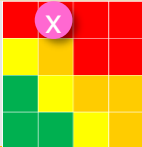




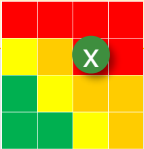
Cyber Security

Emerging Risk	Cyber Security	
Source of Risk/Category	Technological/Operation Risk	
Time frame of impact	Short to medium term (2-5 yrs.)	
Level of potential impact of the risk	Risk Level: Extremely (Red) Impact: 4 /Likelihood: 2 (Unlikely)	
Scenario	<p>Cybersecurity threats are rapidly on the rise these days, with impacts seen in various forms, including data breach, ransomware, cyber extortion, image and reputation loss, and possibly disruption to business interruptions.</p> <p>In 2021, the spread of COVID-19 had shaken many industries and companies. PTT had closely monitored the situation and launched the Work from Anywhere policy, allowing employees to work anywhere via a virtual private network (VPN) system., which might make cyber attacks easier.</p>	
Impact	<p>PTT continuously prioritizes cybersecurity as a corporate risk with close monitoring and outcome measurement and takes more seriously preventive and mitigation actions to curb the risk of becoming a target, which would have severe repercussions on corporate confidence and image among stakeholders. A list of cyber threats that could happen to PTT (or have been reported of attempt once), Malicious E-mail, URLs and attachments, Malwares and Trojans, Hacking, Spear-Phishing, Leakage of Confidential information and information theft, System shutdown of major facilities such as Network and Data centre, etc.</p> <p>The result of accomplished cyber threats vary from small disturbances to tremendous impact like business and operational disruption as well as devaluation of brand image. This includes critical information thefts from PTT and customers, computer virus attacks, ransomwares, and penetration to the organization’s important infrastructure control systems.</p>	
Mitigation	<p>PTT commands a roaming security system designed to ensure safe work from employees’ computers accessed from their residences or other work sites. The virtual private network (VPN) boasts a network with high protection and privacy; to access the network, computers must pass PTT’s security standard and self-authentication each time. In addition, software for conference calls is graded standard or nonstandard.</p> <p>As well as plans to increase efficiency to reduce risk and impact levels on an ongoing basis. The plans include investment in technology, increasing process efficiency, as well as raising awareness of cyber threats to employees, such as enabling two-factor authentication (2-FA) for access to email and in-house systems, educating and phishing test campaign to create awareness of cyber threats to employees. Vulnerability assessment and penetration tests are regularly performed to find and close loopholes, covering both Information Technology (IT) and Operation Technology (OT) at the same time.</p> <p>PTT assigns PTT Digital Solutions Company Limited to operate and provide cybersecurity services to PTT Group, with the Cyber Security Operation Center (CSOC) responsible for monitoring abnormalities from cyber attacks, providing PTT Group 24 hours a day service with high-technology monitoring tools such as machine learning, along with personnel with international certifications, and Security Incident Response, including coordination with the Thailand Computer System Security Coordination Center (ThaiCERT) and other international communities to exchange the latest information of the cybersecurity incidents</p>	

Personnel Development to Sustain Business Growth

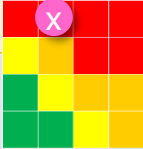
2

Disruption by Clean Energy & New Business Development

Emerging Risk	Disruption by Clean Energy & New Business Development	
Source of Risk/Category	Technological/Strategic Risk	
Time frame of impact	Long term (5 – 10 yrs.)	
Level of potential impact of the risk	Risk Level: Extremely (Red) Impact: 3 /Likelihood: 3 (Possible)	
Scenario	<p>With dynamic innovation or technological progress resulting in disruptive technology as well as global environmental awareness, creating energy transition concepts from conventional energy consumption to new forms of clean energy that changes customers’ needs and current business flows, PTT values the determination of PTT Group’s business strategic directions to accommodate changing directions of the economy, society, energy, technology, and consumers’ behavior.</p> <p>LNG Value Chain and New S-Curve business strategies have therefore been devised to pursue opportunities and develop new business models to handle upcoming changes. For example, investments in EV business, renewable energy, life science; the preparation of human capital to efficiently accommodate business expansion and emerging shifts. A new set of vision, direction and future business strategies has been mapped out by an annual Top Executive Thinking Session (TTS) and a Strategic Thinking Session (STS) among senior PTT Group executives. The resulting business strategies then translate into five-year business plans, which are then integrated with risk management plans.</p>	
Impact	To cope with the clean-energy disruption, PTT needs to transform itself to align with global megatrends. This is due to technological innovation including the falling costs of renewables and energy storage, along with the environmental policies and regulatory reform. These changes are most apparent in many countries, especially in the EU. Also, innovations in energy storage and digital technology might keep these costs down. If PTT’s strategies cannot promptly cater to such change, it could suffer from impacts on businesses and performance.	
Mitigation	<p>To conform to the context of the energy transition, the trend of lowering greenhouse gas emissions to zero, and the leaping technological advancement including changing social and consumer behaviors, PTT exercised the Reimagination strategy to manage risk of disruption by Clean Energy. Accelerate and diversify new business models to replace the share of growth in hydrocarbon value chain, in the areas of</p> <ul style="list-style-type: none">▪ Future Energy: Renewable power generation; Energy Storage and Systems; EV Chain; exploring potential new energy source such as hydrogen.▪ Beyond Energy: Life science such as pharmaceutical, nutrition, medical device and diagnosis; high value business, mobility and lifestyles, logistics and infrastructure; AI, Robotics and Digitalization, and seeking for other potential investment opportunity. <p>PTT focuses on the clean energy ecosystem, which encompasses renewable power generation, energy storage technology, electric vehicle business, and new forms of consumer energy consumption. Global Power Synergy Public Company Limited (GPSC), PTT Group's power flagship, has invested in wind and solar power plants in Taiwan, as well as a solar company in India, and opened Southeast Asia's first semi-solid energy storage plant. PTT has a joint venture agreement with Foxconn Group through ARUN PLUS Company Limited to develop a fully integrated electric vehicle production platform technology in the country and is working with Hozon New Energy Automobile Company Limited to explore the possibilities of expanding the complete range of electric vehicle commercial opportunities, including relocating the EV manufacturing base to Thailand. There is also a commitment to expand charging stations both inside and outside of service stations, as well as to build a comprehensive ecosystem through EVME PLUS Company Limited to accommodate and encourage the use of electric cars in the country.</p> <p>On top of the energy sector, PTT has concentrated on investment in the life science industry through Innobio (Asia) Company Limited to become a major shareholder with a 37% stake in Lotus Pharmaceutical Company Limited, which has a global network of pharmaceutical trading and patent businesses. PTT has also partnered with Nove Foods to manage a plant-based protein food business for healthy food option expansion and has signed an agreement with Plant & Bean, (UK), to set up an alternative protein manufacturing plant in Thailand. PTT established Innopolymed Company Limited in cooperation with IRPC Public Company Limited (IRPC) to create a medical device factory.</p> <p>In the mobility and lifestyle sector, PTT Oil and Retail Business Public Company Limited (OR) has been raising funds and trading on the Stock Exchange of Thailand to invest in the expansion of retail, food, and logistics service businesses, as well as moving toward a business that fits consumers’ future lifestyle needs. PTT Global Chemical Public Company Limited (GC), on the other hand, acquired Allnex in the High Value Business to develop its coating resins business.</p>	



Risks Arising from COVID-19

Emerging Risk	Risks Arising from COVID-19	
Source of Risk/Category	Pandemic/Operation Risk	
Time frame of impact	Short to medium term (2-5 yrs.)	
Level of potential impact of the risk	Risk Level: Extremely (Dark Yellow) Impact: 4 /Likelihood: 2 (Unlikely)	
Scenario	In 2021, the persistent challenge of the COVID-19 pandemic's effect on industry, and consumer behavior, have gradually adapted to the New Normal. PTT had closely monitored the situation and launched the Work from Anywhere policy, allowing employees to work anywhere via a virtual private network (VPN) system.	
Impact	The spread of COVID-19 and relevant public-sector measures have shaken the petroleum and petrochemical industry. PTT is exposed to disruptions of production and business operations resulting from pandemic which affect the business performance of PTT.	
Mitigation	<p>PTT Group has short-and-long-term business continuity management plans to maintain competitiveness and strength of PTT Group through PTT Group Vital Center with the following measures:</p> <p><u>Performance Results and Financial Strength</u></p> <ul style="list-style-type: none">Strategic Moves: Built strategic partnerships within PTT Group, improved work efficiency, including monitoring results and expense reduction directions of each company to maintain the financial strength of PTT Group.Cash & Credit Securement: Focused on maintaining cash and liquidity for PTT Group through both short-and-long-term funding plans together with credit risk management and close follow-up of financial risk factors to ensure that PTT can keep the credit rating at the Investment Grade. <p><u>Supply Chain and Business Process</u></p> <ul style="list-style-type: none">Supply Chain Management: Collaborated within PTT Group in jointly operating petroleum and petrochemical businesses, aiming to develop and improve management processes throughout the supply chain for optimum efficiency and benefits.Customer Engagement: Improved communication formats with customers e.g. electronic meetings and communication via video conference and developing online video training programs.Workforce Protection: For business continuity management, PTT set up PTT Palungjai to manage the overall situation of PTT Group by formulating the Work from Home Policy for all employees as deemed appropriate and supporting the use of digital equipment for work efficiency.Cybersecurity: PTT commands a roaming security system designed to ensure safe work from employees' computers accessed from their residences or other work sites. The virtual private network (VPN) boasts a network with high protection and privacy; to access the network, computers must pass PTT's security standard and self-authentication each time. In addition, software for conference calls is graded standard or nonstandard. <p><u>Personnel Health and Safety</u></p> <ul style="list-style-type: none">PTT COVID-19 Monitoring and Surveillance Center ("PTT Palungjai ") manages personnel's physical and mental safety. Stringent preventive and control measures are in place for COVID-19 infection together with regular provision of news and information along with easy access to the hub, including the procurement of "Sinopharm", an alternative vaccine to build immunity for employees and their families by continuously monitoring the number of infected people and people at risk.	