

And the answer to GLOBAL WARMING is...

## **THE OCEAN.**

SACRAMENTO MAN CALLS FOR CONGRESS  
AND THE PRESIDENT

TO MAKE OCEAN ENERGY A TOP PRIORITY,

TO MAKE PROTECTION OF THE OCEAN  
AND NURTURANCE OF THE OCEAN A TOP PRIORITY,

AND TO INVEST \$50 BILLION  
IN THE WAR AGAINST GLOBAL WARMING.

“Think outside the box.” Who could disagree? But to actually do so, to think outside the box, now that is a rarity. What *is* the box, anyway? Maybe the box is the continental United States, Alaska, Hawaii, and the various dependencies and territories of the United States. Maybe the box is everything associated with the land, with *terra firma*. If so, what we *ought* to be thinking about, outside the box—is the ocean. Yes, *the ocean!* ***Energy from the ocean!***

It’s the thing outside the box.

Ocean energy, or ocean power, is comprised of ***marine biomass*** energy, ***ocean solar*** energy, ***marine current*** energy, ***ocean wave*** energy, ***off-shore wind*** energy, and any number of yet to be discovered *ocean-based* energy technologies. My term for the mix or amalgam of these technologies is ***OceanNRG***.

— Frank Trujillo

# An Open Letter to the President and Congress:

Ocean Energy is Vital in Our Battle Against Global Warming

March 8, 2007

**To: Members of the United States House of Representatives  
Members of the United States Senate  
The President and Vice President of the United States**

**From: Dr. Frank Trujillo, Private Citizen**  
[tru-HEE-yo]

**Dear Mr. President and Mr. Vice President:  
Dear Honorable Member of Congress:**

I can remain silent no longer. Like many throughout the world, I am increasingly concerned about global warming. Not nearly enough is being proposed to address this serious problem, and even less is being accomplished. Under no circumstances would I write this letter unless I perceived my ideas to be of fundamental importance at precisely this moment in history. In the lines that follow, I wish to advocate for declaring ***ocean-based energy*** a national priority, and strongly recommend that the United States act with all due haste to bring this form of clean, renewable energy to fruition.

It's time we declare war against global warming, time for us to wage a full frontal assault against it. There is irrefutable evidence that climate change is a major problem and that we humans are responsible for it. Let us not await the next severe storm that kills hundreds or renders thousands homeless, let us not put it off until millions of innocent people in the world suffer and die. Indeed, it seems entirely likely that untold numbers of people here and elsewhere will assuredly suffer, and die, in the near future as a result of human-caused climate change.

The United States leads the entire world in carbon dioxide emissions, with China expected to surpass us in 2009. The U.S. is not doing nearly enough. Nor is China, India, Europe, or anyone else. No one is doing nearly enough. It is imperative that the entire world change. As a civilization, we can no longer rely on 19<sup>th</sup> century fuels, or technology. **There is an urgent need, worldwide, for a new energy paradigm.** And how can we possibly expect the rest of the world to accept this as reality if we ourselves are unable or unwilling to do so? America must lead the way.

As a practical matter, it is essential the U.S. begin as soon as possible to restrict the nation's use of coal, oil, and natural gas to fire the boilers that today produce the bulk of our electricity. Eventually, our reliance on fossil fuels must be entirely eliminated. Whether doing so is possible in 25 years or 40 years, no one knows. But it needs to happen, and the sooner the better. Because global warming is a

serious problem, because reliance on fossil fuels every day, every minute, serves only to exacerbate the problem, I am today calling on Congress and the administration to take a truly bold step—similar to the one taken, in 1961, by President John Kennedy with respect to the Apollo program—and declare **ocean energy** (*ocean power*) a top national priority, and, over the course of a decade, transform this clean and renewable source of energy from its present embryonic and quasi-experimental stage to full-scale functionality. My recommendation is that the U.S. invest a minimum of \$50 billion over the course of eight (8) years for research and development of ocean energy. The following *ocean-based* technologies<sup>1</sup> comprise what I refer to as *the ocean energy matrix of the future*:

**Marine Biomass Energy** (Marine Farm or Ocean Food and Energy Farm, OFEF). *Marine farming* can capture incredible amounts of solar energy. It has been estimated that large, open ocean farms planted with giant kelp (as one example) could potentially provide *most if not all* of the energy needs of the United States. As contrasted with combustion of fossil fuels, *marine biomass energy* removes carbon dioxide from the atmosphere and converts it, via photosynthesis, into chemical energy.

**Ocean Solar Energy** (Ocean Thermal Energy Conversion, OTEC). The ocean is the largest solar collector in the world.<sup>2</sup> It is estimated that 300 times what the entire world consumes in electricity is available by tapping the upper layers of the tropical ocean. An added benefit of *ocean solar power* is the production, via desalinization, of fresh water.

**Marine Current Energy** (Tidal Energy). Seawater is 800 times denser than air; hence water traveling at 12 mph exerts force comparable to a 110-mile wind. This power can successfully be harnessed, via turbine. Ocean current is of two types, two-way (ocean tides) and one-way (i.e., the Gulf Stream, for example) and can be used to generate electricity. Experts contend *the Gulf Stream alone* transports some 1.5 petawatts of heat, equivalent to 100 times the world energy demand. A *tidal fence* (between two land masses) can serve as a conduit for autos and trains (picture a high-speed bullet train linking Miami, Houston, and San Diego, for example). With regard to future water scarcity issues (rivers like the Colorado drying up, drought, etc.), a *tidal fence* could also be used for transporting desalinated water to shore.

**Wave Power/Wave Energy** (Ocean Surface Wave Energy). Using a variety of innovative technologies, electricity is today being generated, via *wave energy*, in dozens of locations throughout the world. Wave energy is pollution-free and entirely, persistently, renewable. It has been estimated that ocean waves are capable of producing between 2,000 and 4,000 gigawatts of electricity, the latter according to UNESCO.<sup>3</sup> And, if that isn't enough, every 15 seconds, or so, here comes another wave! (I like to look at wave energy in this way: In 2007, seven years into the 21<sup>st</sup> century, only one wave in every one-hundred-million-billion-gazillion, has *ever* been harnessed for purposes of electrical production! As anyone can plainly see, we've got quite a waves to go! Ha!)

**Off-Shore Wind Energy** (Wind Farm) Most Americans are familiar with the land-based wind energy turbine. Fewer are acquainted with its off-shore cousin. The ocean makes up 73% of the earth's surface, hence *off-shore wind energy* potential is enormous—*several times again* the energy

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<sup>1</sup> Unlike nuclear power, ocean-based technologies pose no risk of nuclear accident, nuclear radiation, and nuclear waste. Fossil-fuel power (coal, oil, and gas) contributes to acid rain, global warming, and air pollution. Not so with ocean energy.

<sup>2</sup> With regard to the ocean, Mariette DiChristina has stated, "The world's largest solar collector absorbs an awesome amount of the sun's energy: equal to 37 trillion kilowatts annually - or 4,000 times the amount of electricity used by all humans on the planet. A typical square mile of that collector—otherwise known as the surface waters of Earth's vast oceans—contains more energy than 7,000 barrels of oil."

<sup>3</sup> David Ross, now deceased, one of the preeminent authorities in the field, has stated, "Wave energy has been hailed as the most promising renewable source for maritime countries. It does no environmental damage and is inexhaustible – the waves go on forever. It is invariably popular with the public, which has a sentimental love of the sea... The potential resource is vast. It is usually estimated as being of the order of 2,000 gigawatts (GW), though UNESCO has put it at roughly double that amount. But what we need to estimate is how much can be gathered and delivered at an economic price."

requirement of the entire world. A *wind farm* is unobtrusive, assuming placement of turbines 10 or 100 miles from shore. One *wind farm* complex alone—comprised of 250 or 300 wind turbines—can produce as much electricity as is produced annually in a nuclear power plant. *Off-shore wind energy* is clean and renewable. If implemented on a large scale, it *alone* could fulfill 100% of the energy requirement of the United States.

A Congressional goal, assuming one is established, should be highly ambitious, perhaps something along the following lines:

*Within a decade, by 2018, a minimum of a dozen ocean energy facilities (electrical generation plants) will be on line, or nearing completion. Initially, these will generate only a very small percentage, perhaps 3% or less, of the U.S. total. Over the next several years, by 2025 or so, we anticipate attaining 75% of our nation's energy from clean and renewable sources, an ever increasing percentage of which, 20% or so, will come from the new ocean energy. Our ultimate goal is, by the year 2040, to obtain 95% of all energy from clean and renewable sources, approximately 50% of which will be produced via ocean energy.*

Such an effort would represent a magnificently bold undertaking and would require the full support of the American people. \$50 billion is a lot of money. Still, it's only a fraction of the \$400 billion the U.S. has already spent on the wars in Iraq and Afghanistan—some \$10 to \$20 billion of which, according to reliable sources, has been squandered—and the threat our country faces with respect to global warming is certainly on a par with global terrorism. Realistically, in comparison with what our nation has to gain, this expenditure of economic and human capital could very well go on record as one of the smartest investments the U.S. ever made.

For the most part, Americans know little if anything about these relatively recent, clean-energy, technologies. Indeed, many in your own ranks may be hearing of these today for the first time. This is understandable, as information with respect to these technologies has typically been suppressed. Big oil, coal, and other fossil fuel giants, along with government leaders (under pressure from paid lobbyists) and the utilities themselves (seeking protection from competition), have constituted the primary logjam to their implementation on anything other than a very small-scale. Today, these emerging technologies, because they are clean and persistently renewable, dare no longer go unexamined and untried. Ocean energy is *the most effective and efficient way possible of producing energy*. Perhaps more importantly, these technologies produce zero emissions, hence every moment of every day, they can simultaneously help the United States wage war against the vagaries of climate change. To this date, no major corporation has invested substantially in this new technology. Were things left to progress naturally, one can envision that, by 2015 or 2020, one or more of the energy giants would perhaps invest (to one degree or another) in ocean energy. Thus, perhaps by 2025 or 2030, ocean energy would supply some small fraction of U.S. electrical demand. Unfortunately, given the existing situation, facing the set of circumstances we face at this moment in time, natural progression offers too little, too late. Which is why, in order to “jump-start” ocean energy, and put it on a “fast-track” to full implementation, I recommend a federal investment of \$50 billion over the course of 8 years. Federal encouragement can assume many forms—tax-exempt financing, federal energy credit facilities, inclusion of ocean energy in emissions credits program, subsidized federal loans, and others.

Were our country seriously to consider *ocean power*, an absolute imperative is this: We must prioritize the ocean and everything related to it. Were the United States to pursue ocean energy, two things must occur, each as important as the other, and it is imperative that both occur simultaneously:

- A full array of ocean-based resources and technologies (i.e. wave power, off-shore wind energy, marine current energy, etc.) must diligently be pursued and developed, including potential energy

sources and technologies yet to be explored. This must be accomplished, by engineers and scientists, in ways that are open and transparent, with full accountability measures in place, exercising due diligence at all times, and with appropriate government involvement and oversight.

- More than ever, the environment must be protected and nurtured. Protection and nurturance of the ocean (inclusive of all marine animals, ocean habitat, and marine life), with an emphasis on safekeeping ocean resources for all future generations to make use of and enjoy, must steadfastly be advocated and enforced. Today, throughout the world, society is guilty of doing very little in way of protecting the ocean.

For too many years the ocean, and virtually everything pertaining to it, has been relegated second-class status. For decades, there existed a hodgepodge of laws and a somewhat duplicative and redundant assortment of federal agencies governing both the ocean and the territorial waters of the United States. As late as 2005, perhaps because no one knew what else to do with them, *all* “Renewable Energy and Alternate Use” projects (i.e., wind, wave, marine current, ocean solar, etc.) were put under the jurisdiction of the Minerals Management Service, a bureau of the U.S. Department of the *Interior* (emphasis mine). This is somewhat like grouping Education within the U.S. Department of Commerce, or NASA within the U.S. Department of the Interior. Actually, my point is that there exists today a very real need for just one comprehensive law with respect to the ocean, and one department—and one only—overseeing exploration and protection of the ocean. To these ends, I am calling on the president and Congress to create a new, Cabinet-level, **United States Department of the Ocean**. Nearly three-quarters of the surface of the earth is ocean. In what more significant way can the fundamental importance of the ocean to our very survival as a planet be communicated? In what better way do we put stewardship of the ocean, safeguarding of the ocean for future generations, front and center on America’s stage? (Or the world’s?) The real surprise, in all this, is not that a private citizen is calling for a Cabinet-level U.S. Department of the Ocean, but rather—considering how exceedingly important the ocean is to the survival of country and to our planet—that 231 years have elapsed without it having merited Cabinet-level status, and attention.

A second fundamentally important concept is this: *As the U.S. goes, so goes the world*. Fortunately for virtually the entire world (and maritime countries in particular), these clean, entirely renewable, *ocean energy* alternatives are available, 24/7/365, until the end of time. As I see it, one of the brightest stars in our constellation is the knowledge that, once a practicable “mix” of these clean energy alternatives (i.e., *wave power*, *ocean solar energy*, *biomass energy*, etc.) has been implemented, once these technologies are up and running, the United States will be in a perfect position to share its technological know-how with the rest of the world. In so doing, the U.S. can facilitate a potential worldwide conversion to these sources of clean energy. Nothing would do more to help ensure our survival as a species. I pray that in a generation or two this will have come to pass.

The world is at war. The United States is at war. The enemy is global warming, and it must be defeated at any cost. In a time of war nothing is impossible. During the Great Depression, programs such as the WPA and the CCC came into existence. Construction of massive dam projects (resulting in hydroelectric power) was seen not only as necessary, but also as a way to “jump-start” the economies of regions in which they were constructed. Many of the largest dams—including the Grand Coulee Dam, Elephant Butte Dam, and Hoover Dam—were built by the federal government. Not only has the federal government constructed dams, it has built (and continues to build) levees, it has constructed nuclear power plants, it has designed and constructed canals (the Panama Canal, for example), and it has involved itself in the construction of solar power plants. (*Nevada Solar One*, the world’s third largest solar thermal plant, is under construction in Boulder City, Nevada. It will produce 75 megawatts of electrical power. It is a joint development of the U.S. Department of Energy (DOE), the National Renewable Energy Laboratory (NREL), and *Solargenix Energy*, a private corporation. In an interesting twist, *Acciona*, a conglomerate from Spain, recently purchased a 55% stake in

*Solargenix*, and my understanding is that *Acciona* will eventually own it outright.) *If it decides to, if it elects to*, the United States can most certainly involve America's best and brightest in jump-starting the design and construction of electrical generation plants, even in the deepest waters of the ocean.

Suppose you have a rare form of cancer, possibly terminal, and one medical team, and then another, advises a particular procedure or regimen be followed. You give it a try, don't you? Not that our planet has cancer, *per se*, but assuredly we will all continue to suffer the pandemic consequence of fossil fuel combustion—unless we act. Earth is suffering from an acute case of global warming. Why *wouldn't* the United States initiate simultaneous construction of, say, 6 or 8 ocean solar electrical generation plants (facilities), each capable of generating 1,200 or 2,400 megawatts of power? What's to stop the United States from having these new plants up and running in 8 to 12 years? Concurrent with this, what is to keep the United States from initiating construction of 3 or 4 major marine tidal installations (facilities), each capable of producing 10,000 megawatts?<sup>4</sup> My advice? Jump on it! Get on with an intense scrutiny of these technologies immediately! Ultimately, you may very well find yourself a strong advocate of *Ocean Energy*. Read up on it. *Ocean power* could very well represent *the* most beneficial technological breakthrough of the 21<sup>st</sup> century. These technologies could change the world—and very much for the better—in as few as 25 to 40 years. Naturally, some will be skeptical that a change of this magnitude can occur at all, much less so very quickly. *But this magnitude of change has happened before*. Consider the following:

- Electricity from nuclear energy was generated for the first time at the *EBR-1* reactor in Idaho on December 20, 1951. EBR-1 was 100% federally funded. Annual expenditures at the Idaho National Laboratory (as it is now known) are \$1.2 billion. Today, only 56 years later, there are 104 licensed commercial nuclear reactors at 65 sites in 31 states. Worldwide, there are 442 licensed nuclear power reactors. 31 countries each have at least one. 400+ plants in 50+ years. Incredible.
- Only in 1996 did the word “Internet” begin coming into common daily usage. As of January 2007, more than one billion people use the Internet on a daily basis. Change can happen very quickly!

More than any other program America could implement, more than anything else America could do, ***ocean energy represents a tipping point in the full-scale frontal assault against global warming***. By turning to clean ocean power, it is possible to freeze CO<sup>2</sup> emissions, to curtail and eventually put a stop to the current exploitation of fossil fuels, to eliminate our country's dependence on foreign oil, to scale down America's gas and coal-fired electrical plants—and to eventually see these 19<sup>th</sup> century-based facilities razed. But, most importantly, in doing these things, it's entirely possible to help turn the tide on climate change. It will not be easy—nothing worthwhile is easy—but transforming the energy matrix is something we can, and should, do. The most practical way to accomplish all these things is to turn to the ocean.

There are important implications as well for the automobile. Will the fuel of the long-term future be ethanol from cellulose and sugar cane, or methanol from coal, or anything else requiring combustion to produce? My view is that combustion (of any type) is out, and that electricity is demonstrably the wave of the future. Electricity is much cleaner. Until now, some have felt that *even if* the increased demand for electricity to power our cars came from *conventional power plants* (i.e., coal-fired and gas-fired boilers), the U.S. would still *pollute less than we do at present by utilizing gasoline*. But what if, in the not too distant future, 100% of the electricity to power our cars came from the ocean? What if, in 10 to 15 years, the power source (i.e., *ocean energy*) and vehicle type (i.e., electric vehicle) were *both* 100% pollution free? Zero emissions to produce; zero emissions to drive. Just imagine that!

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<sup>4</sup> For the last three sentences, commencing with, “Why wouldn't...,” the reader is asked—in fact, encouraged—to freely substitute one example of an energy source or technology for another (i.e., *wave power* for *ocean solar*, or *off-shore wind* for *marine tidal*).

Clean energy advocates are pressuring Congress to adopt a goal of obtaining 25 percent of the nation's energy—electricity, motor fuel and other power—from renewable sources by 2025. I say, "Dare to do better than that!" Present circumstances call for truly a *bold* initiative. Go out on the ledge a bit—somewhat like President Kennedy did in 1961, with the space program, or President Roosevelt, in 1933, with the TVA. By prioritizing ocean energy, by advocating for it, we proclaim to all Americans, and to the world, that we are not powerless in the face of global warming, that indeed there is something we *can* do to dramatically curb greenhouse emissions. And we can do it much, much earlier than has previously been considered. Set a goal of obtaining 75% of the nation's energy from clean and renewable sources—including the new *ocean energy*—by 2025. Set a goal of 95% by 2040. Both are entirely reasonable, and can be met. The outstanding benefit of establishing a goal is that, in so doing, we communicate a spirit of good old-fashioned American ingenuity, and help generate an *anything's possible*, infectious enthusiasm. Stop for a moment, and think. *Ocean energy. The power of the ocean.* Relying on clean energy from the ocean to power, and empower, our lives.

Sad to say, but today there is a perceptible attitude that exists, a sense of foreboding that looms here in America, and elsewhere. Imagine the signal our intended use of this clean and persistently renewable source of energy would send our nation, and the world. Imagine the message it would send our children. Imagine the spark of hope and of optimism it could very well instill in them—and even, perhaps, even in the most jaded among us. Proclaim clean ocean energy a priority, invest in it, and within a decade, there is no doubt, *it will come to pass*. In 10 years, *Ocean Power* will have gained a significant foothold. In 25 years, 75% of all electrical power will come from the ocean *and* from America's expanded arsenal of clean, renewable energy sources—solar, wind, geothermal, hydroelectric, and biomass. In 40 years 95% of all America's energy will come from entirely clean and renewable sources, the majority from the ocean. Best of all, imagine for one moment the likely impact of all this, over the course of the next 100 years, on global warming.

All this is possible. But what is the *biggest obstacle* to full implementation of ocean energy? ***Our inability to think outside the box.*** In a recent editorial in *The Christian Science Monitor*, this inability (or incapacity) is highlighted quite nicely, I believe. In a March 2, 2007 op/ed piece, the writers state,

This week a panel of scientists handed the UN its ideas on ways to wean the world from using coal, oil, and gas. Two ideas led the list: more renewable energy—and more nuclear energy. Other recent studies have reached similar conclusions. Many environmentalists see wider use of nuclear energy as a non-starter, citing proliferation, terrorism, waste disposal, large and long-term costs and, most of all, lingering doubts about safety. None of these concerns is trivial. Yet a number of leading environmentalists have jumped ship to back nuclear, saying it's essential to saving the planet from global warming despite potential problems. *Something besides wind power, geothermal, solar energy, and conservation is needed to curb carbon use* (italics mine).<sup>5</sup>

Even this panel of scientists doesn't get it. "**Something** (emphasis mine) besides wind power, geothermal, solar energy, and conservation is needed to curb carbon use."

"Hello. Trujillo to scientists... Trujillo to Earth... That *something* is ocean energy!"

*Ocean energy* may well represent the world's *last best hope* for combating global warming. It's hard to believe, but at this very moment in history, *ocean energy* is not even a tiny speck on our nation's radar screen! Given its potential, one would think it would merit serious discussion. But when is the last time you heard the merits of *ocean-based energy* debated on national television by the leading

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<sup>5</sup> See "Splitting Atoms to Cool the Planet," *The Christian Science Monitor/The Monitor's View* (Editorial), Friday, March 2, 2007.

candidates for the presidency of the United States? Has it *ever* been debated? When is the last time a leading candidate stated publicly that, if elected, he or she would make *ocean-based energy* a top priority? In all history, has this ever happened? When is the last time *ocean-based energy* was openly debated on the floor of the United States House of Representatives or the United States Senate? Has it *ever* been debated? Little wonder so few have even heard of it.

As an advocate for children and for young people everywhere, as an advocate for all future generations, I beg you to consider this: Now is the time for every one of us to take the very best look we can at a point in the distance some 25, 50, 250, and 500 years down the road. And then, paying absolutely no attention to the naysayers, or to those who lobby on behalf of vested interests, let us proceed to make the very best alternative energy decisions humanly possible on behalf of our children...and our children's children.

Fifty years from today, no one will remember what the vote was, what the sound bites may have been on one side or the other, or even how much money was spent. Fifty years from now, it will only matter that people have a reliable, and constantly renewable source of electricity, and that humans *no longer are complicit in fouling up the air* in order to turn on their lights, drive their automobiles, power their electronic devices, and operate their air conditioners. Fifty years from today, we will have made significant advances in the battle against global warming. People will consider themselves very, very fortunate that, in 2007-2008, we in the United States had the foresight to pursue *ocean energy* when the opportunity presented itself. Either that, or people will consider it tragic that we did not.

The favor of a written response will be greatly appreciated. Thank you.

Sincerely,

Frank Trujillo

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**Full Disclosure.** I am not an expert. I am beholden to no one, which is to say no one other than my wife, my friends and family members, my native New Mexico, my Sacramento, my California, my nation, my World, and my God. For present purposes, I am neither a Republican nor a Democrat...nor a member of any other political party. The current situation calls for something well beyond politics as usual. I own no patents or proprietary claims with respect to the technologies I am advancing and which, for the most part, I support. I neither own stocks or bonds in any corporation, nor do I presently sit on any corporate board of directors. I represent no organization or corporate lobby. (In actuality, as was the case with Groucho Marx, I refuse for the most part to join any organization that would have me as one of its members!) I am an equal rights proponent and an advocate of children and young people. Most of what I think, and write, relates in some way to helping build a better future for our children and for all future generations. I am, for the most part, an optimist. My present state of mind, however, has come to mirror what I see all around me, in my country, and in my world: I am *unwell*. As the lyric of the *Matchbox 20* song suggests, "*I'm not crazy, I'm just a little unwell...I'm not crazy, I'm just a little impaired.*" But as I look all around me, one thing is certain: I have plenty of company.

About the Author. A short "bio" is available by navigating to the *About the Author* section on the website, [ProTeachPublications.com](http://ProTeachPublications.com).