Oil Transportation in the Global Landscape:
The Murmansk Oil Terminal and Pipeline Proposal Evaluated

by

Ankur Roy
B.S., Accountancy
University of Illinois, Urbana-Champaign, 1999

Submitted to the Engineering Systems Division
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Signature of Author____________________
Engineering Systems Division
May 9th, 2003

Certified by____________________
James Masters
Director, MLOG Program
Thesis Supervisor

Accepted by ____________________
Yossi Sheffi
Professor of Civil & Environmental Engineering
Professor of Engineering Systems
Co-Director, Center for Transportation and Logistics

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ABSTRACT

Oil and transportation have been commingled since the first oil reserves were discovered. The importance of energy, namely oil, and the transportation of that energy from the producers to the consumers is persistently monitored and evaluated. Oil producers often seek novel transportation channels to increase oil production, thereby increasing revenues. Oil consumers seek unique transportation nodes to reduce their reliance on a single set of producers while potentially reducing prices. An example of the transportation interplay between global producers and consumers is highlighted by the Murmansk Oil Terminal and Pipeline proposal that seeks to provide Russian oil to the United States in a safe, efficient, and economic manner. The framework and corresponding feasibility analysis highlight the importance of oil transportation in a global landscape and peruse the macro and micro variables that intertwine and impact that landscape. A thorough evaluation of both Russian and US oil reliance must be understood, while extrapolating the influence of ancillary players such as OPEC, West Siberian Oil Reserves, the Murmansk locality, and the marine transportation industry. This thesis seeks to provide a overview of the oil industry generally, while specifically focusing on marine oil transportation. The thesis does so with a case evaluation of the Murmansk Oil Terminal and Pipeline project.

Thesis Supervisor:..James Masters
Title:..Director, Master of Engineering in Logistics Program

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Also, I thank my younger brother for ensuring that I never lose my edge. The day that I lose my edge is the day I take the chance of no longer being someone you look up to. I can never take that chance. Thank you for allowing me the fortuitous opportunity to be your role model. More so, thank you for making me proud and being my role model.

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Finally, I would like to, specifically, thank James Masters for he is a culmination of everything that I have experienced here at MIT. He gave me the opportunity to attend this wonderful institution and for that I will be forever indebted. He nurtured and catered along the way never wavering from the fact that we were what made MIT, not the other way around. That was a novel idea at first, but one that I wholly accept and appreciate now. Thank you, Jim and good luck in your future.

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CHAPTER 1 - INTRODUCTION

Energy, in simplest terms, is usable power. Energy also refers to the source of that usable power that we as a global society rely on, almost unwittingly, on a daily basis. Sources of energy include natural gas, coal, wind, the sun, and even heat from a nuclear reactor. A most important source of current global energy is unrefined crude oil, or one of its many refined forms such as petroleum. Until a newer, more efficient, more reliable, and less costly source of energy is developed, oil will continue to play an essential role in the world energy marketplace.

Oil is of the utmost importance in the global landscape. Interestingly, the bulk of the oil consumption occurs in western, industrialized nations, yet the bulk of the production takes place in locations such as the Middle East, West Africa, South America, and the former Soviet Union. The disparity underscores the grave importance of not only the production of oil, but also the transportation of that oil.

Oil (petroleum is the type of oil this thesis refers to as opposed to fatty oils which come from plants and animals) is a flammable liquid that occurs naturally in deposits beneath the earth's surface (The Columbia Electronic Encyclopedia). Since oil is deep underneath the surface of the earth, there exists no foolproof way of knowing whether it lies under a particular site. Thus, an exploratory well, or wildcat, must be dug to determine the existence of oil. An underground site that is determined to have oil is called an oil reserve. Once it has been determined that a particular site has oil, it must be forced to the surface. This oil, called crude oil, is then transported via pipelines, tanker ships, trucks, and rail to refineries across the world for various uses.

It may not seem completely obvious when one initially thinks of important aspects of oil, but *transportation* is an utmost vital factor in analyzing and understanding the nature and role of oil globally. The transportation of oil is extremely vital in both the transparent and not so transparent regards. Oil, in its most unrefined form, is produced naturally deep underneath the earth's surface. In the not so obvious aspect, that oil deep underneath the surface must be "transported" to the surface via drills, oil wells, water, steam, etc in order to refine the it into usable energy form. In the more transparent aspect, that same oil, once it is "transported" to the surface must be physically transported from areas of production to areas of consumption. In essence, the oil must be transported from where it is created to where an entity can actually use it. Transportation, in that transparent regard, occurs via underground pipelines, tanker ships across the oceans, and trucks and rail across the land. In understanding the importance of energy, and oil specifically, transportation is often overlooked and that fact points out its subtle importance in the macro picture. The effective and efficient transportation of this oil from producer to consumer is the underlying theme of this thesis.

The thesis proceeds to examine the feasibility of a cost-efficient method of importing oil from Russia to the US, as is proposed by the Murmansk Terminal. As indicated below, there exist numerous permutations that will affect the economic analysis of the Murmansk terminal - namely, the supply of tankers, or dwt, as well as the geopolitical landscape at the time of completion. Clearly, given the US production and consumption trends, there exists a strong need for an alternative source of imported oil. The question, though, is if it is feasible and that feasibility analysis will rely heavily on a transportation analysis.

CHAPTER 2 - METHODOLOGY

Focus

This thesis strives to thoroughly examine, understand, and analyze the intersection between transportation and oil in the general sense, but also strives to achieve a more focused understanding by examining the feasibility of a specific oil transportation case. The thesis provides a general overview of the energy (specifically, oil) sector and the transportation sector. The relevant players, roles, and dynamics are discerned before delving into a specific proposal that is currently on the table. That project, dubbed the Murmansk Oil Terminal and Pipeline, is then examined in order to gain an understanding of the costs, benefits, and logistics. It is with this specific example that the paper hopes to tie the presumedly disparate worlds of oil and transportation. The Murmansk proposal allows for an understanding of the key players in oil today, potential future suitors, and the importance of efficient transportation to both the players involved as well as the global economy.

Information provided by the Energy Information Administration which is housed under the United States Department of Energy played a vital role in this thesis. The agency provides independent statistical and analytical data on an ongoing basis to monitor the energy sector as well as to provide information to the general public. Along with the official US agency reports, Russian, Finnish, and Persian Gulf agency reports were utilized. Also, existing general and specific communiqué were utilized to gain an understanding of the various pieces within this thesis. For example, articles from trade journals, independent analyses, and books were utilized to paint a clearer picture. Each of the aforementioned reports, articles, data, etc were first examined independently and then distilled and amalgamated within the context of this thesis.

Structure

This thesis is structured so that it provides both a general background, followed by a specific, concrete example highlighting the intersection between transportation and oil. The thesis provides a brief overview of the energy and transportation sectors as a whole. It proceeds to drill into each of those sectors by highlighting the specific players and variables that integrate the two. The transportation sector is then narrowed with a thorough examination of the marine/water transportation industry, which is a most vital player in intercontinental oil transportation. The general economics, business cases, and technicalities will be explained to provide a framework for the specific Murmansk case.

At this point, the existing transportation nodes that play key roles in the current marine oil transportation industry will be introduced. These nodes provide a framework of how things currently stand and serve to highlight the differences in the Murmansk proposal.

After the existing transportation nodes are introduced, the paper begins to delve into the case of the Murmansk project by introducing the key players, Russia and the United States. Again, in understanding the feasibility of the project, one must gain an understanding of the current state of events in oil and transportation with the two main players. That is, why is the integration of oil and transportation important to Russia and the US? What are the current geopolitical and economic states that dictate the nuances of the Murmansk project?

The thesis then delves into the other ancillary, yet key players: Western Siberia and Murmansk itself. Western Siberia is the origination point of the entire transportation cycle. That is, the oil that is proposed to be exported from Russia to the US is deep underground in Western Siberia. Murmansk is both a destination and a gateway. It is the final point for the oil that is transported from Western Siberia within Russia, but it is also the gateway as the loading dock for marine vehicles before the oil travels to the United States. The landscape of both Western Siberia and Murmansk must be understood to appreciate the importance of oil transportation on the Murmansk proposal.

Finally, the thesis concludes with a thorough explanation and examination of the Murmansk Oil Terminal proposal. Specifically, what are the logistics, costs, and benefits of the proposal? This portion highlights the nuances of the proposal as it stands while providing potential alternatives to, perhaps, improve the viability of the proposal.

CHAPTER 3 – OIL TRANSPORTATION DYNAMICS

Transportation Sector Overview

The oil transportation industry, specifically the maritime tanker industry, competes broadly in the transportation sector. The global transportation sector encompasses all economic activities that are performed to convey passengers or goods. Activities include hauling freight and individuals via land, air, and water. According to the Bureau of Economic Analysis (BEA), transportation accounted for $306 billion in GDP as of 2001. The players in the industry range from government agencies such as the United States Postal Service to Fortune 500 companies such as United Parcel Service, Union Pacific, and Federal Express. The sector is further segmented into the following specific industries: air courier, airline, miscellaneous transportation, railroads, trucking, and water transportation.

The air courier industry focuses on the air transfer of *freight* across both national and international borders. Air courier players include the aforementioned FedEx, along with Airborne, EGL, and a host of smaller firms. The airline industry deals with the air transportation of *individuals*. Recognizable firms include AMR, UAL, and Southwest Airlines. Miscellaneous transportation is a sort of catchall for all those companies that do not fit nicely into one of the other transportation industries. It does include many of the non-asset based logistics service providers such as C.H. Robinson Worldwide and Expeditors International of Washington, though. The railroad sector is home to those firms that transfer goods and people via rail, and includes historic names like Union Pacific, Burlington Northern Sante Fe, and Norfolk Southern. The trucking industry deals with the transport of freight on land. The most recognizable name is

United Parcel Service, but also includes players such as J.B. Hunt Transportation Services and Yellow Corporation. Finally, the water transportation industry, in which oil tanker transportation falls, deals with the transport of freight and people via water.

According to the BEA, maritime shipping accounted for 5% or $15.7 billion of the $306 billion GDP of the transportation sector in 2001. According to the United States Environmental Protection Agency (EPA):

> The water transportation industry (Standard Industrial Classification code 44) includes establishments engaged in freight and passenger transportation on the open seas or inland waters and establishments furnishing such incidental services as lighting towing, and canal operations. This group also includes excursion and sightseeing boats, water taxis, and cargo handling operations.

Since the water transportation industry deals with the transfer of freight (both goods and people) via large marine vessels, the industry categorization naturally includes the support for these vessels and the facilities (i.e., ports) for loading and unloading the cargo. Finally, according to the EPA, domestic and foreign waterborne commerce has increased more than 20% since 1976, but is expected to remain stagnant in the foreseeable future.

Marine Transportation

Economics of Marine Transportation

Vessels are available on a **voyage**, **time**, or **bareboat** basis. In the water transportation industry, a voyage charter is one where the owner of a vessel agrees to provide the vessel to transport specific goods between specified ports in return for an agreed upon payment. Within the voyage charter arrangement, a specific agreement may be a spot-market (single voyage where a charter may spend time idle while awaiting business), or a consecutive voyage arrangement (more than one voyage with the same charterer). All operating costs, including fuel, crew, tariffs, etc, are the vessel owner's responsibility.

A time charter arrangement is one where the charterer agrees to take possession of a vessel in, essentially, a rental agreement for a specified period of time. The owner of the vessel usually charges a fee on either a daily or monthly rate. All operating costs are the owner's responsibility, and the charterer is responsible for the voyage costs such as fuel and port charges.

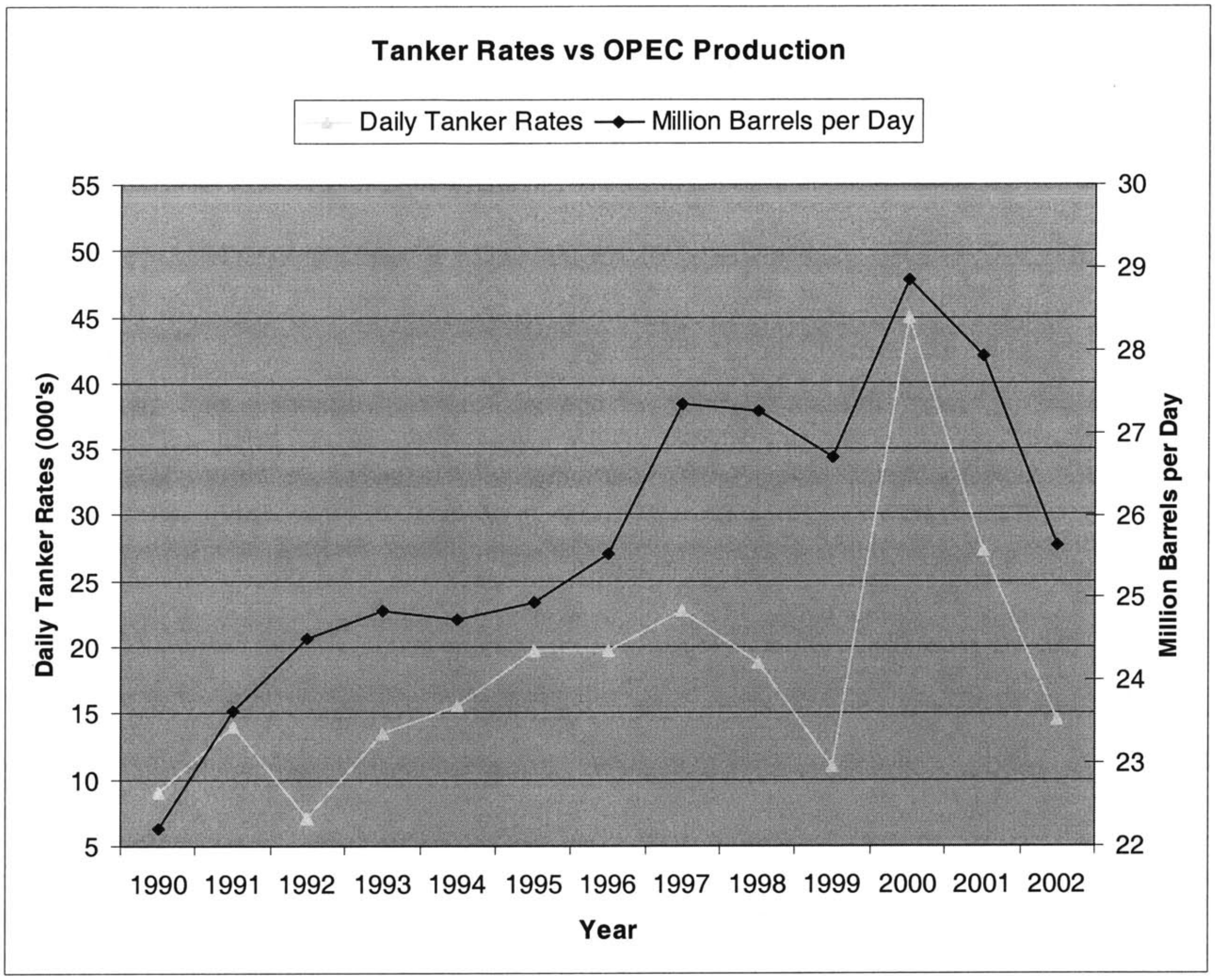
The final arrangement is the bareboat charter. This is an arrangement where the charterer takes complete possession of the vehicle in return for a specified payment to the owner. All operating costs, including crew, fuel, and voyage expenses are the responsibility of the charterer. The arrangement alleviates risk concerns to both the charterer and vessel owner at the expense of eliminating speculative opportunities offered by tanker rate fluctuations.

The rates which players in the industry can charge are a direct derivative of world events, weather conditions, strikes, policy, supply, and demand - most of which are outside of each firm's control. Vessel charters range from long-term arrangements through short-term spot-market arrangements. Long-term arrangements are desirable to the vessel owner because they offer greater assurances that the owner will cover operating costs. Spot market arrangements are more risky, but also desirable for speculative opportunities.

Tanker Rates

In the water transportation industry, oil transportation providers are very much influenced by the simple economic dynamics of supply and demand. In this case, it happens to be that tanker rates have consistently tracked OPEC production. See figure 1 below.

Figure 1 – Tanker Rates vs. OPEC Production



Figures as of 3rd Quarter of each year

Sources: Clarkson Research Studies; OPEC Statistical Bulletin; Pira Energy Group

For instance, in 1990 when OPEC was producing 22.21 million barrels per day, the average daily tanker rate was only $9,000. Ten years later, towards the end of 2000, OPEC production had increased to almost 29 million barrels per day, and daily tanker rates had increased to an average of $45,000 per day. In the last two years OPEC has made a concerted effort to decrease production in order to maintain its stated goal of price stability. The OPEC Price Band, created in response to the volatile oil market of 1998, seeks to maintain a per barrel price of between $22 and $28 (OPEC Annual Statistical Bulletin 2001). Since OPEC cannot control oil demand, its primary lever to maneuver prices is crude oil production. Also, in late 2001, due to the global economic downturn and terrorist attacks, global demand for oil dropped substantially with a subsequent reduction in production by OPEC to maintain price stability. The production decrease continued well into 2002 leading to further price drops in tanker rates as highlighted in figure 1 above.

OPEC has averaged over 40% of the world's daily crude oil production dating back to 1992. Also, since the organization is a cartel of about a dozen nations, it is the only producer of oil that can effectively increase and decrease its supply in the short-term. Non-OPEC producers, on the other hand, are governed more by free-market economic forces and often produce towards capacity. Non-OPEC oil production is a sort of constant, while OPEC production increases and decreases per the needs of OPEC initiatives. Thus, it makes complete sense that daily OPEC production has had the most influence on daily tanker rates because that has been the primary variable (for the most part) that impacted the economics of energy marine transportation companies.

Also, there exists another factor in the interplay between crude oil production and tanker rates that has become more prominent in recent years and will continue to be in coming years. According to the International Energy Agency (IEA), non-OPEC crude oil production has increased from 44.9 million barrels a day in 1999 to an estimated 48 million barrels a day in 2002. The IEA, furthermore, expects the 48 million barrels to increase by another 1.1 million barrels per day in 2003. Although, in the past, tanker rates have tracked OPEC production, going forward non-OPEC production will exert a greater influence on tanker rates for 2 reasons:

1) Russia has accounted for more than half of the recent non-OPEC increase and that trend is expected to continue due to deregulation and the political shifts in the region.

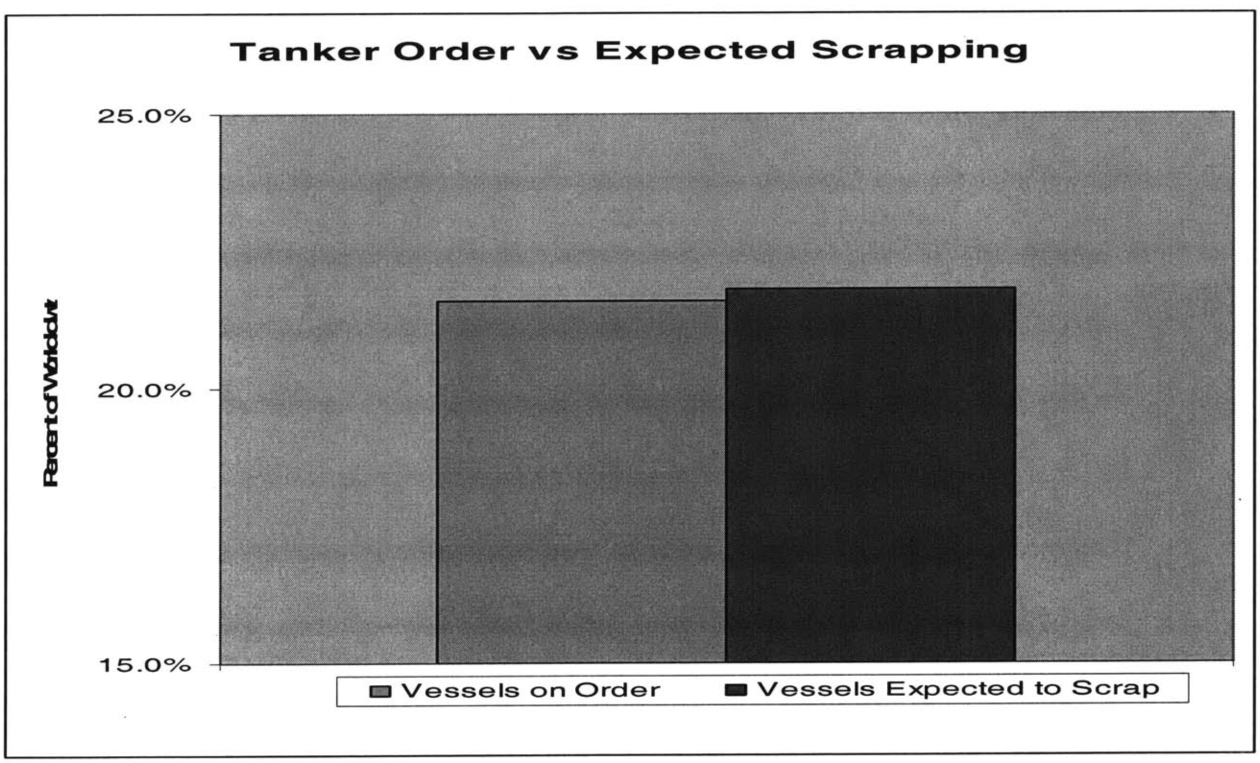
2) Russia and other non-OPEC producers are guided by economics, not a cartel. That is, the Russian market is slowly becoming a free, private market with profit-seeking oil companies. OPEC can control the production of its members. Private Russian companies, on the other hand, are producing and exporting as much oil as possible. According to the OPEC Annual Statistical Bulletin, Russia has the most proven crude oil reserves outside of OPEC members. According to the Washington-based Center for Strategic and International Studies, in mid-1988 Russia was leading the world in terms of oil production at 11.4 million barrels per day. It clearly has the capacity to impact supply, and that alone indicates that Russia itself can impact tanker prices. Beyond that, 4 Russian oil companies and the United States recently agreed to build a new Arctic port to export directly to the US which will further increase production in the coming years.

Besides oil production, though, there exists another piece of the equation that must be accounted for to complete the tanker rate equation. Simple economics, once again, dictate that even if oil production increases, carrier capacity must remain stagnant or decrease, in order for tanker rates to increase. In the water transportation industry, carrier capacity is measured in dead weight tons (dwt). The equation can loosely be formulated as follows:

tanker rates = oil production / dead weight tons

Of course, the actual tanker rates are a derivative of many factors, but the above equation can be used for illustrative purposes. It highlights the importance of oil production and total available dwt on daily tanker rates. According to Fearnleys, an Oslo-based shipping consultancy, the percentage of dwt from new vessels on order is expected to match the percentage of dwt that will be scrapped in 2003 (see figure 2). That means the total dwt in the industry will remain constant, and crude oil production will be the strongest determinant of daily tanker rates.

Figure 2 – Tanker Order vs. Expected Scrapping



As of 9/30/02

Source: Fearnleys

Intercontinental Oil Transit

Over 35 million barrels of oil per day (bbl/day) are transported via either pipelines or tankers (Energy Information Administration). Of the 35 million barrels, 2/5 or 14 million bbl/day are passed via pipelines. Pipelines are the vast amounts of underground and undersea networks that serve as the conduit for oil transport from one locale to another. Pipelines are best suited for transcontinental oil transportation. The remaining 3/5 or 21 million bbl/day are transported via tanker ships. Tanker ships, on the other hand, are best suited for intercontinental oil transport.

Tankers

There exist over 3,500 oil tankers in the world today of varying sizes and capabilities:

Ultra Large Crude Carriers (ULCCs) – tankers that can carry over 300,000 dead weight tons (dwt) of crude oil

Very Large Crude Carriers (VLCCs) – tankers that can carry from 200,000 to 300,000 dwt of crude oil

Suezmax Tankers – can carry between 125,000 and 180,000 dwt of crude oil

Aframax Tankers – can carry between 75,000 and 125,000 dwt of crude oil

Panamax Tankers – can carry around 50,000 dwt of crude oil

Handymax Tankers – can carry around 35,000 dwt of crude oil

Handy Size Tankers – can carry between 20,000 and 30,000 dwt of oil

For reference purposes, it is important to note that a 150,000 dwt suezmax tanker can carry approximately 1,000,000 barrels of crude oil.

Routes

Given the importance of oil on a global scale and the discernible distance between the major producers and consumers, the routes of the 3,500 tankers are of acute importance. There exist 7 major routes or paths that the tankers traverse on a regular basis to transport oil from the producers to consumers. Much like the tankers, these strategic routes come in varying sizes and nuances and thus lend themselves to optimal tanker size to route economics. The strategic routes, ordered by oil flow per day are:

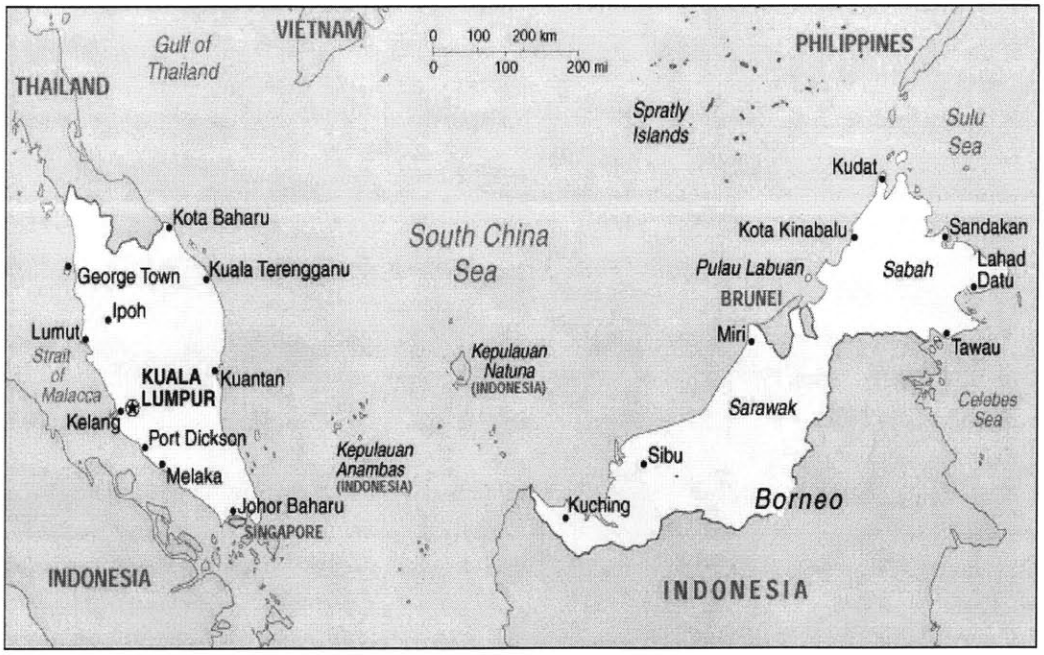
Strait of Hormuz – The strait is a 4-mile wide channel between Oman and Iran that connects the Persian Gulf with the Arabian Sea. It is, by far, the most important strategic channel in oil transportation due both to the amount of oil flow per day, as well its particular role as the heart of Middle East oil transport. Approximately 13 million bbl/day, or upwards of 37% of the world's daily oil transport flows through Hormuz.

Figure 3 – Strait of Hormuz

Source: EIA

Strait of Malacca – Malacca is located between Malaysia/Singapore and Indonesia. It serves to connect the Indian Ocean with the South China Sea and eventually the Pacific Ocean. It is of immense strategic importance because it is the shortest sea route between three of the world's most populous countries (China, India, and Indonesia). At its narrowest point it is only 1.5 miles across, yet the strait supports the transport of 10.3 million bbl/day or over 29% of daily oil transport flow.

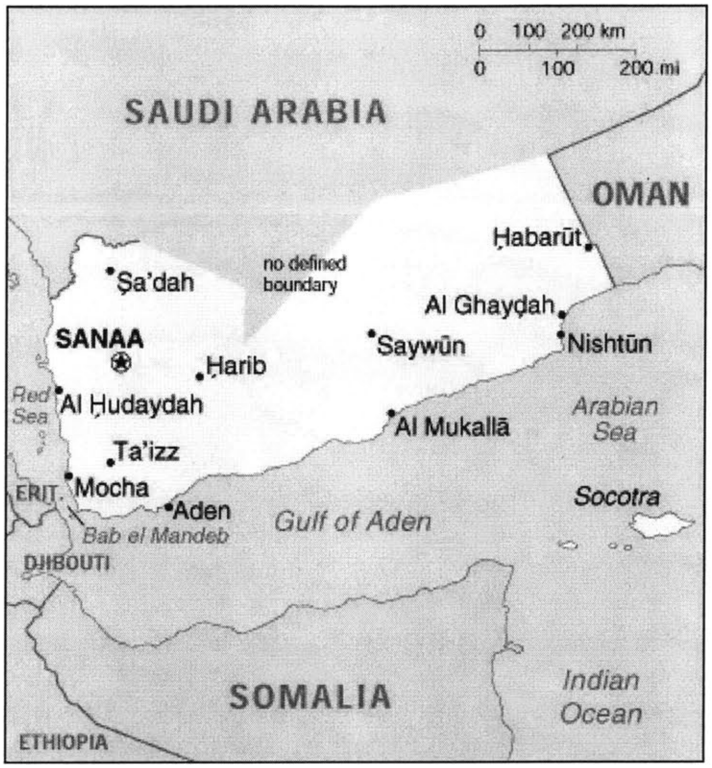
Figure 4 – Strait of Malacca



Source: EIA

Bab el-Mandab – The strait is located between Yemen and Eastern Africa and connects the Red Sea with the Gulf of Aden and eventually the Arabian Sea. Over 3 million bbl/day pass through the strait on a daily basis, or almost 10% of daily oil transport flow.

Figure 5 – Bab el-Mandab



Source: EIA

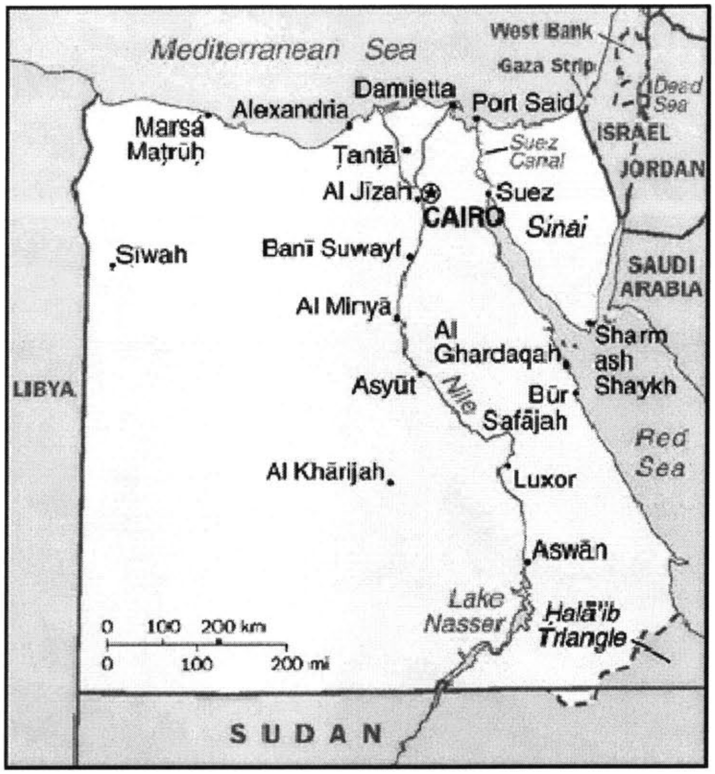
Bosporus Straits – The straits are in Turkey and divide Asia from Europe while connecting the Black Sea with the Mediterranean Sea. About 2 million bbl/day or over 5% of daily oil transport flows through the straits.

Figure 6 – Bosporus Straits

Source: EIA

Suez Canal – The canal lies in Egypt and serves to connect the Mediterranean Sea with the Gulf of Suez and eventually the Red Sea. 1.3 million bbl/day, or nearly 4% of daily oil transport flows through the Suez. Also, the Sumed pipeline runs through the area and transports 2.5 million bbl/day of oil.

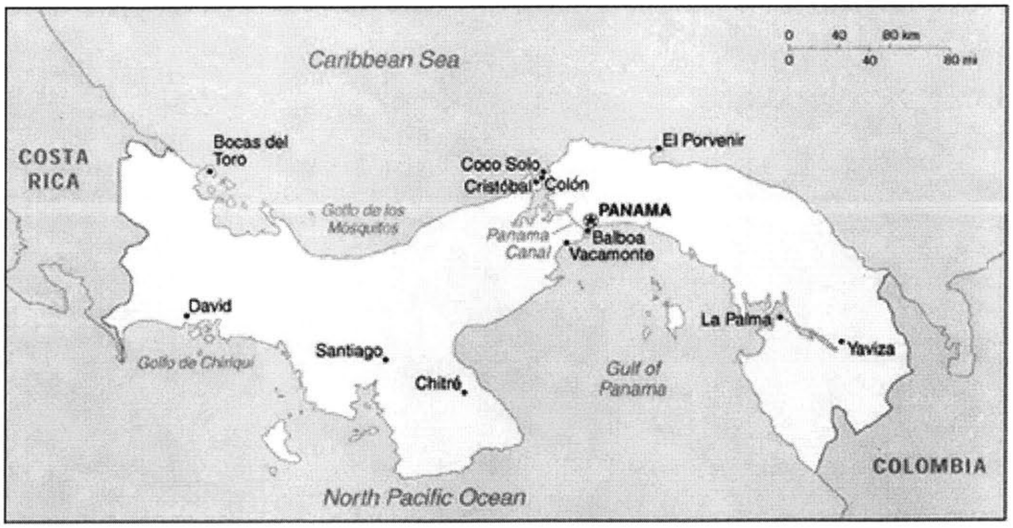
Figure 7 – Suez Canal



Source: EIA

Panama Canal – The canal is located in Panama and connects the Pacific Ocean with the Caribbean Sea and eventually the Atlantic Ocean. Approximately, 613,000 bbl/day, or less than 2% of daily oil transport flows through the canal.

Figure 8 – Panama Canal



Source: EIA

Russian Oil Pipelines and Ports – Since the majority of Russian oil is inland, there exist a vast array of pipelines that transport the oil to various ports (for transfer to tankers that would transport the oil as above around the globe) and direct refineries. Russia exports nearly 5 million bbl/day via the use of these pipelines and ports.

Figure 9 – Russia Oil Pipelines and Ports

Source: EIA

CHAPTER 4 – GLOBAL PLAYERS

Russian Oil Exports – Past, Present, and Future

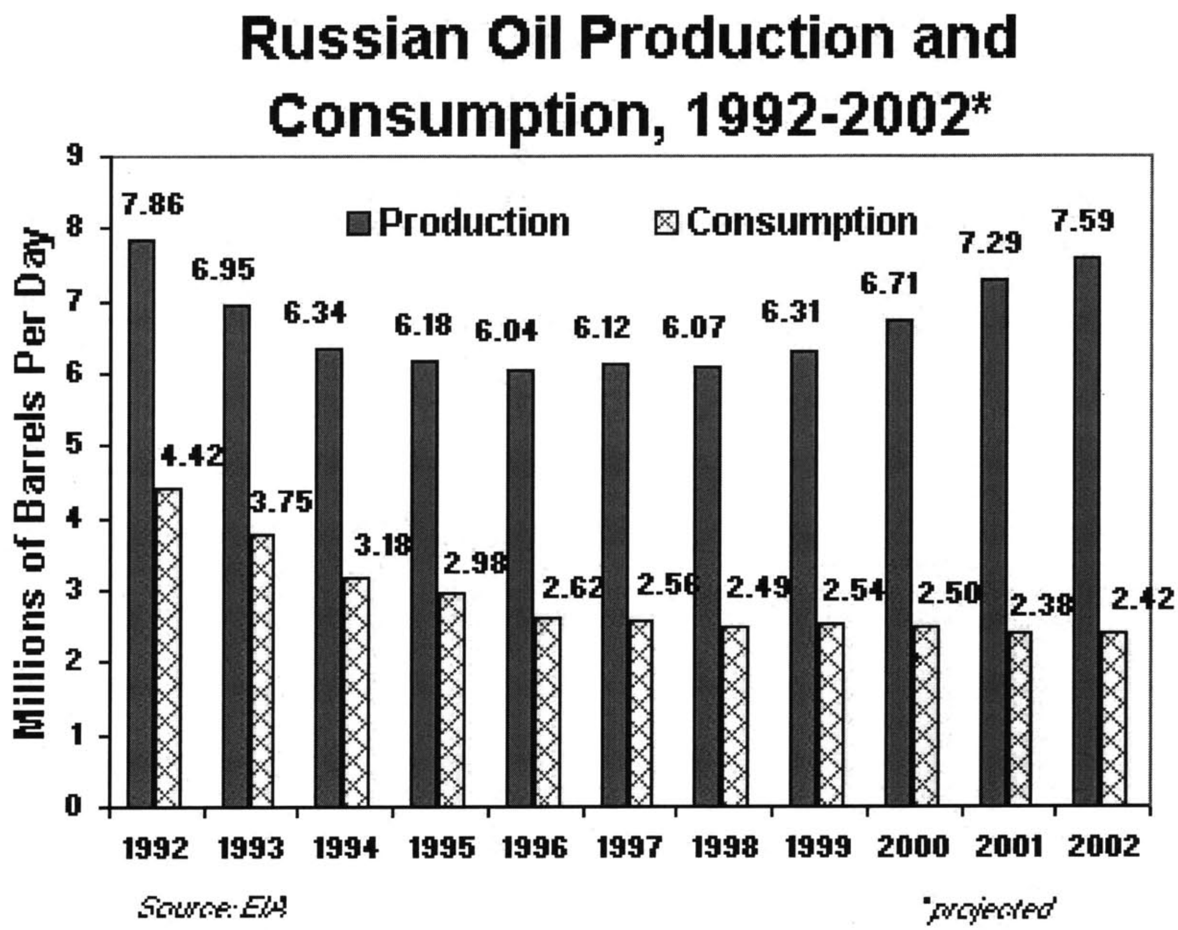
The Soviet Union was a monolithic figure in the world of oil transportation prior to its collapse in 1991. It was the world's largest oil exporter at 12 million bbl/day at its peak (EIA). 10.8 million bbl/day, or 90%, of that oil export came from its largest republic, Russia. Russia is once again an important player in the world energy markets today. It holds the world's largest natural gas reserves, the second largest oil reserves, and the eighth largest coals reserves (EIA). Russia has 48.6 billion barrels of proven oil reserves (USGS). Despite the massive oil reserves Russia only consumes about 2.4 million bbl/day while producing 7.3 million bbl/day (EIA). It should come as no surprise as Russia slowly recovers from its collapse it is currently second only to Saudi Arabia in oil exports at just about 5 million bbl/day (EIA).

Prior to Russia's recent recovery, though, there was massive change and restructuring. After the collapse of the Soviet Union, Russian oil exports declined 70% from its peak to barely over 3 million barrels/day. The continued decline leading up to 1994 led to a massive government sponsored restructuring proposal towards privatization of the state owned energy industry (EIA). The proposal was a two-step process which began with the organizing of majority state-owned joint-stock companies. These majority state-owned enterprises were transitioned into private ownership via joint-stock offerings leading to large oil companies such as Lukoil, Yukos, Surgutneftegaz, Tatneft, and Sibneft. The second phase, which began in 1995 and is still ongoing, involves the auctioning off of large government owned shares in these companies.

Despite the privatization effort, until recently Transneft, the state-owned transport monopoly managed all aspects of transportation including tankers and the domestic pipeline system.

The privatization effort seems to be working as Russian oil exports have increased every year since 1998.

Figure 10 – Russian Oil Production



Source: EIA

The trend is expected to continue as some long-standing quotas expire and are lifted. Currently, Russian producers can export only 30% of their output due to the quotas. Since open market prices are nearly twice that of Russian prices, it is safe to assume that the producers will increase production and exports if allowed.

The privatization effort is not only a boon to private company coffers, but also extremely beneficial to the government. Oil exports account for 25% of the Russian government's annual income. Each $1 increase in per barrel price leads to $1 billion in extra earnings (EIA).

Destinations

Prior to 1991 and the collapse of the Soviet Union, Russian oil exports were mainly to republic members. Since 1991, though, there has been a concerted strategic shift of focus from former Soviet Union members to central and Western Europe. Currently, the majority of Russian oil exports are to countries such as Germany, Italy, Spain, and the United Kingdom. The share of net exports to countries which were not part of the former Soviet Union is currently 4.23 million bbl/day, or 86% of total exports (Tavernise).

The net export to non-European countries in both Asia and the United States is under development, and will likely increase in the next decade. Oilfields in East Siberia and Sakhalin Island are being developed to export to Asia (Yergin). In addition, the Murmansk oil terminal and connecting pipeline has been proposed by a group of private companies that will allow the companies to export oil from West Siberia to the United States (Yukos Oil Company).

Future Proposals

Russia has an extensive domestic oil pipeline system dating back to the old Soviet Union days (Gustafson). Nowadays, though, large portions of the pipeline system are outside of Russian control and are owned by former Soviet republics. These independent countries require substantial transit fees for oil that is channeled through their pipelines for export. Russia's main current export pipeline is the Druzbha which provides over 1.2 million bbl/day to Europe. The existing pipelines are in dire need of an upgrade, lack capacity, and are consistently tapped illegally. To increase oil exports and subsequent revenue, while addressing the aforementioned issues, Russian enterprises (both private and government-owned) are working on a number of initiatives (EIA):

Baltic Pipeline System (BPS) – The Russian government has initiated this project so that it can bypass Baltic States when exporting oil. The Baltic States, including Latvia, Estonia, and Lithuania are strategic transit centers for Russian northern exports. Correspondingly, they garner substantial transit tariff revenue from the Russians.

The BPS will incorporate new pipelines from Kharyaga to Usa, the reconstruction of the Usa-Ukhta, Ukhta-Yaroslavl, and Yaroslavl-Kirishi pipelines, and a new pipeline from Kirishi to an oil terminal in Primorsk in the Gulf of Finland where tankers will load for transit.

The first stage of the BPS, which is wholly owned by Transneft, was completed in December 2001 and added an additional 240,000 bbl/day in export capacity. It allows Russia a direct gateway into the Northern European markets and saves almost $1.5 billion in revenue while generating $100 million in fees. The second stage of the BPS, expected to be completed in December of 2003, will add another 120,000 bbl/day in capacity.

Caspian Pipeline Consortium (CPC) – The first phase of the CPS was completed in March of 2001 and added an additional 564,000 bbl/day in export capacity with an expected increase to 1.34 million bbl/day by 2015. The CPC is run by an international consortium with Transneft holding a 24% stake.

China Oil Pipeline – Russia is currently in negotiations with China to build a pipeline that would link the two countries. The negotiation involves the state owned Transneft as well as Russia's second largest private oil company, Yukos. The proposal calls for a 1,500 mile pipeline that would transit up to 600,000 bbl/day from East Siberia into Northeast China.

Murmansk Oil Terminal – Lukoil, along with a few other private Russian oil companies, proposed the construction of a deepwater oil terminal that would allow oil to be exported from West Siberia to the to the terminal in Murmansk and eventually shipped to the United States. The proposed 1,860 mile pipeline would increase export capacity by approximately 1-2 million bbl/day. It will not be completed any earlier than 2005.

Sakhalin Pipelines – Sakhalin-1 group (led by ExxonMobil) and Sakhalin-2 group (led by Royal Dutch/Shell) are two independent groups competing to construct a pipeline from Sakhalin Island to Japan, South Korea, and Taiwan. The Sakhalin Pipelines are expected to increase export capacity by approximately 300,000 bbl/day.

Druzhba-Adria Pipeline Integration – In late 2000, Yukos signed an agreement with Croatia to upgrade and integrate the Druzhba and Adria pipelines. Exports via the pipelines would rise to approximately 300,000 bbl/day after 10 years.

Sukhodolnaya-Rodionovska Pipeline – This pipeline was completed in September of 2001 from Sukhodolny to Rodionovsky to divert oil that previously passed through Ukraine during transit. It saves Russia transit fees.

US Energy Landscape

Consumption/Production/Imports

The United States of America (US) is the largest player in the energy industry by consumption, production, and imports. Also, it ranks first in coal reserves, sixth in natural gas reserves, and twelfth in oil reserves (Energy Information Administration). As of the beginning of 2002, the US has 22.0 billion barrels of proven oil reserves. A proven oil reserve is simply a term indicating that the oil is anticipated to be commercially recovered sometime in the near future from known accumulations. The US produces approximately 9.1 million barrels of oil per day, of which over 70% is crude oil. Production is a term referring to the actual drilling, flowing, and storage of the oil via the use of wells, flowlines, and other gathering equipment that taps and extracts the oil from underground and undersea reserves. In short, it is all the ancillary actions which are non-transportation related to extract the oil from reserves, but does not include the refining processes. As mentioned the US is, by far, the largest consumer of oil in the world. In 2002, the US consumed nearly 20 million bbl/day of oil. The chasm between US oil production and consumption is the reason that the US is also the world's largest importer of oil. In 2002, the US imported over 10 million bbl/day of oil, of which 26% was from Persian Gulf countries. The top exporters to the US were Saudi Arabia, Mexico, Canada, and Venezuela.

Refineries

Once the oil is produced or imported into the US, it must be refined into a usable form (petrol, for instance). The US, currently, has the capacity to refine almost 17 million bbl/day of oil via 153 operable refineries. These refineries are estimated to be operating at between 88-92% of capacity. These refineries are strategically important in that they ensure the efficient and effective use of the oil by the end-user.

Companies

There are a variety of players in the US oil industry. Of course, this includes the trade partner countries mentioned above, but also includes domestic producers and refiners. Starting in 2000, there has been a glaring increase in mergers and acquisitions in the oil industry, in part, to acquire additional oil reserves, cut costs, and gain market share. High profile mergers and acquisitions include BP and Amoco, Exxon and Mobil, BP Amoco and Arco, Chevron and Texaco, Pennzoil-Quaker State and Shell, and Phillips Petroleum and Conoco. Also, Russian companies are making a foray in the US market with Lukoil making the initial plunge by acquiring Getty Petroleum Marketing. The new entities formed by these mergers also represent the largest players in the US oil industry.

Strategic Petroleum Reserve (SPR)

To fully understand the oil industry landscape in the US, the importance of the Strategic Oil Reserve must be scrutinized. On December 22, 1975, then President Gerald Ford signed the Energy Policy and Conservation Act - EPCA (Economides, Stoughbaugh). Given that the US is the largest consumer of oil in the world, yet lacks the capabilities to produce even half of the oil it consumes, its reliance on outside producers is magnified. The purpose of the EPCA was to establish US policy that called for a reserve of up to 1 billion barrels of oil to be accumulated and used strategically to offset geopolitical and economic turmoil. According to the EPCA, there exist no specific reasons to tap the SPR, but drawdown occurs when there is "a severe energy supply interruption or by obligations of the United States." If the president decides to order a drawdown of the SPR, oil would be distributed in a competitive fashion to the highest bidder. According to the EPCA, a "severe energy supply interruption" is one which:

1) "is, or is likely to be, of significant scope and duration, and of an emergency nature;"
2) "may cause major adverse impact on national safety or the national economy (including an oil price spike);"
3) and "results, or is likely to result, from an interruption in the supply of imported petroleum products, or from sabotage or an act of God."

The EPCA underscores the importance of oil on the US economy as well as accentuating its reliance on imported oil. Despite the request to have up to 1 billion barrels of oil in reserve, at its peak in 1994, the SPR stored only 592 million barrels of oil. Currently, it contains 590 million barrels of oil that allows for a tiered drawdown of:

90 days – 4.3 million bbl/day

91-120 days – 3.2 million bbl/day

121-150 days – 2.2 million bbl/day

151-180 days – 1.3 million bbl/day

If there was a disruption in the imported supply of oil, the strategic reserve (per the above schedule) would run dry within 6 months. Again, the importance of the efficient and effective transportation of outside countries' oil is highlighted.

Forecasts

Not only is the US the current largest consumer of oil, but forecasts predict that that consumption will continue to increase. According to the Energy Information Administration's International Energy Outlook Report, even in a low economic growth scenario, US consumption is expected to increase to 20.1 million bbl/day by 2005, 22.3 million bbl/day by 2010, 24.1 million bbl/day by 2015, 25.5 million bbl/day by 2020, and 26.9 million bbl/day by 2025. In the reference (or mean) case scenario, the US consumption patterns are 20.5 million bbl/day by 2005, 23.0 million bbl/day by 2010, 25.2 million bbl/day by 2015, 27.1 million bbl/day by 2020, and 29.2 million bbl/day by 2025. In the high economic growth rate scenario, the US consumption patterns are 20.8 million bbl/day by 2005, 23.9 million bbl/day by 2010, 26.5 million bbl/day by 2015, 28.9 million bbl/day by 2020, and 31.8 million bbl/day by 2025.

Table 1 – US Oil Consumption Forecasts

US Oil Consumption (Million Barrels per Day) Scenario	**1990**	**2000**	**2001**	**2005**	**2010**	**2015**	**2020**	**2025**
Low Case	17.0	19.7	19.6	20.1	22.3	24.1	25.5	26.9
Reference Case	17.0	19.7	19.6	20.5	23.0	25.2	27.1	29.2
High Case	17.0	19.7	19.6	20.8	23.9	26.5	28.9	31.8

Source: EIA

While consumption patterns are expected to increase, US oil production is expected to actually drop in the short-term future and then rise slightly in the long-term. US oil production in the low case is expected to be 9.0 million bbl/day by 2005, 9.1 million bbl/day in 2010, 8.9 million bbl/day in 2015, 9.2 million bbl/day in 2020, and 9.0 million bbl/day in 2025. Using the reference (or mean) case, US oil production is expected to be 9.0 million bbl/day in 2005, 9.2 million bbl/day in 2010, 9.0 million bbl/day in 2015, 9.4 million bbl/day in 2020, and 9.4 million bbl/day in 2025. In the high case, US oil production is expected to be 9.1 million bbl/day in 2005, 9.4 million bbl/day in 2010, 9.4 million bbl/day in 2015, 9.7 million bbl/day in 2020, and 10.0 million bbl/day in 2025.

Table 2 – US Oil Production Forecasts

US Oil Production (Million Barrels per Day) Scenario	**1990**	**2001**	**2005**	**2010**	**2015**	**2020**	**2025**
Low Case	9.7	9.0	9.0	9.1	8.9	9.2	9.0
Reference Case	9.7	9.0	9.0	9.2	9.0	9.4	9.4
High Case	9.7	9.0	9.1	9.4	9.4	9.7	10.0

Source: EIA

The above consumption and production forecasts once again highlight the heavy reliance of the US on imported oil. They also prove to highlight the importance of projects like Murmansk. The possibility of efficiently transporting oil from Western Siberia to the US in a safe and reliable logistical manner helps the US in diversifying its risk while adding another capable provider.

Western Siberia

Siberia

Siberia, located in the world's largest country, Russia, is a region stretching from north-central to northeastern Asia. Although historically, it had no official political or territorial division, it was understood to stretch from the Ural Mountains in the west to the Pacific Ocean in the east. In the north, it is presumed to commence with the East Siberian, Laptev, and Kara seas stretching southward to Kazakhstan, the Altai and Sayan mountain range, and the border of Mongolia. It covers almost 3 million square miles and is home to an estimated 32 million inhabitants.

In 2000, Siberia was established as one of the seven administrative districts of Russia and formally separated from the Russian Far East (formerly commonly considered a part of Siberia). The formal administrative units established within Siberia were the Taymyr, Ust-Ordyn-Buryat, and Evenki autonomous areas; the Omsk, Novosibirsk, Tomsk, Kemerovo, Irkutsk, and Chita regions; the Altai and Krasnoyarsk territories; and the Altai, Buryat, Khakass, and Tuva republics.

Siberia can be divided into topographical zones running from north to south. The zones commence with the tundra along the arctic coast, followed by the taiga, the mixed forest belt, and the steppe zone. 40% of Siberia's land is forest. Siberia is drained from the south to north by the Lena, Yenisei, and Ob rivers. The rivers are also the only form of north-south transportation. Means for east-west transportation are the Trans-Siberian Railroad and to a certain extent the Arctic sea route.

Siberia is subdivided into four geomorphic areas beginning with the northeast Siberian mountain systems, the south mountains, the Central Siberian plateaus, and the West Siberian lowland. East Siberia is Russia's leading producer of gold, diamonds, mica, and aluminum. It also possesses rich waterpower resources and houses four large hydroelectric power stations along the Angara River. East Siberia is, nonetheless, very desolate due to the extremely cold temperatures.

West and Southwest Siberian, on the other hand, house over 60% of Siberia's population, as well as major industrial complexes and cities. West Siberia is favorable to agriculture, but its primary resources are the huge natural gas and oil fields that extend, via pipelines, to the rest of Russia and the Eastern European bloc of republics (The Columbia Electronic Encyclopedia).

West Siberian Basin

The West Siberian Basin is the largest oil and gas producing area in Russia, as well as one of the largest in the world. The basin covers an area that is over twice the size of Alaska, or approximately 1.3 million square miles. The basin commences east from the Ural Mountains to the Yenisey River and north from the Kazakh border into the Kara Sea. It is nearly a perfect plain covered by shallow lakes and swamps (EIA and USGS).

According to a 1997 study by the Energy Information Administration (EIA) in conjunction with the United States Geological Survey (USGS), Russia's West Siberian Basin contains enough oil to have a significant impact on the world petroleum markets. The basin supplies over 70% of Russia's internal consumption of oil, and the remainder is exported to surrounding Eastern European countries. In 1995, the West Siberian Basin produced approximately 1.5 billion barrels of oil, of which 1.07 billion barrels was consumed by Russia, and the remainder exported. Although these figures have changed substantially since 1995 due to Russia's increased oil production, they do serve an illustrative purpose – an increase in West Siberian oil production will substantially increase Russia's oil export revenues. Currently, besides supplying Russia, the basin supplies other parts of the former Soviet Union as well as parts of Europe. There exists definite, measurable demand from countries like the US, China, and other Western European countries if West Siberian Basin oil production is increased.

Oil in West Siberia

The first discovery of petroleum in the basin was made in 1961 in the Samotlor field (EIA and USGS). Samotlor is one of the largest oil fields in the world with an estimated ultimate oil recovery (EUR) of 24.7 billion barrels. At its peak (during the mid- and late 1980s Soviet Union era), the West Siberian basin was producing over 8.5 million bbl/day of Russia's total 11.5 million bbl/day oil production. After the fall of the Soviet Union, West Siberian Basin production dropped to 4.1 million bbl/day of Russia's 6.0 million bbl/day in 1996. Again, that production has seen an increasing trend in recent years and also highlights the production capacity of the basin.

As mentioned, over 70% of West Siberian Basin oil production is consumed by Russia, as it is the world's fourth largest oil consumer behind the United States, Japan, and China. The internal Russian oil industry supplies all Russian consumption and the remaining produced oil is exported. Currently, Russia has the capability to increase production as there is strong export demand, but is limited by transportation capacity constraints. That is, if the existing pipelines were upgraded, or additional pipelines were enacted from the West Siberian Basin, along with a corresponding shipping capacity increase, Russia could easily increase its oil production to meet existing export demands.

There exist over 600 oil fields in the West Siberian Basin which represent over 1500 reservoirs of oil. According to the 1997 USGS, there remain significant resources in the basin despite its having produced oil for more than 30 years. Cumulative oil produced from the basin stands at approximately 50 billion barrels. There exists a remaining EUR of approximately 66 billion barrels in developed fields, and an EUR of 51 billion barrels in undeveloped fields. Finally, according to the USGS mean value, there remain approximately 50 billion barrels of undiscovered oil in the region. The total basin resources, incorporating both produced oil as well as EUR figures, stands at almost 217 billion barrels of oil. According to the survey, given that 50 billion barrels have been produced, indications are that approximately 77% of the total discovered and undiscovered oil is still available for production. Even if the 50 billion barrels of undiscovered, but estimated oil is subtracted, approximately 70% of the oil is still available for production. In fact, even if the West Siberian Basin were to increase production to 10 million bbl/day, the basin could produce for over 40 years before it is dry. West Siberia, indeed, has the vast potential to impact the world oil economy. See table 3 below.

Table 3 – West Siberian Oil Fields

West Siberian Oil Fields
Oil Recovered and Available

USGA, 1997 Survey	Western Siberia		Timan-Pechora	
Cumulative Produced	49.3		2.6	
Discovered, Developed EUR	65.8		10.6	
Discovered, Undeveloped EUR	51.0		-	
Total Discovered	116.8		10.6	
Undiscovered	50.4		5.6	
Total Unproduced	167		16.2	
Total	216.5		18.8	
Percent Produced, Ultimate		22.8%		13.8%
Percent Produced, Discovered		42.2%		24.5%

	West Siberia/Timan Pechora Usable Life			
Total EUR (in billions)	183.4		183.4	
Total Exported per day (in millions)	1.6		1.6	
Days in year	365.0		365.0	
Total Exported per year (in millions)	584.0		584.0	
Useful life of Murmansk (years)	**30**		**50**	
Cumulative Oil Exported (in billions)	17.5		29.2	
Percentage of EUR		9.6%		15.9%
Percentage of Discovered, Developed		22.9%		38.2%

Source: USGA Survey

Murmansk

Murmansk is a most northern west city of Russia on a peninsula in the Barents Sea. It is the capital of the Murmansk Region and part of what is considered European Russia. It is home to an ice-free port that played a strategic national defense role for the former Soviet Union. An ice-free port is one that is free from obstructive ice and presents a clear channel of navigation to ships. Prior to the collapse of the Soviet Union, Murmansk played a vital role as a major naval base, fishing base, freight port, and a home port for Soviet nuclear submarines. After the collapse, though, the once vibrant port town became somewhat desolate as train traffic decreased by 50%, much of the industry laid-off workers, and the nuclear submarines relocated. The deterioration, of course, led to the decreased use of the port and its gradual deterioration as well (Nikolaeva and Spiridnov).

The Murmansk Region is 333 miles from east to west, 252 miles from north to south, and covers an area of a little over 90,000 square miles. The climate is mostly arctic, but does benefit from the Gulf Stream currents. It is bordered by Finland to the west, Norway to the north, and the Russian Republic of Keralia to the south. As of 1999, the total population was 1.2 million people dispersed among 12 cities and 20 small towns. Murmansk, the city, is inhabited by 453,590 people.

The Murmansk Region has over 700 natural resources, including substantial oil and natural gas reserves. The oil reserves, located in the Barents and Kara Seas, are undeveloped but estimated at 40 million tons (or 293 million barrels) of oil. These undeveloped reserves can, potentially, be incorporated into the long term Murmansk Oil Terminal feasibility study (Nyberg).

According to the Murmansk Administration, there exist numerous areas for economic investment. A Pechinanickel plant needs to be upgraded, the Mrmashi Airport needs reconstruction, and an upgrade of the Kandalaksha Aluminum plant would be beneficial, amongst others. All of the aforementioned upgrades, though, can easily be of an ancillary nature to the most important upgrade: a reconstruction and upgrade of the Murmansk Sea Port with a corresponding construction of a Murmansk Oil Terminal. The potential economic windfall from that project would not only have huge repercussions on the Murmansk region, but also the economies of Russia as a whole and the US. It would serve as the end of potential 2,250 mile pipeline route from Western Siberia, and the gateway to the 5,800 mile route to the US. It is a center point in the Russian/US oil export partnership.

CHAPTER 5 - PROPOSAL

Murmansk Oil Terminal & Pipeline

US

To fully understand the feasibility and underlying dynamic scope of the Murmansk Oil Terminal and Pipeline proposal, one must understand the perceived necessity for it. There exist underlying and important strategic and policy interests for both major countries (the United States and Russia) involved, as well as potential extended repercussions to other countries, namely the Organization of Petroleum Exporting Countries (OPEC).

As mentioned, the US, by far, is the largest consumer of oil in the world, but it is only twelfth worldwide in terms of oil reserves. Currently, the US consumes nearly 20 million barrels of day of oil, but produces less than 10 million barrels a day. That level of consumption calls for a heavy reliance on exported oil. The US exports from numerous countries including Mexico, Canada, and Venezuela. Although, Canada is the largest exporter of oil to the US, 26% of US oil exports came from OPEC countries. There exists a strong notion in the US to reduce reliance on OPEC, as well as a corresponding need to diversify its oil import sources and reduce the corresponding export risk.

Alexander Vershbow, US ambassador to Russia, noted in a recent speech to Russian oil players:

> When it comes to pipelines and countries that serve as sources of imported oil, my Government has followed a particular philosophy summed up by the English expression,

> "Don't put all of your eggs in one basket." It means, don't rely entirely on one thing or person or approach to achieve your goals. Relying on Middle Eastern oil, we ran into big problems that had huge economic implications during the OPEC oil embargo in the 1970s. For the past several years, however, we have tried to diversify, receiving oil shipments from many countries from various points of the globe, including Venezuela, Canada, and Nigeria. We've also been working on the development of energy resources in the Caspian region, promoting the construction and use of multiple pipeline routes as a means of enhancing world energy security.

It seems the US has been burned once by OPEC and will do everything in its power to ensure it does not occur again. The diversification of oil import sources guards against microeconomic risk at the US level, but also assists in stabilizing the macroeconomic landscape due to reduced reliance on a single provider with a corresponding increase in supply.

Russia

Just as there are huge economic and geopolitical benefits for the US, there exist corresponding and somewhat common benefits for Russia. Oil producers in Russia are increasingly constrained by pipeline capacity. The pipeline infrastructure is extremely important in Russian oil production because the bulk of its oil reserves are inland. Unfortunately, much of the pipeline infrastructure is antiquated and lacks capacity despite Russian producer capabilities. Russia is prevented from being a vital supplier in the world oil market because the infrastructure hinders it capabilities to be considered a reliable supplier. Not only does the existing pipeline system lack capacity, but Russia insists that up to 5% of the oil that traverses the pipelines is stolen. Railways are also running at capacity thus reducing rail oil transportation as a viable alternative.

Russian producers, both private and government-run, are keen on increasing production. Not only would an increase help stabilize world oil prices, but it would be prove a direct boon to the coffers of these producers. Correspondingly, the proof that Russia is a sustained player in the world oil markets would increase investment capital that can be funneled back into the country's energy transportation infrastructure. The investment in infrastructure assists in fulfilling Russia's promise as a producer while reducing reliance on existing pipelines and oil transportation nodes like the Bosphorus and Danish straits.

While the government may be thinking of the long-term infrastructure and investment grade benefits to the country as a whole, private producers are thinking about the increased revenue stream. The US is ready to buy up to 1 million bbl/day immediately. The increase may potentially reduce global oil prices, but Yukos (a private producer) estimates that it can easily export to the US at a price of as low as $19 a barrel. There are definite symbiotic interests for the Murmansk Oil Terminal and Pipeline project.

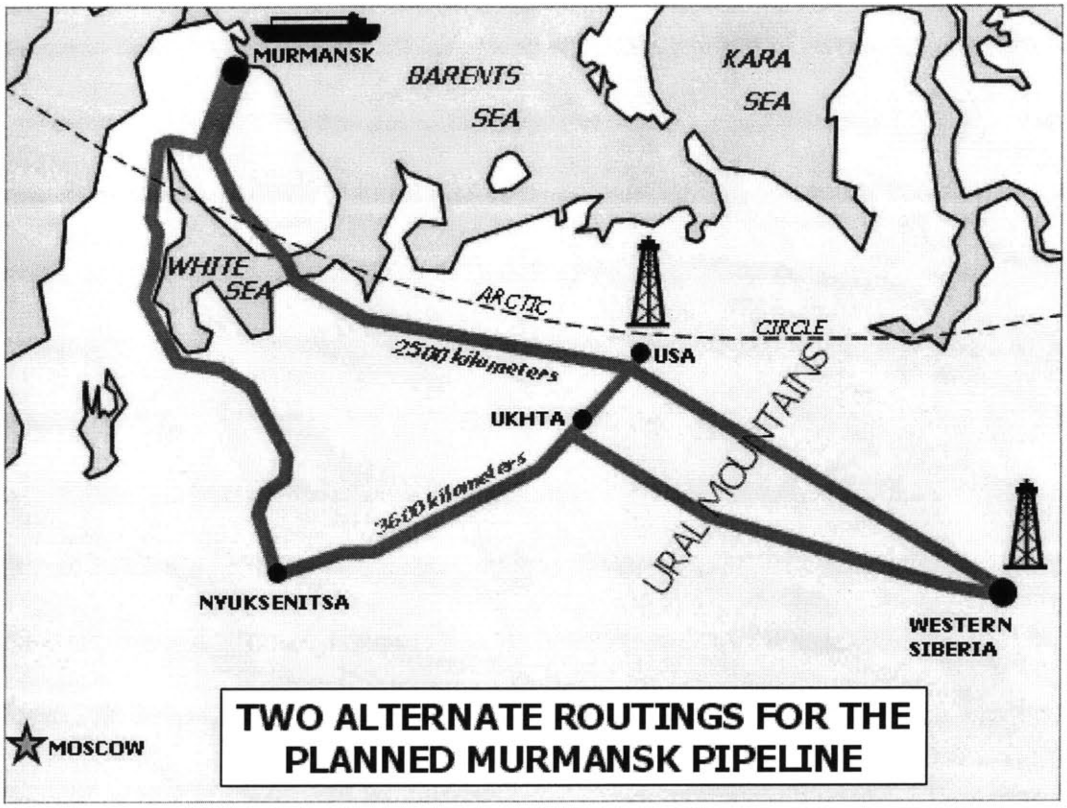
Proposal

The official idea for the Murmansk Oil Terminal and Pipeline was launched with a formal memorandum of understanding between four private Russian oil producers (Yukos Oil Company). Lukoil, Yukos, Sibneft, and Tyumen Oil Company launched the formal proposal on November 27, 2002, but the framework for the project had been laid well before then.

As it stands now there are two formal routes under consideration: a short route, and a long route. The shorter route is a sea bound route which begins in the oil fields of the West Siberian Basin, proceeds to Usa, and finally terminates at Murmansk via the White Sea. The pipeline would be a total of 1,560 miles and requires a capital outlay of $3.4 billion. The pipeline is expected to supply at least 1.6 million bbl/day initially and has an operating life of at least 20-30 years .

The longer route is a completely land bond route of 2,250 miles. It commences in the Western Siberian Basin, proceeds to Ukhta, on to Nyuksenica, and ends at Murmansk. The longer transportation route increases the capital outlay to an expected $4.5 billion and it too has an expected operating life of 20-30 years (Gorbachev). The added benefit to the longer route is that the pipeline would run through the Timan-Pechora oil field garnering access to an additional EUR 14 billion barrels of oil.

Figure 11 – Routes from Western Siberia to Murmansk



Source: Yukos Oil Company

Timeline

According to estimates (both Russian and US players) the Murmansk Oil Terminal and Pipeline would follow the following timeline:

2003-2004: Feasibility study and investment cases are prepared

2004: Construction commences (including pipeline infrastructure, as well as deep-water terminal in Murmansk)

2007: Pipeline begins full operations

Although, full completion is not expected until 2007, the consortium estimates that some operations can begin as early as 2005. The project initially expects to export 584 million barrels a year (or 1.6 million bbl/day) with a peak capacity of 876 million barrels a year (or 2.4 million bbl/day).

Given a 30 year useful life, at 1.6 million bbl/day exported, the project will tap less than 10% of the West Siberian EUR for export, or only 23% of its discovered and developed oil fields (see table 3).

Murmansk to US

While it certainly is important to have the proper infrastructure in place in West Siberia as well as from West Siberia to Murmansk, it is equally, if not more, important to have to have an infrastructure that can carry the oil from Murmansk to the United States. This infrastructure, of course, includes the terminal at Murmansk itself, but also includes the systemic analysis of the processes that transport the oil across the seas. The costs and processes involving the deep-water terminal, loading, sea transportation, tariffs, and unloading must be understood and analyzed.

In order to achieve the stated goal of both Russia and the US, that is, to have Russia eventually supply 10-15% of US oil imports, the costs surrounding the proposal must be understood. As mentioned, the total capital costs for the proposal range in the $3.4 to $4.5 billion range with a useful life of at least 30 years. Along with those capital costs, the operating costs associated with the regular transport of the oil must be examined to ascertain feasibility. Clearly, as far as infrastructure feasibility is concerned, both Russian and US private and government entities have determined that the project is viable.

Pipeline Transportation Costs

As mentioned, there exist two possible alternatives oil transport from West Siberia to Murmansk via the use of the pipeline: the short route and the long route. According to New Energy Analytics (NEA), an energy consulting firm, expected tariffs are $2.70 per barrel for the short route and $3.30 per barrel for the longer route. These tariff numbers are, of course, preliminary and would be charged by the Russian government for seceding monopoly control of the Russian oil transportation pipelines. As it stands now, Transneft, the state-run oil transportation monopoly, has complete control of all the pipelines in Russia. Private Russian oil companies currently pay tariffs for use of the pipelines. The above tariff rates assume that despite the fact that private companies will build and own the West Siberia-Murmansk pipeline, the government will still expect some sort of reparation for its use and for relinquishing control over its monopoly.

Loading

Once the oil has been transported via the pipeline from West Siberia to Murmansk, there will be costs associated with transferring the oil from the pipeline to the oil tankers, i.e., loading fees. The new oil terminal at Murmansk will be a deep-water oil terminal that can handle large tankers, such as a VLCC, of up to 300,000 DWT. Given the large size of these tankers, loading costs are estimated at around $0.30 per barrel at a maximum.

Sea Transportation

The final phase of the oil transportation puzzle from West Siberia to the US is the cost of sea transportation. As mentioned, tanker spot rates are heavily dependent on oil supply and demand. Specifically, throughout the last decade or so (see figure 1) rates have tracked OPEC production. Since the Murmansk Oil Terminal and Pipeline is expected to increase production, oil tanker rates are not expected to increase substantially. Of course, OPEC can cut its production levels and that might put slight upward pressure on tanker rates, but generally, the rates are not expected to deviate much higher than $1 per barrel. Also, the total distance from Murmansk to the East Coast of the United States is only 5,800 miles as opposed to current distance from the Persian Gulf of 12, 800 miles. The sea transportation costs are substantially lower via the Murmansk Oil Terminal and Pipeline proposal.

Figure 12 – Sea Routes to US

Source: New Energy Analytics

Table 4 – Murmansk Costs

Murmansk Oil Terminal Revenues and Costs per Barrel				
	Short Route		**Long Route**	
Revenues	$	19.00	$	19.00
Oil Lifting Costs	$	(2.00)	$	(4.00)
Pipeline Transportation Costs	$	(2.70)	$	(3.30)
Loading Costs	$	(0.30)	$	(0.30)
Marine Transportation Costs	$	(1.00)	$	(1.00)
Profit per Barrel	$	13.00	$	10.40

Source: New Energy Analytics, Yukos Oil Company

As noted in the table above, even at a sale price of $19 per barrel, which is far below current market prices, the Murmansk Oil Terminal and Pipeline proposal is hugely profitable to the Russian producers. The benefit to the US is reduced oil prices and a diversified supplier base.

CHAPTER 6 – CONCLUSION

The transportation and energy sectors are completely intertwined because producers of energy must transport that energy to consumers of energy. The importance of this intersection is underscored by the fact that the largest energy producers are not the largest energy consumers. Therefore, this energy, or oil, must traverse from the producers to the consumers.

The United States is the largest consumer of oil in the world. One of the many risks is its need for a diverse set of providers and diverse transportation nodes to minimize the impact of producer disruptions. For instance, the US has strategic reserves to ensure that supply outages are minimized as well as concerted efforts to diversify suppliers other than Persian Gulf (i.e., OPEC) providers. The US relies on Canada, Venezuela, and Mexico as providers.

Producers, namely Russia, are also constantly seeking ways to increase oil production and revenues. In doing so, they make concerted efforts to devise and evaluate alternative transportation nodes which allow their oil to reach the greatest mass of consumers.

A natural offshoot of the parallel goals of both producers and consumers is a proposal such as the Murmansk Oil Terminal and Pipeline. It is a means of providing Russian oil to the United States which would prove beneficial to both parties. The US can continue diversifying its provider risk by adding an additional supplier. Russia can increase exports and thus oil revenue by providing oil to a massive consumer of oil. An added benefit for the Russians is the infrastructure upgrades (both intra- and intercontinental) to the existing oil transportation nodes.

The Murmansk Oil Terminal and Pipeline proposal is hugely beneficial to both parties. That is not to say that it is without risk. The capital outlay and the time horizon prove very risky. For instance, capital costs required may take years to justify the returns. Also, given the time horizon of approximately 5 years for the project, the oil economic landscape can change enough that the project is no longer necessary. That is, alternative sources of energy or transportation methods might be devised that make the Murmansk project null and void

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