

Economics of the Atlantic Coast Pipeline Considered

A White Paper for Dominion Shareholders

by Doug Hornig

Executive Summary

Dominion Resources is proposing to build the \$5 billion dollar Atlantic Coast Pipeline (ACP), to deliver natural gas from the Marcellus shale in West Virginia to markets in southeastern Virginia and eastern North Carolina. This is a highly questionable decision from the standpoint of return on investment as well as potential dilution of shareholder value. Dominion faces multiple challenges on both the supply and demand side of this equation. To wit:

Demand Side

- World economic slowdown
- Oil and gas glut
- Receding Japanese demand
- Rapid build out of new nuclear plants
- Explosion of renewable energy sources
- Emergence of the U.S. Smart Grid
- The LNG boondoggle
- Shakiness of Dominion's pre-negotiated contracts
- Stagnant population growth and electric demand in the U.S.

Supply Side

- Shale gas production not economical at depressed price levels
- Rig shutdowns
- Enormous debt overhang in the teetering shale industry
- Very quick decay of shale gas fields
- Overly optimistic gas reserve figures

Any of these things could derail the ACP and cause an economic disaster for both the company and those who own it, we shareholders. Taken together, they add up to one simple statement: The ACP is just not worth the risk. If I have your attention, please read on for a more in-depth consideration of all of these elements.

To My Fellow Dominion Shareholders:

I am writing you in regard to the economics of Dominion's proposed \$5 billion Atlantic Coast Pipeline (ACP). As shareholders, there are some things you need to know, and that Dominion doesn't want to tell you, about this project.

You need to stay well informed, because this company does not belong to Dominion's executives. It belongs to us. We own it. When those we've entrusted with the management of the company make ill-advised decisions, it's both our *right* and our *responsibility* to hold them to account. It is critical that we force them to disclose publicly what they are doing when they propose to spend huge amounts of our money. (At the moment, they are proceeding with a proposal for a multi-billion dollar project without disclosing to shareholders just how they intend to pay for it.) If they persist in behaving irresponsibly, we can and must replace them. Otherwise, monies wasted will translate into a dramatic loss of shareholder value or, worst case, the actual insolvency of the company.

This is not what you were looking forward to when you bought your shares, I'm sure.

Be aware that Dominion is already deeply involved in the permitting process for an exceedingly costly (\$3 more billion, at least) project—conversion of the Cove Point LNG plant to an export facility—that has all the earmarks of a major boondoggle. No, this is not a white paper about LNG. If you wish to learn more about the fading lustre of LNG, there is plenty of information readily available on the Internet. But many of the points I'll be making also apply to Cove Point. In addition, the future of LNG does impact the potential profitability of the ACP, so I will touch upon it briefly later on. I encourage you to follow up with your own due diligence.

You will ask, and rightly so: What are my qualifications for writing this paper?

I am a senior editor with Casey Research, a leading financial research and advisory firm that specializes in the natural resource markets. My work keeps me in close and regular contact with some of the brightest and most knowledgeable analysts in the energy industry. I spent much of last year helping research and edit a book—Marin Katusa's New York *Times* bestseller, *The Colder War*—that takes a clear-eyed look at the world energy situation. In the course of my work on the book, I had to immerse myself in a study of the global particulars of fossil fuel extraction and consumption. Thus I can speak on this subject with some familiarity.

The ACP is wrong-headed on many counts, including health hazards, environmental damage, harm to businesses, excessive seizure of private property through the abuse of eminent domain, and much more. I'm certainly not conversant with all of them. But again, the

information is out there if you choose to seek it. I will confine myself to that which I do know about, the economic considerations that underlie this pipeline project.

Dominion is painting a rosy picture of the future of the ACP. Of course they are. You can't sell skeptical people something of this magnitude without casting it in the best possible light. But, equally predictably, they are not going to expose you to the potential downsides. Which are considerable. Dominion is proposing to gamble with a *lot* of our money. The economic challenges faced by the ACP are steep. Insurmountable? Perhaps not. No one knows for sure what the future holds. But what we can do is weigh risk against reward. I know I can count on Dominion to trumpet what they *think* the rewards of the ACP are going to be.

But they are not likely to present you with an honest accounting of the risks they're taking. That's what I can do. And then at least you can start to ask informed questions.

As always in any business venture, the primary consideration is the supply and demand equation, and Dominion faces very serious obstacles on both fronts.

Let me explain.

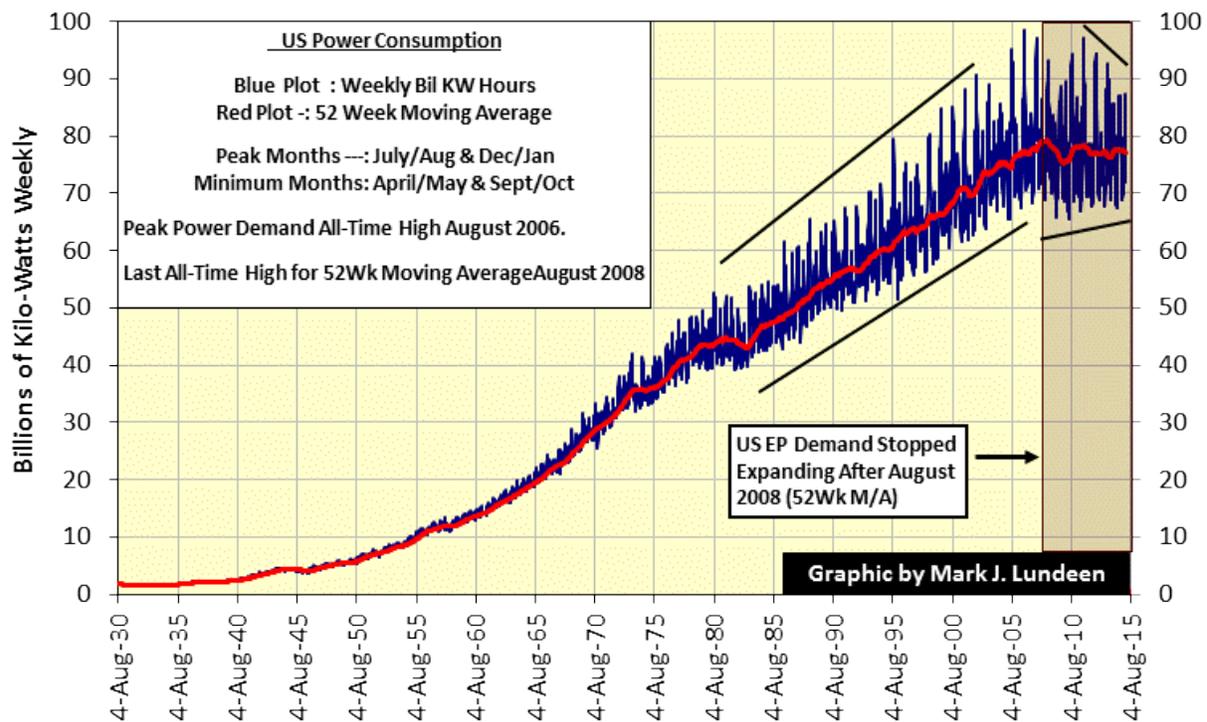
Part I - The Demand Side

The world of energy is changing, very fast and in far-reaching ways. Many of these ways were not foreseen even as recently as ten years ago. The following chart tells an important story that almost no one has heard, and that the big utilities are going to have to confront:

13 Feb 2015

GATA.Org

US Electrical Power Usage Billions of Kilo-Watt Hours Weekly & 52 Week Moving Average



Source: Barron's Statistics

That's right, believe it or not, demand for electricity has flat-lined in the U.S., and is now lower than it was at its peak in August of 2008. We haven't experienced a 6½-year period of static usage since the Great Depression 80 years ago.

Concurrently, as everyone knows by now, we are facing a global decline in demand for oil and natural gas that has led to plummeting prices for both commodities. In terms of natural gas, this is due not only to slack physical demand, but also to the way that the two commodities are linked. On the international markets, gas is typically priced through what are called oil-linked contracts, under which gas sells for a percentage of the price of crude oil. Thus, when oil falls, so does gas, regardless of underlying demand.

This is a key factor that must be taken into account when trying to project the profitability of the sale of a given amount of gas. The practical effect of this can be seen in the pricing of a barrel of Brent crude—down about 54% from mid-June of 2014 to March of 2015. Its drag on the Henry Hub natgas spot price helped pull it down more than 40% over the same period.

As prices drop, shale wells—whose cost of production is higher than with conventional ones—become uneconomical, and they shut down. As of early February, the natgas rig count in the U.S. was down by 37, year over year, and the shutter rate of operations in the field is growing. What's important to remember is that capping a well is not a simple matter of nailing down a lid that can be easily removed in the future. Decommissioning a well is an expensive proposition involving complex equipment, and re-starting one is also very expensive. Many closed wells will never be re-opened.

Rig declines are happening against the backdrop of the changing global energy economy. Many of the experts with whom I speak believe that this supply glut is not a transient situation. They point to the world economy, which is stagnant. Even China, formerly red hot, has slowed dramatically. Japan and most of Europe are either in or about to enter recession.

Sluggish growth = reduced demand for energy, despite low prices.

The U.S. *seems* to have dodged the bullet so far, but that has been due to a combination of ingredients: an unrealistically strong dollar, debt creation on a massive scale, and the emergence of trillions of new currency units out of thin air. This is not a prescription for a healthy economy.

Moreover, all of the increases in U.S. GDP over the past four years—modest though they have been—have been due to the shale revolution. That has given a big boost to the energy sector, almost exclusively in the five states in which such drilling is practiced. Outside of the energy sector, there has been *zero* GDP growth.

In addition, due to massive government bailouts of the guilty parties, the recession of 2007-09 did not liquidate the misallocations of capital that precipitated it, which is the primary thing that recessions are supposed to do in a free market system. In fact, things are worse. The unregulated global derivatives market—in which are traded the same kind of explosively volatile “financial instruments” that laid the world low in 2008—is now at least 50% larger than it was in '07. This financial overhang is a *\$600+ trillion* ticking time bomb. About all we can hope is that it doesn't detonate and cause a severe worldwide depression that makes the most recent crash look trivial in comparison.

The U.S. has also enjoyed decades of general asset inflation. How long can this last? Perhaps for a while, so long as the Fed keeps up its rampant expansion of the money supply. The Fed has stopped its QE program for the moment. It can re-start it at any time, of course, if economic growth continues to sputter. But this is very dangerous. The Fed is already sequestering trillions of new dollars on its own balance sheet. If more new dollars are added, and any substantial portion of that money is loosed into the economy, the inflation will be very, very ugly.

On the other hand, if *QE-forever* is transformed into *QE-never again*, there are predictable consequences. Interest rates must rise at some point. When they do, even the country's present sluggish growth will be choked off, and the U.S. will enter its own deflationary period. When that happens, GDP growth will be flat to negative and energy demand will continue to weaken substantially, especially in the business sector as industry tightens its collective belt. Many economists and financial analysts are predicting that those conditions will be with us by 2016, and could endure for a *decade* or more. That sounds outrageous, I know. But if you question whether it's even possible, just ask the Japanese, who have endured a 20-year deflationary death spiral.

And speaking of Japan, another factor in the coming drop-off of natural gas demand is the situation in that country. It was formerly one of the world's leading consumers of nuclear-generated electricity, but shut down all of its nukes in the wake of the Fukushima disaster. In order to fill the giant energy gap thus created, Japan had to import enormous quantities of natgas. Now, however, Japanese reactors are poised to come back on line, one by one, starting this year. The need for gas will fall sharply, and no other nation is poised to absorb the resultant oversupply.

Nuclear will play an increasing role in the U.S. energy sector, as well. The country already gets 30% of its electricity from nuclear power, despite three decades during which there was no new construction. Since 2007, however, there have been 16 license applications to build 24 new reactors. Six are expected to come on line in the next five years. A little further down the road are the innovative small, buried, town-sized reactors that will be supplementing large-scale plants in the years to come.

Other countries' reliance on atomic energy is either already large and/or growing fast. France derives 75% of its electricity from nuclear power. China has 23 nuclear plants in operation, another 26 under construction, and many more on the drawing board. Russia is building 10 new ones, with 14 more planned. India has 22 in operation, 20 planned and 5 more under active construction, including a large prototype fast breeder reactor that can utilize thorium, one of the important clean fuels of the future.

Next, close consideration must be given to the rise of renewable energy sources. Yes, renewables. They are no longer the joke they were a mere decade ago. The world is turning away from fossil fuels and toward renewables, in a very big way, with profound consequences for the energy business.

This not something that the major utilities can pretend they don't know about. An authoritative analysis of the issue was offered in a January 2013 report from the Edison Electrical Institute, a major association of investor-owned electric companies, Dominion Virginia

Power among them. The report is called *Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business*, and it was authored by Peter Kind, Executive Director of Energy Infrastructure Advocates LLC. It can be found online and should be read by everyone interested in the subject.

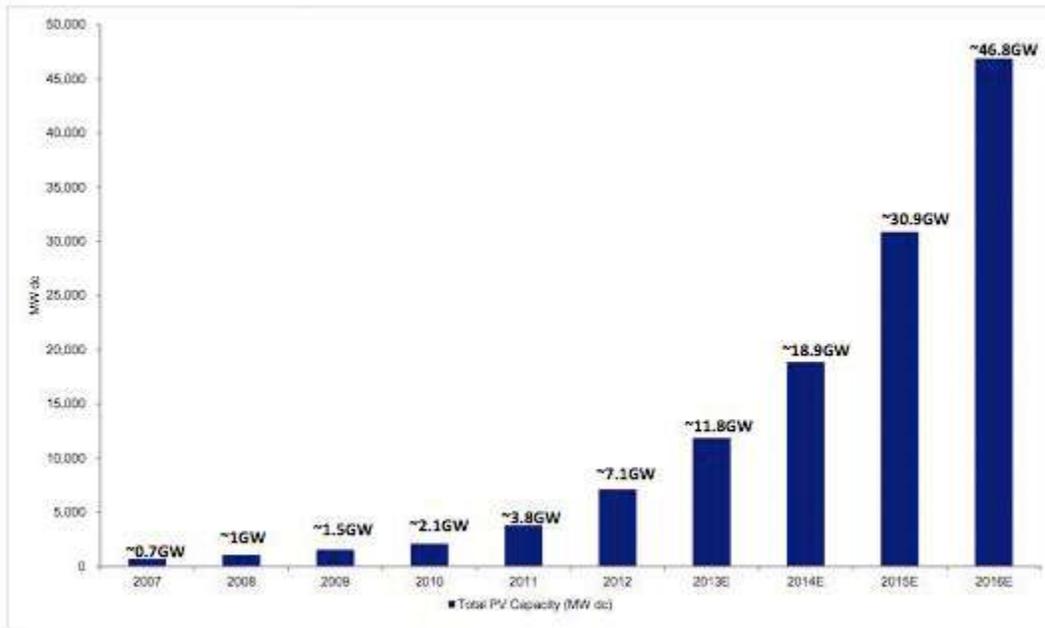
Kind's paper deals with the unstoppable emergence of DERs (*distributed energy resources*, of which solar is the most prominent), from the perspective of how they will disrupt existing utilities. The word *threat* is used repeatedly. He states that "with the potential for technological innovation (e.g., solar photovoltaic or PV) becoming economically viable ... the industry and its stakeholders must proactively assess the impacts and alternatives available to address disruptive challenges in a timely manner."

Peter Kind is correct. Dominion *must act proactively*. And the way to do that is to embrace a trend that is not ephemeral. It's the new normal. DERs are the wave of the future, and a more distributed energy grid will supplant the current system as surely as distributed computing eliminated single-source mainframes.

If Dominion does not ride that wave, it will be swamped by it. Success going forward means it has to accept an increased role as manager of DER systems and a lesser role as producer, as demand for centrally-generated power recedes. Giant pipelines and costly new LNG plants are exactly the wrong way to go. They're anachronisms. They will probably be obsolete before they're even operational, and will certainly become so long before their shelf life expires.

Solar collectors—the primary driver behind the explosive PV adoption rate—have dropped 90% or more in price over the past decade, and nearly doubled in efficiency. In consequence, as the following bar graph reveals, the total cumulative PV capacity in the U.S. rose from one lonely gigawatt in 2008 to an estimated 46.8 gigawatts by the end of 2016, a gain of close to 4,700% in just eight years.

Figure 29: Total PV Capacity



Source: Deutsche Bank

We could only wish that Dominion stock had done one-tenth as well.

Many new neighborhoods under construction are fully solarized, and retrofits are proceeding all over. In my own town, if you want solar panels you are faced with a 6-9 month wait before providers can even assess your suitability. And when solar produces more energy than needed, the excess can be fed back into the grid, profiting users and further reducing demand from centralized power plants.

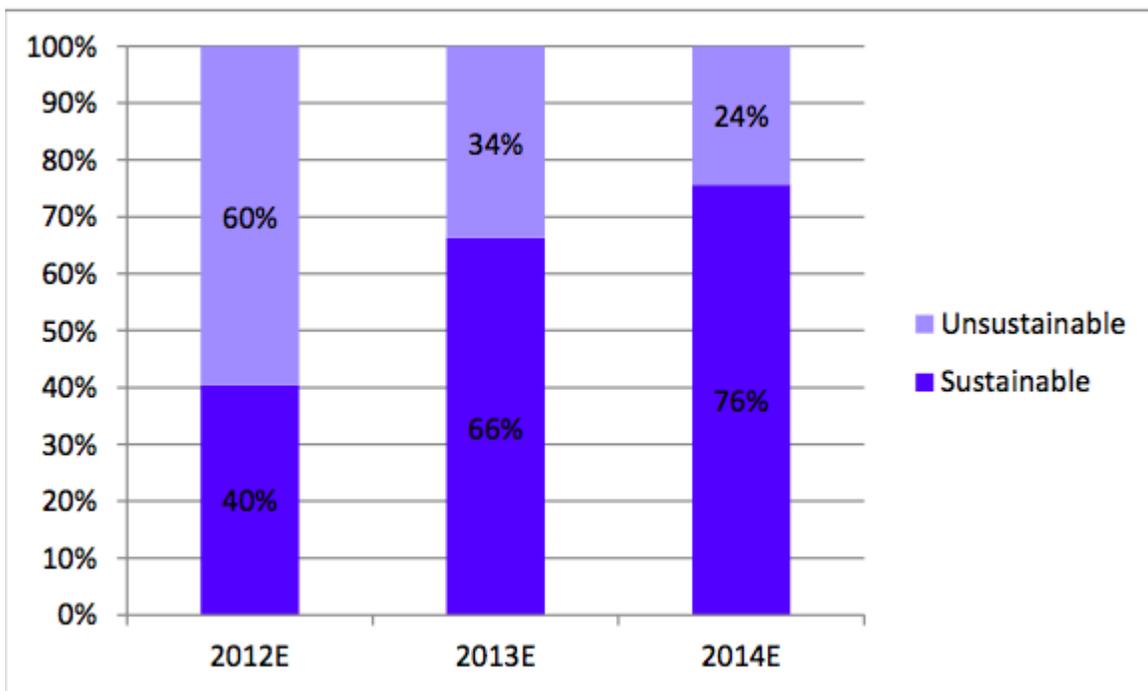
Because collectors have become so cheap and efficient, large-scale producers have also seen massive shrinkage in their capital outlays. The standard measurement used to determine economic viability of a generating plant is called the LCOE, or *levelized cost of electricity*. It represents the per-watt cost (in real dollars) of building and operating that facility over an assumed financial life and duty cycle. Key inputs to calculating LCOE include capital costs, fuel costs, fixed and variable operations and maintenance costs, financing costs, and an assumed utilization rate for each plant type.

The LCOE for a watt of solar-produced power is now in the 10-20 cent range. In 1977, solar's LCOE was more than *75 dollars* a watt. As recently as 2005, a scant ten years ago, the figure was still about five dollars.

All right, but what about the argument that solar power is only viable because of government subsidies? Well, that used to be true. A few years ago. It isn't now. Yes, the 30% federal Investment Tax Credit for solar in the U.S. helped kickstart the industry and continues to incentivize buyers. But it has actually become unnecessary. The fact is that, around the world, the cost of solar power is already below the cost of retail electricity in many places, and rapidly approaching wholesale averages for fossil fuels.

The landscape is changing so rapidly now that stunning advancements are being made in a single year.

Figure 4: Sustainable Markets Increasing



Source: Deutsche Bank

That bar graph displays the global contrast between unsustainable solar power (which requires government subsidy) and sustainable solar power (which doesn't). You can clearly see the enormous jump between 2012 and 2013, when sustainability rose from a 40% minority to a 66% majority. And it continues higher.

At the same time that production and installation costs have been plummeting in the solar industry, the systems' allure has been enhanced by providers who have developed a new, innovative business model. Since the initial capital outlay might be prohibitive for many average potential buyers, the sellers decided to give their product away. For free.

Industry leader SunPower is typical. It offers two very attractive options that both involve installation of the solar energy system at the company's expense.

Under the terms of your contract with SunPower, you can let the company retain ownership of the system and pay a fixed monthly lease fee for 20 years (the cells' expected lifetime). The company also gets to keep any credits for power pumped back into the grid. It maintains the system, including repairs, at no cost to you. Alternatively, you can buy the installation through a 5-20 year loan from the company, again with a lifetime fixed monthly payment, in which case you get to keep any credits generated. In both instances, the lease or loan payment added to the remaining power bill will usually amount to less than you formerly paid your conventional utility.

But the last, greatest stumbling block for solar (after cost) has always been storage. The ability to generate electricity when the sun isn't shining is paramount, and cutting-edge battery developers are going full tilt at this problem. Earlier this year, Elon Musk, the founder of Tesla Motors, revealed that many of his best battery designers have been deployed away from electric cars and into research at SolarCity, a Tesla subsidiary that is the nation's largest home solar installer.

Tesla is building a giant "gigafactory" in Nevada that will be dedicated to mass production of new, affordable, compact 10-kilowatt-hour whole-home battery packs that can store enough energy to run a house for two full days. These are currently being field tested in 500 California homes. Musk expects to go commercial with them in the late summer of 2015, and they will be standard in all homes built by SolarCity within five years.

Of course, conventional plants will still be needed to provide base load power. The point is not that such facilities are going to disappear, it's that they will lose their monopoly as we move to a new, distributed system.

Utilities can, should and will harness solar energy for their own purposes. Is Dominion listening to what the market is shouting? How much more productive would our capital be if it were deployed by the billions into renewables, instead of into pipelines and LNG plants that are speeding toward obsolescence?

Though the rapid spread of solar has dominated the energy sector, it is by no means the only DER in the field.

Windmill farms are also sprouting up, and becoming a significant source of electricity. And the future of wind power is very exciting. We will soon see a transition from the old propeller-blade type of generators to the next generation. These will be large cylindrical ones that ride on maglev bases. This frictionless type of operation means a huge ramp up in efficiency (they

require only light winds to keep turning) and a steep drop in footprint (they require only a small fraction of the land traditional wind farms need). China is already building huge ones to power whole cities. Home units will spread in popularity in those regions where wind is more plentiful than sunlight, as soon as competitive price points are reached, which they will be.

DERs are creating a global revolution. For example, Germany set a one-day record in 2014 by filling 74% of its total energy needs from renewable sources. On a sustained basis, the figure for Germany is near 30%, with a 45% target expected to be reached in 15 years. The figure for Italy is currently north of 25%. Denmark and the Netherlands are pushing rapidly toward their goal of 100% renewable energy. Costa Rica this year is completely satisfying 100% of its electric needs through renewables. Scotland has the potential to generate 100% of its electricity from the wind in a few short years, with a large surplus left over to export to England. Back at home, Iowa generated only 4% of its electricity from renewables in 2005; today, the figure is 28%. California has embarked on a massive project that mandates 1.3 gigawatts of solar storage by 2020. And so on.

Hydropower has not disappeared, either. China, for example, has 10 new hydroelectric stations under construction and due to come online between 2015 and 2020. In addition to conventional hydro, run-of-river generators are just beginning to be built.

And on the horizon are fuels produced by living organisms such as algae. Though this technology is still in its infancy, it's expected to ramp up to commercial-level production within a decade. Though the initial emphasis is on ethanol, companies are busily testing new, so-called "designer fuels" not found in nature, which are being created at the molecular level to maximize their efficiency. They will eventually be competitive in price with fossil fuels, but will burn cleaner than even natural gas.

Another factor is efficiency. It has become the new normal, whether we're talking about residential construction, government buildings, manufacturing, or household appliances. Houses are built tighter and better insulated, to cut down on heating and air conditioning costs. All new federal government buildings must meet strict Department of Energy standards that cover the Building Envelope, HVAC, Water Heating, Power, Lighting, and other equipment for different climate zones. Developers of high-rise apartment complexes and office buildings strive to meet ENERGY STAR guidelines. Private dwellings are increasingly integrated into the Internet of Things, where computers monitor everything electric to maximize savings. Even the lowly incandescent lightbulb is now illegal to import and sell in the US, in favor of much more energy efficient CFL and LED bulbs.

Increased efficiency will also result from the emergence in the U.S. of the Smart Grid. The electric grid in the U.S. is undergoing an elemental and truly profound makeover. As we've

always known it, the grid was thrown together chaotically, a hodgepodge of overlapping companies, aging generating plants and creaky transmission lines. It's a wasteful mess. According to former Federal Energy Regulatory Commission chairman Jon Wellinohoff, "The United States loses more than 40 percent of the electricity it produces because of inefficient grid infrastructure."

No thought was ever given to the most efficient ways of delivering product to the end user, nor to making it function as a seamless whole. Formerly, we didn't have the means. But we do now. The Smart Grid will go a long way toward reducing if not eliminating that waste. It is a development that is just beginning to take off, but it will be a game-changer.

In Grid 2.0, real-time electronic controls will replace the system's existing electromechanical switchgear; integration of power and communications will create a dynamic, interactive feedback mechanism that supports the real-time exchange of power where needed; old analog metering systems will give way to digital two-way energy information systems, that will not only remove inefficient manual labor from billing, but allow price signals, market information and buyer decisions to change and optimize consumption; distributed generation sources will improve system reliability and capacity; and, ultimately, there will be a network of connected micro-grids that will be able to automatically self-monitor and heal.

Every efficiency gain—whether from light bulb substitution or enormous grid modification on the national level—naturally reduces demand for electricity from conventional power plants, including gas-fired ones that will be forced to scale back their gas purchases.

Moreover, rapid advances in battery technology are bringing down costs and boosting efficiency, as we saw earlier in our discussion of renewables. A proliferating number of homes and businesses (including WalMart) already store energy for when it's most needed, and that number is going to grow exponentially the better our batteries get. That energy being stockpiled won't only come from renewables, either. Savvy users will store electricity from the utility company itself, acquired during lower-cost times of day, and decouple from the supplier for growing periods of higher-cost time. Why wouldn't they? Once again, an irreversible technological trend signals difficulties for the traditional utility.

Then there is the export dilemma. The U.S. is presently a very minor gas exporter, since we don't yet have sufficient LNG facilities to make bulk shipments possible. A number of them are, however, under construction or awaiting approval, including Dominion's Cove Point project. There has been a flurry of applications in the wake of the shale revolution. *We have so much gas*, the argument goes, *that we can become a net exporter and make tons of money.*

Reality is rather more complex. Any LNG terminal is an enormously expensive proposition. The only one actively under construction today is at Sabine Pass, in Louisiana. The tab: a staggering bill of \$10 billion and counting.

(Since this is not a paper about risks, I won't go into detail about how dangerous LNG plants, including Dominion's proposed one at Cove Point, actually are. Suffice it to say that if one ever exploded, due to accident or terrorist attack, the resultant blast would be nuclear in scope.)

Even retrofitting import plants is very costly, as Dominion's minimum projected budget of \$2.5-3 billion for Cove Point illustrates. To justify the expense, then, companies must have reliable customers to whom to sell the product at a profitable price. Will any of these LNG plants be constructed? Possibly. Will they have anyone to sell their exports to, at a price the buyer is willing to pay? Not likely.

The softening of world demand—whether caused by economic slowdown or the move to nuclear and renewables—has forced many would be builders to have second thoughts. In December 2014, for example, Malaysian energy giant Petronas canceled plans to construct the world's largest LNG export terminal in British Columbia.

The Petronas pullback will have ripple effects, as companies take a harder look at the cost/benefit numbers. Other cancelations are sure to follow. And that undermines one of the core justifications for the ACP: If Dominion siphons off shale gas in the future, in order to export it, then shale drillers can continue full speed ahead, with projects like the ACP in place to ensure adequate domestic supplies after export begins in earnest. Or so the theory goes.

This is a very flawed argument, based as it is on highly unrealistic expectations. The reason Petronas scrapped its LNG plant was because it didn't project as economically viable. Why? The aforementioned coming falloff in Japanese demand; slowing of China's economy; a huge Russian gas supply deal signed with China last November; and competition from Australian and Qatari exports. All of these added up to an Asian demand that just wasn't strong enough to justify heavy construction costs and the future expense of trans-Pacific shipment.

If western Canadian LNG can't effectively compete in Asia, then U.S. LNG won't fare well there either. Thus, most if not all American LNG exports—if there ever are any—will be aimed at the European market. Now, notwithstanding that the E.U. is facing falling demand due to a looming recession of its own, it is as noted ramping up renewables.

Moreover, in terms of natgas, it is already well supplied and about to become much more so. Several nations (like Poland) are on the verge of starting shale drilling of their own, and reserves are estimated to be considerable. Israel controls enormous gas fields off its shores and is moving quickly to open them up, in partnership with Russia. North African fields,

particularly in Algeria, are only beginning to be exploited. And Russia has so much gas that it hasn't even had to begin tapping shale formations.

LNG is much more expensive than pipeline-delivered gas. When push comes to shove, Europeans are going to opt for cheaper gas that is sourced closer to home and can be delivered across an existing network of pipelines, negating the need for new import terminals. They are not going to pay more for a commodity, just because it comes from America. U.S. exports will only add to the overall gas supply glut.

Dominion is jumping into the shaky LNG sector with both feet, primarily involving the billions of our dollars that they already plan to commit to Cove Point. But that doesn't involve the ACP, we're told. None of the gas that moves through this pipeline is for export, they insist. It's all to serve projected demand in southeastern Virginia and North Carolina.

Well. That's a difficult line to swallow whole. Dominion recently announced that it has completed the acquisition of Carolina Gas Transmission, which operates pipelines in South Carolina. It could connect North Carolina with Georgia which is, you guessed it, the site of a proposed LNG plant. Is the long-range plan to eventually pass ACP natgas along to Georgia for export? That would make the giant 42" size of the ACP—which is *initially* slated to run at an internal pressure of 1440 psi, or only 72% of its 2000 psi capacity—more logical.

But it would also ensure the very capital-intensive need for yet more pipeline construction, further raising the stakes of Dominion's reckless gamble.

Many respected analysts agree with me that the current infatuation with LNG in the U.S. is going to fizzle, probably rather quickly.

Finally, we need to take a close look at demographics. The U.S. as a whole has experienced a multi-decadal decline in family size. American population is barely growing, up just 0.71% in 2013, the lowest such number since 1937. And that follows growth rates of 0.75% in 2011 and 2012.

People are having fewer children and they're having them later, even as the Baby Boom generation begins to get old and die off. The fertility rate in the U.S. in 2013 was 1.86 children per couple; not even close to the 2.1 level needed merely for replacement. If there were no immigration, the U.S. would be *losing* population. This is a long-term development that shows no sign of reversing anytime soon. Moreover, tighter immigration regulation is almost certainly on the way. When it's imposed, and if it proves effective, then the inevitable result will be an American population whose growth falls to zero and then into negative territory.

Now look at Virginia. A recent UVA Demographics Research Group study concluded that Tidewater—the region whose rising demand, according to Dominion, the ACP is supposedly needed to service—is projected to grow barely at all by 2020. The combined populations of Hampton, Norfolk, Portsmouth, Virginia Beach, Chesapeake and Newport News are expected to rise by a mere 13,000 people, a miniscule 0.2% per year. Moreover, even this prediction may be overly optimistic. Federal money which previously buoyed the economy in Tidewater, because of the large military presence there, has fallen dramatically. An actual loss of population would not be surprising.

While electricity generated by gas-fired plants can certainly be shipped elsewhere, it is not encouraging to find slack demand in the alleged target area.

To be completely fair, it should be mentioned that Dominion has been touting contracts it supposedly has for the bulk of the output of both Cove Point and the ACP. All well and good. Unfortunately, we don't know the details of these contracts, if they are as advertised. There's a lack of transparency here that is unsettling, to say the least. What kinds of conditions and contingencies do these contracts come with, for example? Chances are, if those of us who are non-lawyers were to read through the contracts, we wouldn't have a clue what we were looking at.

Worst case, what if the massive pipeline project proceeds and then slack demand causes buyers to simply walk away from their contracts? One of Cove Point's biggest contracts, for instance, is with Japan where, as noted earlier, nuclear re-starts are going to drive gas demand down, way down. Contract or not, can Japan be relied upon to continue to take gas it doesn't need? Another contract is with a company in India. Would *you* trust them to honor it if demand shrinks or if they get a better offer from nearby Russia or Australia?

As you'll see at the very end of this report, even Dominion admits the risk of contract default. And who gets left holding the bag if one or more of these demand outlets blows up? Shareholders do.

Obviously, the world energy situation is a fluid one. Some things we can confidently predict; others will undoubtedly unfold in ways unforeseen. But obviously, if you put all of these potential negative factors together, you get a very compelling argument for a demand-weakness scenario that extends far into the future. Cove Point is all but certain to flop, which will be a disaster for the company if it proceeds with construction. And if LNG export from Georgia figures into the plan, then that merely doubles down on an already-shaky bet.

Even if ACP gas never departs the mainland, there's still a strong possibility that we wind up with a massive pipeline that finds itself stitting there, stuffed with gas that no one wants. Are these risks that we as shareholders are prepared to assume?

In summary, the demand side alone reveals that Dominion management is forging blindly ahead, intending to apply 20th century thinking to 21st century issues. This will not work in a world in which slackening rather than ever-increasing energy demand is the new ruling trend. But unfortunately for Dominion, and for us, neither is it the end of the story.

Part II - The Supply Side

As bleak as the demand picture looks, it's very remotely possible that things will work out. However, there is a threat from the opposite direction—the supply side—as well. It's substantial and it's undeniably real. The fact of the matter is that the gas surplus we currently enjoy *could* turn into a shortage in the relatively short run and *will* for sure in the long run. Let's examine the facts.

The ACP is meant to carry gas from shale wells, which is problematic for a number of reasons. Everyone knows the spreading environmental objections to fracking that caused the recent ban in New York state, a move that is sure to be replicated in other locations. Could spreading anti-fracking sentiment impact the Marcellus shale areas from which Dominion expects to gather its supply? Of course it could. That's a threat that will hang over the ACP in perpetuity.

But there's more to the shale dilemma than that.

First, shale production—more costly than conventional drilling—needs a robust market in order to be profitable. As we've seen, though, it's a market likely to experience tepid demand and low prices for years to come. That's a recipe for disaster among drillers. Less profitable companies will simply go under. Others will cap their wells and, while those could be reopened at some point, doing so is an expensive proposition. A lot more optimism than exists in the industry today would have to surface.

As the number of wells diminishes, companies that have promised to deliver product to buyers will have to scramble to meet their obligations. The competition will be stiff. There is no predicting who will come out on top.

Second, the shale boom was financed by an explosion of debt. As energy prices drop, the necessary re-financing of that debt is going to become impossible for a large number of companies. Financial problems can be papered over for a while, due to hedges that the companies put on at higher prices, but eventually the piper must be paid.

The *Wall Street Journal* wrote in January 2015: "American oil and gas companies have gone heavily into debt during the energy boom, increasing their borrowings by 55% since 2010 ... In 2010, U.S. companies focused on producing oil and gas had \$128 billion in combined total debt,

according to financial data collected by S&P Capital IQ. As of their latest quarter [in 2014], such companies had \$199 billion of combined total debt...

“But signs of strain are building in the oil patch, where revenue growth hasn’t kept pace with borrowing ... Energy analysts warn defaults could be coming. ‘The group is not positioned for this downturn,’ said Daniel Katzenberg, an analyst at Robert W. Baird & Co. ‘There are too many ugly balance sheets.’

“Before crude prices began falling, U.S. oil and gas producers were able to acquire leases and drill wells even if that meant outspending their incomes. Debt was used to bridge the cash shortfall ... [Now t]he upshot of cash conservation and higher borrowing costs will be less money spent on producing oil and natural gas.”

Again, many gas producers will find it impossible to raise any more money, and will be forced to shut down their rigs as a result. Dominion’s contracts to sell gas will be worth nothing if its suppliers can no longer supply. Industry experts predict that stressed producers will begin breaking delivery covenants as soon as 2017.

Nor is Dominion, large though it may be, immune from the consequences of high debt levels. So far, the company has not told us how it plans to finance the ACP, only that it will involve some combination of ingredients, including cash, debt and securities. But Dominion is presently the 18th most leveraged energy company in America, an unenviable distinction. Total debt/EBITDA is 5.2X, not a healthy number. Shareholders must ask: is it wise to take on yet more billions in debt to finance a project that could very well yield a negative return on investment?

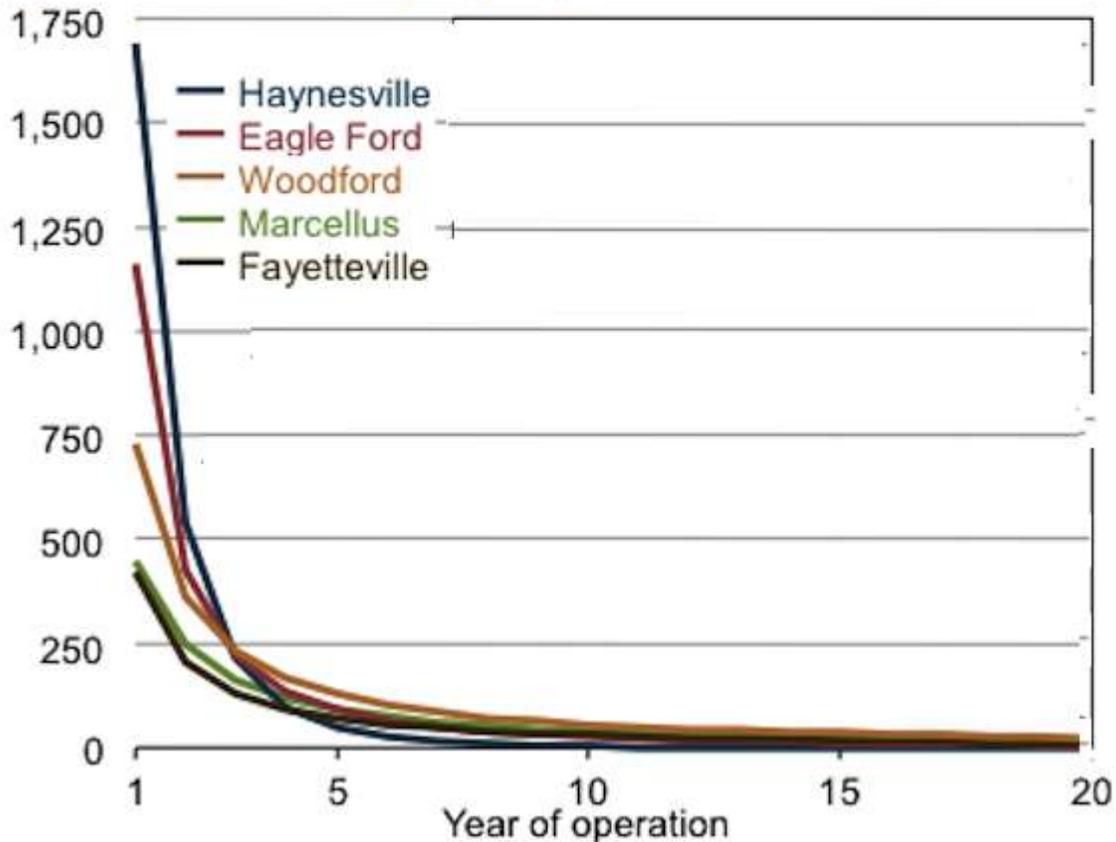
Since equities, Dominion says, will also be part of the mix, then these new issues, of course, mean dilution for present shareholders.

Third, perhaps the most ominous question: Will the gas even be there?

Shale wells are subject to a far steeper decline rate than conventional wells. Several of the more mature plays are either already in decline or appear to be approaching peak production. In 2001, the overall U.S. natural gas decline rate was about 23%; today, it’s about 32% and rising fast. That’s entirely due to the shale revolution.

The ACP is intended to transport Marcellus Shale gas. Note in the following chart how quickly that source could dry up (if viewing this in black and white, the Marcellus curve is second from the bottom on the far left). Not very encouraging, is it?

Figure 54. Average production profiles for shale gas wells in major U.S. shale plays by years of operation (million cubic feet per year)



Businessinsider.com

Simply to maintain today's production levels will require the discovery and conversion to productivity of a huge number of wells, year after year without end. That's an extremely dubious proposition, at best.

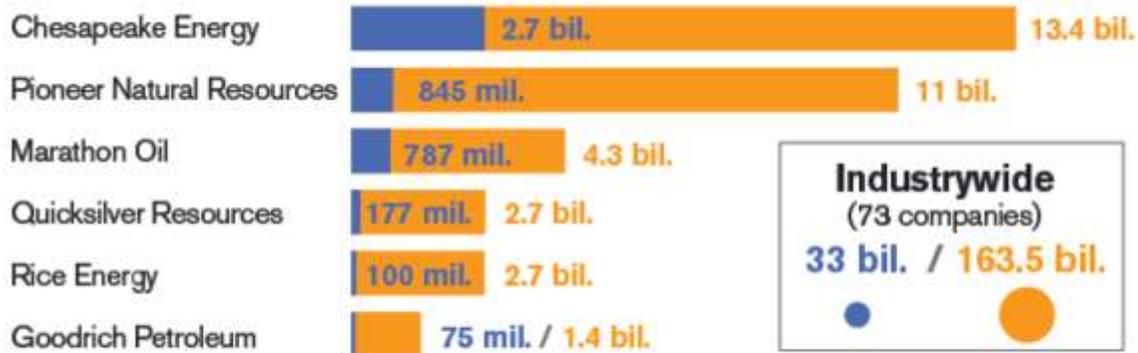
Worse, many experts question the highly optimistic reserve figures that the gas producers have put out there. In fact, even those producers themselves admit they may be overstating their case. This bar graph compares the projected reserves they're required by law to report to the government with the inflated figures they've been providing to investors (and buyers). It tells a dramatic story:

Selling the Shale Boom

An analysis of 73 shale drillers found that almost all reported higher oil and gas prospects to investors than to the Securities and Exchange Commission (SEC). These six companies illustrate the range of estimates within the industry.

■ Reserves reported to the SEC ■ Resources presented to investors

(selected examples in barrels of oil equivalent)



Source: Company presentations and SEC filings

Bloomberg Visual Data

Yes, the producers have an interest in understating their reserves to the government. Even allowing for that, this is a striking disparity. But if you want a sober, realistic assessment, ask an expert:

Arthur Berman is a geological consultant with 34 years of experience in petroleum exploration and production. He has published over 100 articles on petroleum geology and technology, made 25 presentations just in the last year to professional societies, investment conferences and companies, and is currently consulting for several E&P companies and capital groups in the energy sector. He is Associate Editor of the *American Association of Petroleum Geologists Bulletin*. He has appeared on or in *CNBC*, *CNN*, *Platt's Energy Week*, *BNN*, *Bloomberg*, the *Financial Times*, and the *New York Times*.

Berman takes issue with the kinds of rosy futures envisioned by the likes of the Energy Information Administration (EIA), which predicts rising shale gas production every year through 2040. That's probably the scenario Dominion Resources relies upon as it tries to make its case for the economic viability of the ACP.

And it's dead wrong. In its forecasts the EIA is contradicting its own hard data, Berman says: "The EIA publishes reserves for shale gas and anybody can go look at it. This is not Art Berman's interpretation. This is what the EIA [itself] says. So the total [available] shale gas for the United States at our annual consumption rate of about 26 trillion cubic feet is eight years. We got eight years of shale gas. That is what we got."

Additional research supports this viewpoint, too. "The University of Texas Bureau of Economic Geology has done a comprehensive and detailed study of all the shale gas plays over the last couple of years," Berman says, "and their forecast is completely different from the EIAs. The University of Texas forecast says that gas production, all gas production for the United States is going to peak in 2022 and then decline ... and there is a third source of all of this forecast work, which is a geologist named David Hughes who ... retired from the Canadian Geological Survey and he is currently working with the Post Carbon Institute. He did a similar in-depth, blood and guts ... analysis of every well in all of the shale gas plays in the US. And his number is very similar to the Bureau of Economic Geology, the University of Texas numbers. So when I compare the UT, the David Hughes and the EIA forecast with again proven and proven undeveloped reserves, UT is dead on..."

"As I understand it—and I think I understand it pretty well—the UT study and the Dave Hughes study looked scrupulously at every single well and did reserve estimates for every single well. They did all the economics, all the geology, all the engineering, all the geophysics. EIA doesn't do that level of work and they would be the first to admit it to you. I don't even think EIA has a geologist on staff. You know, they do sampling and scenarios ... [so] what you should take away is there is a lot more uncertainty around these fanciful projections than anybody wants to admit."

Eight years is what we got. If the ACP becomes fully operational in 2019, then Dominion has maybe four years before the shale gas begins to dwindle and, as the graph above shows, that decline is apt to be precipitous. Four years of adequate input before supply tightens up. Does any sane person believe that that reality justifies a capital outlay of \$5 billion?

Conclusion

In summary, the present leadership of Dominion is backwards-looking, proposing to address the issues of this century with solutions from the last one. They don't seem to grasp that the era of massive, capital-intensive infrastructure projects is over. It's time to embrace the new reality, a conclusion reached by the Edison Institute paper cited earlier, and also by the U.S. Department of Energy, which wrote in a recent research paper:

“Two primary factors mitigate the need for additional interstate natural gas pipeline infrastructure and related capital expenditures... First, the growth in both natural gas demand from electricity generation and natural gas production is broadly distributed rather than geographically concentrated, reducing potential interstate pipeline capacity constraints as well as the need to new interstate pipelines. Second, increasing utilization of capacity that is not fully utilized in existing interstate natural gas pipelines, re-routing natural gas flows, and expanding existing pipeline capacity are potentially lower-cost alternatives to building new infrastructure and can accommodate a significant increase in natural gas flows.”

The ACP (like its sister mistake, Cove Point) is not just the wrong kind of project to be undertaken at this time, it's the exact opposite of the right one. Just for starters, it faces the large number of serious roadblocks outlined here. Not everything that can go wrong will go wrong, of course; but it is naïve in the extreme to expect that everything will go right. The above arguments should convince you that there are sufficient risks to make shareholders question why Dominion is proposing this deeply flawed project.

The company, in short, wants to spend \$5 billion (or more) on a pipeline that will carry potentially non-existent natural gas to a potentially non-existent market. There may be a universe in which this makes good economic sense, but it isn't the one most of us live in.

Listen to these words about yet more dangers, from a May 2013 speech by someone who should know: “Betting too much on natural gas, no matter how much it appeals to us, exposes consumers to supply disruptions, shortages and price hikes. Not to mention abrupt and unexpected shifts in the regulatory climate.”

And who expressed such a cautious sentiment? Tom Farrell, CEO of Dominion Resources, that's who.

Farrell should not only know, he should know better. The ACP is a bad deal for the company, and for shareholder value. But perhaps Farrell is still basking in the glow of the 59% pay raise he got in 2014, to \$17.3 million, on the back of a performance-based bonus that came from a 5% bump in the company's operating earnings.

That's the metric the company uses to assess performance. But seasoned investors know that earnings figures can be manipulated in a multitude of ways. The one thing that cannot be manipulated (at least not legally) is revenues. Rising revenues are the best measure we investors have of the health of a company.

And in this area, Dominion is in a prolonged slide, including fiscal '14 results (recently posted) which show a 5% drop from '13. Looking further back, revenues in fiscal '08 were \$16.29

billion. From fiscal '09 to '14, the numbers are \$14.8 billion, \$14.93B, \$13.76B, \$12.84B, \$13.12B, and \$12.44B, the lowest in 12 years.

These are not encouraging revenues, and we should be deeply concerned. Initiating two new, extremely capital-intensive projects at this time carries more than a hint of desperation. Does Dominion truly believe the ACP is going to boost revenues even back to where they were in the depths of the recession? The odds, as this paper explains, are highly stacked against them, and it's fair for shareholders to ask: What on earth are they thinking?

Surprisingly, Dominion *argued against its own project* in its 2014 annual report to the Securities and Exchange Commission. In a rather candid assessment of just a few of the risks the ACP poses, Dominion wrote:

"The Atlantic Coast Pipeline project, which will be constructed by DTI, is expected to have a total cost of approximately \$4.5 to \$5 billion, excluding financing costs, and will involve significant permitting and construction risks. The project requires the approval of FERC and other federal and state agencies, which could be delayed or withheld. Dominion expects opposition from certain landowners and stakeholder groups, which could impede the acquisition of rights of-way and other land rights on a timely basis or on acceptable terms. The large diameter of the pipeline and difficult terrain of certain portions of the proposed pipeline route aggravate the typical construction risks with which DTI is familiar. In-service delays could lead to cost overruns and potential customer termination rights. Dominion owns a 45% membership interest in Atlantic Coast Pipeline. Dominion's lack of a controlling interest means that it has limited influence over this business. If another member were unable or otherwise failed to perform its obligations to provide capital and credit support for this business, it could have an adverse effect on Dominion's financial results."

That's worth reading again. In addition to everything else covered in this letter, the company is admitting to any number of *other* things that could, and probably will, go wrong in the construction of this pipeline, which could adversely affect the security of its financial future. And by extension, *our* financial future.

To reiterate one last time, this is our money they're playing with. Dominion is a public company, to which we hold ultimate ownership. Management's job is to serve shareholders and to increase the value of our stake in the company. It should *not* be making decisions that, with a high degree of certainty, will dilute the value of our holdings, if not seriously cripple the company altogether. So far, I have not seen any hard data from the company that would counter any of the issues I've raised. This project simply makes no financial sense.

Shareholders need to make their voices heard. It's past time to call on management to convince us to our satisfaction that the pipeline is both necessary and economically viable, a

very dubious proposition. If they can't do that, then they should reverse course and kill the ACP (and the Cove Point LNG plant, as well). And if they won't do *that*, then we need a change of management.

Thank you.

Doug Hornig, Sr. Editor for Technology and Natural Resources at Casey Research LLC

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