

UNITED STATES DEPARTMENT OF ENERGY
OFFICE OF ENERGY POLICY AND SYSTEMS ANALYSIS

QUADRENNIAL ENERGY REVIEW STAKEHOLDER MEETING NO. 4

THE WATER-ENERGY NEXUS

PUBLIC MEETING

DATE: THURSDAY, JUNE 19, 2014

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LOCATION: SAN FRANCISCO CITY HALL
1 DR. CARLTON B. GOODLETT PLACE
SAN FRANCISCO, CA 94102

REPORTED BY: FREDDIE REPPOND

1 A P P E A R A N C E S

2 MEETING FACILITATOR:

3 Peggy Welsh, Energetics

4 INTRODUCTIONS:

5 Jonathan Pershing, Deputy Assistant Secretary and
6 Deputy Director, DOE Office of Energy Policy and
Systems Analysis

7 OPENING REMARKS:

8 Dr. John Holdren, Assistant to the President for
9 Science and Technology and Director of the
White House Office of Science and Technology
10 Policy
Mike Connor, Deputy Secretary of the Interior

11 PANEL 1: AN INCREASING URGENCY TO ACT ON THE
12 WATER-ENERGY NEXUS

13 Peter Gleick, President and Co-Founder, Pacific
Institute
14 Rob Oglesby, Executive Director, California Energy
Commission
15 John Andrew, Assistant Deputy Director, Climate
Change, California Department of Water Resources
16 Adnan Mansour, GPM-Monitoring Solutions, GE Water
and Process Technologies
17 Nathan Bracken, Assistant Director and General
Counsel, Western States Water Council
18 Marcus Griswold, PhD, Water Resources Scientist,
Natural Resources Defense Council
19 Catherine J.K. Sandoval, Commissioner, California
Public Utilities Commission

20 PANEL 2: INTEGRATING WATER AND ENERGY OPERATIONS,
21 POLICY AND PLANNING: LESSONS LEARNED AND
REMAINING CHALLENGES

22 Eric Schmitt, Vice Operations, California ISO
23 Alex Coate, General Manager, East Bay Municipal
Utility District
24 Randal Livingston, Vice President, Power
Generation, Pacific Gas & Electric Company
25 Frank Loge, PhD, Director, Center for Water-Energy
Efficiency, University of California at Davis

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A P P E A R A N C E S (Cont.)

Randy Howard, Assistant General Manager, Los Angeles Department of Water and Power
Jim Herberg, General Manager, Orange County Sanitation District
Keegan Moyer, Western Electricity Coordinating Council

MEMBERS OF THE PUBLIC:

Peter Wright
Walter Robinson
James Farrow
Judith Iklé

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Quadrennial Energy Review Meeting No. 4 06-19-2014

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1 P R O C E E D I N G S

2 MS. WELSH: Good morning. Welcome to the
3 fourth Quadrennial Energy Review public meeting here in
4 San Francisco in the beautiful City Hall.

5 My name's Peggy Welsh. I'm with Energetics.
6 My company is the technical support contractor to the
7 U.S. Department of Energy; and we're honored to have the
8 role of supporting the QER team. I'm going to act as
9 your facilitator today. And I want to welcome all of
10 you in the room and welcome those who are listening in
11 via live streaming.

12 Couple housekeeping notes before we begin:
13 We're anxious to hear from everywhere who is interested
14 in the QER. So we ask those in the room, if you wish to
15 speak and have not signed in, to do so. Please do that
16 now. And those who are listening in via live streaming,
17 we ask you submit your comments in written form to
18 qercomments@hq.doe.gov.

19 We've got a stellar group of speakers today;
20 and their presentations will be on the DOE Website
21 shortly after the meeting is over. And that address is
22 www.energy.gov/qer and look for the June 19th public
23 meeting. There you'll find not only the speaker
24 presentations but a background memo setting the stage
25 for this topic, which as we all know is the energy-water

1 system's nexus and issues surrounding that.

2 So before we also get started, I wanted to
3 just talk about the purpose of this meeting today. And
4 let me just read a short statement to you.

5 Pursuant to the Federal Advisory Committee
6 Act, the purpose of today's meeting is to ask for your
7 individual input or your organization's input regarding
8 energy-water nexus issues and to provide a forum for
9 exchange of information. To that end, it would be most
10 helpful to us for you to provide these recommendations
11 and information based on your personal experience, your
12 individual advice, information, or facts regarding the
13 topic of energy-water nexus.

14 The object of this session is not to obtain
15 any group position or consensus. Rather, the
16 Departments of Energy, Interior, and the White House
17 Office of Science and Technology Policy are seeking as
18 many recommendations as possible from all individuals at
19 this meeting.

20 I want to note that today is a very special
21 day in that we have three federal agencies -- three
22 federal entities, I should say -- co-hosting this
23 meeting.

24 The Department of Energy serves as the
25 executive secretariat to the QER task force, but it is

1 made up of agencies across the federal government. And
2 we also have the Department of Interior and, as I said,
3 the White House Office of Science and Technology Policy.

4 So with that, let me turn to Jonathan
5 Pershing, who is the Deputy Assistant Secretary and the
6 Deputy Director of the DOE Office of Energy Policy and
7 Systems Analysis; and he will have the pleasure of
8 introducing our first speakers.

9 MR. PERSHING: Great. Thank you very much.

10 And I'd like to thank all of you for coming
11 today. This is one of a series of sessions which we are
12 doing as part of the Quadrennial Energy Review, an
13 effort to solicit input to collect comments. So it's
14 really very helpful, very important as part of the
15 process that we get a good sense of the expertise that's
16 out there in the community and a better understanding of
17 the options and issues that we ought to be addressing as
18 we do our own work.

19 Today is one of a series of these sessions and
20 the focus today is on the energy-water space. With that
21 particular point in mind, it gives me pleasure to
22 introduce our two lead speakers in the opening session.

23 Speaking on behalf of the administration and
24 the work that we are doing, one is Dr. John Holdren, who
25 is one of the co-chairs of the Quadrennial Energy

1 Review. The second is Mark [sic] Connor. He is from
2 the Department of Interior. They'll both be speaking,
3 so let me introduce them both to you at the same time;
4 and then we can hear from them both in their opening
5 remarks.

6 Dr. Holdren is the Assistant to the President
7 for Science and Technology. He's also director of the
8 White House Office of Science and Technology Policy.
9 He's the co-chair of the President's Council of Advisors
10 on Science and Technology, known as PCAST. Prior to
11 joining the administration, Dr. Holdren was the Teresa
12 and John Heinz Professor of Environmental Policy as well
13 as the director of the Program on Science, Technology,
14 and Public Policy at Harvard University's Kennedy School
15 of Government. He was also a professor in Harvard's
16 Department of Earth and Planetary Sciences and director
17 of the independent nonprofit Woods Hole Research Center.
18 He's been on the faculty at the University of California
19 in Berkeley, where he co-founded in 1973 and led until
20 1996 the interdisciplinary graduate-degree program in
21 energy and resources.

22 During the Clinton administration Dr. Holdren
23 served as a member of PCAST, the President's council,
24 and in that capacity chaired studies requested by
25 President Clinton on nuclear materials, weapons,

1 plutonium, prospects for fusion energy, R&D strategy in
2 the energy sector, as well as international cooperation
3 on energy.

4 He holds advanced degrees in aerospace
5 engineering and theoretical plasma physics from MIT and
6 from Stanford. He is a member of the National Academy
7 of Sciences, the National Academy of Engineering, and
8 the American Academy of Arts and Sciences, as well as a
9 foreign member of the Royal Society of London and the
10 former president of the American Association for the
11 Advancement of Science.

12 Clearly, he'll bring a great deal of
13 substantive expertise, but he also serves critically in
14 this context as the co-chair of the Quadrennial Energy
15 Review interagency effort.

16 Mr. Michael Connor, sitting to my right, is
17 the Deputy Secretary at the Department of Interior.
18 He's served there since nominated in July of 2013; and
19 he was confirmed without opposition in February of 2014.
20 For those of you who follow these things, it's really a
21 substantial achievement. As Deputy Secretary,
22 Mr. Connor is the second-highest-ranking official at the
23 Interior Department. He has statutory responsibilities
24 as the chief officer of an agency with more than 70,000
25 employees and an annual budget of about \$12 billion.

1 The Deputy Secretary is a key leader in implementing the
2 administration's priorities for the department,
3 including water policy and relations in the face of an
4 unprecedented Western drought that all of you are quite
5 familiar with. He also serves as the head of the
6 department's land buy-back program, the land
7 consolidation of the Cobell Settlement.

8 Mr. Connor has got more than two decades of
9 experience in the public sector. He served as the
10 Commissioner of the Bureau of Reclamation from 2009
11 through 2014. During that capacity he led efforts to
12 promote the sustainable use of water to address current
13 and future challenges associated with water supply and
14 power generation in the American West. As a
15 Commissioner, he forged major Indian water rights
16 settlements and worked to resolve water conflicts in
17 California, in New Mexico, in Oregon, and in other
18 Western states. He's led the Department of Interior's
19 efforts on two major bi-national agreements with Mexico
20 on the Colorado River that have received international
21 attention. And he's also directed the Reclamation's
22 efforts to expand hydropower generation at existing
23 facilities.

24 Until his confirmation as Reclamation
25 Commissioner, Mr. Connor served as counsel to the U.S.

1 Senate Energy and Natural Resources Committee, where he
2 helped enact significant legislation addressing both the
3 Bureau of Reclamation and the U.S. Geological Survey as
4 well as Native American issues that were within the
5 Energy Committee's jurisdiction. He also previously
6 served in the Department of Interior from 1993 to 2001
7 in the Solicitor's Office and then as the Director of
8 Secretary's Indian Water Rights Office.

9 He holds a JD from the University of Colorado
10 Law School and has been admitted to the bars in Colorado
11 and New Mexico and is a native of New Mexico, also
12 holding a degree in chemical engineering. So he brings
13 the science and the policy together.

14 So with that introduction, let me first turn
15 to Dr. Holdren, who will give us some opening remarks
16 and frame some of the issues before us. Dr. Holdren.

17 DR. HOLDREN: Well, thank you, Jonathan, for
18 that kind introduction. Let me add my welcome to this
19 fourth regional stakeholder meeting for the Quadrennial
20 Energy Review. And let me convey greetings from
21 President Obama to this group. He is following this QER
22 process very closely.

23 President Obama's energy vision is one where
24 affordable, clean, and secure energy contributes to
25 multiple national goals. One, of course, is economic

1 growth, competitiveness, and job creation. Another is
2 protecting our environment and, most challenging,
3 protecting the global climate. And yet another is
4 contributing to ensuring U.S. national and homeland
5 security.

6 Achieving that vision and those goals, of
7 course, requires a comprehensive and integrated energy
8 strategy. And that integration goes well beyond energy
9 per se. The President understands and his vision and
10 strategy for energy reflects the understanding that
11 energy is closely linked with a variety of other
12 technological issues; a variety of other environmental
13 issues; and, again, particularly closely with the
14 overwhelming challenge of managing and coping with
15 global climate change. In fact, the decision to
16 understand a Quadrennial Energy Review, which was
17 initially recommended in the first term by the
18 President's Council of Advisors on Science and
19 Technology, the ultimate decision to press ahead with
20 that was part of the formulation of the President's
21 climate action plan which he rolled out just a little
22 less than a year ago, on June 25th, 2013.

23 The Quadrennial Energy Review process, as has
24 already been briefly suggested, is built on three
25 pillars. One is strong analysis led by the Secretary in

1 the Department of Energy with contributions and
2 interactions among the many other federal agencies that
3 also have stakes and responsibilities in the energy
4 domain; and involving as well active engagement of
5 external stakeholders, which, of course, is what this
6 series of meetings -- and this is the fourth -- is all
7 about. We in the QER central operation learn a lot from
8 these interactions. I expect to learn a lot today.

9 The focus for the Quadrennial Energy Review in
10 its first year is the nation's infrastructure for
11 transporting, transmitting, and delivering energy. And
12 I stress that "quadrennial" does not mean that nothing
13 happens until four years, when we issue a report. There
14 is a moving-spotlight approach to the QER in which the
15 spotlight for this first year is on these infrastructure
16 issues.

17 It is, I think, particularly telling that
18 relatively few members of the public and, indeed,
19 relatively few of our policy-makers really understand
20 the extensiveness of the energy infrastructure on which
21 our country depends. They don't generally understand
22 the expensiveness, how costly this energy infrastructure
23 is. They don't understand that, in part as a result of
24 the very large capital investment in this infrastructure
25 and the characteristics of the technology, it turns over

1 very slowly so that, if you want the energy
2 infrastructure 30 or 40 years from now to look very
3 different from the energy infrastructure today, you
4 better start changing it now, because these capital
5 investments ordinarily only turn over with a
6 characteristic time of 30 or 40 years.

7 And very few people understand how
8 interdependent the energy infrastructure is with other
9 elements of our infrastructure -- for example, the
10 transportation infrastructure, the communications
11 infrastructure, the electricity infrastructure, and so
12 on.

13 One of the most important of those
14 interdependencies is the one between energy and water.
15 And that is a subject that is going to be the main focus
16 of the presentations and discussions at this meeting. I
17 think there are four major aspects of this intersection
18 that make it particularly challenging and make this a
19 particularly opportune time to look at it. We have come
20 to call this the energy-water nexus -- and that is a
21 term I think you will hear repeatedly in today's
22 conversations.

23 And the first of those developments is that
24 global climate change is affecting patterns of
25 temperature, patterns of precipitation, snowpack,

1 evaporation from soil and surface water. And those
2 factors together are influencing -- and mostly for the
3 worst -- water availability in California and in much of
4 the rest of the American West.

5 Secondly, U.S. population growth and regional
6 migration trends are telling us that the population in
7 the West, including particularly the Southwest, is going
8 to continue to increase, which further complicates the
9 management of energy and water systems and their
10 intersections. Many of you may have read in the paper
11 just the other day that there is a threat of reductions
12 in water supply to cities in Arizona if upstream users
13 in the Colorado River Basin are not able to considerably
14 reduce their demands in this particularly demanding
15 year.

16 A third factor is the introduction of new
17 technologies, both in the energy space and in the water
18 space, are shifting demands and patterns of supply and
19 transport of both sets of commodities, the energy
20 commodities and the water.

21 And, finally, developments in policies
22 addressing water rights and the water impacts of energy
23 production are posing additional challenges, but of
24 course also some opportunities for policy-making.

25 An overarching issue that adds to the

1 complexity of this whole domain is how diverse the array
2 of decision-makers is that have to deal with it. State
3 planners, electric utilities, power-plant operators,
4 environmental regulators, regional water-resource
5 managers, water utilities, refineries, oil and gas
6 producers are among the constituencies that play
7 important roles in this domain. And while those diverse
8 stakeholders often act independently and sometimes have
9 goals that are in competition or intention, the impacts
10 of the individual decisions they make are all
11 intertwined.

12 So this is a big challenge. And given this
13 extraordinarily complex and extraordinarily coupled
14 system, it is, I think, particularly important that we
15 take a clear look at where the most urgent questions in
16 the water-energy nexus are. That will be the general
17 subject of the first panel today. The second panel will
18 take a hard look at what has been learned in recent
19 years about the opportunities and the remaining
20 challenges of integrating operations of our energy
21 systems with our water systems and vice versa.

22 And I should add that these questions are also
23 the focus of a report issued just yesterday by the
24 water-energy-tech team at the U.S. Department Of Energy.
25 It's called "The Water Energy Nexus: Challenges and

1 Opportunities." It is available on the DOE Website at
2 www.energy.gov/water-energy-tech-team.

3 But now we're going to have the opportunity to
4 learn firsthand from a variety of distinguished experts
5 on these topics. And I'm pleased indeed to have the
6 opportunity to listen to them, to interact with them, to
7 learn from them.

8 And, with that, let me turn to my colleague,
9 Deputy Secretary of the Interior Mike Connor, who, as
10 Jonathan Pershing's introduction has already made clear,
11 brings tremendous expertise and background to this
12 topic, particularly from his time as Commissioner of
13 Reclamation in the Department of Interior and from his
14 service prior to that with the Senate Energy and Natural
15 Resources Committees.

16 So, Mike, the floor is yours.

17 DEPUTY SECRETARY CONNOR: Thank you,
18 Dr. Holdren.

19 I appreciate the opportunity to be here with
20 all of you today and make use of this dialogue that
21 we're having as part of the Quadrennial Energy Review.
22 I appreciate the very generous introduction by Jonathan.
23 I was struck in two ways as he was going through the
24 bios, that, one, given Dr. Holdren's biography, I should
25 just say, "Me, too," to whatever he said. And,

1 secondly, I hope I'm not judged by how well I've
2 resolved water conflicts in California, because
3 hopefully we'll get there, but we're obviously not there
4 yet with all the water issues exacerbated by this
5 drought going on this year.

6 This is an incredibly important topic. And I
7 appreciate the leadership from the White House and the
8 Department of Energy in this Quadrennial Energy Review
9 process and its recognition, of course, of the
10 importance of energy and water issues and how they are
11 linked.

12 I had the opportunity to participate May 27th
13 in the dialogue in New Orleans on the transmission,
14 distribution, and storage of petroleum products. And
15 even in that capacity, water issues came up. And so
16 part of this review, I think, getting this foundational
17 assessment of how energy and water issues are linked, is
18 important overall to the review. And particularly,
19 teeing off of one of Dr. Holdren's comments, we need to
20 be planning now and understanding all the linkages now
21 in order to meet the challenges, the changing market
22 demands of energy resources in this country.

23 And from that standpoint, the Department of
24 the Interior very much agrees that our energy services
25 are key to improving our economic productivity, of

1 enhancing quality of life; to our overall security
2 issues; and, of course, how we deal with our energy
3 services now and in the future. Those needs are also
4 key to protecting our environment and addressing the
5 challenges posed by climate change. And we know the
6 high-risk that exists to both water supplies in
7 particular; but how that can impact our energy
8 infrastructure and energy services, given the third
9 national climate assessment that came out, I believe,
10 last month in identifying the number of challenges and
11 impacts that we're already experiencing and that will be
12 exacerbated by climate change.

13 So, as Dr. Holdren mentioned, the DOE report
14 that just came out talks about the water-energy nexus
15 and the challenges that exist. But also the title
16 itself is "Challenges and Opportunities."

17 And there are opportunities. There are
18 opportunities for policy-making. There are necessities,
19 at least, with respect to policy-making. And I want to
20 talk a little bit about where Interior has been in
21 trying to address the energy-and-water nexus and how it
22 really goes across all of our programs that exist at
23 Interior. And from that standpoint, I think we've been
24 active. I think we've been engaged, but I recognize
25 that there is much more to do in this area.

1 First of all, back in 2010 Secretary Salazar
2 convened a number of us in his
3 water-and-science-leadership team and asked that we put
4 together a program to address certainly the need for
5 increased water conservation, given the challenges we
6 face, but also to address the interaction of energy and
7 water issues. So that ultimately resulted in
8 Secretarial Order 3297 in 2010 under Secretary Salazar's
9 signature that recognized the linkage between energy and
10 water and instituted a number of programs to address
11 that and also directed us to integrate policies
12 associated with energy and water as much as possible.

13 The outgrowth of that Secretarial Order was
14 the creation of the WaterSmart program within Interior,
15 which has a number of different aspects to it. One -- a
16 couple that I want to talk about.

17 First, the water-and-energy efficiency grant
18 program that exists. This is a program where we've
19 invested well over -- in the last five years -- well
20 over a hundred million dollars to leverage significant
21 local and state resources to implement water
22 conservation projects. And the change that we've had --
23 this has been a program that was in existence prior to
24 the Obama administration coming in. But we have
25 modified the program to incentivize the integration of

1 either energy conservation or renewable
2 energy-generation projects in association with these
3 water-conservation projects.

4 Last week we just announced our awards under
5 the 2014 program. Overall there's, I think, 36 projects
6 that we're funding about \$18 million. That's going to
7 increase water conservation by 67,000-acre feet on an
8 average annual basis. Also, we've got, I think, 6.1
9 megawatts of new generating capacity based on the
10 integration of renewable energy projects associated with
11 those water projects -- typically, improved piping
12 systems, taking out earthen canals, eliminating seepage
13 and waste where it makes sense for local entities, and
14 making use of the drops that exist in those
15 water-delivery systems to put small hydropower units on
16 that -- on those systems.

17 Overall, over the past five years, we have
18 now, with the announcement of the 2014 grant program,
19 facilitated and created an additional 800,000-acre-feet
20 of water supply across the West through these
21 water-conservation initiatives.

22 We've also -- I think you can see the
23 escalating aspect of the renewable-energy immigration.
24 In the prior four years I think we had had 6.1 megawatts
25 of new generating capacity. We added 6.1 just this last

1 year. So 12 megawatts of new generating capacity just
2 through this grant program associated with
3 water-conservation projects.

4 And, of course, as part of that we also asked
5 grant applicants to identify the energy savings
6 associated with these water-conservation projects. And
7 a great part of that happens here in California, where
8 localized supplies are used in Southern California,
9 which reduces their reliance on the Bay Delta and the
10 pumping associated with bringing water over the
11 mountains from this region down to Southern California.
12 So it's a good program. It's growing in its scope.
13 It's got a lot of support on the ground. Who can argue
14 with increasing water-supply reliability and reducing
15 energy costs in association with carrying out
16 water-delivery activities?

17 A corollary is the basin-studies programs.
18 And part of, I think, what's key to this Quadrennial
19 Energy Review is the planning and the assessments that
20 are ongoing. And, certainly, our basin-studies program
21 at the Interior is consistent with that. It looks for
22 cost-share partners in individual river basins to want
23 to engage in a detailed analysis, long-term, of
24 water-supply-and-demand imbalances and to start to
25 identify adaptation strategies to address that imbalance

1 and also to assess the impact on our energy
2 infrastructure in association with those basin studies.
3 An example is -- and probably the largest one that we
4 have had -- is the Colorado River Basin study. Seven
5 basin states and a number of local entities as well as
6 NGOs participated in the development of that study.

7 Certainly there's strong concerns as you look
8 out over time over the next 50 years. We've got a
9 projected 3-million-acre-feet imbalance between supply
10 and demand. That has implications, obviously, for a lot
11 of existing uses that are dependent on water supply. It
12 also has projected impacts to our overall ability to
13 generate hydroelectric power on our facilities on the
14 Colorado River. And as an example of how that planning
15 and that basin analysis is being used two-fold, it's
16 being used to address the water-resource needs that
17 we've identified and we are engaging now with states in
18 a very active planning effort for a drought-contingency
19 plan.

20 We have worked with seven basin states through
21 a number of agreements over the last decade to produce
22 about a million acre-feet of water of additional supply
23 that we've stored in Lake Mead. That's worth about ten
24 feet of elevation. Notwithstanding that action, we see
25 ourselves with declining reservoirs in a situation where

1 by 2016 there's a 23-percent chance that we will
2 experience the first-ever water shortages in the lower
3 Colorado River Basin. In the upper basin we're
4 concerned about the elevation of Lake Powell, because if
5 we fall below elevation 3490 in Lake Powell we cease to
6 be able to generate hydropower at that facility. So
7 these are really serious concerns that we're trying to
8 address through our WaterSmart program.

9 We've also got an MOU in 2010 that we're
10 actively working on with Department of Energy and the
11 Corps of Engineers related to our sustainable hydro
12 program. We're trying to increase hydropower-generating
13 capacity at existing units, implement an array of small
14 hydropower programs, and also better optimize the use of
15 our hydropower-generating capacity. All told -- and as
16 an aspect after the basin study, part of this analysis,
17 also, we are retrofitting our turbines at Hoover Dam and
18 other facilities so that they can generate the same
19 level of hydropower at lower head levels, given the
20 declining levels of our reservoirs. So the low-head
21 turbine projects that we are implementing across the
22 West, our overall goal was to generate the same amount
23 of energy with less water because that's what we see in
24 our future.

25 All told, that program has resulted in over a

1 hundred megawatts of new generating capacity at our
2 existing facilities. And we look to expand upon that in
3 the future.

4 Couple of other items, just briefly:

5 Assessing and understanding and getting better data is
6 obviously part of what we need to do to better address
7 the energy-water nexus. USGS have been very active. It
8 has a partnership with the Energy Information
9 Administration at Department of Energy to better assess
10 and understand the consumption of water at
11 thermoelectric power plants. We all know that it's been
12 the largest diverter of water -- even though it's not
13 the largest consumer of water, those power plants -- but
14 we want to better understand the nature of that water
15 consumption associated with those plants and how that
16 changes over time. Through the national water census,
17 USGS will facilitate a better database on water uses,
18 which will help in energy planning overall. It is
19 assessing produced water in the Powder River Basin in
20 Wyoming and produce water from coal-bed methane
21 extraction and development to understand whether that
22 produced water can be treated and used for beneficial
23 purposes.

24 And, finally, I would just mention, beyond
25 what I think it pretty evident about this energy-water

1 nexus we have in our unconventional-oil-and-gas
2 development, a large focus of the Interior Department
3 has been on the new technologies associated with
4 hydrologic fracturing. We have a regulatory initiative
5 ongoing right now that we hope to complete by the end of
6 this summer with new regulations for hydraulic
7 fracturing. I would just note that the focus of that
8 has been well-bore integrity, water management for
9 flow-back water, and chemical-disclosure aspects. And
10 we think those in particular are areas that we need to
11 focus on to continue to demonstrate safe and responsible
12 energy development to build the public confidence and to
13 ultimately protect our water systems because I think
14 that is a source of concern from a lot of communities.
15 And so I think we're in sync with a lot of the states in
16 that area. And that is something that we look forward
17 to finalizing over the next couple months.

18 So that's just an example of the programs
19 ongoing at the Interior Department. I'm sure there are
20 more opportunities. And that's the basis for why I
21 wanted to be here today to participate in this effort to
22 learn from all of you and be part of the dialogue. And
23 so from that standpoint, I look forward to listening and
24 stop talking. That's the end point.

25 MS. WELSH: Thank you very much.

1 I'm going to let this panel go on for just a
2 minute, because we're anxious to hear from you. There
3 should be a microphone in the back of the room. We'll
4 take a couple questions. Please identify yourself if
5 you have a question for either of these two VIP
6 speakers. Don't be shy.

7 Do you mind going to the mic? Thanks.

8 MR. WRIGHT: I have a question, mostly for
9 Mike. I'm not sure this is on --

10 MS. WELSH: Can you identify yourself, please.

11 MR. WRIGHT: Yes. My name is Paul Wright.
12 I'm the director of the Berkeley Energy and Climate
13 Institute at the campus. I'm also a
14 mechanical-engineering professor.

15 The campus-wide concern, of course -- and I
16 fully resonate with the data you're collecting on the
17 use of the water in the hydraulic fracturing. I'm
18 actually, as a mechanical-engineering professor, very
19 confident about the importance of this technology is the
20 shale revolution that we cannot ignore. But I want to
21 get as much data as I can as quickly as possible to do
22 the same thing that you want to do, which is assure my
23 public, my rebellious students on the campus. And even
24 though I'm speaking in a very calm and pleasant way, I
25 get a lot of unpleasant attacks on campus. And I think

1 it's worth sharing that. And I'd like to see that data
2 collected as fast as possible and encourage us to do
3 many scientific projects that address that head-on and
4 get the information out to the public as quickly as
5 possible.

6 And my last comment, I think we all know, is
7 that since geological formation is so incredibly varied,
8 not only in the U.S. but all through the world, this is
9 not something you can solve necessarily in a
10 comprehensive way unless you look at every single
11 geological formation and the impact it has.

12 So there's several parts to my question. And
13 I guess I'm urging fast collection of data specific to
14 geological regions and getting the information out as
15 quickly as possible.

16 I'm talking a bit too much now, so I will hand
17 it back to our distinguished panel. Thank you.

18 DR. HOLDREN: Let me jump in even ahead of
19 Mike to mention that, number one, the Obama
20 administration shares the very strong interest in making
21 sure that hydro-fracturing is done in ways that protect
22 surface water and groundwater and that very much limit
23 the fugitive emissions of methane to the atmosphere,
24 which are an important driver of global climate change.
25 We released some weeks ago now, maybe a couple of months

1 ago now, a national methane strategy which entails a
2 number of components that address --

3 It is on the -- it is on the Web. You can
4 find it on White House Website, www.whitehouse.gov. You
5 search on "methane" and you'll find that very quickly.

6 In addition, there is an interagency task
7 force hard at work on the wider questions of
8 hydro-fracturing and looking at questions of data
9 collection and what the most appropriate approaches to
10 monitoring and regulation are. So this is an issue
11 whose importance we very much recognize.

12 DEPUTY SECRETARY CONNOR: Absolutely. Just
13 to -- obviously, the Interior Department is part of that
14 effort and we're working hand and hand with the White
15 House as well as Department of Energy and EPA, because
16 we agree. Good data and information is the key to
17 making good decisions as well as to build public trust
18 for a lot of the things going on. We fully believe that
19 communities in the areas of significant energy
20 development, they value that economic opportunity; but
21 they want to know that it's being done safely and
22 responsibly and that their communities are protected.
23 And so that's our goal to help achieve that good
24 information and then good policies through our
25 regulatory process.

1 MS. WELSH: One more question?

2 Well, please join me in thanking our very
3 distinguished and honorable speakers.

4 (Applause)

5 MS. WELSH: So I'll ask the next panel to come
6 up. Dr. Holdren has very kindly agreed to stay on and
7 participate in the panel. Undersecretary Connor will be
8 in the audience. So go whisper in his ear, if you like.

9 And for those who are watching live streaming,
10 just give us a moment to set up the stage.

11 Thank you.

12 MS. WELSH: Thank you very much for bearing
13 with us as we change out the tent cards, et cetera. Let
14 me also point out that the live streaming bandwidth is
15 having some issues. So for those of you that are
16 watching live streaming, you will need to refresh on a
17 regular basis. So, if you will, please do that so that
18 you don't lose us as we begin this excellent panel.

19 I want to remind the panelists that you have
20 five to seven minutes. I'll hold up this stop sign. So
21 something my way when you think you're going a little
22 long and I will interrupt if you go too long.

23 I want to also say that we have a tremendous
24 group of panelists today. But their views that they are
25 going to express are their own. They are not those of

1 the Departments of Energy, Interior, or the White House.

2 So let's introduce them. I'm not going to
3 read the bios, as Deputy Assistant Secretary Pershing
4 did. I will just introduce them by name, title, and
5 affiliation.

6 Next to me, of course, remains Dr. Holdren,
7 who has kindly agreed to participate in the panel asking
8 you throughout the morning. Next to him is Peter
9 Gleick, president and cofounder of the Pacific
10 Institute. Ron Oglesby, executive director of the
11 California Energy Commission. John Andrew, deputy
12 director for climate change for the California
13 Department of Water Resources. Adnan Mansour,
14 Monitoring Solutions for GE Water and Process
15 Technologies. Nathan Bracken, assistant director and
16 general counsel of the Western States Water Council.
17 Marcus Griswold, water resources scientist at the
18 National Resources Defense Council. And the Honorable
19 Catherine Sandoval, California Public Utility Commission
20 Commissioner.

21 So with that, let me turn it over to
22 Dr. Holdren to say a couple of words; and then we'll get
23 started on prepared statements.

24 DR. HOLDREN: Well, I had my say a moment ago.
25 I just want to take the opportunity to introduce two of

1 my colleagues who are with me at this meeting. Dr. Bob
2 Simon, who is senior advisor for environment and energy
3 at OSTP and the President's nominee to be the associate
4 director for environment and energy, is standing in the
5 back.

6 And Kristin Lee. Kristin, if you would stand.
7 Kristin Lee is the director of strategic communications
8 at the White House Office of Science and Technology
9 Policy. So you may want to take the opportunity to quiz
10 them during the breaks.

11 MS. WELSH: And, with that, let me say that we
12 will hear from all the speakers, so please hold your
13 applause until all speakers have made their
14 presentations, some of whom have PowerPoint slides; so
15 we'll be sliding around up here so that those
16 live-streaming and those in the room can see.

17 But with that, Mr. Gleick, the floor is yours.

18 DR. GLEICK: Good morning, everyone. I'm
19 Peter Gleick from the Pacific Institute in Oakland. I'm
20 happy to be here. A Quadrennial Energy Review is a good
21 thing. Once every 400 years is certainly not too much
22 for a country like ours.

23 I'm going to talk about water and energy and
24 climate and security. But before I start, a little
25 teaching moment here: We are in California, in San

1 Francisco. We have some of the best tap-water supply in
2 the world, mostly gravity-fed. We did an assessment at
3 the Pacific Institute a couple of years ago of the
4 energy required to produce bottled water in the United
5 States. It's the equivalent of about 17 million barrels
6 of oil a year for primarily the plastics, but
7 distribution, transportation, processing. So here's
8 another piece of the energy-water nexus, if you will.

9 I'm going to talk about energy and water. I'm
10 going to talk about climate and security and the
11 integration of these things into policy and then a
12 little bit about emerging issues in five to seven
13 minutes, so --

14 MS. WELSH: Can I interrupt you for just a
15 second?

16 DR. GLEICK: My time is up. Thank you very
17 much.

18 MS. WELSH: Can the panelists kind of scoot
19 around so that people can see the screen? That's why we
20 got chairs on rollers. Awkward as it may be, we want
21 you all to see the PowerPoint slides.

22 DR. GLEICK: That doesn't come out of my time,
23 does it?

24 MS. WELSH: No, it does not.

25 DR. GLEICK: Okay. So I'm going to start at

1 the end so that when I run out of time you'll have heard
2 it.

3 Water and energy are closely linked. Limits
4 to each are beginning to affect the other; and yet we
5 rarely integrate these things in policy together. The
6 drought is a great example in California, where it is a
7 very severe drought. We're going to lose hydro
8 generation this year. We're going to see an increase in
9 energy costs for pumping of groundwater in the Central
10 Valley. Another quick example for you.

11 Considering those two issues together offer
12 substantial benefits; and other speakers will speak
13 about that. But there are economic benefits; there are
14 environmental benefits. The reality of climate change
15 affects policies on the energy side, on the water side,
16 both of the above. And there are growing risks over
17 conflicts worldwide over water resources and energy
18 resources as well.

19 The energy-water nexus used to mean one thing.
20 It used to mean the water requirements for energy
21 systems. And a lot of work has been done on that. We
22 did a lot of work early on at the institute about this.
23 Water is required as inputs to each piece of the fuel
24 cycle for energy systems from extraction all the way to
25 waste disposal. But I would note that an equally

1 important piece of this is that there's an enormous
2 energy demand for our water systems -- for source and
3 conveyance; for treatment; for distribution; for end-use
4 of water in particular; for wastewater treatment.

5 Again, the Pacific Institute has done a lot of
6 work on this. The Energy Commission in California has
7 done a lot of work on this to try and understand this
8 piece of the energy-water nexus. And we've seen already
9 in the past headlines where water constraints have
10 limited our energy production, primarily not because of
11 shortage of water but more for formal constraints for
12 protecting ecosystems, have shut down or de-rated power
13 plants in the Tennessee Valley Authority area and other
14 parts as well. But there are other connections we have
15 to think about as well.

16 And here's another example. The Pacific
17 Institute did a study a couple of years ago looking at
18 energy scenarios in the Intermountain West. And this is
19 a complicated slide, but I just want you to see a couple
20 of things. The first is the difference between the
21 light blue and the dark blue is the difference between
22 withdrawals of water and consumptive use of water. And
23 there's a distinction. But energy is a big demand on
24 our water systems, both withdrawals and consumption.
25 And the bar on the far left is, for 2010, the total

1 water requirement for the energy system in the
2 Intermountain West system of the U.S. Withdrawals and
3 consumption. The next bar over is a projection for
4 2025; and it shows a slight increase if we go business
5 as usual, increasing demand for water.

6 The thing to understand is we looked at
7 different scenarios for cooling systems and for swapping
8 out more renewables rather than fossil-fuel systems; and
9 the implications are that the choices we make about
10 energy have enormous implications for water. I don't
11 know which scenario we're going to go to, a
12 low-fossil-fuel, high-renewable scenario, a once-through
13 cooling versus dry-cooling systems; but the choices we
14 make about energy have big implications for total water
15 demand. And that's a key conclusion as well.

16 In addition, the amount of energy required for
17 our water choices varies. These are bar charts -- hard
18 to read in the back -- but these are bar charts for
19 different water options for Southern California. The
20 biggest bar is ocean-water desalination. Very
21 energy-intensive. The second biggest bar is the energy
22 to run the State Water Project to move water from
23 Northern California to Southern California. The biggest
24 single consumer of power in the State of California when
25 the pumps are running are the pumps that move water over

1 the Tehachapi Mountains into the Los Angeles Basin. If
2 you save a gallon of water in Los Angeles and you save a
3 gallon of water in San Francisco, you're saving more
4 energy if you're doing it in Los Angeles. And so our
5 choices about water supply have energy implications.

6 Groundwater pumping is there. Energy use for
7 reclaimed wastewater is very low. Brackish water,
8 desalination is low. Different choices have different
9 energy implications.

10 There's a climate link. All of these energy
11 water issues have a link with the emissions of the
12 greenhouse gases and our choices about energy and water
13 options affect greenhouse-gas emissions. It's pretty
14 clear that some climate change, perhaps significant
15 climate change, is already unavoidable; and the truth is
16 we're already seeing evidence of climate change. And we
17 are seeing the impacts, the influence of climate change
18 on water systems in the United States and on drought in
19 the Western U.S. We have to move to avoid those
20 consequences we can't manage and we have to learn to
21 manage the impacts that we're not going to be able to
22 avoid for both water and energy.

23 And there are policy implications. Water and
24 energy are tightly linked. The links are increasingly
25 better understood but not perfectly understood and

1 they're rarely interested in policy. Decision-makers
2 and corporations and local agencies and communities have
3 to integrate energy issues into water policy and water
4 issues into energy policy. And our failure to do that
5 is inevitably going to lead to disruptions in both water
6 and to energy.

7 Some comments about water and fracking.
8 Again, the institute did a report on the water risks of
9 fracking; and we're doing two more now, one for BLM and
10 one for the State of California, to try and understand
11 for California what are the water risks of hydraulic
12 fracturing and, more broadly, oil and gas extraction.
13 The science says water and fracking don't mix. The
14 truth is they do mix; and that's the problem. And
15 figuring out if we're going to pursue hydraulic
16 fracturing or other enhanced oil and gas production, we
17 better do it in a way that protects our water resources,
18 minimizes demand on water, protects groundwater from
19 reinjection. There are a whole series of water-related
20 risks that are not adequately understood or addressed in
21 policy.

22 And it's more than science, this issue. This
23 issue is a national security question. There's a lot of
24 debate about fracking. Some people think, look, this
25 oil and gas revolution, the shale revolution as it was

1 just described, is an important thing because we don't
2 want to import energy from the Middle East. That
3 affects our international policy. That's part of the
4 debate. I'm not weighing in on it. I'm raising it as
5 an important part of the policy debate; and it's linked
6 to this question of oil and energy and water and policy.

7 Last couple of slides. Definitions of
8 security vary. National security means a lot of things
9 to a lot of different people. I would say the
10 definitions are varying and growing. And we do a lot of
11 work on conflicts over water internationally. There is
12 a growing risk of disputes and violence over water
13 resources internationally. Those conflicts have taken
14 many different goals -- many different forms. Water is
15 a goal. I want your water. That's a tension in many
16 parts of the world where water is scarce. But water's
17 been used as a weapon. It's been used as a target.
18 It's been used in development disputes. There's a
19 connection between water and terrorism. And the risks
20 of these disputes are growing, including disputes over
21 what we call peak water. That is absolute limits on
22 water availability and -- I'm pretty close to the end.

23 And these water-related factors are going to
24 have direct and indirect impacts on security and
25 conflict.

1 I'm just show this slide quickly to show that
2 we maintain a history of water-related conflicts world
3 wide. Those conflicts are growing, not shrinking in
4 number; and increasingly are subnational not
5 international.

6 So some recommendations. There are strong and
7 growing links between water and energy and climate and
8 security. We rarely consider those integrated policies
9 together to address those links. The failure to address
10 those links is going to lead to inappropriate decisions
11 or actions and unnecessary risks. And, conversely,
12 smart policies can be very effective and very efficient.
13 And choices now have to consider water, availability and
14 quality, I would note.

15 Water-efficiency efforts offer substantial
16 water and energy savings. And Deputy Secretary Connor
17 mentioned this: Some of the cheapest energy
18 improvements now are water-efficiency improvements, not
19 energy-efficiency improvements. Water-efficiency
20 improvements that save energy. Water-energy strategies
21 integrated together can lead to fast and cost-effective
22 greenhouse-gas-emissions reductions.

23 This is my contact information. A lot of our
24 publications are on our Website. And I'm happy to stick
25 around for a discussion afterwards. Sorry.

1 MS. WELSH: So I hate to cut Mr. Gleick off,
2 but we've got a lot of other speakers. I want to note
3 that all speakers' full presentations will be on the
4 Website. That address again is www.energy.gov/qer, with
5 this meeting's date.

6 So thank you very much. I hated to cut you
7 off. Very fascinating.

8 Mr. Oglesby.

9 MR. OGLESBY: Thank you.

10 So I'm Rob Oglesby. I'm the executive
11 director for the California Energy Commission.

12 First, I want to thank the opportunity to be
13 here and present our thoughts on water and energy. This
14 is a great process and we're happy to be here.

15 I would also mention that we presented
16 lengthier comments in writing and I'm just going to hit
17 a few of the highlights. But I also included a series
18 of links to various reports and documents that I hope
19 will help inform the process and provide some background
20 that you might find useful. I'll be mentioning a few
21 here, but there are various links in --

22 MS. WELSH: We'll make sure the right staff
23 see those.

24 MR. OGLESBY: Great. Fantastic.

25 Peter's opening comments are a very good

1 setting. He covered some of the topics I wanted to get
2 to. I will adapt to that.

3 But one of the challenges in dealing with
4 water energy is the fact that we've basically created
5 government infrastructure in silos that deal with water
6 and energy and climate to a certain degree and making
7 progress in understanding the issues. And developing
8 public policies requires bridging those silos. So in
9 California I just wanted to open by mentioning that
10 we're attempting to do that; and I think we've done it
11 pretty well by creating some institutions, some
12 activities that attempt to recognize the link between
13 climate, water, and energy and get this
14 cross-communication among policymakers and different
15 governmental jurisdictions.

16 And some of those include an organization with
17 the unfortunate acronym of WET-CAT. And it was formed
18 under the auspices of our major overarching climate
19 legislation, AB 32. And it's essentially the
20 water-energy team of the climate-action team. And it's
21 been meeting regularly to develop policies, share
22 information, and provide input on the scoping plan,
23 which is kind of the blueprint for our climate reduction
24 goals here.

25 It's also -- another mechanism that's been

1 created under the Brown administration is the energy
2 principles. That's where the heads of the agencies
3 responsible for energy and climate and water meet
4 monthly to coordinate on policy and share information on
5 development. And that's been a very effective tool to
6 make sure that we are on track and basically on the same
7 page as we pursue our climate and energy and water
8 goals.

9 And, finally, the -- we mentioned the drought.
10 It's a very deep drought, a very serious drought. And
11 there's been an ad hoc drought task force of all the
12 major state agencies that have a hand in it and that are
13 meeting weekly and broken into subcommittees to
14 coordinate policies.

15 So I think one of the first messages I'd like
16 to leave with this is that it's important to be able to
17 have cross-connecting structures as we tackle water
18 energy and climate nexus.

19 Very quickly, on some of the other elements,
20 we talk about the collaboration of these agencies.
21 Those have led to the scoping plan. Again, these are
22 referenced AB 32. We've done a series of climate
23 assessments, about to embark on another one.

24 Safeguarding California Plan, which deals
25 primarily with adaptation as well as various things

1 related to tracking what's going on with water and
2 energy related to the drought. There's a Web page set
3 up for that.

4 You mentioned the connection between water and
5 energy. I think it's important to note there are a lot
6 of different statistics that get thrown around about how
7 much energy is related to water. It basically relates
8 to the assumptions and what's included or not included.
9 At the Energy Commission we refer to it as 19 percent of
10 electricity embedded in water. That includes wastewater
11 treatment. It's a fairly comprehensive inclusion of
12 just the energy use. We don't net out energy
13 generation.

14 And as you noted in your presentation, it is
15 very variable throughout the state. Clearly, a great
16 deal more energy is embedded in water in the southern
17 part of the state than the northern part of the state,
18 as you noted.

19 In terms of direct generation from water in
20 California, it's gone down as a percentage of the energy
21 use. It used to be about 60 percent in-state generation
22 of hydro feeding into our grid. It's now down from --
23 this isn't a normal year, so perhaps I should qualify
24 that and call it the old normal. It seems like we're
25 headed for a new normal. But historically it's been

1 around 14 percent in recent years, down from 60 percent.
2 This year, of course, will be much, much less. But we
3 also import hydro generation from over the border. And
4 so our total hydro profile in average years in recent
5 history has been about 25 percent.

6 Water is clearly a precious commodity and
7 limited. And so we do a number of things to try and
8 reduce our need for water and to recognize that. One of
9 the things we do -- and the Energy Commission is also
10 responsible for siting power plants -- is take water use
11 into consideration. And so we look at reuse,
12 wastewater, recycled water. And then the state has a
13 policy that phases out once-through cooling statewide --
14 and that is on schedule -- primarily ocean water
15 impacts, but it also drives once-through cooling policy
16 elsewhere. It's the statewide rule.

17 And, again, one of the other things that is a
18 dramatic impact on our need for water in our power grid
19 is the advancement of renewables that are not
20 water-intensive. We have great growth in solar and
21 wind. We have state policies that mandate renewable
22 energy to 23 percent in 2020. We're at about 20 percent
23 right now. And, by the way, that doesn't include large
24 hydro, so we're on track to do that.

25 Another rule of the California Energy

1 Commission is to adopt energy-efficiency standards. We
2 have authority over buildings and appliances. And
3 through that authority that we've exercised since the
4 middle '70s, we're reduced water consumption
5 substantially. Our per capita water use is reduced by
6 about 19 percent.

7 In appliances we have water-efficiency
8 standards over ten types of fixtures -- faucets,
9 showers, urinals, toilets, and so forth and -- since
10 1977. And we've reduced water use by 39-million-acre
11 feet. The cumulative minimum efficiency standards that
12 we've adopted now result in 2.1 million acre feet of
13 less water used per year for the state. That's like
14 having two Lake Folsoms or it would be the equivalent to
15 having every year the city and county of San Francisco
16 under 65 feet of water. So it's been a great cumulative
17 benefit in the state in commensurate energy use and
18 conserving resources. The Energy Commission has a
19 rule-making under way to increase that by about a
20 quarter million acre-feet, adding some additional time.

21 Let me just close by noting that one of the
22 remaining areas that helps advance water-energy policy
23 is the research that we invest in. We have invested
24 \$12.8 million in the last eight years on water supply
25 and conveyance, water and wastewater treatment, energy

1 from wastewater, energy recovery from wastewater, and
2 water end-use efficiencies.

3 So with that, I'll conclude my remarks. And
4 thank you again.

5 MS. WELSH: Thank you.

6 Mr. Andrew.

7 MR. ANDREW: Thank you very much. I am John
8 Andrew. I am actually the assistant deputy director of
9 the California Department of Water Resources. So thanks
10 for the promotion, but I think I'll pass on it this
11 morning. Maybe some day. I oversee all of the
12 department's climate-change activities; and, again,
13 appreciate the invitation to have our department on the
14 panel this morning to engage on this conversation.

15 In my five to seven minutes of fame here I'm
16 going to hit very quickly on probably three or four
17 things. I'll talk a bit about what our department does
18 and its role in the water-energy operations planning and
19 policy. Talk a bit about -- sort of link with Rob's
20 presentation on strategic planning at the state level,
21 which is something that we do. And I'll close on some
22 challenges and opportunities that may be fodder for
23 discussion later.

24 Our department does provide a number of
25 service -- water-management services -- to the state of

1 California. We have a -- we're over \$3 billion in
2 annual budget and well over 3,000 employees now. A
3 couple of those activities relate directly to water and
4 energy.

5 One is that we are the owners and operators of
6 the State Water Project, which Peter mentioned in his
7 presentation. We were No. 2 in the blue -- heights of
8 the blue on the chart there. I think we used to be No.
9 1, but fortunately, desal has shown up to out-do us.
10 The local NPR affiliate actually once said that there
11 was -- 50 percent of the energy in California was used
12 to pump water over the Tehachapi Mountains. It's
13 certainly a big number, but it's nowhere near -- orders
14 of magnitude lower than what was reported in that story.

15 The State Water Project, for those of you who
16 may not know, conveys water from Northern California to
17 the San Francisco Bay Area, to the southern San Joaquin
18 Valley, Central Coast, and then over the mountains into
19 the South Coast Basin.

20 One of the other things that we do is the --
21 and I'd be happy to talk more about the energy and
22 climate implications of the project, but maybe we can
23 get to that in the discussion -- because one of the
24 other things that we do is that we also are statutorily
25 required to develop the state's water plan -- strategic

1 plan for water, which is called the California Water
2 Plan Update. We've been updating it -- the original
3 California Water Plan was issued in 1957; and we've been
4 updating that roughly every five years, usually a bit
5 late every time that it's due. And it sets out the
6 vision, if you will -- high-level vision -- of water in
7 California.

8 Just to give you an idea of what -- and I
9 should note that Peter was actually an advisor on our
10 2005 Water Plan Update. And in that, just to give you
11 an idea of the growth of water-energy at the strategic
12 planning level in California, in 2005 in that update
13 there was exactly three paragraphs out of literally of
14 hundreds of pages on water and energy -- the
15 water-energy nexus. I know that because I wrote those
16 three paragraphs.

17 So, fortunately, our folks across the street
18 -- Rob's organization -- actually had a complete
19 appendix when they were doing their version of the
20 strategic plan for the integrated-energy policy report
21 that year; and much of our information and views of how
22 the numbers that Rob mentioned come from that
23 foundational report back in 2005.

24 Going back to giving you an idea of how that's
25 grown within our strategic planning process, if it was

1 three paragraphs, eight, nine years ago now, the update
2 that we are about to issue -- it's in draft -- it's the
3 California Water Plan Update 2013 -- again, a bit late
4 -- which should be issued in 2014 at some point -- each
5 of the 30 resource-management strategies -- and by
6 "resource-management strategies" I mean things like
7 water conservation, recycled water, and storage. And
8 there's 30 of these -- 30 types of strategies that local
9 water agencies, local water stakeholders can use to
10 address their water future. Each one has an in-depth
11 discussion of energy and at times carbon in them.

12 We also divide up the state into ten
13 hydrologic regions. And I think, as was mentioned by, I
14 think, Rob -- maybe it was Peter -- there's a real
15 difference -- actually, probably both of them -- there's
16 a real difference in the regional energy intensity. And
17 so for each of the ten regional reports that are part of
18 the California Water Plan Update this time, you will
19 actually see the different water supplies, whether they
20 be surface water, groundwater, recycled water -- there's
21 usually ten or so in each region -- you will actually
22 not only see how much of that type of water is used, but
23 what is the energy-intensity of that water at the
24 regional level. So quite a bit of growth. I don't
25 think it's an exaggeration, but the three paragraphs was

1 not an exaggeration; and I don't think it would be an
2 exaggeration to say that there's been an explosion of
3 growth in terms of linking water energy at the strategic
4 level with the State Water Plan.

5 Going back to some of the numbers very
6 quickly -- and, again, this has been mentioned by Rob
7 and Peter as well -- the -- of all the energy-intensity
8 that there is statewide in water systems, about 80
9 percent of that is at the end-use, especially urban
10 users. So the water to convey, to treat the water,
11 to especially what the customer does with the water --
12 the end-use, the heating, the pressurization sometimes
13 used for cooling, and then the collection -- the
14 wastewater collection and treatment and disposal --
15 that's 80 percent of all the energy-intensity in the
16 water sector.

17 So I don't want to diminish the role of -- you
18 know, the impact of energy -- on energy in California
19 from our water system or any other water system at the
20 local level. But it's really what the customer does
21 with the water is where the greatest potential is for
22 reducing the energy and the carbon impact of water in
23 California.

24 And for even a bit of a pessimist like me when
25 it comes to water issues, that's actually good news,

1 because there's very good reasons -- again, touched on
2 before by Peter -- for reducing our water use in
3 California. And so reducing, especially, urban end-uses
4 of water is good for water. It's good for reducing the
5 energy and carbon footprint of California. It's
6 consistent with the State's Water Plan. It's consistent
7 with state law, which we have a state law passed in 2009
8 which requires a 20-percent reduction in urban -- for
9 capital water use by 2020. With the drought, who knows?
10 We may hit that in 2014, well ahead of the 2020
11 deadline. So this is an area where actually water and
12 energy line up very well in terms of policy, planning,
13 and law.

14 I'll close if I -- oops, I'm stopped.

15 I'll close with just a couple of challenges
16 and opportunities. And maybe I'll mention one of both.
17 I think opportunities -- I think it's important that
18 organizations like Rob's and mine and Commissioner
19 Sandoval's coordinate. But I think it's more important
20 what's going on at the local level. And I think there's
21 many collaborations going on between local water and
22 energy utilities around California. And I think
23 continuing to facilitate and support those are very
24 important. And I'm hoping we'll hear more about that in
25 the second panel today.

1 In terms of the challenge, I think we talked a
2 lot about the water-energy nexus, quote/unquote, but I
3 think the nexus with other water-management objectives
4 is sort of our next frontier. We have important
5 water-management objectives for public health, for
6 water-supply reliability, public safety, climate
7 adaptation, ecosystem restoration. It -- there's a need
8 to be able to integrate not only what we do on water and
9 energy, but also what we're going to do on a lot of --
10 for a lot of other water-management objectives.

11 Thank you very much.

12 MS. WELSH: Mr. Mansour.

13 MR. MANSOUR: Good morning. Thank you for the
14 opportunity to be here. My name is Adnan Mansour and I
15 am the general manager for monitoring solutions a GE
16 Power and Water, Water & Process Technologies.

17 GE Power & Water is a \$25-billion business
18 unit which sits really at the very intersection of the
19 energy-water nexus. Our suite of power-generation
20 technologies produces 25 percent of the world's
21 electricity. And in addition to that, we are a global
22 leading supplier of water treatment, wastewater
23 treatment, and process systems solutions for water. Our
24 treatment systems provide clean, safe drinking water to
25 millions of people in water-scarce regions around the

1 world. They also are a critical resource for helping
2 industries minimize water usage in support of their
3 operations.

4 It is a privilege to share with you this
5 morning our water business unit's thoughts on some of
6 the opportunities to address the energy-water nexus. At
7 GE Water, we are not only focused on treating drinking
8 water, industrial water, and wastewater, but also on
9 reducing the amount of energy used in running and
10 maintaining these critical operations of these complex
11 water systems. And so today, really, I am going to talk
12 about how we are using Big Data and analytics to do
13 this.

14 The Industrial Revolution and the Internet
15 Revolution are two waves of transformative innovations
16 that have unequivocally shaped the modern world. It has
17 been argued that the third wave -- the Industrial
18 Internet -- is at a point of convergence for the
19 advances of the preceding revolutions, the Industrial
20 and Internet Revolutions. The core elements that
21 comprise the Industrial/Internet dialogue are comprised
22 of three things: Intelligent machines. These are
23 machines that connect -- this is the method by which we
24 connect the world's myriad machines, facilities, fleets,
25 and networks with advanced sensors, controls, and

1 software applications in new ways.

2 Advanced analytics, wherein one can capture
3 the power of advanced models, predictive algorithms,
4 automation, and deep-domain expertise in material
5 science, electrical engineering, and other disciplines
6 to understand how machines and larger systems operate
7 and interact.

8 And then there's people at work, of course.
9 And that's where we connect people, whether they be at
10 work in industrial facilities, offices, hospitals, or
11 anywhere on the move at any time to support more
12 intelligent design, operations, maintenance, as well as
13 higher-quality service and safety.

14 At GE Water & Process Technologies, the
15 Industrial Internet is a process and required
16 infrastructure to transform water-system operational
17 data into meaningful, actionable information that
18 produces a better result in terms of reliability,
19 sustainability, and performance over time. We do this
20 through secure enterprise cloud-based platforms. Within
21 the water business we call it Water and Process Insight,
22 a GE Predictivity Solution, that provides for multiple
23 opportunities to manage these capabilities, these water
24 systems. Visualizing current conditions and their
25 trajectories; diagnosing problems and seeing

1 opportunities for improvement; alarming on events and
2 trends before they threaten asset production or
3 integrity; and reporting on key performance indicators
4 and their impact on business objectives and operations
5 optimization.

6 All of this allows one to respond immediately
7 to operating issues. In other words, it provides
8 predictivity for performance and proactive optimization
9 of assets and subsequent improvements.

10 For example, the U.S. Energy Information
11 Administration reports that energy usage accounts for
12 more than 40 percent of the total operating expense for
13 a typical refinery, excluding crude acquisition
14 components. Software and analytics simplify the
15 visualization of status and trajectory of key
16 performance indicators in critical refinery-water
17 assets. Hidden cause-and-effect interrelationships are
18 brought to light. Troublesome events and trends are
19 detected at incipient stages, with speed to resolution
20 and confidence that production operations are not
21 compromised and no unplanned downside occurs, which
22 obviously leads to significant cost in energy
23 consumption and losses. The Industrial Internet
24 provides refineries a lens to aggregate resources and
25 expertise to break through the next threshold of

1 optimization that drives total cost out, of which energy
2 typically is the largest component and contributes to
3 sustainability.

4 These capabilities and benefits can be
5 translated across industries and public works. Whether
6 in refining or in other sectors, for the past several
7 decades, we have seen a steady stream of innovations in
8 sensing, chemical delivery, and local automation
9 hardware for water-treatment applications and processes.
10 These advances are and will continue to be welcome
11 contributions to the benefit of operators of water
12 systems.

13 GE Water is really in the early stages of
14 using Big Data and analytics to make efficiency
15 improvements at the energy-water nexus. But we are at
16 the same time nonetheless already achieving significant
17 operational efficiencies for our customers in terms of
18 water consumption, water usage, and energy consumption
19 as well. Looking forward, we are on the verge of what
20 we believe to be a new level of productivity and
21 predictivity that will drive better management of energy
22 consumption as it relates to water treatment.

23 I want to thank you again for holding this
24 very important meeting and certainly will answer
25 questions relative to Big Data and analytics as it

1 relates to the energy-water nexus and water-treating
2 systems. Thank you.

3 MS. WELSH: Thank you.

4 Mr. Bracken.

5 MR. BRACKEN: Thank you very much. It's a
6 pleasure to be here today.

7 The organization I represent, the Western
8 States Water Council, serves as an advisor to the
9 governors of 18 western states on water issues. And as
10 you can imagine, when you represent 18 western states
11 with very different issues, there are a lot of issues
12 that are important to the states. Sometimes they're
13 different. Sometimes they're the same. The
14 energy-water nexus is one of those issues where there's
15 a wide and broad swath of agreement that this is an
16 issue that warrants attention. So I want to talk to you
17 today about two important things that can help the
18 western states plan for future energy demands associated
19 with water.

20 The western states are primarily responsible
21 for the management and allocation of a lot of different
22 waters. Currently most of the water that's withdrawn
23 and used in the West is used for agricultural purposes.
24 However, the West is also the nation's energy
25 breadbasket and is home to many of the renewable and

1 nonrenewable energy sources that will power our nation
2 in the coming decades. And so we're expecting to see
3 significant energy demands associated with energy
4 extraction -- as mentioned, hydraulic fracturing and
5 other energy-extraction activities. Many of the
6 population centers in the West are also experiencing
7 significant population booms, which will also entail
8 increased demand for electricity generation; which will
9 entail, in turn, new power plants, which will also
10 require water both for their construction and ongoing
11 operation. All of these pressures create a situation
12 where the amount of water that's currently used for
13 energy will likely increase.

14 And that raises significant policy
15 considerations about what happens when the whole pie of
16 water is reallocated. In order to plan effectively for
17 our growing energy needs as well as demands associated
18 with growing populations, environmental needs, and other
19 issues, the states need reliable and accurate data. And
20 this is an issue I think that has been hit on repeatedly
21 this morning over the course of this meeting. And I'd
22 like to add that part of the challenge that western
23 states have right now with managing their water
24 resources is that many of the critical and vital federal
25 data programs that the states rely on haven't received

1 the amount of funding that they need. In many cases we
2 are seeing a lack of capital investments that have led
3 to the discontinuance, disrepair, and obsolescence of
4 key data programs. And this creates significant
5 challenges for the western states.

6 You can't manage what you can't measure and we
7 need these vital data programs in order to do that. And
8 there are a couple key programs that we have long
9 supported. There are many that we rely on, but two big
10 ones are U.S. Geological Survey's stream-gaging
11 programs; the Landsat satellite series that's operated
12 by USGS and NASA; and the Natural Resources Conservation
13 Services SNOTEL sites, the snow-survey program. All
14 three of these programs provide vital data that states
15 use on a daily basis to manage their water resources and
16 make sure that they allocate water rights efficiently.

17 At the state level, the council embarked on a
18 pretty important initiative in 2011. It's called the
19 Water Availability Data Exchange. And the purpose of
20 this effort is to improve access to state data on water
21 resources. States collect a variety of data on water
22 use and availability. And the goal of this particular
23 initiative is to create a data port -- an online data
24 port where people can go and access the best available
25 state data. It's real-time access to the state data,

1 not necessarily the water conditions on the ground. The
2 idea is to help plan -- to help improve planning and
3 give people a better sense of what's happening to the
4 West.

5 I was also asked to comment briefly on some of
6 these steps that my organization has taken over the
7 years to support greater certainty for water-rights
8 administration. Much of the water in the West has
9 already been allocated. And what that means is, if you
10 need water for a new energy purpose such as extraction
11 or a power plant, you will likely need to get it from an
12 existing use. Part of the challenge that we have is
13 that we have significant water rights that are yet to be
14 adjudicated. Specifically, many Native American
15 communities have significant claims to water that
16 predate nontribal uses. And those uses are significant,
17 both in their size, but also in the fact that because
18 they're older they have a potential to displace existing
19 state uses. And that creates a lot of uncertainty. It
20 makes it very hard for states to manage water when they
21 don't know exactly when these water rights will be
22 claimed.

23 So for the last 30 years my organization has
24 worked with the Native American Rights Fund and the
25 Western Governors' Association to support favorable

1 federal policies that support a negotiated resolution of
2 tribal claims. We've worked very closely with Deputy
3 Secretary Connor and his office and his staff; and
4 they've been great partners in helping us with this.
5 And one of the things that we found is that settlements
6 are the preferred way of resolving this issue, partly
7 because they allow tribes to receive benefits that they
8 wouldn't otherwise get through litigation, namely
9 funding to build water-infrastructure projects,
10 drinking-water projects, and water supply -- things that
11 most of us take for granted. At the same time they
12 provide for mechanisms that allow the state uses to
13 continue without too much displacement, thereby
14 providing the certainty that the states need to plan
15 effectively for the future.

16 However, we've been able to support or
17 contribute to a process that's resulted in 27 authorized
18 settlements. But there are hundreds of tribes across
19 the country, most of which are located in the West. And
20 that creates a significant amount of uncertainty, both
21 for planning for future energy needs as well as any
22 other future water uses. And so our position has long
23 been that these settlements are a federal trust
24 responsibility. They require, I think, a greater
25 recognition of their importance and their role in

1 planning both for water use and energy use in the
2 future. And it's something that they probably don't
3 get. And so we would urge that settlements and basic
4 data be considered as tools at the federal level that
5 can be used to help plan effectively for the water needs
6 and uses associated with energy development, both in the
7 nation and in the West.

8 Thank you.

9 MS. WELSH: Thank you very much.

10 Mr. Griswold.

11 MR. GRISWOLD: Good morning and thank you.

12 Natural Resources Defense Council uses law,
13 science, and the support of 1.3 million members and
14 online activists to protect the planet's wildlife and
15 wild places and to ensure a safe and healthy environment
16 for all living things.

17 I would like to thank the Department of Energy
18 and the task force for tackling the climate-water-energy
19 nexus. Water and energy will be the two most
20 challenging issues of current and future generations;
21 and when combined with climate change will involve the
22 most important decisions our society makes.

23 Our nation stands at a fork in the road: To
24 maintain the status quo and build and water-and
25 energy-intense systems or expanding the use of our

1 sustainable, low-carbon energy systems that are both
2 water- and energy-efficient. A step in the right
3 direction, a step that can save as much as 190 billion
4 gallons a day in water withdrawals, would upgrade
5 existing power plants to closed-cycle cooling or better,
6 as required by Section 316 of the Clean Water Act. By
7 upgrading these outdated systems, industry can reduce
8 environmental risks, improve the health of our rivers
9 and lakes, and prepare for the impacts of climate
10 change, impacts that would reduce vital reliability and
11 increase costs.

12 So we've moved beyond the "if climate change
13 occurs" phase. As we know, some climate impacts will
14 occur even with greenhouse-gas reductions we already
15 have in place. Recent droughts and rising temperatures
16 provide a window into the potential impacts of climate
17 change.

18 Water levels at Lake Mead, as we heard before,
19 have dropped over a hundred feet since '99, reducing the
20 electric capacity by 33 percent. In 2012, the drought
21 in the Missouri River Basin reduced energy production by
22 three billion kilowatts in 2012. Because of drought,
23 generators at Browns Ferry nuclear plant were shut down
24 four out of the past six years to protect aquatic
25 ecosystems in the Tennessee River.

1 Newly proposed wind-speed power plants
2 continue to be planned in water-starved states. We
3 cannot expect to build a water- and climate-smart energy
4 system by using outdated technology.

5 Investments in low-carbon/low-energy systems,
6 wind, natural gas plants, dry-cooling, and reclaimed
7 water have allowed Texas to avoid a water-energy
8 conflict during the 2011 drought.

9 President Obama's recently announced Clean
10 Power Plan provides an initial and important step toward
11 securing a low-carbon future, but we must ensure this
12 step includes water-smart strategies as well, strategies
13 that it should invest heavily in energy efficiency and
14 renewable energy, strategies that could reduce water
15 withdrawals by one estimate by 17 trillion gallons by
16 2030 compared with the "business as usual" scenario.
17 Such strategies would give as much as 9 to 13 billion
18 gallons a year back to farmers in California or
19 Colorado, reduce groundwater withdrawals in the Colorado
20 River Basin by two trillion gallons by 2050, and cool
21 down the Coosa River in Alabama by as much as 13 degrees
22 in the summer, which will protect the fisheries
23 downstream.

24 Locally, NGSC is working with the California
25 Public Utilities Commission to address the amount of

1 energy that's embedded in the water system. We
2 encourage DOE and the task force to continue to evaluate
3 embedded energy in the water sector at the national
4 level. We also ask the DOE to work to resolve key
5 challenges to low-carbon, low-water energy systems such
6 as carbon-capture and storage technology that requires
7 40 to 90 percent more water than coal-powered plants;
8 concentrated solar power plants that require twice as
9 much water as coal plants; and unconventional natural
10 oil and gas development which requires nearly five times
11 as much water as conventional natural gas, which can
12 increase greatly with enhanced recovery processes.

13 Water availability is not just about the
14 amount of water but the water quality, the quality
15 affected by a legacy of energy development. We
16 encourage the QER process to address these risks. For
17 instance, in Montana, brine has contaminated the Fort
18 Peck's tribe's drinking water sources; and nearby in the
19 Bakken oil and brine spills have increased by 42 percent
20 in the past year. Coal ash has leaked from waste sites
21 polluting millions of gallons of river water with heavy
22 metals. and discharge from power plants kills billions
23 of fish annually and overheats downstream waters. Given
24 that much of this waste is exempt from federal
25 regulations, we should take every step to ensure we

1 safely reduce, reuse, and regulate waste or the legacy
2 of conflicts between energy and water will continue.

3 A water-resilient energy system shall recycle
4 water to the greatest extent scientifically possible.
5 And for power plants Section 316B of the Clean Water Act
6 would support this. For unconventional oil and gas
7 systems, water on-site and water reuse on-site can
8 decrease water-management costs by as much as 44 percent
9 as well as reduce infrastructure needs in those well
10 heads.

11 To address this water-energy-climate nexus, we
12 need decision-relevant data during the development of a
13 national framework for energy and QER should ensure that
14 a water-resource plan is concurrently developed.
15 Understanding the life cycle water use of energy systems
16 is critical to plan for our water-constrained future.
17 We encourage QER to model possible energy futures and
18 identify outcomes on ecosystem and climate result
19 resilience, an effort that would also identify regional
20 risks and benefits of such futures. We need access to
21 consistent water data. We as well support the USGS
22 surface water and groundwater data we believe are
23 critical for these water-energy decisions. But, again,
24 they continue to lose funding for these important
25 services. We need access to water-reduce data from

1 power plants that includes the facility of fuel-type
2 information and to accurate domestic and agricultural
3 water-use data, which is in many cases self-reported.

4 DOE and its partners could provide guidance,
5 support, and funding for an improved water withdrawal
6 use and reporting system to address water constraints
7 within the energy system. And without due consideration
8 for existing water stress from growing populations and
9 climate change, energy prices will rise and water
10 conflicts will become more common. Planning now for
11 anticipated water and energy infrastructure can curtail
12 use and reduce environmental impacts.

13 Thanks for your time.

14 MS. WELSH: Thanks.

15 Yeah. Can you all do a little switching
16 around so Commissioner Sandoval can be on camera?

17 COMMISSIONER SANDOVAL: Thank you. Can you
18 see me now? Good morning, everyone.

19 MS. WELSH: I think we can see you on camera.
20 And let me welcome you, Commissioner Sandoval. The
21 floor is yours.

22 COMMISSIONER SANDOVAL: Great. Thank you. So
23 thank you to the Department of energy for this
24 invitation. And it is a pleasure and an honor to be
25 here on behalf of the California Public Utilities

1 Commission, as several of my colleagues from the CPUC
2 are here with me. Our office is right across the
3 street, so we really appreciate this opportunity for
4 collaboration with our federal partners as well as our
5 state partners.

6 So I wanted to focus, in fact, on a proceeding
7 that the PUC is doing that is focusing on exactly this
8 issue, the water-energy nexus. I am the assigned
9 Commissioner for our water-energy nexus proceeding. We
10 are in the throes of finalizing our scoping memo which
11 defines the issues that we're going to address. So we
12 expect to get that out very, very shortly. So I wanted
13 to talk to you about a few of the issues that we have
14 identified in our scoping memo that we will be analyzing
15 through our proceeding.

16 So, first of all, is a water-energy
17 cost-effectiveness tool. So this is a project that
18 we've been working on for some time through a series of
19 workshops developing a methodology for determining the
20 embedded energy in water as well as the embedded
21 water-and- energy nexus. So we're going to be looking
22 at these methodologies. I mentioned there have been
23 workshops and that will continue. We already do have a
24 number of tools that we use to identify cost
25 effectiveness. And so this will come up with regard to

1 energy efficiency, which I will mention shortly.

2 So we also want to use this proceeding to look
3 at actions for the water-energy nexus in multiple
4 contexts. For example, water conveyance, delivery and
5 use for water storage, stormwater capture,
6 water-recharge delivery, and other types of areas. So
7 this is one of the issues that Governor Brown has also
8 addressed in some of his emergency measures this year to
9 deal with the California drought, just to try to make
10 water conveyance easier and water transfers easier.

11 I have spent a lot of time as well in the
12 communications industry. I've taught telecommunications
13 for over a decade. I directed a department at the FCC
14 for over six years. And I mention this because, when
15 you look at water, water is very much where
16 communications and energy was over a hundred years ago
17 in terms of having many disparate unconnected systems.
18 It's like -- water is a lot like energy without
19 transmission, with the exception of some grand projects
20 such as the California Water Project and the Federal
21 Water Project. And so doing what we can to share
22 information but also create opportunities for conveyance
23 and exchange is really critical to our future.

24 As was mentioned, our proceeding will also
25 look at the role of water and energy production, but

1 also in agricultural pumping and irrigation. Here in
2 California agriculture is the largest sector that uses
3 water; and, of course, also residential and commercial
4 landscaping is a huge part of the use. So we cannot
5 address our drought effectively in California without
6 the agricultural sector and without also helping
7 residents to understand how can they get to the next
8 level of conservation. We've already heard this here,
9 even as we have entities like the Russian River
10 Valley -- they've asked for 50-percent cutbacks -- that
11 people are reporting that they are struggling to cut
12 back because they've done a lot of the things that are
13 easy. And so we also want to make it easy for people to
14 understand what are the next level of things that they
15 can do both indoors and outdoors to make a difference
16 and to save water. And we'll also do this in part
17 through our energy-efficiency programs, which, again,
18 I'll mention in just a second.

19 So we're going to be also focusing on
20 interagency coordination, coordinating with our sister
21 agencies, the California Independent System Operator,
22 California Energy Commission, the Department of Water
23 Resources; and also with tribes as well as state, local,
24 federal, and regional governments; and then, of course,
25 coordinating with other related agencies, including

1 federal agencies.

2 Through intra-agency coordination, we're going
3 to be focusing on what we can do to harness a variety of
4 programs, including our energy-efficiency programs. I'm
5 the assigned Commissioner for the CPUC's Energy Savings
6 Assistance Program, which is the partner to CARE,
7 California Alternative Rates for Energy, that helps
8 low-income users. So one of the things that we have put
9 into the decision that actually we already adopted for
10 the smaller multi-jurisdictional water utilities this
11 year is promoting the energy-water nexus as a step in
12 energy-efficiency savings for this year. And we have
13 also directed them -- these are companies like Pacific
14 Power that serve over 45,000 households in California --
15 and we've directed them to include the energy-water
16 nexus in their energy-efficiency savings plans for the
17 next cycle. Right now we are considering the proposed
18 considering the proposed energy-savings assistance plan
19 petition for modification privilege for 2014 and also
20 the guidance document for the large investor-owned
21 utilities. And, again, one of the centerpieces that we
22 made of this area was to also address the energy-water
23 nexus, both this year and coming years.

24 So as was mentioned, there are a number of
25 things that can be done indoors to address the

1 energy-water nexus, especially things like hot-water
2 heating, wrapping of hot-water pipes are things that can
3 really help with the energy-water nexus and the
4 end-user; but also going deeper into collaboration with
5 community-based organizations, consultation with tribes,
6 and looking at working with different entities,
7 including landlords. Addressing multi-family housing is
8 absolutely critical.

9 When we look at low-income Californians, a
10 third of all California households are low-income.
11 Two-thirds of those household are renters. Now, in
12 California we also have a different renter profile than
13 in the East. Most of those renters live in
14 single-family homes, although single-family is
15 apparently classified in Energyland as up to a
16 four-plex. But most California renters are not in the
17 tall apartment buildings that may characterize some of
18 the East Coast and large Midwestern cities, but are in
19 smaller rental units. So thus cooperation with
20 landlords is absolutely critical.

21 We've also talked to you a lot about the
22 energy-water nexus and in fact the energy-water
23 climate-change nexus. And I would also like to
24 introduce another stool to this leg, which I believe is
25 critical and was mentioned somewhat in the discussion of

1 sensors, which is the energy-water-communications nexus.
2 So this is another area that our proceeding will look at
3 is to examine the nexus of water, energy, and
4 communications; for example, the use of
5 information-management systems, high-speed Internet
6 access, and supervisory control and data-acquisition
7 systems for water management and treatment and the
8 communications needed to be able to manage transfer, use
9 water, to gather data, to do analysis, and also to have
10 water for wildfire and other public-safety areas. And
11 on this we also would evaluate the access to
12 electric-gas storage and renewable energies to address
13 the energy-water nexus, including the link between power
14 access and communications facilities.

15 So let me give you an example of why this is
16 critical. Whether we're talking about in a city like
17 San Francisco, which is a very, very crowded city -- in
18 fact, more crowded per capita than Manhattan -- you
19 still have places where you have communications valleys
20 and cellphones that don't work because of a variety of
21 ways that things are set up and that there still are
22 constraints in terms of our ability to be able to use
23 communications. So as we look at the development of the
24 Internet of things, we also need to make sure that the
25 Internet of things is also enabling us to analyze our

1 use of water, to address our use of water, and to be
2 able to facilitate wiser use of water. And we need to
3 analyze where the lack of access to communications
4 facilities constrains our ability to manage water.

5 So I'm very glad that you're here, Secretary
6 Connor, and to hear about your work with Native American
7 reservations, as this is demonstrated most graphically
8 in our Native American reservations here in California.

9 California has more Native American tribes
10 than any other state. And I've had the pleasure and the
11 opportunity to spend some time with our Native American
12 tribes in far Northern California, particularly the
13 Yurok tribe, the Karuk tribe, the Hupa tribe, that all
14 have issues with lack of access to communications
15 facilities and in some cases lack of access to
16 electricity. So what's happening is in these places,
17 where we all work very hard to bring electricity to the
18 Yurok tribe, which is near Eureka, they got access to
19 electricity in most of the tribe but not all of the
20 tribal area in June of 2013. They got plain old
21 telephone service, in part but not all of the
22 reservation, in April of 2014. There's no cellphone
23 service up there. They face the wrong side of the
24 mountain. The trees are too tall. They don't have
25 satellite.

1 So what you see in a lot of these places is an
2 amazing number of people who have cellphones in places
3 where there's no cellphone service. And what they do is
4 that they drive every day about 45 minutes each way to
5 get to a place where there's a cellphone signal, text
6 their messages, do business, and then drive back into a
7 place where they may as well be back in the 19th
8 century.

9 There's a lot of greenhouse gases being burned
10 for lack of access to communications facilities. And
11 this is really dangerous in an area that is a high
12 wildfire-danger area. And when I met with the chief of
13 the Hupa tribe -- and we also met with some of the
14 tribal facilities leaders -- the water facility director
15 said, It is really difficult to run a water facility in
16 an area where you don't have enough broadband to
17 properly run your SCADA system. And that could be
18 really scary. If you have don't have enough broadband
19 for your SCADA system, your pumps could fail to open; it
20 can create problems with treatment, let alone with
21 conveyance and ability to go to the next step.

22 Let alone, when you also talk about farmers
23 and what you can do with agriculture, one of the things
24 that I heard from Fresno State, which is one of our
25 centers for looking at energy-water nexus and they also

1 have a WET center, Water Education Technology Center, is
2 while there are great advances being used with sensors,
3 one of the big barriers to the use of sensors in the
4 field is the lack of communications technology in the
5 field, which is also driven by the lack of electricity
6 on the field.

7 So one of the things that we're going to be
8 doing also to look at this issue is that I have also
9 proposed that we look at some of the things that
10 California has done in the past, in fact, with farmers
11 where we have created incentives to, instead of using
12 diesel to power water pumps in the fields, to change to
13 electricity, which helps with climate and get them
14 access to cleaner electricity and particularly since so
15 many of the farmers are in the Fresno Basin, which is
16 one of our most impacted air basins.

17 So we are also working with the tribes to see
18 if we can use this model to count how many people are
19 out there. I have been to the elementary school on the
20 Yurok reservation, which is still being run by diesel.
21 K-through-8 children breathing diesel every day. And
22 people who are using diesel because of lack of access to
23 electricity. And this affects not just climate but also
24 water.

25 So we expect to be putting this out within the

1 next few days. And we look forward to your
2 participation and your collaboration. And I look
3 forward to working with you on those issues.

4 Thank you.

5 MS. WELSH: Everyone has such great
6 information. I hate to stop. But we want to get into a
7 discussion and have time for that.

8 So let me throw out the first question. And
9 I'll ask Commissioner Sandoval to start and then we'll
10 move down the table.

11 You all have expressed, very articulately,
12 that there is great challenges, in the West
13 particularly. But the QER task force is tasked with
14 looking at what should the federal government be doing
15 in this space. So a lot of what you talked about,
16 Commissioner, is at the state level; but you did mention
17 some federal programs. Can you and then can the other
18 panelists talk about what you think, if you had the
19 ability to tell the task force one specific
20 recommendation, that the federal government should be
21 doing? What would that be? Would it be in the
22 executive space? In new legislation? Give us your one
23 very specific recommendation.

24 And then from there we'll go to Mr. Griswold
25 and then come down.

1 COMMISSIONER SANDOVAL: Well, I'm confined to
2 one. So one suggestion that comes to mind is, again,
3 when we talk about coordination with Interior, federal
4 parkland, being able to create the connections, for
5 example, to develop broadband Internet that can cross
6 through some of the federal parklands and some of the
7 Interior lands is going to be absolutely critical to
8 addressing the energy-water nexus, because some of these
9 things you really can't do unless you have the
10 communications infrastructure; and especially whether
11 you're talking about the source of water or some of the
12 users of water, coordinating to make it easier to be
13 able to deal with that is critical. And that will also
14 help with addressing wildfire areas that both affect
15 federal lands as well as state lands. So that would be
16 one suggestion.

17 MS. WELSH: Mr. Griswold.

18 MR. GRISWOLD: Yeah. As I mentioned in the
19 beginning, I think --

20 MS. WELSH: Can you speak into the mic?

21 MR. GRISWOLD: As I mentioned in our
22 statement, one of the key steps is to move forward with
23 technology we already know is useful. So part of that
24 is the DOE's role in developing and fast-forwarding that
25 technology through working with universities and others

1 that have that technology resource and ultimately
2 getting the funding out there to move that technology
3 forward today instead of 10 or 20 years from now. I
4 think that's the critical --

5 MS. WELSH: Thank you.

6 Mr. Bracken.

7 MR. BRACKEN: Well, if I only have one, I
8 would say basic data. Fund it and make it a priority.
9 And one of the things we often see, at least in the
10 water world, is we see a lot of other programs that are
11 good, that are worth doing, but basic data shouldn't
12 come -- they shouldn't be the scapegoat. These programs
13 shouldn't happen at the expense of the basic data
14 programs, which really are the fundamental thing western
15 states need to manage water effectively.

16 MS. WELSH: Mr. Mansour.

17 MR. MANSOUR: Sure. So in the context of Big
18 Data analytics, from a position of the federal
19 government and what role it can play in planning and
20 implementation of water research and development, you
21 know, if we really want to change how our nation
22 addresses looming water-scarcity challenges and
23 addressing issues relative to the water-energy nexus,
24 it's going to take a community of government and
25 national labs and academia and industry in close

1 collaboration. And from the context of, again, Big Data
2 and analytics, advanced sensor development to provide
3 the sensor and monitoring and broadband development to
4 enable the acquisition of data and analysis of data to
5 ensure that issues are addressed appropriately is going
6 to be paramount.

7 MS. WELSH: Thank you.

8 Mr. Andrew.

9 MR. ANDREW: Thank you. I'll go back to my --
10 one of the -- the opportunity that I mentioned in my
11 remarks, which was supporting local water-energy
12 collaboratives. And I guess the federal government
13 could lead by example. It's certainly our -- there's
14 just such a huge number and variety of federal
15 facilities in the West; and it's the federal government
16 but not -- I suspect in many cases there are also local
17 water-energy customers. And to the extent that they can
18 set an example, that would be the one thing.

19 MS. WELSH: Great.

20 Mr. Oglesby.

21 MR. OGLESBY: It's kind of a toss-up. But
22 since California has standard-setting authority for
23 efficiency, what -- and speaking for this state, I'd say
24 funding research. There's a great deal of opportunity
25 out there to improve the way that we handle water, treat

1 water, convey water. And I think fundamental -- the
2 resources available to advance technology in that area
3 could use additional support.

4 MS. WELSH: Mr. Gleick.

5 DR. GLEICK: So what does the federal
6 government do? They do national standards and
7 regulations, cross-state responsibilities. They operate
8 some infrastructure, especially water-related
9 infrastructure in the West. Federal lands. So my one
10 recommendation would be integrate water and energy in
11 those responsibilities. We have Water Sense and Energy
12 Star standards at the federal level. That's an effort
13 just trying to integrate energy and water. And I think
14 there should be much more of that.

15 MS. WELSH: Thank you, all.

16 Let me turn to Dr. Holdren, as I know he's got
17 a plethora of questions for all of you.

18 DR. HOLDREN: Well, I don't think we have time
19 for a plethora, but thank you, Peggy.

20 You actually asked what my first question was
21 going to be. I was going to focus a little more
22 narrowly and ask, if you had five minutes with the
23 President of the United States, what would be your ask
24 or your proposal? Pretty similar to your question.

25 So what I will suggest on that one is that

1 people who have additional ideas that they would like to
2 convey to the president, convey them to me. My email
3 address is jholdren@ostp, as in Office of Science and
4 Technology Policy -- .eop.gov. I read my own emails.
5 It's not filtered.

6 MS. WELSH: Do you want to say that into the
7 mice, because the people listening by live stream --

8 DR. HOLDREN: Jholdren -- no caps, all one
9 word -- jholdren@ostp -- as in Office of Science and
10 Technology Policy -- eop, as in Executive Office of the
11 President -- .gov. Suggestions for what the federal
12 government could or should be doing constructively in
13 this area that we're not already doing would be most
14 welcome.

15 I will say I was gratified by quite a number
16 of the comments on what they'd like the federal
17 government to do, because many of them are things we're
18 already working on, particularly in partnerships on Big
19 Data and analytics, in opening up government data in
20 machine-readable and user-friendly forms across a number
21 of the domains we've been talking about. These are
22 things that we are already working on.

23 The other question I had is probably really
24 mostly a question for Dr. Gleick and Dr. Mansour. And
25 that is how close are we to having a meaningful supply

1 curve for water supply on the margin, say, in the State
2 of California?

3 And by "supply curve," for those of you who
4 are not familiar with this context, a supply curve is a
5 graphic that tells you how much you can expect to get at
6 a given cost and at a given time. So -- and you arrange
7 the potential contributions from the least cost to the
8 highest cost contributions. And what supply curves in
9 energy have typically shown are that the cheapest and
10 most abundant sources of energy on the margin come from
11 saving a kilowatt hour or saving a gallon of fuel rather
12 than producing one from scratch. And of course from the
13 standpoint of the economy, a kilowatt hour or a gallon
14 saved is every bit as good to the economy as a kilowatt
15 hour or a gallon produced, because the one saved can be
16 used elsewhere.

17 The same obviously is true of water. A cubic
18 meter or an acre-foot or a billion gallons a day saved
19 is as good as one produced, as far as the economy is
20 concerned. But I've personally seen some very
21 impressive and informative supply curves for energy. I
22 haven't, that I recall, seen one for water supply. Are
23 we close to being able to produce such a thing? And
24 what would it tell us?

25 DR. GLEICK: So that's a great question. It's

1 a difficult one in part because there's so many
2 different options. You could build a reservoir here or
3 a reservoir there. You could do groundwater storage and
4 recharge and extraction. You could do water
5 conservation and efficiency.

6 There has been some work done developing
7 supply curves for water. In a report done a couple of
8 years ago on urban water called "Waste Not, Want not" at
9 the Pacific Institute, we did a supply curve of
10 conserved water, looking at replacing a toilet,
11 replacing a washing machine, building new reservoirs --
12 sort of a comprehensive assessment. Obviously, depends
13 on where you are, depends on the choices you make.
14 There are different models of washing machines. There
15 are different ideas for reservoirs. So it's not an easy
16 thing to do.

17 The short answer, from what we know so far, is
18 that conservation and efficiency is by far the cheapest.
19 It's cheaper to save a gallon of water than to find a
20 new source of supply in the western U.S. We're reaching
21 peak water. There aren't really many new sources of
22 water. And the gallon of water that we're wasting with
23 inefficient toilets is a gallon of water we've already
24 collected. We've already spent money to collect and
25 deliver, treat and deliver to our homes.

1 We just released a series of reports on
2 drought options looking at urban and ag efficiency and
3 wastewater reuse and stormwater capture and reuse for
4 California. Those are new supply increases in demand
5 reductions and the potential is very significant. The
6 costs vary and more work needs to be done really on the
7 cost side of things.

8 DR. HOLDREN: Dr. Mansour, do you have --

9 MR. MANSOUR: Certainly. I'm not -- I am
10 going to echo what Peter said. And in addition to that,
11 from our standpoint we think about conservation,
12 efficiency, and reuse primarily. So really is a
13 broad-brush look at supply curve. I don't know that
14 we've got everything that we need to know to be able to
15 establish that, but certainly reuse is a big component,
16 conservation is a big component, and efficiency is a big
17 component.

18 Just take, for example, a thousand-megawatt
19 power plant and taking cooling tower blow-down from that
20 power plant and reusing that, figure out how to reuse
21 that within the facility. That basically translates to
22 about 15 percent of the energy required -- energy
23 required to bring in water and treat that water for
24 discharge as well. And from the standpoint of what that
25 translates to, it's about the power for 350 homes on an

1 annualized basis. So there's that component.

2 From the standpoint of reducing a thousand
3 gallons of water of use intake and then treating for
4 discharge as well, it's about eight kilowatt hours to do
5 that. So that's a significant amount of consumption
6 reduction as well.

7 So reuse is a big deal. Taking gray-water and
8 using that as well and bringing that into systems for
9 cooling towers. There is technology available to be
10 able to treat gray-water appropriately such that it
11 enables cooling towers to operate efficiently and
12 effectively. So really taking gray-water and not
13 treating that to completion for potable use -- to that
14 level of reuse -- is something that would be
15 advantageous as well. So really managing resources from
16 the standpoint of reuse, consumption, and efficiency is
17 a big driver.

18 DR. GLEICK: If I can give one more specific
19 example, when we did this assessment of efficiency --
20 this is why energy and water is so important to look at
21 together -- we looked at the potential to save water
22 with dishwashers -- efficient dishwashers. The amount
23 of water an efficient dishwasher saves is significant,
24 but not a lot from an economic point of view. And it
25 was not cost-effective.

1 But when we looked at the energy savings as
2 well of heating the water, it became cost-effective to
3 the consumer, to the end-user, to replace that
4 inefficient dishwasher. And this is relevant for
5 Commissioner Sandoval's work at the PUC of integrating
6 these things together. You get benefits that you don't
7 expect when you integrate the energy and water numbers
8 together from a cost point.

9 MS. WELSH: So one of the things I've heard
10 all morning is the critical need to start thinking about
11 these systems in an integrated way, that regulators are
12 approaching things in a stovepipe way and we need to
13 bring them together. The federal government has found
14 that public-private partnerships have often been a good
15 way to bring all the players to the table.

16 Commissioner Sandoval, you mentioned
17 collaboration. Several others on the panel mentioned
18 it. Is there a role for a public-private partnership
19 effort that the federal government could serve to bring
20 some of the collaboration needs and thinking together in
21 the energy-water nexus? You want to start, Commissioner
22 Sandoval?

23 COMMISSIONER SANDOVAL: Yes. Thank you.

24 Yes. So we also think that private-public
25 partnerships are really critical. I would add

1 community-based organizations, tribes, other community
2 organizations as part of that collaborative. I think
3 understanding -- one of the questions that I always ask
4 is what are the barriers? What are the barriers to
5 development in terms of going to the next level of
6 whatever it is that the business wants to do or that the
7 community wants to do.

8 And one of the things I was going to mention
9 is, when we talk about some of these water uses or
10 energy uses, one of the key barriers is the energy
11 intensivity. And so getting back to priorities for the
12 federal government, I would echo the priority of
13 supporting research and also supporting some of the
14 state efforts to do things like look at storage. We
15 have a very aggressive storage-procurement mandate here
16 in California. And there are some very exciting things
17 that are happening in this space. So I think
18 particularly if we could look at how could we integrate
19 and use storage to be able to help us address things
20 like the energy intensivity of desal, the energy
21 intensivity of fracking, the lack of energy in some of
22 the wildfire danger areas. These are all areas where we
23 could help with collaboration in terms of the private
24 sector initiative. But also one of the things that is
25 stopping deployment in some of these areas is some of

1 these barriers and some of the gaps that could be
2 addressed by some very exciting new stuff that is going
3 on in storage.

4 MS. WELSH: Terrific. Anybody else want to
5 weigh in?

6 All right. Well, let's talk about technology.
7 We have heard about Big Data and the use of data, the
8 need for accurate and reliable data. What other
9 technologies would you recommend that the federal
10 government look into, fund, conduct R&D?

11 Dr. Mansour, you want to start and then we'll
12 go up the line?

13 MR. MANSOUR: Certainly. So from my
14 standpoint, I can certainly say that accurate and
15 reliable data is critical. In order to receive accurate
16 and reliable data, you need good communication as a
17 starting point to receive it. But to acquire it is
18 going to require advanced sensors, advanced capabilities
19 to sense -- and not just sense key parameters -- but
20 also to measure those key parameter, right. So not just
21 to see whether are not they're there, but to be able to
22 quantify how much is there. So that's, I think, a
23 significant requirement. The other piece is --

24 MS. WELSH: What is the federal role in that?

25 MR. MANSOUR: So encouraging and establishing

1 research and development priorities around that and
2 funding priorities around that --

3 MS. WELSH: Got it. Thank you.

4 MR. MANSOUR: Sure. That's one component of
5 it.

6 And the other part of it is really working in
7 partnership from the standpoint of sponsoring or
8 collaborating in terms of pilots and being able to
9 validate the technology that is developed as well. So
10 working in partnership. You mentioned public-private
11 partnerships. Certainly, developing partnerships to
12 ensure that there's a close collaboration to develop
13 that technology and make sure it's recent.

14 MS. WELSH: Anyone else? Mr. Gleick?

15 DR. GLEICK: So we don't measure groundwater
16 extraction in California. For those of you not from
17 California, you may find that shocking.

18 One of the things the federal government could
19 do is support -- and it's in the sensing category -- is
20 support satellite systems, earth-observing systems.
21 We've learned a tremendous amount about groundwater
22 extraction in California from the GRACE satellite
23 system, which is a gravity-measurement system circling
24 the earth. And it looks at groundwater storage around
25 the world. And it's identified, especially in the

1 western U.S., some quite remarkable changes in
2 groundwater. Until we're doing on-the-ground
3 measurement of water use more accurately, there's an
4 enormous federal role for remote sensing from satellite
5 systems, which are increasingly sophisticated and, I
6 would argue, underfunded.

7 MS. WELSH: Great suggestion.
8 Commissioner.

9 COMMISSIONER SANDOVAL: Yes. So I wanted to
10 jump on the water-management-sensor bandwagon and say
11 that this is very important. Also, that there's an
12 opportunity there to help to address the
13 electricity-and-communications nexus in order to be able
14 to do that. The Rural Utility Service and the Rural
15 Electrification Administration run by the federal
16 government was hugely effective in helping to bring
17 electricity to rural America. However, they tended to
18 concentrate on the farmer's house. So when we talk
19 about the deployment of sensors, one of the things that
20 we're hearing is that when you get to the fields,
21 actually one barrier to deploying sensors is you get to
22 the point where there's not only not the traditional
23 telecommunications infrastructure, but there's no
24 electrical power.

25 So we're looking at how can we do things like

1 build off of what we already did to try to move the
2 farmers from the diesel-based pump to electricity to
3 then be able to harness, now that you've got electricity
4 in the fields, how can you mesh networks and other
5 things to push out beyond the place where the farmer's
6 house was connected by RUS long ago to be able to push
7 into the fields to be able to get the sensing technology
8 so then you could feed into lower thermal infrared
9 satellites or other types of technology and then looking
10 at where the gaps in terms of electricity or
11 communications.

12 When we talk about public-private
13 partnerships, also one of the largest communications
14 networks in rural America is run by John Deere, Because
15 they have a need to communicate with the users of their
16 tractors. They have long sought out the farmer with the
17 farmer with the tallest silo or the biggest barn to be
18 able to put their communications technology. So our
19 communications division has reached out to John Deere to
20 see what we can do to work together. But working with
21 John Deere as a resource, how can we also help the
22 farmers be energy-efficient is going to be absolutely
23 critical. And how can we work together to build a
24 communications technology that will give us the ability
25 to manage and to sense and create data.

1 MS. WELSH: So share the results of that with
2 the White House, if you would.

3 Mr. Bracken.

4 MR. BRACKEN: Yes. I just wanted to add to
5 Dr. Gleick's comments about --

6 MS. WELSH: Can you bring the mic close?

7 MR. BRACKEN: Yes. I just -- I wanted to
8 support the comments about remote sensing. That's
9 something that we've actually long supported,
10 particularly the LandSat satellite. As I mentioned
11 before, it has a terminal infrared sensor that allows
12 water managers to actually look at consumptive use on
13 the ground. It's a very cost-effective way of doing
14 that.

15 I want to add one caveat to the topic of new
16 research. And that is we don't want it to come at the
17 expense of stuff that already works. And the TRS
18 sensor, the thermal infrared sensor on LandSat is a key
19 example. There was a lot of uncertainty with the last
20 LandSat satellite launched last time year about whether
21 it would have a thermal infrared sensor. And that was a
22 big challenge for the western states. So we had to go
23 and argue quite thoroughly and extensively to get it on
24 the satellite. And part of the challenge that we kept
25 bumping into is, This isn't new science. And our

1 response was, We don't care. It works. It works now.
2 We don't want to have something that works become
3 obsolete just because it's not new.

4 So, yes, new science is needed. I think
5 remote sensing is a great way to do it, but we need to
6 make sure that we're not throwing out the stuff that
7 already works.

8 MS. WELSH: Thanks.

9 Last comment, Mr. Andrew -- Mr. Oglesby.
10 Excuse me.

11 MR. OGLESBY: I'd be remiss if I have an
12 audience of the Department of Energy if I don't observe
13 that with the amount of hydro that we use in the West
14 and with decreasing availability of hydrowater resources
15 that part of the investment in technology should be to
16 further renewable technologies that are less reliant on
17 the water as the driving force on that side. I would
18 add that to the discussion.

19 MS. WELSH: Great recommendation.

20 So let me give the floor to Dr. Holdren to
21 conclude our fantastic discussion here this morning.

22 DR. HOLDREN: Well, let me start by saying I'm
23 very grateful to the panelists. I think we got
24 interesting ideas from everyone. I took a lot of notes.

25 I think three themes really stand out. One,

1 Peggy mentioned a moment ago, it is clear that
2 integrating assessment and planning for energy and water
3 would bring many benefits, many insights. And, as
4 Dr. Gleick most recently commented, one often finds that
5 thinking about them together underscores opportunities
6 that you might not otherwise have recognized as paying
7 off.

8 Second point that came up again and again and
9 again is we need to do better with the interaction of
10 sensing, monitoring, communicating those data, making
11 them available, applying Big Data analytics to
12 understanding what the patterns are actually telling us.
13 This again is already a major thrust of what the federal
14 government is trying to do in this domain and many
15 others.

16 The satellite issue is one very close to my
17 heart and close to my responsibilities; and we are
18 working on it as best we can under some rather
19 constraining budget circumstances in the federal
20 government.

21 The third theme that comes through again and
22 again and again is the importance of partnerships across
23 federal, state, and local governments and national labs,
24 universities, companies, community organizations,
25 planners, tribal leaders. And that applies to both of

1 the other domains: Partnerships to figure out how to
2 better collect and use data, partnerships in terms of
3 understanding how best to integrate assessment and
4 planning across the water and energy domains.

5 So I've got a lot of more specific notes that
6 came out of the comments of the panelists and I'll take
7 those back. And I'm sure that our Department of
8 Interior and Department of Energy colleagues will do the
9 same.

10 Thank you.

11 MS. WELSH: Please join me in thanking this
12 stellar panel.

13 [Applause]

14 MS. WELSH: I'll now ask the next panel to
15 join us.

16 And while we're doing that, let's remind folks
17 that we want to hear from you. Even though I'm cutting
18 people off this morning, it doesn't mean that we don't
19 want to hear from each of you. So I'm going to repeat
20 that the address for submitting comments is
21 qercomments@hq.doe.gov.

22 Thank you very much. And we'll get the next
23 panel set up here. Thank you.

24 For those of you who are listening via live
25 stream, let me remind you to refresh again. We heard a

1 lot about communications technologies; and we want to
2 make sure that the technology we're using this morning,
3 the live stream, is working well. So, everyone, please
4 refresh.

5 We're going to go out of order this morning
6 from the printed agenda that's on the Web because some
7 of our speakers have PowerPoint slides and some do not.
8 So we're going to ask those who do have slides to go
9 first. And if there is a way we can ask the speakers to
10 kind of move around so that the screen can be seen by
11 those in the room and it can get on camera, I would
12 appreciate it. So if we need to do some musical chairs,
13 let's do that.

14 I want to remind everyone that the panelists
15 we've invited today we are honored to have. Their
16 views, however, are their own and are not the views of
17 the Department of Energy or Interior or the White House.

18 With that, let me start with this panel. I'm
19 going to first introduce Frank Loge, who is director for
20 the Center for Energy -- excuse me -- Water and Energy
21 Efficiency at the University of California at Davis.

22 We then have Randy Howard, who is the
23 assistant general counsel at the Los Angeles Department
24 of Water and Power.

25 Keegan Moyer with the Western Electricity

1 Coordinating Council.

2 And I can't see all the way down there. Eric
3 Schmitt, vice-president of operations for the California
4 ISO.

5 Alex Coate, general manager for the East Bay
6 Municipal Utility District. I'm not sure if I've got
7 you in the right order because I can't see all the way
8 down there.

9 Randal Livingston, vice-president, power
10 generation for Pacific Gas and Electric Company.

11 And last but certainly not least we have Jim
12 Herberg, general manager with the Orange County
13 Sanitation District.

14 Thank you, gentlemen, for being here. Let me
15 turn the floor over to Dr. Loge.

16 DR. LOGE: Good morning. So I personally feel
17 that there's four critical areas that need to be
18 functional to really drive innovation in the
19 water-energy space. And those four areas are
20 illustrated up here on the schematic to your right.

21 So the first three are policy, technology, and
22 either businesses or business models and then the fourth
23 one is data; and to really have policy and technology
24 and business models driven by data. And I think the
25 biggest impediment to really driving innovation in the

1 water-energy space in the State of California to date is
2 the availability and accessibility of data.

3 And I'll be brief because this has already
4 been mentioned. I think we really are leaders within
5 the policy space, but data is the biggest impediment.
6 So that's going to be my principal thesis for today.

7 So very simply stated, our center has focused
8 largely on the energy that goes into the water sector.
9 You can look at that in one of two ways. This is a very
10 simple schematic. So the first kind of graphic across
11 the top is you can focus on reducing energy use in the
12 water sector by making energy use more efficient. So
13 the lightning bolts and the water cups are becoming
14 smaller and thereby you're saving energy.

15 The other way is by conserving water. So the
16 second kind of line down there is representing you can
17 save energy in the water sector by conserving energy.

18 Now, when you begin to look deeper into this
19 very simple schematic, these two systems get a lot more
20 complex. So I just want to use one slide, the next
21 slide is an illustrated case study to begin to
22 illustrate the complexity of dealing with the
23 water-energy nexus. So I'm going to focus on the bottom
24 portion where we're going to look at conserving energy
25 and, of course, find energy saving -- I'm sorry --

1 conserving water and the corresponding energy savings.
2 And the one thing that's needed is having an
3 understanding of what the energy intensity is in those
4 cups.

5 So this is a study that we recently completed
6 in collaboration with Pacific Gas & Electric and East
7 Bay Municipal Utility District. We looked at the energy
8 intensity just down here, which is measured in kilowatt
9 hours per million gallons as over a year, which is shown
10 down here, over a time period that spans from 2006 to
11 2011.

12 And the first take-home message here is that
13 you do see quite a bit of variation in the energy
14 intensity over the course of a year. You see even more
15 variation when you begin to look at the differences in
16 energy intensity spatially across the East Bay MUD
17 service territory. So there's roughly a 12-fold
18 variation in the energy embedded in water across the
19 East Bay MUD Municipal Utility District.

20 Having an understanding of this level of
21 granularity both in time and space is really critical to
22 understanding energy savings associated with different
23 types of water-conservation technologies and therefore
24 the businesses and the types of policies that might be
25 rolled out to help enable those types of joint savings.

1 Now, this study focused on only ten pressure
2 zones. East Bay MUD has about roughly 120 pressure
3 zones. We focused on ten, largely because of the
4 complexity of the data. And when you begin to look at
5 that complexity now overlaid on top of what a lot of us
6 are talking right now, about looking at the meter and
7 looking at the households and the businesses and their
8 energy use, because much of the energy that's embedded
9 in water and much of the energy that's associated with
10 water use is at the end-use, you begin to add on those
11 layers of data as well as all the data upstream and you
12 begin to then look at that throughout the State of
13 California; and the complexity of the data becomes
14 overwhelming. And for many people, I personally feel,
15 it's really inhibiting activities in the water-energy
16 space in the State of California.

17 So the greatest thing that can happen to help
18 drive innovation in this space, from my point of view,
19 is to really focus on building a centralizing data
20 platform that can integrate data from multiple sources
21 into one easy-to-use format that then could drive
22 analytics to help advance activities in the water-energy
23 space. So those analytics shown up here, I just gave a
24 few. There's many. But you can look at water-use
25 bench-marking, targeted conservation, leak-loss

1 detection, you can do the monitoring and verification
2 necessary to assess many of those programs. And you can
3 do similar things in the energy sector. So you can look
4 at energy intensity in the water. You can do
5 demand-response and issues like that. But it's those
6 innovations -- or those activities are only going to be
7 possible by combining these data-sets together and
8 beginning to use them in the management of this joint
9 resource.

10 So if you look at the next steps, I think
11 immediately one of the next steps is to get stakeholders
12 together who really -- who work within the space and
13 begin to build that joint platform with a lot of user
14 input. And one of the critical issues that is going to
15 have to be addressed that we've seen over the last
16 couple of years as we've worked in the space is the
17 security and privacy provisions associated with that
18 data. So if you begin to try to get water-utility data
19 for East Bay MUD and corresponding utility data for PG&E
20 for customers, it becomes very difficult to begin to
21 integrate that data to get it let alone make it
22 accessible to people who can build those analytics to
23 help drive innovation in this space.

24 So anticipating some of the questions you
25 might ask, I think one of the greatest things the

1 federal government can do to help advance activities is,
2 one, is to help expand the WaterSmart program that, from
3 my view, largely focuses on kind of hard infrastructure
4 into the soft infrastructure of information technology.
5 I think one of greatest things is that if you can get
6 the federal government helping fund the joint -- the
7 development of this platform between water and energy
8 utilities and provide some sort of guidance on standards
9 around that, that is going to drive innovation, in my
10 view, over almost anything else.

11 And this is -- in particular, there's a lot of
12 comments on the other panel about sensors. So we're not
13 only talking about combining large amounts of data that
14 currently exist. We're talking about adding to that
15 amount of data. So, to me, that's the most important
16 thing the federal government can do.

17 Thank you.

18 MS. WELSH: Thank you very much.

19 Mr. Howard.

20 MR. HOWARD: Good morning.

21 MS. WELSH: Can everyone see the screen?

22 Okay.

23 MR. HOWARD: So good morning. I need to first
24 correct Peggy. I am not counsel at LADWP. I am the
25 senior assistant general manager of the power system.

1 I have -- one of the benefits most of the
2 other folks up here don't have, within our title we're
3 water and power. So we have a nexus within the
4 framework of our organization. We are a city department
5 of the City of Los Angeles, the largest municipal
6 utility in the United States.

7 So I'm going to quickly go through -- got it.

8 All right. So first up, on the power systems,
9 just to give you a quick overview, we remain a
10 vertically integrated utility. We own generation,
11 transmission, and our distribution system. We serve all
12 of Los Angeles and Owens Valley. We have about 1.4
13 million electric meters, 4.1 million people that we
14 serve. We have a large thermal generation.

15 And what this slide shows, it shows you a
16 depiction of a lot of our transmission system. We own
17 or operate about 26 percent of the transmission in the
18 State of California. Many of these go to far-off
19 generating stations, but what you see now on this map is
20 you see renewable-energy facilities that have been
21 co-located and clustered around hydro facilities. So up
22 in the Pacific Northwest we've now developed a number of
23 wind farms up and around our point of interconnection in
24 the Pacific Northwest. Around Hoover Dam we're
25 currently developing and constructing about

1 500 megawatts of solar as well. We're the largest
2 off-taker of Hoover Dam. And then I'll go over to some
3 more details of our additional hydro and clustering
4 strategies that we've put in place for renewable energy.

5 Our water system. We currently have 338 miles
6 of an aqueduct from the Mono Basin, 233 miles from the
7 Owens Valley to Los Angeles. So two major aqueducts
8 feeding what used to be our primary water supply. This
9 year, due to the drought conditions, about 80 percent of
10 our water is purchased. It used to be historically at
11 least 80 percent were delivered through our own aqueduct
12 systems. So that's water that would come off of the
13 State Water Project through the Colorado River. And as
14 most Californians know, there is not water being
15 delivered through the State Water Project down into the
16 Los Angeles Basin this year due to the drought.

17 We have multiple energy-storage reservoirs in
18 addition to tanks. We have open reservoirs within the
19 city and we use about 215 billion gallons of water
20 annually. But we do have one of the lowest usages per
21 capita of any major, metropolitan entity.

22 What I just wanted to do -- and there was some
23 earlier discussion about carbon intensity -- because I
24 think that needs to be a factor considered when you're
25 looking at the nexus of both water and energy. And what

1 it shows is, where we were in 2013 on the blue dotted
2 line, it shows the intensity based on our current
3 resource mix. It shows -- and then on the red line
4 where we are going as a utility. And most of the
5 utilities in the state as we're changing our resource
6 mixes and getting out of coal-fired generation, going to
7 a cleaner fuel source, as we're looking at intensity.
8 And so LADWP, being a water and power entity, has that
9 ability to cross functionally, look at the strategies
10 between the two sides of the business and look at what
11 will optimize the reduction in carbon intensity.

12 So this just depicts currently we're at
13 21 percent 1990 levels, expected to be 55 percent below
14 1990 levels by 2028 for our CO2. And much of this is
15 because of that nexus in addition to changing out of the
16 coal strategy.

17 So a couple of things on operations: What can
18 we do and what have we done related to the planning that
19 goes on between the water and power systems?

20 One, we have developed a coordinated and
21 optimized energy and capacity production strategy on the
22 energy side that will minimize the impact to our
23 water-filtration and water-delivery system. So they're
24 coordinated approaches. We move water when it is
25 optimal to generate electricity for the power side, but

1 it also will minimize the impacts to when they need the
2 water to move into the water-filtration system for
3 delivery into our system.

4 We implement a number of cost-effective
5 approaches using the water for our energy, backing up
6 our renewable energy using that hydroelectric
7 generation. I'll discuss that in a little slide ahead.

8 We also have a high level of
9 solar-incentive-program participation on all
10 water-system facilities. We utilize as many of those
11 reservoirs, tanks, and locations to locate or co-locate
12 solar facilities as well.

13 We jointly coordinate all of our
14 energy-efficiency and water-conservation programs for
15 our customers. We also partner with the gas company, so
16 we deliver both the energy and the water side within the
17 city. It's become quite efficient in looking across the
18 board for a customer as a one source for helping them
19 conserve both the water and the energy.

20 We share common right of ways. Why is that
21 important? Because we use right of ways for
22 transmission to also do water capture, stormwater
23 capture, and collection for reuse.

24 We have an extensive recycling program and
25 plans to continue to expand that. So using your

1 transmission right of ways jointly with your water
2 system so they can take advantage of that land is quite
3 important.

4 We also coordinate all training and emergency
5 response because for the City of Los Angeles and the
6 prevalence of earthquakes, that's a very important
7 feature.

8 This is going to be hard for you to see in the
9 back. It depicts a transmission system that goes from
10 our eastern side of the Sierras up from our Owens Gorge
11 plant down into Los Angeles. And what it depicts is
12 along the way of this hydroelectric transmission line
13 that was built almost a hundred years ago delivering
14 water, it follows the aqueducts down into Los Angeles.
15 We have a number of reservoirs and power plants.

16 Our strategy has been to co-locate
17 renewable-generation facilities along that pathway; and
18 we're building some additional transmission that are in
19 the dotted red line and a new station. It will be the
20 first new system to tie extensively a large renewable
21 region to pump storage. We have a Castaic power plant.
22 It's a 1,250-megawatt pump-storage system. So you can
23 see there's a number of solar projects that are
24 currently in construction along this pathway or in
25 potential development. There are wind farms as well.

1 It goes through one of the most robust solar regions of
2 the United States, as well as the wind. So you have an
3 opportunity here to optimize how the water is delivered.
4 We now dispatch the water down those reservoirs when we
5 are not generating new electricity from the renewable
6 sources. And we are now able to -- or will be able
7 to -- put some of this renewable energy in the pump
8 storage when we don't need it in the city at that time.

9 I've got to close it up. But we provided some
10 recommendations for policy and planning based on our own
11 experience. We would echo many of the comments related
12 to data collection. We've done a joint study with UCLA
13 that will allow customers to see how they compare to all
14 their neighbors in usage. They don't get to see the
15 exact address, but they get to see their neighborhoods
16 and see how they compare. It's had incredible benefits
17 in savings as people have some peer pressure. But we've
18 provided a number of recommendations.

19 We do think there are still a number of
20 challenges out there. Some of the environmental
21 regulations in drought years have caused some great
22 grief. We currently put as much water on the Owens Dry
23 Lake to keep dust mitigation from occurring as the
24 entire City of San Francisco uses; and we do that
25 annually every single year. So there are things that

1 can be done and need to be done to look further at some
2 of those activities.

3 Thank you.

4 MS. WELSH: Thanks much.

5 Mr. Moyer. And there may be some seat changes
6 that need to take place here, if you don't mind. And
7 we'll get your PowerPoint set up here in a second.

8 Let me remind everybody, because I'm cutting
9 people off, that full presentations are on the Website,
10 www.energy.gov/qer.

11 MR. MOYER: Thank you. Thank you for having
12 me here this morning.

13 My name is Keegan Moyer. I'm the manager of
14 transmission-expansion planning at the Western
15 Electricity Coordinating Council. The Western
16 Electricity Coordinating Council, or WECC, has a role in
17 ensuring the reliability of the bulk electric system for
18 the western interconnection. The western
19 interconnection is essentially the high-voltage and
20 power grid covering the 14 western states, two Canadian
21 provinces, and the northern part of New Mexico [sic], an
22 area of approximately 1.5 million square miles.

23 WECC completes its reliability mission through
24 a number of functions. One of those functions is
25 transmission-expansion planning; and we leverage a

1 board-level committee known as TEPPC, which is the
2 transmission-expansion planning and policy committee.
3 TEPPC is a multifaceted stakeholder group that helps
4 guide our transmission-planning function at WECC, where
5 we focus on looking at very different but plausible
6 long-term 10- and 20-year scenarios and evaluating their
7 impact to the transmission system. So that process, of
8 course, creates a number of different documents and
9 data-sets that are used widely across the Western
10 electric industry. And given that we strive to
11 incorporate different driving factors within the
12 industry, we have some inherent interest in quantifying
13 and coordinating the impact of water into our planning
14 efforts.

15 As we've talked the last couple of hours, the
16 connection between water and electricity has been made
17 very clear, so there's little need for me to go into
18 that any further. But WECC's interest in this area is
19 unique from probably two perspectives, the first of
20 which is our regional focus. Again, I mention we're
21 focused on a sort of overall picture of the western
22 interconnection in that region. So I find that unique.

23 And also our focus on strictly the electric
24 reliability aspect of the water-energy nexus. So,
25 again, those two things sort of set us apart in terms of

1 how our perspective may differ from those offered by
2 other parties here today.

3 So what I'm going to talk about in the next
4 couple of minutes is some of our past experience, some
5 of the things we've done to incorporate water into our
6 planning efforts and things we're looking at going
7 forward. So our four main kind of areas of effort that
8 WECC is pursuing as it relates to connecting water and
9 energy are listed here.

10 The first one is around collaboration. Our
11 main partners for our efforts thus far has been the
12 Western Governors Association, the WGA. I mentioned
13 TEPPC and the diverse stakeholder group there; and then,
14 as of late, the Western States Water Council. It became
15 apparent to us early on that this topic is not one that
16 a roomful of transmission planners has the expertise or
17 the capability to address from the electric perspective.
18 We needed the input of a broader set and we're
19 attempting to gather that through our collaboration.

20 The next effort, which I'll talk more a little
21 bit here in a minute, is the evaluations of study cases.
22 WECC has a significant analytical foundation to build
23 from in this area. Specifically, we look at evaluating
24 and studying long-term drought scenarios and varying
25 hydro conditions. I'll talk about those in a minute, as

1 I mentioned.

2 The third area of effort is around the
3 development of long-term scenarios. So this is creating
4 a depiction of how a 10- or 20-year future might look
5 considering a number of different drivers within the
6 industry, water being one of them.

7 And our last area of efforts is the
8 application of research. Through a grant made available
9 to WECC from the Department of Energy, we've been able
10 to collaborate with a number of national labs to
11 incorporate water into our long-term
12 transmission-planning tools. And so I'll give an
13 example of that here in a minute as well.

14 So I mentioned some of the study work that
15 we've performed. Here's an example of some work we did
16 about a year and a half ago evaluating in the 2022 time
17 frame a 10-year study on the drought impacts for the
18 western interconnection. This study took into
19 consideration the impacts of higher temperature, a lack
20 of availability for generating from hydro resources, and
21 also a lack of cooling water for thermal units. And we
22 devised this scenario with significant input from Sandia
23 National Labs, Argonne National Labs, and made available
24 through federal funding. And you can see kind of the
25 basis for this analysis here was using water basins and

1 identifying which types of generation within those water
2 basins were hydro-generation; at-risk thermal generation
3 in terms of those resources could be at risk in terms of
4 the impact from the drought; and thermal generation that
5 was perceived to have a low risk. And so we took this
6 information in and incorporated it into our models and
7 studied this future scenario. And what we learned based
8 off this first iteration -- again, we're still learning
9 more about this -- is the impact from the lack of hydro
10 resources sort of masked any impact that we saw from the
11 lack of cooling water available for thermal resources.
12 The obvious driver here is that in some years the
13 Western Interconnection meets its load with about
14 25 percent from hydro resources. So that again was a
15 big driver of our study results.

16 The other area of our past work that I wanted
17 to show an example of today was the consideration of
18 water availability in our long-term planning exercises.
19 This work stemmed from Argonne National Lab and Sandia
20 National Lab working to identify the water basins and
21 the amount of water that would be available in those
22 basins in the 10-to-20-year time frame and the amount of
23 water use in those same basins by electricity
24 generation. And we were able to feed this into our
25 long-term planning-tool model. And it gave us the

1 ability to do our generation and transmission expansion
2 studies considering water as a constraint, meaning we
3 were not able to add a generation -- electric
4 generation -- beyond what was available in terms of the
5 water supply for those resources. So, again, some early
6 work in terms of WECC trying to focus on drawing a link
7 between how water could impact the future reliability of
8 the system.

9 Next steps for our group here is basically
10 based around coordination. And so you can see here a
11 large list of stakeholders that we're trying to draw
12 into our efforts. And our first effort, again, is going
13 to be focused on developing a plausible future scenario
14 that considers the different drivers associated with
15 climate change and water availability and developing
16 studies to feed into our long-term planning models.

17 So with that, my comments are submitted to the
18 Department of Energy. And I think I'd be happy to take
19 any questions once we conclude.

20 MS. WELSH: Thanks very much.

21 All right. So everyone can come back to the
22 table. And I'm having a hard time seeing who is next,
23 but I believe it's Mr. Schmitt. And welcome. The floor
24 is yours.

25 MR. SCHMITT: Thank you.

1 MS. WELSH: For only seven minutes. And I'll
2 be cracking the whip.

3 MR. SCHMITT: Thank you. I'm Eric Schmitt,
4 vice-president of operations for California ISO. And
5 we're responsible for balancing electricity supply and
6 demand in about 80 percent of California. We do that by
7 way of sort of security-constrained economic dispatch
8 model which is long for the optimized resource in the
9 market given transmission systems and a portfolio of
10 resources which includes -- certainly includes
11 hydroelectric.

12 So let me just give you a couple of numbers,
13 at least for our system. It's a long-standing really
14 historic relationship that California has enjoyed with
15 hydroelectric or energy and water. And in any given
16 year that contribution from hydroelectricity can be
17 between 12 and 15 percent of all the electricity that we
18 use and bring to the marketplace. Obviously, in drought
19 years those numbers can be lower. And there also can be
20 local considerations versus system considerations, so
21 those numbers are system-wide. But some 14,000
22 megawatts, about 400 hydroelectric plants of varying
23 sizes in the system. And Cal ISO dispatches about
24 60 percent of that, so that's -- if you do the math,
25 it's about 8,400 megawatts or so.

1 And the breakout is, with the four big
2 players, Pacific Gas & Electric has the most resources,
3 almost 5,000 -- and this is installed capacity or
4 potential -- about 5,000 megawatts. Southern California
5 Edison about 1,200, San Diego about 45 megawatts. And
6 then we heard from CDWR earlier and they have about
7 2,000 or so megawatts.

8 So those megawatts are available to us.
9 There's various types in terms of their characteristics.
10 The large reservoirs can give us longer run times on
11 hydro and some flexibility. Pump storage can give us
12 the maximum flexibility. You'll hear me use the word
13 "flexibility" quite a bit. I think that should be the
14 takeaway, because the portfolio of energy use, supply,
15 and consumption is changing dramatically. I'll talk
16 about that a little bit later.

17 But the need for resources that can start
18 quickly, that can ramp significantly is mounting; and
19 it's really at our doorstep. We're living those needs,
20 those characteristic needs. So hydro resources are more
21 valuable today than they've ever been from a pure energy
22 point of view.

23 We heard from, again, California Department of
24 Water as they talked about their aqueduct system. And I
25 just want to highlight that, because for decades, again,

1 it's provided us with this sort of flexibility. While
2 it consumes a lot of energy, it generates a lot of
3 energy. And there's multiple generation opportunities
4 across that 700 miles or so of aqueducts as it moves
5 water south and then up over the mountains 2,000 feet
6 and then of course into the southern part of California.
7 And it gives us an opportunity to really tune the system
8 realtime. Sometimes we need more supply. Sometimes we
9 need more demand. And that particular piece of
10 infrastructure has provided a lot of value in that
11 regard.

12 In emergency response these kinds of resources
13 prove to be critical. And indeed in our analysis we
14 build in assumptions about how these resources would
15 react if we need supply quickly or demand quickly. So
16 important resources.

17 Let me talk quickly about the drought. And
18 this is really a near-term perspective, not a five-year
19 or ten-year perspective. We're in a long-standing
20 drought. But for this year the bulk electric system in
21 California, we don't anticipate any reliability issues.
22 The drought does have an impact in our modeling. We've
23 de-rated hydroelectricity by about 1,300 megawatts in a
24 typical scenario. In an extreme scenario, which is what
25 we call a one in ten or a ten percent chance of extreme

1 weather conditions and so on, it's derated at about
2 1,600 or 1,700 megawatts. But even with that, our
3 reserve margins are adequate. One of the main reasons
4 for that is our renewable resources have increased
5 dramatically, particularly solar. And it's helped to
6 offset some of that hydro loss during this drought
7 period.

8 Again, flexibility. In many of the ideas
9 we've already heard, I think our grid -- and there's a
10 graphic in my handout you can take a look at -- we refer
11 to it these days as the "duck chart." And what the duck
12 chart does is it takes a typical, let's say, spring day
13 when our lows on the system are low. And it analyzes
14 net load conditions, so that, if you backed out the wind
15 that you would expect during that period and the solar
16 during that period, it gives you a load curve. The
17 message from that is we have very steep down-ramps in
18 the morning and very steep up-ramps in the afternoon,
19 because the sun comes up, we use that energy.

20 Conventional resources need to back off. They go into
21 sort of an idle load, if you will, and then they need to
22 ramp back up in the afternoon when the sun goes down.

23 So opportunities for flexibility as those
24 steep ramps get steeper and steeper are essential.
25 Hydro plays a role in that. Demand response plays a

1 role in that. Energy efficiency plays a role in that.
2 Renewables. So the mix in our peaking in our use of
3 resources is absolutely changing.

4 And so as the water folks begin to look at
5 either infrastructure improvements or mitigations or
6 even new infrastructure, they should absolutely consider
7 this changing profile.

8 The availability of electricity -- for the
9 first time in really the history of some of these hydro
10 plants they're actually pumping during the day. So they
11 were designed to pump at night when electricity was
12 plentiful and cheaper and then generate during the day
13 when we need the load. But under the changing profile
14 of our system, we actually have an opportunity for
15 over-gen situations where pumping with hydro resources
16 can help. So if you're designing or modifying a
17 water-treatment facility and you recognize these changes
18 in availability of energy, then you can design in
19 technologies and storage capabilities and flexibility in
20 your process to really capitalize on the availability
21 and cost of energy going forward.

22 So that's my key message. I'd be happy to
23 take any questions. Thank you.

24 MS. WELSH: Thank you very much.

25 Okay. Our next speaker is Mr. Livingston.

1 MR. COATE: Alex Coate.

2 MS. WELSH: Alex Coate. Okay. I'm sorry. I
3 cannot see the name plates, so I'm going by the agenda,
4 which is all messed up. So pardon me. I apologize.
5 Mr. Coate, please.

6 MR. COATE: No problem.

7 Well, thank you for the opportunity to address
8 this energy review task force. My name's Alex Coate and
9 I'm the general manager of the East Bay Municipal
10 Utility District. We're headquartered in Oakland, just
11 across the Bay. And we supply drinking water to 1.3
12 million residents in the East Bay and the greater parts
13 of Alameda and Contra Costa County; and we provide
14 wastewater-treatment services to 650,000 customers with
15 our wastewater-treatment plant at the foot of the Bay
16 Bridge.

17 We deliver an average of about
18 161 million gallons per day of water -- drinking
19 water -- to businesses and residents in the East Bay.
20 And, next to labor, energy is our highest cost. And
21 it's our highest cost even though we have a
22 well-designed system that optimizes the use of gravity
23 to move water from the Sierras to the East Bay. And
24 that system also has a very high-quality source of water
25 that allows us to sort of pass all the state and federal

1 drinking water regulations with some very low
2 energy-intensive treatment processes.

3 And across California the average amount of
4 electricity used to deliver a million gallons of water
5 is on the order of 7,000-kilowatt hours. And in normal
6 water years, East Bay MUD uses about 1,250-kilowatt
7 hours, or about 80 percent less than the average
8 California utility. Part of that is the way the system
9 is designed. It's gravity-fed all the way from the
10 Sierras to the Bay. And part of that is what I'm going
11 to talk about.

12 East Bay MUD's been focused on energy and
13 water issues and the nexus between those for many years
14 in order to do us right, which is to control costs and
15 to reduce the amount of new supplies that we need to
16 develop and in so doing meet our board's policies in the
17 areas of sustainability and energy. To minimize energy
18 use, we promote aggressively water conservation and
19 optimize our operations to conserve energy. Our board
20 adopted a water-conservation master plan. We started
21 doing that in the late '80s and we had a plan that went
22 to 2020. More recently we have a plan that guides our
23 conservation efforts to 2040. And the plan includes
24 both supply-side and demand-side measures. And on the
25 demand side, the measures improve water efficiency

1 through rebates and other incentives, education,
2 outreach, market support, and regulatory programs. We
3 also have long-standing partnerships with water-agency
4 peers and investor-owned utilities, such as PG&E to my
5 left. East Bay MUD's been involved in
6 water-energy-efficiency research, as you heard from
7 Dr. Loge; and program implementation at the consumer
8 level.

9 We try to make new development water-smart
10 from the start. We require new water-service customers
11 to meet rigorous indoor and outdoor water-efficiency
12 standards for plumbing fixtures, appliances, landscaping
13 and commercial operations. And our efforts address not
14 only conservation savings but energy-resource
15 efficiencies.

16 As Dr. Loge mentioned, we have a very
17 complicated system. It has five water-treatment plants
18 in the service area. Each one is capable of treating a
19 different quality of water. We have 4,200 miles of
20 water-distribution pipeline. That's enough to go all
21 the way from here to D.C. and then back to Chicago. We
22 have more than a 130 water-distribution pumping plants,
23 because there's a lot of topography in the area and some
24 steep hills, so we've got to move it up and let it go
25 down.

1 And so we optimize our operations to try to
2 minimize what it costs us to move that water around. We
3 try to use the lowest-cost water-treatment plants where
4 possible, meaning that we use Mokelumne supplies, which
5 are purer than local supplies which have local runoff to
6 the degree that we can. We shift our pump operations to
7 off-peak hours and we've been participating for a long
8 time in demand-response programs to get off the grid
9 when the cost and demand is high and get back on in the
10 off hours. And we have pumps of varying ages and
11 efficiency; and we try to use the most efficient ones
12 first. And, of course, we invest in energy-efficiency
13 improvements.

14 So there was some discussion earlier about
15 energy curves. We call it loading order for water
16 supplies. And while obviously we're driven to use the
17 lowest-cost supplies first to draw on conservation as
18 much as possible, discussion around dictated loading
19 orders, which would drive us or reduce the flexibility
20 that we have, need to be sensitive to the fact that we
21 have very complicated systems and not all our water can
22 even reach all the parts of our service area. And so
23 it's important to consider that we have site-specific,
24 geographically based constraints that need to address
25 water quality, reliability, the kind of infrastructure

1 that we have, and our operations.

2 We are working very hard to produce as much
3 renewable energy as we can. We have hydro, bio-gas
4 production at our wastewater facilities and solar power
5 production. We are producing hydro at a couple of
6 facilities up in the Sierras on our reservoirs; and
7 we've been doing that for about 80 years and we produce
8 about 185,000 megawatt hours of electricity annually,
9 which comes over a period of just three or four months
10 primarily. But in total that's more than all of the
11 power that we use to move the water over the course of a
12 year in the service area.

13 On the wastewater side of the house, we have a
14 fairly state-of-the-art facility where we collect all
15 sort of food wastes; and that allows us to generate more
16 than 55,000-megawatt hours of energy.

17 So in closing, I would say that there are
18 several areas we'd like to get the Department of Energy
19 to focus on -- advancing awareness, improving data
20 collection and metrics, promoting incentives for
21 water-energy efficiency programs, and expanding public
22 funding for public and private partnerships. And in
23 particular -- and I think maybe Mr. Herberg will be able
24 to talk about it -- we'd like to see investments in
25 wastewater treatment methods and technologies.

1 Wastewater has the opportunity to -- it's the end of the
2 hydrologic cycle and it has the opportunity to generate
3 a fair amount of energy to contribute to the grid.

4 So thank you again for allowing me to share
5 our experiences.

6 MS. WELSH: Thank you.

7 Now, Mr. Livingston.

8 MR. LIVINGSTON: Good morning. Thank you for
9 the opportunity to address the task force. My name is
10 Randy Livingston. I'm vice-president of power
11 generation for Pacific Gas & Electric. And I'm an East
12 Bay MUD customer.

13 PG&E is one of the largest combined natural
14 gas and electric utilities in the country. We're
15 headquartered here in San Francisco and we provide
16 natural gas and electric service to approximately
17 15 million people through a 70,000-square-mile service
18 area. We also own and operate the nation's largest
19 investor-owned hydroelectric system, covering 17 river
20 basins stretching over 500 miles.

21 Along with our hydro system, we have a series
22 of modern, efficient combined-cycle and
23 reciprocating-engine plants to support customers. And
24 those are all air-cooled facilities so they use about
25 three percent of the amount of water that a more

1 conventional plant would use.

2 So we have pretty firsthand knowledge. We
3 have hydro systems that's been around for, in many
4 cases, a hundred years and has experienced many of the
5 droughts of the past, some worse than what's happening
6 now. Also experienced some very robust years of
7 rainfall and been able to try and operate and still
8 provide customers through that.

9 So really nowhere is the energy-water nexus
10 kind of more realized than inside of a hydro plant where
11 the -- you might call it the water-energy-gravity nexus
12 that really happens within there. But it's, I think, an
13 important part of the overall consideration of what the
14 task force is looking at.

15 Roughly three percent of this nation's dams
16 have hydroelectric production on them. I think there's
17 great opportunity to look at how the energy that falling
18 water is used and really look at opportunities for
19 smaller hydro on some of the conveyance and other
20 facilities to capture some additional energy.

21 I think part of what needs to be looked at
22 that is how that licensing of those facilities and the
23 permitting of those facilities goes forward in a way
24 that both addresses the environmental needs but also is
25 not such an impediment to entry that facilities cannot

1 be built because of the high cost versus the smaller
2 plants.

3 As I think about the water-energy nexus in
4 our -- in the western states in the '30s through the
5 '50s, the whole grid was interconnected in a way that
6 electrons now flow generally from their point of
7 production to their point of use in the most direct path
8 they see. And certainly not so with water in this
9 state. We pump water from all the way -- or bring water
10 all the way -- from the very north to the very southern
11 part of the state. In the Bay Area we see the east-west
12 and we even flow water all the way up the San Joaquin
13 only to pump it back to the same place where it came
14 from. So trying to think of the efficiency of water use
15 and finding ways to better integrate savings. It's
16 very -- as was pointed out -- very heavily dependent
17 upon where you are in the state for the potential water
18 and energy savings that you're going to get. And I
19 think that programs that are designed need to look at
20 that.

21 I think within the electric industry for the
22 investor-owned utilities in this state, the California
23 Public Utility Commission, as we're looking at improving
24 energy efficiency, had the foresight to de-link returns
25 from overall production or overall consumptive use. And

1 I think that's one of the struggles, that a lot of these
2 systems are fixed-cost heavy. Consumption is fixed-cost
3 heavy. And having rates that are all based on
4 incremental use creates a challenge in terms of
5 incenting conservation in the way that it's happened in
6 the electric industry.

7 I think there's been many points that are
8 covered that I all agree with completely. I think some
9 of the things that the task force may want to consider
10 as we look at the western system is a very high
11 percentage in certain years of our total storage for
12 water comes in snow and really understanding the impacts
13 of climate change and snowpack as it affects
14 water-supply issues. Certainly within the hydro
15 systems, they're not consumptive use. They do, though,
16 feed at different gravity elevations, consumptive
17 end-users in many cases with our hydro systems that
18 provide the flexibility that Eric was talking about.
19 Those are higher on the hill and generally feeding the
20 large state and federal rim dams that are the primary
21 source of consumptive use in the state; and we need to
22 understand the interrelations. Storage in, for
23 instance, PG&E's system, our total storage of the entire
24 hydro system that we have would really fit completely in
25 New Melones reservoir. So overall water storage is

1 relatively small. The total useable storage is actually
2 much less.

3 I think just a couple of other things is, you
4 know, just in the western states, endangered species --
5 salmon, steelhead, delta smelt -- all have a big impact
6 on the energy-water nexus and how we look going forward.

7 So thank you for the opportunity to address
8 the task force.

9 MS. WELSH: Thank you.

10 Mr. Herberg.

11 MR. HERBERG: Thank you. I'm Jim Herberg, the
12 general manager of the Orange County Sanitation
13 District. And I'm thankful for the opportunity to
14 participate today.

15 A little bit about our agency, the Orange
16 County Sanitation District. We operate regional
17 wastewater collection and treatment facilities serving
18 two and a half million people in central and northern
19 Orange County. When we talk about treatment plants,
20 today in our industry we call them
21 water-resource-recovery facilities, which I think is
22 much more accurate to describe what we do. At our
23 facilities we really produce three products. We produce
24 clean water for recycling. We produce energy. And we
25 produce biosolids for agriculture.

1 We generate about 11 megawatts of electrical
2 power. That's enough to meet two-thirds of the needs of
3 our treatment plants' energy demand. We also have a
4 project going on right now that's just closing off.
5 It's a three-year pilot project. It's a public-private
6 partnership with help from the Department of Energy,
7 FuelCell Energy, the National Fuel Cell Research Center,
8 Air Products Corporation, the California Air Resources
9 Board, where we are generating hydrogen fuel from the
10 bio-gas in our treatment plant, actually fueling hydro
11 vehicles. We have a fuel dispenser at our plant. We're
12 near a freeway. And that has been a successful pilot
13 project that is just winding down right now.

14 Also, on the water side, in partnership with
15 the Orange County Water District, we're currently
16 recycling 70 million gallons of purified water per day
17 to replenish our groundwater aquifer. And this is
18 enough new water to meet the needs of a population of
19 over 600,000 people.

20 Biosolids. That is beneficially reused as
21 well by conversion to compost and for land application.
22 And when you land-apply with biosolids, you reduce the
23 use of water for crops that are needed and increase the
24 production by over 30 percent. Again, the term
25 "water-resource-recovery facility," I think, is more

1 accurate than "sewage-treatment plant."

2 How can we fit in to help the goals of the
3 State of California and the nation? Well, wastewater
4 utilities produce renewable energy that can help meet
5 climate-change goals. The wastewater community through
6 its statewide association of California, the California
7 Association of Sanitation Agencies, has actively engaged
8 its partners within the state to fulfill some of the
9 goals to mitigate climate-change impacts. Providing
10 33 percent of the state's energy needs from renewable
11 sources, reducing carbon-dioxide-equivalent emissions to
12 1990 levels, reducing carbon intensity of transportation
13 fuel used in the state by 10 percent, and recycling
14 75 percent of solid waste generated in the state are all
15 things that we can work toward in the wastewater
16 industry. Most of our wastewater-treatment plants use
17 the anaerobic-digestion process which produces
18 bio-methane, as I mentioned earlier. The majority of
19 the wastewater-resource-recovery facilities generate
20 between 40 and 70 percent of their energy needs on-site
21 from this.

22 Alex mentioned the East Bay Municipal Utility
23 District's process, where they're actually bringing in
24 waste -- organic waste -- and adding them to the
25 digestors. That generates even more greenpower as well.

1 It can also -- in addition to the hydrogen
2 example that I gave, the methane produced in the
3 anaerobic digestion process, or at least a portion of it
4 can be converted to a low-carbon intensity
5 transportation fuel.

6 In California, there is a problem though that
7 has come up where some of the smaller plants are
8 required to meet the same stringent air-emissions
9 standards in the South Coast Air Basin in Southern
10 California as the larger plants. These controls are
11 expensive, especially for small and medium-size
12 facilities. And there's a concern that some of these
13 smaller plants might forego generating power with their
14 bio-methane and have to flare it off because of the
15 expense of meeting those requirements. I think this is
16 a place where a grant funding would be an opportunity to
17 help with that.

18 Water recycling can save energy and help
19 reduce greenhouse-gas emissions. In California we've
20 heard that there's an estimate that 20 percent of the
21 state's electricity demand is used for the transport,
22 treatment, recycling, heating, consumption, and disposal
23 of water supplies. Water recycling can reduce this
24 demand, as we've illustrated with the
25 groundwater-replenishment system in Orange County. The

1 production of water -- recycled water -- that goes
2 through microfiltration, reverse osmosis, and
3 ultraviolet light treatment only requires about 1,500
4 kilowatts per acre foot of produced water. Now, when
5 you look at Southern California, that's contrasted with
6 3,000 kilowatt hours per acre-foot of water to move
7 water from the State Water Project down to Southern
8 California. So it's actually less energy-intensive than
9 importing water.

10 And, finally, biosolids usage can help
11 mitigate climate change. We use it in agricultural and
12 horticultural settings. And by avoiding the use of
13 fossil-fuel-intensive inorganic fertilizer, roughly
14 about a quarter of a gallon of fossil fuels required to
15 produce a pound of inorganic nitrogen fertilizer. When
16 we use biosolids, we offset that need.

17 And, finally, in closing, if we've learned
18 anything from our varied efforts here to leverage the
19 embedded energy and resources in water and
20 wastewater-treatment processes, it's the partnerships
21 that matter. We couldn't have done what we did with the
22 hydrogen fueling station without the technical and
23 financial collaboration of the federal government and
24 the private sector. Similarly, our partner agency, the
25 Orange County Water District, was successful moving

1 forward with the country's most advanced water-recycling
2 program with significant support from the U.S. Bureau of
3 Reclamation. All of our shared experiences show that
4 the federal government must address energy and water
5 nexus through meaningful collaboration among federal and
6 local agencies; and we stand by ready to help.

7 MS. WELSH: Terrific. Thanks.

8 I'm going to let Dr. Holdren ask the first
9 question.

10 DR. HOLDREN: Well, thank you.

11 This was certainly a set of presentations from
12 people who know something about the on-the-ground
13 realities of infrastructure in both the energy and the
14 water domains and in many cases their interactions.
15 Again, I took a lot of notes.

16 The single question I'd like to ask is
17 everybody's been emphasizing the importance of
18 partnerships. That was a theme in the previous panel.
19 It's been a theme in this one. I'd be interested in
20 your thoughts about what single thing the federal
21 government could do to be a better partner for you in
22 the energy and water space. One -- one thought each for
23 what we could do from the federal government side to be
24 more useful and effective for you as a partner. Just
25 run down the table, starting at the end.

1 MR. HERBERG: One thought would be to continue
2 funding with the WaterSmart program.

3 DR. HOLDREN: Okay.

4 MR. LIVINGSTON: Continue funding the
5 hydropower research program in DOE.

6 MR. COATE: Continue investing in research
7 and, in particular, research in new anaerobic digestion
8 techniques.

9 MR. SCHMITT: I think technology initiatives
10 are very important.

11 MR. MOYER: I think, again, on the funding
12 line, focused on the national labs and their unique
13 position, I think, to analyze both water and energy
14 issues.

15 MR. HOWARD: I'm going to agree with everybody
16 there, but I would say put the resources on some of the
17 permitting aspects. We still struggle with the
18 timelines related to the federal permitting to support
19 some of the efforts in trying to get this nexus moving
20 forward.

21 DR. LOGE: And I'd say increase focus on
22 information technology within the WaterSmart program.

23 DR. HOLDREN: Terrific. It was great. Thank
24 you very much.

25 MS. WELSH: Let's continue along that, 'cause

1 I'm wanting more from you. You all were invited here
2 because you're the innovative-solution guys on the
3 ground. Several of you talked about incentives. And
4 the task force would like to look at what kind of market
5 or financial or other incentives would help shape the
6 energy-water nexus to bring us to the innovative
7 solutions that we need to get to.

8 So do any of you have comments on what the
9 appropriate incentives should be from the federal
10 government in this space?

11 Dr. Loge.

12 DR. LOGE: I'll start. You know, I don't
13 really -- I don't think there should be incentives. I
14 think there's a strong enough business case for having
15 companies either start up or refocus their current
16 efforts or have startup companies start focusing in this
17 space. I think the big challenge is making the
18 information available to these entities so they
19 understand what the business case is.

20 And someone said in the prior panel you can't
21 manage what you don't understand. I completely agree
22 with that. Right now we have a tremendous amount of
23 data, but we don't understand what it means. I mean
24 businesses don't understand what that data means, such
25 that they can't then invest in this market.

1 MR. COATE: I'd say we regularly evaluate
2 renewable and alternative energy approaches -- ways to
3 save energy. And, you know, we do a business analysis.
4 We look at a 20-year life-cycle cost. And there are
5 lots of things out there like in-conduit hydro, other
6 things, where it doesn't pay back in 20 years, but it
7 makes sense to do. So it would be helpful if the
8 federal government were providing incentives that help
9 us bite down and get into those things. And in so doing
10 that provides experiential basis for improving those
11 systems and maybe bringing the cost down over the course
12 of time.

13 MR. LIVINGSTON: If I was to -- I would agree
14 that I don't think incentives are necessarily the right
15 way to get to the end point we want. We want these
16 technologies to stand up on their own. But this is a
17 very heavy permitting and up-front cost business, both
18 water and energy. And trying to find ways to have some
19 of the small developments be able to make it through
20 that process and to be able to interconnect to any local
21 distribution or transmission in a more facilitated,
22 quicker process, especially the early adopters, I think
23 would be a faster, better, cheaper way of getting there.
24 Obviously, we need to, through that whole process,
25 preserve the important environmental reviews that go

1 through that, but do that in a way that can help
2 streamline for some of the early adopters.

3 MR. HOWARD: I think one of the things that we
4 have determined is some of the energy produced from
5 hydroelectric facilities is no longer as valuable as it
6 used to be, but the capacity is extremely valuable,
7 meaning to ability to back up as we're moving to this
8 greater renewables world in meeting our reliability
9 requirements, having that hydro capacity. I think the
10 Department of Energy really could assist, instead of
11 financial incentives, some of the incentives they could
12 offer related to their hydro facilities to support more
13 of the efforts to back up the intermittency issues would
14 provide significant value and help us transform more of
15 our resources into renewables if we had that ability.

16 MS. WELSH: Okay. So I asked this of the
17 second [sic] panel. And I'm going to ask it of you all
18 as well. The task force is grappling with what their
19 role should be in this, because so much of this is state
20 and locally driven. What is your one recommendation to
21 the QER task force on what the federal government's role
22 should be in the energy-water nexus that we haven't
23 already talked about?

24 So I'll start here and -- Dr. Loge. And then
25 we'll go down the table. What's your one

1 recommendation?

2 DR. LOGE: I sound like a broken record, but I
3 really do feel strongly about this. It's to help
4 initiate the integration of water and energy data
5 together so that then all sorts of thing can happen,
6 many of which we probably don't even understand right
7 now because it hasn't been done. But once that -- once
8 that information gets integrated together, I think, you
9 know, the business case will be made for many, many
10 activities in this sector. And it could be driven
11 largely by state, local governments and the private
12 sector in partnership with these entities.

13 MS. WELSH: So are you -- just to dig a little
14 deeper -- are you recommending R&D into data analytics?
15 Are you recommending funding to academia to do the data?
16 What specifically when you say "integrating data"?

17 DR. LOGE: So I think much, if not all, of the
18 IT infrastructure and architecture exists to already do
19 this. I think what the big -- right now water utilities
20 energy utilities don't understand how to integrate their
21 data together very well; and they don't understand the
22 value of doing that. So I think -- I think anything you
23 could do to help them initiate that conversation --

24 MS. WELSH: Okay. Thank you.

25 DR. LOGE: -- and that's why I keep coming

1 back to the WaterSmart program. One way to help
2 initiate that is if you offset the cost by 50 percent
3 and then they each come to the table with 25 percent of
4 the overall cost. Now suddenly you're -- at least, I'm
5 assuming that you're developing more of a case for water
6 and energy utilities to start to work together. I think
7 once they start doing that, they will understand the
8 value of continuing do that.

9 MS. WELSH: Thank you. Thank you.

10 Mr. Howard.

11 MR. HOWARD: So I'm going to go back to, I
12 think, the federal facilities, the power-generation
13 facilities of the federal government and just the
14 integration to work with the other utilities on more of
15 this energy-water nexus and especially those hydro
16 facilities that are available through the federal
17 government.

18 MS. WELSH: So you're referring specifically
19 to the power-marketing administrations? Yeah. Okay.

20 MR. MOYER: I suppose my recommendation --
21 we've heard the need for data and remote sensing --
22 these things. Mine's going to be slightly different.
23 My recommendation for the role of the federal government
24 to play in supporting this issue in the West is around
25 providing a forum, or at least the financial support for

1 others to provide a forum, to bring the appropriate
2 parties together from both the electric and water
3 perspectives, because frankly right now there isn't a
4 place where that's supported. And I'm not just talking
5 about the electric utilities and the municipalities.
6 There's the tribes, the nongovernmental organizations,
7 those that need support in order to participate. We've
8 had success at WECC in doing that in transmission
9 planning, giving people a seat at the table that don't
10 typically get one, and I think there's an opportunity to
11 have that when you talk about the water-energy nexus as
12 well.

13 MS. WELSH: I know that the Department of
14 Energy is quite sensitive to bringing opportunities for
15 those who can't afford it and have done it in many other
16 forums, so we'll make sure they hear.

17 MR. SCHMITT: My thoughts center on renewables
18 integration. And most of you know that in California we
19 have a 33-percent RPS requirement by 2020. We're well
20 on our way to that. We'll absolutely make a 33 percent
21 renewables penetration. In fact, on some spring days
22 we've seen north of 30 percent renewables penetration.
23 Now, that's not on average.

24 So I say that again because the business is
25 changing, right? The electric business is changing.

1 And renewables penetration is one of the main factors
2 changing it. But demand-response, energy, efficiency,
3 storage -- all those things together -- require all of
4 us -- the federal government, the state agencies to
5 understand this shift. So to the extent that there's
6 silos either in regulatory space or policy space between
7 water and electricity, we need to at a minimum
8 appreciate the shift. Business as usual for the last
9 hundred years is over. It's over in the electric space.
10 And so that's going to drive things in a way that we've
11 never seen before. So that's what I would suggest that
12 we do.

13 MS. WELSH: Excellent.

14 Mr. Coate.

15 MR. COATE: So this is going to sound rather
16 simple. But I think an area that the government can
17 assist in is to really advance awareness of the
18 water-energy nexus at all levels. We're pretty well
19 aware of it here in this room. But our surveys indicate
20 that many of our customers don't even know where their
21 water comes from. They take infrastructure and
22 utilities for granted. And so to the degree that the
23 federal government can bring, as others have suggested,
24 the right people to the table, they also need to help
25 everybody understand that this is an important area that

1 we ought to be paying attention to.

2 So thank you.

3 MS. WELSH: I think my colleagues would agree
4 that one of the roles of federal government is their
5 convening power. And so we take that to heart and we'll
6 take it back to the right folks.

7 DR. HOLDREN: Great.

8 MR. LIVINGSTON: I agree that a lot of this
9 issue is heavy in the state and local jurisdiction or
10 use. But I think in participating on things like some
11 of the DOE peer-review forums, I think the federal
12 government can bring together the different federal
13 agencies that have a very targeted role in all this to
14 help look at a bigger role that they together can impact
15 often. Certain agencies might be a single-resource
16 look. And none of these issues are single-resource
17 look. And the more that they can bring together, how
18 can we get hydropower production off of the Corps or
19 Bureau of Rec dam that might not exist? Or how can we
20 look at the release of water from a facility in terms of
21 how it can help the issues Eric's talking about? As far
22 as cycling and not just a pressure-reduction valve on
23 the back end of the facility, we can really enhance that
24 view of the world and probably break through some of the
25 problems.

1 MS. WELSH: Well, and not to toot our own
2 horn, but this QER process involves about 14 to 15
3 federal agencies. So hopefully we're doing that within
4 this process, at least partially.

5 DR. HOLDREN: Excellent.

6 MR. HERBERG: I was going to talk about
7 breaking down silos, but I would be the third person to
8 do that. So short of that, I'll say that, you know, for
9 utility -- and a local utility in particular -- there's
10 a lot of new technology coming up in the area of solids
11 treatment or digestion and the ability to extract energy
12 in different ways. And with a lot of new technologies
13 coming out, it's a big risk for a local agency to take
14 something on that's not fully proven. So to the extent
15 that the federal government can help partner with us and
16 build partnerships to spread some of that risk around to
17 provide some funding, we would be more willing to try
18 new technologies.

19 MS. WELSH: Terrific.

20 Thank you all. Let me turn it over to close
21 our session and maybe ask a final question to
22 Dr. Holdren.

23 DR. HOLDREN: Well, thank you. I do have sort
24 of a combination of a question and a comment. The QER
25 has, as one of its major focuses in this year where it's

1 looking at infrastructure, the question of how climate
2 change is impacting and will continue to impact going
3 forward our various energy infrastructures and related
4 infrastructures. And that is also, of course, a theme
5 of a separate interagency council which I co-chair with
6 the CEQ chair and the head of Homeland Security and the
7 National Security Council, which is the Interagency
8 Council on Climate Change Preparedness and Resilience.

9 I'm just wondering to what extent you folks in
10 your responsibilities are already looking explicitly at
11 the ways in which climate change is influencing or is
12 likely to influence your operation and your
13 infrastructure going forward. And to what extent, given
14 that you're already doing some of that, are you also
15 engaged with each other in sharing notes and sharing
16 best practices and how to address that particular
17 challenge?

18 MR. HERBERG: I know that in the wastewater
19 industry there already are groups together talking about
20 climate change and the impacts. And just to tell you
21 about three ones that come to mind real quickly is a lot
22 of us have facilities in coastal areas, low-lying areas
23 that -- critical infrastructure near sea level.
24 Obviously, sea-level rise is a concern.

25 With change in climate, if we have stronger

1 storms over shorter periods of time, higher intensity
2 but less frequent on water and wastewater area flooding
3 and being inundated with water during these short
4 high-intensity storms is something that we're looking at
5 as well.

6 And if we have a really hot summer this year
7 with low reservoir levels we'll be monitoring the Cal
8 ISO Website very closely because we need the power.

9 MR. COATE: And a from a water agency
10 perspective in California in this dry year, I can say
11 that we've been engaged in climate change, as it's
12 critically important to us to understand it for many
13 years now. And we're obviously that it impacts
14 snowpack. It impacts demand. And the sea-level rise
15 impacts the low-lying facilities; and it also impacts
16 facilities in the Delta that are critical to moving
17 water from east to west. So we've done lots of work to
18 try to increase our reliability, but -- and we are
19 participating at the federal level as well. But
20 additional efforts in those areas to help us understand
21 the impacts on hydro generation would definitely be
22 helpful.

23 MR. LIVINGSTON: Certainly -- certainly within
24 our organization we're continuing to look at climate
25 change, its impact on hydroelectric production, and so

1 on. We have -- we have a system, fortunately, that's
2 designed for pretty big annual variability. So for some
3 time to come, while there's a directional change that we
4 definitely see, the change is within our normal --
5 within the seasonal variability. I think it's also,
6 just in terms of what we look at in terms of snow versus
7 rainfall versus storage, the storage of water is
8 something that is going to become increasingly
9 important.

10 MR. SCHMITT: While I mentioned earlier that,
11 at least in the near term, the drought is not having
12 significant impacts on supply, there's one area in our
13 business that is very acute. And that is around fires,
14 especially here in California, and the threat that those
15 fires have on transmission systems. So without regard
16 for our reserve calculations and analysis and so on, we
17 all know that it's an ever-present danger. They can
18 flare up quickly and they can cause problems on the
19 system. So, indeed, these conditions are a consequence
20 of climate change. And they are with us today in real
21 time.

22 MR. MOYER: At WECC we're sort of organized to
23 evaluate and study and develop climate-change-oriented
24 scenarios sort of based on two different perspectives,
25 at least the way that I see it. It's the direct impacts

1 from climate change. Those are those drought-type
2 scenarios that may influence weather. And we're putting
3 together the tools and models to look at those. But
4 then there's also the sort of policy impacts, those
5 policies being driven to thwart climate change and
6 evaluate in those policies as well. So we kind of see
7 it as the direct impacts and the indirect impacts of
8 that issue and the need to study both of them.

9 MR. HOWARD: So I think being in California,
10 the state has done a good job coordinating with many of
11 the utilities. I would echo some of our greater
12 concerns with fire during climate-change conditions.
13 We've looked at that. We're changing what might our
14 reserves need to be to keep our system backed up because
15 of the contingencies related to a transmission-line-type
16 outage. Because of fires, we're making substantial
17 capital investment in more reclaimed-type activities to
18 ensure that we're capturing as much water as possible
19 that does fall and reusing that water and then looking
20 aggressively at how we can do storage, because we're
21 seeing those impacts of the storms will be of greater
22 intensity, maybe less frequency. We need to capture it
23 when we can and make sure that we have a place to store
24 it going forward, so we have been putting together
25 integrated plans to do so.

1 DR. LOGE: I don't run a utility, so I can't
2 answer your question from that perspective. But very
3 broadly speaking, the California Water Plan updates that
4 the State of California puts out every five years, they
5 are based on data that they collect from water
6 utilities. And then California Department of Water
7 Resources in turn uses that update to do strategic
8 water-resources planning within the State of California.
9 If you talk to people who are part of that process --
10 and, again, I don't work for DWR -- I'm not speaking for
11 them, but this is the impression I get -- is that the
12 quality of data is -- it could be improved greatly. And
13 if the data were improved, it would help California DWR
14 make more strategic plans for water-resources management
15 in the State of California.

16 So drought -- you know, it's the ups and downs
17 and the peaks are getting more pronounced with climate
18 change. But with better data, they can do better
19 strategic planning to anticipate what's going to happen
20 with those peaks.

21 DR. HOLDREN: Great. Well, thank you very
22 much. It's been a very informative panel.

23 One further plea I would make. I think going
24 forward, all the way across the country, our states and
25 our cities are going to need increasing analytical help

1 in thinking about how to address the wider problems of
2 infrastructure and climate change that they're going to
3 be facing. I think, for example, when you look at the
4 new EPA-proposed regulations for existing power plants,
5 there's a large amount of flexibility for states to
6 figure out how they're going to deal with that. There
7 are a number of different ingredients that can be
8 brought to bear. This is a plea from me for your
9 engagement, all of you, with the state planners who will
10 be figuring out how California can best do that.

11 My sense is that California is ahead of most
12 other states in the degree of engagement that already
13 exists between the folks who run the energy and water
14 infrastructure and the state authorities. But I would
15 just urge you to continue to be attentive to that
16 interaction to that particular partnership. And I would
17 say that, with respect to cities, what we know and what
18 we emphasize in the national climate assessment and in
19 the climate action plan is that measures for
20 preparedness and resilience and adaptation mostly take
21 place at the local level because impacts are by their
22 nature local and diverse across different localities.

23 And, again, I think our cities, our mayors,
24 our city planners are going to need all the help they
25 can get going forward from entities like yours. So,

1 again, I would just urge you to continue to do even more
2 of what I know you've already been doing, which is to
3 interact very closely with city officials as well.

4 MS. WELSH: So with that, let's give this
5 panel a great big round of applause.

6 [Pause]

7 MS. WELSH: Well, now we come to the important
8 part of the meeting; and that is hearing from the
9 public. As I reiterated several times today, the QER
10 task force led by the White House and DOE as the
11 executive secretariat is extremely interested in hearing
12 from individuals and organizations.

13 We only have three people who signed up to
14 speak today, unfortunately. But I want to encourage
15 everyone who is in the room and who is watching us by
16 live stream to submit written comments. We do read
17 every single one of them. They are assessed and
18 considered and will be part of the analysis that goes
19 into this first year's report.

20 But for today I want to ask our first speaker
21 Juana -- am I pronouncing your name right -- Tietze.

22 Juana, are you here? Okay.

23 We will move on. That person did not wait
24 till the end.

25 Walter Robinson.

1 MR. ROBINSON: Thank you. Thank you for this
2 opportunity for letting me speak on this environmental
3 issue. I come from one of the stakeholders that you're
4 probably surprised that I'm here. And I'm with the
5 Laborers International Union of North America, which
6 I'll refer to as LIUNA moving forward.

7 And along with building and highway
8 construction, our core work includes energy and the
9 water sector. Our members work in conveyance and
10 treatment of water as well as the building of
11 water-management systems. They also work on all facets
12 of energy infrastructure from oil, natural gas
13 pipelines, nuclear and renewable energies.

14 LIUNA's interest in water and energy includes
15 alternative water-source projects, including
16 desalination plants. Here in California there's one in
17 construction in Carlsbad and one that may be on the way
18 in Huntington Beach.

19 With the ongoing drought and climate change,
20 fresh water has become a precious commodity. Conserving
21 water is important, but converting salt water and
22 reusing water are also essential to continue provisions
23 of the water supply, even our energy production. Plus,
24 renewable energies can be used for salt-water
25 desalination, either by producing thermal energy

1 required to drive the phased-change process or producing
2 electricity required to drive the membrane process.

3 As for renewable energy projects, LIUNA
4 members recently played an essential part in the Orchard
5 Solar Forum Project in Imperial County. The Imperial
6 County project -- the solar project -- Imperial
7 Irrigation District now receives the energy's off-take.

8 We also benefit from hydropower both in
9 construction and in the maintenance process. But due to
10 the drought, less water may be available to generate
11 hydroelectricity. LIUNA, therefore, understands the
12 interdependency of energy and water on practical levels.

13 Further, we are acutely aware of additional
14 impact climate change and other competing demands is
15 having, increasingly limiting our resources. While we
16 anticipate continued priorities and varied approaches to
17 addressing the water-energy nexus issues going forward,
18 we would like to make it clear our need for a commitment
19 to the allocation of water and energy infrastructure
20 funds necessary to effectively resolve its issues.
21 Specifically, private partner. We recognize and are
22 receptive to the growing role of private financing --
23 specifically, private/public partnerships and providing
24 additional funding for much-needed projects. When
25 structured properly, they can be very beneficial. With

1 members in both energy and in the water sector, LIUNA
2 clearly has a stake in this nation's continued ability
3 to provide clean, affordable energy and water. We
4 believe our skilled workforce and our commitment to this
5 country's infrastructure needs are part of the solution
6 and ensure the success of our nation.

7 I thank you for the time.

8 MS. WELSH: Thank you.

9 James Farrow, your five minutes, please.

10 MR. FARROW: Good afternoon. Yeah. Thank so
11 much for the opportunity. My name is James Farrow. I'm
12 with The Energy Coalition. I just wanted to say thank
13 you for being here and for putting this together. I
14 appreciate the efforts on behalf of the Department of
15 Energy to hold this Quadrennial Energy Review. And
16 while I wasn't exactly familiar with what the process
17 for the energy review was going forward, I was sort of
18 notified of this recently of this meeting. So I will
19 provide formal written comments on behalf of my
20 organization as well as the Southern California Regional
21 Energy Network --

22 MS. WELSH: Great.

23 MR. FARROW: I work on behalf of the water and
24 wastewater agencies in Southern California to help them
25 with energy projects. At the same time I do work on the

1 water-energy nexus trying to identify the embedded
2 energy in our water supply and how water-efficiency
3 measures can actually result in energy efficiency.

4 A couple of comments I wanted to make today
5 based on the conversation we had, was that I do believe,
6 like many folks from Orange County Sanitation District
7 and East Bay MUD have demonstrated, some of these larger
8 agencies are very capable of reducing their energy
9 demand through a long-term process. The other, smaller
10 agencies out there just physically do not have the
11 capacity or the technical expertise to really approach
12 energy management as these two exemplary agencies have
13 over the past decades.

14 So I would encourage the Department of Energy
15 to really focus on training for an energy curriculum, if
16 you will, for training of the water and wastewater
17 operators. Really think about making energy integral
18 into what they are learning as they go through their
19 career advancement developing skills to operate our
20 complicated wastewater facilities, or water-treatment
21 facilities.

22 At the same time I think we need to really
23 focus on bringing new technologies from other sectors
24 into the water and wastewater space. These plants that
25 I work with, specifically in Southern California, were

1 designed in the 1970s and operate much the same -- many
2 of them operate much the same -- as when they were
3 designed. The technological advancements in other
4 sectors are available to the wastewater facilities and
5 water agencies.

6 Finally, I think there's not quite enough
7 emphasis on stormwater management and how we as a
8 society could look at stormwater as a resource to help
9 reduce our reliance on other sources of water, at the
10 same time to reduce energy demand in groundwater
11 pumping. A lot more to come on that from my behalf.

12 And I think the only other thing that wasn't
13 really mentioned today was the food nexus here to the
14 water-energy-carbon nexus. We do export lots and lots
15 of food; and essentially it's virtual water marketing
16 where we're exporting our water resources in many cases
17 that don't make economic sense if we look at it
18 holistically as a country and as a state in California.

19 So I just want to say one final piece. I
20 would encourage the Department of Energy to extend
21 funding for the Industrial Assessment Center. I find
22 the partnership that has been helped -- I've been helped
23 to form this partnership through my colleagues at the
24 EPA Region 9, who have helped me to work with the IAC to
25 do -- to fund some of the audits with the water agencies

1 that I'm working with. I think that kind of partnership
2 right there needs to really be extended and just should
3 be commended for building that kind of program that
4 water agencies can take advantage of. So thank you for
5 that, folks.

6 Appreciate your time and good luck.

7 MS. WELSH: We look forward to receiving your
8 written comments as well.

9 Judith Iklé.

10 MS. IKLÉ: Hello. I'm Judith Iklé and I work
11 for the California Public Utilities Commission. And I
12 also didn't prepare remarks on behalf of my
13 organization. Of course, Commissioner Sandoval
14 participated; and we may, you know, submit something
15 else in the future.

16 I just wanted to talk in terms of our
17 experience working with DOE on the smart grid. DOE
18 actually reached out through NARUC to provide grants to
19 public utilities commissions to help them deal with the
20 additional workload associated with the smart grid under
21 ARRA. Our grant was started in 2009. And, of course,
22 all of these ARRA grants are ending as well as the work
23 at TEPPC that was also ARRA-funded.

24 So in terms of considering whether in order to
25 draw in the utility commissions, which in our case we

1 regulate most of the energy production in this state --
2 over 80 percent of the energy consumers' electricity,
3 but also 14 percent of the private water companies --
4 whether you can consider providing support to public
5 utilities commissions who are going to take on this
6 additional work and break down our silos and that sort
7 of thing.

8 Just in terms of some reaction to what I heard
9 today in terms of analytical questions for us relying --
10 in terms of looking at renewables, the question of
11 geothermal and its impact on water is something that we
12 would love some analytical support on in terms of
13 fact-finding when we consider these projects. The role
14 of our agency is not in permitting these, but is in
15 approving the power-purchase agreement which finances
16 these projects.

17 Also, in combined heat and power, the
18 impacts -- a lot of the combined heat and power is
19 enhanced oil recovery and just the water footprint of
20 that; and additional analytics on that is useful. We
21 again have a combined heat-and-power settlement that
22 we're implementing and we have combined heat-and-power
23 goals. We're also looking at, in the context of the
24 climate action plan, what role combined heat and power
25 should play in the future in the state. So that would

1 be appreciated.

2 As we go forward in building actual desal
3 plants in the state, the first one is, as the previous
4 speaker mentioned, is in Carlsbad -- I guess I'm
5 interested -- and I'm not sure, kind of discussing this
6 with other experts -- if we can have desal plants
7 actually produce water in off-peak times and use that as
8 a means of storing the embedded energy. So right now
9 the contract that's being negotiated between San Diego
10 Gas and Electric and the desal plant doesn't provide a
11 lot of flexibility in terms of making that an effective
12 demand-response resource. And I guess if our future is
13 more desal plants, it would be great to see whether just
14 providing more storage of the water itself could serve
15 this role to make them more flexible in terms of the
16 grid demand.

17 Another thing is the NRC and options to
18 develop non-once-through cooling options for the nuclear
19 plants in the relicensing process.

20 And I guess I'll stop there. Thanks.

21 MS. WELSH: Thanks very much.

22 That's the conclusion of public comments, much
23 to our dismay. We wanted to hear from more of you. But
24 we will hope to see those in writing.

25 Before we close let me turn it over to

1 Dr. Pershing to give a few closing comments.

2 MR. PERSHING: I don't know if anybody else
3 who has not had a chance to sign up would like to offer
4 some comments. We're certainly interested in what
5 people might have to say. If you'd like to say few
6 words, you're certainly welcome to do that. I don't
7 want to cut things off if there are others who might
8 want to make some comments or suggestions. I don't want
9 to push you, but we are certainly interested in them.
10 And as Peggy said, we very much welcome the written
11 materials that you might submit as well.

12 So without curtailing the discussion, I wanted
13 mostly to do two things. One is to thank all of you for
14 coming. I think that what we're embarked on is an
15 exercise which I think will have potentially significant
16 value, not narrowly only in this water-and-energy
17 connection, where we have heard much of the panels'
18 focus today, but in a larger review of our energy
19 system, which is I think, as many of the panelists have
20 said and as we certainly observe from inside the
21 Department of Energy, is a system in flux. We have new
22 technologies. We have new demands. We have new
23 pressures. They come from an increase in population, an
24 increase in the challenges like climate change, but also
25 from new technologies that make it different to operate

1 than we used to do.

2 But those come with opportunity as well.

3 There's certainly opportunity for the business
4 community. There's opportunity for jobs. We certainly
5 heard from one of our labor colleagues, some that we're
6 going to very much pick up in other parts of the report
7 as well, the question around the energy sector and jobs
8 play out quite substantially and significantly. I think
9 the role of the federal government in all of this, both
10 as a catalyst for change as well as a convenor and a
11 connector and those who are actively working on the
12 ground is something that we're also seeking to evaluate.

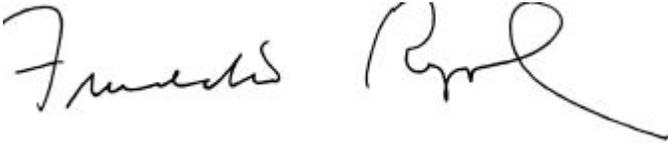
13 So please stay tuned. Please send us back
14 additional input, additional thoughts. I think Peggy
15 said -- or one of us said earlier in the meeting --
16 we're doing a series of meetings around the country.
17 This one happened to be focused on water which really is
18 topical right now in this part of the word, but there
19 are other pieces that are certainly relevant to all of
20 you who focus on the energy system. Questions around
21 how we manage our electricity and how that is changing
22 with intermittent supply. Questions around the new gas
23 boom and what happens there. Discussions around oil and
24 its distribution as well as its availability. This
25 year, I think as Dr. Holdren started off by saying,

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CERTIFICATION OF TRANSCRIPT OF PROCEEDING

I, Freddie Reppond, a stenographic reporter,
do hereby certify that the pages of this transcript
prepared by me comprise a full, true, and correct
transcript of the testimony and proceedings held in the
above-captioned matter on June 9th, 2014.

EXECUTED this 1st day of July, 2014.



Freddie Reppond

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