THE 3RD AMMONIA CONFERENCE
GOLDEN, CO, OCTOBER 2006

Ammonia Fuel and the THE ENERGY-WATER NEXUS Issues

William H. Kumm, P. E.
President, Arctic Energies Ltd.

"THE ENERGY-WATER NEXUS"

Congress sees an inevitable, terrestrial,

INTERDEPENDENCE OF ENERGY AND WATER.

Yet,
The Role of
OTEC, and
AMMONIA, is
little understood

but first,

WHY NH_3 ?

THE OBJECTIVES

1. N_2 From the Atmosphere
2. H_2 From Water
3. No Resulting CO_2
4. Balance-Of-Payments Neutrality

Does Starting With A "Domestic" Carbon Fuel As The Hydrogen Source, i.e. Coal Or Natural Gas, Suffice The Objectives?

NO !

Particularly if imported !

DOE "FREEDOM-CAR PROGRAM", and "WELL-TO-WHEEL" studies say:

"Do not expect to get the Hydrogen Fuel from the carbon- based Industry sector."

<u>Therefore</u>,

"These cars MUST receive their Hydrogen fuel from RENEWABLE SOURCES".

Potential Roles of Ammonia in a Hydrogen Economy

A Study of Issues Related to the Use Ammonia for On-Board Vehicular Hydrogen Storage

U.S. Department of Energy

"***Although DOE is not currently funding conventional fuel processing of ammonia for on-board hydrogen storage, the potential use of ammonia as an energy carrier, particularly during the transition towards the hydrogen economy, is not disqualified. Ammonia may be considered as a potential hydrogen carrier for hydrogen delivery and off-board storage, such as at refueling stations and for stationary power applications.***"

Does Solar Energy As The Source Of The Hydrogen For the Ammonia Suffice These DOE Objectives?

YES !

THE MOST DESIRED FORM OF SOLAR ENERGY IS:

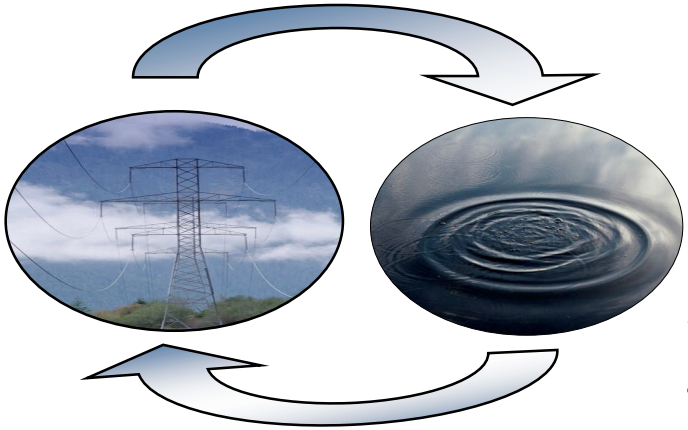
A. “24/24” Available

B. Continuous, Not Intermittent, (as is wind)

C. Easiest Energy Transport

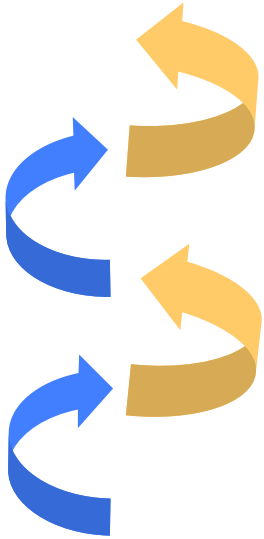
D. World-Scale Applicable

Energy production and generation require water

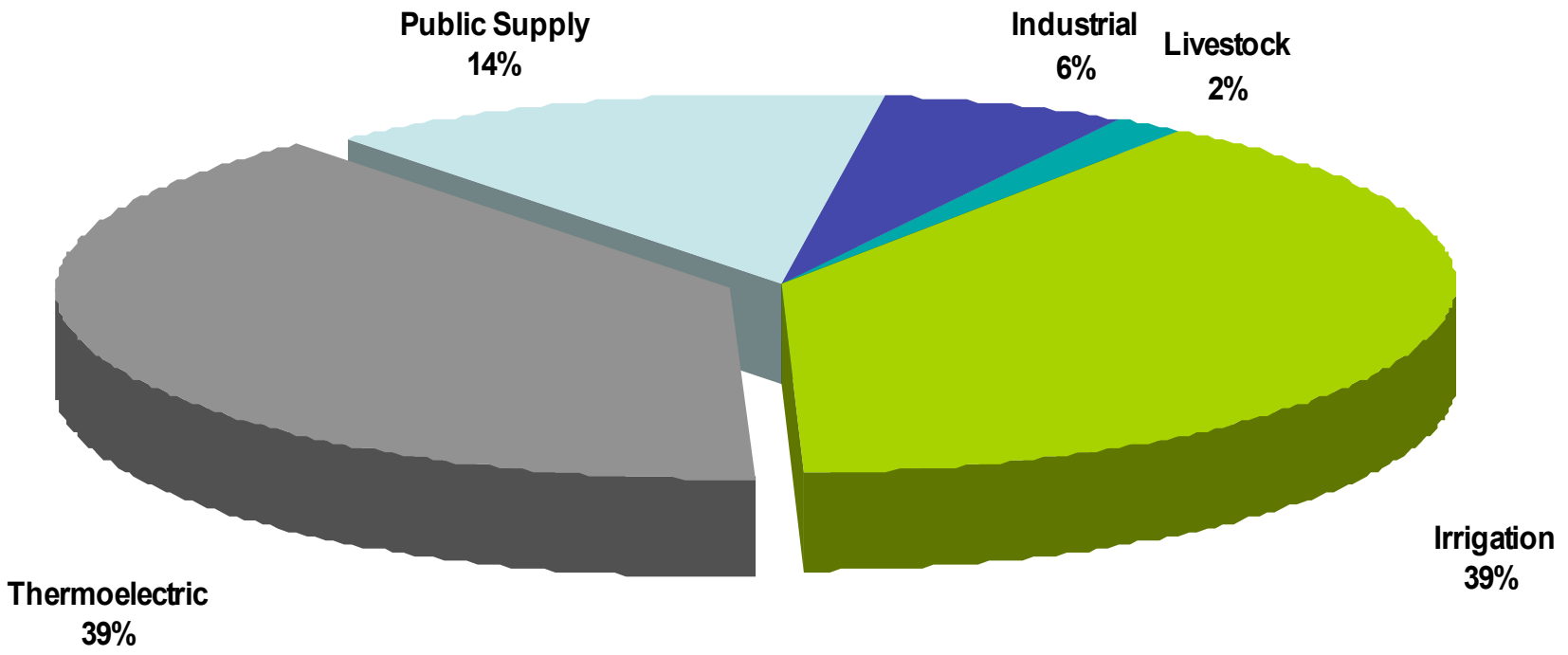


Water pumping, treatment, and distribution require energy

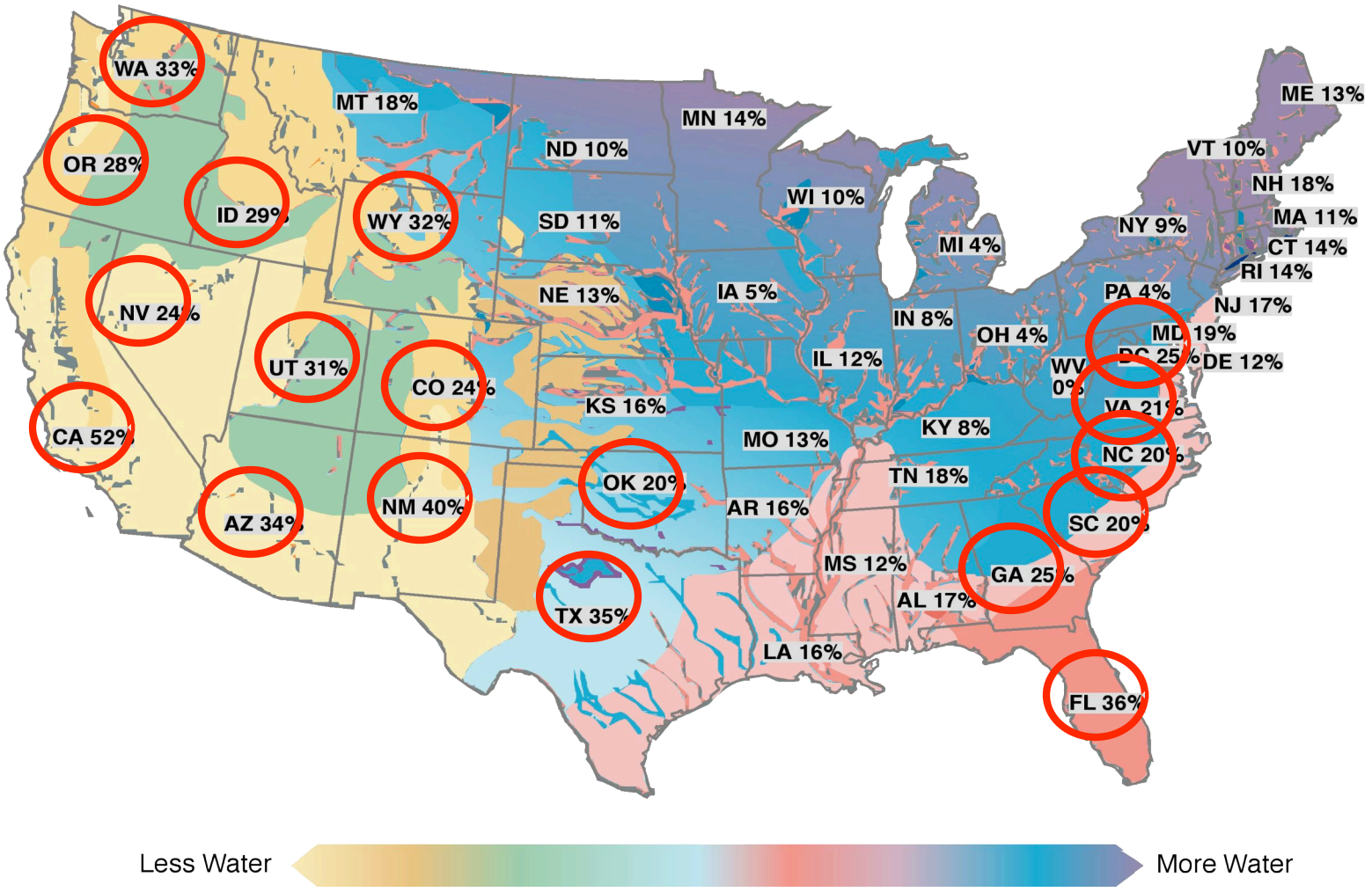
- As water availability decreases, cost increases
- As water cost increases, energy cost increases
- As energy cost increases, water cost increases
- And so on…..



Estimated Freshwater Withdrawals by Sector, 2000

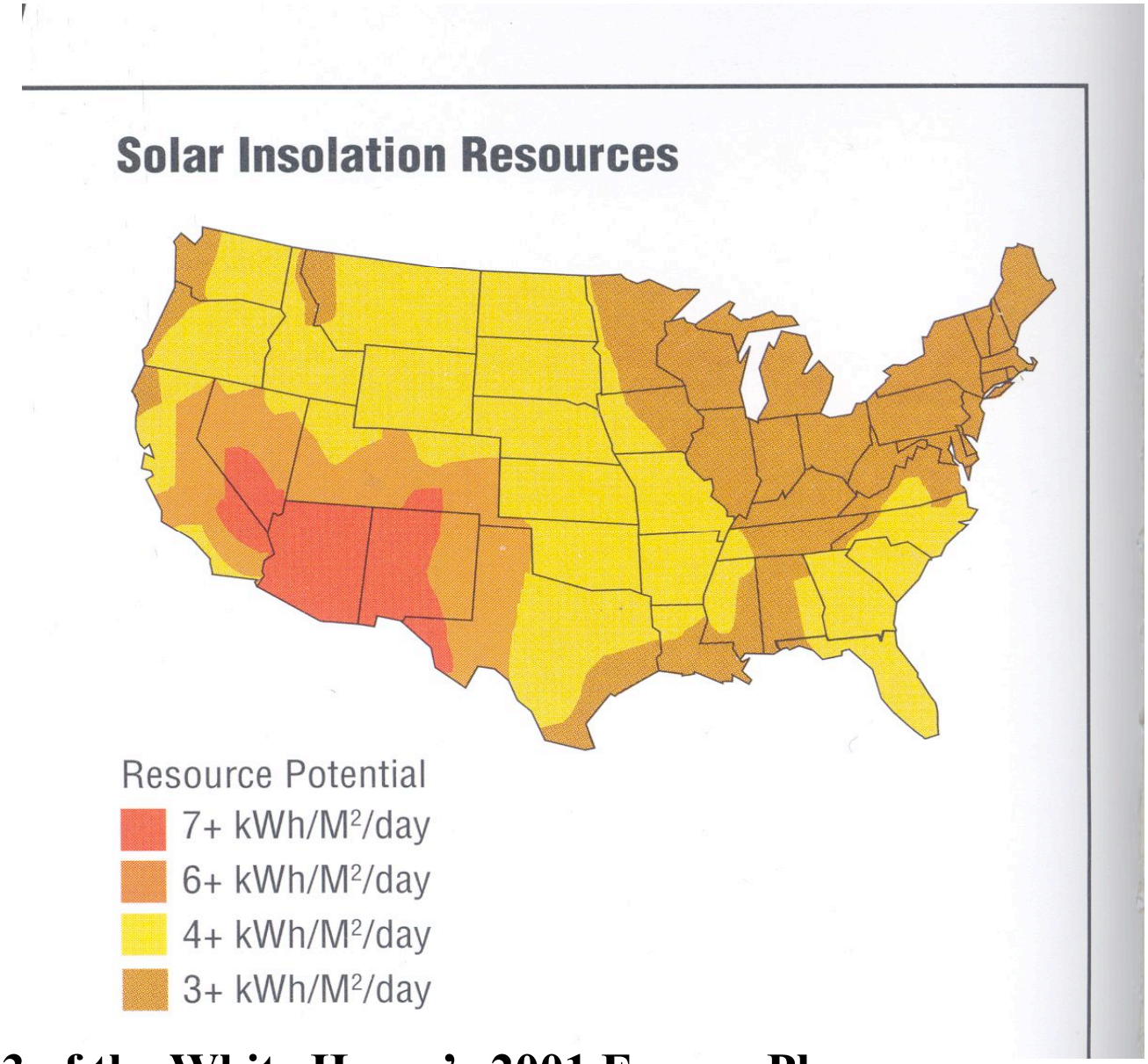


Highest population growth projected in regions with limited water resources



SO, WHERE ARE THE ACCESSABLE SOLAR RESOURCES,

AND HOW DOES THE DOE AND CONGRESS STILL THINK OF THEM ?



Pg.6-3 of the White House's 2001 Energy Plan

"NATIONAL ENERGY POLICY" MAY 2001, Pg. 6-3

"ENDING THE ENERGY STALEMATE" DEC 2004, Pg. 65

AND THE DEPARTMENT OF ENERGY,
ARE STILL CONTINENTALLY FOCUSED,
YET,

THE "CONUS" HAS AN OCEAN ON THREE SIDES,
AND
THE SUN SHINES ON THESE OCEANS AS WELL.

SO, WOULD DOE GET IT RIGHT THIS TIME?

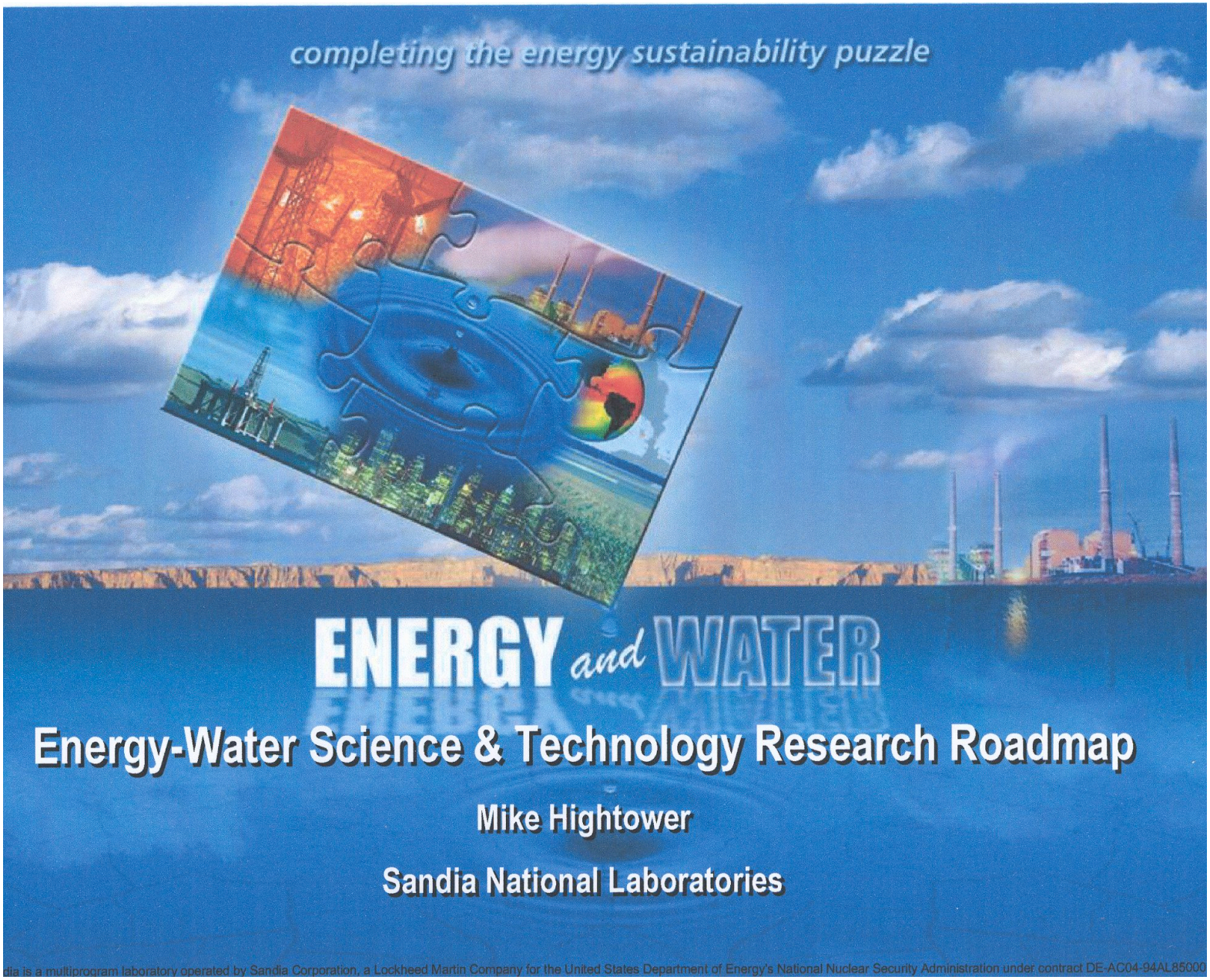
THE ENERGY-WATER NEXUS

MORE WATER-TO-ENERGY (Electrical kWh)? OR ENERGY-TO-WATER (Desalination) PRODUCTION FOR THE US ECONOMY?

SOLAR ENERGY 24/24 (OTEC) TO ENERGY (Commodities) FOR THE ECONOMY ✓
PLUS OTEC PRODUCED POTABLE WATER (Commodity) FOR THE ECONOMY ✓

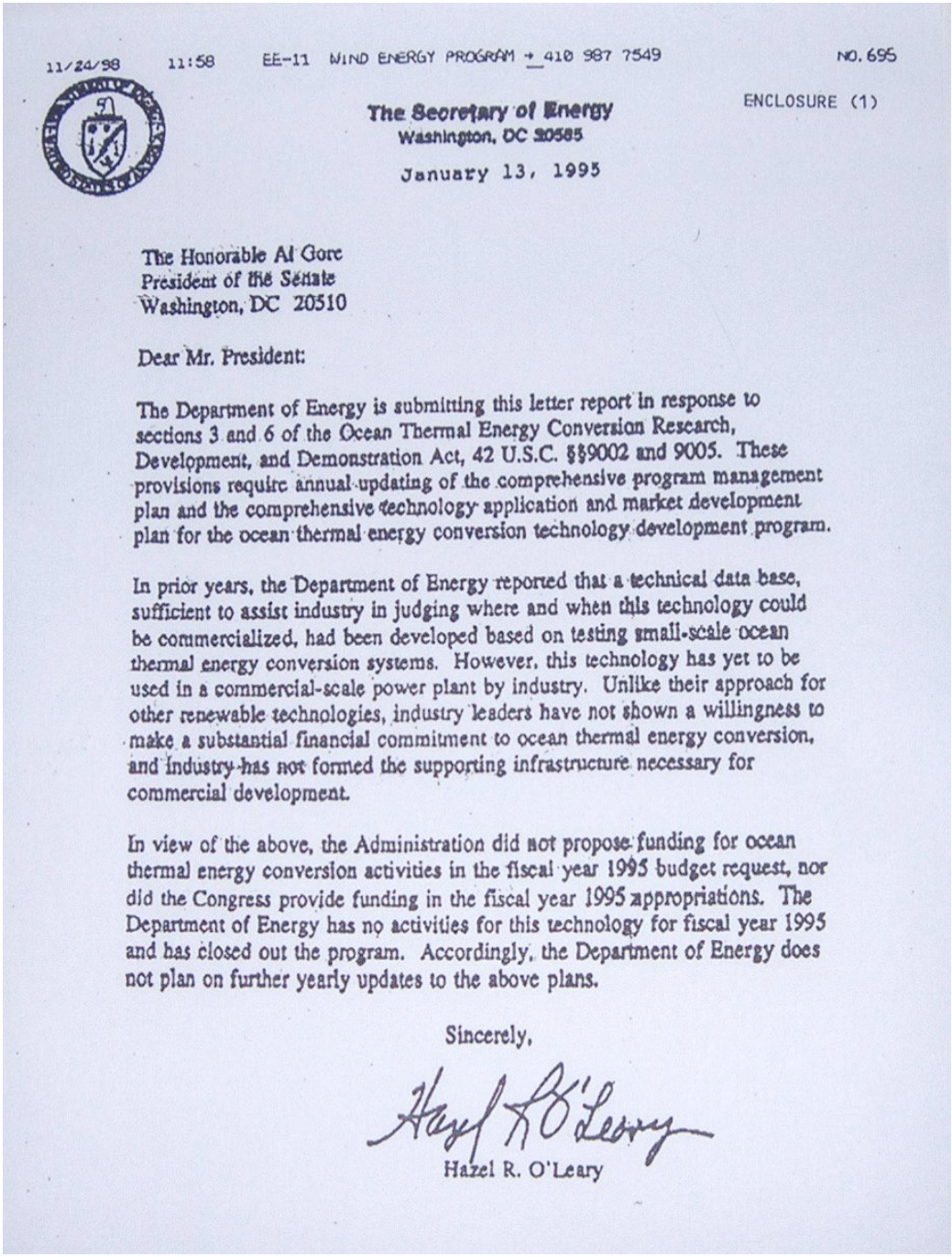
AS PRESENTED TO DOE WORKSHOP, DEC 05

THE SEPT. 06 DOE NEXUS STUDY – TERRESTRIAL FOCUS AGAIN



THE JANUARY 15, 1995, LETTER TO CONGRESS SHUTTING DOWN THE DOE OTEC PROGRAM.

DOE THEN CHALLENGES CONGRESS TO TURN IT BACK ON, BUT ONLY WITH FUNDING.



11/24/98 11:58 EE-11 WIND ENERGY PROGRAM → 410 987 7549 NO. 695

ENCLOSURE (1)

The Secretary of Energy
Washington, DC 20585

January 13, 1995

The Honorable Al Gore
President of the Senate
Washington, DC 20510

Dear Mr. President:

The Department of Energy is submitting this letter report in response to sections 3 and 6 of the Ocean Thermal Energy Conversion Research, Development, and Demonstration Act, 42 U.S.C. §§9002 and 9005. These provisions require annual updating of the comprehensive program management plan and the comprehensive technology application and market development plan for the ocean thermal energy conversion technology development program.

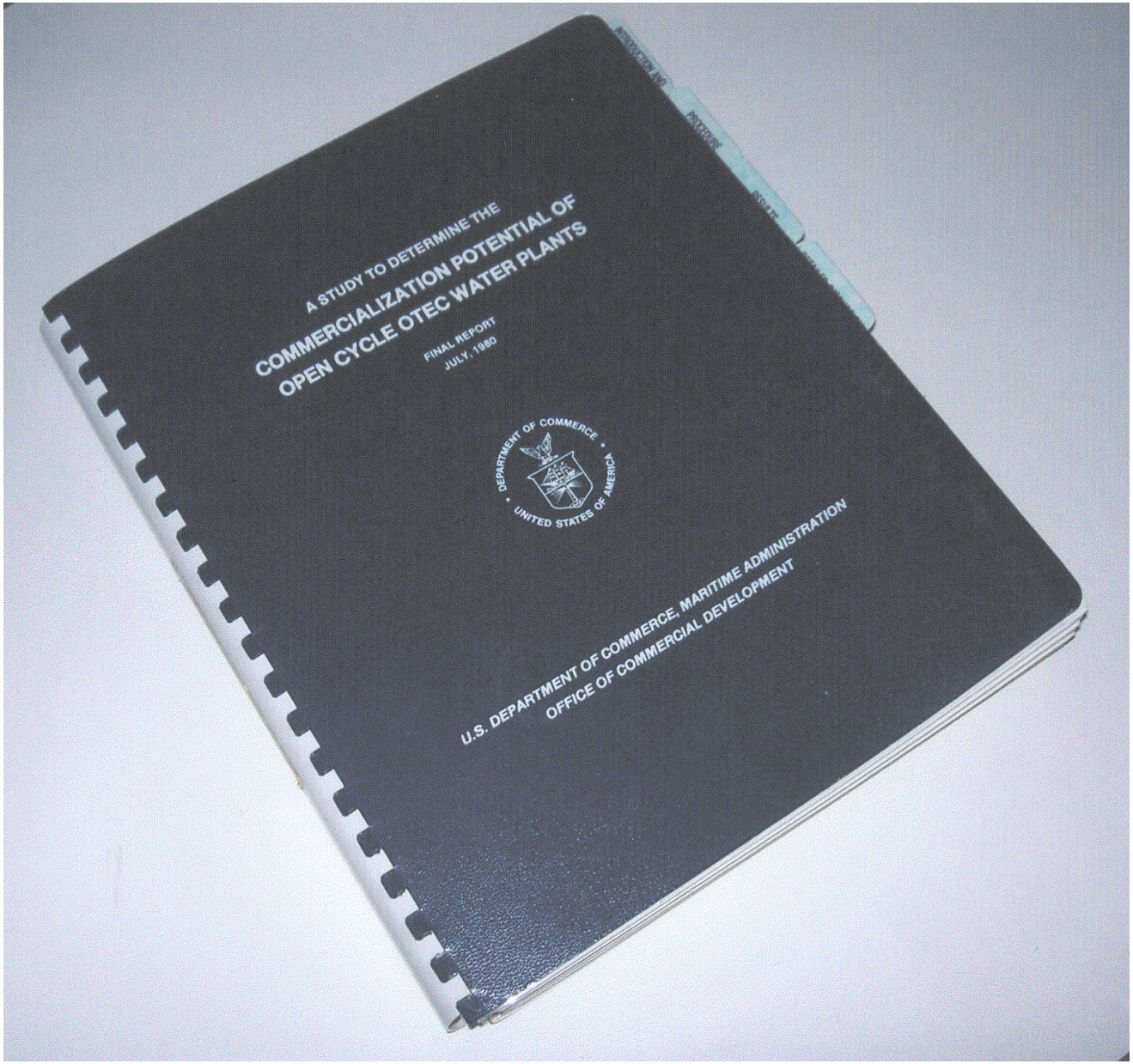
In prior years, the Department of Energy reported that a technical data base, sufficient to assist industry in judging where and when this technology could be commercialized, had been developed based on testing small-scale ocean thermal energy conversion systems. However, this technology has yet to be used in a commercial-scale power plant by industry. Unlike their approach for other renewable technologies, industry leaders have not shown a willingness to make a substantial financial commitment to ocean thermal energy conversion, and industry has not formed the supporting infrastructure necessary for commercial development.

In view of the above, the Administration did not propose funding for ocean thermal energy conversion activities in the fiscal year 1995 budget request, nor did the Congress provide funding in the fiscal year 1995 appropriations. The Department of Energy has no activities for this technology for fiscal year 1995 and has closed out the program. Accordingly, the Department of Energy does not plan on further yearly updates to the above plans.

Sincerely,

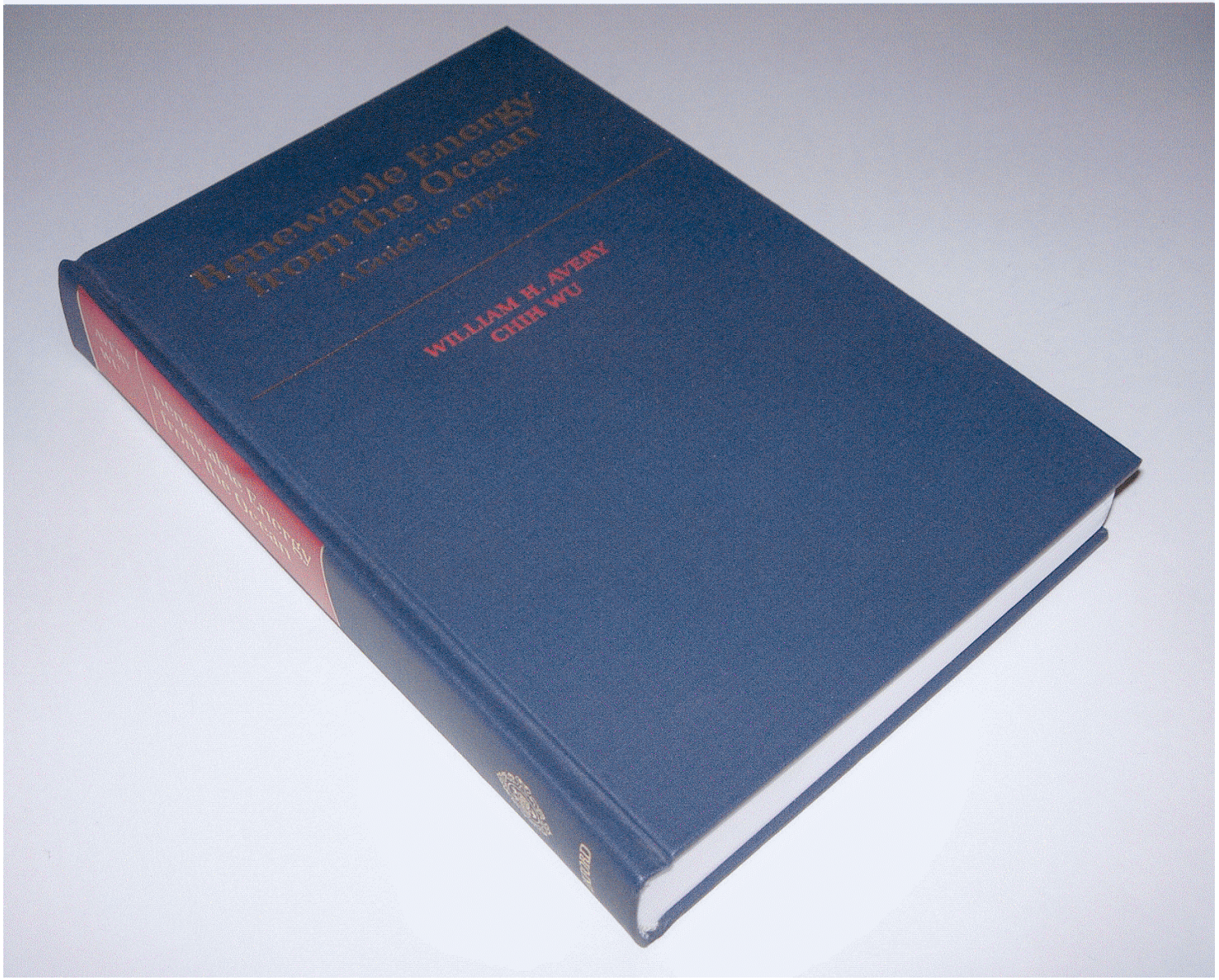
Hazel R. O'Leary

MARAD-FUNDED OTEC DESALINATION STUDY July 1980



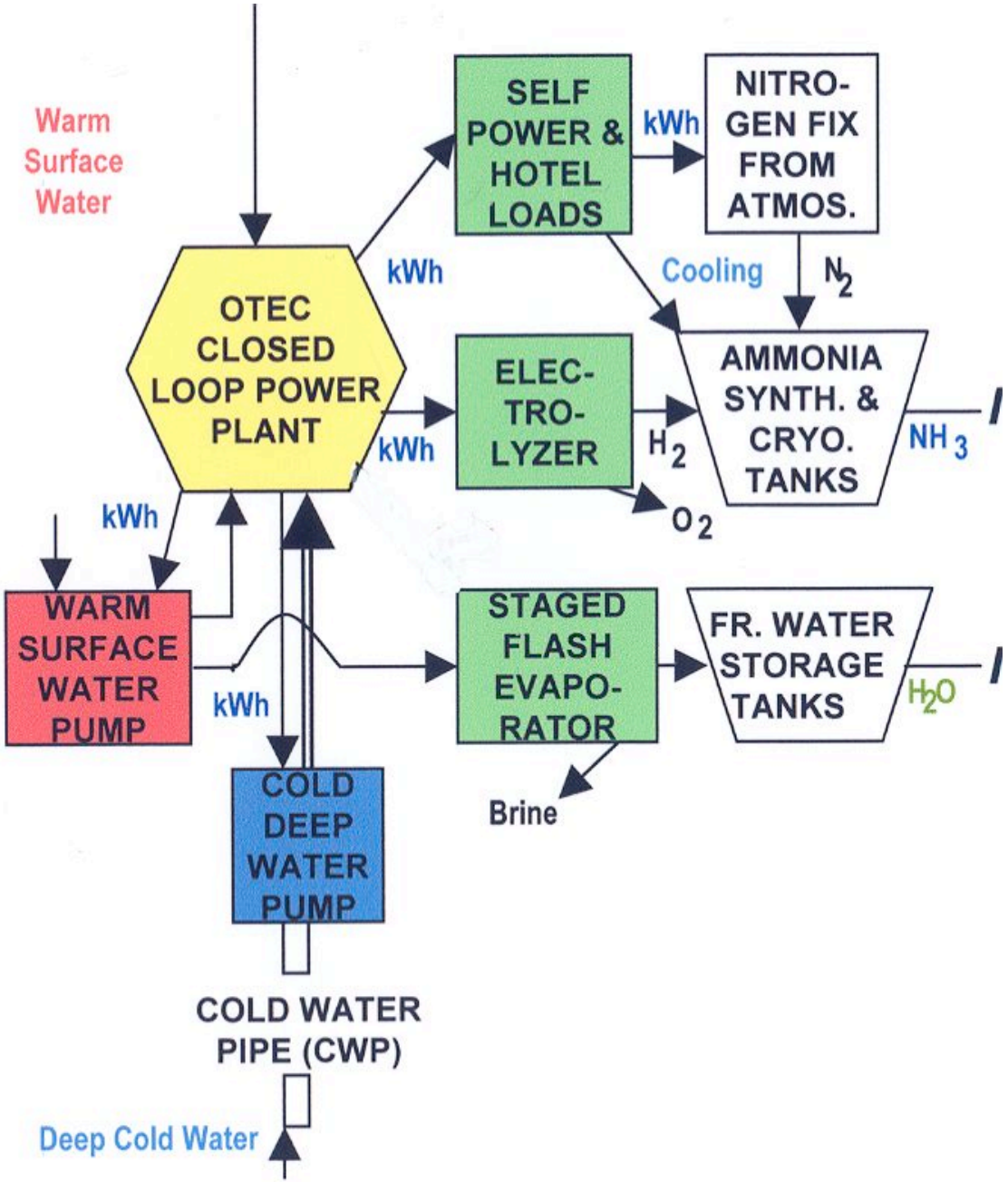
THE OTEC "BIBLE" BY AVERY AND WU, 1994

WITH FORWARD BY JOHN P. CRAVEN, IS ALL ABOUT AMMONIA_

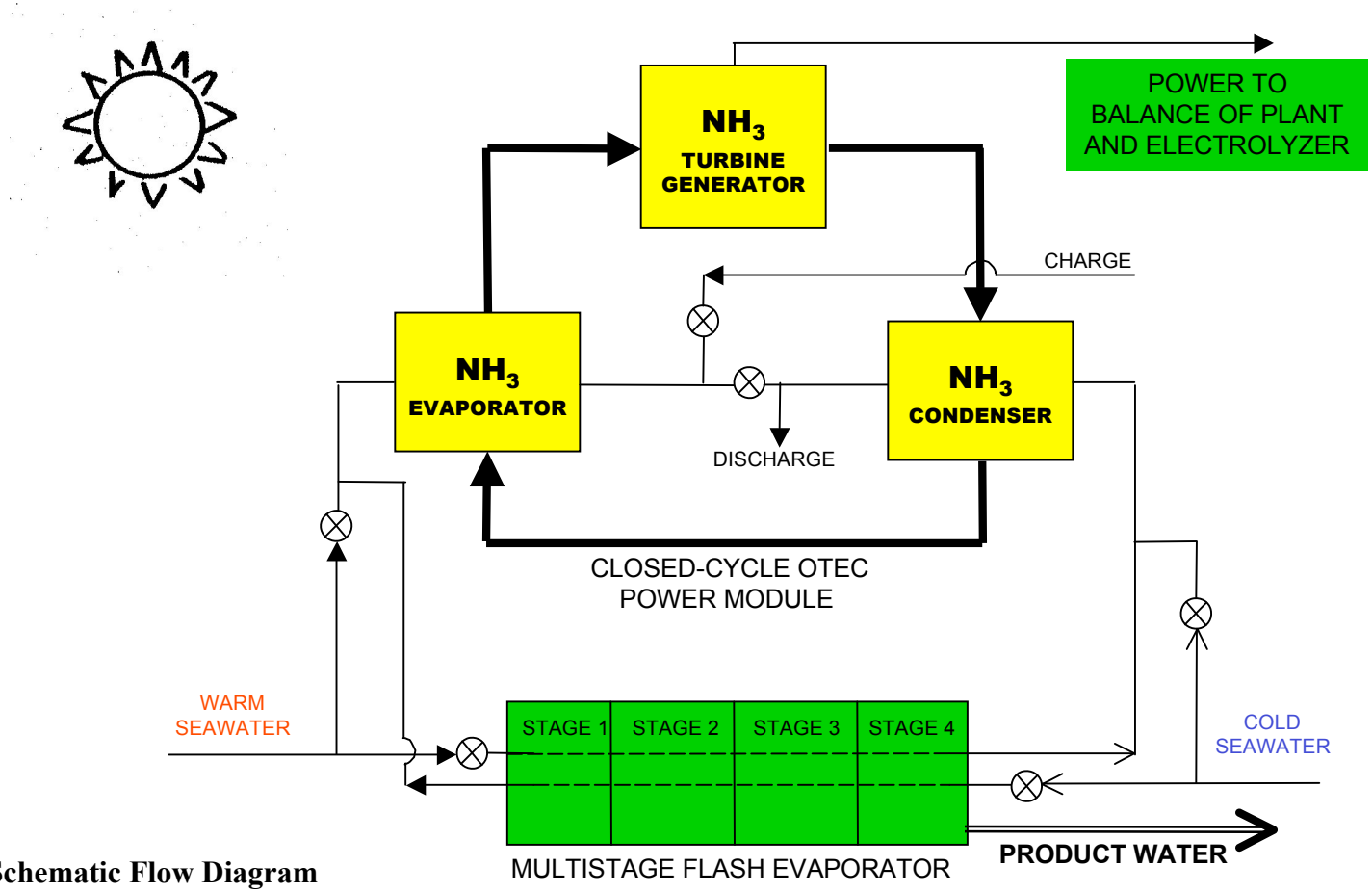


Consider,
AT-SEA
OCEAN THERMAL ENERGY CONVERSION (OTEC) PLANT-SHIP SYSTEMS CAN
UNIQUELY
CAPTURE SOLAR ENERGY
24 HOURS PER DAY

CONUS ON-LAND SOLAR CAPTURE IS ONLY 33% EFFICIENT (8/24 HOURS)



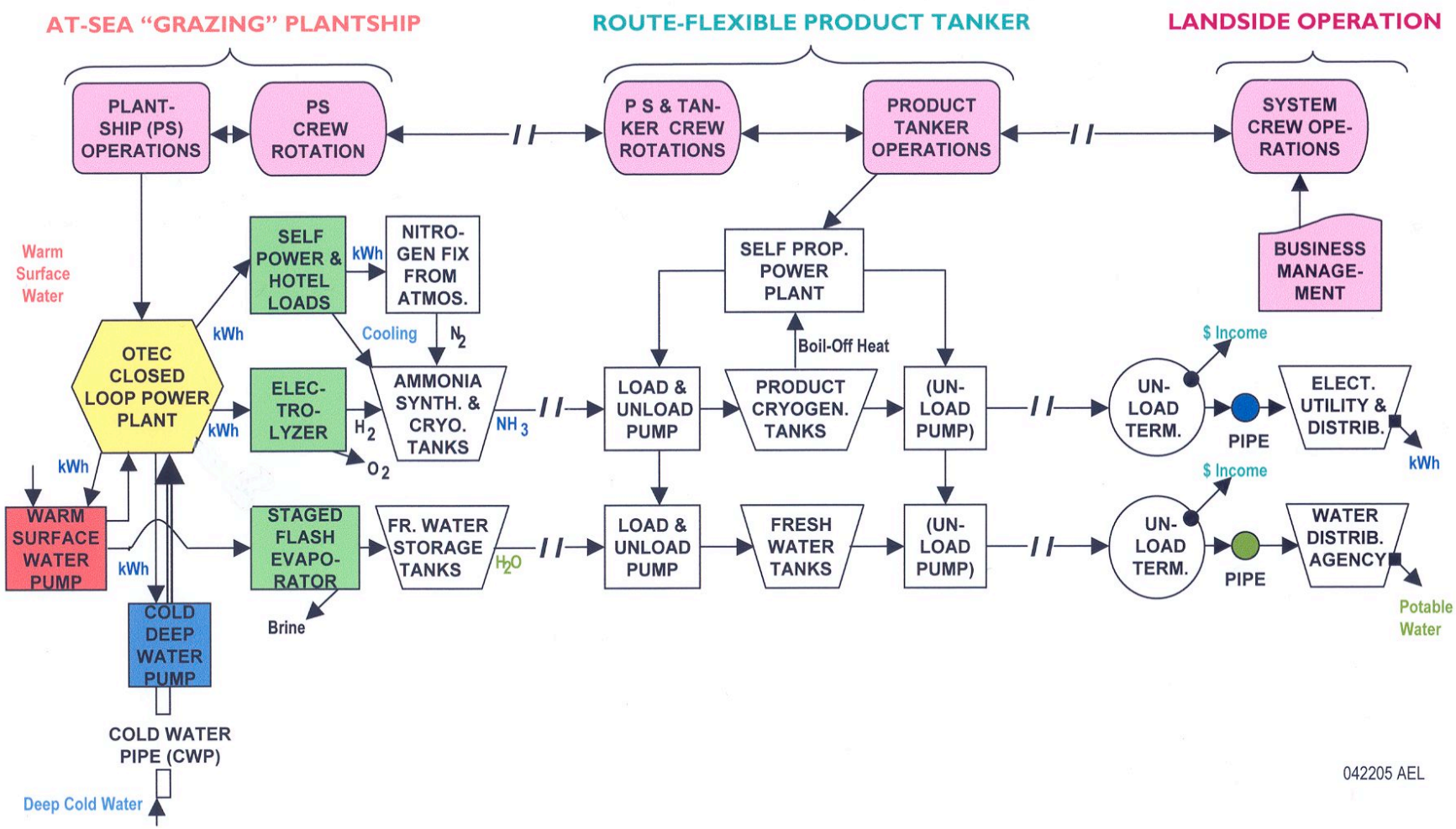
PLANTSHIP BLOCK DIAGRAM



Schematic Flow Diagram for a Hybrid-Cycle At-Sea OTEC Water Plant

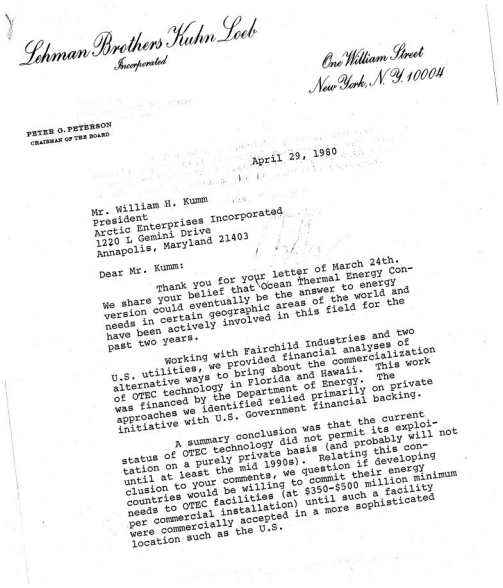
Per T. Rabas, C. Panchal and L. Genens, Argonne National Laboratory, DOE, 1991

SYSTEM BLOCK DIAGRAM



AN ENERGY COMMODITY IN TRANSIT TO CONUS MARKETS

THE BIGGEST PART OF THE EXPLODING US DEBT TO OTHER COUNTRIES IS DRIVEN BY FOSSIL FUELS, AND IT IS LIKELY TO INCREASE WITH LNG IMPORTS



Lehman Brothers Kuhn Loeb
Incorporated

One William Street
New York, N.Y. 10004

PETER G. PETERSON
CHAIRMAN OF THE BOARD

April 29, 1980

Mr. William H. Kumm
President
Arctic Enterprises Incorporated
1220 L Gemini Drive
Annapolis, Maryland 21403

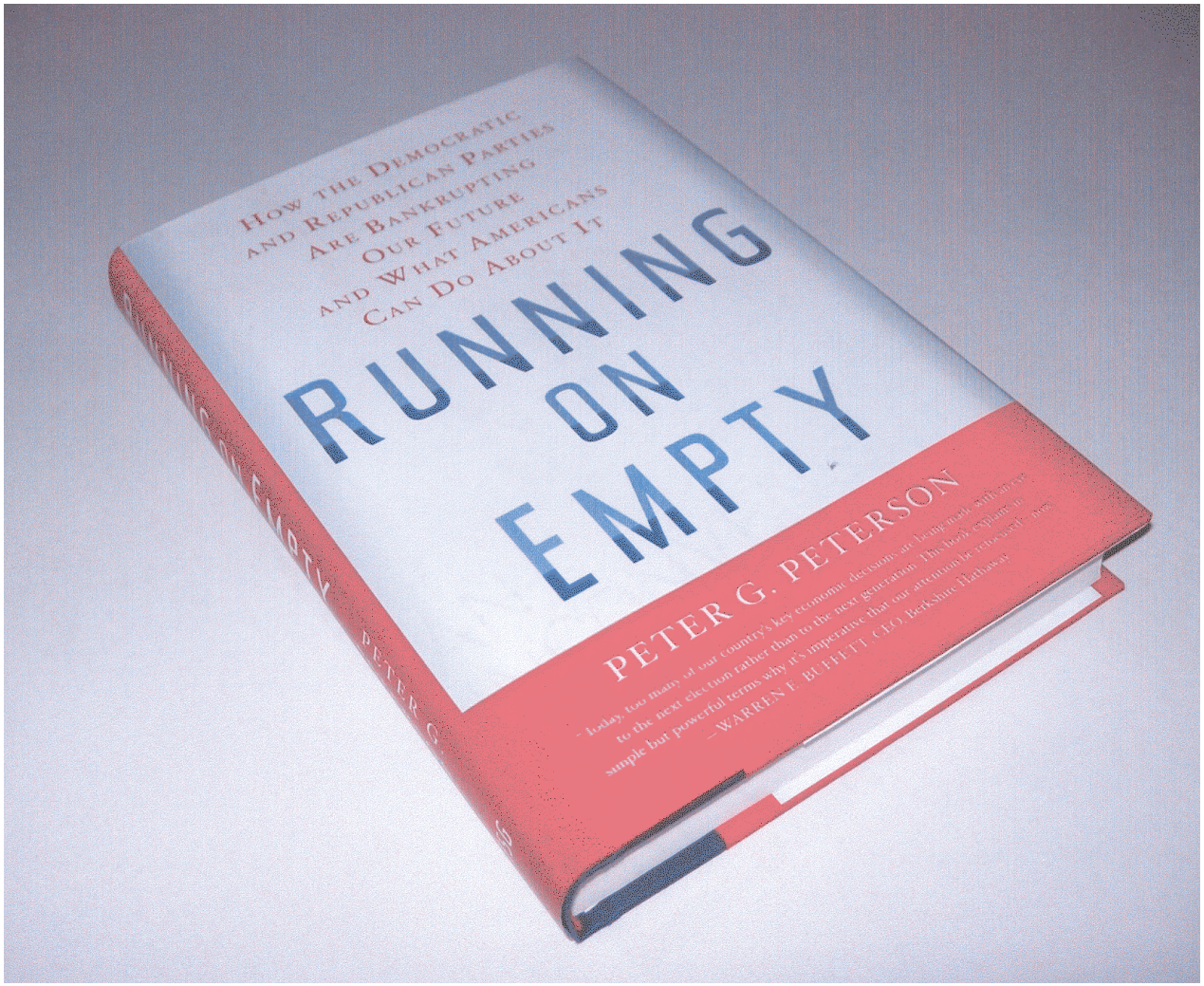
Dear Mr. Kumm:

Thank you for your letter of March 24th. We share your belief that Ocean Thermal Energy Conversion could eventually be the answer to energy needs in certain geographic areas of the world and have been actively involved in this field for the past two years.

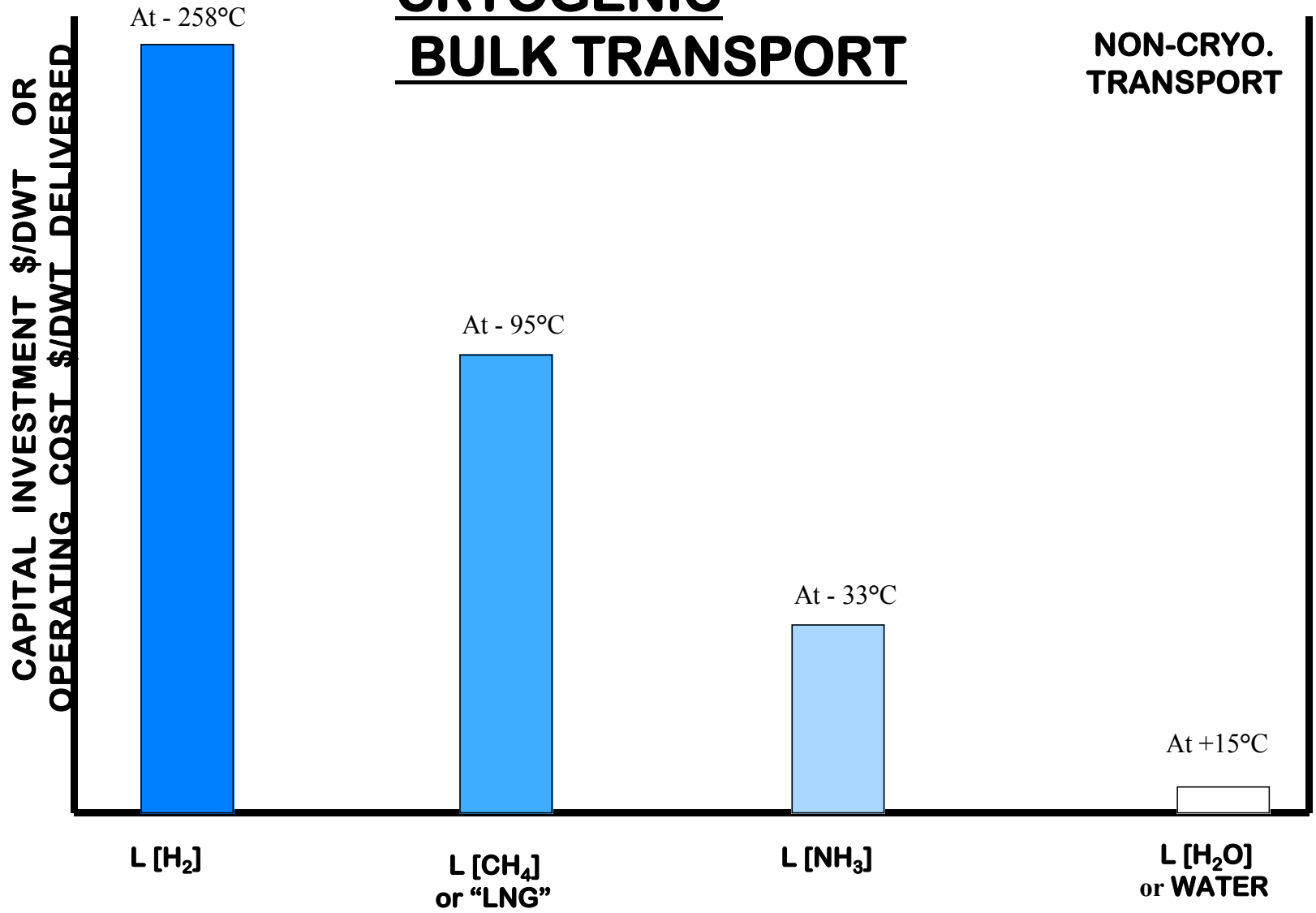
Working with Fairchild Industries and two U.S. utilities, we provided financial analyses of alternative ways to bring about the commercialization of OTEC technology in Florida and Hawaii. This work was financed by the Department of Energy. The approaches we identified relied primarily on private initiative with U.S. Government financial backing.

A summary conclusion was that the current status of OTEC technology did not permit its exploitation on a purely private basis (and probably will not until at least the mid 1990s). Relating this conclusion to your comments, we question if developing countries would be willing to commit their energy needs to OTEC facilities (at $350-$500 million minimum per commercial installation) until such a facility were commercially accepted in a more sophisticated location such as the U.S.

A SUPPORTIVE APRIL 29, 1980 LETTER FROM PETER G. PETERSON ON OTEC



CRYOGENIC BULK TRANSPORT



OTEC PLANT SHIPS ARE TSU-NAMI WAVE IMPER-VIOUS.

COAST-LINE FACILI-TEES ARE NOT.

The Washington Post

OUTLOOK

SUNDAY, JANUARY 9, 2005

TSUNAMI ACTIVITY
1901–2000

This map shows both the location and the relative intensity of earthquake-generated tsunamis.

- **OBSERVED** Historical reports of unusual wave activity but no information as to actual size.
- **PERCEPTIBLE** Records include measurements of wave heights and extent of inundations.
- **DAMAGING** Tsunamis caused death and/or destruction.
- U.S. deep-ocean tsunami-measuring devices. (one not shown)

The Waves on Our Shores

About 80 percent of tsunamis occur in the Pacific Ocean, and this map locates the site of earthquake-generated waves that reached U.S. Pacific coastlines in the past century. Tsunamis have also afflicted the Caribbean, while along the Atlantic, there is a record of at least one relatively small tsunami. The map also shows positions of some of the U.S. government's undersea sensing devices in the Pacific.

■ **Looking back:** *A history of tsunamis in U.S. waters* **Page 2**

■ **Looking ahead:** *Efforts to lessen waves' impact* **Page 3**

SOURCE: INTERNATIONAL TSUNAMI INFORMATION CENTER

RESEARCH BY OUTLOOK STAFF; MAP BY LARIS KARKLIS AND GENE THORP THE WASHINGTON POST

The Unfathomable

Swept Away

Still Missing

Sl

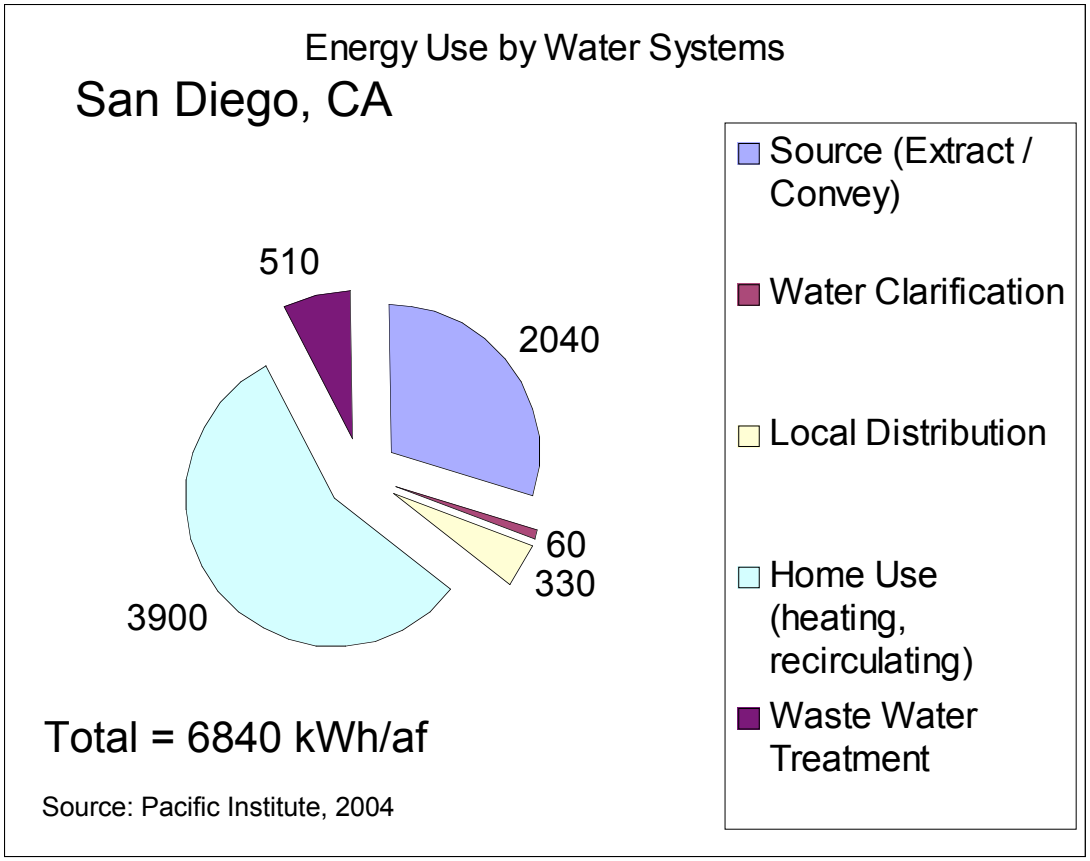
At 17,

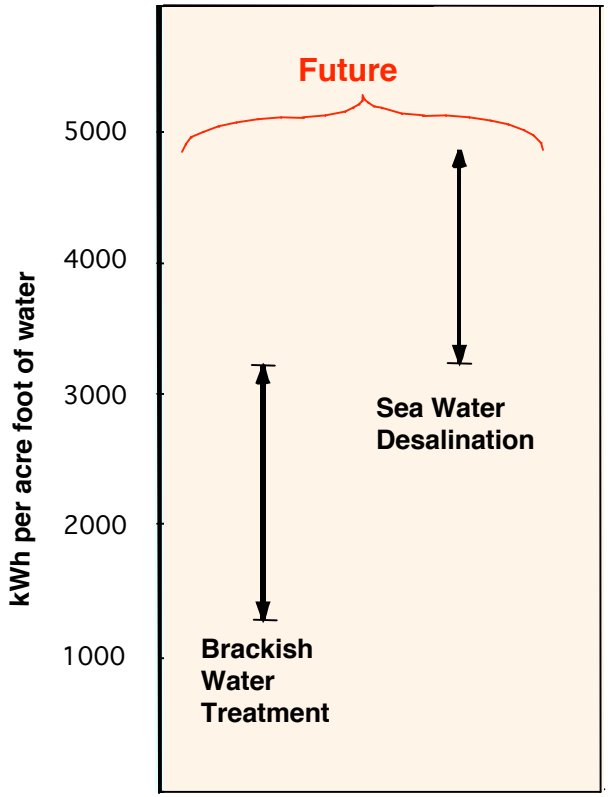
By A.J. Will

Every t
momen
ly: get
Acura
Taco Bell on t
feelings of
combination of
stomach churn
radiator.
I remember
alert, looking
everywhere to
was no poss
Ultimately, fo
distraction, I r
shopping cente
trip to pick u
hooked for life.
a round trip in
unscathed. No
the open road–

*A.J. Willingha
Lady of Good
in Wheaton.*

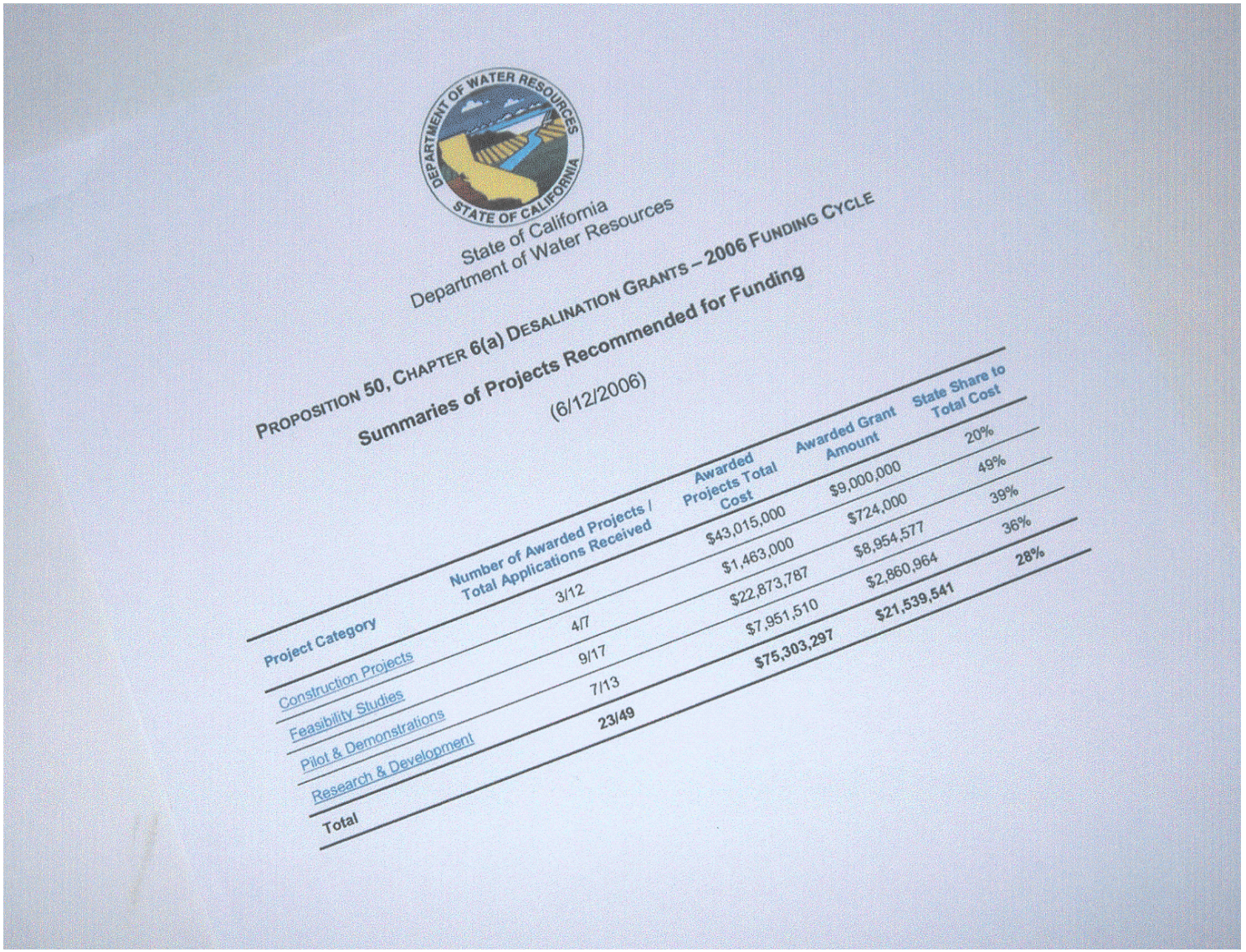
7% of Electricity Consumption used for water pumping, and as much as 25% of the consumption related to water use.





DWR has just completed 2 cycles of Desal Awards, with some inland, some coastal/surf zone, but none yet at sea

CADWR 2ND ROUND DESAL. AWARDS, ALL ARE KWH-DEPENDENT, NONE SOLAR, NONE OTEC



State of California
Department of Water Resources

PROPOSITION 50, CHAPTER 6(a) DESALINATION GRANTS – 2006 FUNDING CYCLE

Summaries of Projects Recommended for Funding

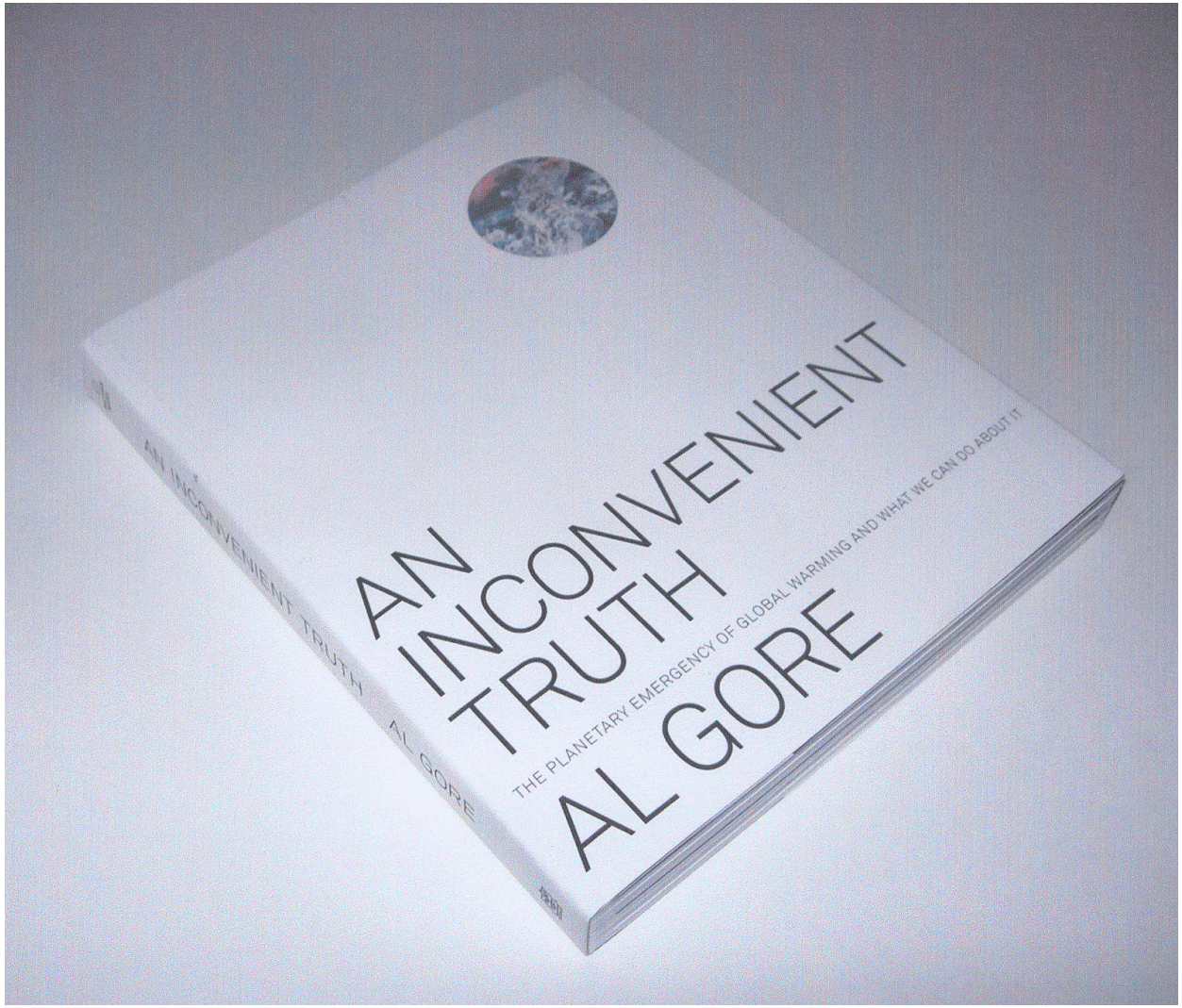
(6/12/2006)

Project Category	Number of Awarded Projects / Total Applications Received	Awarded Projects Total Cost	Awarded Grant Amount	State Share to Total Cost
Construction Projects	3/12	$43,015,000	$9,000,000	20%
Feasibility Studies	4/7	$1,463,000	$724,000	49%
Pilot & Demonstrations	9/17	$22,873,787	$8,954,577	39%
Research & Development	7/13	$7,951,510	$2,860,964	36%
Total	**23/49**	**$75,303,297**	**$21,539,541**	**28%**

THE ENERGY-WATER NEXUS

WORLD-SCALE OTEC MEANS:

- ✓NO AIR POLLUTION IMPACT
- ✓NO ENERGY FUEL DEPLETION IMPACT
- ✓NO BALANCE-OF-PAYMENTS "River Of $"
- ✓NO FOSSIL ENERGY REQUIRED
- ✓INFINITELY SCALABLE


AN INCONVENIENT TRUTH
AL GORE
THE PLANETARY EMERGENCY OF GLOBAL WARMING AND WHAT WE CAN DO ABOUT IT
AN INCONVENIENT TRUTH
AL GORE

EARLY 2006

LATE 2006

A22 THURSDAY, SEPTEMBER 28, 2006

The Washington Post

AN INDEPENDENT NEWSPAPER

Heed This Warning

The problem of climate change has become a crisis that no responsible politician can ignore.

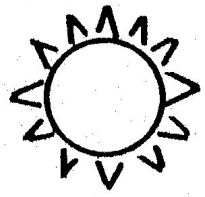
BENEATH ITS dry scientific lingo, a new analysis of global climate change by a group of NASA scientists is terrifying. Headed by climate specialist James E. Hansen, the group argues that recent global warming has been quite rapid — about 0.2 degrees Celsius over each of the past three decades — and has largely tracked climate models that predict more dramatic warming in the decades to come. If the world continues increasing carbon emissions at its current pace, by about 2 percent a year, the authors argue that the resulting warming will cause the extinction of about 60 percent of species around the world and "sea level rise of several meters per century with eventual rise of tens of meters, enough to transform global coastlines."

The scientists posit an alternative scenario as well, one predicated on dramatic reductions of carbon emissions. In that case, sea levels would still rise substantially and "cause problems for humanity," and 20 percent of species would still go extinct — but the most catastrophic effects of warming might be averted. Most distressingly, they contend that humanity doesn't have long to make up its mind whether to pursue policy changes; another decade without emissions being reduced, they said, would probably make the alternative scenario infeasible.

The likely consequences of global warming are a hotly debated subject, and one has to be cautious about predictions concerning hugely complicated systems — such as average global temperature over time. But there is at least a decent chance that this and the many similar analyses by other reputable climatologists will prove correct. And that means that global warming represents a policy crisis responsible politicians can no longer ignore — one as potentially existential as the threat of global terrorism, only in slow motion.

Countering that threat will require regulatory initiatives and societal investments. It will require significant changes in American attitudes toward energy use and conservation. But these may prove far less wrenching than many people imagine. What it certainly also will require is a great deal of political will — political will of precisely the type the Bush administration has dedicated to a host of other issues but has assiduously avoided devoting to climate change. Most of all, it will require an end to denial — denial that the problem exists, denial that anything can be done about it if it does and denial that the problem is urgent and requires immediate attention.

AT-SEA SOLAR-DRIVEN OCEAN DESALINATION, PLUS HYDROGEN {MOVED AS AMMONIA} PRODUCTION AND DELIVERY



THE H_2TEC ® SYSTEM

2006

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Whkwhoswhoworld@aol.com

Q E D