Creating a Fusion Economy: There Are No Limits to Growth

Jason Ross and Meghan Rouillard of the LaRouchePAC Science Research Team addressed an LPAC webcast Oct. 26, on the potential for a rapid reorganization of the world economy around the concept of a thermonuclear-fusion-powered future. The entire program can be viewed at www.larouchepac.com.

Meghan Rouillard: Good morning, good afternoon, and good evening; *hola a todos y todas.* My name is Meghan Rouillard, I'm a member of the LaRouchePAC Scientific Research Team, called "The Basement," and I will be moderating, and participating in today's international webcast event, which is on the subject of "How and Why To Create a Fusion Economy, and Why There Are No Limits to Growth."

This is a live event. We have live participation from a special audience gathered in Mexico City, organized by the Mocila, the LaRouche Citizens Movement of Mexico. We have other audiences gathered around the globe, and especially in Ibero-America, and I'll outline where some of those audiences are in a moment.

Today's event is going to feature a presentation by my colleague Jason Ross, followed by a period of questions and answers with both Jason and myself.

Now, as I'm sure I've already made clear to our viewers and listeners, I am not Benjamin Deniston, whom some of you might have been expecting to see at this event. But, I can say that Jason, Ben, and I all worked together to write the report, "Nuclear NAWAPA XXI: Gateway to the Fusion Economy," and we'll hear more today about this program and about NAWAPA, the North American Water and Power Alliance.

So, as I mentioned, we also have participation from satellite audiences around the world, specifically in Ibero-America. This includes, but

it's not limited to, viewings taking place at some of the following universities. In Mexico, we have an audience gathered at the auditorium of the Economics Department at the University of Sonora in the state capital, Hermosillo. In Colombia, we have several viewings taking place, at two campuses, of the Universidad del Valle. I know one of these is happening in the city of Buda. Also at the Universidad Libre in Cali, which is the capital of the province of Valle. And also in Peru, at the Department of Economics Engineering at the National Engineering University in Lima.

We also, I know, have audience participation in Spain, Argentina, and Chile, although I'm sure not limited to that. . . .

And I would like to add at the beginning, that a report written by Mr. LaRouche called "The Thesis," is a document which can serve to accompany this event and the discussion which will take place, andhas been translated into Spanish and can be found at http://spanish.larouchepac.com.

Two Outlooks

Just to give some context for Jason's presentation, I would like to clarify for people what the fundamental nature of the strategic situation is, which can certainly seem a bit unwieldy, in terms of figuring out what's determining everything that's going on. And why, in this strategic situation, the fusion economy and the fight over creating a fusion economy, is a key battlefront.

I would assert at the beginning, and I'm sure this is going to be a lot of the substance of our discussion, that ultimately, this is not just the easiest way; but it is the most truthful and best way to understand the world political situation: It's not that it's a fight over money; it's not a fight among political parties, or even among nations. It's really a fight over the nature of the human species.

Just to outline this in broad strokes, but in a very stark way, I would like to read two quotes that were featured on one of the invitations we published to this event, illustrating these two completely different ways of viewing mankind.

The first quote is from His Royal Highness Prince Philip, the Duke of Edinburgh. This is something he said in 1988. He said, "Human population is probably the single-most serious long-term threat to survival. In the event that I am reincarnated, I would like to return as a deadly virus, in order to contribute something to solve overpopulation."

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Meghan Rouillard, who moderated the webcast, defined the battle that the LaRouche movement is engaged in as "a fight over the nature of the human species."

Now, Lyndon LaRouche in a document called, "There Are No Limits to Growth," in 1983, wrote the following, which stands in stark contrast to Prince Philip. LaRouche said, "Man is fundamentally different from the beasts. Man has the potential of reason, the power to make creative discoveries which advance his scientific knowledge, and to convert such scientific advances into advances in technology. If, at any point, we halt technological progress, the society foolish enough to do such a thing, condemns itself to die."

So, I would assert that understanding the fight between these two outlooks, about what mankind is, this is how to understand—this makes the strategic situation clear. This is how to understand the roots of the economic crisis; why it is that there are people who defend the crimes of Wall Street, and who oppose the reinstatement of Glass-Steagall. This is how to understand the intention behind policies of austerity, war, and also, the Green policies which are being forced down the throats of all of us, and all of you in your respective nations.

I would add, it's very notable that in Mexico, and in much of the developing sector, there's been an ongoing dialogue with LaRouche on this very question, and its resolution, which, as we will discuss today, really lies in man's control of the forces of the atom, in nuclear fission and nuclear fusion. And I would add that a real inflection point in this dialogue, was LaRouche's collaboration and discussion with the government of President José López Portillo of Mexico. In 1978, the Fusion

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"Why did the U.S. economy stop growing after 1970?" asked Jason Ross. Because we accepted the "oligarchical principle": that man is an animal whose population must be reduced. Instead, as Promethean man, our prospects are unlimited.

Energy Foundation, Lyndon LaRouche, submitted a 24-page memo called "The Nuclear Development Policy" to the government of López Portillo, and shockingly, this outlined a plan for fission and fusion development in Mexico, and said that there could be real development of fusion in Mexico, which would have taken place by the year 2000—13 years ago.

In 1980, on a trip to Canada, López Portillo said that the development of fission and the development of fusion power were the most serious alternatives to Mexico's energy problem and energy crisis.

López Portillo had some other good advice, when he said in a conference in 1998, that it was "time for the world to listen to the wise words of Lyndon LaRouche."

So, I will end there, and I say, we should now listen to the wise words of my colleague Jason Ross, and get on with the event. Thank you.

Promethean Man

Jason Ross: Well, it's certainly a pleasure to be here and have the opportunity to speak to you all. Thank you for participating in this event.

As Meghan had laid out, there are two paths for the world to take, there are two main directions that the fight is about right now, between the oligarchical outlook expressed by Prince Philip, "His Royal Virus," and the outlook expressed today by Lyndon LaRouche, which is the development proposal for mankind as expressed by the greats of the past, such as Nicholas of Cusa and the Founders of the American Republic, for example, and others.

Currently, we are confronting a major crisis worldwide, economically, politically, strategically. On the economic front, I'm sure everybody is aware of the cuts being made in budgets by nations all around the world, at least those in the trans-Atlantic world. We're all aware of the "bail-in" policy, that was pursued in Cyprus, where people had their accounts simply taken from them; or the similar policy taken in Spain, with Santander and other banks there.

The policy is a deliberate push for reducing the world's population to cause death and depopulation. That's the intention behind those policies that protect Wall Street and similar gambling by the banks, instead of the well being of the population, of the people of the planet.

So, the question before us now is, will we go in the direction of the oligarchical outlook, which views people as if they were animals, with some very unwholesome animals on the top, such as the Queen of England; I'm not quite sure what kind of animal she thinks she is, to go along with the kinds of animals she thinks we are. And the humanist outlook, in which all people are equal, not in their physical bodies or anything like this, but in the fact that we all have a spark of creativity, and every person is equal in respect to our ability to potentially discover something of great and wonderful importance for mankind as a whole.

That is the outlook that Lyndon LaRouche expresses in his economics and in his politics. This outlook provides the key for getting out of the current crisis.

Now, there are a lot of crises, and people ask, how are we supposed to pay for big projects if we do not have enough money for our current needs? This is something we hear every day in the Congress. They say, "Yes, you have wonderful plans for the future—*but*, how are we going to pay for it today?"

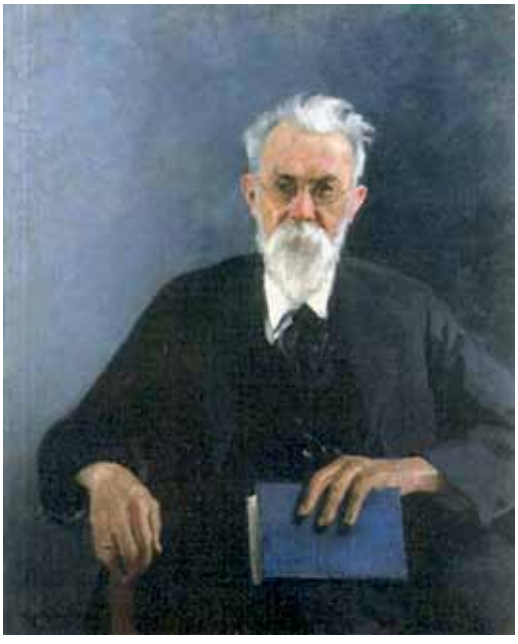
Well, the technique that we need now, is nothing really that special. It's simply a very good idea that has been deliberately attacked and deliberately prevented. In broad terms, this goes back—it's very useful to look at the great play of the Greek playwright Aeschylus. He wrote a series of plays about Prometheus. We only have one play that still exists, *Prometheus Bound*, and it tells the story of Prometheus, who took fire from the gods on Mount Olympus, and he brought that fire to mankind. He also brought the beginnings of knowledge: He brought

poetry, astronomy, agriculture, understanding of the materials around us. Basically, he brought knowledge to mankind, which finally separated us from the animals.

If you look at the use of fire, animals experience fire; a forest fire occurs, animals will run away from it, but there is no animal that uses fire deliberately. This was the first definition of the human species, the fact that a new kind of life had existed on the planet that was using fire, willfully.

Now, in Aeschylus' play, the gods of Olympus, Zeus and the other gods, are not very happy about this. They're enraged that Prometheus has taken their power, and shared it with mankind. They punished Prometheus: They chained him to a rock, in intention, forever.

That's really the context for today. We have new kinds of fire since the time of Prometheus. We use steam engines—this is a couple of centuries ago—the use of steam engines to free us from the labor of our bodies and those of animals. We have, today, nuclear fire, fire metaphorically: We have fission which we already use, to some degree. We have the potential for fusion. So, will we use these forms of fire, or, will we give in to the desires of the new gods of Olympus, who hate what Prometheus stands for, and intend to keep mankind in a weak position?



The great Russian scientist Vernadsky said: "Reason changes all.... From a scientific standpoint, humanity as a social force, as a discovering force, is a force of nature. The power of the human mind is itself, a force of nature."

Reason Changes All

I'd like to read a quote to you from Vladimir Vernadsky. He was a Russian-Ukrainian biogeochemist—he did everything—and this is a quote from a paper that he wrote toward the end of his life, where he discussed from a physical standpoint what makes mankind unique. Vernadsky says, "Man is profoundly distinguished from the other organisms, by his action on the environment. This distinction, which was great from the beginning, has become immense with the passage of time. The action of other organisms is almost exclusively determined by their nutrition and their bodily growth and increase. Mankind certainly acts in the same way as all these organisms, but his mass is negligible in comparison with the totality of living matter.

"Reason changes all: Through it, man utilizes material in the environment, inanimate and living, not only for the building of his body, but also for his social life. And this usage has become a great geological force. Thought, by its existence, introduces into the mechanisms of the Earth's crust, a powerful process having no analogue for the appearance of man.

"From a scientific standpoint, humanity as a social force, as a discovering force, is a force of nature. The power of the human mind is itself, a force of nature. Like magnetism, gravitation, geological forces, life, our reason is a force of nature."

Now, that is the basis of Lyndon LaRouche's economic outlook. His view is that economic wealth does not derive from a stock market. Economic wealth does not derive from finance. Economic wealth does not derive from a hypothetical mortgage. Instead, economic wealth does not come from money at all, or anything measurable as money. It comes from a development of new technologies, by the creative minds of human beings.

I'll give you an example, we can measure things in terms of money—we do every day. Things have costs, they cost different amounts. Some things are worth much more in money than other things. A car costs more than a melon. But, if you were to go back in history, say, two millennia; let's say we go back even further, to ancient Egypt. The Egyptians had gold, they used money, but how many pieces of gold would an X-ray machine be worth in Egypt? How much Roman money would one have to pay to buy a car? Right? These things simply did not exist.

So what we do when we introduce new discoveries, we do not make money, we change the value of money by changing the economy in which it is used. So, *physical* economy is the key. Understanding economic wealth must come from our physical activity as a species.

There is a very simple measure for this, that La-

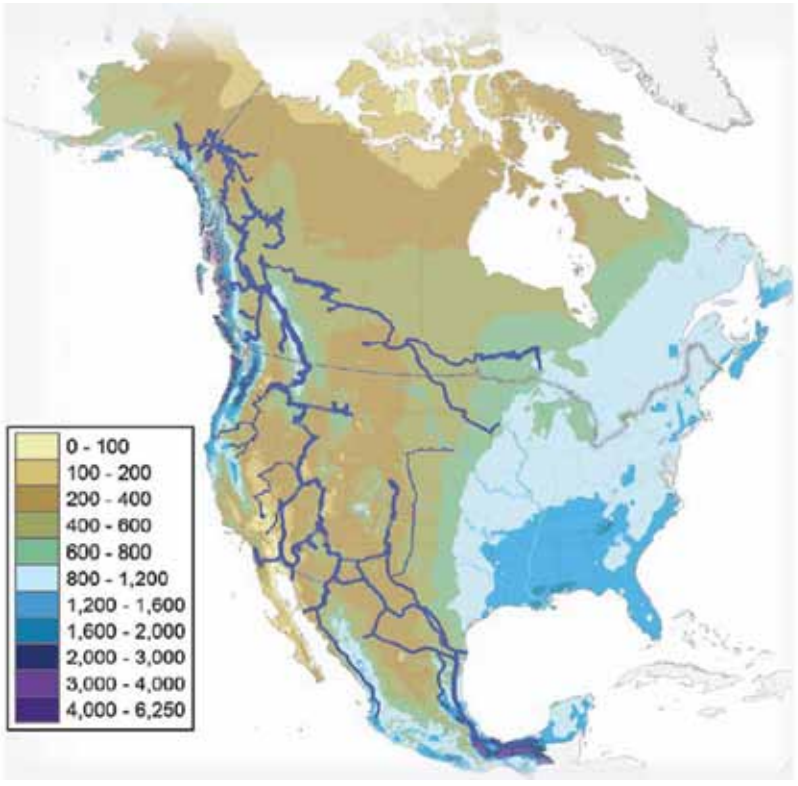
Rouche introduced in his economics textbook *So, You Wish To Learn All About Economics?*. The measure that he used, he called "potential relative population-density." Population-density—that's a familiar term: That just means how many people live in a certain area. This exists for people, it exists for animals, it exists for rabbits, it exists for cows, it exists for grasshoppers, but think about this word *"potential"* population-density. In a certain square kilometer of land, there is a potential number of grasshoppers that can live; there is a potential number of cows that can live; there is only so much grass, so the number of cows is limited. Cows cannot change that limit.

Let me ask you a question: What is the potential population-density for human beings? Is there one number? Let's say that aliens come in a spaceship to the Earth, and they're writing an encyclopedia about all the life they find on Earth. They could write about cows, they could write about grasshoppers, but if they wrote about human beings 2,000 years ago, they might say, "This is the potential population-density of human beings. This many people can live in a certain area."

But now, today, think of all the advancements we have. With modern agricultural, with electricity, with health care, with medicine, with water-purification systems, with transportation, with refrigeration, the number of people we can support has increased. Those people who say that there are "limits to growth," and those especially who say we have surpassed those limits, like Prince Philip—they are denying this essential aspect of the human species: We change the potential population-density of our species, when we evolve in our relationship to nature. This evolution is not like that of other life. We do not grow wings, or four more arms. Instead, we change how we act, we change our social life.

FIGURE 1

NAWAPA: The North American Water and Power Alliance
PLHINO: North West Hydraulic Plan
PLHIGON: Northern Gulf Hydraulic Plan



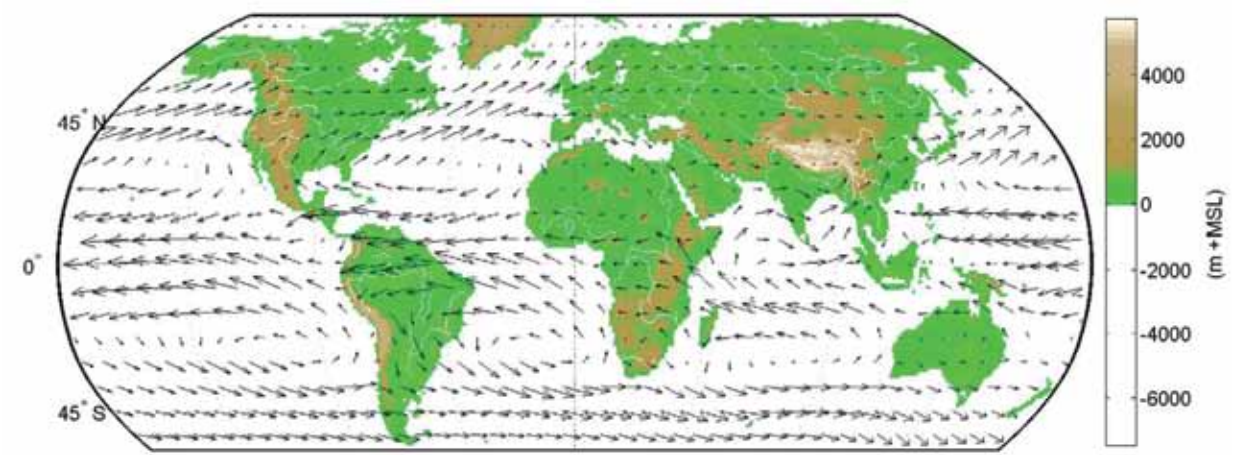
NAWAPA

So, I'd like to discuss two aspects of this that are key: the NAWAPA proposal as a key program for North America, and as a model for the rest of the world; and the potentials inherent in fusion energy. So let me jump into that: In **Figure 1** we see NAWAPA, and two companion projects in Mexico, the PLHINO [North West Hydraulic Plan] and the PLHIGON [Northern Gulf Hydraulic Plan]. Together, this North American Water and Power Alliance, and the hydraulic plans on the two coasts of Mexico, have the potential to, in some states, double or triple the amount of available water.

The map presents the continental scale of this project: Water from Alaska and northern Canada, where there is plenty of water, or, from the southern parts of Mexico, where there is plenty of water, will be moved, by canals, pumps, and tunnels; it will be moved to the central part of our continent where there is the Great American Desert stretching between the United States and Mexico. By moving this water, we will increase the number of people that can be supported, tremendously, by making new land available for irrigation. We will produce power in the process as well, and we will change the continent's weather.

So, I would like to present a tour of the weather of the North American continent; we'll look at the world

FIGURE 2
Flows of Moisture Across the Planet, 1999



Source: Rudi J. van de Ent et al., "Origen and Fate of Atmospheric Moisture over Continents"

also. Let's look at **Figure 2**. Here we see flows of moisture across the planet. The arrows indicate the motion of the moisture in the atmosphere. So let's look at the Americas: In North America, the predominant moisture flow in the northern parts, is from west to east. So moist air from the ocean hits the Pacific Coast of the United States and Canada, and because of the mountain range there, all that water falls on the Pacific Coast. It does not move farther inland.

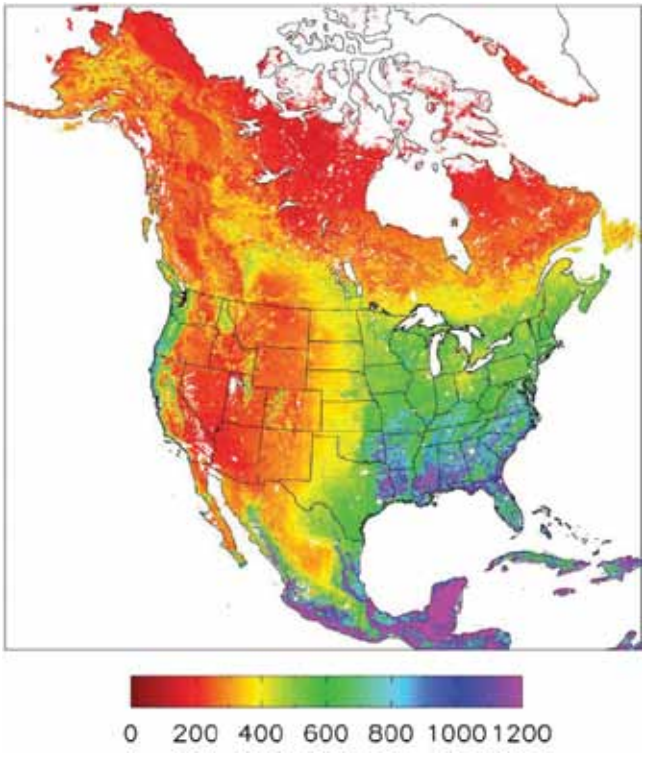
If we look at South America—look for example, at Brazil—we see how the moisture's moving from east to west. Because the mountains are on the west side of South America, as well, the moisture is able to move into the continent, and fall as rain, providently, plenty of water and moisture. If you look at Chile, we have a similar situation, where there is both a lack of moisture and an inability for it to get past the mountains.

The next image (**Figure 3**) shows photosynthesis rates in North America. This chart is a measurement of the amount of new plant life that is growing every year, the rate of biological flow in plants. The purple indicates a great deal of growth; so, as we see here, southern Mexico has very much vegetation; the southeast United States has much life. And the very edge of the Pacific Coast of the United States also has a lot of life.

But look at the size of the red area: There are two different reasons for this. If we look in Canada and Alaska, the reason is not a lack of water, but a lack of sunlight and warmth. It's very hard for plants to grow in ice. However, if we look at the Great American Desert, if we look at California in this area, we see a red that is not from a lack of sunlight; it's from a lack of water.

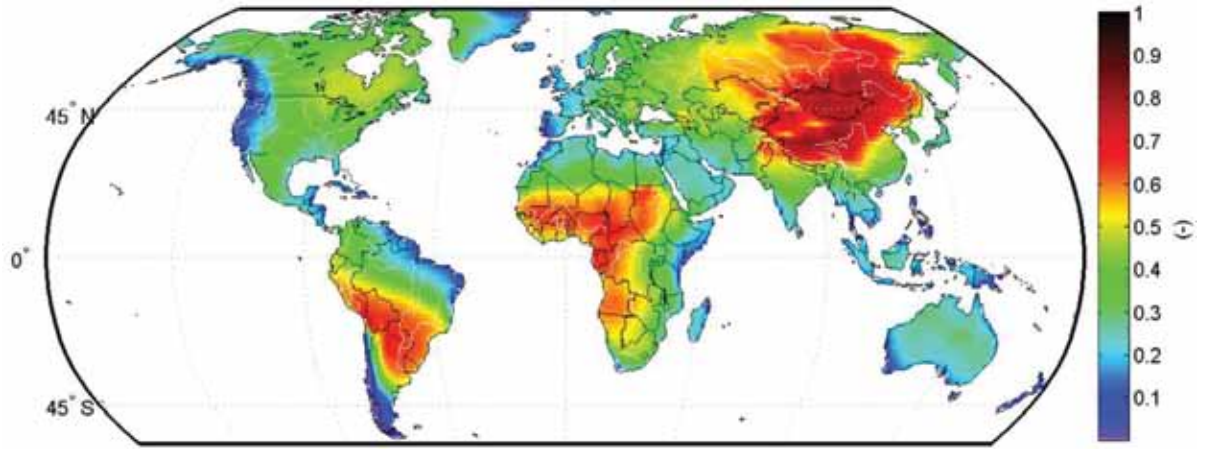
So nature has distributed water in a certain way, and it's not very good. If you had paid an engineer to design a water system for the continent, and this is what they developed, they wouldn't get paid! You would fire them. It's a very bad plan!

FIGURE 3
North American Photosynthesis, 2000



NASA/EOS/UMT NTSS

FIGURE 4
Continental Precipitation Recycling Ratio



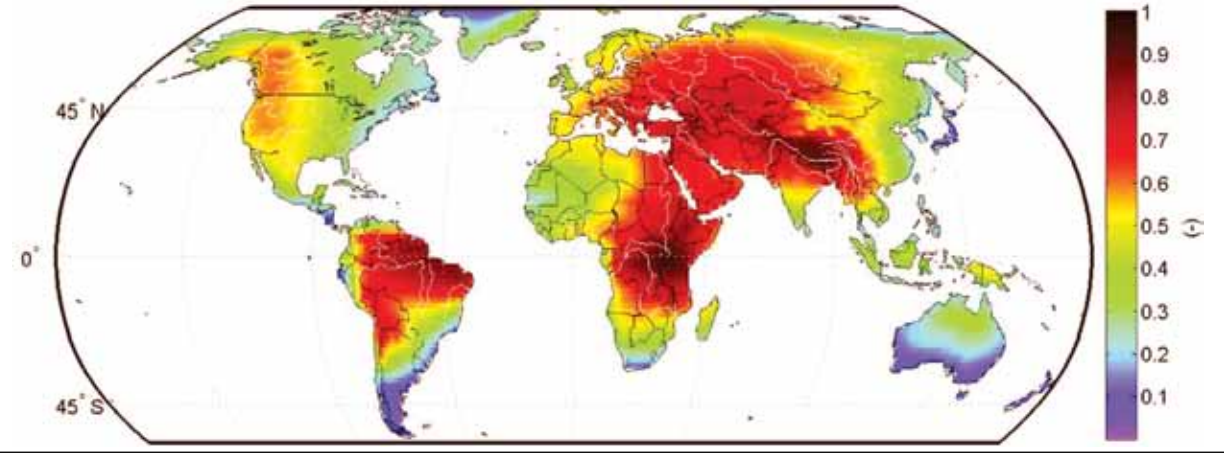
Source: Rudi M. van der Ent et al., "Origin and Fate of Atmospheric Moisture over Continents"
Global topography: height above Mean Sea Level (MSL), major rivers, and average horizontal (vertically integrated) moisture flux (1999-2008).

Let's take a look at the next image (**Figure 4**). Here we see the recycling of rain: The colors here—blue is low, red is very high—the color indicates how much of the rain that falls evaporates, and then precipitates again. Here we see on the Pacific Coast of the northern part of North America, very little of the rain that falls evaporates to precipitate again. What happens to this water? It goes into the ocean. By comparison, if you look at Mongolia and China, or if you look at the central part of South America, almost all of the rain that falls evaporates, and then falls again.

The next image (**Figure 5**) shows a similar chart, where we see the percentage of rain that falls: How much of it came from evaporation? Here we see that there are some parts of the Earth, where a great deal of the precipitation, most of their precipitation, does not come from the ocean; it comes from the land.

So, as we've seen in these images, there is a wide variety on this planet. Some parts of the planet are very wet; some parts are very dry; some parts are hot, some parts are cold, some parts are rocky, some parts have good soil—nature was not equally sharing in her gifts; some parts of

FIGURE 5
Continental Evaporation Recycling Ratio



Source: Rudi M. van der Ent et al., "Origin and Fate of Atmospheric Moisture over Continents"
Global topography: height above Mean Sea Level (MSL), major rivers, and average horizontal (vertically integrated) moisture flux (1999-2008).

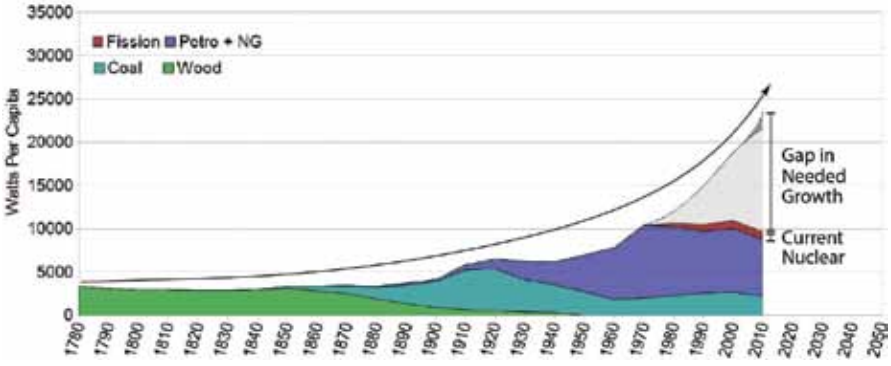
the world are more productive, by their geographical considerations.

Now, this does not mean that we have to let things remain so. Let's look back at Figure 1, at NAWAPA. This program takes this disparity, this bad engineering job that nature did, and it aims to correct it, by taking water which would flow to the ocean and never be used, and instead, making that water more productive. If you have a liter of water, and you say "how much is this liter of water worth?" You say, "Well, what do you do with it?" You could have a lot of money, but it might be worth very little to you; you might be a gambler and lose it at a casino. So, for one liter of water: Is it used for something productive? Does it feed a plant, does it create food, is it used for industry? Is it used for somebody to drink water at home?

Or, does it just go to the ocean?

I think this water will be much happier, when we use it more effectively—otherwise, it rains and it does nothing; it goes back to the ocean. What a waste! What unhappy water this must be.

FIGURE 6
United States Power Per Capita



Power

Let's take a look at the types of energy that we use, to make the kinds of things that we do, possible. Look at **Figure 6**; we see different types of power. This is in the United States, and this is power per capita. So, how much energy is each person using?

To explain the colors, we see from the early times of the United States, the main power source was wood, which we see as green. At a certain point, with the development of coal, which is blue, it became more useful to use coal, and not wood. Think of all the things you can do with wood: You can have a nice forest. You can build a house. Wood is useful for construction, and coal is *much* better for burning, than is wood.

Also, with coal, the energy is condensed, and it is possible to have a steam-powered engine. With this, instead of people being slaves of other people, the power of coal becomes a slave for mankind. Maybe this is a strange word, but you understand my meaning! We bring in new sorts of power.

Then you see the purple, where the purple is petroleum and natural gas. The internal combustion engine, which uses petroleum, made it possible to have smaller vehicles, such as automobiles and trucks; it made it possible to have airplanes, and it has a higher density of power.

So in this history, we see that at first we have wood; its use is replaced by a new, higher energy-flux density: coal. Coal has a use; it continues to be used. However, petroleum and also natural gas, have a higher type of power, and they are replacing it. But then, look at that very small red curve. The very small piece of red, that's nuclear power. That is the nuclear fission power that we already have in power plants.

See how little there is. This new technology, why did it not grow, as did coal? Why did it not grow as did petroleum? What's the difference? And if we look at the gray triangle, we see how much energy would be used today, if the trend had continued, if our use of power had increased as it had in the past. Why did this change occur? What happened around the year 1970? What occurred as a result of the assassination of President Kennedy and the American toleration of this action?

To speak more about the potential of nuclear power, there are various aspects to this. One aspect is the incredible power that exists within the nucleus of the atom. I'm going to speak of different kinds of power: We have very large objects, like wind, or water, and we have windmills, we have watermills. These are old technologies; these go back many centuries. They involve the motion of a very large substance, wind or water. We use the motion of animals and our own muscles—this is a source of power for us.

But, think of the difference with the use of coal: When we burn, when we use fire, we're getting energy not from a large object that is moving, but from the chemical bonds that form these substances around us. By breaking these bonds, as when we break apart coal

and take that carbon apart and combine it with oxygen, we can release a tremendous amount of energy! There is much more energy if you burn a piece of coal, than if you had a lot of coal and you poured it down a water mill! The energy that comes from burning is much bigger than the gravitational power of water, or of coal running down.

Nuclear Processes

Let's take a look at nuclear processes: Now, nuclear science is a very new science. The first discovery of the effects of radiation came about from Henri Becquerel, in 1896. He was studying how different kinds of minerals would emit different kinds of light, when one kind of light strikes them. He discovered that some of his minerals emitted light that caused a photographic plate to be exposed, even when there was no light on it. These minerals contained uranium, and he discovered that uranium emits energy, all by itself.

By the early 1900s, Ernest Rutherford had distinguished between several different kinds of radiation, alpha radiation, beta radiation, and gamma radiation. At the time, it was not clear what these radiations consisted of: Did they exist as matter? Were they just like light? What were they? What kind of power did they have?

Well, a simple study revealed this: If you have 1 kg of radium, which is a radioactive element, if you have 1 kg of radium, if you just leave it sitting around, it gets warm. It creates warmth and heat all by itself, no burning, internal heat. The amount of heat in 1 kg of radium is equal to the heat of *100 tons* of burning coal. Think of this comparison: 1 kg to 100 tons!

Now, to get that energy out of a kilogram of radium, you have to wait a very long time. There is a concept called the "half-life": A radioactive substance, as it emits these different kinds of radiation—alpha, beta, gamma; there are others, too—as it emits these kinds of radiation, and each kind of radiation is different, there are different kinds of alpha, different kinds of energy of beta radiation—as it does this, it transforms into a different element. Ultimately most of these turn into lead. The half-life of radium is 1,600 years. This means that if we have 2 kg of radium after 1,600 years, we will have 1 kg remaining.

So, 2 kg of radium, after 1,600 years, will release the energy of 100 tons of coal. This is very slow. Over such a long period of time, it is equivalent to 60 kg of coal per year, or 150 grams of coal per day. That is not enough to do anything useful with, except maybe warm your coffee.

So the breakthrough that makes radiation into a powerful source of energy for us, is not from radiation, it is from fission. These are different processes. There are many kinds of radioactive elements, radioactive isotopes; if they are radioactive, what that means is, they emit different kinds of radiation on a regular basis. Fission is different. In fission, instead of emitting one of these kinds of radiation, the nucleus of the atom breaks apart into two pieces and emits other, smaller particles such as neutrons, as well. These neutrons, if they hit another one of these fissile isotopes in the right way, will cause it to break up also.

So, for example, there are two kinds of uranium. There is uranium-238, meaning its total mass is 238. It is radioactive, but it is not fissile. It cannot run in a nuclear power plant. You can use it to keep your coffee warm, but you cannot use it to make electricity. Uranium-235, which is a rare kind of uranium—it is less than 1% of the uranium ore that we mine; this kind of uranium, 235, is fissile. It can be caused to fission.

So, by assembling enough uranium-235, we can cause these fissions to then cause other fissions to occur, and if we have enough, there will be a continuous cycle of fissioning, releasing energy much more quickly than the 2 kg of radium. So the energy is already there. What we do in a fission nuclear reactor, is, we release it more quickly than if the isotope were sitting around on its own.

Now, the reason that this isotope U-235 is rare, is because it has a shorter half-life than U-238. Every day, the uranium in the Earth is disappearing. Every day, whether we use it or not, it is radioactive and it is decaying; if we don't use it, it keeps the Earth warm, slowly. If we use it as a source of power, it provides many benefits, and electricity is only one!

When we saw the earlier different kinds of energy—coal can be burned for heat, like wood, but, because it is so much hotter, it allows us to create different kinds of metals. It's very difficult to make steel with wood—you can't. You could make charcoal out of the wood, but coal makes it much easier. Coke, made from coal, burns even hotter. So the new energy source is not only used to heat the house, or food, like wood is, it's also used to create a steam engine, to create new types of metal. It's transforming what we do.

The use of petroleum, when we use petroleum for energy—it's very silly, actually, because plastics—maybe this is not known to you, but plastics, do you where they come from? Petroleum! We make plastic out of petroleum. So when we burn petroleum for

energy, it is almost as silly as burning wood, instead of building a house with the wood, or making a chair out of the wood!

Or, today, there are some biofools, who say that we should use ethanol: They say we should take food—this plant has taken the Sun's energy, transformed into an organized, structured type of biological substance, which we can eat and obtain nutrition from—we can't eat coal, we can eat plants—and these idiots say that we should take that food and turn it into gasoline! How foolish is that? If we could turn gasoline into food, now that would be interesting, but we can't, at least, it doesn't sound very appetizing; maybe it's possible.

TABLE 1
The Energy Density of Fuels

FUEL SOURCE	ENERGY DENSITY (J/g)
Combustion of Wood	1.8×10^4
Combustion of Coal (Bituminous)	2.7×10^4
Combustion of Petroleum (Diesel)	4.6×10^4
Combustion of H_2/O_2	1.2×10^5 (only H_2 mass considered)
Combustion of H_2/O_2	1.3×10^4 (Combined mass considered)
Typical Nuclear Fuel	3.7×10^9
Direct Fission Energy of U-235	8.2×10^{10}
Deuterium-Tritium Fusion	3.2×10^{11}
Annihilation of Anti-Matter	9.0×10^{13}

Nuclear Isotopes

So, we have used nuclear fission to make electricity. That's very nice, but that is not all that it could do. The other applications are for the very special kinds of isotopes that it creates. I'll give you one example that's used in the medical field. When uranium splits up, it makes every kind of atom you can imagine; it creates everything. One of the things that it creates is an element called molybdenum. One isotope of molybdenum, molybdenum-99, has a half-life of two and a half days, very short. There's none on the planet, except for what we create in a fission process. This molybdenum-99 then turns into a very special isotope of the element technetium, technetium-99m. This isotope is used for tens of millions of medical procedures every year: The isomer technetium-99m is incorporated into some other biological molecule; it is injected into a patient, and then it goes to wherever that biological substance is used. Perhaps it goes to tumors, to cancers that are growing very rapidly. The technetium then emits its own X-rays. So, instead of taking an X-ray of the patient, by shooting X-rays at them, they emit them themselves, and the technetium has a very short half-life, six hours, so it disappears very quickly after the image has been taken.

This is only one example of our use of nuclear, except for making electricity. What we could be using it for, for other types of isotopes, for using the heat from the plant for industrial processes, or for desalination of water, these uses are not being adopted right now.

Also our use of the fuel is very foolish: There is a phrase, "nuclear waste." It's a very silly term. Imagine if, after somebody wore some pants for a week, you'd say, "Oh, this is cotton waste. These pants are old, I'm throwing them away." That would be a waste! Because you know, they're still useful. We have used-clothing stores, for example—it may be a silly example—but with nuclear energy, the material that comes out of a nuclear plant, most of the fuel is still there. It can be recycled to make the fuel again.

Also, new kinds of nuclear reactors can use the uranium-238 I had mentioned, which is not fissile, but in a breeder reactor, when neutrons strike the uranium-238, they turn it into plutonium and the plutonium *is* fissile; you can make a power plant with plutonium, as well.

Thorium is another example. Thorium is slightly radioactive, but when we use it for power, we do it by transforming the thorium into another kind of uranium, uranium-233, which then produces fission.

The Oligarchical Principle

So the whole science behind this is very little known, and people hear stories about Fukushima to terrify them. Think about Japan: Japan was hit by an earthquake, a huge wave, a tsunami. This killed many, many, *many* people! But where is the concern for all of these people that were killed? Why is the focus on the Fukushima power plant, which has killed nobody? What is the attack on nuclear?

Why did it never grow after 1970? The answer is the oligarchical principle. The answer is—it's in the quote that Meghan read from Prince Philip: that if there are people who believe that there are too many people on this planet, and I assure you, there are—and many of these people, they're committed—they will reduce the

world's population! And in fact, they're already succeeding.

One of the major ways has been by this environmentalist movement. "Environmentalist" is not the best term for many of these people. Many environmentalists want to do good, they want clean water, they want clean air; nobody wants to have the kind of air pollution that you see in a big city in China, for example; that's not good. But, think about how it has become, intentionally, almost a religious cult, where, instead of saying, "This practice is bad for the environment, because it is bad for life, or bad for people," they say, "it is bad for the environment, because it is a change."

What makes nature so perfect? Why is the current state of things perfect? Why can we not change it? The Olympian gods told Prometheus he couldn't change anything; why should we not improve our surroundings? Why should we not improve our environment by moving water to make it more productive? Why should we not use new types of infrastructure and power, to enable us to bring life to places that it does not currently exist? To transform our own species' ability to live?

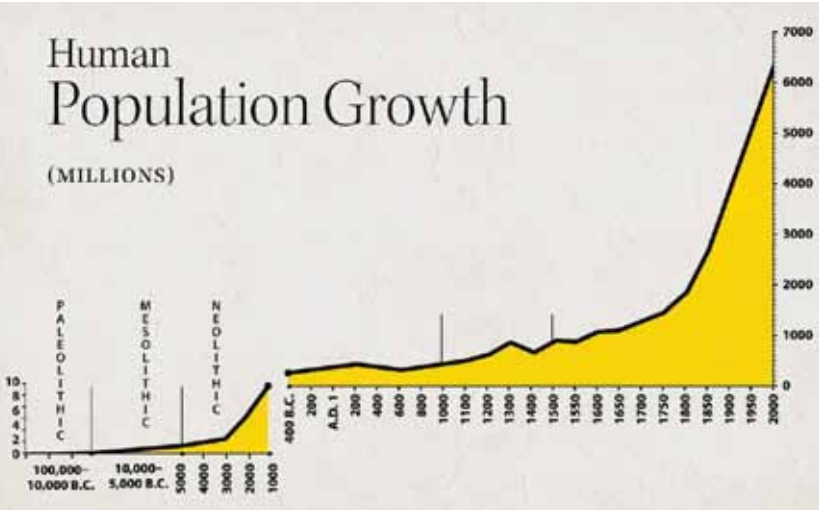
Why do we have poverty? Why is there poverty anywhere on this planet? Why are people hungry on this planet? Do we not know how to produce food? Of course we do! Do we not know how to produce fertilizer? Of course we do! Do we not know how to move water? We do! Do we not know how to desalinate water from the ocean, remove the salt, and make it good for irrigation? We do!

Why is there poverty? It is intentional. The only reason poverty exists on the planet at this point, is intentional, and it is because of a policy of empire, from the Dutch, to the British Empire, that operates, not with armies, although sometimes they do, but financially, through loans from the IMF designed to keep countries in debt. Through making it impossible for nations to get loans for development projects, by saying they are "environmentally damaging, they are changing the environment too much," so the international banks will not give a loan for the production of a project.

We can eliminate all the poverty on this planet, we can transform our living standards fundamentally.

Let me show an idea of what this could look like: If we look at **Figure 7**, we see what human population has been in history. On this chart, we see how the human population has changed. Why did this change occur? Was it because we found more land, with wonderful fruit and animals on it? Is it because people became more sexually proficient and had more children?

FIGURE 7
Human Population Growth
(Millions)



EIRNS/Daniel Grasenack-Tente

No. The reason this increase has happened, is that we have, as discussed, created new technologies and evolved. If we look at **Figure 8**, we see what has been happening recently. This chart shows the annual change in population in the 1960s. You can see, around 1960, there's 2% annual growth in the world population. Look at today: We are at half that. Look at the projection: we're to become half of that in another generation.

So those who say the world is overpopulated and we must reduce the population—*they're already doing it.* The direction is human extinction. This is not acceptable.

What Is Our Purpose?

So what we have to do instead—what should the goal of civilization be? Why are we here as people? What is our purpose? Our purpose, what is it? To be happy? Yes, in a certain way. But think about how many people in history have lived lives that we now read about, that we can proud of. Most people in history have not had the opportunity to do something that really transformed civilization. It's been very few. What if, we had the goal of educating people as geniuses, and not as slaves? What if we had missions, such as NAWAPA,

which will take a decade or two to build? Which will transform our relationship to nature; which will make us independent of floods and droughts and the weather; that will let us determine our own future?

What happens, when we develop fusion power, to bring the entire world up to the energy-density of the United States and beyond? What happens when the entire world has the energy-density two and half times the current U.S. energy-density? How will that transform our relationship to everything? Will it be difficult to create food at that point? No, of course not.

So our goal must be to provide for the people in our nations, in society, the opportunity to live a life of lasting value. To do that, we must defeat and overthrow the oligarchical principle, that says, we will not develop; that says, we are animals, like the others; that says we are *worse* than the other animals! That humanity is a plague! A virus! A cancer! Do you wonder why children are depressed? What if they go to school, and their teacher tells them, "You are a cancer! You are a virus!" What kind of world will that create?

So, between these two missions—and we can discuss them in much more detail in the discussion period—we see a very clear image of what we could do as a human species, the beautiful things we could accomplish, and the path towards eliminating poverty completely on this planet, and providing a mission and an object, and a real joy, to our fellow citizens around the globe.

Thank you.

FIGURE 8
World Population Growth Rates
1950-2050