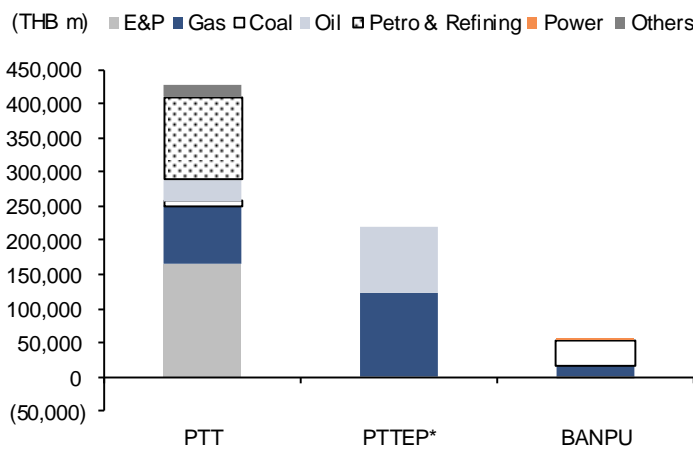
Source: Bloomberg

Exhibit 56: Dirty VLCC Middle Eastern Gulf to Singapore Tanker



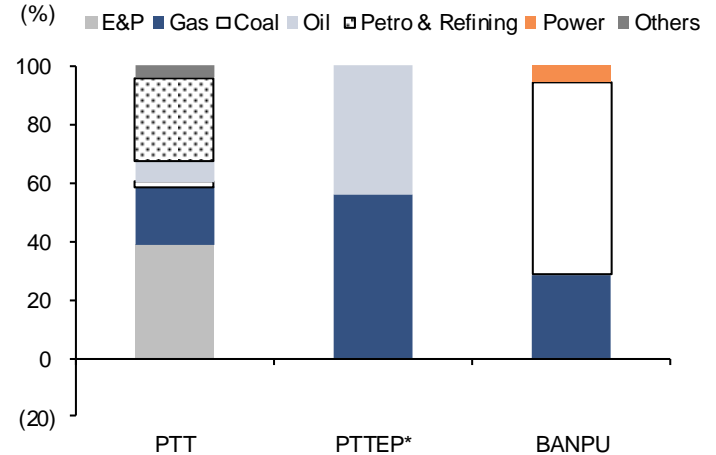
Source: Bloomberg

Exhibit 57: EBITDA/revenue breakdown



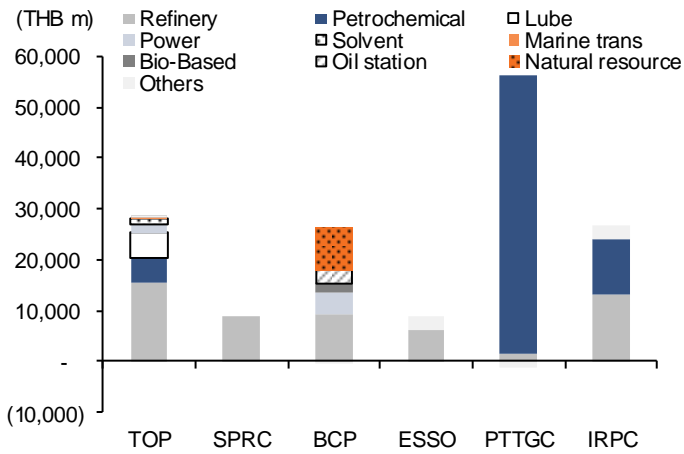
* Revenue breakdown
Source: Company data

Exhibit 58: EBITDA/revenue breakdown (%)



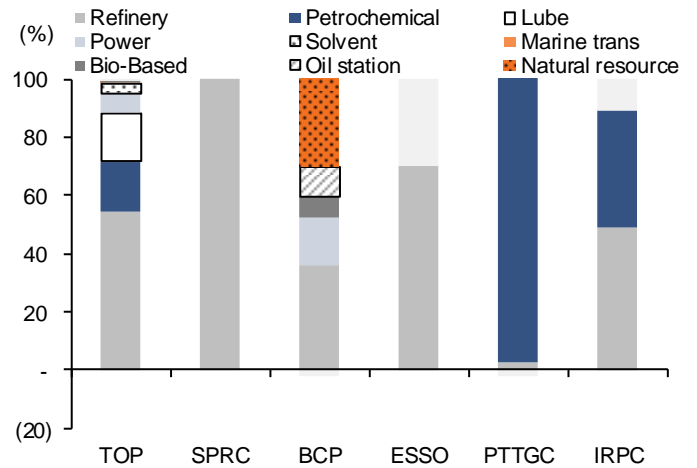
* Revenue breakdown
Source: Company data

Exhibit 59: EBITDA breakdown



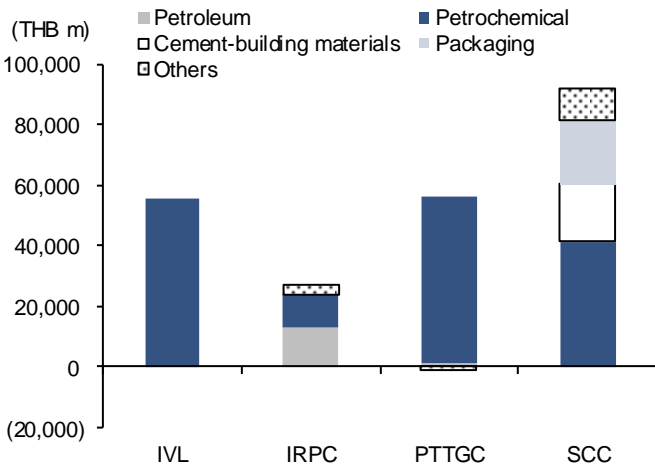
Source: Company data

Exhibit 60: EBITDA breakdown (%)



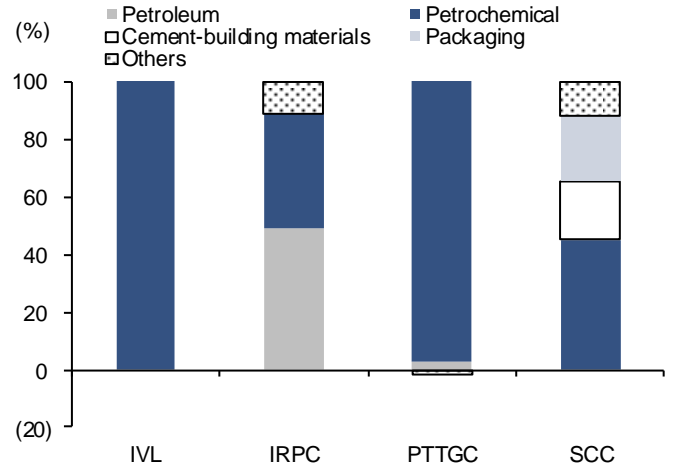
Source: Company data

Exhibit 61: EBITDA breakdown



Source: Company data

Exhibit 62: EBITDA breakdown (%)



Source: Company data

Exhibit 63: Peer comparisons

Company	BBG code	Rec	Share Price	Target price	Up side	Market Cap	3Y EPS CAGR	----- PE ----		----- ROE ---		---- PBV ----		EV / EBITDA	
								22E	23E	22E	23E	22E	23E	22E	23E
			(LCY)	(LCY)	(%)	(USD m)	(%)	(x)	(x)	(%)	(%)	(x)	(x)	(x)	(x)
THAILAND															
Ptt	PTT TB	BUY	38.25	60	57	32,927	16.7	7.2	7.7	12.7	13.2	1.0	0.9	4.7	4.1
Ptt Explor & Prod	PTTEP TB	BUY	152.5	162	6	18,246	(0.5)	13.4	12.7	10.8	10.3	1.4	1.4	5.0	5.2
Thai Oil	TOP TB	BUY	48.75	67	37	2,997	2.0	8.1	7.5	9.9	9.4	0.8	0.7	10.3	11.3
Bangkok Aviation	BAFS TB	BUY	24.8	40	61	476	(100.0)	10.0	-	20.0	23.5	2.6	2.2	9.6	7.3
Star Petroleum Refin	SPRC TB	BUY	8.5	13.5	59	1,111	57.5	6.0	4.9	16.0	14.8	0.9	0.8	3.4	2.8
Bangchak Corp	BCP TB	BUY	31	38	23	1,329	20.8	7.4	7.1	10.7	10.3	0.8	0.7	5.7	5.9
Esso Thailand	ESSO TB	BUY	7.4	8.9	20	772	86.2	4.4	4.3	24.6	24.2	1.2	1.0	5.2	4.5
Ptt Global Chemical	PTTGC TB	BUY	48.75	75	54	6,624	(6.2)	8.0	8.5	8.2	8.7	0.7	0.7	9.0	7.5
IRPC	IRPC TB	BUY	3.54	5.8	64	2,180	0.6	4.7	4.3	14.3	16.2	0.8	0.7	5.4	4.4
Tipco Asphalt	TASCO TB		15.8	22.5	42	752	(8.9)	11.2	11.0	20.7	17.4	1.9	2.0	7.9	10.5
Thailand avg						67,414	4.4	8.9	8.9	12.0	12.1	1.1	1.0	5.6	5.2
PAKISTAN															
Oil & Gas Develop	OGDC PA	NA	89.31	NA	NA	2,163	7.7	4.2	3.2	12.2	14.7	0.5	0.4	nm	1.3
Pakistan Petroleum	PPL PA	NA	82.32	NA	NA	1,248	nm	4.4	3.2	13.8	16.5	nm	nm	nm	nm
Pakistan avg						3,411	(7.3)	4.3	3.2	12.8	15.3	0.3	0.3	-	0.8
HONGKONG															
Cnooc	883 HK	NA	10.12	NA	NA	57,776	nm	5.0	4.3	15.6	16.2	0.8	0.7	2.2	1.9
China Petro&Chem	386 HK	NA	3.49	NA	NA	74,039	nm	4.6	5.0	9.6	8.4	0.4	0.4	3.4	3.4
Petrochina	857 HK	NA	4.17	NA	NA	158,445	nm	6.7	6.6	7.3	7.5	0.5	0.5	3.9	3.7
China Oilfield Sers	2883 HK	NA	8.70	NA	NA	9,404	nm	14.0	10.4	6.0	7.7	0.8	0.8	9.3	8.8
Hongkong avg						299,664	nm	6.1	5.9	9.4	9.4	0.5	0.5	3.6	3.4
INDONESIA															
Medco Energi Inter	MEDC IJ	NA	650.00	NA	NA	1,144	nm	15.2	11.4	6.5	7.5	nm	nm	5.6	5.0
Energi Mega Pers	ENRG IJ	NA	149.00	NA	NA	259	nm	nm	nm	nm	nm	nm	nm	nm	nm
Indonesia avg						1,403	nm	12.4	9.3	5.3	6.1	-	-	4.6	4.1
INDIA															
Reliance Industries	RIL IN	NA	2,235.50	NA	NA	208,051	26.1	33.9	26.6	8.6	7.9	2.6	2.0	21.9	16.3
Oil & Natural Gas	ONGC IN	NA	179.10	NA	NA	28,826	39.1	17.8	5.2	6.1	17.4	1.0	0.9	6.7	4.3
Oil India	OINL IN	NA	245.90	NA	NA	3,450	11.5	12.9	4.6	7.3	21.9	0.9	0.9	21.4	4.5
Indian Oil	IOCL IN	NA	117.05	NA	NA	14,383	(4.2)	7.2	5.2	14.6	17.7	1.0	0.9	6.5	5.2
Bharat Petroleum	BPCL IN	NA	341.60	NA	NA	9,710	(14.4)	7.3	7.3	24.7	19.0	1.6	1.3	6.8	6.8
Hindustan Petrole	HPCL IN	NA	270.50	NA	NA	4,987	(7.0)	5.1	5.7	24.1	17.5	1.1	1.0	5.4	6.3
Gail India	GAIL IN	NA	157.40	NA	NA	8,962	14.9	13.7	6.9	10.7	17.7	1.4	1.2	11.0	5.7
Petronet Lng	PLNG IN	NA	220.85	NA	NA	4,168	7.6	11.8	10.7	23.9	24.5	2.7	2.4	6.8	6.1
India avg						282,536	23.5	28.3	21.1	9.7	10.6	2.2	1.8	18.2	13.4
JAPAN															
Inpex Corp	1605 JP	NA	1,338.00	NA	NA	16,015	5.9	10.0	6.3	6.8	9.5	0.7	0.6	4.2	3.2
Japan avg						16,015	5.9	10.0	6.3	6.8	9.5	0.7	0.6	4.2	3.2
TAIWAN															
Formosa Petroch	6505 TT	NA	100.00	NA	NA	33,517	nm	18.4	20.3	15.3	13.2	2.7	2.7	11.5	12.0
Taiwan avg						33,517	nm	18.4	20.3	15.3	13.2	2.7	2.7	11.5	12.0
SOUTH KOREA															
S-Oil Corp	010950 KS	NA	91,900.00	NA	NA	8,423	(13.2)	7.1	7.8	23.5	18.7	1.5	1.3	5.3	5.9
South Korea avg						8,423	(13.2)	7.1	7.8	23.5	18.7	1.5	1.3	5.3	5.9
AUSTRALIA															
Woodside Petroleum	WPL AU	NA	33.20	NA	NA	23,587	(12.3)	15.3	8.9	11.4	20.2	1.7	1.6	6.6	4.4
Santos	STO AU	NA	7.78	NA	NA	19,307	5.6	14.0	8.4	11.0	14.8	1.5	1.3	8.3	4.8
Australia avg						42,894	(10.0)	14.7	8.7	11.3	17.8	1.6	1.5	7.4	4.6
Oil & Gas under coverage						67,414	4.4	8.9	8.9	12.0	12.1	1.1	1.0	5.6	5.2

Share price as of 08 March 2022

Sources: Bloomberg, FSSIA estimates

Exhibit 64: Peer comparisons

Company	BBG code	Rec	Share Price	Target price	Up side	Market Cap	3Y EPS CAGR	PE		ROE		PBV		EV / EBITDA	
								22E	23E	22E	23E	22E	23E	22E	23E
			(LCY)	(LCY)	(%)	(USD m)	(%)	(x)	(x)	(%)	(%)	(x)	(x)	(x)	(x)
THAILAND															
Indorama Ventures	IVL TB	BUY	42.50	70.00	65	7,191	8.4	9.2	8.6	13.7	13.3	1.3	1.2	6.8	5.9
Irpc Pcl	IRPC TB	BUY	3.54	5.80	64	2,180	0.6	4.7	4.3	14.3	16.2	0.8	0.7	5.4	4.4
Ptt Global Chem	PTTGC TB	BUY	48.75	75.00	54	6,624	(6.2)	8.0	8.5	8.2	8.7	0.7	0.7	9.0	7.5
Siam Cement	SCC TB	BUY	370.00	483.00	31	13,381	20.0	6.9	5.5	15.4	15.0	1.1	1.0	8.4	7.8
Eastern Polymer	EPG TB	BUY	8.80	16.00	82	743	14.4	14.1	13.5	14.6	14.1	2.0	1.9	10.9	10.0
Vinythai Public	VNT TB	NA	32.75	NA	NA	1,175	nm	14.9	14.9	11.5	10.6	1.6	1.5	nm	nm
THAILAND avg						31,294	17.8	8.0	7.3	13.3	13.2	1.1	1.0	7.7	6.8
INDIA															
Reliance Industries	RIL IN	NA	2,235.50	NA	NA	208,051	26.1	33.9	26.6	8.6	7.9	2.6	2.0	21.9	16.3
INDIA avg						208,051	26.1	33.9	26.6	8.6	7.9	2.6	2.0	21.9	16.3
TAIWAN															
Formosa Plastics	1301 TT	NA	105.50	NA	NA	23,630	nm	9.6	11.0	19.7	15.3	1.7	1.7	9.2	11.4
Nan Ya Plastics	1303 TT	NA	88.00	NA	NA	24,556	nm	8.7	11.6	21.1	16.0	1.7	1.7	7.5	10.8
Formosa Chem&Fi	1326 TT	NA	78.60	NA	NA	16,209	nm	11.3	14.4	10.8	8.5	1.2	1.2	8.4	11.7
Formosa Petro	6505 TT	NA	100.00	NA	NA	33,517	nm	18.4	20.3	15.3	13.2	2.7	2.7	11.5	12.0
TAIWAN avg						97,913	nm	12.7	14.9	17.0	13.6	2.0	2.0	9.4	11.5
SOUTH KOREA															
Hanwha Solutions	009830 KS	NA	35,400.00	NA	NA	5,511	13.7	7.7	10.3	12.6	7.6	0.9	0.8	7.1	7.1
Lotte Chemical	011170 KS	NA	192,000.00	NA	NA	5,356	(3.9)	4.4	6.9	11.2	6.7	0.5	0.4	2.6	3.2
Lg Chem	051910 KS	NA	503,000.00	NA	NA	28,900	2.5	9.8	14.1	19.5	12.0	1.7	1.5	6.0	6.5
Kumho Petro	011780 KS	NA	147,500.00	NA	NA	3,637	(21.3)	2.2	3.8	49.3	22.7	1.0	0.8	1.6	2.5
Oci	010060 KS	NA	106,000.00	NA	NA	2,058	(16.6)	4.8	4.7	19.9	16.8	0.9	0.7	4.3	3.9
SOUTH KOREA avg						45,462	(1.0)	8.1	11.5	20.1	11.9	1.4	1.2	5.3	5.8
MALAYSIA															
Petronas Chem	PCHEM MK	NA	9.97	NA	NA	19,074	(8.6)	12.2	13.0	20.5	16.1	2.4	2.2	8.1	8.3
Lotte Chemical Titan	TTNP MK	NA	2.35	NA	NA	1,280	(23.1)	5.0	15.8	9.4	2.8	0.4	0.4	0.8	1.6
MALAYSIA avg						20,354	(9.0)	11.7	13.2	19.8	15.3	2.3	2.1	7.6	7.9
Average (Asia)						403,075	6.5	22.7	19.9	12.8	10.5	2.2	1.8	15.2	12.8
US															
Eastman Chem	EMN US	NA	105.04	NA	NA	13,547	9.2	11.8	10.8	16.6	20.0	2.3	2.2	8.3	8.5
Dupont De Nem	DD US	NA	68.81	NA	NA	35,293	22.9	16.4	14.3	7.0	9.2	1.4	1.3	10.7	10.1
Celanese	CE US	NA	133.90	NA	NA	14,465	(2.4)	7.3	8.5	49.7	34.1	3.9	3.0	6.4	7.4
Westlake Chem	WLK US	NA	110.04	NA	NA	14,076	(5.7)	7.3	7.1	27.5	22.0	1.8	1.2	5.1	4.9
Ppg Industries	PPG US	NA	117.74	NA	NA	27,787	16.6	17.6	15.8	25.3	25.9	4.3	4.0	12.8	11.7
Alpek Sa De Cv	ALPEKA MM	NA	27.30	NA	NA	2,719	(14.8)	7.3	8.5	18.9	14.4	1.2	1.2	4.1	4.7
Avg (US)						107,887	6.3	13.5	12.4	21.6	20.0	2.7	2.3	9.5	9.1
ME/Europe															
Saudi Basic	SABIC AB	NA	138.00	NA	NA	109,071	1.0	17.5	18.1	13.4	12.9	2.3	2.2	9.4	9.4
Saudi Kayan	KAYAN AB	NA	22.92	NA	NA	8,876	3.0	14.5	16.9	15.7	15.2	2.0	1.7	8.9	12.5
Yanbu National	YANSAB AB	NA	72.10	NA	NA	10,915	8.3	24.1	25.2	10.9	12.1	2.7	2.7	12.4	12.1
Industries Qatar	IQCD QD	NA	20.10	NA	NA	32,631	(8.9)	14.2	12.6	22.7	23.8	3.3	2.9	15.6	12.5
Basf Se	BAS GR	NA	51.39	NA	NA	53,848	0.9	8.0	9.1	16.0	12.0	1.3	1.2	5.7	6.1
Arkema	AKE FP	NA	99.14	NA	NA	8,674	(8.0)	9.8	10.8	14.1	11.0	1.3	1.2	5.4	5.6
Lanxess Ag	LXS GR	NA	37.17	NA	NA	3,832	nm	9.0	7.9	9.3	11.4	1.1	1.0	5.6	4.7
Solvay Sa	SOLB BB	NA	84.48	NA	NA	10,470	(2.8)	10.0	9.5	13.4	11.5	1.2	1.2	6.0	5.7
Avg (ME/Europe)						238,316	(0.9)	14.3	14.8	15.2	14.1	2.1	2.0	9.2	9.0
Petrochem under coverage						30,120	17.8	7.5	6.7	12.8	12.8	1.0	0.9	7.7	6.8
Average (all)						749,278	5.0	18.7	17.2	14.8	13.0	2.2	2.0	12.5	11.1

Share price as of 08 March 2022

Sources: Bloomberg, FSSIA estimates

Exhibit 65: Peer comparisons

Company	BBG code	Rec	Share Price	Target price	Up side	Market Cap	3Y EPS CAGR	PE		ROE		PBV		EV / EBITDA	
								22E	23E	22E	23E	22E	23E	22E	23E
			(LCY)	(LCY)	(%)	(USD m)	(%)	(x)	(x)	(%)	(%)	(x)	(x)	(x)	(x)
THAILAND															
B Grimm Power	BGRIM TB	BUY	31	44	42	2,436	34.7	14.2	13.6	11.8	16.4	2.5	2.2	10.4	8.7
Gulf Energy Deve	GULF TB	BUY	47	60	28	16,620	21.1	37.3	35.2	13.6	13.6	5.2	4.9	30.5	28.4
Global Power Syn	GPSC TB	BUY	66.25	90	36	5,630	20.4	17.4	12.0	6.5	9.4	1.7	1.6	17.4	14.2
Banpu Power	BPP TB	BUY	15.6	20	28	1,433	29.1	8.5	8.5	11.5	11.2	1.0	0.9	33.9	25.3
Electricity Gen	EGCO TB	BUY	168.5	245	45	2,673	13.8	5.1	8.7	14.3	13.1	0.7	0.6	11.3	10.4
Ratch Group	RATCH TB	BUY	44	60	36	1,923	3.0	7.5	7.5	14.6	11.6	0.9	0.9	12.2	11.6
Wha Utilities&Pow	WHAUP TB	HOLD	4.02	4.5	12	463	18.1	11.3	10.8	10.2	10.7	1.2	1.2	32.4	31.4
Bcpq	BCPG TB	BUY	11.5	17	48	1,003	(9.7)	18.9	19.8	9.1	5.9	1.1	1.1	14.3	20.4
Ck Power	CKP TB	BUY	4.84	6.6	36	1,186	19.5	12.6	10.4	11.8	10.8	1.4	1.3	10.5	11.9
Energy Absolute	EA TB	BUY	83	122	47	9,330	35.7	22.9	20.7	28.7	28.8	7.4	5.9	22.4	17.3
Gunkul Engineer	GUNKUL TB	BUY	5.8	8.1	40	1,553	45.7	12.7	8.7	27.1	24.9	3.3	3.0	12.3	11.2
Demco Pcl	DMCO TB	BUY	3.12	5.9	89	69	nm	9.3	-	4.4	4.9	0.5	0.4	(61.4)	nm
Power Solution	PSTC TB	BUY	1.87	3.7	98	134	nm	11.4	-	5.8	6.1	0.7	0.7	14.8	14.0
Sermang Power	SSP TB	BUY	11.4	20	75	390	34.0	9.3	5.8	18.0	18.0	1.8	1.6	9.5	8.7
Tpc Power	TPCH TB	BUY	11.5	14	22	139	60.3	8.2	8.3	15.8	17.0	1.4	1.3	8.0	6.8
Tpi Polene Power	TIPIPP TB	BUY	3.88	5.7	47	982	nm	8.1	-	14.8	12.7	1.0	1.0	6.1	6.6
Absolute Clean	ACE TB	BUY	3.04	4.6	51	932	nm	11.8	-	13.8	18.4	2.3	2.1	11.6	9.5
Earth Tech	ETC TB	HOLD	3.8	3.8	-	257	nm	23.8	-	11.3	11.4	2.8	2.6	16.7	15.8
Thailand avg						47,153	19.8	23.3	20.8	16.0	16.3	4.0	3.6	21.7	19.2
HONGKONG															
Datang Intl Power	991 HK	n/a	1.37	n/a	NA	6,410	nm	14.6	6.5	1.9	4.1	0.5	0.5	9.2	7.9
Huadian Power	1071 HK	n/a	2.67	n/a	NA	5,738	nm	nm	5.6	(4.9)	9.6	0.4	0.4	15.6	8.8
Huaneng Power	902 HK	n/a	4.55	n/a	NA	18,497	nm	nm	10.0	(5.0)	5.5	0.5	0.5	15.0	9.1
China Power Inter	2380 HK	n/a	4.39	n/a	NA	6,081	nm	295.4	16.3	2.1	7.1	1.1	1.0	3.7	2.5
China Resources	836 HK	n/a	16.62	n/a	NA	10,223	nm	14.2	7.6	5.9	11.0	0.9	0.8	3.7	2.6
Clp Holdings Ltd	2 HK	n/a	77.45	n/a	NA	25,020	nm	17.6	17.7	9.7	9.5	1.7	1.6	9.1	8.9
Power Assets	6 HK	n/a	50.55	n/a	NA	13,795	nm	16.9	15.7	7.6	8.2	1.3	1.3	86.9	86.0
Hongkong avg						85,765	nm	31.6	12.8	3.6	8.0	1.0	1.0	22.3	20.0
MALAYSIA															
Petronas Gas	PTG MK	n/a	16.80	n/a	NA	7,949	(0.9)	16.2	17.0	15.7	14.5	2.6	2.5	9.0	9.0
Tenaga Nasional	TNB MK	n/a	8.82	n/a	NA	12,077	10.5	10.3	10.7	8.6	8.1	0.9	0.8	6.6	6.5
Ytl Power Inte	YTLP MK	n/a	0.57	n/a	NA	1,104	nm	10.2	18.4	3.6	2.2	0.4	0.4	10.4	11.1
Malaysia avg						21,131	5.3	3.1	3.3	2.7	2.5	0.4	0.4	1.9	1.9
CHINA															
China Datang	1798 HK	n/a	3.44	n/a	NA	3,199	nm	14.2	10.8	7.1	7.8	1.6	1.1	9.8	8.4
China Gas	384 HK	n/a	12.02	n/a	NA	8,508	nm	5.8	7.6	23.5	14.4	1.3	1.0	nm	nm
China Longyuan	916 HK	n/a	17.08	n/a	NA	31,273	nm	18.1	15.3	10.4	11.0	1.8	1.6	nm	nm
Beijing Enterprises	392 HK	n/a	25.40	n/a	NA	4,099	nm	3.8	3.8	9.4	9.0	0.3	0.3	3.5	2.9
Kunlun Energy	135 HK	n/a	7.20	n/a	NA	7,972	nm	10.0	8.9	10.2	11.7	0.9	0.9	3.5	3.2
China avg						55,052	nm	8.8	7.7	7.8	7.3	1.0	0.8	0.9	0.8
INDONESIA															
Perusahaan Gas	PGAS IJ	n/a	1,545.00	n/a	NA	2,622	nm	10.8	8.3	12.3	10.4	1.1	0.9	6.0	5.5
Indonesia avg						2,622	nm	0.3	0.3	0.4	0.3	0.0	0.0	0.2	0.2
SINGAPORE															
Sembcorp Indus	SCI SP	n/a	2.73	n/a	NA	3,571	(4.8)	17.4	11.2	8.3	11.0	1.4	1.2	9.7	9.4
Singapore avg						3,571	(4.8)	0.7	0.5	0.3	0.5	0.1	0.0	0.4	0.4
Utilities under coverage						47,153	19.8	23.3	20.8	16.0	16.3	4.0	3.6	21.7	19.2
Average (all)						215,294	nm	20.2	12.0	7.2	8.9	1.6	1.4	14.1	12.6

Share price as of 08 March 2022

Sources: Bloomberg, FSSIA estimates

Corporate Governance report of Thai listed companies 2020

EXCELLENT LEVEL										
AAV	ADVANC	AF	AIRA	AKP	AKR	ALT	AMA	AMATA	AMATAV	ANAN
AOT	AP	ARIP	ARROW	ASP	BAFS	BANPU	BAY	BCP	BCPG	BDMS
BEC	BEM	BGRIM	BIZ	BKI	BLA	BOL	BPP	BRR	BTS	BWG
CENTEL	CFRESH	CHEWA	CHO	CIMBT	CK	CKP	CM	CNT	COL	COMAN
COTTO	CPALL	CPF	CPI	CPN	CSS	DELTA	DEMCO	DRT	DTAC	DTC
DV8	EA	EASTW	ECF	ECL	EGCO	EPG	ETE	FNS	FPI	FPT
FSMART	GBX	GC	GCAP	GEL	GFPT	GGC	GPSC	GRAMMY	GUNKUL	HANA
HARN	HMPRO	ICC	ICI	III	ILINK	INTUCH	IRPC	IVL	JKN	JSP
JWD	K	KBANK	KCE	KKP	KSL	KTB	KTC	LANNA	LH	LHFG
LIT	LPN	MAKRO	MALEE	MBK	MBKET	MC	MCOT	METCO	MFEC	MINT
MONO	MOONG	MSC	MTC	NCH	NCL	NEP	NKI	NOBLE	NSI	NVD
NYT	OISHI	ORI	OTO	PAP	PAP	PCSGH	PDJ	PG	PHOL	PLANB
PLAT	PORT	PPS	PR9	PREB	PRG	PRM	PSH	PSL	PTG	PTT
PTTEP	PTTGC	PYLON	Q-CON	QH	QTC	RATCH	RS	S	S & J	SAAM
SABINA	SAMART	SAMTEL	SAT	SC	SCB	SCC	SCCC	SCG	SCN	SDC
SEAFCO	SEOIL	SE-ED	SELIC	SENA	SIRI	SIS	SITHAI	SMK	SMPC	SNC
SONIC	SORKON	SPALI	SPI	SPRC	SPVI	SSSC	SST	STA	SUSCO	SUTHA
SVI	SYMC	SYNTEC	TACC	TASCO	TCAP	TFMAMA	THANA	THANI	THCOM	THG
THIP	THRE	THREL	TIP	TIPCO	TISCO	TK	TKT	TTB	TMILL	TNDT
TNL	TOA	TOP	TPBI	TQM	TRC	TSC	TSR	TSTE	TSTH	TTA
TTCL	TTW	TU	TVD	TVI	TVO	TWPC	U	UAC	UBIS	UV
VGI	VIH	WACOAL	WAVE	WHA	WHAUP	WICE	WINNER	TRUE		

VERY GOOD LEVEL										
2S	ABM	ACE	ACG	ADB	AEC	AEONTS	AGE	AH	AHC	AIT
ALLA	AMANAHA	AMARIN	APCO	APCS	APURE	AQUA	ASAP	ASEFA	ASIA	ASIAN
ASIMAR	ASK	ASN	ATP30	AUCT	AWC	AYUD	B	BA	BAM	BBL
BFIT	BGC	BJC	BJCHI	BROOK	BTW	CBG	CEN	CGH	CHARAN	CHAYO
CHG	CHOTI	CHOW	CI	CIG	CMC	COLOR	COM7	CPL	CRC	CRD
CSC	CSP	CWT	DCC	DCON	DDD	DOD	DOHOME	EASON	EE	ERW
ESTAR	FE	FLOYD	FN	FORTH	FSS	FTE	FVC	GENCO	GJS	GL
GLAND	GLOBAL	GLOCON	GPI	GULF	GYT	HPT	HTC	ICN	IFS	ILM
IMH	INET	INSURE	IRC	IRCP	IT	ITD	ITEL	J	JAS	JCK
JCKH	JMART	JMT	KBS	KCAR	KGI	KIAT	KOOL	KTIS	KWC	KWM
L&E	LALIN	LDC	LHK	LOXLEY	LPH	LRH	LST	M	MACO	MAJOR
MBAX	MEGA	META	MFC	MGT	MILL	MITSIB	MK	MODERN	MTI	MVP
NETBAY	NEX	NINE	NTV	NWR	OCC	OGC	OSP	PATO	PB	PDG
PDI	PICO	PIMO	PJW	PL	PM	PPP	PRIN	PRINC	PSTC	PT
QLT	RCL	RICHY	RML	RPC	RWI	S11	SALEE	SAMCO	SANKO	SAPPE
SAWAD	SCI	SCP	SE	SEG	SFP	SGF	SHR	SIAM	SINGER	SKE
SKR	SKY	SMIT	SMT	SNP	SPA	SPC	SPCG	SR	SRICHA	SSC
SSF	STANLY	STI	STPI	SUC	SUN	SYNEX	T	TAE	TAKUNI	TBSP
TCC	TCMC	TEAM	TEAMG	TFG	TIGER	TITLE	TKN	TKS	TM	TMC
TMD	TMI	TMT	TNITY	TNP	TNR	TOG	TPA	TPAC	TPCORP	TPOLY
TPS	TRITN	TRT	TRU	TSE	TVT	TWP	UEC	UMI	UOBKH	UP
UPF	UPOIC	UT	UTP	UWC	VL	VNT	VPO	WIJK	WP	XO
YUASA	ZEN	ZIGA	ZMICO							

GOOD LEVEL										
7UP	A	ABICO	AJ	ALL	ALUCON	AMC	APP	ARIN	AS	AU
B52	BC	BCH	BEAUTY	BGT	BH	BIG	BKD	BLAND	BM	BR
BROCK	BSBM	BSM	BTNC	CAZ	CCP	CGD	CITY	CMAN	CMO	CMR
CPT	CPW	CRANE	CSR	D	EKH	EP	ESSO	FMT	GIFT	GREEN
GSC	GTB	HTECH	HUMAN	IHL	INOX	INSET	IP	JTS	JUBILE	KASET
KCM	KKC	KUMWEL	KUN	KWG	KYE	LEE	MATCH	MATI	M-CHAI	MCS
MDX	MJD	MM	MORE	NC	NDR	NER	NFC	NNCL	NPK	NUSA
OCEAN	PAF	PF	PK	PLE	PMTA	POST	PPM	PRAKIT	PRECHA	PRIME
PROUD	PTL	RBF	RCI	RJH	ROJNA	RP	RPH	RSP	SF	SFLEX
SGP	SISB	SKN	SLP	SMART	SOLAR	SPG	SQ	SSP	STARK	STC
SUPER	SVOA	TC	TCCC	THMUI	TIW	TNH	TOPP	TPCH	TIPIP	TPLAS
TTI	TYCN	UKEM	UMS	VCOM	VRANDA	WIN	WORK	WPH		

Description

Score Range

Excellent

90-100

Very Good

80-89

Good

70-79

Disclaimer:

The disclosure of the survey results of the Thai Institute of Directors Association ("IOD") regarding corporate governance is made pursuant to the policy of the Office of the Securities and Exchange Commission. The survey of the IOD is based on the information of a company listed on the Stock Exchange of Thailand and the Market for Alternative Investment disclosed to the public and able to be accessed by a general public investor. The result, therefore, is from the perspective of a third party. It is not an evaluation of operation and is not based on inside information.

The survey result is as of the date appearing in the Corporate Governance Report of Thai Listed Companies. As a result, the survey results may be changed after that date. FSS International Investment Advisory Company Limited does not confirm nor certify the accuracy of such survey results.

* CGR scoring should be considered with news regarding wrong doing of the company or director or executive of the company such unfair practice on securities trading, fraud, and corruption SEC imposed a civil sanction against insider trading of director and executive; ** delisted

Source: Thai Institute of Directors Association (IOD); FSSIA's compilation

Anti-corruption Progress Indicator 2020

CERTIFIED										
2S	ADVANC	AI	AIE	AIRA	AKP	AMA	AMANAH	AP	AQUA	ARROW
ASK	ASP	AYUD	B	BAFS	BANPU	BAY	BBL	BCH	BCP	BCPG
BGC	BGRIM	BJCHI	BKI	BLA	BPP	BROOK	BRR	BSBM	BTS	BWG
CEN	CENTEL	CFRESH	CGH	CHEWA	CHOTI	CHOW	CIG	CIMBT	CM	CMC
COL	COM7	CPALL	CPF	CPI	CPN	CSC	DCC	DELTA	DEMCO	DIMET
DRT	DTAC	DTC	EASTW	ECL	EGCO	FE	FNS	FPI	FPT	FSS
FTE	GBX	GC	GCAP	GEL	GFPT	GGC	GJS	GPSC	GSTEEL	GUNKUL
HANA	HARN	HMPRO	HTC	ICC	ICHI	IFS	INET	INSURE	INTUCH	IRPC
ITEL	IVL	K	KASET	KBANK	KBS	KCAR	KCE	KGI	KKP	KSL
KTB	KTC	KWC	L&E	LANNA	LHFG	LHK	LPN	LRH	M	MAKRO
MALEE	MBAX	MBK	MBKET	MC	MCOT	MFC	MFEC	MINT	MONO	MOONG
MPG	MSC	MTC	MTI	NBC	NEP	NINE	NKI	NMG	NNCL	NSI
NWR	OCC	OCEAN	OGC	ORI	PAP	PATO	PB	PCSGH	PDG	PDI
PDJ	PE	PG	PHOL	PL	PLANB	PLANET	PLAT	PM	PPP	PPPM
PPS	PREB	PRG	PRINC	PRM	PSH	PSL	PSTC	PT	PTG	PTT
PTTEP	PTTGC	PYLON	Q-CON	QH	QLT	QTC	RATCH	RML	RWI	S & J
SABINA	SAT	SC	SCB	SCC	SCCC	SCG	SCN	SEAOIL	SE-ED	SELIC
SENA	SGP	SIRI	SITHAI	SMIT	SMK	SMPC	SNC	SNP	SORKON	SPACK
SPC	SPI	SPRC	SRICHA	SSF	SSSC	SST	STA	SUSCO	SVI	SYNTEC
TAE	TAKUNI	TASCO	TBSP	TCAP	TCMC	TFG	TFI	TFMAMA	THANI	THCOM
THIP	THRE	THREL	TIP	TIPCO	TISCO	TKT	TTB	TMD	TMILL	TMT
TNITY	TNL	TNP	TNR	TOG	TOP	TPA	TPCORP	TPP	TRU	TSC
TSTH	TTCL	TU	TVD	TVI	TVO	TWPC	U	UBIS	UEC	UKEM
UOBKH	UWC	VGI	VIH	VNT	WACOAL	WHA	WHAUP	WICE	WIJK	XO
ZEN	TRUE									

DECLARED										
7UP	ABICO	AF	ALT	AMARIN	AMATA	AMATAV	ANAN	APURE	B52	BKD
BM	BROCK	BUI	CHO	CI	COTTO	DDD	EA	EFORL	EP	ERW
ESTAR	ETE	EVER	FSMART	GPI	ILINK	IRC	J	JKN	JMART	JMT
JSP	JTS	KWG	LDC	MAJOR	META	NCL	NOBLE	NOK	PK	PLE
ROJNA	SAAM	SAPPE	SCI	SE	SHANG	SINGER	SKR	SPALI	SSP	STANLY
SUPER	SYNEX	THAI	TKS	TOPP	TRITN	TTA	UPF	UV	WIN	ZIGA

Level	
Certified	This level indicates practical participation with thoroughly examination in relation to the recommended procedures from the audit committee or the SEC's certified auditor, being a certified member of Thailand's Private Sector Collective Action Coalition Against Corruption programme (Thai CAC) or already passed examination to ensure independence from external parties.
Declared	This level indicates determination to participate in the Thailand's Private Sector Collective Action Coalition Against Corruption programme (Thai CAC)

Disclaimer:

The disclosure of the Anti-Corruption Progress Indicators of a listed company on the Stock Exchange of Thailand, which is assessed by Thaipat Institute, is made in order to comply with the policy and sustainable development plan for the listed companies of the Office of the Securities and Exchange Commission. Thaipat Institute made this assessment based on the information received from the listed company, as stipulated in the form for the assessment of Anti-corruption which refers to the Annual Registration Statement (Form 56-1), Annual Report (Form 56-2), or other relevant documents or reports of such listed company. The assessment result is therefore made from the perspective of Thaipat Institute that is a third party. It is not an assessment of operation and is not based on any inside information. Since this assessment is only the assessment result as of the date appearing in the assessment result, it may be changed after that date or when there is any change to the relevant information. Nevertheless, FSS International Investment Advisory Company Limited does not confirm, verify, or certify the accuracy and completeness of the assessment results.

Note: Companies participating in Thailand's Private Sector Collective Action Coalition Against Corruption programme (Thai CAC) under Thai Institute of Directors (as of June 24, 2019) are categorised into: 1) companies that have declared their intention to join CAC, and; 2) companies certified by CAC.

Source: The Securities and Exchange Commission, Thailand; * FSSIA's compilation

GENERAL DISCLAIMER

ANALYST(S) CERTIFICATION

Suwat Sinsadok, CFA, FRM, ERP FSS International Investment Advisory Securities Co., Ltd

The individual(s) identified above certify(ies) that (i) all views expressed in this report accurately reflect the personal view of the analyst(s) with regard to any and all of the subject securities, companies or issuers mentioned in this report; and (ii) no part of the compensation of the analyst(s) was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed herein.

This report has been prepared by FSS International Investment Advisory Company Limited (FSSIA). The information herein has been obtained from sources believed to be reliable and accurate; however FSS makes no representation as to the accuracy and completeness of such information. Information and opinions expressed herein are subject to change without notice. FSS has no intention to solicit investors to buy or sell any security in this report. In addition, FSS does not guarantee returns nor price of the securities described in the report nor accept any liability for any loss or damage of any kind arising out of the use of such information or opinions in this report. Investors should study this report carefully in making investment decisions. All rights are reserved.

This report may not be reproduced, distributed or published by any person in any manner for any purpose without permission of FSSIA. Investment in securities has risks. Investors are advised to consider carefully before making investment decisions.

Company	Ticker	Price	Rating	Valuation & Risks
Thai Oil	TOP TB	THB 48.75	BUY	Downside risks to our EV/EBITDA-based TP are a sharp rise in oil price and weak demand for refined oil products.
Star Petroleum Refining	SPRC TB	THB 8.50	BUY	TP is based on EV/EBITDA. Downside risks are a sharp rise in oil price and weak demand for refined oil products.
Bangchak Corp	BCP TB	THB 31.00	BUY	The downside risks to our SoTP-based TP include: 1) lower-than-expected demand for petroleum products; 2) higher crude premiums; and 3) unplanned shutdowns of the company's refinery plants.
Esso Thailand	ESSO TB	THB 7.40	HOLD	The downside risks to our SoTP-based TP on ESSO include 1) lower-than-expected demand for petroleum products; 2) a higher crude premium; and 3) unplanned shutdowns of its refinery and petrochemical plants. The upside risks include 1) higher-than-expected demand for petroleum products; and 2) a lower crude premium.
PTT Global Chemical	PTTGC TB	THB 48.75	BUY	The key downside risks to our EV/EBITDA-based TP are the weaker-than-expected HDPE price and HDPE-naphtha margin
IRPC PCL	IRPC TB	THB 3.54	BUY	Key risks to our positive view and EV/EBITDA-based target price are weaker-than-expected oil product demand growth and lower-than-expected PP-naphtha and SM-benzene margins.
Tipco Asphalt	TASCO TB	THB 15.80	BUY	Downside risks to our EV/EBITDA multiple based TP include 1) a lower asphalt margin due to an oversupply in Asia on the back of faster recovery of utilisation rate for global refiners; and 2) a lower-than-expected supply of alternative crudes and asphalt.
PTT PCL	PTT TB	THB 38.25	BUY	Risks to our SoTP-based valuation are the oil price and potential earnings downside from government intervention.
PTT Explor & Prod	PTTEP TB	THB 152.50	BUY	Risks our TP, which is based on EV/EBITDA, are a sharp decline in oil price and a potential earnings downside from government intervention.
Bangkok Aviation Fuel Services	BAFS TB	THB 24.80	BUY	Downside risks to our SoTP-based target price include a slower than expected vaccination rate, leading to slower demand in tourism activities, plus uncertainty in the fuel volume demand in the north which could lead to volatility in Fuel Pipeline Transportation Limited (FPT)'s income.
Indorama Ventures	IVL TB	THB 42.50	BUY	The key downside risks to our EV/EBITDA-based TP are weaker-than-expected margins for PX-PTA and PET-PTA, lower demand for polyester, and delays in IVL's projects.
Siam Cement	SCC TB	THB 370.00	BUY	Downside risks to our SOTP based TP include 1) a lower-than-expected demand for chemicals, CBM, and packaging; 2) rising coal costs for its cement and packaging units; and 3) weaker demand from the automobile industry that could erode the demand for SCC's chemical unit and its dividend contributions.
Eastern Polymer Group	EPG TB	THB 8.80	BUY	Downside risks to our EV/EBITDA-based target price include 1) a sharp rise in feedstock prices, driven mostly by a higher oil price; and 2) lower-than-expected demand for plastics used for insulators and the automobile and packaging industries.
B.Grimm Power	BGRIM TB	THB 31.00	BUY	The downside risks to our SoTP-based TP include 1) lower-than-expected demand for electricity in Thailand, 2) a lower crude price, and 3) unplanned shutdowns of its SPPs.
Gulf Energy Development	GULF TB	THB 47.00	BUY	The downside risks to our SoTP-based TP on GULF include 1) lower-than-expected demand for electricity in Thailand; 2) a lower crude price; and 3) delays in project commercial operation dates.
Global Power Synergy	GPSC TB	THB 66.25	BUY	The downside risks to our SoTP-based TP on GPSC include 1) lower-than-expected demand for electricity in Thailand; 2) a lower crude price; and 3) lower-than-expected demand from industrial users.
Banpu Power	BPP TB	THB 15.60	BUY	Downside risks to our SOTP valuation are the start-up delays of its new projects and government intervention in the electricity tariff.
Electricity Generating	EGCO TB	THB 168.50	BUY	Downside risks to our SoTP-based TP include 1) lower-than-expected demand for electricity in Thailand; 2) delays in project commencement or commercial operation dates (COD); and 3) government intervention in electricity tariff subsidies.
Ratch Group	RATCH TB	THB 44.00	BUY	The downside risks to our SoTP-based TP include 1) lower-than-expected demand for electricity in Thailand; 2) lower crude price; and 3) delays in starting new projects.

WHA Utilities & Power	WHAUP TB	THB 4.02	HOLD	Downside risks to our SoTP-based TP include 1) lower-than-expected demand for electricity in Thailand; and 2) lower crude prices. Upside risks are the higher than expected sales volumes of water and electricity for industrial users.
BCPG	BCPG TB	THB 11.50	BUY	The downside risks to our SoTP-based TP include: 1) lower-than-expected demand for electricity in Thailand, the Philippines and Indonesia; and 2) government intervention by way of electricity tariff subsidies.
CK Power	CKP TB	THB 4.84	BUY	The downside risks to our SoTP-based TP include lower-than-expected demand for electricity in Thailand and lower-than-expected water supply for hydro projects.
Energy Absolute	EA TB	THB 83.00	BUY	Downside risks to our SoTP-based TP include: 1) lower-than-expected demand for electricity in Thailand; 2) lower crude prices; and 3) lower-than-expected demand for batteries.
Gunkul Engineering	GUNKUL TB	THB 5.80	BUY	The downside risks to our SoTP-based TP on GUNKUL include 1) lower-than-expected demand for electricity in Thailand, 2) declining EPC backlogs, and 3) lower-than-expected utilisation rates for solar and wind farms
Demco	DEMCO TB	THB 3.12	BUY	Downside risk includes delays in bidding for power transmission projects.
Power Solution Technologies	PSTC TB	THB 1.87	BUY	The downside risks to our SoTP-based TP on PSTC include 1) lower-than-expected demand for electricity in Thailand and delays of power plant project start-ups.
Sermuang Power Corp	SSP TB	THB 11.40	BUY	The downside risks to our SoTP-based TP for SSP include 1) a lower-than-expected demand for electricity in Thailand; 2) a lower crude price; and 3) project start-up delays.
TPC Power Holding	TPCH TB	THB 11.50	BUY	The downside risks to our SoTP-based TP include 1) lower-than-expected demand for electricity in Thailand, 2) a lower crude price, and 3) higher costs of biomass feedstock.
TPI Polene Power	TPIPP TB	THB 3.88	BUY	Downside risks to our SoTP-based TP include 1) lower-than-expected demand for electricity in Thailand; 2) lower crude price, and 3) unplanned shutdown of the company's power plants.
Absolute Clean Energy	ACE TB	THB 3.04	BUY	The downside risks to our SoTP-based TP include 1) lower-than-expected demand for electricity in Thailand, 2) a lower crude price, and 3) higher costs of biomass feedstock.
Earth Tech Environment	ETC TB	THB 3.80	BUY	Downside risks to our SoTP-based TP include: 1) lower-than-expected demand for electricity in Thailand; 2) lower crude price; and 3) lower-than-expected industrial waste volumes.

Source: FSSIA estimates

Additional Disclosures

Target price history, stock price charts, valuation and risk details, and equity rating histories applicable to each company rated in this report is available in our most recently published reports. You can contact the analyst named on the front of this note or your representative at Finansia Syrus Securities Public Company Limited

FSSIA may incorporate the recommendations and target prices of companies currently covered by FSS Research into equity research reports, denoted by an 'FSS' before the recommendation. FSS Research is part of Finansia Syrus Securities Public Company Limited, which is the parent company of FSSIA.

All share prices are as at market close on 08-Mar-2022 unless otherwise stated.

RECOMMENDATION STRUCTURE

Stock ratings

Stock ratings are based on absolute upside or downside, which we define as (target price* - current price) / current price.

BUY (B). The upside is 10% or more.

HOLD (H). The upside or downside is less than 10%.

REDUCE (R). The downside is 10% or more.

Unless otherwise specified, these recommendations are set with a 12-month horizon. Thus, it is possible that future price volatility may cause a temporary mismatch between upside/downside for a stock based on market price and the formal recommendation.

* In most cases, the target price will equal the analyst's assessment of the current fair value of the stock. However, if the analyst doesn't think the market will reassess the stock over the specified time horizon due to a lack of events or catalysts, then the target price may differ from fair value. In most cases, therefore, our recommendation is an assessment of the mismatch between current market price and our assessment of current fair value.

Industry Recommendations

Overweight. The analyst expects the fundamental conditions of the sector to be positive over the next 12 months.

Neutral. The analyst expects the fundamental conditions of the sector to be maintained over the next 12 months.

Underweight. The analyst expects the fundamental conditions of the sector to be negative over the next 12 months.

Country (Strategy) Recommendations

Overweight (O). Over the next 12 months, the analyst expects the market to score positively on two or more of the criteria used to determine market recommendations: index returns relative to the regional benchmark, index sharpe ratio relative to the regional benchmark and index returns relative to the market cost of equity.

Neutral (N). Over the next 12 months, the analyst expects the market to score positively on one of the criteria used to determine market recommendations: index returns relative to the regional benchmark, index sharpe ratio relative to the regional benchmark and index returns relative to the market cost of equity.

Underweight (U). Over the next 12 months, the analyst does not expect the market to score positively on any of the criteria used to determine market recommendations: index returns relative to the regional benchmark, index sharpe ratio relative to the regional benchmark and index returns relative to the market cost of equity.