LPAC TALKS WITH INFRASTRUCTURE EXPERTS

NAWAPA: Towards a New Economic Platform

The following is an edited transcript of a conference call hosted by the LaRouche Political Action Committee (LPAC) on Oct. 23, 2010, with specialists in different fields from around the country, on the topic of implementing the North American Water and Power Alliance (NAWAPA). This was one of a series of ongoing such conferences.

*The specialist participants were **Terry Bates**, project manager, heavy industry construction; **Howard Chang**, professor emeritus of civil and environmental engineering at San Diego State University, president of Chang Consultants; **Hal Cooper**, railroad engineer, Cooper Consulting Company; **Dewitt Moss**, chemical and nuclear engineer, project manager for BWR and Liquid Metal Fast Breeder Reactor fuels and materials, U.S. Department of Energy (DOE) senior site representative at EBR-II, Argonne National Labs-Idaho; **Don Riley**, nuclear engineer (ret.), DOE branch chief for Fast Flux Test Facility core design, DOE chief engineer Clinch River Breeder Reactor Plant. The LPAC moderators were **Michael Kirsch**, **Oyang Teng**, **Cody Jones,** and **Dave Christie**.*

Last week's EIR *presented synopses of the videos posted at www.larouchepac.com on the expanded NAWAPA project. The reader is urged to consult these and the larouchepac website, to grasp the full scope of what is being proposed here.*

Michael Kirsch: Good afternoon, and welcome to the NAWAPA call, which we've been having for a number of weeks, as we've launched a push for a new recovery program for the United States, and which has implications for the world. We have just this week posted a new video on our website, called "Taming the Darien Gap," which really completes the connectivity of all Eurasia, Africa, and the North American landmass, in one whole process of guided development, and connected development, and coordinated development, of water projects, uplifting the different regions of South America, water projects throughout Africa, projects for the deserts of Eurasia and Asia, as well as our own desert here, in the United States.

The context in which we're discussing a complete upshift in management of our whole Biosphere, and a return to a real science-driver program that we had during the time of the Tennessee Valley Authority (TVA)—the effects seen in Oak Ridge, the space program, which would necessitate the kind of control room sense of it, as Charles Wojcik talked about on the interview video we had featured on our website [http://www.larouchepac.com/node/16114]—is that we are here, with, unfortunately, a Congress, which, although it has a Constitution to accomplish such a task as this, and history embedded in a nation, a sovereign nation, which could lead other sovereign nations in coordination to

This prototype model of an integral fast reactor is a technology that, in the broader NAWAPA context, could be part of a huge economic upshift. It was under construction at the Argonne National Lab West in Idaho, but was shut down in 1994, three years prior to completion. The IFR is a closed cycle: It uses existing waste for fuel, and no long-lasting waste is produced. The fuel is irradiated, melted, reprocessed, and put right back in again.

accomplish this project, we unfortunately have a Congress and a leadership which is currently gripped by a set of axioms of monetarism, and other axioms about economics and science, which are pushing us now; where we've elected a President, who needs to be put through the gauntlet of the 25th Amendment, and taken out of office, for complete incapacity to lead.

And we have been putting on our website in the last couple weeks, that we are now at a last chance, where Obama has to go, because he's standing in the way of initiation of an emergency, Franklin Roosevelt-style 1933 bankruptcy reorganization. And the organizing principle for that would be a return of Glass-Steagall, a repeal of the repeal of Glass-Steagall. And unless Obama is removed, that bill cannot be passed; it will not be passed under his watch. But without its passing, we are actually facing now a global hyperinflation, which has been picking up speed over the last few weeks, and Fed chairman Ben Bernanke has now signed through a second round of what he's now calling "quantitative easing," which is, unlike Germany's 1923 hyperinflation in Weimar, not enclosed within the borders of Germany: It is a global inflation, which nations around the world are all partaking in, to continue this current paradigm of restricting human development, to monetarism.

So, as this system is ending, that's the context in which we, here, are discussing what the alternative would be, a general upshift of humanity's development of the Biosphere, improvement of the Biosphere, and our own economies. And if we can paint both the necessity and possibility of this, it will aid in that political agenda, but if we also achieve in that political agenda, accomplishing this change in our policy governing the United States, we will have something in place—people ready to run into the White House, and say, "Here's the program!"

And so, that's the context that we're facing here, today, with this current discussion. And, the format of today's call, is that I'm going to have one of my associates, Oyang Teng, introduce the theme of today's discussion. And we have a few featured guests, a hydrologist from California, as well as a couple of leading nuclear experts, and we want to invite everybody on the call today, to participate, after, and during, discussing the general theme. . . .

Biospheric Development

Oyang Teng: Hi, I'll keep this brief. I just want to point out, that in the course of elaborating the NAWAPA project—and when we discuss NAWAPA, we really mean the North American Water and Power Alliance and the implied global developments, through the Bering Strait, into South America, some of the things that Michael alluded to, all of which we have, or much of which we have video material on. That, in the course

of elaborating the project, there are a number of different features, one of which has been described by Mr. LaRouche as, in effect, a university. And I think the representation on today's call, gives some sense of that: We've got rail engineers, nuclear engineers, civil engineers and hydrologists, I think we have an architect, people involved in forest management. So that already gives a sense that the scope of what we're dealing with here, and is going to require a kind of deliberation and a dialogue across different disciplines.

One of the areas that we want to define as, effectively, a new science, is something that we're terming "biospheric development." And it's a term that we use in the same sense of Biosphere as it was defined by biogeochemist Vladimir Vernadsky. There's an interesting political environment, today, in which the term "geoengineering" has become somewhat of a fad. Unfortunately, that's largely discussed within the terms of the global warming hoax: the idea that somehow, the only effect that human beings can or have had on the environment, is negative, and therefore, any large-scale schemes for intervening into the Biosphere, will be effectively emergency schemes, to either reduce carbon dioxide emission or reduce the amount of sunlight hitting the Earth, or other things like that.

"The water supply system for Southern California is one of the seven wonders of the modern world," said Dr. Howard Chang. Shown here, the irrigated land of the fertile Imperial Valley.

Clearly, what we're talking about is the inverse, the complete opposite of that. That we're in an era, where the responsibility for mankind as a whole is to increasingly direct, and improve, biospheric processes on a large scale, and that involves the development of integrated infrastructure systems, of rail, high-speed rail, maglev rail, nuclear power; moving on to fusion power; water management, large-scale reforestation, irrigation, and so forth, where the different cycles, biogenic cycles, increasingly come under our control and our management. And the issue here, is not ever sitting on any one technological platform, or sitting on any one set of technologies, but continually pushing forward. And that's the real distinction that we want to make clear in what we present, as far as how we're going to carry out this project.

So, with that said by way of preface, I'd like to make a start, with newer participants, if Dr. Chang is willing to share some of his thoughts, in terms of his expertise in the area of water projects, and large-scale civil engineering works in this regard, and particularly what the considerations are that he sees, in terms of bringing the hydrological cycles of the planet, including in areas like the desert Southwest, under our control and management. And then we'll see if people have questions, and move on from there.

An Enormous Undertaking

Howard Chang: Sure. Well, I happen to be familiar with water diversion projects in China, which I also participated in to a certain extent.

See, the rainfall distribution in California: We have a lot more rainfall in the north, much less in the south; for the North American continent, we have a lot more rainfall in the northwestern part, such as Alaska, Alberta, Yukon Territory, and so forth, but there's a scarcity of water supply in the Southwest, such as Nevada, California, Arizona, and also Mexico. And there is actually a water diversion project, a very extensive water diversion project, in Southern California.

In fact, the water supply system for Southern California is one of the seven wonders of the modern world. Think about this: Seven counties in Southern California, with a population of 20 million—90% of the water we use in this area is actually imported from two primary sources: from Northern California and from the Colorado River. The Colorado River water is shared between California and Arizona. Arizona takes a good share of the Colorado River water, what's called the Central Arizona Project. Of course, Colorado River

water is also shared by Mexico; they also have extensive irrigation systems.

You know, a lot of development is connected to the water distribution and the water supply. Right now, development in California is very much limited in the arid Southwest, by the supply of water. Water has become very expensive.

Now, water diversion is feasible, but let's keep in mind, this is going to be a gigantic project. We are talking about the distance, for water diversion; we are talking about construction of infrastructure associated with water diversion, where it will consist of canals, pipes, tunnels, pumping stations, storage reservoirs. Not only water diversion, but water storage and water distribution involve very extensive construction of infrastructure for water projects.

NASA

The All-American Canal in Southern California is the largest irrigation canal in the world. It brings water westward from the Colorado River to irrigate the Imperial Valley and supply water to nine cities. The dark line is the canal, which is crossed in this image by Interstate 8.

Well, it's got to be a long-term project. There's got to be a master plan to be made. In fact, I can see something like this. It's going to be good for the economy of America. Economic development right now is closely related to infrastructure construction. During the [Franklin] Roosevelt era, you see, the economy was revitalized, recovered, partly because of infrastructure construction. I'm not an economist, so I don't know so much about that. But I believe that water projects are feasible. What I have to say is, this is going to be a very expensive, long-term, and a gigantic project.

Let me spend a couple minutes talking about a water diversion project in China. You see, there's a lot more rainfall in the southern part of China, much less rainfall in the North. In fact, the city of Beijing is on the edge of a huge desert, the Gobi Desert. They are building—the project is actually going on—they're diverting water from the Yangtze River to the north, by three different routes: the eastern route, the middle route, and the western route.

Well, the eastern and the middle routes are already under construction, but involve a huge investment, something like $120 billion. It involves resettlement of a lot of people, something like 600,000. Of course, the resettlement of people would not be a concern for the United States; it would be a concern for a very densely populated country such as China.

The western route's water diversion has not been started, because that involves very, very expensive construction. Now, they want to solve their water supply problem by redistributing the water. That involves almost 50% of the whole country.

Now, if we divert water from say the area from Canada, from the Yukon territory, from Alberta, from Manitoba, and so forth, to the south, that project is definitely feasible. Of course it involves gigantic infrastructure construction, and also long-term investment. That's how much I have to say. That's going to be very good for the long-term economic development of America.

Large-Scale Irrigation

Teng: Yes, thanks for that. I do have one question related to irrigation: Let's take the Southwest United States. In particular, what kinds of considerations have to be brought to bear as far as large-scale irrigation goes, with respect to runoff, and maintaining the quality of the soil? And you have arid regions versus say, marginal lands that have some moisture, but maybe need a little bit of help. What are the relative trade-offs and benefits of irrigating marginal lands, versus very

arid lands, like in the desert?

Chang: Well, we have a lot of fertile land in the Southwest. If you look at the map of Arizona, large chunks of land are fertile, and it's not developed for agriculture.

I'll give you one example: Imperial County, California. Imperial County was a desert, a wasteland; but after they completed the All-American Canal, they turned that desert wasteland into the natural hotbed of the U.S.A. Imperial County can feed the population of California, only because of irrigation. Because of the use of the water from the Colorado River, to irrigate the land, for very large-scale farming.

You can find such lands, fertile land, large pieces, in Arizona, New Mexico, and Nevada, which are not cultivated, which are not being used, because of lack of water. And also in Northern Mexico.

Of course, there are many other concerns, environmental concerns, ecological concerns. All these issues would have to be studied, to be addressed, and the problems would have to be solved. It's a big challenge. This project is going to involve a lot of challenges, a lot of expertise.

Cody Jones: Do you know where we can obtain some of the specifics on where this quality soil is?

Chang: Have you heard about the Agriculture Research Service? By now, the name has been changes into NRCS, Natural Resource Conservation Service. It's part of the U.S. Department of Agriculture. They publish a soil report. They have extensive soil reports for the United States. What soil is good for cultivation, or not, can be determined from the soil report. Their study is quite extensive.

They cover much of the United States.

Jones: Okay, good. We've seen some of the satellite imaging also, that they've put together, and they do this soil-quality index. I guess that they put that together for determining where they can use a certain type of satellites. The parameters that they defined for soil quality were things like the amount of clay in it, certain mineralizing of the soils.

See, one thing we're trying to do is determine how useful the maps that they put out were for determining agricultural use as well.

Chang: I think this kind of information is quite available, with remote sensing, with the mapping by the Department of Agriculture, Agriculture Research Service. Counties and cities all have this kind of information. And I believe large pieces of land will be good for agriculture, but they are not developed because of the lack of water.

Teng: Okay, let me ask if anyone else has questions or comments in this general area.

Hal Cooper: Oh, I think Dr. Chang is exactly right in what he's saying, and that there's certainly a great deal of potential. You know, I proposed the extension of the NAWAPA project to California, because it really doesn't include very much of California right now. It's already in Arizona, but there needs to be more, certainly, in California, as a work-creation mechanism, as well as a way to solve our problems of water, as well as the economy.

The Arid Southwest

Dewitt Moss: Though I'm in kind of a temporary residence down here in Palm Springs [Calif.] now for a few months, I'm aware of the fact that the Colorado River is totally over-allocated. And there's been a Federal judge who has said that Southern California's usage of the Colorado River has to drop back now, to accommodate Arizona's increased usage; and that usage must go from somewhere in the 5.4-5.5 million acre feet range, within a few years, to, I believe, 4.4 million. So that's a reduction of 25% in one of the most highly dense populated areas, and that is not necessarily all associated with agriculture, although the Imperial Irrigation District that was mentioned by Dr. Chang is probably responsible for somewhere in the order of, I believe, 80-90% of that water. They feed the Western half of the United States, and they have somewhere between 500,000 and 600,000 acres of land under cultivation, that basically grows crops 24/7, 365 days of the year.

So, Southern California has a real need to, in fact, promote this, because whatever water shortage there is, Arizona and California, are going to have to cut back to meet the treaty commitments that we have with Mexico.

There is just, I think, a terrible shortage of water in the arid Southwest, and by the time you take Arizona, California, and then the treaty requirements that we have with Mexico, there's a need for something. And the Colorado River can't provide it.

Cooper: Michael, exactly what he's saying is correct, and that's why I put together that plan for California, because the NAWAPA plan was not really including that much of it. I totally agree with that.

Moss: And as someone that's kind of fought these

water battles for quite a few years, I like it. But Nancy Pelosi seems to be quite enthused about stopping the Western Irrigation District from irrigating about 500,000 acres there, because of the delta smelt [an endangered species of fish—ed.].

That will not go away.

Cooper: Yeah, Nancy Pelosi has been a real enemy of keeping water in the San Joaquin Valley for farming. And it's funny, that's never been really pointed out very much, but it should have been.

Terry Bates: Just a little more on what Dewitt had to say from the Palm Springs area, and substantiating Dr. Chang's thesis. Dewitt could probably address it better than I could, but I've been through Northern Mexico, at the border there, I believe it's Mexicali and Calexico, and that is a terrific example of what can happen when water gets into an arid area.

Chang: Many more acres can be put into production, if there's more water available. Right now, the Colorado River entering Mexico has become a trickle. I have visited the entire irrigation system in Northern Mexico, and also Imperial County, as well as the water supply systems of Southern California.

There's one organization, called the Metropolitan Water District, that supplies water to 20 million people in Southern California, seven counties. And 90% of the water they supply is imported.

Effect on Climate

Teng: We've got another question here for you, Dr. Chang, and then we'll see if there are any others. Then we'd like to move to the question of nuclear. Here's Cody.

Jones: Yes, Dr. Chang, I was also wondering: In many of these big water projects that you've been involved in, in China, or in the research you've done in the United States, has any work been done on looking at some of the climate effects, the changing climate, temperature, also things like weather systems, how these would affect the rain cycles, or any other elements of the weather cycles? Is there any research that's been done on that, or any studies you know of?

Chang: Well, there was a big study that took place in the Soviet Union, when they diverted water from Siberia to Central Asia, through Kazakstan, and also Uzbekistan.

They were concerned that that would have a climatic effect. That's one area—that's not my expertise.

You know that involves a global study, how the redistribution of water would affect the climatic pattern. On the other hand, whatever we do, in comparison to the Earth, is really a very tiny part. My feeling is, if there's any impact, that impact would be quite small, because the Earth is so great. The hydrosphere is not very much affected by human activities. Human activities would have limited impact.

The only study I'm aware of is that study in the Soviet Union, that took place maybe 40 or 50 years ago.

Teng: Great, we'll try to track that down.

Chang: That would be interesting. They took so much water from Siberia, for irrigation, they drained much less water into the Aral Sea, or something.

Cooper: The Aral Sea, yes.

Chang: That sea has shrunk, by something like 60%, because there's less inflow of water into that lake.

Teng: Right. We actually have a video on that area, specifically. [http://www.larouchepac.com/nawapa-aral]

Chang: That's a very big lake, an inland lake.

Cooper: The water never really was diverted from the northern rivers, from the Ob and the Yenisei rivers. It shows you how *not* to do it.

Chang: Right. That's because they used the water on land, thereby reducing the water inflow into the lake. That's what happened to the lake. But the diversion from Siberia never took place?

Cooper: No, it really didn't. And it was not properly done. If it had been properly done, those bad effects would never have occurred.

By the way, on the climate issue, in Eastern Washington, with the development of the Columbia Basin project, since the 1930s, I can personally tell you that you don't see the extreme high temperatures in the Summers that you saw before it was built, according to people who live there.

Chang: So, it does have local impact on the weather.

Cooper: And, it has increased the rainfall over there in central Washington too. That would just be an example.

Chang: I see.

Cooper: You guys would have to check out the climate data, but it's available, and I think you'd find out that there's been a significant change, in terms of lower extreme temperatures and higher rainfall in that region.

Teng: Yes, there are a number of interesting case studies that are worth looking at. What you just mentioned, Hal, the Central Valley, what John Sparland described in Oklahoma [on an LPAC interview with engineers], and certain other areas which we're in the process of looking at.

©Carlsbad Desalination Project

The site of the Carlsbad Desalination Project, now under construction in San Diego County, Calif. Power is supplied by conventional sources of electricity. The plant is scheduled to be operational by 2012.

Global Impact

Kirsch: I have another question for Dr. Chang. From what you've seen—you've seen northern Mexico, you know the situation in the U.S. rather well—just showing, once again, what we could do with this immediately, how would all these areas of the NAWAPA system overlap the current local systems, that have all their own problems? What is your sense of that, of what would that make possible?

Chang: Well, it takes a lot of construction. It takes a lot of energy, for water transfer, that's for sure. And it's going to take a long time. Long-term planning. But definitely it's going to improve the productivity of the arid areas tremendously, that's for sure. It could be a long-term goal. It's going to be a very ambitious project, let's face it. Because the distance to travel is very long. The quantity of water to be imported is large. And it's going to take a lot of energy, that's for sure.

Teng: Just one thing, that we've discussed with a few people, as maybe a thought-experiment. It might be something that you guys in Arizona, or people who have been down there, might have a more visceral sense of, but there is an interesting question: If we had large-scale irrigation in the Southwest, and in Northern Mexico, that could have an effect on what's called the North American monsoon. Either by adding moisture, or reducing the amount of heating of the land. And I throw that out there, maybe just as a provocation for people to think about.

Let me pause and see if there are more questions.

Nuclear Desalination

Dave Christie: I'm a LaRouchePAC organizer in Seattle. I do have a question, because it comes up often in my work, organizing some of the people in the nuclear field. Immediately, when I bring up NAWAPA, and where a lot of the water use goes, the question is posed, "Well, why don't we just do nuclear-powered desalination facilities?"

And once you get into the questions of energy spent in desal, and then, of course, the pumping systems to get it to where a lot of this water goes, people see that it's not really worth it, whereas, as one person put it, "NAWAPA is essentially building a new river." And once the river is built, you've got a continuous supply of water, virtually free, in that sense. So, people maybe see that, where a lot of the water goes.

However, the use of nuclear-powered desal for the coastal cities, San Francisco, Los Angeles, San Diego, and then, potentially, for areas immediately around there, for irrigation: We haven't discussed that much. It comes up periodically in my organizing.

Chang: Yes, I happen to know something about desalination. A big project for desalination has just been approved by the Coastal Commission, in San Diego County. That project has not been built, but there has been a cost analysis. The water produced by the desalination project will cost twice as much as the water we currently use, from the Colorado River, that's one thing. The San Diego County water authorities are consider-

ing purchasing that desalination plant, but they do have that cost analysis consideration in mind: That water's going to cost twice as much per acre-foot, as the water we currently get from the Colorado River.

Because desalination, first of all, if you want to get a permit, that's a long process! It's going to go through all kinds of scrutiny; and it's going to be energy-intensive.

The company that developed that desalination plant in San Diego County is called Poseidon. They probably have more information about that. I know it has been approved. It's a huge project!

Teng: Good, that's good to know.

A New Platform for Nuclear Power

I know that we have a couple of newer folks on the call, including Don Riley, who's a longtime nuclear expert, and I'd like to invite Don to comment on his thoughts, in terms of NAWAPA, as bringing about a new platform for nuclear power, which, as we probably all know, we should have done 30 or 40 years ago. And including, if you have thoughts particularly on this question of desalination.

Don Riley: I haven't done any research on this particular subject, but it appeared to me that there was a lot of potential nuclear power in here. But, you'd want to look at the details and see what the advantages might be, versus the cost and schedule.

One of the big things that's been mentioned occasionally in the discussion so far, especially for that San Diego desalination, is how long it would take to get it approved. I think that is, by far, one of the biggest problems we're confronted with: that the government has become so involved in detailed requirements that are almost impossible to meet, and to meet them takes years of background work.

So, I don't have any significant contribution, except to say that it looked to me like what you were talking about had the potential for making effective use of nuclear power.

Kirsch: I did have a question for you on nuclear power and its relation with NAWAPA. Here it is, 2010, and for this program we're talking about, obviously, we need a revamping and gearing up of our technological capacity in the United States, and we've lost the sense of investment in infrastructure as something which is going to transform the whole economy. There are still innovations being made here and there in the economy, of new technologies and things like that. But what we're talking about here is, we need to apply the new discoveries that have occurred in the last 50 years, to the entire economy.

And NAWAPA is obviously a grand-scale management system. One thing that we need to do, before we come up with the final design for this program, for today, versus 1964 [when the program was designed by the Ralph M. Parsons Co.—ed.], is to get someone like yourself and the people who have a very good sense of what is the baseline technology that we want to bring to the table, to apply to this design. And so, my question to you is, what would go into considering such a baseline technology? Would nuclear power be a consideration in it? If we want to sit down at the table and say, "Here are the new technologies that can be applied to NAWAPA, and here's what we include in the package"? Is that clear?

Riley: Well, I think that your thoughts are very fine. It turns out, at the present time, that the government is opposed to anything that even sounds like nuclear power. I myself was challenged by the head of DOE, because I had advanced reactor experience. So, basically, they're trying to destroy anything that exists in that area.

It also turns out, that our only future, in terms of significant power, lies in nuclear power, and the integral fast reactor, which, in 1994, was destroyed by the government.

So, right at this point in time, there's nothing being mentioned about nuclear power. You can look at the Oak Ridge National Lab's brief study of energy in the U.S.—it doesn't mention nuclear power! So, basically, there's a big hurdle that we have to get over, that exists in the government, that is anti- any advanced concepts that might be productive and useful for the U.S. in the future.

Kirsch: Well, if we assume here, here that we both can make the case for the needed removal of Obama, and overhaul of the financial system; and also, assuming that there was a changed political environment, in which we would be moving, as FDR did, in bringing all of our capacities to the table, let's say that all of these hurdles are out of the way, those which you're referencing, which are obviously there. Now, would you have some thoughts on what would be the new technologies that we could use, if we had the capability to apply them?

Riley: I think the most potential technology is the

integral fast reactor, and the pyro-processing [high-temperature reprocessing of nuclear fuel—ed]. Basically, that would supply us with over 1,000 years of total fuel requirements that we might have. But that's being put under cover by the present government.

Teng: Yes, let me open it up and see if people have comments. I think that what Dave raised, the issue of desalination, does open up an important point. Going to a higher technological platform, especially when it's integrated, when you're taking transportation, when you're taking water management, when you're taking power generation, and you're developing them as an integrated system, now you're at a level where you have more than the sum of the parts. You take any one technology, like nuclear fission, and you can have desalination. If you have these fast reactors, you can close the fuel cycle, you can reprocess fuel, you can create new isotopes, so we wouldn't have to import medical isotopes, and things like that.

And it does get you to a higher level, where the point of technological development, is to continually move off of what you're using now. And so, we'll eventually go to fusion and other things.

Bates: I have a comment and a couple questions. It would be interesting to do an energy balance between desalination and BTUs per pound; it's about 980 BTUs per pound to evaporate water at 1 atmosphere, and that requires a horrendous amount of energy. Number two, what are the current costs, per kilowatt, or megawatt, of a nuclear plant? Number three, it seems to me to be advantageous to have an array of nuclear plants along the entire system, generating electricity for the pumps. And I would like your comments on using the river itself for cooling. It also seems to me that there's some advantage in using slightly warmer water for the propagation of crops.

Teng: That's an interesting point you raised. Other people before have raised the issue of having the modular reactors along the route, which seems to make sense.

On the warmer water, advantages for agriculture, I'd certainly like to know more about that. Does anyone else have any comments?

Moss: In southern Idaho, down the Bruneau River, there's a lot of hot water, and a lot of this hot water is pumped out and put to irrigation of crops. It serves two things: one, it keeps the frost away, and it grows the crops quicker. So, there really is not much of a detrimental effect, as long as you are not talking about scalding water.

The Cost of Nuclear

Let me just backtrack a little bit: I just read an article, I think in one of the technical magazines, which outlined the costs of various power productions, and I'm sure that these are all based on large, commercial-scale power production. Nuclear was listed as 8-10 cents/kilowatt hour (kWh) compared to coal, which was about 6, as I recall, and compared also to natural gas, which was in that range.

But that was before this large influx of natural gas that became available because of the fractionation process, clear throughout the Appalachians, and Northeast, and now in the South and Southwest. What was, a few years ago, thought to be a 20-year supply of natural gas, has now become almost an 80-year supply! So, all of a sudden, natural gas looks much better than coal, because of the carbon imprint, and so it is going to kind of be the yardstick, as I view it, that nuclear power is going to have to be associated with.

And for nuclear, the cost really comes from the processing, the licensing, that Dr. Chang mentioned, and it's time-consuming, it's expensive. You have to design for a maximum, credible accident, and then you have to build in safety features that no other plant, or no other industrial process, has to consider. This is why nuclear power plant pricing probably will not come down significantly; it is an energy source that may last a thousand years. We could make it longer, if we went to a breeder.

So, there is tremendous potential, but it's going to have a penalty.

Riley: I think you'll find out, if you really look at the details, that the cost of nuclear power would be equivalent to the cost of coal power. You can add to that, there is presently 700 years of nuclear fuel available for fast reactors, just sitting there, waiting to be destroyed by the Department of Energy.

So, basically, the cost, once you started building some plants, would be equivalent to coal-fired plants. And in addition to that, you've got over 700 years of nuclear fuel available for fast reactors, that's just sitting there, free, the result of World War II enrichment process.

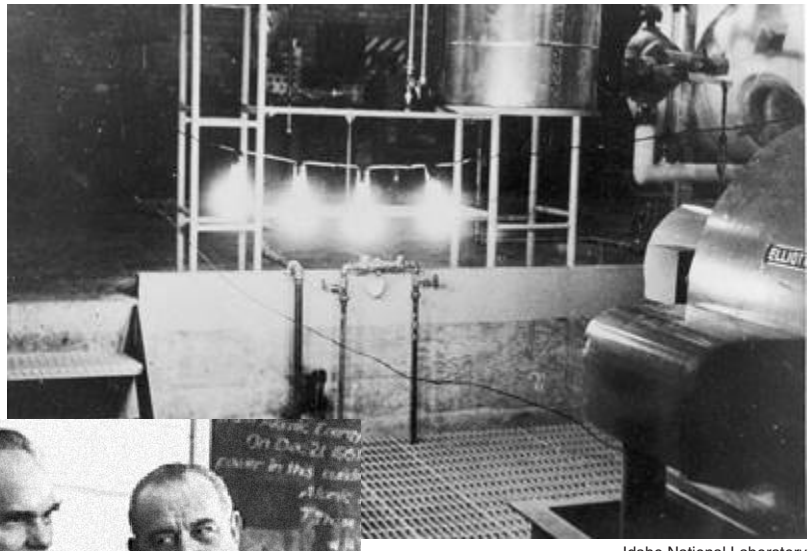
Teng: A quick question for Dewitt: You said that

some of this nuclear river-cooled water was already happening. which river was that?

Moss: I'm talking about geothermal warm water, that's applied to crops in southern Idaho.

Teng: Oh, okay.

Moss: It's deep-ground pumping out of a geothermal resource.



Idaho National Laboratory

The first U.S. Experimental Breeder Reactor (EBRD 1), near Arco, Idaho, became the world's first electricity-generating nuclear power plant, in 1951. It was deactivated in 1964 and declared a National Historic Landmark by President Johnson (shown here, with Atomic Energy Commission chairman Glenn Seaborg) in 1966.

Fast Breeder Reactors

Teng: Okay, interesting. I also have a quick follow-up: Is there a difference between what Don referred to as an integrated fast reactor [IFR] and a breeder reactor?

Moss: They can be one and the same, but the integral fast reactor is in a closed cycle, in which you irradiate the fuel, take it out, pyrophorically melt it, reprocess it, and put it right back in. It never sees daylight; it just goes from the processing unit, right back into the reactor. And it could be a breeder fuel, if you wanted it.

Does that agree with you, Don?

Riley: Full agreement with what was mentioned.

Moss: This is a comment: The integral fast reactor concept has really been demonstrated, some with plutonium, the majority with uranium. And the EBR2, the Experimental Breeder Reactor—we operated that reactor for about 20 or 25 years, in which we reprocessed that fuel, and it simply went right back into the reactor, and never became available for terrorists or any other concept that people have objected to. It simply is an integrated loop cycle.

Riley: The fast reactor has been shown—the EBR2, and the C4 reactor that was built specifically for that—to shut down by itself, without any special devices or operator control, just automatically. EBR2 demonstrated that and C4 demonstrates that.

So, there's no problem in terms of safety, or potential [for a disaster], like Chernobyl. In fact, if Chernobyl had been a fast reactor, it wouldn't have destroyed itself!

Another factor: The fast reactor IFR program is proliferation-resistant, so there's no potential in that, I think, for using any plutonium for bomb materials. When the [Clinton] Administration shut down the IFR program in 1994, they were so ignorant, they didn't understand that there wasn't any proliferation potential, in that program.

Overhaul the NRC

Teng: Is there anyone who hasn't yet had a chance to speak who wants to say anything?

Bates: This is Terry Bates, again. It seems obvious from the several nuclear experts that have been talking, that a gross overhaul of the Nuclear Regulatory Commission and their review procedures is necessary. This is consistent with your opening statements, insofar as the way our current government is functioning. From a nuclear construction point of view, and heavy construction, heavy industrial construction is my forte: Any time you're making a pick, you have to have a testing laboratory on site, to test the choker, to be sure it will withstand picking up a water cooler, to put in the operating room of the reactor. That's absurd! The costs become astronomical! And hence, my statement that a gross overhaul of the NRC rules and regulations, and permitting procedure, needs to occur. It will not occur under this Administration, and it may have to be by Presidential fiat, as a directive, to just

Argonne National Laboratory West

The Experimental Breeder Reactor 2 (EBR 2) went operational in 1965 and ran for 30 years.

"make it happen," and "I am suspending this and that requirement."

Teng: Well, the good thing, as I've told a couple of people, is that on the political side of things, that's what we do best, in changing the climate there. What we've got going here is a good start, towards being able to hit the ground running, as we make breakthroughs on the political side. And it's clear that there's a serious breakdown, not just economically, but also mentally in the White House, which is contributing to that climate.

Prospects for Future Work

This has been very useful today. We're continuing, I should say, to pull together the picture on some of these more speculative questions about the role of changing climate, managing different aspects of weather systems and so forth. One thing that comes to mind is, there have often been cases in science, where very weak forces apparently were ignored for a long time, because it didn't seem that they were significant—things, for example, having to do with the role of magnetism or electromagnetic effects in the body, in physiology, and only later was it realized, that they actually have a significant effect. And I think, actually going forward, as a science-driver on something like NAWAPA, will show us that there are a lot of surprises in store for us, once we begin to actually experiment and actually build these large-scale projects and intervene in a way that we haven't yet.

I think that's an exciting prospect, as far as essentially creating a new science, and interfacing that, with questions that come up with space colonization and space exploration, and realizing that the gaps between those kinds of frontier exploration questions, of keeping human beings alive in space, apply similarly to developing our knowledge for creating those kinds of infrastructural systems on Earth.

Secondly, I'll say to people on this call, it would be useful to also sort of stretch your imagination, and think about how your various levels of expertise could be brought to bear on questions that we haven't yet taken up in too much depth, but we've raised before: For example, the issue of city-building, and the organization of new urban/industrial/agricultural centers, where we're going to be able to integrate the availability of water and power, and mass transportation in a new way. And that's something we still would like to present, from our end, here.

Let me turn it over to Michael. I think he has a couple of things.

Kirsch: Yes, that our political movement, and what you can see on our website, has the characteristic that we're not waiting for the gods to descend upon the scientific community and the people who know how to build things, and say, either "Here's your funding," or "Here's your right of way." But our outlook, and what we're building, and what I posted on our website last week—the discussion amongst seven different engineers in the United States—has the direction to it, that the layers that are on this call today, amongst the population of the United States as a whole, really have to have a shift in identity.

And rather than being just people who have a background and are skilled in the technology of the United

States, really have to see themselves now, as the defenders of that technology and of that scientific capability we have as a nation. Because it's really only the people who can conceptualize the kind of economic program that we're talking about, that are going to be able to make it a reality. Because—well, let's just say this: The benefits of the NAWAPA system, if we look at it, in everything it would accomplish, that's very clear. It's been shown. But we're not going to sit back and say, "Well, we've made the case, and we hope people will decide to go with it."

The idea here, is to continue to have these discussions, and also I'm inviting everybody here to participate even more actively in opening up different discussions amongst many different people, and really pulling together a coordinated discussion amongst, you could say, a new "Brain Trust," like FDR had; a real think tank, the brain of the nation, to continue to make the case, for the people who can't see and who have mental blocks about why we need to do this.

And so, if there's more and more to clarify, and more and more to show what a benefit this would be, and to provoke the imagination, of what this could mean—just as the space program was for technology, what NAWAPA would be to the study of natural resources and development of them—to really provoke more and more of that kind of imaginative inspiration amongst the United States layers.

That's what we have to do, and I invited everybody here on the call, to participate in that process, and join us in making more videos for our website, which we're doing, and also broadening this discussion. And if anybody has any thoughts on that, or immediately, referrals, and things that you think we should keep our eye out for, or things that you can help us out with, please comment. Or any questions from today, or on what I just said?

Closing Remarks

Moss: Can I comment on a couple issues that we talked about today? One of the phenomena in the West, we talked about additional agricultural land that we would like to irrigate, and there's some productive land out there. But there's quite a bit of productive land that has really been taken *out* of service, because it becomes a point at which it is too expensive to pump water from 600 feet, instead of 200 feet, to irrigate a crop. It just makes no sense; you lose money. So, one of the real primary justifications, I think, is laying out the need to replenish the depleted aquifers.

And secondly, these depleted aquifers apply to about, I believe, three-quarters to 80% of all Western rural water-supply systems; they pull it out of the groundwater.

So, there is a real justification there, to, in fact, stop this continual depletion of the groundwater, for either commercial, for residential, cities, and agricultural use. Okay, that's kind of another hidden agenda, that I think NAWAPA can serve.

The gentleman who talked about the time it consumes to do a nuclear power plant review, in the Regulatory Commission and the environment today: He's absolutely right! I'd just say—I don't want to beat a dead horse, though, because we have operated about 120 nuclear power plants commercially, in the United States, and I will bet you that about 110 of them are all different. There have, over the years, been almost no two similar reactors; not totally dissimilar, but dissimilar enough that an entire safety analysis review has to be incurred. These reactors took that information from the previous generation, even if that was ten years prior, and incorporated it, to make a cheaper, more efficient, better running plant for the next one. So, anyway, what I'm telling you, is the Nuclear Regulatory Commission, for all of the faults and the like, they had to deal with about 110 individual reactors.

Riley: I know that those 110, or however many you mentioned, nuclear reactors, it turns out that they hold the U.S. industry safety record over the last 10-12 years, and I think that's fairly significant, based on people's concern about reactors, promoted by the media as a result of Three Mile Island and Chernobyl.

Moss: Don, I agree with you 100%!

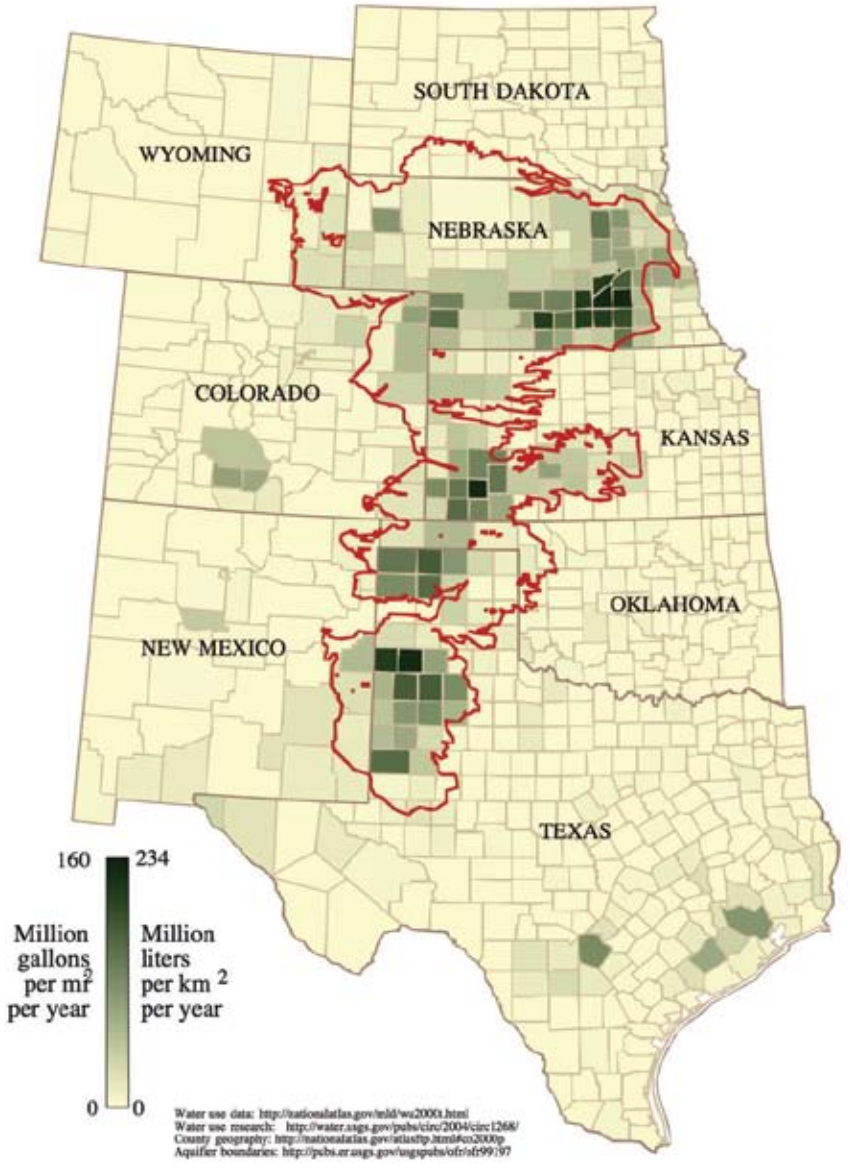
Bates: I do, too.

Christie: I just have one comment here, to kind of refer back to the beginning of the discussion around some of the further implications of NAWAPA and the kind of development programs that we're promoting. Obviously, NAWAPA is isolated to North America—you know, Canada, United States, Mexico; but then, of course, there's the development program through the Darien Gap connecting Central and South America; and the Bering Strait project, connecting the United States and Russia: that this represents a whole break with so-called globalization, where powerful financial cartels and mineral cartels and so forth, run the planet as an empire.

FIGURE 1

Groundwater Withdrawals from the Ogallala Aquifer, 2000

(Estimated, for all uses, by county)



U.S. Geological Survey

The Ogallala (High Plains) Aquifer is being seriously depleted, as are many others in the United States, underlining the urgency of NAWAPA. On the map, the dark red line shows the extent of the huge Aquifer.

This gets back to the concept that the United States has been based on: cooperating with other nations in developing. And I would just refer to the contrast between what happened in Chile, and what's currently happening in Haiti. In Chile, you had a rallying of nations around the world, to put the best of our scientific capabilities to save these miners, and it was a really beautiful rallying point of that kind of common human spirit. Versus what's going on with Haiti, where we're letting that place just rot, and now we're seeing cholera outbreaks.

That these kind of development projects represent getting back to what John Quincy Adams had laid out: a community of principle among sovereign nations. We can all be sovereign nations, we can all have our distinct cultures and so forth, but we recognize a commonality to man, which is that we are creating, which is that we are creative, and we are united around that idea.

So, I'd like to just say that we're at a point where the globalization model of keeping nations backward, preventing them from developing, stopping science and advancement, that era is now over, and we have an opportunity, with NAWAPA and related programs, to strike a new era, which is in a sense an old policy of the United States, of good neighbors.

Teng: I think that's a perfect note to end today's call. We'll be in touch with people individually, and on follow-up developments and follow-up calls, videos, and interviews that we'll want to do. I'd also encourage people, in terms of the issues that were raised to day, to follow up with your own resources, and to talk to other people, people that we have not yet gotten in touch with. I mean, we've had a pretty impressive national mobilization, but I think we've still only scratched the surface, when you consider what is out there in terms of potential. And so, with that, I'd like to thank everyone for being on this call, and we'll be in touch.