

AN ANALYSIS OF VARIABLES AFFECTING
RUSSIA'S FUTURE IN THE
RENEWABLE ENERGY
MARKET

by

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INTRODUCTION

The purpose of this paper is to provide an overview that identifies different approaches that allow Russia to become a world leader in renewable energy technology and present options within each different approach. The paper presents the obstacles Russia needs to overcome to accomplish this goal, identifying the preferable option in doing so. A policy analysis approach is employed; that is, the paper will examine the various alternative policies and select which will be most likely to achieve the goal of becoming a giant in the renewable energy technology, ultimately advocating for a single policy after completion of the analysis (Yang, 2006).

In determining a strategy for Russia to become a leader in renewable energy technology, three different approaches are identified: an external approach and an internal approach which is subdivided into an incremental category and an accelerated category. The external approach focuses on looking into potential partner nations to help Russia achieve this goal, specifically China and Germany. The external approach also examines the possibility of foreign direct investment and looks at how Russia's recent entry into the World Trade Organization could affect its ability to make strides in the area of renewable technology. The two internal approaches focus on methods that allow Russia to become a leader in renewable energy with little-to-no outside funding. The internal incremental approach proposes a plan for building expertise within the field of renewables, focusing on infrastructure and industry that already exists within Russia. In contrast, the internal accelerated approach adopts a more innovative bent, proposing greater use of natural resources and more job creation within the energy sector.

However, each approach is tested by three major obstacles that hinder Russia's chances at achieving the goal of renewable energy technology leadership. The first great obstacle is Russia's tendency to distrust foreign nations, especially major Western powers (Mankoff, 2011). This distrust can cause, and has caused, Russia's international business relations to turn sour and fail. The second obstacle is Russia's weak economy and the overall frailty of the world economy in general, which could cause issues in generating the capital necessary for pushing Russia forward in the field of renewable energy technology (Douhovnikoff & Henry, 2008). The third obstacle is Russia's ever-present desire to be a world power which affects Russia's decision-making process in almost all political fields, sometimes to the point that it causes Russia to act irrationally (Mankoff, 2011).

There are several motivators for undertaking this advancement in the field of renewable energy technology: Russia will not simply take on the reforms listed in this work for the good of the planet. Russia remains the primary exporter of oil and natural gas in the Eastern world, continuing to lead every other nation in natural gas production by a significant margin (CIA, 2012). Yet, due to this abundance of non-renewable energy sources, Russia suffers from what is known as the resource curse, the paradoxical fact that countries with a plethora of natural resources, especially non-renewables, tend to suffer from slow economic growth (Sachs & Warner, 1995). In addition, as a major exporter of oil, Russia needs to take into account the Hubbert curve, the theory first purported by Dr. M. K. Hubbert that global oil reserves will peak and sharply decline, expected to occur as soon as the year 2020 (Ballard et al., 2003). By incorporating renewable resources into its already vast energy market, Russia has the potential both to

overcome the hindrance caused by both the resource curse and the Hubbert curve. In addition, investing in renewables will allow Russia total dominance over the energy market and allow it to present itself as a technologically forward-thinking nation (Gleason, 2009). Becoming a world leader in renewable energy technology will catapult Russia back to the forefront of environmental discussion and debate worldwide, a position which greatly benefitted Russia during the *perestroika* era and could return great prestige to Russia in the present day (Yanitsky, 2009).

LITERATURE REVIEW

In structuring such an analysis, it is important to consider the different factors that will affect the ultimate policy choice that this paper advocates. As a starting point, no policy making occurs in a vacuum. Russia's choices arise within a domestic and international environment that is in some ways specific to Russia itself. Jeffrey Mankoff's *Russian Foreign Policy: The Return of Great Power Politics* provides a thorough outline of general background information on how Russian politics operate both internally and internationally, detailing Russia's relationships with major world nations and explaining Russia's energy politics in the former Soviet states and most of Europe.

After examining the specific political background that drives and motivates Russia to opt for specific policy choices, one must turn to the role environmental issues and environmental activism play in contemporary Russia. For example, Russia has noticeably suffered from global warming: winter temperatures in Siberia have risen an average of 7°C since 1960 (Douhovnikoff & Henry, 2008). However, the government has done little to mitigate its effects: pollution continues to be widespread in both rural and urban areas and in many of Russia's rivers, and the continued push for oil shows how the

Duma prioritizes continual economic growth over environmental concerns (Douhovnikoff & Henry, 2008). Russian citizens as a whole believe the government should address environmental issues; however, Russian environmental activism has plummeted since the 1980s (Douhovnikoff & Henry, 2008). Shortly following the Chernobyl incident, environmental activism and concerns became major talking points for both the Russian government and the Russian citizens (Yanitsky, 2009). However, since the fall of the Soviet Union and especially after the global economic crisis of 2008, those striving for environmental change have struggled, suffering from a lack of government funding and especially from a lack of government trust (Henry, 2010). Environmental activists whose works run counter to the overall goals of the government have found themselves raided and arrested, perpetuating a lack of trust from both the government and their fellow Russians (Henry, 2010).

However, one must remember that Russia is perfectly capable of making strides in the field of renewable energy technology. Due to the country's size, Russia has a bevy of natural resources at its disposal, including widespread forests, geothermal resources, an extensive river network, and a sizeable amount of space for installing wind turbines and solar panels (Moore & Smith, 2007). Russian energy analysts have already made plans to incorporate renewable technologies into their overall power network and power production; however, due to these widely available renewable resources, Russia has great potential to go further than the already-existing plan for Russia's power production (Volkov et al, 2010). For example, Russia's vast river network can generate hydropower and Russia could look to the Northeast to capitalize on stores of geothermal energy (Moore & Smith, 2007). In addition, Russia already produces technology such as wind

turbines, solar panels, and solar-powered water heaters domestically (Martinot, 1998). Russia could capitalize on this already-extant technology to upgrade existing heating technology, make stronger use of its renewable resources, and create a more energy-efficient nation as a whole (Martinot, 1998).

Additionally, it must be made clear that nuclear energy is not considered a renewable resource; though Russia has made significant strides in the fields of nuclear technology, the highly enriched uranium produced by generating nuclear energy is highly toxic and difficult to dispose of (Sarsikov & Gottemoller, 2009). Though the spent fuel rods can be reused, most nations are wary of doing so due to the fact that the byproducts of nuclear energy are used to craft nuclear weapons; thus, the highly enriched uranium and plutonium from nuclear power plants is usually sealed in airtight containers and buried (Goldwin & Kalicki, 2005). Thus, the byproducts of nuclear energy are not reused, making nuclear energy an alternative resource rather than a renewable resource.

APPROACHES

Internal Incremental

The internal incremental approach focuses on slowly increasing Russia's renewable energy technologies and capabilities, building on already existing industry and infrastructure. The proposals most applicable to this approach allow Russia to move towards the goal of world leadership in renewable energy technology without suffering from any heavy economic burden. This approach does not suggest altering any plans Russia has already created to move towards greater use of renewable energy; rather, the internal incremental approach should be seen as an addition to any proposals Russia already has on paper (Volkov, et al., 2010).

One renewable resource that Russia can most easily utilize is its widespread forestry: Russia contains 22% of the world's forests (Russian Academy of Sciences, 2001). Russia already reaps the benefits of this resource quite regularly, as it already supplies a steady stream of paper products to both Europe and China (OECD, 2008). The remaining biological products from the paper making process could be saved and recycled as available fuel for the district heating systems present in the majority of large Russian cities (Moore & Smith, 2007). One advantage in using leftover products from paper production is that recycling these products does not require Russia to do any further harvesting of its forests. Russian forestry absorbs around 15% of the world's carbon dioxide, marking the forests as a vital tool to combat global warming and climate change (Walsh, 2003). Russian district heating systems would especially benefit from leftover paper products: these systems operate by distributing heat throughout a building from one centralized location and receive their heat from a cogeneration power plant, a plant that generates both electricity and heat (Danfoss, 2013). Cogeneration plants can easily be converted to run on biomass, excess growth and material harvested from plants, and this conversion is possible both in large cities and small towns and especially in northeastern Russia, in regions such as Leningrad and Novgorod (Martinot, 1998). In addition, if Russia cannot meet the demand for heat simply by using biomass, the converted district heating systems should also be able to rely on and process the 10 million tons of sewage that Russia produces annually for heat (Moore & Smith, 2007).

Russia also has great potential to improve its solar energy capabilities without great economic investment or disruption of already existing production. Making good use of solar energy is not a foreign concept to Russia: the nation is already working on

installing the country's first major solar power plan in the Chelyabinsk region, and Russian factories readily produce solar cells (Energysafe, 2012) (Moore & Smith, 2007). If Russia can implement available solar technologies on a small scale in major cities, energy produced from these solar cells can serve as an alternative method to heat water during the summer months.

In addition to making greater use of its readily available biomass and solar power, Russia can also improve its energy efficiency simply by improving various systems that have been in place for years. Returning to the example of district heating systems, Russia can reduce the amount of energy necessary to run these systems by upgrading their valves and heat meters at both the building and apartment level and by redoing hot-water pipe and heat-pipe insulation (Martinot, 1998). Russia need not turn outward or create any new factories to install these reforms: all the necessary technologies are already readily available inside the country, from new valves and pre-insulated piping to solar photovoltaic cells (Martinot, 1998).

In the transportation sector, Russia can push advertising and sales of electric cars produced by various car manufacturers, as Russia largely imports most of its motor vehicles since most Russians prefer foreign models to their own domestically produced automobiles (Kuboniwa, 2009). Mitigating emissions produced by cars that run off of gasoline will help improve Russian air quality, something that has worried the Russian government for over sixty years and also demonstrate Russia's commitment to capitalizing on green technology, both that which is imported and that which is produced at home (Kelley, 1976). Russia could especially focus on increasing imports of hybrid

vehicles from Japan, a country with which Russia has already established a strong automobile import partnership (Kuboniwa, 2009).

Internal Accelerated

In contrast to the internal incremental approach, the internal accelerated approach centers around creating new power plants and job in the renewable energy sector with the goal of stimulating Russia's economy. Rather than slowly build Russia's renewable capabilities, the internal accelerated approach encourages innovation and quickly-enacted changes. Though this approach will not change any specific proposals in place for new renewable technology, the internal accelerated approach will broadly alter current plans by pushing harder for new technology and increasing monetary investment in the renewable sector beyond current paltry levels (Energysafe, 2012).

Job creation will serve as the major goal for the internal accelerated approach. The Russian economy, though far stronger than it has been in the past, is still not on par with other major world economies in regards to GDP (IMF, 2008). Environmentalism and economic stimulus have already clashed in Russia; outdated factories that emit pollutants, originally shut down due to environmental concerns, have been reopened to provide much needed jobs (Sangha, 2010). By adding jobs in the renewable energy sector, Russia can help resolve the issue of friction between environmentalism and economics. Many of these jobs will come from staffing new power plants, such as the fully solar plant under construction in Chelyabinsk or new plants designed to harness geothermal energy in Kamchatka (Energysafe, 2012) (Svalova, 2003). Investment in Chelyabinsk would be especially welcome following the recent damage to the region caused by a comet explosion. Other jobs will arise upon constructing new power plants,

such as capitalizing on possibilities for wind energy in the Northern Caucasus mountains, Leningrad, Kaliningrad, Stavropol, Krasnodar, and Volgograd (Martinot, 1998). Russia also has the possibility of creating jobs specifically designed for harvesting biomass from the vast network of Siberian forests, though convincing Russians to move to the unpleasant Siberian region will not be an easy task (Douhovnikoff & Henry, 2008). In short, there are ample opportunities for creation of new jobs across all regions of Russia, from the Far West to the Far East.

As mentioned, the internal accelerated approach will create many new jobs in order to staff power plants and other technology that focuses specifically on harnessing renewable energy. Thus, the secondary goals of the internal accelerated approach are to push creation of new power plants and better harness Russia's vast natural resources. Of all its natural resources, Russia only currently harnesses hydropower at a competitive level, with the Sayano-Shushenskaya plant in Krasnoyarsk being the country's largest power plant; however, Russia does have plans in place to construct more large-scale hydropower plants in the Far East (Brown, 2005). In addition to hydropower, Russia could easily harness its vast stores of wind power via construction of new turbines along the coasts of the Barents Sea, the Kara Sea, and the Bering Sea using wind turbines that are already constructed in Russian factories (Brown, 2005) (Martinot, 1998). Russia should also focus heavily on exploiting its stores of geothermal energy in Omsk, Krasnodar Krai, Kaliningrad, and the Kamchatka/Kuril Islands, which have the potential to meet the energy needs for Kamchatka for the next 100 years without any supplemental energy source (Moore & Smith, 2007). Though slowly transitioning Russian energy systems to use biomass for energy is detailed in the internal incremental approach, the

internal accelerated approach also heavily encourages the use of biomass waste products to generate energy and advocates doing so *on an even larger scale*. Russia generates up to 15 billion tons of biomass each year, largely in non-urban areas; thus, biomass is the ideal resource to create economic benefits by creating new jobs and developing technology on a large scale to harness this resource (Moore & Smith, 2007).

Though all of the goals of the internal accelerated approach can be met, they will require implementation of additional economic policies with environmental aims in mind. Previous experience has shown that stimulating renewable energy by way of price premiums works poorly in Russia; thus, generating revenue to fund environmental projects must be incentive based (Energysafe, 2012). A viable option for Russia would be to institute a carbon tax to generate revenue by requiring additional payments from those large companies, small businesses, and individuals, who use carbon-based fuels beyond a certain level (Moore & Smith, 2007). To work alongside the carbon tax, Russia could introduce a system of tradable green credits, distributed based on how few fossil fuel emissions a company generates. These green credits would essentially transform renewable energy into a commodity, in which larger businesses can buy green credits accrued by smaller companies to offset the harshness of said large businesses' carbon tax to (Brown, 2005). Not only do the carbon tax and the green credits, known more familiarly as the cap-and-trade approach throughout the world, generate revenue for Russia to use in developing renewable technology, they also force Russian businesses to be conscious of their energy use, both carbon-based and renewable, and encourage businesses to work towards lowering their carbon-based energy use so that they do not have to forfeit a large portion of their profits to the carbon tax (Brown, 2005).

External

As previously stated, the external approaches focuses on turning outward to other nations to find funding for Russia's transition to renewable energy giant. Two nations in particular make particularly viable partners for Russia: Germany and China. Of all the countries in the European Union and indeed the Western Hemisphere, Germany is the nation that Russia has had the strongest and most amiable relationship with since the end of the Cold War, stemming initially from the rapport between Vladimir Putin and Gerhard Schröder and Putin's personal comfort of working in Germany, having long served in East Germany as a KGB officer (Mankoff, 2011). Though the relationship between Putin and Angela Merkel is not as strong as that of Putin and Schröder, the two continue to work well together and appreciate the economic and energy opportunities that each nation creates for the other (Rahr, 2007). Germany also creates an attractive prospect in that it already has significant energy ties to Russia: both domestic and industrial German infrastructure rely on Russian natural gas, a dependence that has only increased since the completion of Nord Stream, an undersea gas pipeline that directly connects Russia and Germany, in October of 2012 (Goldman, 2010). Therefore, Germany has both the strong personal ties and the already-existing energy connection to make it a viable partner nation for Russia. Russia's proposal of a renewable energy partnership appeals to Germany's already booming renewable energy sector; Germany's reliance on renewables continues to grow and the country's renewable energy sector is already among the most successful in the world (WorldWatch Institute, 2007). To form such a partnership, German energy firms and Russian energy firms would form a partnership that allows Germany to trade its renewable technology for a share in the energy sales

produced by said technology in Russia, both domestically and internationally.

Alternatively, though Russia should not need to threaten or coerce Germany into such a partnership, it does have the option to close the taps on its natural gas pipelines in order to force Germany's hand. However, this is not the recommended strategy, as it sets a poor precedent for Russia and Germany's potential renewable energy partnership.

Instead, if Germany and Russia cannot come to form a renewable energy partnership, Russia also has the option of forming a renewable energy partnership with China. The Russians generally view their international relationship with China as one of normalcy and neutrality, and China has long been pushing to use the Shanghai Cooperation Organization, formed in 2001, to create stronger economic ties and looser customs regulations between the SCO's partner nations (Mankoff, 2011). China's rapidly increasing population also creates an increasing demand for energy, a demand that can be filled by Russia's abundance of natural resources (Gleason, 2009). Thus, a Russo-Chinese renewable energy partnership would be one in which the Chinese exchanged capital for renewable energy, rather than the possibilities of a technology-sharing relationship like that of the Russo-German option. The Chinese would fund creation of renewable power plants, most likely additional hydropower plants, in exchange for a deep discount on the energy Russia produces at said plants. However, Russia is already wary of the vulnerability it could face by becoming China's primary supplier of natural resources, as Russia already supplies a good amount of natural resources to China (Gleason, 2009) (OECD, 2008). Chinese migrant workers who cross the Russian border to take jobs in Siberia also serve as a point of contention between the two nations

(Mankoff, 2011). Therefore, though a Russo-Chinese renewable energy partnership is possible, it should only be considered as an alternative to a Russo-German partnership.

Additionally, if both nations seem to present themselves as favorable candidates for renewable energy partnerships, Russia could elect to form a dual partnership with Germany and China, sharing technology and resources with both nations. Due to the fact that Germany has made greater advancements in renewable energy technology than China has, Russia would likely wish to purchase or barter for German technology while receiving investments from China (Worldwatch Institute, 2007). In turn, Russia would then provide discounted energy to both nations. However, the dual partnership complicates Russia's overall desire to completely dominate the European energy market, as giving both nations discounts undermines the overall profit generated by producing energy through renewable means (Goldman, 2010). Thus, though partnering with both nations allows Russia to make speedy progress in the field of renewable energy, it will hinder Russia's profit margin and dominance in the long run.

Regardless of whether Russia elects to partner with Germany, China, or both nations, a great deal of the partnership will focus around foreign direct investment. Compared to the other two nations, Russia's economy and GDP, though nowhere near as frail as it was in 1998, still pale in comparison to those of Germany and especially China (IMF, 2012). Russia will use this influx of capital to focus on altering already existing energy infrastructure and develop new power plants that specifically harness renewable technology, both of which will be further detailed later in this work. However, this foreign direct investment must be handled in such a way that neither the investing nation nor Russians, both the elite and the masses, become wary of the partnership (Auer, 2004)

(Rahr, 2007). Thus, it is important to stress that the funding comes directly from the German or Chinese government; the Russian populace greatly mistrusts NGOs (Douhovnikoff & Henry, 2008). It is also critical that the Russian government maintains a high level of transparency with its partner nation so that the environmental funds are not spent in some other sector (Henry, 2010). Lastly, in order for an international environmental partnership to thrive, the Russian government must always keep sight of the ultimate incentives: prestige and control over the European energy supply. History has shown that Russia makes a poor environmental partner without an outside motivator, but it has also shown that if another nation, Western or otherwise, plays to these motivators, Russia can be an excellent vessel for making significant environmental gains (Douhovnikoff & Henry, 2008).

In addition to the foreign direct investment an environmental partnership would provide, Russia will also greatly benefit from sharing technology with its partner nation, especially in the Russo-German scenario. Germany can already be considered a world leader in renewable energy technology; German scientists have done extensive research and developed methods for harnessing solar energy, wind energy, hydroelectric power, geothermal energy, biomass and biogas power (Wengenmayr & Bürke, 2008). For example, German researchers are exploring methods that would allow cheaper production of solar cells, such as printing the cells on ribbon silicon (Wengenmayr & Bürke, 2008). This silicon ribbon technology could be used to cheaply mass-produce solar cells for placement in Siberia. German advances in geothermal energy technology could also help Russia harness geothermal stores in the Far East, as well as the regions of Kaliningrad and Omsk, areas of the country which have previously suffered from a lack of funding to

exploit their geothermal stores (Moore & Smith, 2007). The Russo-Chinese relationship generates less potential for technology sharing; however, the two nations could benefit from one another's forays into the exploration of hydropower and biomass technology, areas both governments have already expressed interest in expanding (National Development and Reform Commission of the People's Republic of China, 2007) (Volkov et al., 2010). Regardless of which partnership Russia elects, it can easily share resources and technology with both countries due to the fact that all three nations are members of the World Trade Organization. Thus, procedural hurdles will not complicate trade regulations and negotiations in neither the Russo-German nor Russo-Chinese partnership.

Though each of these approaches contains some overlap and work towards the same goal, in the end they have distinct and different requirements for Russia. The internal incremental approach requires Russia to slowly restructure and build already existing renewable energy capabilities by using renewable resources leftover from other sectors of production and adapting Russian energy and heating systems with renewable technology already produced in Russia. The internal accelerated approach, though also centered domestically, requires Russia to push for greater production of renewable-based power plants, stronger capitalization of renewable resources, and implementation of a cap-and-trade system to generate revenue. Lastly, the external approach is the sole method that requires Russia to look beyond its borders and form a partnership with Germany or China to trade for renewable technology or obtain the funds to build it.

OBSTACLES

Distrust of Foreign Nations

Though all of the aforementioned approaches have potential to propel Russia to a position of renewable technology leadership, they will be forced to contend with three major obstacles to determine their actual viability. Russia's general distrust of foreign nations is the first factor that could hinder or outright deter pursuing leadership in the field of renewable energy. This distrust and suspicion mostly focuses on Western nations, specifically the United States; environmental activists in Russia have had the most difficulties gaining support when anti-American sentiments among Russians have been the strongest (Henry, 2010). Though the United States is not posed as a partner nation for Russia in the external approach, ingrained suspicion of Americans could affect the viability of turning to foreign powers for support depending on how those foreign powers deal with the United States on a daily basis. Many nations, including Germany, have close political ties with the United States, and many multinational corporations have a basis in the United States. Thus, how a nation acts in congruence with American politics or American-based business can lead Russia to become suspicious of that nation. Despite amelioration of Russo-American relations since the Obama presidency, around one-third of the Russian populace still regards the United States in a negative light, which may affect how the Russian people view a country that has strong ties to the United States (Mankoff, 2011). Furthermore, Putin's second presidency may also affect Russia's ability to interact with foreign nations, as Putin has generally espoused more nationalist sentiment than Medvedev did (Mankoff, 2011).

However, those who wish to invest in Russia often reciprocate the suspicion and mistrust with which Russia regards foreign and specifically Western nations. Though Russia's large market makes it a ripe candidate for foreign investors, Russia's weak banking system and unpredictable tax system can leave those who choose to invest in Russia feeling frustrated and confused about how their money is used (Ahrend, 2000). International investors are also dissuaded from turning towards Russia due to the Russian attitude towards foreign nations; many transnational investors who work to foster international cooperation in the market find themselves turning away from Russia as their possible Russian partners behave in a distant and suspicious manner during business transactions (Henry, 2010). Indeed, the erratic tax system and guarded Russian attitude have left German Chancellor Angela Merkel hopeful but suspicious in regards to investing in Russia, a factor which could greatly affect the success of the external approach (Rahr, 2007). In addition, Merkel also regards Russia warily due to her youth in Soviet-controlled East Germany (Rahr, 2007).

Weak Economy

Another major obstacle that hinders Russia from achieving leadership in renewable energy technology is its relatively feeble economy. The current Russian economy suffers from the legacy of the transition to a market system after the fall of the Soviet Union, which led to a massive economic collapse and depression in 1998 (Mankoff, 2011). Though Russia's economy has since recovered, it is by no means on par with the economies of other major world powers, and is still considered to be a developing or transitioning economy by most economic organizations and analysts (OECD, 2008). Russia's economy is considered the ninth-largest in the world; though

Russian GDP continues to grow at a rate of 3.4% per year, its GDP of \$1.9 trillion annually is greatly outstripped by other nations such as China, Germany, France, the United States, Brazil, and even Italy by a significant margin (CIA, 2013) (IMF, 2012). Thus, Russia does not possess the same economic capabilities that other countries do to undertake major policy reforms. Current Russian spending patterns also pose a problem for undergoing major policy reform: the Russian government continues to place heavy emphasis on military and defense spending, despite the fact that there are other major sectors that could greatly benefit from additional government funding (Henry, 2010). Putin has also shown a willingness to bypass opportunities for growth in the environmental sector in order to stimulate the Russian economy, a factor which may complicate the internal incremental approach in particular (Sangha, 2010).

However, the Russian economy has not been the only economy to suffer in recent years; many economies have experienced some sort of strain following the global economic crisis of 2008. The world's strongest economies all experienced a drop in percent GDP growth during this period, and some economies have yet to return their growth rate to pre-2008 levels, including the United States, Russia, and China (IMF, 2012). Lowered GDP rates have caused many nations, including Russia, to focus on their own internal growth; therefore, world powers such as Germany may not be as willing to lend funds for a project that takes place outside their borders. Though the world economy is beginning to recover, recovery is slow and not necessarily assured due to continued financial crises in countries such as Greece, Italy, and Spain. As these nations are a part of the European Union, Germany's priorities will likely remain with ensuring the EU's survival over lending capital to Russia (Rahr, 2007). Thus, though Germany has not

suffered as gravely as the rest of the world from the 2008 financial crisis, the nation may be wary of funding Russia's environmental projects due to their own internally-motivated goals (IMF, 2012). China, on the other hand, retains the second highest GDP worldwide and has shown that it is perfectly willing to take substantial risk in investing in foreign nations as it continues to invest in securing oil from Sudan and Nigeria (Hanson, 2008). Thus, foreign caution in international investing is more problematic for a Russo-German partnership than a Russo-Chinese partnership.

Desire to be a World Power

The final, but equally important obstacle that could hinder Russia's quest for leadership in renewable energy technology is the nation's desire to return to world power status. Russia still harbors resentment over its 'loss' of the Cold War and the loss of prestige and influence that followed the events of 1989 and 1990 (Mankoff, 2011). This resentment leads Russia to both consciously and subconsciously factor this desire into nearly every policy decision it makes, be that domestic or foreign; thus, Russia cannot be counted on to act rationally when making decisions. For example, Russia and Japan are still engaged in a bitter dispute over the true ownership of the Kuril Islands because Russia refuses to concede any territory; doing so might seemingly make Russia appear weak to the rest of the world, even though native Japanese call some of these islands home (RIA Novosti, 2012). The Russian government also has a tendency to forcibly silence individuals who protest the state, be they scientists or ordinary citizens, in order to preserve the appearance of a powerful centralized government for other international observers and allow government official to retain their positions (Auer, 2004).

However, Russia's aspirations to return to world power status could be both a hindrance and a boon in the pursuit of renewable technology leadership. During the height of the Soviet Union, from the 1960s onward and especially following the Chernobyl incident, both the Russian government and populace began to concern themselves with environmental preservation and activism, both domestic and international (Yanitsky, 2009). Environmental discussion filled both television screens and newspapers, and the Soviet government began laying plans to mitigate air pollution and experiment with hydropower as early as the late 1960s (Kelley, 1976). If the Russian government realizes that the desire to be at the forefront of global environmental debates coincided with the height of Soviet prestige, Russia could return to its lost environmental activism as yet another method of achieving world power status. Generating more energy from renewable sources would also help generate prestige, further cementing Russia's claim on the title of energy superpower (Goldman, 2010).

EVALUATION

Internal Incremental

Perhaps the greatest draw of the internal incremental approach is how easily it mitigates the first obstacle, Russia's distrust of foreign nations. Due to the small, gradual nature of the changes within the internal incremental approach, Russia should not need to rely on any outside nation for aid and supplies whatsoever. All of the available technologies needed for the internal incremental approach are already available and constructed within Russian borders, meaning Russia will not need to import any new equipment to undertake this approach (Martinot, 1998). Because this approach also focuses on upgrading already-existing technologies as well, especially in regards to the

district heating system, it is almost impossible to conceive that Russia would require any outside aid to achieve this task (Moore & Smith, 2007). Perhaps the only factor in the internal incremental approach that would be a point of contention would be recycling waste products from Russian paper mills; however, as these mills are largely owned by natives Russians, whether they be private companies or the Russian state itself, Russia does not have to worry about foreign powers when negotiating for the use of these paper waste products (Walsh, 2003).

The internal incremental approach also does not come into contention with the obstacle of the weak economy. As previously stated, since the majority of the necessary products for the internal incremental approach are produced within Russia, the country does not need to purchase these technologies from an outside source (Martinot, 1998). The internal incremental approach also resolves the problem of Russia's weak economy with its largely gradual nature. Russian factories need not produce a large amount of renewable technologies to fuel the internal incremental approach, as the necessary changes will take place at a slow but steady rate. Therefore, the internal incremental approach will not harm the economy, and, in the end, will actually benefit the economy slightly. The internal incremental approach also avoids encountering issues with the weak global economy for the same reasons it mitigates the first obstacle, the Russian distrust of foreign nations: Russia will not need to turn outward for any of these technologies, and thus will not encounter issues trying to make purchases from other countries that, due to a weak economy, have raised their prices to a point where Russia cannot feasibly purchase the goods necessary to this approach (Martinot, 1998) (IMF, 2013).

However, the internal incremental approach may run afoul of the final obstacle, Russia's ever-present desire to be a world power. The incremental changes proposed in the internal incremental approach does not directly hurt Russia's international prestige, nor do they run into conflict with any preceding environmental commitments Russia has made on a grand scale, such as Russian ratification of the Kyoto protocol and Russia's already strong hydropower network (Goldwin & Kalicki, 2005). However, the internal incremental approach does not launch Russia to the forefront of environmental debates as it was during the Gorbachev years; though commitment to the internal incremental approach would be seen as progressive, it would not launch Russia to international environmental leader status (Yanitsky, 2009). The internal incremental approach does not carry the weight and prestige of the other two approaches, and indeed could perhaps be seen by Russian environmental activists as satisficing, taking a small step towards environmental reform because the Russian state cannot resolve conflicting desires to undertake major environmental improvements and to continue prioritizing the revitalization of the Russian economy (Henry, 2010). Angering the environmental activists could cause the Russian government to have to deal with riots and protests, which, from a Russian standpoint, would hurt Russia's overall prestige (Mankoff, 2011).

Internal Accelerated

The internal accelerated approach may come into conflict with the first obstacle, Russia's distrust of foreign nations, but this is highly unlikely. Like the internal incremental approach, the internal accelerated approach focuses on undertaking environmental reform completely inside Russia, though on a larger and more immediate scale. Though Russia could benefit from generating funding through foreign direct

investors, such capital is not necessary for the internal accelerated approach to be successful. Russia's suspicion of foreign nations may come into play if the regime cannot find native Russian workers to fill the jobs generated by the internal accelerated approach. Chinese workers have a history of crossing the borders to take Russian jobs in Siberia that few Russians want, a point of contention between the two nations (Mankoff, 2011). However, the majority of the new jobs generated should not be located in Siberia; thus, stress in Russo-Chinese relations should not be an issue. Otherwise, Russia should not need to deal with foreign nations in creating stronger environmental technologies, for, as previously stated, Russia already produces necessary components, such as wind turbines, in native factories (Martinot, 1998).

Of the three approaches, the internal accelerated approach is the choice that, long-term, will bring the largest benefit to the Russian economy. Initially, funding the internal accelerated approach will require some careful balancing of funds on the part of the Russian government in order to fund new power plants; however, coming up with the necessary capital for these projects should be possible by implementing a carbon-tax system (Moore & Smith, 2007). Additionally, if absolutely necessary, Russia could reallocate a portion of its funds in the military sector if numbers of retained military personnel continue to fall (Mankoff, 2011). However, once the power plants are constructed and Russia as a whole makes the transition to greater use of renewable energy, the funds saved from using renewable sources of energy combined with additional renewable energy sales should revitalize the Russian economy as a whole (Martinot, 1998). Though the internal accelerated approach necessitates some self-

imposed economic restrictions in its first few years, due to the quickly implemented and growth-encouraging nature of the approach, the capital saved and the revenue generated by the internal accelerated approach will far outweigh its initial burden.

Unlike the internal incremental approach, the internal accelerated approach does a neat job of adding to Russia's international prestige, thus overcoming the issue of Russia's desire to return to world power status. Enacting a plan on such a rapid and grand scale will make the international community take notice of Russia, especially given Russia's already strong track record with keeping carbon emissions low (Stern, 2007). Having the eyes of the international community focused on its plans will help encourage Russia to follow through with the internal accelerated approach. By doing so, the international community will see that Russia can follow through on its commitments, environmental or otherwise (Goldwin & Kalicki, 2005). The internal accelerated approach will also satisfy Russian environmental activists and encourage them to place more trust in the government (Auer, 2004). This, in turn, will please Russian elites due to greater support from the Russian populace and thus, from the Russian perspective, increase Russian prestige. Lastly, from an economic standpoint, the internal accelerated approach will also help Russia increase international prestige as it further solidifies control on the European energy market by adding renewable energy to its already highly profitable stores of oil and natural gas (Goldman, 2010).

External

Of the three approaches, the external approach will have the hardest time reconciling Russia's distrust of foreign nations due to its heavy reliance on interaction with outside nations. Though Russia and Germany have had friendly relationships in

recent years, current German Chancellor Angela Merkel has been more inclined to support strong relations with the European Union rather than maintain close ties to Russia (Rahr, 2007). Russo-Chinese relations have remained somewhat neutral since the end of the Cold War in regards to energy, though Chinese immigrants stealing Russian jobs has been a point of contention (Mankoff, 2011). If Russia elects to pursue a dual partnership, balancing these foreign relations will be even more difficult, as Germany and China do not always agree on environmental and energy policy (OECD, 2008). Indeed, Germany could be considered the current world leader in renewable energy technology, while China remains under scrutiny from environmental activists due to its continued heavy reliance on coal (Worldwatch Institute, 2007) (National Development and Reform Commission of the People's Republic of China, 2007). In addition, Russia itself will have to make sure it deals openly and honestly with whatever business partners it chooses. Russia's history of poor and confusing business dealings has a tendency to dissuade investors, and the nation will have to elucidate how it chooses to use the technologies it purchases, trades for, or receives in order to foster a working international partnership (Ahrend, 2000). However, due to Russia's ingrained distrust of foreign nations, the Russian government may not be inclined to share such information with foreigners so openly; Russians do not tend to look back fondly on the *perestroika* and *glasnost* eras (Sixsmith, 2012). Thus, many factors at play cause the external approach to run afoul of the Russian tendency to view foreign nations with suspicion.

However, the external approach does fare better when it comes to the obstacle of the weak Russian and global economy. With both countries, Russia has the opportunity to engage in a trade relationship in order to foster an international environmental

partnership. In regards to the Russo-German relationship, Germany would share its more modernized renewable technologies with Russia in return for a share of the profits Russia reaps from the energy that these technologies generate (Rahr, 2007). Regarding the Russo-Chinese relationship, Russia and China would share natural resources and labor to work together on creating a major electric grid, powered by renewable sources, that links both nations (Gleason, 2009). Unless Russia opts to directly purchase technologies directly from Germany, Russia suffers very little financial strain in undertaking the external approach. In fact, if Russia's partner nation elects to provide funds in addition to labor and technology, Russia may actually see significant economic gain from partnering with a foreign nation (Ahrend, 2000). Russia is also quite fortunate in that its two potential partner nations, Germany and China, still have very strong economies in a time of global economic hardship; China has the second-strongest economy worldwide, and Germany has the strongest economy out of all the nations in the European Union (IMF, 2013). The external approach should not hinder Russia's economy unless the country chooses to purchase labor or technology, which could potentially place Russia under a great deal of debt.

The external approach could also help Russia make strides in its desire to be a world power. By joining forces with another nation in its mission to expand its renewable energy capabilities, Russia presents itself as a forward-thinking nation with a strong propensity for international cooperation. However, Russia must also consider how it presents the partnership, especially the Russo-Chinese partnership, to other nations in order to boost its international prestige. Though a Russo-Chinese effort to grow renewable energy technologies would be genuine effort, because it is a partnership

between two BRIC countries, countries that are generally considered to have weak environmental policy, other nations may look at the partnership as ineffective at best and laughable at worst (OECD, 2008). In addition, Russia will have to present the Russo-German partnership as one of equal cooperation, not one of Russian dependency on German technologies and aid. Being the subject of ridicule or appearing weak and dependent would hurt Russia's self-image and discourage the nation from continuing the partnership (Mankoff, 2011). The dual partnership option does benefit Russia's international interests in that it makes the nation's desire to grow its renewable energy capacity genuine and, additionally, shows that Russia is willing to work with two very different nations to do so. However, like the nature of Russia's desire to be a world power, the external approach could either be a boon or a burden to Russia's international image and prestige.

CONCLUSION

The purpose of this paper has been to examine different broad-based approaches that will allow Russia to become a leader in renewable energy technology, present major obstacles that could hinder this goal, and then evaluate the outlined approaches against those obstacles. In doing so, the paper has presented three approaches: the internal incremental approach, in which Russia gradually adapts already-existing technologies to become more environmentally friendly and renewable-based; the internal accelerated approach, in which Russia spurs renewable production by building more renewable resource-based power plants and utilizing more of Russia's many natural resources; and the external approach, in which Russia creates a partnership with one or two foreign nations to foster growth in the renewable technology sector. In turn, the paper has also

identified three major obstacles that encumber Russia's chances to become a world leader in renewable energy technology: Russia's distrust of foreign nations, the weak Russian and global economies, and Russia's desire to be a world power. Lastly, the paper has analyzed each approach in light of these obstacles and will now present the preferable approach for Russia to select.

Of all the approaches, the internal accelerated approach best resolves all three of the obstacles presented in the work. As previously discussed, this approach can benefit from but does not necessitate use of foreign labor, technology, or capital, as most of the technologies needed for this approach are already produced in Russia (Martinot, 1998). By pushing to create new power plants, the internal accelerated approach, due to its swift nature, will benefit the Russian economy strongly over time by reducing power costs at a fairly fast rate (Energysafe, 2012). The internal accelerated approach also adds to Russia's international prestige by presenting the nation as forward-thinking and innovative, helping resolve Russia's desire to be a world power.

Thus, of the three, the internal accelerated approach does the strongest job accounting for the three major obstacles. The internal incremental approach does ameliorate the problems of Russia's distrust of foreign nations and the weak Russian economy, thanks to its gradual nature. However, this same slow and steady nature does little for adding to Russia's international prestige. The external approach suffers major contention with Russia's distrust of foreign nations due to major reliance on outside aid, and has the potential to run into issues with Russia's desire to be a world power depending on how the renewable energy partnerships are presented to and viewed by the

international community. Thus, though the other two approaches remain viable, they encounter more issues with the obstacles than the internal accelerated approach.

Lastly, of the three approaches, the internal accelerated approach is also preferable because it best resolves Russia's ultimate motivators for undertaking major renewable energy reform: the desire for total dominance over the European energy market. By independently creating additional sources of energy for both domestic energy needs and foreign purchase, Russia will ensure that it retains control over the energy needs of its European, and some Asian, customers (Goldman, 2010). Greater creation of renewable energy will also help Russia in avoiding the aforementioned resource curse and give Russia greater independence in the international trade market (Sachs & Warner, 1995). Thus, the internal accelerated approach fuels Russia's desire to be a world power in two separate ways: not only does it present Russia as an innovative nation and environmentally forward, as it was during the 1980s, it also adds to Russia's status as an energy superpower (Douhovnikoff & Henry, 2008) (Goldman, 2010). At the core, striving to become a leader in renewable energy technology paints Russia favorably in the eyes of the international community and greatly benefits the Russian economy, goals that are not entirely altruistic but benefit the global environment nonetheless.

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ABSTRACT

This study focuses on how Russia can take steps to become a world leader in renewable energy technology and production. Specifically, the paper presents three approaches for Russia to achieve this goal: an external approach which brings in foreign investors, an internal accelerated approach in which Russia slowly adapts existing technology to become more energy efficient, and an internal accelerated approach in which Russia focuses on building renewable-based power plants and creating a cap-and-trade system. The work then presents three major obstacles to this goal and evaluates each approach in light of these obstacles, which are Russia's distrust of foreign nations, the weak Russian and global economy, and Russia's desire to be a world power. Upon completing this evaluation, the study determines that the internal accelerated approach best adapts to the three obstacles, and thus is selected as the optimal approach for Russia to make major strides in renewable energy technology.