

California Water and Infrastructure Report



For October 26, 2017

by Patrick Ruckert

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<http://www.californiadroughtupdate.org>

<https://www.facebook.com/CaliforniaDroughtUpdate>

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Whether or not that "beautiful world" will be built, depends in large measure on the upcoming Asian trip of President Trump, and most especially on his Nov. 8 meeting with Xi Jinping. If Trump accepts Xi's repeated offers to join the Belt and Road Initiative, a dramatic strategic sea-change will be underway. If, however, Trump remains largely tied down by British slanders and threats against him—such as the tidal wave of Russiagate and anti-China propaganda spewing from the British Empire and their assets—then the entire world may well sink with the bankrupt Old Paradigm. Yesterday's revelations that both the DNC and the Clinton campaign directly funded the work of British intelligence agent Christopher Steele—the author of the lying anti-Trump dossier regurgitated ad nauseum in the liberal media—are a long-overdue but very timely step to help free Trump from the British campaign.

China Commits to Building a "Beautiful China" and a "Beautiful World"

<https://larouhepac.com/20171026/china-commits-building-beautiful-china-and-beautiful-world>

A Note To Readers

It has taken months of searching, but finally we have a new title for this weekly report. If any of my readers have a better suggestion than “California Water and Infrastructure Report,” please let me know and I will give it serious consideration.

As President Trump said in an interview with Lou Dobbs Wednesday evening, he looks forward to his meetings with President Xi of China for two days around November 8 in Beijing. The quote above sets the tone for what is possible in the weeks to come.

With the United States continuing its emergency repair work in Houston, Florida, Puerto Rico and

California, the U.S. Congress is allocating tens of billions of dollars to do so. The question remains, when and how, beyond emergency repairs, the nation will begin a real infrastructure building program that, like the Apollo Project of President Kennedy, transforms and uplifts the power of the economy? It is the frontiers of science and technology that do that. Today that means not only building the water projects, the high-speed rail network and desalination plants, but it the frontiers of fusion research and the space program that can and will create, as President Xi said the other day, a "Beautiful World."

Meanwhile, back at the ranch, so to speak, this week's report focuses on two major areas: The tunnels under the Delta, a project, which almost daily, appears to be heading to the dustbin of history; and, the Oroville Dam spillway project. With just one week to go to the deadline of November 1 to complete phase I of the rebuilding of it, the main contractor says it shall be done.

The concluding section of the report provides more thoughtful material on how to organize an economy the American System way. This section includes some excerpts from Paul Gallagher's presentation to the Manhattan Project last Saturday. Toward the end of that presentation is a surprise: The "Golden Age" for the increase of labor productivity of the U.S. economy was the 1930s, with the massive building of transformational infrastructure and FDR's Rural Electrification project. The second surprise: The IT sector over the past two decades has added almost a zero percent increase in labor productivity.

If They Can Claim to Know the Weather 100 Years From Now, Why Can't They Decide What the Next Six Months Will Bring?

Weak La Nina portends winter of weather uncertainty in California

The federal Climate Prediction Center's winter outlook calling for weak La Nina atmospheric conditions means that most of California faces equal chances of a wetter- or drier-than-normal winter, although 60 percent of comparable winters since 1950 have been dry.

[Tim Harden](#)

Capital Press

Published on October 23, 2017 9:55AM

<http://www.capitalpress.com/Water/20171023/weak-la-nina-portends-winter-of-weather-uncertainty-in-california>

SACRAMENTO — Much of California could be in for a drier winter if the building consensus calling for a weak La Nina pattern turns out to be accurate, a National Weather Service meteorologist warns.

The federal Climate Prediction Center issued its winter outlook on Oct. 19, noting that oceanic and atmospheric conditions appear to favor wetter-than-average conditions across the northern U.S. and drier weather across the South.

For California, similar conditions early last fall led to one of the wettest seasons on record. But since 1950, only 10 percent of weak La Nina winters have been wet, noted Cindy Matthews, an NWS forecaster in Sacramento.

Sixty percent of such winters turned out dry, including 2011-12, which was the first of five years of drought.

"The main point here is, just like last year, past events do not guarantee a future outcome," Matthews

said in an email.

New federal forecast: What the coming La Niña means for California rains Forecasters are scratching their heads for now

By [Patrick May](#)

Bay Area News Group

October 19, 2017

<http://www.mercurynews.com/2017/10/19/el-nino-la-nina-or-neither-thats-the-question-this-winter-for-northern-californians/>

The Delta Tunnels: One Blow After Another to Jerry's Project

With two of the major water districts voting to not participate in funding the California WaterFix project of building two tunnels under the Delta, the governor did not need to hear that the Federal Government will not participate either. But, that is the news this week. That is on top of the findings by “the Interior Department’s inspector-general last month..., saying the U.S. agency under former President Barack Obama had improperly contributed \$84 million in taxpayer funds to help pay for planning for the tunnels.”

The two excerpted articles below, together, give a good picture of these developments.

Is Donald Trump fighting the Delta tunnels? No. But he won't pay for them either

By Dale Kasler

October 25, 2017

<http://www.sacbee.com/news/state/california/water-and-drought/delta/article180828981.html>

Is the Trump administration opposed to the Delta tunnels, Gov. Jerry Brown’s plan to remake the troubled estuary and improve water deliveries to the southern half of the state?

For a while Wednesday, it certainly looked that way. A top spokesman for the U.S. Interior Department, Russell Newell, told the Associated Press that “the Trump administration did not fund the project and chose to not move forward with it.”

Although officials have been downplaying the U.S. government’s potential involvement in the project for months, outright opposition from President Donald Trump could have been fatal to Brown’s \$17.1 billion tunnels plan. The Interior Department needs to sign off on environmental reviews before the project can go forward.

As it turned out, the Trump administration said it isn’t trying to kill the project.

Newell told The Sacramento Bee that the federal government is still working on the environmental issues related to the Delta tunnels.

However, he said the feds won’t help pay for the tunnels – mirroring a stance the federal government has held for months.

“While the Department of the Interior shares the goals of the state of California to deliver water with more certainty, eliminating risks to the California water supply, and improving the environment, at this

time, the Department under the current state proposal does not expect to participate in the construction or funding of the CA WaterFix,” Newell said in a statement later in the day.

Conceived a decade ago, WaterFix would be financed by the south-of-Delta water agencies that get deliveries from the State Water Project or its federal counterpart, the Central Valley Project.

However, the project has been faltering for weeks because of water agencies’ reluctance to commit financially. That’s due largely to a complicated cost-allocation formula imposed by the Bureau of Reclamation, which runs the Central Valley Project and is part of the Interior Department.

The bureau says the tunnels aren’t an official Reclamation project and, as a result, the federal government won’t contribute to the construction costs and its Central Valley Project customers are free to opt out. What’s more, it told one major group of customers that, because of historic water rights, its supplies are so secure that it probably doesn’t need the tunnels anyway. With those customers essentially exempted from payment, the costs have shot up for every other Central Valley Project customer – and none of them has agreed to participate. That leaves a funding gap of \$6 billion or more in Brown’s \$17.1 billion plan.

In recent weeks, as funding from Central Valley Project water agencies has collapsed, the Brown administration has talked about scaling back the project and funding it solely with dollars from State Water Project customers.

Most of the major state customers have agreed to participate, although some have made firmer commitments than others. In contrast with the feds’ approach, Brown has said every state water district south of the Delta must help pay for WaterFix – or find another customer to take their place. The largest single commitment so far came from the Metropolitan Water District of Southern California, which agreed to spend more than \$4 billion building the tunnels.



Trump opposes CA's massive twin tunnels water project

AP

Updated: 2:32 PM PDT Oct 25, 2017

<http://www.kcra.com/article/trump-opposes-cas-massive-twin-tunnels-water-project/13094310>

Brown wants California water agencies to pay the \$16 billion price tag to build two, 35-mile-long

tunnels to divert part of the state's largest river, the Sacramento, to supply water to the San Francisco Bay Area and central and Southern California.

But the plan has run into its biggest obstacles yet in recent weeks, when two key water districts opted not to help fund it. While the federal government was never supposed to bear the cost of the project, the Obama administration spent millions planning for it.

The Interior Department's inspector-general last month challenged that financing, saying the U.S. agency under former President Barack Obama had improperly contributed \$84 million in taxpayer funds to help pay for planning for the tunnels, which would be California's most ambitious water project in decades.

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An Interior official under the Bush and now Trump administrations, David Bernhardt, has professional ties with a leading California water district whose support was vital to the project.

However, the district, Westlands, voted last month against participating, saying it did not make sense financially for its rural water users.

Oroville Dam Update

The deadline for the repair of the main spillway is less than one week from today. The General contractor Kiewit Corp, expresses confidence that that deadline will be met. It is surprising how fast the big hole created when the spillway disintegrated has come to be filled so rapidly these last few weeks with roller-compacted concrete, and is now near ready for the construction concrete finish. That can be seen when one watches the September 18 video, below, to the one dated October 24, also below.

The first two excerpted articles below, one on the doubling of the cost of the repair, and the second, "Rebuilding Oroville Spillway....," are really construction reports. Together they provide a good overview of the project.

To remind readers of how the rebuilding of this huge project has been accomplished in so brief a period of time, here is a quote from my article, "New York City Can Learn a Lesson From the Oroville Dam Catastrophe," published in *Executive Intelligence Review* on July 14, 2017:

https://www.larouchepub.com/eiw/public/2017/eirv44n28-20170714/30-32_4428.pdf

While the Oroville Dam spillway collapse has been a wake-up call which demonstrates that ignoring the nation's deteriorating infrastructure for decades guarantees that disaster will strike, it is what has happened since at the dam, that provides us with another wake-up call, this one demonstrating how the rebuilding of the nation must be done.

What has occurred in the six months since the dam's spillway broke, goes far beyond the streamlining of regulations called for by President Trump. The entire regulatory structure of the state and federal governments has been thrown in the garbage can, including the normally required and usually

obnoxious environmental-impact statements. There have been no years-long studies of the problem, no drawn-out court battles delaying construction, and no bureaucratic or other delaying actions allowed by the legislature, the Congress or anyone else.

That spillway must be repaired and repaired fast, before the rainy season begins in October. And so the announcement, bidding, and awarding of the construction contract process, which normally takes years, was done in less than two weeks. The actual construction work to repair the spillway began in early May, after more than two million tons of rock and dirt, which had washed into the Feather River, had been removed. That job had been done on a 24 hours a day, seven days a week schedule.

The construction contract to rebuild both the broken spillway and the emergency spillway was awarded to the Kiewit Corporation, an internationally renowned contractor for big jobs. As many as 500 workers, dozens of pieces of heavy equipment, a large fleet of trucks, and two concrete plants built on site, are now working 20 hours per day, six days a week, to get the first phase completed by October 1.

Earlier, on April 12, as reported by the Chico Enterprise-Record, Bill Croyle, State Department of Water Resources Acting Director, said that normally, a project of this size would take years just for the planning. "We need hours and days for approval vs. weeks, months and years," he said. Rather than have paperwork shuffle back and forth, staff from agencies will meet together, Croyle said.

Videos

Oroville Spillway Flyover September 18, 2017

<https://www.youtube.com/watch?v=dVe304ciVuA>
[California DWR](#)

Published on Sep 19, 2017

Oroville Spillway Update October 20, 2017

<https://www.youtube.com/watch?v=GCSp7NcN9hs>
[California DWR](#)

Published on Oct 23, 2017

Roller-compacted concrete (RCC) in the center chute has nearly reached the upper chute as crews continue to place material. Cranes move a concrete hopper to place material in leveling slabs for the vertical culvert at bottom corners of the upper chute. In the center chute, crews continue to prep the RCC for the final layer of enriched RCC. Rebar and concrete forms are installed in the trench where RCC will connect to structural concrete in the lower chute.

Oroville Spillway Flyover October 23, 2017

https://www.youtube.com/watch?v=2ONKIwvhM_o
[California DWR](#)

Published on Oct 24, 2017

Oroville Spillway Update October 24, 2017

<https://www.youtube.com/watch?v=zAuJ4qWYIyg>
[California DWR](#)

Published on Oct 25, 2017

On October 24, 2017, crews made the connection between the lower and upper chutes, having placed more than 300,000 cubic yards of roller-compacted concrete (RCC) in the middle area of the main Lake Oroville spillway. Crews will continue to finish the RCC walls and place a layer of enriched RCC over the surface of the center chute.

Reports



Construction continues at the Lake Oroville Dam Spillway Wednesday Oct. 18, 2017. (Photo: Mercury-Register)

Cost of Oroville dam repair nearly doubles as unexpected problems emerge

By Dale Kasler

October 19, 2017

<http://www.sacbee.com/article179858341.html>

The reconstruction of Oroville Dam's flood control spillway is likely to cost as much as \$500 million, state officials said Thursday, as design changes and unexpected additional work has inflated the cost of the project.

Originally budgeted at \$275 million, the repair has grown to cover a greater level of protection for the dam's emergency spillway – whose near failure in February sparked the evacuation of 188,000 downstream residents – as well as unforeseen problems in the bedrock beneath the main spillway, said Erin Mellon, a spokeswoman for the state Department of Water Resources.

Mellon said the state hopes to recover up to 75 percent of the reconstruction costs from the Federal Emergency Management Agency. But she said water districts that store water behind Oroville Dam, such as the Metropolitan Water District of Southern California, the Santa Clara Valley Water District and the Kern county Water Agency, will be expected to pick up whatever costs the federal government won't cover.

Mellon said state officials have known for several months that the cost would exceed the original budget. General contractor Kiewit Corp obtained the two-year, \$275 million contract in April, when the reconstruction project was still only 30 percent designed, she said.

Although the reconstruction costs have risen, Mellon noted that the cost of handling the initial emergency in February came in at around \$160 million, or more than \$100 million below original estimates.

The higher costs for the reconstruction came to light as officials from DWR and Kiewit led a media

tour of the construction site, where 700 workers are racing to meet a self imposed Nov. 1 deadline to have the dam ready for wet weather. Although the spillway project won't be completely finished for another 12 months, the spillway should be able to release 100,000 cubic feet of water per second during the upcoming rainy season.

"I don't want to jinx it, but we're ahead of schedule," said Jeff Petersen, Kiewit's project manager. The rain expected to hit the region late Thursday might cause slight delays but wouldn't derail the project, he said.

Petersen told reporters that costs rose in part because workers discovered that a portion of the main spillway was built on underlying rock that was deemed unsuitable. As a result, workers had to dig a lot deeper into the bedrock than they had planned before laying the new concrete. That led to much higher costs for excavation and concrete to fill in the hole.

"We had to take that cavity out," he said.

Petersen said the higher costs aren't unusual for a project that has been designed and built on the fly. "When you get out on the construction site, there's so much more information that you glean," he said.

Problems with girding a portion of the emergency spillway with concrete have contributed to the higher costs. The original plan called for that layer of concrete to run about 300 feet down the hill from the top, ending with a massive underground wall designed to curb erosion. But the underground wall had to be moved several hundred feet further down the hill because the rock beneath the original site wasn't strong enough. Moving the wall downhill meant doubling the size of the layer of concrete.

Rebuilding Oroville Spillway, With the Rainy Season Just Around the Corner



The construction site from across the Feather River channel (also known as the Thermalito Diversion Pool). At the direction of federal regulators, the spillway must be ready for releases from Lake Oroville by Nov. 1. (Dan Brekke/KQED)

By [Dan Brekke](#)

October 23, 2017

<https://ww2.kqed.org/news/2017/10/23/rebuilding-oroville-spillway-with-the-rainy-season-just-around-the-corner/>

November 1.

That's the deadline for the army of construction workers laboring to rebuild Oroville Dam's main spillway to finish the first phase of the 18-month project — now expected to cost [at least \\$500 million](#).

This year's work aims to ensure that the spillway is capable of handling large releases of water this winter, if necessary, and that the first step in reinforcing the erosion-prone slope serving as the dam's emergency spillway is well underway.

The result is a construction effort of vast scope and complexity.

The Oroville project? With the coming rainy season as a deadline — Oroville Dam got .69 of an inch of rain in last week's first storm of the season — design, demolition and construction have been compressed into a few months.

"What's different is the design's being done fast. It's different for the regulatory agencies to approve it as fast as they did," Petersen said.

He notes that many parts of the project construction have been under discussion even as demolition and construction began earlier this year. One of those unknowns involves the massive chasms that eroded beneath the spillway and how much excavation would be needed to reach the competent bedrock upon which the new spillway must be built.

"We didn't know how deep this cut was going to go," Petersen said as he stood at the edge of one of those chasms. "So we had a rough plan, and then as you come out here and start doing the excavation and some more exploration, you say, 'Hey, we gotta get rid of this bad rock, let's take some more excavation out of this area.'"

The main spillway itself is a structure whose scale is nearly impossible to comprehend, even when you're standing in the middle of it. The chute is 3,000 feet long and 180 feet wide, with side walls that are close to 3 stories tall. The chute plunges downhill from a structure housing eight massive gates designed to control the release of water.

The system — the flood control outlet, the spillway and the emergency — are part of conventional dam design, allowing operators to manage the level of the reservoir behind Oroville Dam. What's not conventional is the scale: The dam is the tallest in the United States, rising 770 feet from the bed of the Feather River. And the reservoir behind it, Lake Oroville, is California's second largest (only Shasta Lake is bigger), with the capacity to store enough water to supply about 7 million California households for a year.

The Feather River watershed's potential for unleashing massive amounts of runoff is also vast, and the main spillway and emergency spillway are designed, in theory, to allow passage of more than 600,000 cubic feet per second without threatening the dam's integrity (under this scenario, the concrete spillway would discharge 277,000 cfs and the emergency spillway — again, an unpaved hillside — would handle about 350,000 cfs).

Oroville Dam: DWR plans to use Gold Rush rock from wildlife area

By [Risa Johnson, Chico Enterprise Record](#) |

October 25, 2017

<http://www.mercurynews.com/2017/10/25/oroville-dam-dwr-plans-to-use-gold-rush-rock-from-wildlife-area/>



Rocks piles like these found throughout the Oroville Wildlife Area will be used by the Department of Water Resources to make aggregate for concrete to repair the Oroville Dam spillways. (Bill Husa — Mercury-Register)

Oroville – The state Department of Water Resources plans to clear mounds of rock from the Gold Rush days at the Oroville Wildlife Area and put them to use in the rebuilding of the spillways at Oroville Dam.

DWR received approval from the Federal Energy Regulatory Commission, according to a filing made last week.

The wildlife area stretches nearly 12,000 acres, located in southwest Oroville along the Feather River. It is owned by DWR and managed by the state Department of Fish and Wildlife.

Much of it is covered with long mounds of rock that were left behind by dredgers searching for gold.

The rock is now useful for creating the aggregate needed for the spillway concrete. And since it's local, it will reduce truck traffic on highways to the area. And since DWR owns the rock, it's free.

And finally: Yea! Just what we need, turn the public's property over to entities whose only reason for existence is to make a profit. Remember Enron?

Oroville Dam: Independent Institute report calls for DWR to transfer dam ownership

By Risa Johnson

10/22/17

<http://www.oroillemr.com/general-news/20171022/oroville-dam-independent-institute-report-calls-for-dwr-to-transfer-dam-ownership>

Oakland >> The state Department of Water Resources has received a satirical award for its management of the Oroville Dam crisis from the Independent Institute, which also recommends the department transfer dam ownership to private entities.

The Oakland-based institute gives the California Golden Fleece Award quarterly to state government agencies that “swindle taxpayers or violate the public trust.”

“In the case of DWR, the mistakes and wrongdoing could have caused a total dam collapse resulting in severe property damage, mass injuries, and fatalities,” a press release from the institute reads. “After the spillway failures, which prompted the evacuation of nearly 200,000 people in downstream

communities, details emerged showing that DWR failed to act on specific warnings about spillway integrity, provided insufficient inspection and repair processes, and made poor design and construction choices. Worse, the agency also concealed safety problems from the public.”

Independent Institute senior fellow Lawrence J. McQuillan [goes further in his report](#) to state that DWR should no longer operate California's 44 state-owned dams and suggests private water companies or private irrigation districts take over.

Feature: The American Credit System

We begin with Class No. 4 of the LaRouche PAC economic class series, and then some excerpts from Paul Gallagher's presentation to the Manhattan Project last Saturday. Toward the end of that presentation is a surprise: The “Golden Age” for the increase of labor productivity of the U.S. economy was the 1930s, with the massive building of transformational infrastructure and FDR's Rural Electrification project. The second surprise: The IT sector over the past two decades has added almost a zero percent increase in labor productivity.

Class No.4: Qualitative Change: What Number Cannot Measure

<https://larouhepac.com/20171025/class-no4-qualitative-change-what-number-cannot-measure>

Welcome to the fourth class in our 2017 Economic Class series, investigating Lyndon LaRouche's method of economic forecasting. Today's class will be streamed live at 1:00 pm eastern with live participation from Dresden, Germany. Register for archive classes, homework and access to teachers [here](#). This week: Compared to making money by investing in the market, the economic changes discussed last week—in the upgrades of power over different forms of “fire,” from wood, to charcoal, to chemistry, electricity, nuclear, and fusion—occur as jumps. They create new fields of potential that did not exist before, and cannot be understood in terms of the past.

And here are the links to the first three classes:

Class No. 1: LaRouche's Science of Economics is the Basis for US Joining the New Paradigm

<https://larouhepac.com/20171004/class-no1-larouches-science-economics-basis-us-joining-new-paradigm>

Class No. 2: [https://action.larouhepac.com/2017-econ-class-series-second?](https://action.larouhepac.com/2017-econ-class-series-second?utm_campaign=2017_econ_3&utm_medium=email&utm_source=larouhepac)

[utm_campaign=2017_econ_3&utm_medium=email&utm_source=larouhepac](https://action.larouhepac.com/2017-econ-class-series-second?utm_campaign=2017_econ_3&utm_medium=email&utm_source=larouhepac)

Class No. 3: Physical Chemistry: Stages of Development <https://larouhepac.com/20171018/class-no3-physical-chemistry-stages-development>

A Tale of Two Economies: Forward With Hamilton Along the Belt and Road, Or Blow Out With Public-Private Partnership

LaRouche PAC Manhattan Project Dialogue with Paul Gallagher

Saturday, October 21, 2017

<https://larouhepac.com/20171021/manhattan-town-hall-event-paul-gallagher>

(Extended excerpts)

The real question, as you may know if you read about this at all, is that there are two huge expansions of credit -- that is, debt -- which have gone on over the past 10 years. One by the major central banks of Japan, Europe, the United States; the other by the People's Bank of China and the publicly held large commercial banks in China -- the big five commercial banks. Both of those credit expansions have been huge. They are comparable, and they are in the range of \$15-20 trillion equivalent in each case. All of the discussion in these warnings which are coming out now is about what is going to collapse.

As you may know, the majority of so-called financial experts in the financial media say that it is the Chinese credit expansion which is going to blow out. So, what is the truth of that? Obviously, what is immediately needed to stop this is, first of all, to separate commercial banking from speculative investment banking and similar things, so that these huge volumes of speculative debt which are now going bad cannot be dumped by the big banks onto all of the pension funds and savers and so forth around the world. That's what they did in 2007-2008. Anyone who has seen the film "The Big Short" saw a demonstration of exactly how they did it. They are now doing the same thing with unpayable auto debt, unpayable corporate debt and so forth.

So, reinstating Glass-Steagall for one thing, will stop that process because it will not allow the bank holding companies to do this, to create the securities by which they're doing this. And then secondly, more importantly, increase productivity rapidly. That means increasing investment in high-technology infrastructure rapidly -- I'll get into that.

China's rapid economic expansion has been going on now for just about 30 years. The longest period of financial stability in the United States really been the period of enforcement of the Glass-Steagall Act from roughly 1933 to 1985, when it was fully enforced. That's the only period in which there was not a continuous threat of bank panics and general financial collapses. China has a Glass-Steagall law, and it is in effect; and recently has been more strongly enforced because of challenges to it by the formation of what we call non-banks in China -- what we might think of as hedge funds and private equity funds here. In the middle 1990s, when the major Chinese public commercial banks were formed through action of the People's Bank of China and through legislation, they were also separated and not allowed to participate in merchant banking activities, investment banking activities; and have not been allowed to do that since that time. China has a Glass-Steagall law; it is really the only major economy in the world which has a currently enforced Glass-Steagall law. It isn't called that, but it's called that in informal discussion among Chinese economists.

If you look now at the credit expansion, the debt expansion which has taken place by the central banks of Japan, Europe, and the United States, it has created -- since 2010, only seven years ago -- \$7 trillion in new corporate debt; corporate debt has more than doubled in a period of seven years in the United States. \$1 trillion in new auto debt; \$1 trillion in new credit card debt; \$2 trillion in new household debt overall; \$11 trillion of new debt in seven years. And that is not counting government debt, which has increased by \$7 trillion, or student debt which has increased by \$600 billion in that period of time. Those four big central banks -- and I'm including also the Bank of England -- alone have bought \$14 trillion of this debt during that period of time. That's the quantitative easing; that's not the bail-out which took place in 2008, where they were buying the stock of the biggest banks. They were guaranteeing their assets, lending them huge volumes; a lot of that has been paid back. We're talking about the currency that was printed by the Federal Reserve and the other central banks in order to directly transfer to the major banks of those countries; which then in turn used it to create a now 10-year-long era of effectively 0% interest rate credit for speculation. That is, 0% interest rate credit for

the securities' markets of the trans-Atlantic world.

For the major central banks as a whole, this debt expansion added up to about \$15 trillion. You put that \$15 trillion in expansion of debt on top of no productivity growth. Since 2000, the average growth in labor productivity in the United States has been 0.5% per year. The average growth in what is called total factor productivity, a significantly more important measure I'll explain in a minute, that has averaged 0.3% annual increase. You put \$15 trillion in debt on top of that, and then look at the labor markets and what has happened to the labor forces in the United States and Europe.

In the United States in the 1980s and the 1990s, of the people who were newly eligible to enter the labor market during those two decades, about 75% - 80% of them did enter the labor market during those two decades and stayed in it; they were still in it either working or looking for work at the end of that decade. In the decade from 2000 to 2010, of the potential eligible new entrants into the labor force during that decade, 30% of them actually entered the labor force and stayed in it. During the Obama Presidency, between 20% and 25% of the expansion of the labor force that could have occurred, actually occurred. So, you had a collapse in the quality of employment and in the portion of the labor force which was actually taking part in any way at the same time as this \$15 trillion money printing was being thrown at the securities' markets and bringing them to the point of a crash.

China's debt expansion has been approximately the same magnitude; in fact, it may have been somewhat more new credit, new debt created through those public commercial banks in China. Now, we find that two-thirds of the corporate debt in China, two-thirds of all of it -- it's concentrated in 22 companies. They are, all 22 of them, involved either entirely or to a very great degree in infrastructure building and in energy development. I'll just quote *Asia Times* for example in an analysis on Thursday: "A great deal of Chinese corporate indebtedness should be viewed as public works investments by the Chinese sovereign" -- the Chinese government. "The point to take away is that we are not looking at a speculative bubble in corporate debt, but at a heavily concentrated investment in state-sponsored infrastructure." They continue: "Manufacturing, health care, and other major corporate sectors in China actually show declining debt leverage. The bulk of corporate debt has built up in energy production, power production, rail development, high-speed rail, airlines. Sectors that in many other countries would be funded directly via the state budget. China has been borrowing mainly to expand infrastructure." Rather surprisingly, the ratio of net debt to earnings of these 22 companies -- they're all large companies, obviously -- will fall from 3.71 in 2016 to 2.5; that is, they will be less leveraged with debt by a significant amount in 2017 and 2018 than they were in prior years. So, this \$20 trillion, if you call it that, debt expansion from China over the past decade, is backed by at least \$10 trillion in infrastructure, public assets alone. Furthermore, the firm of Pricewaterhouse Coopers has done several recent studies this year, showing that the value of China's capital assets in infrastructure, in the Belt and Road countries, -- we're not talking about in China, which are now scores of them all over the world -- the value of China's capital assets is rising by 40-50% every year, and is already in the order of hundreds of billions of dollars.

It (infrastructure building) has not occurred in the United States since World War II, and the results, the fourth slide [Fig. 4] shows infrastructure investment as a percentage of GDP in the United States, going back to the 1950s. You see how sharply it rose during the impulse of Kennedy's nuclear development, water development, Apollo Project and so forth, and then how steadily it fell ever since then, to where it is now less than 1.5% of GDP. Compare it to China, where it is consistently 9% of GDP every year. And most of this investment in infrastructure in the United States now is done by municipalities, not by the federal government.

And the effect [Fig. 5], this is Total Factor Productivity. What that means is labor productivity the way you read about it, is simply the total GDP, the total output which could be anything, divided by the total number of hours worked by the workforce. That doesn't tell you much. Total factor productivity is something different: It's an index which attempts to measure the impact of technological advance on labor productivity. It's complicated, but it essentially looks at what has been wrought by technological advance on productivity in the economy.

You can see that there was a golden age of productivity in the United States and that it began with Roosevelt's 1930s and that that decade actually had the largest steady increase in technological productivity of any decade in American history. The studies which were done of it, made absolutely clear that this rate of growth, which was in the order of 3-3.5% per year, that this rate of growth was the result of the great projects in infrastructure of the New Deal, and the way in which those great projects challenged the companies that were working on them, just as we see in the Chinese bridge-building and so forth today. They challenged the companies which were working on them to develop completely new technological methods and inventions in order to carry them out. And the result of that, even more than the war mobilization of the 1940s, the result of that was the most rapid growth in technological productivity in the U.S. economy at least in the whole period in which this index has been measured.

By comparison, the National Bureau of Economic Research here, estimated in a study in 2014 that the rate of growth in total factor productivity in the Chinese economy in the period of 1999 to 2011 had been 3.11% annually. So comparable to this, comparable to the golden age of productivity in the United States economy, not what you see after that, and if we continued it one more bar to the right, to the period since 2010, you would be at zero. Which is why the zero growth in total factor productivity, which is why the average since 2000 is below one-half of 1%.

There's a fellow who just wrote a book, Robert Gordon, a very famous economist, on *The Rise and Fall of American Growth*, all about total factor productivity. He won all sorts of prizes for it. The most surprising thing that he details there, is that the information technology (IT) revolution did not produce *any* growth in productivity at all. In May, the Organization of Economic Cooperation and Development, the OECD, put out a similar report and held a big conference in Paris about it, because of the surprise of the disappearance of productivity growth, in the United States and European economies. And, they said, especially in the sectors directly related to IT, that's where the greatest absence of productivity growth was.

So that is not the same as developing a crash program for fusion power; it's not the same as building high-speed rail, it's not the same as nuclear desalination. It does not have the kind of effect of protecting the cities on the Texas coast, and New York City and so forth, from devastation in hurricanes. Repeatedly, over and over again, it did not and does not have that effect.