

Address before the National OTEC conference: Ocean thermal energy: An untapped resource

Senator Spark M. Matsunaga Papers

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OCEAN THERMAL ENERGY:
AN UNTAPPED WORLD RESOURCE

ADDRESS BY SENATOR SPARK MATSUNAGA
BEFORE THE 5TH ANNUAL NATIONAL OTEC CONFERENCE
FEBRUARY 21, 1978
MIAMI, FLORIDA

I AM DELIGHTED TO BE WITH YOU TONIGHT AND THANK YOU ALL FOR THIS OPPORTUNITY TO ADDRESS THE 5TH ANNUAL NATIONAL OTEC CONFERENCE. I ESPECIALLY APPRECIATE THE WARM RECEPTION EXTENDED ME BY OUR HOST, THE UNIVERSITY OF MIAMI, AND THE WONDERFUL WEATHER IN MIAMI. ABOUT THE ONLY BETTER SITE YOU COULD HAVE SELECTED FOR YOUR CONFERENCE IS IN MY HOME STATE OF HAWAII. IN FACT, I KEEP ADVISING MY COLLEAGUES IN THE CONGRESS THAT THEY MUST VISIT HAWAII BEFORE IT BECOMES TOO LATE FOR THEM; THAT BY SEEING HAWAII THEY WOULD AT LEAST KNOW WHAT HEAVEN LOOKS LIKE, IF THEY HAPPEN TO GO THE OTHER WAY.

THIS EVENING, I WOULD LIKE TO SPEND A FEW MINUTES WITH YOU ON THE NATIONAL AND WORLD ENERGY PICTURE AS I SEE IT BEFORE SHARING WITH YOU A FEW THOUGHTS ON THE SUBJECT OF THIS CONFERENCE.

IT HAS NOW BEEN TEN MONTHS SINCE THE PRESIDENT PRESENTED A NATIONAL ENERGY PLAN TO THE CONGRESS AND THE AMERICAN PEOPLE. DURING THESE MONTHS IN WHICH ENERGY HAS BEEN THE DOMINANT TOPIC OF DEBATE IN THE HALLS OF CONGRESS, AN OMNIBUS LEGISLATIVE PROPOSAL OF SOME 113 SECTIONS HAS BEEN MAKING ITS WAY THROUGH THE HOUSE AND THE SENATE. IT IS NOW COMPLETELY STALLED ON THE ISSUE OF NATURAL GAS PRICING AND REGULATION.

OUR NATION CAN ILL AFFORD ANY FURTHER DELAY IN THE FORMULATION OF A NATIONAL ENERGY PLAN IN THE FACE OF A CRISIS ABOUT WHICH PRESIDENT CARTER HAS ACCURATELY DESCRIBED AS THE GREATEST DOMESTIC CHALLENGE THAT AMERICA WILL FACE DURING OUR LIFETIME.

EVERYONE HERE, I AM SURE, UNDERSTANDS THE RELIANCE OF OUR INDUSTRIALIZED SOCIETY ON AN ADEQUATE AND DEPENDABLE SUPPLY OF ENERGY. ENERGY IS THE VERY FOUNDATION OF OUR WHOLE ECONOMIC SYSTEM. IF THERE IS ANY DOUBT ABOUT THIS PROPOSITION, ONE NEED ONLY CONSIDER THE POTENTIALLY CRIPPLING IMPACT THIS COUNTRY WOULD SUFFER SHOULD THE PRESENT COAL STRIKE CONTINUE INDEFINITELY.

NOTHING RUNS WITHOUT ENERGY. OUR FACTORIES, TRANSPORTATION SYSTEMS, STORES, BANKS, SCHOOLS, AND OUR HOMES CANNOT FUNCTION WITHOUT ENERGY. EVEN OUR FOOD CANNOT BE GROWN, DISTRIBUTED AND MARKETED WITHOUT ENERGY. ALL ASPECTS OF OUR ECONOMY, INCLUDING JOB OPPORTUNITIES, ARE TIED FIRMLY TO ENERGY.

IF THE MONEY SPENT TO BUY 5 MILLION BARRELS PER DAY OF IMPORTED OIL, WERE USED TO PRODUCE AN EQUIVALENT AMOUNT OF ENERGY IN THIS COUNTRY, IT WOULD GENERATE 200,000 AMERICAN JOBS AND INSURE OUR ECONOMY AGAINST THE DRASTIC EFFECTS OF AN INTERRUPTION IN OIL IMPORTS. NEEDLESS TO REMIND THIS AUDIENCE, WE, OF COURSE, ARE NOW IMPORTING AN AVERAGE OF MORE THAN 8 MILLION BARRELS OF OIL AT A COST OF OVER \$120 MILLION, EVERY DAY OF THE YEAR. LAST YEAR, OUR OIL IMPORTS CONTRIBUTED \$45 BILLION TOWARDS OUR NATIONAL TRADE DEFICIT.

OUR CONTINUED DEPENDENCE UPON FOREIGN SOURCES OF ENERGY NOT ONLY ACCOUNTS FOR THE HUGE DEFICIT IN OUR BALANCE OF TRADE, IT ALSO UNDERMINES OUR NATIONAL SECURITY. OUR NATIONAL SECURITY DEPENDS ON MORE THAN JUST OUR ARMED FORCES. IT ALSO RESTS ON OUR

NATIONAL WILL AND ON THE STRENGTH OF OUR ECONOMY, WHICH DETERMINES THE ABILITY OF THE UNITED STATES TO PURSUE ITS FOREIGN POLICY AS A FREE AND INDEPENDENT NATION. THE SECRETARY OF DEFENSE RECENTLY STATED THAT, "THE PRESENT DEFICIENCY OF ASSURED ENERGY SOURCES IS THE SINGLE SUREST THREAT ... TO OUR SECURITY AND THAT OF OUR ALLIES."

FOR THE BENEFIT OF OUR FOREIGN GUESTS IN THE AUDIENCE, LET ME HASTEN TO ADD THAT MY REMARKS CONCERNING THE IMPORTANCE OF ENERGY TO OUR OWN ECONOMY AND SECURITY CAN ALSO BE EXTENDED TO OTHER DEVELOPED NATIONS THROUGHOUT THE WORLD. IN FACT, IT IS BECOMING INCREASINGLY EVIDENT THAT WHILE EARLIER ATTENTION RELATIVE TO OUR NATIONAL ENERGY PROBLEM TENDED TO CONCENTRATE ON WHEN DOMESTIC OIL AND NATURAL GAS RESOURCES WOULD BE EXHAUSTED, NOW THE PRESIDENT AND HIS ADVISORS ARE FOCUSING INCREASING ATTENTION ON THE TRENDS IN WORLD DEMAND FOR OIL IN RELATION TO WORLD SUPPLY. THERE IS NOW REASON TO BELIEVE THAT, UNLESS WORLD CONSUMPTION OF OIL IS SIGNIFICANTLY MODERATED, THE RESULTING, PERHAPS DESPERATE, INTERNATIONAL COMPETITION FOR AVAILABLE SUPPLIES

WILL PORTEND ECONOMIC AND POLITICAL CATASTROPHE IN ALL COMPETING COUNTRIES.

WHAT IS ESPECIALLY ALARMING TO ME IS THAT AMONG PROFESSIONAL ENERGY ANALYSTS THERE IS NOW NEAR-UNANIMOUS AGREEMENT THAT THE WORLD OIL PRODUCTIVE CAPACITY WILL NOT BE SUFFICIENT TO MEET THE WORLD DEMAND BY THE MID-1980'S, AND THAT SAUDI ARABIA'S POLICIES, ON BOTH PRICE AND PRODUCTION, WILL PLAY THE CRITICAL AND CONTROLLING ROLE.

GETTING BACK TO THE PROBLEMS OF THIS COUNTRY, I BELIEVE THAT A MEANINGFUL NATIONAL ENERGY POLICY SHOULD BE ONE THAT CONSISTS OF THREE VITAL COMPONENTS:

THE FIRST IS ENERGY CONSERVATION. IN MY OPINION, THE ADMINISTRATION PROGRAM DOES A GOOD JOB IN REDUCING WASTE, AND IN IMPROVING THE EFFICIENCY OF ENERGY PRODUCTION AND USE. IN THE SHORT TERM, CONSERVATION MEASURES WILL CONTRIBUTE MORE TO SOLVING PROBLEMS THAN WILL NEW SUPPLY TECHNOLOGY. CONSERVATION, HOWEVER, CAN MAKE ONLY A LIMITED CONTRIBUTION BEFORE UNACCEPTABLE CHANGES IN LIFE STYLE BECOME NECESSARY. FURTHERMORE, CONSERVATION

CAN BE PROGRAMMED ONLY TO THE EXTENT THAT IT DOES NOT INFLICT A NEGATIVE IMPACT ON THE ECONOMY AND ON EMPLOYMENT,

THE SECOND KEY COMPONENT OF AN ENERGY POLICY SHOULD BE THE AGGRESSIVE DEVELOPMENT OF OUR EXISTING DOMESTIC RESOURCES. HERE I AM REFERRING PARTICULARLY TO OUR RESOURCES OF OIL, NATURAL GAS, COAL AND URANIUM. THIS ISSUE IS ONE WHICH RAISES A MAJOR CONTROVERSY OVER THE ADMINISTRATION'S PROPOSALS. INDUSTRY SPOKESMEN ARE CONTENDING THAT THE PROPOSALS WILL NOT PROMOTE NEW OIL AND GAS DISCOVERIES AND INCREASED PRODUCTION BECAUSE THEY DO NOT PROVIDE ADEQUATE RETURNS TO THE PRODUCERS. DESPITE WIDESPREAD BELIEF TO THE CONTRARY, THE PRESIDENT'S PLAN DOES INCLUDE GENEROUS INCENTIVES TO ENCOURAGE PRODUCTION OF OIL AND GAS IN OUR OWN COUNTRY. MY ALOTTED TIME WILL NOT PERMIT ME TO DWELL ON THE SUPPORTING DETAILS IN THIS REGARD.

THE THIRD, AND IN MY JUDGMENT, THE MOST IMPORTANT COMPONENT OF AN ENERGY POLICY SHOULD BE THE ACCELERATED DEVELOPMENT OF NEW SOURCES OF ENERGY. IF I HAVE ANY CRITICISM OF THE ADMINISTRATION'S PLAN, IT WOULD BE THAT INSUFFICIENT EMPHASIS HAS BEEN PLACED ON THE

DEVELOPMENT OF ALTERNATE SOURCES OF ENERGY, SUCH AS SOLAR, GEOTHERMAL, BIOMASS, OCEAN THERMAL, AND WIND ENERGY.

THE ISSUE OF TRANSCENDENT IMPORTANCE IS NOT THE FACT THAT ONE ENERGY OPTION MUST INEVITABLY EMERGE AS BEING SUPERIOR TO ANOTHER, OR FAVORED AT THE EXPENSE OF ANOTHER, BUT, RATHER, THAT THE NATION NEEDS ALL THE ENERGY IT CAN MUSTER FROM ALL SOURCES; BE THEY COAL, OIL, NATURAL GAS, NUCLEAR, SYNTHETIC FUELS, OR RENEWABLE ENVIRONMENTAL ENERGY SOURCES. RENEWABLE ENERGY OPTIONS APPEAR PARTICULARLY ATTRACTIVE FROM THE STANDPOINT OF EXTENDING THE LIFE OF NON-RENEWABLE FOSSIL AND NUCLEAR FUEL RESOURCES FOR OUR MID-RANGE PLANS, WHILE DEVELOPING A STABLE AND PERMANENT SOURCE OF ENERGY FOR OUR LONG-RANGE PLANS.

THE DEVELOPMENT OF THE SO-CALLED ALTERNATE SOURCES OF ENERGY IS, OF COURSE, OF SPECIAL INTEREST AND IMPORTANCE TO MY OWN STATE OF HAWAII, WHICH PRESENTLY DEPENDS ALMOST ENTIRELY ON PETROLEUM, ALL OF WHICH MUST NOW BE IMPORTED.

HAPPILY FOR HAWAII, HOWEVER, IT IS BLESSED WITH AN ABUNDANCE OF POTENTIAL GEOTHERMAL AND ALL FORMS OF SOLAR ENERGY,

INCLUDING OCEAN THERMAL. THE POTENTIAL OFFERED BY THESE ALTERNATE SOURCES REPRESENTS AN OPPORTUNITY OF GREAT SIGNIFICANCE FOR THE PEOPLE OF HAWAII.

I AM PLEASED TO REPORT THAT HAWAII HAS BEGUN TO PURSUE THE DEVELOPMENT OF ALTERNATE SOURCES OF ENERGY WITH IMAGINATION AND VIGOROUS DETERMINATION. THE FUTURE OF THE STATE IS INDEED BRIGHT IN THIS AREA, AND THIS PERIOD OF EXPLORING THE ALTERNATIVES WILL UNDOUBTEDLY STAND OUT AS PERHAPS THE MOST CONSTRUCTIVE AND CREATIVE PERIOD IN THE HISTORY OF THE STATE. ALREADY, THE USE OF SOLAR ENERGY IS BECOMING EVIDENT THROUGHOUT THE STATE, AND BIOMASS IS BEING CONVERTED TO ELECTRICAL ENERGY. GEOTHERMAL POWER WILL BECOME A REALITY SOON WITH THE INSTALLATION OF A 2½ TO 3 MEGAWATT ELECTRIC WELL-HEAD GENERATOR ON THE ISLAND OF HAWAII. ITS SUCCESS WILL LEAD TO THE CONSTRUCTION OF MORE GENERATORS PRODUCING AS MUCH AS 50 MEGAWATTS FROM THE SAME STEAM WELL. IN THE NOT-TOO-DISTANT FUTURE, I PREDICT THAT MANY OF HAWAII'S HOMES AND BUSINESS BUILDINGS WILL BE PROVIDED WITH ELECTRICITY GENERATED BY MODERN AND EFFICIENT WINDMILLS AND THERMAL ENERGY FROM THE OCEAN. AS THE PRICE OF

PETROLEUM AND GASOLINE CONTINUES TO RISE, ALCOHOL, METHANOL AND ETHANOL, PRODUCED FROM REPLENISHABLE BIOMASS WILL POWER OUR AUTOMOBILES, AND ELECTRICAL ENERGY WILL BE CONVERTED DIRECTLY FROM THE SUN WITH THE USE OF SOLAR CELLS. IT IS MY DREAM THAT HAWAII WILL ONE DAY BECOME SELF-SUFFICIENT IN ENERGY AND BE A MODEL FOR THE NATION AND THE WORLD.

AS A MEMBER OF THE SENATE ENERGY COMMITTEE, I HAVE HAD THE OPPORTUNITY OF HEARING FROM A NUMBER OF YOU ABOUT THE PROGRESS YOU ARE MAKING IN DEVELOPING OCEAN THERMAL ENERGY. I WOULD ESPECIALLY LIKE TO COMPLIMENT YOU ON THE EXCELLENT PROGRESS WHICH YOU HAVE MADE, ESPECIALLY DURING THE PAST 3 YEARS. WHAT WAS IN 1975 AN OTEC PROGRAM MOSTLY DIRECTED TO THEORETICAL STUDIES, PAPER INVESTIGATIONS AND BASIC RESEARCH, HAS PROGRESSED THROUGH 1977 AND THE BEGINNING OF 1978, INTO A HARDWARE PROGRAM WITH GREAT OPPORTUNITY FOR EARLY, SUBSTANTIAL PILOT PLANT CONSTRUCTION AND RAPID FOLLOW-UP COMMERCIALIZATION. LET ME COMPLIMENT YOU ON THAT PROGRESS. LET ME COMPLIMENT YOU WHO HAVE SUCCESSFULLY BUILT THE HARDWARE AND RUN THE TESTS. LET ME COMPLIMENT YOU IN THE DEPARTMENT OF ENERGY WHO HAVE

BROUGHT THIS OTEC IDEA ALONG TO A PROGRAM WHICH ENCOMPASSES LAND-BASED TEST FACILITIES IN HAWAII, FLORIDA AND PUERTO RICO. LET ME COMPLIMENT, TOO, THOSE OF YOU FROM INDUSTRY WHO ARE HERE TO ASSESS THE PROGRESS THIS OTEC TECHNOLOGY IS MAKING TOWARD NEAR-TERM COMMERCIAL USE. AND FINALLY, LET ME COMPLIMENT THOSE DELEGATIONS OF OTEC RESEARCHERS FROM JAPAN, FROM FRANCE, AND FROM OUR NEIGHBORING COUNTRIES OF CENTRAL AND SOUTH AMERICA, WHO HAVE COME HERE TO SHARE IDEAS WITH US AND TO BENEFIT FROM THE WORK BEING PRESENTED. THIS IS, AS I UNDERSTAND IT, THE FIRST OTEC CONFERENCE WITH EXTENSIVE INTERNATIONAL PARTICIPATION. TRULY THE ENERGY PROBLEM IS A WORLD-WIDE PROBLEM, AND THE OCEAN THERMAL RESOURCE PROVIDES ENOUGH POTENTIALLY USEABLE ENERGY FOR ALL. FOR JAPAN AND THE FAR EAST, FOR FRANCE AND THE EUROPEAN COMMUNITY, AND FOR THE CENTRAL AND SOUTH AMERICAN COUNTRIES, THE PROMISE OF OTEC IS AT LEAST AS IMPORTANT AS IT IS TO THE UNITED STATES.

AS A SENATOR AND NOT A SCIENTIST, I AM EXCITED OVER THE PROMISE OF OBTAINING ENERGY FROM THE OCEAN. IN TERMS OF AIR AND WATER QUALITY, ENERGY FROM THE OCEAN WOULD BE CLEAN, AND

ESSENTIALLY POLLUTION FREE. AND FURTHERMORE, THE "FUEL SUPPLY"
IS VIRTUALLY INFLATION FREE!! OCEAN ENERGY COULD BE OF MAJOR
IMPORTANCE ON A LOCAL OR REGIONAL SCALE IN PARTICULARLY
FAVORABLE AREAS WHERE THE RESOURCE POTENTIAL IS SUBSTANTIAL.

I AM ESPECIALLY INTRIGUED BY THE FACT THAT THE OCEAN
REPRESENTS A POTENTIAL SOURCE OF ENERGY WHICH KNOWS NO DIFFERENCE
IN CAPABILITY, WHETHER IT BE IN THE BRIGHT SUNLIGHT DURING THE
DAYTIME, OR IN THE PITCH DARKNESS OF A STARLESS NIGHT: ENERGY
WHOSE SOURCE KNOWS SCARCELY ANY SEASONABLE VARIATIONS IN
CAPABILITY. NO STORAGE OF ENERGY IS REQUIRED BECAUSE THE WORLD
OCEAN SERVES AS A HUGE SOLAR HEAT COLLECTOR AND DOES THE STORING
FOR US. FURTHERMORE, THERE IS NO SIGNIFICANT LAND USE REQUIREMENT
FOR THIS SOLAR-DRIVEN ENERGY PROCESS. BOTH COASTS OF AFRICA, THE
TROPICAL WEST AND SOUTHEASTERN COASTS OF THE AMERICAS, AND MANY
CARIBBEAN AND PACIFIC ISLANDS ARE SITUATED WHERE ADJACENT WATERS
POSSESS THE YEAR-ROUND THERMAL CHARACTERISTICS WHICH MEET THE
REQUIREMENTS OF AN OTEC PLANT. I AM INFORMED THAT THIS CONCEPT
HAS EVEN BEEN PROPOSED IN POLAR REGIONS WHERE THE LARGE, STABLE

THERMAL GRADIENT THAT EXISTS BETWEEN THE RELATIVELY WARM WATER BELOW THE POLAR ICECAPS AND THE COLDER AIR ABOVE CAN BE HARNESSSED TO PROVIDE POWER.

ANOTHER ASPECT OF OTEC WHICH FASCINATES ME IS THE FACT THAT THE COLD WATER BROUGHT UP FROM THE DEEP TO COOL THE PLANT WILL BE RICH IN NUTRIENTS THAT COULD SIGNIFICANTLY ENHANCE FISH GROWTH AROUND AN OTEC INSTALLATION. IN A HUNGRY WORLD, THE POSSIBILITY OF STARTING AND SUSTAINING A FOOD CHAIN WITH THE NUTRIENTS IS A MATTER THAT SHOULD NOT BE OVERLOOKED.

HAVING COMPLIMENTED YOU ON THE EXCELLENT PROGRESS MADE TO DATE, LET ME NOW STATE THAT THE PACE OF THAT PROGRESS, IN MY OPINION, IS NOT YET FAST ENOUGH. AS YOU KNOW, FOR THE PAST THREE YEARS THE CONGRESS HAS FAR SURPASSED THE ADMINISTRATION IN PROVIDING FUNDS FOR YOUR WORK. FOR FISCAL YEAR (FY) 1976, THE ENERGY RESEARCH AND DEVELOPMENT AGENCY (ERDA) ASKED FOR OTEC FUNDS IN THE AMOUNT OF \$3.2 MILLION; THE CONGRESS AUTHORIZED OVER \$8 MILLION. FOR FY 1977, ERDA ASKED FOR \$9.2 MILLION; THE CONGRESS AUTHORIZED \$13.5 MILLION. IN FY 1978, ERDA ASKED FOR \$25.3 MILLION

AND THE CONGRESS AUTHORIZED \$35.3 MILLION. AND JUST RECENTLY, FOR FY 1979, THE DEPARTMENT OF ENERGY ASKED FOR \$32.5 MILLION. TOMORROW, A MARKUP IS SCHEDULED IN CHAIRMAN MIKE McCORMACK'S ADVANCED ENERGY TECHNOLOGY AND ENERGY RESEARCH DEVELOPMENT AND DEMONSTRATION SUBCOMMITTEE IN THE HOUSE OF REPRESENTATIVES. I HAVE BEEN INFORMED THAT, ONCE AGAIN, THE HOUSE IS EXPECTED TO COME FORTH WITH A SUBSTANTIAL INCREASE OVER THE ADMINISTRATION'S REQUEST. AS A MEMBER OF THE SENATE ENERGY AND NATURAL RESOURCES COMMITTEE, I BELIEVE I CAN SAFELY PREDICT THAT THE SENATE WILL CONCUR WITH THE HOUSE, AS IT DID LAST YEAR, AND PROVIDE OTEC FUNDS EXCEEDING THE ADMINISTRATION'S REQUEST FOR THE NEXT FISCAL YEAR.

THE CONGRESS HAS TAKEN THESE ACTIONS TO PROVIDE MORE FUNDS TO OTEC DEVELOPMENT NOT ONLY BECAUSE IT BELIEVES IN ITS GREAT FUTURE, BUT BECAUSE OF ALL THE INSTITUTIONS OF GOVERNMENT, THE CONGRESS IS MOST ATTUNED TO THE VOICE OF THE AMERICAN PEOPLE. IT KNOWS THAT THE AMERICAN PEOPLE BELIEVE IN SOLAR POWER, THAT THEY BELIEVE IN YOUR OTEC WORK, AND THAT THEY WANT YOU TO SUCCEED. THROUGH THE CONGRESS THEY HAVE EXPRESSED THEIR FAITH IN YOU BY

PROVIDING THE NECESSARY MEANS. WHETHER YOU LIKE IT OR NOT, YOU ARE THEREFORE CHARGED WITH A SPECIAL RESPONSIBILITY OF EXERTING YOUR BEST EFFORT. YOU ARE CHARGED WITH THE RESPONSIBILITY TO DO YOUR WORK METICULOUSLY, TO DO YOUR WORK SOUNDLY AND SCIENTIFICALLY, TO DO YOUR WORK WITH IMAGINATION AND UNSTINTING EFFORT, AND ABOVE ALL, TO DO YOUR WORK WITH BOLDNESS, WITHOUT FEAR OF FAILURE.

ON THE FLOOR OF THE SENATE LAST JUNE, I REMINDED MY COLLEAGUES THAT OTEC IS ONE OF THE SIX SOLAR TECHNOLOGIES THAT CONSITUTED THE ORIGINAL U.S. SOLAR ENERGY PROGRAM. THESE TECHNOLOGIES WERE SELECTED BY THE NATIONAL SCIENCE FOUNDATION AS BEING OPTIONS WHICH MET THE BASIC TEST OF CLEARLY HAVING THE POTENTIAL, IF PROPERLY SUPPORTED, OF SUPPLYING A SUBSTANTIAL PORTION OF U.S. ENERGY NEEDS FOR ELECTRICITY AND ENERGY-INTENSIVE PRODUCTS. I BELIEVE THE CONGRESS HAS PROVIDED THAT SUPPORT TO YOU.

WE KNOW THAT WHILE THE BASIC TECHNOLOGY REQUIRED FOR OCEAN THERMAL ENERGY CONVERSION IS AVAILABLE AND OTEC OPERATING PRINCIPLES ARE WELL DOCUMENTED, COMPLEX ENGINEERING AND COST PROBLEMS REMAIN TO BE SOLVED. WE KNOW TOO THAT CERTAIN POTENTIAL ENVIRONMENTAL,

LEGAL, POLITICAL, AND INSTITUTIONAL QUESTIONS NEED TO BE ADDRESSED ON A WORLD-WIDE SCALE BEFORE AN OTEC POWER PLANT CAN BE OPERATED IN INTERNATIONAL WATERS AT A TIME WHEN THE LAW GOVERNING USE OF THE WORLD OCEAN IS IN FLUX. THESE WOULD INCLUDE INTERNATIONAL JURISDICTIONAL ISSUES, SPATIAL AND EMERGING USE CONFLICTS, REGULATORY AND LIABILITY ASPECTS, DOMESTIC AND INTERNATIONAL ENVIRONMENTAL ASPECTS, AND THE AVAILABILITY OF FINANCING. THE IMPORTANCE OF RESEARCH REGARDING THE LEGAL, POLITICAL, AND ENVIRONMENTAL ASPECTS OF OTEC CANNOT BE OVERLOOKED. INTERDISCIPLINARY AND INTERNATIONAL EFFORTS NOW COULD GUIDE THE ENGINEERING DEVELOPMENT OF THE TECHNOLOGY IN ORDER TO MINIMIZE FUTURE LEGAL CONFLICTS THAT MIGHT FORESTALL OR IMPEDE THE DEPLOYMENT OF OTEC TECHNOLOGY AS A NEW POWER SOURCE FOR THE NATION AND THE WORLD.

THIS IS, OF COURSE, WHAT THE 5TH OTEC CONFERENCE IS ALL ABOUT, AND I AM PLEASED TO LEARN THAT INFORMATION CONCERNING MANY CRITICAL QUESTIONS IS NOW AVAILABLE AND THAT, GENERALLY, IT IS ENCOURAGING. I UNDERSTAND FROM MY FRIENDS IN DOE THAT ENOUGH INFORMATION IS ALSO AVAILABLE TO ASSESS ACCURATELY THE TECHNICAL

VIABILITY AND POTENTIAL CONTRIBUTION OF THIS TECHNOLOGY. I WAS HAPPY TO LEARN, FOR EXAMPLE, THAT BIOFOULING, CORROSION AND HEAT EXCHANGER CLEANING STUDIES CONDUCTED IN ST. CROIS, HAWAII, FLORIDA AND THE GULF OF MEXICO HAVE SUCCESSFULLY DEMONSTRATED THE TECHNICAL FEASIBILITY OF THESE SYSTEM COMPONENTS. BUT I WAS ALSO MADE TO UNDERSTAND THAT QUESTIONS STILL REMAIN UNANSWERED WITH RESPECT TO THE COLD WATER PIPE AND THE ELECTRICAL UMBILICAL CABLE, WHICH HAVE POSED MORE DIFFICULT ENGINEERING PROBLEMS THAN EXPECTED.

I AM CONFIDENT, HOWEVER, THAT SOLUTIONS TO THE REMAINING TECHNICAL PROBLEMS ARE ALMOST WITHIN OUR GRASP, AND THAT NOW WE SHOULD PUSH RAPIDLY TOWARD SUCCESSFUL DESIGN, CONSTRUCTION AND OPERATION OF EARLY PILOT OR DEMONSTRATION PLANTS USING THE BEST AVAILABLE SCIENCE AND ENGINEERING. I BELIEVE THE POLITICAL CLIMATE IS FAVORABLE AND THE AMERICAN PEOPLE READY TO SUPPORT YOUR EFFORTS. I COMMEND YOU TO THE TASKS WHICH MUST BE COMPLETED, AND TO COME FORWARD EXPEDITIOUSLY WITH A SOUND, TECHNICALLY FEASIBLE PLAN TO HARNESS THE OVER-ABUNDANT ENERGY AVAILABLE IN OUR OCEANS, THE UNTAPPED WORLD RESOURCE.

THESE ARE EXCITING TIMES TO BE INVOLVED IN CHARTING THE ENERGY FUTURE OF OUR NATION AND THE WORLD. YOU ARE IN A POSITION TO MAKE THE GREATEST CONTRIBUTION. YOURS IS TRULY A WORTHY CHALLENGE.

THANK YOU VERY MUCH.

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