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# Redirect the Dominoes:
# Fossil Fuel Dependency with an Alternative Future

It is amazing how the world can be reduced to games, the sort with no clear winners except those who write the rulebook. In 1973 the Yom Kippur War commenced as Egypt and Syria launched an offensive strike against Israel on the Jewish holy day (Flavin, C., & Lenssen, N., 1994). Bombs carved deep religious wounds, drew political blood enough to fill the Red Sea, and knocked fate's line of dominoes into a messy pile. In an attempt to comprehend why things went so wrong, scholars could spend a lifetime putting the pieces back together. However, that is a task we shall leave for them. The purpose of this paper then is not to explain the justifications of war, but to play a simple game of collisions and chain reactions. One domino labeled "Yom Kippur, 1973" was instrumental to knocking down "Energy Crisis, 1973."

When war broke out President Nixon decided it was prudent to back Israel with weapons and supplies, a move which would enrage the "Organization of Arab Petroleum Exporting Countries" (OAPEC). In response, this Middle Eastern coalition enacted an oil embargo against the United States and the Netherlands (Flavin, C., & Lenssen, N., 1994). With oil supplies strangled, the United States energy sector suffered price spikes and instability (Flavin, C., & Lenssen, N., 1994). Oil prices rose from three dollars a barrel to twelve. Shortages were vast, lines at gas stations were daunting, and our nation was exposed to a dependence-ridden reality. In the shadow of this disaster environmentalism

flourished. People everywhere recognized addiction to fossil fuels as a dangerous relationship, hurting both the environment and our energy stability (Flavin, C., & Lenssen, N., 1994). Then, just as the pieces were set for solution, the crisis passed. Fervor in alternative energy steadily dampened. Since then, some documentaries were made, a few governmental departments were organized, and nations congregated for several "climate-rulebook" summits to propose mirage-solutions, namely Kyoto 1997, Copenhagen 2010, and Durban 2011 (Helm, D., 2012). It has been four decades since Yom Kippur, and still no meaningful reductions to our fossil fuel dependency or to global carbon emissions have materialized (Helm, D., 2012). What's more, no one is perfectly sure where the dominoes will fall next.

Any climatologist frozen cryogenically by the government in 1973 would wake with a shock, finding negligible results in carbon emission reduction. One should inform our test subject that temperatures are slightly warmer in the new millennium, so sun-screen may play a revitalized role in his life. Additionally, someone would have to admit to the recently-thawed-climatologist that our love affair with fossil fuels is as passionate as ever. In 2014 a majority of the U.S. energy consumption needs were met by fossils fuels, a figure of 81% (U.S. Energy Information Administration). Likewise, 67% of our nations' electricity generation is powered by fossil fuels as well (U.S. Energy Information Administration).

Regardless of what lessons we should have learned, these numbers show a stubborn adherence toward fossil fuels. It is hard to let go, even with the calamitous effects shouldered by our climates, ecosystems, and polar ice caps. Even in spite of understanding that fossil fuels are a non-renewable resource, capable of vanishing within

a hundred years, we refuse to leap toward change (Nersesian, R. L., 2010). Finally, with a significant portion of consumption traceable to sources abroad, we still enjoy that adrenaline rush of possible oily international conflict (Armaroli, N., & Balzani, V., 2011).

To summarize, our energy consumption is *still* like a Jenga tower, *still* threatening to collapse on us in the coming decades. No matter how careful we are about which sites we extract fossil fuels from, the structure will someday be unsound. Therefore, this paper proposes the following resolution: **The United States should *urgently* reduce Fossil Fuel consumption and production, in coordination with global efforts, while simultaneously increasing funds, research, development, and implementation of Alternative Energy.** The goal is to rid ourselves of fossil fuel dependency and create a sustainable future: environmentally, economically, and politically. Let us end the games played by big oil and international players, and control our own fate once more.

In the bustle of everyday life, it can be easy to write off fossil fuel dependence as an exaggerated issue. Daily scenarios of homework, business reports, and "first-world citizen" schedules distract us from certain questions. One of those questions is, "what happens when I drive my car, switch on my lights, or jack up the heat every winter?" The answer is that we become a statistic. Specifically, we contribute to the United States' 19% share of world energy consumption, despite only holding 5% of the world's population (Komor, Paul, and Andrew Moyad, 1997). When we press our car's gas petal, we help the United States burn 19.11 million barrels of oil a day (U.S. Energy Information Administration). Flicking a light switch activates energy produced by coal firing plants—sources of the dirtiest of all current air pollutants—to deliver 39% of our

electricity (U.S. Energy Information Administration) (Helm, D., 2012). As the holidays roll around we join others in the peak season of natural gas consumption, representing 18% of total US energy consumption annually (U.S. Energy Information Administration). Yet, it can be easy to forget what happens when we burn fossil fuels. What follows is a reminder.

Fossil fuel consumption releases Carbon Dioxide (CO2) emissions into the atmosphere, which accumulate until processed by natural cycles. These emissions create what is known as the "greenhouse" effect, in which sunlight is trapped within our atmosphere at rates higher than natural (Grubb, M., 1991). This problem arose well after the Industrial Revolution as CO2 emissions outpaced plant and oceanic absorption (National Geographic Society). What we're left with is a runaway cycle precipitating quickly into "Climate Change," a process *at least* 2,500 scientists across 130 nations unanimously agree upon. Their consensus also points to the obvious culprits, those being coal, oil, and natural gas (O'Driscoll, Patrick, and Dan Vergano, 2007).

Thus far into our journey, humans have espoused well over 300 gigatons of carbon into the atmosphere (Goswami, D. Y, and Kreith, F., 2007). This measurement doesn't mean much at first glimpse, so perspective is needed. Before the Industrial Revolution the world had a CO2 atmospheric concentration of 275 parts-per-million (ppm) (Helm, D., 2012). Today, we nudge toward 400ppm of atmospheric CO2, an estimated 1-1/2 times higher than pre-Industrialization levels (Helm, D., 2012). Still, measurements don't really convey the seriousness of our carbon emissions. With almost 400ppm in the air, and 3ppm added annually, we are already seeing a kaleidoscope of environmental ramifications (Helm, D., 2012).

According to recent reports by the Intergovernmental Panel on Climate Change (IPCC), the UN, and the United States Department of Agriculture (USDA), climate change personifies itself as increased drought and flood rates, shrinking glaciers, rising sea levels, severe weather patterns, habitat and land degradation, desertification (particularly in Sub-Saharan Africa, where 485 million people risk to be affected), and as a possible factor in bio-diversity extinction rates (*1000 times* higher than natural, to be approximate) (Vidal, J., 2011) (O'Driscoll, Patrick, and Dan Vergano, 2007) (Reich, P. F., et al). Each adversity listed is concurrent with today's atmospheric measurements, with potential to become far worse. In fact, with a projected population of 9.2 billion people by 2050, and its inherently enormous energy demand, emissions are *guaranteed* to multiply if alternative energy is not the dominate energy source (Armaroli, N., & Balzani, V., 2011).

Picture something with me...turn the clock forward! In a decade from now we will easily surpass 400ppm; those aforementioned adversities intensify with a global temperature increase of 2 degrees Celsius (Pascual, C., & Elkind, J., 2010). By 2030 our total carbon emissions could reach 1000 gigatons, three times today's total (Goswami, D. Y, and Kreith, F., 2007). The consequences are unimaginable—but spin the clock hands further—watch our coal stacks keep churning! By 2050 the global temperature rises by 3 degrees Celsius. Those wealthy enough to migrate will head north to escape the cascading disaster. Finally, due to tremendous carbon emissions and environmental chain reactions (such as methane released from melted polar ice caps), by 2100 we'll observe a 6 degree Celsius global increase (Helm, D., 2012). Our journey ends here, less than a hundred years after 2015. If we could look upon that distant world in a glass elevator, its

ruins would stretch far below us. Humanity would have experienced events akin to disaster films, and incessant warfare and starvation over scarce resources would have consumed us (Finn, E., 2013).

Our destructive future is sealed only by fossil fuel consumption on a massive scale. This promise is already ensured though, as inevitable population growth will propagate exponential demand increases. Upward demand trends are further solidified by the likelihood of developing nations industrializing in the near future (Helm, D., 2012). Also, our dismal progress with alternative energy combined with 100 years worth of remaining fossil fuel reserves makes for a queasy prescription (Nersesian, R. L., 2010). Reality has already knocked in some places though, so time travel is unnecessary to see the blemish of humanity's fossil fuel dependence. Suffering is already at our doorstep, whether we wish to see it or not. With each moment we ignore it, another domino is knocked over.

Today, 702 million people live in extreme poverty around the world, equivalent to 9.6% of the entire population (Anderson, M., 2015). Alterations in the world's fabric impact the destitute most severely, as their lack of socio-economic resources inhibits protection from the crossfire. Life is hard for those who can barely scrape by, and it only takes one drought to starve a destitute family to death. This is troubling considering a recent report published by the World Bank. It predicts an *additional* 100 million people will be thrown into extreme poverty by the effects of carbon emissions (Anderson, M., 2015). Climate change has led directly to natural disasters, crop failures, higher food prices, and the spread of diseases, with those dynamics forecasted to intensify for the foreseeable future (Anderson, M., 2015). For those in poor regions, crop rotations and

reliance on consistent weather has created a delicate agreement with nature. Human pollution has indirectly shattered this balance, with the US playing a huge role.

In light of other events, this should not be as surprising as it is tragic. Natural disasters and extreme conditions have rocketed in frequency as of late. For example, the Myanmar cyclone of 2008 killed 85,000 people. In a single day that year, the United States was struck by 87 tornadoes. In a month, 2000 wildfires burned California (Ayres, R. U., & Ayres, E. H., 2010). Even outside the realm of air pollution, fossil fuels still exact terror on the environment. The Deepwater Horizon oil spill of 2010 was the worst in history, spewing 4.1 million barrels of oil into the Gulf of Mexico (*The Telegraph*, 2010). Aside from the irreversible ecological damage, the Gulf's economy was temporarily crippled (Horsley, Scott, 2010). To allow this kind of pollution is unacceptable, which has prompted widespread advocacy against offshore drilling and fossil fuel consumption. People see fossil fuels for what it is, a catalyst for decay and corruption.

Catholics of the world look to Pope Francis for moral and spiritual guidance. In return, Pope Francis aims to pull the world's rulebook away from the rich and greedy, and gift it back to the masses. During his travels in September 2015, he urged both the United States and the world to cut back on fossil fuels, and pursue the avenue of alternative energy (Follain, J., 2015). Pope Francis also weaved a 181-page encyclical, hoping to address the moral deliberations of climate change to peoples of all faiths. In his words,

> *"For human beings... to destroy the biological diversity of God's creation; for human beings to degrade the integrity of the earth by causing changes in its climate, by stripping the earth of its natural forests or destroying its wetlands; for human beings to*

*contaminate the earth's waters, its land, its air, and its life – these are sins."*(Bergoglio, J. M., 2015*)*

There is hope when influential figures speak to the burdens shared by all. Those who deny need for fossil fuel reduction also deny over 2500 scientists, the leader of a 1.2-billion-person faith, and the untold millions who suffer the consequences of our *greed.* In the face of this overwhelming crowd, some still look only to their wallets. In response to the Pope's harrowing words, Republican Jeb Bush said "I don't get economic policy from my bishops or my cardinals or my pope" (Follain, J., 2015).

The extreme disparity of perspectives between Pope Francis and Jeb Bush are key reasons why humanity's emissions are still multiplying. Control of climate change must be a worldwide effort. Numerous summits have ultimately failed to produce meaningful results from fear of stepping on the toes of Industry and Energy giants. The United States' right wing has found deep satisfaction with derailing these conferences, their wallets fat with oily bribes. They decry policies such as carbon taxation as the inhibitor of progress. Ironically though, our future can only be saved by tough sacrifice and cooperation.

*The Carbon Crunch*, by Dieter Helm, details this problem of half-solutions to great lengths. Helm notes that even as Europe has cut emissions, global carbon pollution has not been reduced (Helm, D. 2012). Why? Well, for each wind-farm and solar panel placed in the UK, Germany, or France, a coal-firing plant is constructed in China (Helm, D. 2012). Carbon emissions aren't being cut, they're just being outsourced! The first order of business in mitigating climate change is for all nations to phase coal consumption to zero, and accept products derived only from clean fuels (Helm, D. 2012). To meet this requirement the United States, and the world, must break the record of half-

heartedness. We must understand the relationships between coal "outsourcing," "consumption," and the goods made thanks to burnt coal. Those who refuse to abolish coal must face consequences, as that is where the blackest smoke rises.

Jeb Bush is just one opponent of fossil fuel reduction and alternative energy funding, and he is not alone. However, climate change has mounted a formidable scientific argument through the lens of the environment. In light of that, those who do decry fossil fuel reduction do so for financial reasons. The negative side suggests a continuation of fossil fuel consumption, either by legitimate economic concern, by conflicted interests, or by pure corruption. No matter the reasons, it is still necessary to hear their arguments. As Voltaire said "I do not agree with what you say, but I'll defend to the death your right to say it."

The first opponent I will address puts a stain on more legitimate critics. It is normally not fair to include oppositional arguments having negligible merit, but this case is an exception. Siegfried Frederick Singer, an Austrian born physicist, led the charge in an influential global warming denial campaign (Pooley, E., 2010). At a 2008 conference "Global Warming Is Not a Crisis," Singer was the standout attraction. Although the conference was deliberately organized like an empirical, scientific forum, it was actually controlled by shadowy oil and tobacco anti-tax affiliates. In fact, its most prominent sponsor was the Chicago-based "Heartland Institute," whose interests lay with cigarette companies and CO2 polluters. At the conference and beyond, Singer posited that "climate change is...caused by natural forces...CO2 is not a pollutant...there is no point in trying to control the emissions of greenhouse gases" (Pooley, E., 2010). Issues with his statement were intractably tied to the funding of his work, which provided a clear barrier to the

scientific method. His campaign was empowered by slander against legitimate climatologists, and according to one commentator, he "could take some credit for the many Americans who doubted that humans were causing Global warming." (Pooley, E., 2010). Environmental concerns were not the motivator of Singer's noisy work to uphold fossil fuel consumption. His interests were strictly economical within the confines of his pockets.

Moving from demagogue to legitimate economic commentator, a Wall Street Journal article written by Matt Ridley caught some attention. His argument rested upon the assumption that reasons for the switch to alternative energy were irrelevant. He refuted the argument of "we will run out fossil fuels soon," by pointing to developments in shale extraction and future oil field discoveries: an ultimately misinformed point (Ridley, M., 2015). He also believed alternative energy would never price fossil fuels out of the market, so we shouldn't try to push them. Fundamentally, he shrugged his shoulders and asked "what's the point?"

His criticism of alternative energy focused on its inefficiency, as he scoffed at their miniscule contribution to world energy production (Ridley, M., 2015). Ironically, this is the very reason that pro-alternative energy advocates *argue* for increased research, implementation, and funding for these technologies. By highlighting solar and wind shortcomings, Ridley has inadvertently strengthened this paper's thesis: to clear the gap between current effectiveness and potential of clean energy.

Finally, Ridley argued that fossil fuels have had little impact on our environment. His logic on this point ranged from false, to arbitrary, and then to plain bizarre. At one point he employed a truly pathetic clause which claimed that wood fire pollutants were

harming the lungs of young children more than fossil fuels (Ridley, M., 2015). Meanwhile, he ignored endless research on the detrimental health effects of air pollution within major cities (Chit-Ming, et al, 2008). Clearly, Ridley has employed omission to bring the appearance of stability to his argument.

Another high-profile opponent of alternative energy technologies, in replacement for fossil fuels, is the U.S. Chamber of Commerce. In general, they challenge alternative energy as fiscally irresponsible, while also promoting use of fossil fuels to boost economic wealth (U.S. Chamber of Commerce). While this may be somewhat true for the short-term, its long-term suggestions are anything but wise, as we will discover. In the face of arguments like these, one must use economic reasons for fossil fuel reduction. Fortunately, there are many.

Although the oppositional side to alternative energy has valid points, they fail to realize the focal economic risk of fossil fuels. The reason we should not base our entire society, infrastructure, and development on oil, coal, and natural gas is their quality of *non-renewability* (Nersesian, R. L., 2010). Fossil fuels were once archaic plants and animal species over 300 million years ago. When these species died, their organic matter stratified thousands of times over before withstanding titanic pressure. These forces combined with the work of bacteria to produce fossil fuels. Once these deposits were formed, they sat undisturbed beneath the Earth's surface for millions of years. (U.S. Department of Energy.) Fossil fuels were created under awesome circumstances to which we cannot reproduce realistically. Clearly, new fossil fuel reserves would take millions of years to reform. This logistical inconvenience puts us in a precarious place for when fossil fuels finally do run dry. But according to Matt Ridley we have nothing to worry

about! Fossil fuels won't disappear," he says. In actuality, this statement is completely erroneous.

If we recall from the beginning of this piece, we mentioned that fossil fuels have a "shelf life" of around 100 years. However, this number is more of an approximation to compensate for coal's particularly amazing longevity. The reality is that each fossil fuel has differences in their remaining reserves. Let's review them in ascending order. Oil, otherwise known as "black gold," is the widest used resource in the United States at 35% of our energy consumption (U.S. Energy Information administration). Ironically, it is also has the most brevity. Experts estimate 1,258 billion barrels of oil left in the world, a measurement which includes the margin for currently undiscovered reserves. With considerations of population growth and unremitting demand, the last drop of oil is scheduled to burn 40 years from now (Nersesian, R. L., 2010). Natural gas, coincidentally the cleanest polluter, is set to go in 60 years time (Nersesian, R. L., 2010). Finally, coal is the reigning champion of longevity with 120 years before it runs out (Nersesian, R. L., 2010).

The obvious issue with fossil fuel non-renewability is that our children will inevitably be without them, and without alternative options their society will collapse. More importantly, even before supplies are exhausted their production levels will peak (Helm, D., 2012). This translates to dwindling supplies with an ever-rising demand due to population growth and world economic development. As expert Ed Finn wrote for the CCPA monitor, "long before the last drop goes into the last tank, the ever worsening shortage will cause social, economic, and political upheaval on a colossal scale" (Finn, E., 2013).

Humans have a talent of ignoring the future, forgetting the past is slightly harder though. According to Roy L Nersesian, an educator on energy policy, the year 2000 provided us with a glimpse of what fossil fuel shortages might look like in the future, in terms of supply shocks. That year, California was hit by a drought which crippled its hydro-electric output. This pulled the west-coast energy market into a shortage (Nersesian, R. L., 2010). The drought had occurred shortly before late spring, resulting in dangerously close supply and demand curves. Demand jumped once summer rolled in, resulting in vast electricity price differences between producer wholesale and utility retail rates. Utility companies were forced into energy purchases at $450 per-mega-watt hour in June, 10 times its typical rates (Nersesian, R. L., 2010).

To prevent utility bankruptcy, the state of California spent its budget surplus in panicky fashion. Essentially, this resulted in a huge debt for gradual repayment by taxpayers (Nersesian, R. L., 2010). On top of that, in order to meet demand in absence of hydro-electric power, industrial plants (such as aluminum smelters) laid off their workforces to devote nearby power plant production to recovering the supply disparity. All in all, it was a foretelling quagmire caused by supply shocks and rising demand (Nersesian, R. L., 2010). It raises the question, what would a *worldwide* fossil fuel supply shock look like? Keep in mind; we rely on fossil fuels for 81% of our energy needs. The answer is frightening to imagine, and demonstrates just one economic reason to diversify our energy portfolio with renewable energy.

The instability of fossil fuels are not just rooted in supply and demand curves, it is also a matter of geography. If every nation in the world had fossil fuels distributed evenly, instability would not be a problem. Thinking ideally won't help with reality

though because the world is an unfair place. Some countries have large oil reserves while others rely on imports. Like with any unequally distributed resource, this makes oil into a political substance capable of causing conflict. The United States, historically a net-exporter, is now a net importer. To be precise, we import 27% of our oil. This represents entire lakes of "black gold" flowing into our borders yearly from the Middle East (17% comes from Saudi Arabia, 5% from Iraq etc.) (U.S. Energy Information Administration). Reliance on foreign fossil fuels is a crutch. No example is more pertinent than the multitude of conflicts we've instigated for oil. Bluntly speaking, we've stuck more than just our nose into the Middle East, something that has been costing us dearly. Throughout our lengthy involvement in this theater, we have spent anywhere from $50-150 billion dollars a year "protecting" our energy interests (Pascual, C., & Elkind, J., 2010).

Another economic issue regarding oil reserves revolves around future considerations, rather than past mistakes. China's power has extended thanks to oil seizures around the Pacific region. In order to diversify their supply chains, Chinese NOCs have brokered deals for priority on the world's nascent oil reserves, while simultaneously excluding Western corporations from participation in some of these opportunities (Pascual, C., & Elkind, J., 2010). Such developments expose a simple risk of highly coveted, non-renewable resources in the form of "first come, first serve." Rather than gambling on the world's scattered, unexplored oil reserves perhaps we should be finding a way out of this speculative game. Once again, alternative energy development comes to mind as an ideal direction.

The road *away* from "climate change" and *towards* energy security is long and unfulfilled thus far. Only 10% of our national energy consumption is fulfilled by

alternative energy (U.S. Energy Information Administration). If we break down that statistic, we'll see the following percentages: Hydroelectric power (26%), wind (18%), biomass wood (50%), geothermal (2%), and solar (4%) (U.S. Energy Information Administration). Clearly improvement is needed in order to reach sustainability. This is especially apparent when it comes to solar and wind energy technologies, as their sources are free and omnipresent. While true that many alternative energy options have some development to go, it only further exemplifies the need for dedicated research and funds. In addition, much of this disappointment has to do with an incomplete national policy, rather than a lack of technology or potential.

In the book, *Crossing the Energy Divide: Moving from Fossil Fuel Dependence to a Clean-Energy Future,* the authors make a few important critiques on our national energy policy. First, they identify the subsidies reserved for oil companies as hindrances to alternative energy implementation (Ayres, R. U., & Ayres, E. H. 2010). Essentially, this, along with inappropriate selling price limits for alternative energy producers to utilities, kills the competitiveness of solar and wind power (Ayres, R. U., & Ayres, E. H. 2010). Conversely, the authors believe that competitiveness for alternatives can be achieved through rewards/incentives for clean energy production. Their biggest concern, however, is directed toward the United States' entire energy plan. If alterative energy is to carve out a lasting, meaningful market share, then the national and state policies must be corrected. Currently, the federal government "encourages" alternative energy, but does not offer adequate incentives to "Green energy" production companies. The ultimate decision on energy policy is left to the states themselves, allowing for radically different attitudes on an issue requiring national unity. This hinders any sort of cohesive national

effort to cut emissions or increase alterative energy output. Federal mandates are needed, along with punishments and rewards for states' level of participation (Ayres, R. U., & Ayres, E. H. 2010). In short, the United States must revise its viewpoint on energy, domestically and internationally, to help save the future of our planet and its peoples. Right now, we are playing a risky game to win a few chips and putting the whole jackpot into jeopardy.

We have arrived back upon the resolution: **The United States should *urgently* reduce Fossil Fuel consumption and production, in coordination with global efforts, while simultaneously increasing funds, research, development, and implementation of Alternative Energy.** Reviewing the evidence, it is recommended to reach a conclusion of affirmative. By not acting rationally, we will capitulate to massive environmental collapse and economic hardship in the coming decades. We will sacrifice our chance to rewrite the rulebook for the better of Earth's inhabitants. The only way to avoid a bleak endgame is to commence the transition from fossil fuels into alternative energy sources today. The aim is not to stop the dominoes from falling, as no one can truly control fate. Humanity's concern is to simply redirect them toward a future we can coexist in, to create a truly sustainable home. No peoples ever in the history of mankind have had such a momentous decision to make.

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