

April 15, 2014

Robert deV. Frierson, Secretary
Board of Governors of the Federal Reserve System
20th Street and Constitution Avenue, NW
Washington DC 20551

Re: Docket No. R-1479, RIN 7100 AE-10 (Complimentary Activities, Merchant Banking Activities, and Other Activities of Financial Holding Companies related to Physical Commodities

Prepared by: Cathy Santoro
Date of submission: April 15, 2014

I received the Federal Reserve advance notice of proposed rulemaking inviting public comment on various issues related to physical commodity activities conducted by financial holding companies; and today (04/15/2014), I am providing my written submissions for the record. I also prepared one appendix that contains four charts and a brief summary, as well as one exhibit, both of which I have included with my written submission. The appendix serves to provide a high-level visual of both a micro and macro perspective of the interconnectivities and interdependencies of energy commodities in relation to planet Earth and the global economy while the exhibit provides more granular detail specific to the world's largest discovered oil & gas reserves. My views and opinions are the result of my experience attained when I served in the following capacities: Wells Fargo Bank, N.A. – Vice President; MGM MIRAGE – Senior Vice President and Treasurer; and Walmart Stores, Inc. – Vice President Finance, Capital Markets & Assistant Treasurer.

Prior to my specific comments, I have a few general observations:

1. I believe that there is a high degree of interconnectivity between and among global financial markets, growth in the global economy, and event risk (see attached Appendix). That said, I also believe that current demands for energy will grow exponentially as a function of growth in both global population and GDP. Currently, the global economy relies heavily on North Africa and the Middle East for oil and gas given that 85% and 65% of proven oil and gas reserves, respectively, are located in this region of the world – a region, which has been marked by conflict, both past and present, with extremism and violence continuing to grow. Furthermore, the majority of these reserves are nationalized with limits as to foreign participation¹ with many of these countries' energy sectors in need of significant infrastructure investment to not only support and maintain existing energy flows but for exploration and future development specific to currently unexplored regions². These collective forces are placing pressure on the extraction and flow of existing energy resources – both current as well as future – in turn, increasing demands on defense security and protection so as to mitigate event risk. The U.S. military a global protector – said demands for U.S. defense and protection clearly expanding given the growing global trade linkages, transit routes and global economy. Specific to said growth – financial institutions play a critical role in supporting this global economic growth. U.S. financial institutions often a significant participant – certain of these institutions not only the world's largest in terms of absolute asset size but also largest arrangers of capital, providers of credit, and transaction advisors in the world's largest mergers and acquisitions. Many of these same institutions are

¹ Kuwait, Libya, Algeria, Russia, Venezuela, Iran, Iraq, Saudi Arabia, Nigeria.

² See Exhibit 1.

also systemically important financial institutions and subject to additional monitoring and testing given risks specific to the U.S. economy in the event of pronounced stress. Certain of these stresses include geopolitical events – said events often having had broad and substantive impact on the markets and serving to increase event risk, a component of the sovereign rating methodology³. Furthermore, the most significant geopolitical events in recent decades have largely been tied to regional strife and insecurity within North Africa and the Middle East⁴. These conflicts have placed additional demands on U.S. defense and protection – regardless of U.S. involvement in said conflict – given the vital importance of continued energy flows and risk to global economy of interruption – the U.S. defense a critical component of the U.S. budget. That said, I believe that risk of conflict arises with U.S. financial institution ownership of commodities in relation to the U.S. sovereign rating given the interconnectivity between and among the U.S. financial industry – including systemically important financial institutions, the U.S. budget and fiscal policy, and geopolitical/event risk. Accordingly, I am interested to understand how these conflicts may be addressed in regards to said ownership knowing that the U.S. sovereign rating is clearly a critical component of the global economy – impacting not only the role of the U.S. dollar as a reserve currency, said reserve currency status also an important element in the sovereign rating process⁵, but both access to capital and borrowing rates

³ S&P: The second potential adjustment to the initial institutional and governance effectiveness score relates to geopolitical/external security risks, including war or threats of war stemming from conflicts or from strained relations with neighboring countries. When there is a long-standing risk of war, but we do not foresee that this risk will likely materialize over the next two to three years, the institutional and governance effectiveness score would be one to two categories worse than the initial score, depending on the potential impact on the real economy, fiscal expenditure, and external performance. However, when these risks are imminent or rapidly rising, it would affect the overall rating (see Supplemental Adjustment Factor in Paragraph 25). National security is a rating concern because military threats or other risks to political stability may place a large burden on policies, reduce the flow of potential investment, or put the balance of payments under stress. They may also lead to economic sanctions. Paragraph 25: *Event risk*. In cases of imminent or rapidly rising external or internal political risk (such as war, escalating domestic conflict, and acute and growing risk to institutional stability), a sovereign rating could differ from the indicative rating level, depending on the conflict's expected magnitude and effect on the sovereign's credit characteristics. In the other cases when the risk of conflict is long-standing but not imminent, it affects the sovereign rating through an adjustment to the institutional and governance effectiveness score (see subsection V.C.1.d). Furthermore, the occurrence of a rare, but severe, natural catastrophe could also lead to a material deviation from the indicative rating level depending on the extent of damage and the effect on the country's fundamentals. (source: S&P Sovereign Government Rating Methodology And Assumptions

<http://www.standardandpoors.com/prof/ratings/articles/en/us/?articleType=HTML&assetID=1245356394670>

Moody's: The core of the refined Moody's sovereign rating methodology will continue to focus on an assessment of sovereign credit risk based on the interplay of four key factors: economic strength, institutional strength, fiscal strength and susceptibility to event risk. (source: https://www.moody's.com/research/Moodys-seeks-market-feedback-on-proposed-refinements-to-sovereign-rating-PR_262487) 12/17/12

Level of stress in the banking system and in the economy

Financial and economic crises vary in scope and duration, and the extent and nature of the assistance that may be required also fluctuates. Also, while the actions and amounts of resources that may be required to save individual institutions is typically calculable and circumscribed, it is more challenging to stimulate a stalled economy or to have the expertise and the right plan to rebuild a financial system. As such, the presence of a profound crisis or the frequent recurrence of the need for government intervention in a country prone to failures would put downward pressure on a support assessment. (Source: https://www.moody's.com/researchdocumentcontentpage.aspx?docid=PBC_115275) May 2009

Moody's: July 13, 2011 – Credit Analysis – United States of America

"The crisis of 2008-10 revealed conflicting aspects of institutional strength. On the one hand, the Federal Reserve and the government implemented swift and firm responses to the crisis...however; the necessity of reform in the financial industry regulatory structure came under scrutiny...financial industry regulatory reform has resulted from the crisis."

⁴ Gulf War, September 11, Wars in Iraq and Afghanistan, Arab Spring, Syrian Civil War, Iran's nuclear weapons

⁵ S&P: Three factors drive a country's external score, one of which includes: the status of a sovereign's currency in international transactions. The criteria assign a better external score to sovereigns that control a "reserve currency" or an "actively traded currency." These sovereigns have a common attribute: Their currencies are used (widely for reserve currencies) in financial transactions outside their own borders, which means that they may be less vulnerable to shifts in investors' portfolios of cross-border holdings than are other countries. The international use of these currencies, in turn, stems from (i) the credibility of the countries' policies and institutions, (ii) the strength of their financial systems, (iii) the countries' large and open capital markets, with market-determined interest and foreign exchange rates, and (iv) the use of their currencies as units of account in global capital markets. These characteristics may push the external obligations of these sovereigns to relatively high levels. But this does not necessarily present the same degree of risks as for countries with non-actively traded currencies because these

across the economy, including U.S. financial institutions, specifically systemically important financial institutions, municipalities and, more broadly, business/industry and individual.

2. Given the correlation between and among energy and other physical commodities⁶ coupled with the correlation often present between and among a nation's physical commodities, in relation to its respective currency⁷, I am interested to understand if consideration has been given to the potential conflicts of interest that may arise when financial institutions own underlying physical commodities that said institutions' traders are actively engaged in trading as well. Furthermore, I am interested to understand how inter-agency responsibilities will be coordinated given that the Commodities Futures Trading Commission (CFTC) is mandated to regulate the commodities markets, the Federal Reserve having no direct role in supervision of said market, while both the SEC and the Federal Energy Regulatory Commission (FERC) are also tasked with additional market oversight responsibilities. More broadly, the Dodd-Frank Act, as passed by Congress and signed into law in 2010, serves to substantively "overhaul the existing agency oversight system given that various government agencies regulating the financial industry with their varying rules and standards led to certain entities not being regulated at all, with others subject to less oversight than their peer financial firms organized under different charters"⁸. However, significant elements of said Act remain in progress – certain of which pertain to elements clearly impacting physical commodities' activities. Additional financial institution and market reform is also actively in progress in regards to Basel III and Money Market Fund Reform – responsibilities for said reform tasked to the Federal Reserve (Basel III) and SEC (Money Market Fund Reform, Asset Backed Commercial Paper), respectively. Given that financial institution investments are a component of Basel III and critical aspects specific to Basel III (proposed Liquidity Coverage Ratio

sovereigns' policy settings may more readily preserve foreign investor confidence. The criteria differentiate between sovereigns with reserve currencies and those with actively traded currencies as follows: *Sovereigns with a reserve currency*. A sovereign in this category benefits from a currency that accounts for more than 3% of the world's total allocated foreign exchange reserves based on the IMF's report "Currency Composition of Official Foreign Exchange Reserves," and the sovereign's global economic and political influence supports this official demand. Demand for the debt of sovereigns that control reserve currencies tends to rise in periods of economic stress (this is the so-called "flight to quality"). At the time of publishing these criteria, this category of sovereigns includes the U.S., the U.K., Japan, France, and Germany. The latter two, the largest members of the Eurozone, benefit, in our view, from the reserve currency status of the euro. Given that each accounts for more than 20% of the zone's GDP, it is unlikely that the European Central Bank's monetary stance would be at odds with their economic fundamentals for a long time, as was the case with some of the smaller EMU members that suffered large lending bubbles. *Sovereigns with an actively traded currency*. A sovereign in this category benefits from a currency that is bought or sold in more than 1% of global foreign exchange market turnover, based on the Bank for International Settlement (BIS) report, "Triennial Central Bank Survey," and which is not a reserve currency as defined above. At the time of publishing these criteria, this category includes Australia, Switzerland, Canada, Hong Kong, Sweden, New Zealand, Korea, Singapore, Norway, and Mexico. In addition, all Eurozone countries are included, with the exception of France and Germany, which are included in the previous category. (Source: S&P Sovereign Government Rating Methodology And Assumptions <http://www.standardandpoors.com/prot/ratings/articles/en/us/?articleType=HTML&assetID=1245356394670>)

Moody's: "The global role of the U.S. dollar, which results not only from economic size but also from a history of relative economic stability and the depth and liquidity of financial markets, makes the U.S. unique. It partially offsets the rather low domestic saving rate by providing access to a large pool of investment capital. While there is certainly a case to be made that the role of the dollar will diminish over time as other economic areas increase in relative size, it does not appear likely to happen quickly. U.S. dollar assets still dominate international reserves globally, with over 60% of reserves still held in dollars, and the majority of international trade and investment continues to be denominated in dollars. (Source: Moody's: July 13, 2011 – Credit Analysis – United States of America)

⁶Rising marginal production costs in energy in turn raise production costs for most other commodities, in turn increasing correlations across commodities through cost-push channels.

Source: JP Morgan Global Commodities Research – Commodity Markets Outlook and Strategy (August 2011)

⁷ Chile's \$18,211 per capita GDP (PPP basis, 2012), is the second lowest among Aa- rated sovereigns and less than half the \$36,583 median for this group. While Chile is poorer than other Aa-rated sovereigns, real GDP growth has averaged 3.9% since 2008, higher than the 2.2% Aa median. Chile's economy remains highly dependent on commodities, which consistently represent over 80% of total exports with the bulk coming from copper sales. This is a structural feature of Chile's economy, one that raises concerns about over dependence on a single product line. But Chile's strong macroeconomic framework, including fiscal savings mechanisms, provides a strong bulwark against external shocks. https://www.moodys.com/research/Moodys-Affirms-Chiles-Aa3-Rating-and-Stable-Outlook--PR_285224

⁸ "The Dodd-Frank Act: A Cheat Sheet"; Morrison & Forester <http://www.mofo.com/files/Uploads/Images/SummaryDoddFrankAct.pdf>

(LCR) and Net Stable Funding Ratios) are in draft stages (the NSFR a future initiative⁹) – managed and regulated separately and distinctly across global financial markets, said reform correlated to risks of shadow banking, I would be interested to better understand how regulatory oversight responsibilities specific to these multi-layered functions occurring within, between and among financial institutions are being coordinated between these government agencies knowing that a sovereign rating is based on the nation as a whole – said agencies critical parts to said whole. Furthermore, given these overlapping agency spheres, I would be interested to understand coordination between and among government agencies and Congress specific to both this proposed rulemaking, said proposal pertaining to legislation previously passed by Congress – Congress clearly a critical component of the political elements of the U.S. sovereign rating – its legislation (Dodd-Frank, as an example) having far-reaching impacts on the global financial markets; as well as the demand and supply of physical commodities – including protection, stability and security of said commodities. Commodities which are essential to the global economy and of vital concern to U.S. national security and foreign policy.

3. Given the complex and interconnected global trade and supply chains, with corresponding demands for energy and other physical commodities, in relation to financial institutions, said institutions serving not only as intermediaries to funds flow and liquidity demand/supply transactions but also as critical sources of capital directly, I would be interested to understand the level of interaction or coordination necessary between and among non-U.S. regulators given the globally connected financial markets. The physical borders of countries are often blurred in the daily transaction activity occurring between and among global financial institutions and global financial exchanges – said institutions coordinating flows of funds and serving as intermediaries to and sources of capital that serve to grow and expand said global economy, in turn, affecting demands for physical commodities and the nations which serve to supply said commodities. The net impact clearly a component in corresponding currency and commodity transaction activity – activities carried out in financial institutions which are subject to various forms of regulation, some of which are global in nature (Basel) while others country specific (Dodd-Frank). Given the interconnectivity between and among said institutions specific to these forms of activity, activities which extend to currencies, interest rates and LIBOR, and derivatives coupled with risks specific to said activity¹⁰, it would be helpful to better understand how differences between and among global financial institutions in regards to physical commodity ownership rights and corresponding regulation, accounting treatment and classification as a function of said financial institution's country of domicile, and both physical commodity and currency trading will be addressed globally so as to mitigate systemic risk within the global financial markets.

Comments – Complementary Authority

Specific to Complementary Authority and risk in relation to safety and soundness of the financial system generally, as noted in my comments above, I believe that physical commodities (specifically energy resources) are one of the most

⁹ See:

<http://www.ft.com/cms/s/0/1c4a46cc-57fa-11e2-b997-00144feab49a.html#ixzz2ynH4SiRR> and

<http://www.federalreserve.gov/newsevents/testimony/tarullo20140206a.htm>

for further details.

¹⁰ Financial regulators and monetary authorities around the world are looking into allegations that traders colluded to manipulate benchmark exchange rates, a cornerstone of global markets that are used as reference rates by companies, investors and central banks. Allegations of possible manipulation of the \$5.3 trillion-a-day foreign exchange market have so far centered on major banks. <http://www.reuters.com/article/2014/03/11/forex-investigation-lloyds-idUSL6N0M81SO20140311>

critical elements in global growth and economic development, maintaining stable and secure access to said resources a priority of all nations, the U.S. a global protector in increasingly congested international transit routes – said routes serving as vital waterways in advancing the global economy. At the same time, financial institutions and markets are also essential in furthering a country's full economic development potential – efficiently moving trillions of dollars of liquidity throughout global financial exchanges on a daily basis, the financial crisis a stark reminder of said importance and magnitude of impact given the increasingly interconnected global economy. In addition, financial institution strength, and event risk are intertwined in a sovereign's rating – the U.S. rating clearly impacted by both, and strengthened by its global diversification, U.S. dollar global reserve currency status, as well as steady access to capital. Said currency further intertwined and interconnected to the global economy as a function of growing global trade linkages – trade reliant on energy and physical commodities, currency exchange – whether as a medium of exchange, unit of value or reserve – a significant element of said trade activity.

As reflected in the Appendix, linkages and complexities specific to trade, energy and financial institutions are largely intertwined in iterative feedback, loops – both positive and negative, depending upon broader geopolitical and macroeconomic forces – supported by trade unions¹¹, alliances¹², growth in China¹³ - global trade¹⁴. Underlying said global trade and population growth is the corresponding demand and supply of energy resources¹⁵, new energy alliances¹⁶, and the financial institutions which serve to channel liquidity demand and supply specific to global growth

¹¹ The EU member states, its roots based in the European Coal and Steel Community (1952) and EEC (1955-86), forged in 1992 via the Maastricht Treaty and subsequent monetary union, now exceed 500 million people, are, collectively, the world's largest trading partner – the 2nd largest GDP in the world at \$15.5 trillion, and the Euro the second largest global reserve currency. (Sources: Understanding the European Union, McCormick: CIA World Factbook)

¹² NAFTA: 1993-2013: % change in GDP – Canada (223%); EU (121%); Mexico (131%); US (136%) [Source: The World Bank (GDP: current US\$)]

¹³ China's share of world trade rose from an insignificant 1% of the total in 1980 to 9% today, with five of the ten biggest ports in the world and investing heavily in the construction of major ports in Pakistan, Myanmar and Bangladesh to protect its Middle Eastern energy supplies. One of the world's biggest recipients of foreign direct investment, and the largest foreign investor in Brazil, Laos, Myanmar, Iran, Mongolia and Afghanistan. Additional linkages extend to Africa, much like those that made Mogadishu and Mombassa centers of world trade a thousand years ago – said trade expected to continue to increase while trade between Asia and Latin America projected to rise ten-fold in the years ahead. (Source: "The Southern Silk Road" - HSBC Global Research 6/6/11) In addition, EU exports pertaining to UK, Germany and France comprise 11.2%, 25.7%, and 11.1% of China's GDP. ("The Southern Silk Road" - HSBC Global Research 6/6/11); "Russia Eyes China in Bid to Expand Asian Energy Ties" – Global Risk Insights 3/3/14; Over one-half of the Middle East's merchandise trade was with Asia 52.8% [WTO: International Trade Statistics 2012]; and Africa's trade with Asia was nearly one-third greater than that of its trade with North America 24.5% (Asia) versus 17.1% (North America) [WTO: International Trade Statistics 2012].

¹⁵ While much of the current oil and gas dependency is a function of new growth in China and India, "whose combined populations now account for a third of humanity"¹⁵, with China "the second-largest net importer of crude oil and petroleum products, a net oil exporter as recent as the 1990s"¹⁵, there remains continued dependency on oil and from the most advanced economies, dependencies with roots which date back to the onset of growth in the automobile industry in first half of the 20th century, the critical nature of said dependencies starkly illustrated in the early 1970's oil embargo (Arab oil embargo of 1973-74: Several oil-producing states deliberately reduced the amount of oil that they would export to all of their buyers and cutoff oil shipments to the US and Western Europe leading to enormous disruptions throughout the entire industrialized world given the dependency on oil for virtually all other economic activity. This led to a drastic increase in the price of oil that remained on the market, other commodities becoming scarce, and concerns in regards to OPEC's (Organization of Petroleum Exporting Countries) increasing influence over the price of oil, with the US, for the first time, a net importer of oil. (Source: United States and the Middle East: 1914 to 9/11; Professor Salim Yaquob (p.238-40)

in the case of both Germany and Turkey, energy to fuel much of this growth has been provided by Russia with Europe reliant upon Russia for 40% of its natural gas, Germany importing more than a third of its oil and gas from Russia alone, roughly "half of Europe's" gas piped through Ukraine¹⁵ and Turkey "one of the biggest importers of Russia gas" [Sources: "Dependence on Middle East Energy and its Impact on Global Security,

http://www.iags.org/luft_dependence_on_middle_east_energy.pdf; U.S. Energy Information Administration: China (2/4/14), ¹⁵"4 reasons Russia will keep gas flowing", CNNMoney 3/12/14

<http://money.cnn.com/2014/03/12/news/economy/russia-gas-threat/index.html>

¹⁶ Energy security is leading to a realignment of political linkages around the world. The Shanghai Cooperation Organization is one such example-its key members China, Russia, India, the Central Asian Republics of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan with India, Iran, Mongolia, and Pakistan having observer status. Examples of China specific energy investments in the region include its 2011 \$2.5 billion

via global exchanges and payment platforms. Said financial institutions providing critical access to capital – capital, in turn, which serves to fuel and grow the economy. Increasingly complex¹⁷ and interconnected - often increasing risk exponentially, as well as the need for reform in relation to said risks and crisis¹⁸. The importance of stability and security specific to critical flows of trade, energy and liquidity is clear.

That said, I believe that it is critical to be mindful of increasing velocity, reach¹⁹ and flow specific to said trade, global supply chains, and energy corridors²⁰, as well as the current geographic concentration of energy supply²¹ in relation to escalating demand pressures²². Said concentration primarily located in a region marked by both ongoing and

investment in Iran's South Azadegan oilfield, which follows on from its \$1.76 billion 2009 deal between China National Petroleum Company (CNPC) and the National Iranian Oil Company (NIOC) to develop the North Azadegan field, as well as Sinopec's (another key Chinese oil player) development of the neighboring Yadavaran field, a 60% stake in Aktobemunai-gas in Kazakhstan and a substantial stake in the Greater Nile Petroleum Operating Company (GNPOC) in Sudan. [Source: HSBC Global Research-The Southern Silk Road June 2011]

¹⁷ The financial intermediation industry has experienced significant structural transformations over the past 20–30 years. Some of these changes are well known. Since the 1980s, for instance, the number of commercial banks operating in the United States fell from about 14,000 to 6,000. Most of this reduction was the result of a well-documented process of consolidation, encouraged in large part by geographic deregulation. Along the way, both the average size of bank holding companies (BHC) and their market shares increased remarkably. In the 1980s, the top 10 BHCs accounted for about 20 percent of total bank assets; that percentage is now above 50 percent. Not only did they grow in size, but the remaining entities also grew substantially in their organizational complexity, incorporating a large and growing number of subsidiaries spanning the entire spectrum of business activities within the financial sector. ("Evolution in Bank Complexity" – Federal Reserve Bank of New York March 2014)

¹⁸ Dodd Frank, Basel III, Reg 2a-7, Money Market Fund Reform, Federal Reserve System Payment Reform

¹⁹ In 2011, Asia's largest trading partners were within region, a region that is comprised of many rapidly advancing developing countries (India, Indonesia, Korea, Malaysia, Philippines, Singapore Thailand), the world's largest ports (Shanghai, Hong Kong, Shenzhen) and strategically important waterways (South China Seas, Strait of Malacca). Over one-half, or 52.8%, of the Middle East's merchandise trade was with Asia; and Africa's trade with Asia was nearly one-third greater (24.5% (Asia) versus 17.1% (North America)) than that of its trade with North America. [Source: WTO-International Trade Statistics 2012]. Additional linkages incorporate infrastructure related financing via China policy banks, Exim Bank and China Development Bank (CDB) often through its investment vehicle: the China-Africa Investment Fund (source: Standard Chartered Research 4/1/2011) as well as China's investment in and control of Pakistan's strategic Gwadar port (sources: HSBC Global Economics 6/6/11 and AP 2/18/13). That said, it is important to note China is in the first stages of its Naval development (China's first aircraft carrier, Liaoning, was commissioned and entered service with the PLA Navy on September 25, 2012. Force modernization is a priority as China seeks to protect energy investments in Central Asia, specifically the security situation in the Taiwan Strait as well as risk of piracy in the Gulf of Aden given China's maritime dependency on either the Strait of Malacca or the Strait of Hormuz, for the sheer volume of oil and liquefied natural gas that is imported to China from the Middle East and Africa. (Source: "Military and Security Developments Involving the People's Republic of China 2013: Annual Report to Congress, Office of the Secretary of Defense)said military demands now extending far beyond the Suez Canal, location of one of the first energy crises (Suez Crisis of 1956). Furthermore, more than ½ of the world's annual merchant fleet tonnage passes through the Straits of Malacca, Sunda and Lombok; Taiwan Strait and corresponding China-Taiwan Cross-Strait Stability with the majority continuing on to the South China Seas; almost a third of global crude oil and over ½ of global LNG (liquid natural gas) passes through these waterways, making it one of the most important transit routes in the world (Source: U.S. Energy Information Administration – South China Sea).

²⁰ Strait of Hormuz (located between Oman and Iran: 17 million bb/d in 2011, *most potential options to bypass Hormuz are currently not operational*), Suez Canal/SUMED Pipeline (located in Egypt and connects the Red Sea and the Gulf: 3.8 million bb/d in 2011, closure would add an estimated 2700 miles of transit from Saudi Arabia to the U.S. around the Cape of Good Hope via tanker), Bab el-Mandab (between the Horn of Africa and the Middle East: 3.4 million bb/d, closure could keep tankers from the Persian Gulf from reaching the Suez Canal and SUMED Pipeline diverting them around the southern tip of Africa-*rising piracy a concern*), Turkish Straits (divide Asia from Europe: 2.9 million bb/d, one of the busiest and most dangerous chokepoints in the world supplying Western and Southern Europe) [Source: U.S. Energy Information-World Oil Transit Chokepoints]

²¹ North Africa and the Middle East: A region that "supplies 22% of U.S. [oil] imports, 36% of OECD Europe's, 40% of China's, 60% of India's, 80% of Japan's and South Korea's, and even oil-rich Canada at 45%" and contains "four of the seven most critical world oil transit chokepoints" (Source: Source: "Dependence on Middle East Energy and Its Impact on Global Security, http://www.iags.org/luft_dependence_on_middle_east_energy.pdf)

²² By 2030, Asia is expected to import 880% of its total oil needs. [Source: "Dependence on Middle East energy and its impact on global security" http://www.iags.org/luft_dependence_on_middle_east_energy.pdf]. More broadly, energy demands specific to auto will also exponentially impact the need for supply in the years ahead. For many emerging nations, car ownership is incredibly low relative to the developed world, reflecting a low level of income, in many cases, a lack of reasonable access to credit and the absence of a satisfactory network of roads. As incomes rise, this will surely change – China currently transitioning to a mass automobile culture at an extraordinary rate and on an unprecedented scale, car sales increasing 46% from 2009-2010, 17 million vehicles sold versus 11.5 million in the US, China's automobile industry designated as one of the "core pillars of growth. Only 10 years ago US sales totaled 17.3 million while only 1.9 million were sold in China – at that time, China a net exporter of oil and GDP/capita roughly ½ of current value, or \$4000/person. (Sources: "The Southern Silk Road" - HSBC Global Research 6/6/11; [The Quest for Oil](#), Yergin)

increasing violence and instability²³, largely in need of vast infrastructure improvements and capital investment specific to both current supply as well as future exploration and sourcing specific to undeveloped territories so as to meet growing global population and GDP demands as well as demands specific to installed electricity generating facilities in significant portions of the world economy²⁴. (See attached Exhibit 1 for further details)

The cumulative impact of the above has clearly increased risk – a function of complexity and correlation – posing broader systemic geopolitical and market risks and concerns, in turn, increasing demands specific to collaboration, regulation, and protection so as to ensure continued flow and stability of both energy and capital. Specific to said correlations are the price and value of commodities, currencies and interest rates – highly correlated and a function of the broader economy, in turn, impacting transactional activity specific to trading and derivatives. Furthermore, previous and current interest rate and FX trading issues, ongoing regulatory reform specific to Basel III and Dodd-Frank, as well as current low interest rate environment and the timing of future Federal Reserve policy changes specific to rate increases, tapering, and excess reserves, serve to substantively increase the risk of uncertainty – uncertainties already pronounced as a function of the current energy sector reserve dynamics. These risks and uncertainties have grown exponentially since the amendment to the Gramm-Leach-Bliley (GLB) Act in relation to bank holding companies (BHCs) – whether simply the result of global trade and population growth or due to the financial crisis – said crisis highlighting the connectivity between the U.S. sovereign rating and corresponding financial institutions. That said, I believe that possible adverse effects to the public specific to complementary activities as proscribed in the GLB act have risen substantively. Furthermore, significant questions and issues specific to the stability and security of certain existing energy sources as well as demands specific to future energy sector capital investment and development remain – resolution having the ability to substantively alter the sourcing of global energy, in turn, altering supply flows, transit routes and demands specific to global protection and security²⁵.

²³ Arab Spring; Syrian Civil War; African violence and terrorism: Islamist militant groups from Nigeria to Somalia, including the Maghreb/Sahel region, portions of the North, West and Central Africa. As of 2011, the number of terrorist attacks remains dangerously high...having increased more than 500 percent from their low point of the past ten years. This region includes Algerian terrorists, Al-Qaeda in the Islamic Maghreb (AQIM), its roots tied to the Algerian Civil War, but having since become increasingly internationalized, with operations extending across the Sahel since formally merging with al-Qaeda in 2006; Boko Haram of Nigeria, the country's most potent security threat espousing a virulent anti-secular/anti-Western agenda; Al-Shabab of Somalia and Horn of Africa, officially affiliating with al-Qaeda in 2007; Mali's Ansar Dine, along with the Tuareg rebel group, MLNA, linked to the aftermath of the Libyan Civil War. (Sources: "Islamic Fundamentalism in Africa", Bodirsky, 08/31/12; Potomac Institute for Policy Studies: Special Update Report – Terrorism in North, West & Central Africa: From 9/11 to the Arab Spring (Professor Yonah Alexander – January 2012))

²⁴ The U.S. electric grid is a complex network of independently owned and operated power plants and transmission lines. Aging infrastructure, combined with a rise in domestic electricity consumption, has forced experts to critically examine the status and health of the nation's electrical systems.

<http://www.npr.org/templates/story/story.php?storyId=110997398>

²⁵ Russia: in the case of both Germany and Turkey, energy to fuel much of this growth has been provided by Russia with Europe reliant upon Russia for 40% of its natural gas, Germany importing more than a third of its oil and gas from Russia alone, roughly "half of Europe's" gas piped through Ukraine²⁵ and Turkey "one of the biggest importers of Russia gas"²⁵ (Source: add source from Israel paper)

Iran/Iraq: two of China's top crude suppliers in 2011 with the 2nd and 3rd largest reserves in the world, respectively²⁵ – China a critical trading partner to the US, largest holder of US debt, its exports nearly 11%²⁵ of US GDP; Iran – "the US leading efforts in reaching a landmark preliminary agreement with six world powers to halt its most sensitive nuclear operations"²⁵ with Israel "ordering its army to continue preparing for a possible military strike on Iran's nuclear facilities at a cost of at least \$2.89 billion this year, despite talks between Iran and the West"²⁵; and Iraq – estimated U.S. spending of roughly \$800 billion in relation to the Iraq war²⁵ and expressed, continued support to the government post troop withdrawal²⁵, a government currently in conflict with Iraqi Kurds over control to the country's vital economic resource, which, in turn, is impacting its relations with Turkey – bordering Iraq to the north, a major trading partner to Germany, 2nd only to Russia

Iraq and Iraq Kurdistan/Turkey: Iraq Kurdistan, a semi-autonomous region of northern Iraq bordering Turkey's southern border with more than five million people, one-fifth on the government payroll, or 70% of public spending in 2013, reliant on Baghdad for a portion of the OPEC producer's multi-billion dollar budget, so long as it cannot export oil in large volumes itself. Formally, Baghdad is supposed to give Kurdistan 17% of the national budget after sovereign expenses. How much is actually paid is being disputed, Iraq seeking to maintain control of oil exports (Iraq has the 2nd largest oil reserves and 7th largest natural gas reserves in the world), and the Kurds focused on autonomy via expended relations with oil majors and Turkey. Only a fraction of Iraq's energy transport pipeline capacity is currently being used given wars,

These alterations could clearly impact the nature and flow of global trade with its corresponding complex global supply chains that serve to support critical global industries and corresponding multinationals, many of which are based in the U.S. and often reliant upon global financial markets and access to capital to support continued and sustained growth – said capital clearly critical in growing the economy. Beyond the energy sector, there also remain substantive questions and resolution specific to ongoing financial regulatory reform, the outcome of which will not only impact the availability and cost of capital globally, but costs of energy given the capital intensive nature of oil and gas exploration and development – 65% and 85% of oil and gas reserves, respectively, currently in need of infrastructure improvements and/or investment. At a minimum, critical infrastructure investment requirements have been estimated at \$75 billion²⁶. Said total only reflective of Iran and Iraq (roughly 20% of discovered world oil reserves), with critical investment also needed in Algeria, Libya, Nigeria, and Venezuela. Furthermore, the International Energy Agency estimates that approximately \$11 trillion in new investments in oil and gas supplies will be needed in the 2008-2030 timeframe, averaging \$480 billion *per year* – nearly two-thirds of all TARP dollars, said dollars critical in solving for the global financial crisis, and nearly 10x ExxonMobil's record 2012 investment, or \$39.8 billion²⁷. That said, the world's largest credit facilities are but a small fraction of said total, necessitating global syndication and with certain commitments in said facilities often the largest commitments for many of the world's largest banks; China's onshore capital markets not yet open to foreign investment – its largest state-owned banks primary sources of capital to its oil and gas State-Owned Enterprises (SOE's); and critical European financial markets continuing to recover from ongoing fiscal challenges specific to certain EU member states²⁸. Critical capital to both maintain and expand existing supply sources to meet growing demands of a world population in excess of 7 billion people, nearly one-half with GDP/capita only a fraction of the most advanced countries, complicated by ongoing risks to security and violence, in turn, further exacerbating demands specific to investment – and clearly costs specific to demand and protection of existing supply sources so as to ensure ongoing stability and security. At a granular level, said growth reliant upon energy supply – future supply supported by ongoing capital investment also heavily reliant upon capital. Capital demands growing exponentially at the global level between and among global industry and

saboteurs and, since the 1990s, economic sanctions – a significant section of this infrastructure traveling from Baghdad, north to Kurdistan and across Turkey's eastern region of Anatolia to the Mediterranean – Turkey highly dependent upon said energy to fuel its economy, having recently signed a multi-billion dollar energy package with Iraqi Kurdistan under which the semi-autonomous region would export some 2 million bpd oil to world markets and at least 10 million cubic meters per year of gas to Turkey – said exports awaiting Iraqi consent. (Sources: "Baghdad money squeeze tests limits of Iraqi Kurdistan's autonomy", Reuters 3/17/14 <http://uk.reuters.com/article/2014/03/17/uk-kurds-iraq-idUKBREA2GOYX20140317>; "Iraq, Kurds, Turks and oil – A tortuous triangle", The Economist 12/22/12 <http://www.economist.com/news/middle-east-and-africa/21568760-governments-turkey-iraq-and-iraqi-kurdistan-play-dangerous-game>); "UPDATE 2-Kurdistan oil flow to Turkey begins, exports await Iraqi consent", Reuters 1/2/14, <http://www.reuters.com/article/2014/01/02/turkey-iraq-idUSL6N0KCOM220140102>)

U.S./Canada: Keystone Pipeline – The Keystone XL Pipeline is a proposed 1,179 mile, 36 inch diameter crude oil pipeline beginning in Hardisty, Alberta and extending south to Steel City, Nebraska. This pipeline is a critical infrastructure project for the energy security of the United States and for strengthening the American economy. Along with transporting crude oil from Canada, the Keystone XL pipeline will also support the significant growth of crude oil production in the United States from producers such as Texas, Oklahoma, Montana and North Dakota. This pipeline will allow American oil producers more access to the large refining markets found in the American Midwest and along the U.S. Gulf Coast. (Source: Keystone XL Pipeline September 2013)

²⁶ See Exhibit 1 for further granular details specific to said statistic.

²⁷ Source: Exxon Mobil <http://corporate.exxonmobil.com/en/energy/research-and-development/capital-investments/overview>

²⁸ See

<http://www.ft.com/intl/cms/s/0/d1c77460-c302-11e3-b6b5-00144feabdc0.html?ftcamp=crm/email/2014414/nbe/WorldNews/product> and

<http://www.ft.com/intl/cms/s/0/d84f40e8-c32e-11e3-b6b5-00144feabdc0.html?ftcamp=crm/email/2014414/nbe/WorldNews/product#axzz2ysyuKvjg> and

<http://www.ft.com/intl/cms/s/0/18a35d82-c3d9-11e3-870b-00144feabdc0.html?ftcamp=crm/email/2014414/nbe/WorldNews/product#axzz2ysyuKvjg> for further details specific to the EU and corresponding monetary policy.

business across the rating spectrum, including small-medium enterprise business (SME's), and individuals – consumer, auto, household – in relation to GDP/capita growth and often corresponding fragility²⁹.

Real challenges – correlated with real risk. Clearly, event risk that extends beyond traditional event risk – ironically, these new risks and uncertainties now highly correlated with said traditional risks – a function of globalization with increasing complexity specific to the forces which shape the global economy³⁰. Substantive demands specific to capital - BHCs critical components in both channeling and providing said capital coupled with broader geopolitical and economic risks and uncertainties. Accordingly, I believe that the original intent and purpose specific to the GLB amendment should first be reviewed in the context of said capital demands, risks, and uncertainties prior to addressing much of the more granular aspects specific to ownership and investment as outlined in the granular questions specific to Complementary Commodities Activities by BHCs.

I believe that the outcome of said review will impact shadow banking commodity investment flows, and future actions and/or reform in regards to said activities and investments as a function of corresponding shadow banking risk³¹. Liquidity flows and transactions specific to shadow banks –whether in the U.S. or other non-U.S. financial markets – are intertwined and interconnected with regulated financial institution liquidity flows and global regulatory reform. Said flows comingled together within global financial exchanges moving between and among the global financial markets – said markets a critical source of capital to the energy sector which serves to fuel the global economy.

Comments – Merchant Banking Authority

My comments, and corresponding concerns, specific to investments authorized under section 4(k)(4)(H) of the BHC act parallel those as reflected in my Complementary Authority comments above. Clearly, physical commodity investments whether made by the FHC directly for its own balance sheet or via direct investment in a nonfinancial company as part of a bona fide securities underwriting or merchant or investment banking activity is an investment – regardless of classification – and a use of capital by the FHC. This capital is critical for continued global economic growth, costs of said capital clearly at risk of rising in the future, in turn, placing demands on access – whether as a function of regulatory reform or simply changes in monetary policy and corresponding increases to interest rates, the Federal Fund rate at 0-0.25% and not expected to be increased until 2015. Aside from global demands specific to capital – FHCs a primary source of said capital to global business and industry, I believe that investment by FHCs in nonfinancial companies create additional risks given the correlation between FHCs and nonfinancial companies specific to non-physical commodity transactions which include, but are not limited to, treasury services, debt capital market issuance, mergers and acquisition advisory services, as examples. Furthermore, FHCs often provide critical capital commitments to said institutions via working capital and project financing facilities – many of these credit

²⁹ See

<http://www.ft.com/intl/cms/s/0/f17478b0-c183-11e3-97b2-00144feabdc0.html?ftcamp=crm/email/2014414/nbe/WorldNews/product&siteedition=uk#axzz2ysyuKvjg> and <http://www.ft.com/intl/cms/s/0/34cbc548-b8b3-11e3-835e-00144feabdc0.html?ftcamp=crm/email/2014414/nbe/WorldNews/product#axzz2ysyuKvjg> for additional details.

³⁰ There is considerable ongoing debate about whether the financial crisis and recession amplified changes already afoot in the economy, accelerated them, or simply revealed them more clearly. Whatever one's view on that question, the confluence of some apparently secular trends raises important questions about our nation's future growth potential and our ability to provide opportunity for all of our people. Indeed, these changes reflect serious challenges not only to the functioning of the American economy over the coming decades, but also to some of the ideals that undergird the nation's democratic heritage. (Source: "Longer Term Challenges for the American Economy", Speech: Governor Daniel K. Tarullo, Board of Governors of the Federal Reserve System 4/9/14)

³¹ See <http://www.federalreserve.gov/newsevents/speech/warsh20070305a.htm> for additional details specific to liquidity.

facility commitments often multi-year commitments and of substantive amount, enabling for access to non-public information by FHCs in the analysis and review process specific to said commitments, often necessitating coordination between and among numerous FHC departments in relation to breadth and depth of services provided to said nonfinancial company. Accordingly, I believe that investments in nonfinancial companies by FHCs can serve to introduce additional risks to the market – whether directly or indirectly – and that mitigating said risks across the market takes precedence. This risk mitigation can, in turn, serve to alleviate demands specific to bank capital requirements in relation to stress tests knowing that said stress tests are based on systemic market risk scenarios. This, in turn, can have broad benefit to the global economy and increase the potential of capital access expansion – said expansion serving to offset risks of reduced capital access in a rising interest rate environment with core aspects of regulatory reform uncertain and/or in progress.

That said, I believe that in reviewing risks specific to investment by FHCs in relation to nonfinancial companies that it is important to be mindful of the importance said FHCs serve in regards to advisory services specific to mergers, acquisitions, and divestitures – said advisory services which can clearly be critical in advancing not only the global economy but, more granularly, those businesses, industries and sectors involved in the physical commodity business directly. Furthermore, I believe that FHCs can also serve a critical role in furthering the development specific to global financial markets given the lack of developed and/or stalled financial markets in many of those countries which contain the world's largest oil and gas reserves in relation to said countries' nationalized energy sectors and corresponding infrastructure and investment demands. I believe that the cumulative impact of active advisory engagement in the energy sector and financial market development in developing countries by FHCs at a time of substantive change and uncertainty within the energy sector as well as growth and increasing connectivity between and among global financial markets can have exponential benefit to the global economy, in turn, serving to mitigate event risk – said risk an important element of the U.S. sovereign rating.

Financial markets, energy, and growth clearly intertwined within the global economy – demands for capital, security, protection within this global economy clearly intertwined, as well.

Thank you for the opportunity to present my comment.

Best regards,

Cathy Santoro

APPENDIX

Federal Reserve System

Docket No. R-1479, RIN 7100 AE-10 (Complimentary Activities, Merchant Banking Activities, and Other Activities of Financial Holding Companies related to Physical Commodities: April 15, 2014 - Appendix

prepared by: Cathy Santoro
date of submission: April 15, 2014

I believe that commodities specific to energy are central to the growth of a nation and its people. Harnessing energy – whether wind, millennia ago as the Silk Road (618-907 CE)¹ moved from land to water so that goods reached distant shores in less time, or oil and gas today, moving through vast pipelines, stretching across much of those same lands in which Silk Road caravans traveled via camel and on foot so as to fuel the modes of transportation (air, rail, road, water) and get goods to market quicker – the distance traveled in miles is the same, the time required to traverse said distance lessened through the harnessing of energy.

It is this collective harnessing of energy² which has served to advance the globe, enabling countries to evolve and grow from agrarian roots, roots no different than those found along the Silk Road and in the land of the Fertile Crescent, to the global economies of today³, the U.S. the world's largest GDP in excess of \$16 trillion⁴ and a GDP/capita of \$52,800⁵ - the European Union, the world's largest trading partner and 2nd largest GDP in the world at \$15.5 trillion⁶. This same energy source fueling developing nations, as well – China now the 2nd largest GDP in the world, the origins of its exponential growth only started in the early 1990's⁷, China's GDP/capita, only a fraction of that of the U.S. at \$9,800⁸, continues to increase exponentially, as well⁹ - in both instances, growth fueled by trade¹⁰,

¹ The Silk Road was, in fact, not a single roadway but a vast network of interconnecting routes that linked the East and West for nearly two millennia. Although silk was indeed conveyed to western markets via the Silk Road, it was hardly the only commodity transported along the thoroughfares. All manner of precious goods were likewise carried by Silk Road caravans – from the ancient Chinese city of Xi'an, across Central Asia, stopping at Turfan, Samarkand, and Baghdad – en route to Istanbul. [Source: [Traveling the Silk Road, Ancient Pathway to the Modern World](#), The American Museum of Natural History]

² Nonrenewable: oil (petroleum), natural gas, coal, uranium (nuclear); Renewable: biomass, geothermal, hydropower, solar, wind

³ The mid 1980's marked a period of expansive growth in both the U.S. and Japan. On the European continent, this period marked pivotal geopolitical shifts, which gave rise to the fall of Berlin Wall in 1989 and corresponding reunification of Germany, dissolution of the Soviet Union and end to the cold war by 1991. China, meanwhile, despite significant year over year percentage GDP growth during this period had recorded GDP in 1990 that was less than 6% of U.S. GDP at that time and less than 4% of China's 2013 GDP. In addition, at that time, the number of ports in China that were the world's largest equated to zero. Today China is home to 7 of the 10³ largest container ports in the world. This shifting geopolitical framework has had significant correlating effects on the global economy and geopolitical alliances. Both the expansion of the EEC to the EU as well as NAFTA were finalized in 1993, expanding the reach and interconnectivity between and among respective EU countries on the European continent and Mexico, Canada and the U.S. on the North American continent, respectively. (Source: HSBC Global Research) Specific to Asia, In 2011, Asia's largest trading partners were within region, a region that is comprised of many rapidly advancing developing countries (India, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand), the world's largest ports (Shanghai, Hong Kong, Shenzhen) and strategically important waterways (South China Seas, Strait of Malacca). Over one-half, or 52.8%, of the Middle East's merchandise trade was with Asia; and Africa's trade with Asia was nearly one-third greater than that of its trade with North America (24.5% (Asia) versus 17.1%). (Sources: HSBC Global Research, WTO International Trade Statistics: 2012)

⁴ CIA World Factbook

⁵ Ibid.

⁶ Sources: Understanding the European Union, McCormick; CIA World Factbook

⁷ China's share of world trade rose from an insignificant 1% of the total in 1980 to 9% today, with five of the ten biggest ports in the world (Source: "The Southern Silk Road – HSBC Global Research 6/6/11)

⁸ CIA World Factbook

⁹ China's GDP/capita is increasing at an exponential rate in relation to that which was experienced in the U.S. when U.S. GDP/capita was at similar levels in the 19th and early 20th centuries – enjoying increases in living standards every decade which took the U.S. between 30 and 50 years to achieve. (Source: "The Southern Silk Road – HSBC Global Research 6/6/11)

¹⁰ China's share of world exports is now 10% and calculated by the IMF to rise to "17% by 2020". Furthermore, a significant percentage of China's trade is with developing nations. In 2011, Asia's largest trading partners were within region, a region that is comprised of many rapidly advancing developing countries (India, Indonesia, Korea, Malaysia, Philippines, Singapore Thailand), the world's largest ports (Shanghai, Hong

trade fueled by energy. Specific to Russia – its energy sources, some of the largest in the world¹¹, critical in both fueling said growth in developing and developed nations¹² - its energy sector related ties with China continuing to expand¹³, as well as growth in its own economy given Russia's substantive reliance on its energy sector for GDP growth¹⁴.

That said, this non-linear demand for energy¹⁵ which has served to fuel said growth is only expected to grow in a non-linear fashion given that nearly ½ of the world's population has GDP/capita only a fraction of that of the most advanced nations¹⁶ with many nations of the world still largely agrarian, without significant installed generating capacity and/or infrastructure¹⁷, lacking in diversification and reliant upon its natural resource comparative advantages to sustain its GDP¹⁸. This, in turn, highlights challenges specific to not only the sourcing and transport of energy supply in relation to demand but also the need for protection and stability of said energy sources, the interconnectivity of these complex elements in relation to global financial markets, geopolitics¹⁹, and event risk²⁰ -

Kong, Shenzhen) and strategically important waterways (South China Seas, Strait of Malacca). Over one-half, or 52.8%, of the Middle East's merchandise trade was with Asia; and Africa's trade with Asia was nearly one-third greater (24.5% (Asia) versus 17.1% (North America)) than that of its trade with North America. [Source: WTO-International Trade Statistics 2012]. Additional linkages incorporate infrastructure related financing via China policy banks, Exim Bank and China Development Bank (CDB) often through its investment vehicle: the China-Africa Investment Fund (source: Standard Chartered Research 4/1/2011) as well as China's investment in and control of Pakistan's strategic Gwadar port (sources: HSBC Global Economics 6/6/11 and AP 2/18/13). Specific to Africa, China's increasing trade with many countries in Africa is highly correlated with its growing commodity demands, supported by the commodity rich resources of many countries of Africa (see: "Sale to a consortium led by MMG underscores the country's continued demand for commodities to feed industrial growth"

Read the full article at: <http://on.ft.com/1exSoiM>) – a continent of 1 billion in 2010, which depending upon fertility rate assumptions applied, could account for more than a quarter of the world population versus only "one-tenth in 1970", a significant proportion located squarely within or adjacent to some of the most volatile regions of the continent. (See "The dividend is delayed", The Economist 3/8/14 for further details).

¹¹ World's largest discovered gas reserves in the world; 8th largest oil reserves (Source: U.S. Energy Information Administration (EIA))

¹² Europe reliant upon Russia for 40% of its natural gas, Germany importing more than a third of its oil and gas from Russia alone, roughly half of Europe's gas piped through Ukraine and Turkey one of the biggest importers of Russia gas (Source: 4 reasons Russia will keep gas flowing", CNNMoney 3/12/14

<http://money.cnn.com/2014/03/12/news/economy/russia-gas-threat/index.html>)

¹³ China: Russia's top natural gas producer Gazprom plans to start supplying China with 38 billion cubic meters of gas per year - around a quarter of Russia's exports to Europe - in 2018. Dvorkovich also said Russia and China plan to boost cooperation in oil and oil products, as well as in coal and power supplies. Russia's top oil company Rosneft aims to triple oil supplies to China from the more than 300,000 barrels per day it sent last year. (Source: "Russia, China aim to finish gas talks before Putin's May visit: media

<http://www.reuters.com/article/idUSBREA3D0R220140414>)

¹⁴ Russia remains highly dependent on its natural resources. Oil and gas now account for nearly 70% of total goods exports, and the structure of exports has narrowed since the mid-1990s during which time mineral fuels accounted for around 45% of its exports in nominal terms. Oil and gas revenues also contribute around half of the federal budget – oil accounting for more than 55% of Russia's goods exports, natural gas accounting for around 12%. Specific to employment, the picture is similar with roughly 10% of its workforce employed in manufacturing sectors not directly related to oil, gas or other natural resources – this share declining almost universally between 2002 and 2010, with the exception of the Kaliningrad Region. (Source: "Diversifying Russia", European Bank for Reconstruction and Development

¹⁵ China is the second-largest net importer of crude oil and petroleum products, a net oil exporter as recent as the 1990s (Source: U.S. Energy Information Administration: China (2/4/14)

¹⁶ China/India: ~one-third of humanity, GDP/capita \$9800/\$4000, respectively; Nigeria: 177 million people-largest in Africa, 3rd largest economy in Africa, GDP/capita \$2800. (Sources: CIA World Factbook, "Africa's Largest Economies-Top 20 Economies in Africa", www.therichest.com)

¹⁷ See: Rankings from the World Economic Forum show Brazil as lagging far behind the Brics countries on almost every aspect of infrastructure – the subject of a beyondbrics Chart of the Week. Read the full article at: <http://on.ft.com/17hdL10>; ETFs have become the "weapon of choice" for investors in emerging markets according to Emerging Global Advisors which has recently launched the first India infrastructure ETF. Read the full article at: <http://www.ft.com/cms/s/0/f7399206-aa0a-11df-8eb1-00144feabdc0.html>; Airports, roads and railways may be the most visible elements of emerging market infrastructure investment. But they are all dwarfed by spending on electricity generation and transmission. Read the full article at: <http://on.ft.com/oo0lxP> for further details.

¹⁸ Algeria: 2% of world's gas reserves; 70% of government budget revenue, 98% of export earnings; Nigeria: 96% of government revenues (\$79/barrel price); Libya: 96% of total govt revenue; 98% of total exports - 79% of 98% pertain to crude oil (Source: U.S. Energy Information Administration)

¹⁹ Energy security is leading to a realignment of political linkages around the world. The Shanghai Cooperation Organization is one such example-its key members China, Russia, India, the Central Asian Republics of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan with India, Iran, Mongolia, and Pakistan having observer status. Examples of China specific energy investments in the region include its 2011 \$2.5 billion investment in Iran's South Azadegan oilfield, which follows on from its \$1.76 billion 2009 deal between China National Petroleum Company (CNPC) and the National Iranian Oil Company (NIOC) to develop the North Azadegan field, as well as Sinopec's (another key Chinese oil

the collective forces intertwined between and among nations and its people – forces often at the root of crisis (Suez Crisis of 1956²¹, Energy Crisis of the 1970's²², Gulf War of the 1980's²³), often having far-reaching fiscal impact depending upon severity of said crisis²⁴, in turn, serving to shift global geopolitics, priorities and alliances.

Unlike the fluidity of events, the location of much of the world's largest energy supply sources, and corresponding transit routes required for said supply to reach demand destinations, is fixed – its location part of the land itself – said routes providing critical linkages, the importance of these linkages clearly underscored in times of conflict²⁵. Seven out of ten of the world's largest oil reserves are located in Africa and the Middle East – six out of ten natural gas reserves are located in this same region – collectively 85% and 65% of global oil and gas reserves, respectively²⁶, countries that are highly dependent upon oil and gas revenues with limited diversification beyond the energy sector²⁷. A region with a population in excess of that of the entire European Union, yet a GDP/capita in many countries of said

player) development of the neighboring Yadavaran field, a 60% stake in Aktobemunai-gas in Kazakhstan and a substantial stake in the Greater Nile Petroleum Operating Company (GNPOC) in Sudan. [Source: HSBC Global Research-The Southern Silk Road June 2011].

²⁰ See Exhibit 1 for further details specific to event risk.

²¹ July 26, 1956: President Nasser announces that Egypt is nationalizing the Suez Canal Company (part of Egypt's sovereign territory and one of the most important maritime routes in the world, accounting for the passage of two-thirds of Western Europe's oil imports – mainly British owned at that time) and would use the canal's toll revenues to finance the construction of the Aswan Dam (an ambitious public works project, planned by the Egyptian government, designed to regulate the Nile's flow and thus increase agricultural yield and produce hydroelectric power, thereby raising the living standards of the Egyptian people, the vast majority of whom lived in grinding poverty). Immediately prior to his address, the U.S. had withdrawn its offer to finance the Aswan Dam project – yet, prior to that decision, Nasser had purchased weapons from the Soviet Bloc and retreated on the implicit understanding specific to the peace settlement talks, thereby bringing an end to the mission. The net impact of the foregoing resulted in the Suez Crisis of 1956, which included Britain, France and Israel attacking Egypt in response to Nasser's nationalization and closure of the Suez Canal. The U.S. government, having received no prior notice of this plan, strongly opposed the action, which led to Eisenhower's refusal "to send oil from the Western Hemisphere to Europe until the attack on Egypt ended and his threat to support UN economic sanctions against Israel unless it withdrew its forces from Egypt. Ultimately, these measures were successful – the attack on Egypt ended and Nasser's regime saved. However, as part of the negotiations, Israel gained important concessions in return, including "a termination of an Egyptian blockade against Israeli shipping through the Strait of Tiran [and] an end to cross-border raids into Israeli territory from the Gaza Strip" – concessions which will help to explain the causes of the Six-Day War, occurring nearly 10 years after the Suez Crisis and one which "dramatically altered the political and strategic landscape of the Middle East. (Source: United States and the Middle East: 1914 to 9/11; Professor Salim Yaqub (p. 115, 159)

²² Arab oil embargo of 1973-74: Several oil-producing states deliberately reduced the amount of oil that they would export to all of their buyers and cutoff oil shipments to the US and Western Europe leading to enormous disruptions throughout the entire industrialized world given the dependency on oil for virtually all other economic activity. This led to a drastic increase in the price of oil that remained on the market, other commodities becoming scarce, and concerns in regards to OPEC's (Organization of Petroleum Exporting Countries) increasing influence over the price of oil, with the US, for the first time, a net importer of oil. (Source: United States and the Middle East: 1914 to 9/11; Professor Salim Yaqub (p.238-40)

²³ The Gulf War grew out of the Iran-Iraq War, which ended in 1988 – tensions arising between Iraq and Kuwait thereafter. Despite U.S. urging against force, Iraqi troops invaded Kuwait in 1990, quickly occupying the country and forcing the Kuwaiti ruling family into exile. U.S. troops doubled in the region; and the UN Security Council passed a resolution demanding Iraq withdrawal – said resolution not adhered to by Iraq and the first phase of Operation Desert Storm (air attack) launched in January 1991, the ground war launched on February 23, 1991. 100 hours later – on February 27 – Bush announced the liberation of Kuwait. (Source: United States and the Middle East: 1914 to 9/11; Professor Salim Yaqub (p.24-25)

²⁴ Iraq – estimated U.S. spending of roughly \$800 billion in relation to the Iraq war (~94% of funds are for DOD (Department of Defense), 5% for foreign aid programs and diplomatic operations and 1% for medical care for veterans; State/USAID funding slated to grow for foreign aid programs post troop withdrawal. (Source: "The Cost of Iraq, Afghanistan, and Other Global War on Terror Operations Since 9/11", Congressional Research Service 3/29/11-Amy Belasco, <http://www.fas.org/sqp/crs/natsec/RL33110.pdf>)

²⁵ Except for a brief period in 1943, the Allies did not want Turkey to enter the war – entering the war on the side of the Allies would necessitate having to defend Turkey if attacked by Germany, while, on the other hand, joining with Germany would close the Turkish straits and cut off Russia from the Mediterranean Sea. At the same time, to ensure that territory and resources of the Middle East would remain available to US and its Allies, the US occupied Iran and used it as a corridor – the so-called *Persian Corridor* – for transporting war material from the Persian Gulf to the Soviet Union. (Source: United States and the Middle East: 1914 to 9/11; Professor Salim Yaqub (p.24-25)

²⁶ Data sources specific to said calculations: CIA World Factbook

²⁷ These dependencies on oil and gas from the region have had varied impacts on countries within the region that are the source of said supply, the "poverty paradoxes"²⁷ of Algeria despite being an oil-rich energy provider²⁷ at one extreme and Qatar, at GDP/capita of \$102,100 – the highest in the world, nearly 2x greater than that of the U.S., at the other extreme. Paradoxically, oil and natural gas revenues, despite having increased the nominal wealth of an oil-exporting nation, are no guarantee that it will enter a new period of prosperity. (Source: "The Petroleum and Poverty Paradox: Assessing U.S. and International Community Efforts to Fight the Resource Curse (Committee on Foreign Relations: United States Senate 10/16/08)

region a fraction of that of the U.S., upwards of 70% of people under the age of 30 in certain countries, a significant percentage of said youth unemployed²⁸ - and fertility rates in many instances well in excess of global averages²⁹, serving to exacerbate existing socio-economic demands on the respective economies and lead to a continuation of the "poverty paradox"³⁰. A region marked by both past and current conflict³¹, extremism and violence - post September 11, 97% of declared U.S. Department of State Foreign Terrorist Organizations located in this region³², in turn, giving rise to fluidity that is not fixed to the land itself – a fluidity of conflict.

Collectively, this conflict serves to not only impact the continued flow of the vital oil and gas resources contained within the region³³, increasing internal risk of both continued access to existing resources as well as exploration and development of untapped resources critical to GDP growth and stability, but necessitate significant resources specific to global defense and security so as to mitigate risk of supply disruption, much like was the case in conflicts of past and recent history, as energy resources within the region are transported through the fluid waters of the world's most heavily transited water routes, nearly ½ of which are located in this region, directly adjacent to its borders, tankers moving through said maritime routes carrying a majority of the world's energy resources³⁴.

It is important to be mindful that moving through these water corridors and channels at the same time is also a significant percentage of world trade – growing exponentially with China comprising nearly one-third of regional trade flows in merchandise exports³⁵. Clearly interconnected and highly correlated – energy, growth, and event risk. A function of trade and strategic alliances, technology and innovation, supply and demand – said demand increasing exponentially with the world's population now in excess of 7 billion people, more than one-third living in nations with GDP/capita of less than \$10,000, future growth supported by the global financial markets via corresponding supply of capital. Access to capital a function of regulatory reform³⁶, monetary policy a function of a nation's economy, impacted by fiscal policy – these complex and intertwined forces collectively giving rise to growth, strength, diversification – demonstrated through increasing demands for energy – and visible in said nation's sovereign rating. (see Chart 1)

²⁸ Algeria: believe[d] to be as high as 25% within its labor force of roughly 10 million people out of a total population of 37 million people. (Source: U.S. Energy Information Administration – Algeria (05/20/13))

²⁹ Recent census and survey data suggest that African fertility is falling more slowly than the UN had expected in 2010, when it produced its regular worldwide population survey. Since then, 17 African countries with half the continent's population have reported fertility rates higher than the UN had estimated. Only ten, with 14% of the population, came in lower. Certain of these, most all landlocked and low rates of urbanization, have fertility rates not so different from the 1960s, with Niger, at 7.5, the highest fertility rate in the world. (Source: "The dividend is delayed", The Economist 3/8/14).

³⁰ Source: "The Petroleum and Poverty Paradox: Assessing U.S. and International Community Efforts to Fight the Resource Curse (Committee on Foreign Relations: United States Senate 10/16/08)

³¹ Arab-Israeli War of 1967, Yom Kippur War, Algerian Civil War, Iranian Hostage Crisis, Gulf War, Palestinian Intifadas, War in Iraq/Afghanistan, Arab Spring, Lebanon Civil War, Syrian Civil War, Iran's nuclear weapon crisis

³² See Exhibit 1 for further details specific to Threats Due to Violence/Instability.

³³ New production in Algeria has stalled with a host of new projects planned to come on line, repeatedly delayed. Algeria's failure to effectively use its hydrocarbon revenues for this necessary development parallels that of its Sahel neighbor, Nigeria. In the case of Nigeria, similar failure caused it to lose its lock on production leadership in the region, roiled global oil markets and rendered Nigeria unable to realize the full value of its resources. Attacks by militant groups compounded the issues, resulting in shut-in production, stolen oil, and oil and gas lost – removing as much as 1 million barrels of production at various points in time. Algeria is facing similar risks today, given the security concerns about militant groups across remote areas in the Sahel, which are presenting considerable downside risks to investors interested in investing in Algeria's hydrocarbon sector. See Exhibit 1 for further details. (Source: U.S. Energy Information Administration).

³⁴ Strait of Hormuz: southeastern coast of Iran, an important route for oil exports from Iran and other Persian Gulf countries: only 21 miles wide at its narrowest point yet an estimated 17 million bbd of oil flowed through it in 2011, 35% of all seaborne traded oil and 20% of oil traded worldwide, and ~ 2 trillion of LNG via Qatar's exports, almost 20% of global LNG trade) [Source: U.S. EIA World Oil Transit Chokepoints 8/22/12]

³⁵ See Endnote 10;

³⁶ Liquidity clearly a root element in the financial crisis – exponential global liquidity flows between and among global financial markets, channeled through global financial exchanges, giving rise to the financial crisis; need for liquidity clearly an element in policy response specific to said global financial crisis (TARP); and managing risk specific to liquidity imbalances a core element of ongoing regulatory reform – said liquidity risk, management and policies a continued emphasis and focus of the global financial markets. See http://libertystreeteconomics.newyorkfed.org/2014/04/liquidity-risk-liquidity-management-and-liquidity-policies.html#_U0xhQHko8dU for further details.)

These demands for energy vary from nation to nation, both in absolute levels as well as in form (renewables, nonrenewables) – the diversification and complexity of its economy, coupled with its absolute size and GDP/capita, impacting both the form and composition of energy source demanded in relation to corresponding use. That said, it is important to be mindful of nations' form and level of installed electrical capacity given the significant level of energy demanded for the generation of said electricity³⁷ – both in terms of demand/supply imbalances, highly pronounced in large and developing nations³⁸, as well as concerns specific to climate change and the impact certain forms of installed capacity have in relation to said concerns. Specific to installed capacity, it is important to note that despite certain energy rich resource nations being more readily able to rely on said resource in meeting its electricity demands, many of these countries have significant needs in regards to installed capacity despite said resource, compounded by their growing populations and aging energy sector infrastructure. Clearly, as the global economy grows, supported by increasingly global interconnected trade routes and complex global supply chains, additional installed capacity becomes a necessary and critical focus, especially in those countries with GDP/capita only a fraction of that of the most advanced economies, collectively comprising over one-third of the world's population.

Specific to petroleum demands, it is important to be mindful of the clear and direct correlation between rising GDP/capita and transportation travel and use (industry, personal and leisure³⁹) in relation to current levels, increasingly complex and interconnected global supply chains and trade linkages⁴⁰ and projected global population and GDP growth - the cumulative impact underscoring the importance of a continued focus on climate change impact, alternative forms of fuel and, continued need for defense and protection so as to mitigate risks of disruption and oil price volatility. It is also important to be mindful of the increasing advancements and adoption of technology globally as well as the exponential technology gap which currently exists between and among the most advanced and least developed nations⁴¹, future demands specific to electricity and level of installed capacity compounded by the sheer population size of many of the least developed nations, their current rates of adoption and level of installed capacity currently available. Clearly, said technological growth will clearly add to existing pressures on the sourcing of energy.

As important to said sourcing, though, is ensuring stability of the vital and continued flow of energy globally, the majority of which continues to transit through certain specific maritime routes located in one of the most volatile regions of the world⁴². Clearly, the cumulative impact of the foregoing places substantive pressures on not only the

³⁷ Chart 2 contains more granular detail specific to electricity generation for the U.S.

³⁸ See "India's electricity problems – An area of darkness", The Economist 8/4/12 <http://www.economist.com/node/21559977> for further details. Venezuela: electricity: 72% hydro (consumption expanded 2x > installed capacity; drought in 2009-2010 led to "electricity emergency"), generation ~50% than in 2008 due to demand-reduction policies as function of lack of installed capacity [Source: U.S. EIA]

³⁹ Air travel: The emerging world is projected to enjoy annual growth in revenue per kilometer of 6.1% whereas the maturing regions – the developed world – projected to experience annual growth of only 3.7%. (Source: "The Southern Silk Road" - HSBC Global Research 6/6/11).

Auto – For many emerging nations, car ownership is incredibly low relative to the developed world, reflecting a low level of income, in many cases, a lack of reasonable access to credit and the absence of a satisfactory network of roads. As incomes rise, this will surely change – China currently transitioning to a mass automobile culture at an extraordinary rate and on an unprecedented scale, car sales increasing 46% from 2009-2010, 17 million vehicles sold versus 11.5 million in the US, China's automobile industry designated as one of the "core pillars of growth. Only 10 years ago US sales totaled 17.3 million while only 1.9 million were sold in China – at that time, China a net exporter of oil and GDP/capita roughly ½ of current value, or \$4000/person. (Sources: "The Southern Silk Road" - HSBC Global Research 6/6/11; [The Quest for Oil](#), Yergin)

⁴⁰ Global freight emissions are growing rapidly as a result of increased demands for goods and services. In the United States alone, emissions from freight are project to increase 74% from 2005 to 2035. China is expected to increase its use of freight transportation fuels by more than 320% from 2008 to 2035. (Source: "Smart Moves: Creative Supply Chain Strategies Are Cutting Transportation Costs and Emissions", Environmental Defense Fund)

⁴¹ Internet use in portions of North and Central Africa, areas containing the Maghreb and Sahel regions, comprise only a fraction of that in developed and BRIC countries (~10% versus 70%); furthermore, specific to China and India, despite having a significant number of absolute Internet users, China's total greater than that of the U.S. (389 million versus 245 million), India roughly 60% that of Japan (61 million versus 99 million) said figures reflective of their population base, both in excess of 1 trillion. However, in both instances, % Internet use in relation to total population comprises ~21% and 5% of said population bases, respectively, versus ~ ¼ for that of the U.S. (Source: CIA World Factbook)

⁴² Strait of Hormuz, Suez Canal, Bab el-Mandab (between the Horn of Africa and the Middle East, connecting the Red Sea with the Gulf of Aden and the Arabian Sea) – collectively volume ~24 million bbl/d, or ~30% of total world oil production (2011: 87 million bbl/d) [Source: "World Oil Transit Chokepoints", U.S. EIA 8/22/12]

depth of defense required to protect said routes, a function of the sheer magnitude of energy resources flowing through said corridors, but the global breadth, a function of exponential growth in global trade and linkages, evidenced by China's role as the largest exporter of globally traded goods, home to 5 of the 10 largest ports in the world and now one of the world's largest energy importers (all within the last twenty years) – but with a GDP/capita less than one-fifth that of the U.S., at \$9,800 and its first aircraft carrier only placed in service two years ago despite the Strait of Malacca and Taiwan Straits one of the most transited trade routes in the world today.

To add context to U.S. specific complexities in regards to defense, it is important to note that the U.S. GDP is the largest in the world today at ~\$16 trillion⁴³, its GDP/capita one of the highest of all advanced economies at \$52,800⁴⁴, one of the largest trading partners to the majority of global countries⁴⁵, and home to some of the world's largest corporations with the largest and most complex global supply chains in the world. Said global trade and global supply chains dependent upon energy – energy that is largely currently sourced from countries in North Africa and the Middle East, a region marked by decades of past and current conflict and compounded by growing violence and terrorism. This, in turn, serving to exacerbate costs of protection specific to regional stability given said global linkages and reach, stability clearly critical to both the continued flow of energy and global GDP growth –the U.S. considered a global protector to not only its allies and trading partners but to countries within the energy rich region, as well⁴⁶. Interconnected within these elements are the U.S. financial markets – the world's largest global financial market, a critical source of liquidity and capital to not only the global economy but, specifically, the U.S. government, home to many the world's largest global financial institutions – said institutions considered systemically important financial institutions and often a major source of capital to the energy sector in which the U.S. serves to protect and

⁴³ CIA World Factbook

⁴⁴ Ibid.

⁴⁵ The world's biggest trader in merchandise, with imports and exports totaling US\$3.746 billion⁴⁵ in 2011. (Source: World Trade Organization (WTO): International Trade Statistics 2012)

⁴⁶ China – With China having only recently embarked on its development of a modern military, its leaders routinely emphasizing the goal of reaching critical benchmarks by 2030, viewing a modern military a critical preventative deterrent, it continues to see the US as the dominant regional and global actor and stable relations essential to its stability and development – development which is increasingly dependent upon imported energy to sustain its growth. China first aircraft carrier, Liaoning, was commissioned and entered service with the PLA Navy on September 25, 2012. Force modernization is a priority as China seeks to protect energy investments in Central Asia, specifically the security situation in the Taiwan Strait as well as risk of piracy in the Gulf of Aden given China's maritime dependency on either the Strait of Malacca or the Strait of Hormuz, for the sheer volume of oil and liquefied natural gas that is imported to China from the Middle East and Africa. (Source: "Military and Security Developments Involving the People's Republic of China 2013: Annual Report to Congress, Office of the Secretary of Defense). Continued territorial disagreements by countries bordering the South China Sea, including ownership of the Spratly and Paracel Islands, have hindered efforts for joint exploration of hydrocarbon resources in the area. ASEAN members signed the Declaration of Conduct in 2002 that encourages countries to use restraint and cooperate in the South China Sea, but no regulations were established. China stakes claims to the SCS using a "nine-dash line" to determine each country's maritime borders and resources. Increasing appetites for oil and natural gas have exacerbated tensions, particularly between China and Vietnam and between China and the Philippines, as hydrocarbon development has attracted interest in deep water areas. China has increased its naval activity in the contested areas, and CNOOC's June 2012 tender for nine offshore blocks in the disputed area overlaps several fields located within Vietnam's 200-nautical mile exclusive economic zone. (Source: U.S. EIA – China)

Israel - To date the United States has provided Israel \$118 billion (current, or non-inflation adjusted dollars) in bilateral assistance. Almost all U.S. bilateral aid in the form of military assistance, although in the past Israel also received significant economic assistance. The US having spent more on both global military defense and foreign aid, as a percentage of global GDP, than its allies, Israel the largest cumulative recipient of U.S. foreign assistance since World War II, with defense cooperation evolving to include the co-development of several systems designed to thwart a diverse range of threats, from short-range missiles and rockets fired by non-state groups to middle and long-range ballistic missiles in Syria and Iran. (Sources: "CRS Reports for Congress: U.S. Foreign Aid to Israel", Congressional Research Office 1/2/08, 4/11/13-Jeremy Sharp,

<http://fpc.state.gov/documents/organization/100102.pdf>); Egypt - Egypt receives about a quarter of all U.S. foreign military aid, accounting for a third of Egypt's overall defense budget, and pays for 80% of its new weapon systems. (Source:

<http://economy.money.cnn.com/2013/08/20/where-u-s-aid-to-egypt-goes>)

defend so as to mitigate event risk and geopolitical turmoil, event risk and geopolitical turmoil both factors in a sovereign rating. (see Chart 2: U.S. sources and uses of energy).

Given the linkages between energy, global growth, and geopolitical event risk, I believe that it is important to be mindful of the granular flow of energy from sourcing to generation and use – the cumulative impact serving as a continuous thread that serves to link the world's goods and services – threads with ever increasing interconnections, linkages and dependencies given the depth and breadth of the world's largest and complex global supply chains. Said goods and services ultimately transformed at the time of payment (point of conversion) to an alternative flow – facilitated by currency (ACH, credit, wire, check, cash), one of its primary purposes that as a medium of exchange – said flows of currency ultimately transported into the global flow of funds within the global financial markets in which currency is transformed yet again serving as a unit or reserve store of value, the U.S. dollar the world's largest global reserve currency and the price of oil pegged to the dollar. (see Chart 3: illustrative example)

It is within this post conversion flow of funds in which currency is issued, traded and transferred – financial institutions serving as intermediaries in linking demand and supply of capital – capital that is critical to global trade, energy sector infrastructure, and global growth. Currency flowing between and among financial markets, connected via global financial exchanges and bank accounts with cellular phones an increasing element of said transaction process. Flowing in overlapping channels and corridors – to those serving to spread risk and conflict, violence and terrorism, as well as to those serving to defend and protect against said risk. The supply and demand of energy intertwined and interconnected – defined, often finite sources of supply, in relation to increasingly global and complex demand growth; multiple transformations of energy – aided by technology, communications, and financial markets. An increasing need to measure, monitor, and track said flows of energy and corresponding transformations – information and data underlying these various, interconnected flows clearly critical; and a corresponding need for protection and defense of the continued flow of energy. Complexities – clearly compounded by the depth and breadth of global trade and supply chains, growing global financial markets and exchanges, alliances-both old and new, the global economy – at its root, the global population. (see Chart 4)

APPENDIX

Chart 1

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