

Book

REMARKS OF  
RUTH C. CLUSEN  
ASSISTANT SECRETARY FOR ENVIRONMENT  
U.S. DEPARTMENT OF ENERGY  
PREPARED FOR  
TENTH ANNIVERSARY CELEBRATION  
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INSTITUTE FOR ENVIRONMENTAL STUDIES  
UNIVERSITY OF WISCONSIN-MADISON  
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ENVIRONMENT IN THE REAL WORLD

TEN YEARS IS NOT A LONG TIME AS HISTORY GOES. YET THIS PAST DECADE HAS BEEN OF MONUMENTAL IMPORTANCE TO THE DEVELOPMENT OF THE NATION'S ENVIRONMENTAL CONSCIENCE. WISCONSIN CAN BE PROUD OF ITS PART IN POINTING OUT RESPONSIBILITIES OF HUMAN BEINGS TOWARD THEIR SURROUNDINGS.

THIS STATE'S INVOLVEMENT BEGAN LONG AGO WITH MEN LIKE CHARLES VAN HISE. AS PRESIDENT OF THIS GREAT UNIVERSITY, HE WROTE IN 1910 OF THE IMPORTANCE OF CONSERVATION AND THE NECESSITY OF UNIVERSITIES TO STUDY THE PRESERVATION OF NATURAL RESOURCES. THE WISCONSIN IDEA HAS INVOLVED THE UNIVERSITY IN THE LIFE OF THE STATE, WITH ITS REMINDER THAT THE BOUNDARIES OF THE UNIVERSITY ARE THE STATE'S BOUNDARIES.

CONSERVATION HAS COME TO MEAN MORE THAN PRESERVING BEAUTY, ANIMAL LIFE, CLEAN WATER AND OTHER NATURAL ASSETS. PERHAPS THAT IS WHY THE WORD HAS GIVEN WAY TO THE MORE ENCOMPASSING TERM, ENVIRONMENT. WHATEVER IT IS CALLED, CONSERVATION AND WISCONSIN ARE CLOSELY LINKED.

AS A WISCONSINITE, I AM DELIGHTED TO HAVE BEEN ASKED TO PARTICIPATE IN THIS TENTH ANNIVERSARY CELEBRATION OF THE UNIVERSITY'S INSTITUTE FOR ENVIRONMENTAL STUDIES. IT IS ALSO A CELEBRATION OF THE TENTH ANNIVERSARY OF EARTH DAY, THE CREATION OF GAYLORD NELSON OF CLEAR LAKE, WISCONSIN. I SUPPOSE IT IS ONLY FORTUITOUS THAT THE NAME OF THE SENATOR'S HOMETOWN DRAWS A MENTAL PICTURE OF ENVIRONMENTAL PURITY. CLEAR LAKE, NONETHELESS, IS APROPOS TO THE ENVIRONMENTAL MOVEMENT.

SENATOR NELSON SPEAKING AT SEATTLE IN SEPTEMBER 1959 CALLED FOR A SPECIAL DAY FOR STUDENTS, TEACHERS, SCIENTISTS, PUBLIC LEADERS AND CONCERNED CITIZENS TO DISCUSS THE THREAT TO THE WORLD'S ECOLOGY. HE SUGGESTED A NATIONAL "TEACH-IN" ON COLLEGE CAMPUSES. THE IDEA BROUGHT SPONTANEOUS ACCEPTANCE. THE FIRST EARTH DAY WAS THE OCCASION FOR TENS OF MILLIONS OF AMERICANS TO VOICE THEIR DEMANDS, TO USE THE SENATOR'S WORDS, "THAT THE RIGHT TO A DECENT ENVIRONMENT BE ADOPTED AS A FUNDAMENTAL AIM OF THIS SOCIETY."

THROUGH HIS EFFORTS, CONGRESS ADOPTED A RESOLUTION ESTABLISHING AN ANNUAL EARTH WEEK IN APRIL, STARTING IN 1971.

TO MANY, APRIL 22, 1970, MARKED THE BEGINNING OF A NEW ENVIRONMENTALISM.

SURELY THE NAME OF NELSON WILL BE ADDED TO THE LITANY OF ENVIRONMENTALISTS, EXTENDING BEYOND VAN HISE, MUIR, LEOPOLD, SCHURZ AND OTHER WISCONSINITES TO ROOSEVELT, PINCHOT, AND CARSON.

THE HISTORY OF THE INSTITUTE FOR ENVIRONMENTAL STUDIES IS A LITTLE LESS DRAMATIC THAN THAT OF EARTH DAY. ITS GENESIS IS VERY ACADEMIC. A NUMBER OF FACULTY MEMBERS RECOGNIZED NEARLY TWENTY YEARS AGO THE NEED FOR INTERDISCIPLINARY WORK ON SUCH PROBLEMS AS POVERTY, ENVIRONMENTAL DEGRADATION, POLLUTION, OVERUSE OF RESOURCES. PRESIDENT FRED HARVEY HARRINGTON RESPONDED IN 1962 BY APPOINTING AN INTERDISCIPLINARY STUDIES COMMITTEE TO RECOMMEND ACTION. THAT COMMITTEE EVOLVED UNTIL A GROUP HEADED BY PROFESSOR JOE B. WILSON RECOMMENDED TO CHANCELLOR EDWIN YOUNG IN DECEMBER 1969 THAT THE INSTITUTE BE ESTABLISHED. ITS DIRECTOR WAS TO REPORT DIRECTLY TO THE CHANCELLOR. THE INSTITUTE WOULD ENGAGE IN INSTRUCTION, RESEARCH AND SERVICE. IN FEBRUARY 1970 THE REGENTS RECEIVED THE REPORT ON ESTABLISHMENT OF THE INSTITUTE FOR ENVIRONMENTAL STUDIES. THE INSTITUTE HAS ENDURED FOR THESE TEN YEARS. IT IS THRIVING, JUST RECENTLY AUTHORIZING A MASTER'S LEVEL PROGRAM IN ENERGY POLICY BEGINNING NEXT FALL. IT WON'T BE LONG BEFORE MEN AND WOMEN WITH DEGREES FROM THAT PROGRAM WILL BE JOINING THE DEPARTMENT OF ENERGY AND CONTRIBUTING TO DEPARTMENT'S PURPOSE: ASSURING THE COUNTRY'S ORDERLY TRANSITION FROM AN ECONOMY DEPENDENT UPON OIL TO AN ECONOMY RELYING ON DIVERSIFIED ENERGY SOURCES THAT ARE ENVIRONMENTALLY ACCEPTABLE.

CONGRATULATIONS TO DR. BRYSON AND TO THE INTERDISCIPLINARY FACULTY OF THE INSTITUTE ON ENVIRONMENTAL STUDIES. THE INSTITUTE AND THE ENVIRONMENTAL MOVEMENT HAVE GROWN AND MATURED TOGETHER. THE PEOPLE OF THE STATE, THE COUNTRY AND THE WORLD CANNOT HELP BUT BENEFIT.

THE PROBLEMS THIS INSTITUTE WAS ESTABLISHED TO WORK UPON HAVE NOT GONE AWAY. IN FACT, AS MORE IS LEARNED, THEIR COMPLEXITY INCREASES --- A COMMON SIDE EFFECT OF ADDING TO THE KNOWLEDGE BASE. MY CONCERN IS WITH THE COMPLEX NATURE OF ENVIRONMENTAL PROBLEMS ENTWINED WITH ENERGY CONSERVATION AND PRODUCTION. THEY ARE REAL PROBLEMS.

NOT LONG AGO, VERMONT ROYSTER, THE FORMER WALL STREET JOURNAL EDITOR AND STILL SOMETIME COLUMNIST, WROTE A PIECE WITH THIS HEADLINE: "THE POSITIVE SIDE OF CRISES." ALTHOUGH HE WAS WRITING OF THE SOVIET AGRESSION IN AFGHANISTAN AND ITS PORTENT IN THE PERSIAN GULF HIS CLOSING PARAGRAPH MIGHT VERY WELL APPLY TO AMERICA'S ENERGY PROBLEM OR CRISIS AS IT IS SOMETIMES CALLED. HE WROTE:

"THE DANGER OF THE PRESENT CRISIS IS SELF-EVIDENT. BUT IT CAN ALSO HAVE ITS USES IF IT WILL SOMEHOW TEACH US TO SEE THE WORLD AS IT IS AND GIVE US THE RESOLVE WE MUST HAVE IF WE ARE TO LIVE SAFELY IN IT."

SINCE WORLD WAR II OUR BUSINESS, INDUSTRIAL AND SOCIAL LIVES HAVE BEEN SHAPED BY CHEAP AND ACCESSIBLE OIL. RECENT EVENTS HAVE CHANGED THAT. WE NOW KNOW THAT WE NO LONGER CAN DEPEND UPON FOREIGN OIL, WHICH AS IS THE CASE WITH DOMESTIC OIL, INEVITABLY WILL RUN OUT. BECAUSE IT WILL RUN OUT, THE LAWS OF ECONOMICS FORCED UP OIL PRICES. CONTINUING TO HOLD DOWN ARTIFICIALLY THE PRICE OF DOMESTIC OIL MADE NO ECONOMIC SENSE. FOR THAT REASON, AND TO FORCE CONSERVATION, OIL PRICES ARE BEING DECONTROLLED. SEEING THE WORLD AS IT REALLY IS REQUIRES THAT THE UNITED STATES MAKE THE TRANSITION TO OTHER ENERGY SOURCES. WE MUST BRING TOGETHER ALL OF OUR TECHNICAL, FINANCIAL AND

HUMAN RESOURCES TO MAKE THE CHANGE. THAT'S AN ENORMOUS CHALLENGE, AND AN OPPORTUNITY. NEARLY EVERY DISCIPLINE HAS AN APPLICATION IN THE PERIOD OF TRANSITION. SCIENCE, ENGINEERING, SOCIAL SCIENCES WILL ALL BE INVOLVED IN SHAPING AN EVOLVING SOCIETY NO LONGER HEAVILY DEPENDENT UPON OIL.

BUT FOR THE NEXT FIVE YEARS THE WORLD WILL CONTINUE TO RELY ON OIL, WHICH SUPPLIED ABOUT HALF OF THE WORLD'S ENERGY LAST YEAR. IN THE UNITED STATES, SOME 46 PERCENT OF THE PRIMARY ENERGY CONSUMPTION WAS OIL. OF THAT, 21 POINTS CAME FROM IMPORTS. UNTIL 1985 THE MOST READILY AVAILABLE, ECONOMIC SOURCE OF ADDITIONAL ENERGY IS CONSERVATION --- MORE EFFICIENT USE OF THE ENERGY NOW BEING CONSUMED.

FROM 1985 TO THE YEAR 2000 WE WILL USE MORE COAL, BEGIN USING COAL-DERIVED SYNTHETIC FUELS, TAKE GREATER ADVANTAGE OF SOLAR TECHNOLOGIES, START PRODUCING SHALE OIL, TAP UNCONVENTIONAL GAS SUPPLIES AND HAVE MORE NUCLEAR POWER. IN THAT PERIOD, TOO, WE WILL HAVE MADE CONSERVATION AND ENERGY EFFICIENCY A HABIT.

BEYOND 2000 THE UNITED STATES AND THE WORLD WILL MOVE CLOSER TO USING RENEWABLE ENERGY SOURCES -- SUNLIGHT -- AND ADVANCED NUCLEAR TECHNOLOGIES, SUCH AS FUSION.

I PERCEIVE A WIDESPREAD FEELING THAT CONSERVATION IS AN EASY SOLUTION TO OUR ENERGY PROBLEMS. THAT JUST IS NOT TRUE. SURPRISINGLY, THE FIRST PRESS REPORTS OF WHAT THE DEPARTMENT OF ENERGY IS PROPOSING FOR STANDBY CONSERVATION GOT MUCH LESS THAN FRONTPAGE PLAY. PUBLIC HEARINGS ON THE MEASURES BEGAN TODAY IN ATLANTA. THE PROPOSALS, WHICH WOULD GO INTO EFFECT BY PRESIDENTIAL ORDER IF STATES FAILED TO MEET CONSERVATION TARGETS, APPLY MOSTLY TO CARS AND PLEASURE

BOATS. IF FUEL EMERGENCIES DEVELOPED, THE ORDERS COULD INCLUDE PROHIBITIONS AGAINST DRIVING ONE, TWO OR EVEN THREE DAYS A WEEK. BOATS COULD BE ORDERED DOCKED ON SATURDAYS OR SUNDAYS, OR BOTH. ALTOGETHER THERE ARE NINE PROPOSALS, INCLUDING ODD-EVEN DAYS FOR BUYING GASOLINE, MINIMUM PURCHASES, A FOUR-DAY WORK WEEK FOR NONESSENTIAL EMPLOYMENT.

THE DEPARTMENT HAS SOME OTHER, EVEN STIFFER REMEDIES, NOT YET PROPOSED, THAT MIGHT BE IMPOSED IF ENERGY SUPPLIERS OTHER THAN GASOLINE AND DIESEL FUEL GET TIGHTER. MANDATORY TEMPERATURE CONTROLS IN PRIVATE HOMES, FOR EXAMPLE.

AUSTERITY BEYOND THAT KNOWN IN WARTIME COULD BE IN OUR FUTURE IF VOLUNTARY MEASURES DON'T WORK. EVERY PERSON IN THIS COUNTRY MUST USE LESS ENERGY. SAVING MUST BECOME A HABIT.

PROJECTIONS FOR ENERGY USE ARE SMALLER THAN THEY MIGHT HAVE BEEN HAD THE EVENTS SINCE 1973 NOT HAPPENED. BUT BY THE TURN OF THE CENTURY THE UNITED STATES MUST USE MORE ENERGY THAN NOW IF OUR ECONOMY IS NOT TO STAGNATE. THE COUNCIL ON ENVIRONMENTAL QUALITY ESTIMATED A YEAR AGO THAT GROSS NATIONAL PRODUCT COULD NEARLY DOUBLE IN THE NEXT 20 YEARS WITH AN INCREASE IN ENERGY CONSUMPTION OF NO MORE THAN 25 PERCENT, OR PERHAPS, WITH DETERMINED EFFORT, 10-15 PERCENT.

A MAJORITY OF PEOPLE IN THIS COUNTRY WANT A HEALTHY ECONOMY. NO CANDIDATE WILL BECOME AN OFFICEHOLDER BY ADVOCATING NEGATIVE GROWTH, "FULL" EMPLOYMENT CANNOT BE ATTAINED WITHOUT SUFFICIENT ENERGY SUPPLIES, ALTHOUGH THOSE WILL GROW AT LOWER RATES THAN IN THE PAST.

DURING THE 1990s, THE CONTRIBUTION OF RENEWABLES IS EXPECTED TO INCREASE RAPIDLY TOWARD THE GOAL OF SERVING 20 PERCENT OF THE NATION'S

REQUIREMENTS IN THE YEAR 2000. SOMETIMES THIS IS REFERRED TO AS THE GOAL FOR SOLAR ENERGY.

OVERALL THE OBJECTIVE IN 10 YEARS IS TO CUT THIS COUNTRY'S DEPENDENCE ON FOREIGN OIL BY HALF WHILE MAINTAINING A STRONG AND GROWING ECONOMY. THAT EFFORT REQUIRES BALANCING A REDUCTION IN DEMAND WITH AN INCREASE IN THE SUPPLY OF ENERGY. THE BILLS IN CONGRESSIONAL CONFERENCE ARE A MAJOR PART OF THAT EFFORT. THOSE BILLS CALL FOR AN ENERGY MOBILIZATION BOARD AND A ENERGY SECURITY CORPORATION OR SYNTHETIC FUELS CORPORATION. THE WINDFALL PROFITS TAX BILL WON CONFERENCE APPROVAL LAST WEEK.

FORECASTING THE FUTURE IS NOT A SCIENCE. BUT DECISIONS CANNOT BE MADE WITHOUT LOOKING AHEAD AND HAVE SET POLICIES.

BUT WHAT ABOUT THE ENVIRONMENT?

IS THERE AN ENERGY/ENVIRONMENT DILEMMA? DOES THIS NATION THROUGH ITS GOVERNMENT REALLY HAVE TO CHOOSE BETWEEN TWO SEPARATE BUT EQUAL PROPOSITIONS? IS IT REALLY EITHER ALL THE ENERGY WE CAN PRODUCE WITH CONCURRENT FILTH AND HAZARDS OR PRISTINE SAFETY WITH CREEPING STARVATION? IS IT DOE VERSUS EPA IN THE GLADIATORIAL RING?

THE ANSWER TO ALL THOSE QUESTIONS IS NO. THE FACT IS, HOWEVER, THAT THERE ARE BIG PROBLEMS IN MELDING ENERGY AND ENVIRONMENTAL GOALS.

MY OFFICE OF ENVIRONMENT IS PART OF THE DEPARTMENT OF ENERGY. MY OFFICE SHARES THE MISSION OF DOE TO MAKE SURE THAT THIS COUNTRY'S ENERGY NEEDS ARE MET. SOME CALL MY OFFICE THE MILLSTONE AROUND DOE'S NECK. OTHERS WOULD CALL US SYCOPHANTS. BUT THE BEST WAY TO STATE OUR JOB IS TO QUOTE THE ENERGY ORGANIZATIONAL ACT OF 1977. THAT

LAW SAYS THAT THE ULTIMATE GOAL OF THE OFFICE OF ENVIRONMENT IS "TO ASSURE INCORPORATION OF NATIONAL ENVIRONMENTAL GOALS IN THE FORMULATION AND IMPLEMENTATION OF ENERGY PROGRAMS, AND TO ADVANCE THE GOAL OF RESTORING, PROTECTING, AND ENHANCING ENVIRONMENTAL QUALITY, AND ASSURING PUBLIC HEALTH AND SAFETY."

I SAY THAT IS JUST COMMON SENSE.

THERE ARE SOME ENVIRONMENTALISTS, I KNOW, WHO WOULD SAY THAT ENGINEERS HAVE HELPED CREATE POLLUTION PROBLEMS WE NOW FACE AND WHO WOULD CREATE MORE IF LEFT TO THEIR OWN DEVICES. I AM ONE ENVIRONMENTALIST THAT DOES NOT SHARE THAT VIEW. SCIENTISTS AND ENGINEERS WORKING IN MY OFFICE OF ENVIRONMENT ARE DEDICATED TO FINDING SOLUTIONS FOR THE ENVIRONMENTAL PROBLEMS ASSOCIATED WITH ENERGY PRODUCTION. FROM PERSONAL EXPERIENCE I KNOW THAT THERE IS NO BASIC CONFLICT BETWEEN ENVIRONMENTAL AND TECHNOLOGICAL GOALS. I ALSO KNOW THAT FINDING ANSWERS IS NO EASY TASK.

LAST FALL MY OFFICE SPONSORED A DAY-LONG DIALOGUE THAT FEATURED SOME OF THE AUTHORS OF EACH OF THREE IMPORTANT STUDIES ON AMERICA'S ENERGY FUTURE. ONE SPEAKER SAID IT SHOULD BE POSSIBLE TO DEVELOP A NATIONAL ENERGY CONSENSUS IN SUPPORT OF THREE GOALS . . . GOALS THAT WOULD ACCOMMODATE THE COMBINED OBJECTIVES OF CONTENDING GROUPS. THOSE GOALS ARE: FIRST, AN ADEQUATE DOMESTIC SUPPLY OF ENERGY CONSISTENT WITH THE REQUIREMENTS OF ECONOMIC GROWTH; SECOND, THE ELIMINATION OF ENERGY WASTE, AND THIRD, THE PROTECTION OF ENVIRONMENTAL VALUES INCLUDING HUMAN HEALTH AND SAFETY.

IT SEEMED TO ME THAT THE OTHER SPEAKERS THAT DAY SAID NOTHING THAT WOULD CONTRADICT THAT APPRAISAL. RATHER THEIR REMARKS SEEMED TO AFFIRM THE RATIONALITY OF THOSE GOALS.

STILL ANOTHER POINT OF IMPLIED AGREEMENT WAS THAT THERE IS NO SINGLE TECHNOLOGY -- EXISTING OR PROPOSED -- THAT COULD BE OUR



ENERGY PANACEA. THERE MUST BE A MIX OF TECHNOLOGIES. GOING BEYOND THAT, THERE MUST BE CONSERVATION OF ENERGY. EVEN IN THE FUTURE WHEN RENEWABLE SOURCES WILL ACCOUNT FOR MORE ENERGY THAN THEY NOW PRODUCE. THERE ALSO WAS OVERALL AGREEMENT ON THE NEED FOR PROTECTION OF THE AIR, WATER AND LAND TOGETHER WITH THE HEALTH AND SAFETY OF THE PRODUCERS AND USERS OF ENERGY.

THERE IS NO CONFLICT BETWEEN THE PROPOSALS OF THE ADMINISTRATION AND THE DEPARTMENT OF ENERGY AND THAT HOPED FOR NATIONAL CONSENSUS. I DO NOT STAMP THAT FORMULATION OF GOALS WITH THE IMPRIMATUR OF THE GOVERNMENT. RATHER I CITE IT AS A COMMON SENSE, UNEMOTIONAL STATEMENT, I SEE BALANCE IN THOSE GOALS.

FEW WOULD ARGUE THAT THIS COUNTRY'S PRESENT ECONOMIC PROBLEMS ARE NOT CLOSELY TIED WITH THE WORLD PRICE OF OIL AND THE DEPENDENCE UPON IMPORTS. THE PRESIDENT'S ENERGY PROPOSALS ARE FOUNDED ON THE NEED TO CUT OIL IMPORTS IN HALF WITHIN 10 YEARS. THAT WOULD BE DONE BY TURNING TO UNCONVENTIONAL SOURCES OF ENERGY, PRODUCING SYNFUELS, INCREASING OUR RELIANCE ON COAL, USING AVAILABLE RENEWABLE SOURCES INCLUDING BIOMASS, AND DEVELOPING SOLAR SOURCES IN THEIR VARIOUS FORMS. THAT IS A REALISTIC MIX OF OLD AND NEW TECHNOLOGIES. OF EQUAL IMPORTANCE IS CONSERVATION . . . STOPPING WASTE.

THE TECHNIQUES FOR CONSERVING ENERGY ARE, FOR THE MOST PART, KNOWN. THERE ARE MONETARY INCENTIVES THAT CAN HELP PRODUCE SAVINGS; THE TAX WRITE-OFFS FOR HOME INSULATION BEING ONE ALREADY IN PLACE. DECONTROL OF PRICES IS ANOTHER. BUT THE REAL PROBLEM OF CONSERVATION IS THAT OF PERSUASION. FEW IN THIS COUNTRY, WHETHER THEY BE PENSIONERS OR CORPORATION MANAGERS, WILL PASS UP A CHANCE TO SAVE SOME MONEY. MANY OF YOU PROBABLY WORK FOR COMPANIES THAT HAVE ALREADY

MADE EXTENSIVE SAVINGS BY USING THE HEAT FROM OFFICE LIGHTS TO SUPPLEMENT BOILERS, OR RE-EXAMINING MOTORS, OR RETROFITTING FOR WEATHERIZATION. FOR HOMEOWNERS, SEALING CRACKS, TAPING PLASTIC SHEETS OVER WINDOWS, CLOSING FIREPLACE DAMPERS, CARPOOLING AND MANY OTHER INEXPENSIVE MEASURES CAN SAVE A GREAT DEAL OF ENERGY. THERE ARE MANY MORE SIMPLE AND EXTENSIVE MEASURES THAT CAN BE TAKEN.

CONSERVATION IS THRIFT. IT DEALS WITH ECONOMICS. BECAUSE IT MEANS NOT USING SOMETHING, CONSERVATION ALSO PRESENTS A DIFFICULT MEASURING PROBLEM. WE KNOW THAT GASOLINE CONSUMPTION HAS FALLEN. THAT CAN BE MEASURED. NEVERTHELESS, MILLIONS OF DISPARATE DECISIONS TO SAVE ON ENERGY, AND THUS MONEY, WILL BE NEEDED FROM INDIVIDUAL PEOPLE BEFORE MASSIVE SAVINGS CAN BE CALCULATED. EVEN THEN, SAVINGS WILL BE MEASURED AGAINST PROJECTIONS. FOR INSTANCE, WE USED 78 QUADS IN 1978. AS THAT NUMBER GROWS -- AND EVEN CRITICS FORESEE GROWTH IN THE NEXT FEW DECADES -- IT WILL HAVE TO BE COMPARED AGAINST WHAT MIGHT HAVE BEEN. SO, THE REAL TEST OF A CONSERVATION SUCCESS STORY WILL BE A COUNT OF BARRELS OF OIL AND OF CUBIC FEET OF GAS STILL IMPORTED. FOR CONSUMERS, THE TEST WILL BE LOOKING AT THEIR HEATING AND GASOLINE BILLS. BECAUSE EVEN SUCCESS IN BEATING INFLATION WILL MEAN A LOWER RATE OF CLIMB, THE MEASURE OF CONSERVATION WILL BE SMALLER INCREASES IN TOTAL OUTLAYS FROM YEAR TO YEAR. WE ALL WILL HAVE TO DO SOME BOOKKEEPING TO DETERMINE WHETHER WE ARE DOING OUR PARTS IN THE CONSERVATION EFFORT.

THERE IS A SIMILARITY BETWEEN CONSERVATION AND THE ENVIRONMENT WHEN IT COMES TO MEASURING RESULTS.

AIR, WATER AND LAND CANNOT BE CREATED. ENVIRONMENTAL CONCERNS CAN NO MORE BE IGNORED THAN CAN THE FINITE NATURE OF THE ENERGY SOURCES WE HAVE RELIED ON SINCE THE INDUSTRIAL REVOLUTION BEGAN. SCIENCE, ENGINEERING AND THE SOCIAL SCIENCES MUST PULL TOGETHER TO SOLVE THE PROBLEMS, USING COMMON SENSE IN THEIR APPLICATION. TECHNOLOGY CANNOT BE SUPPLANTED BY WINDING DOWN OUR GROWTH-ORIENTED SOCIETY INTO SOME IDYLIC WAY OF LIFE THAT REALLY NEVER EXISTED.

WE ARE UNABLE TO FUEL OUR ECONOMY WITH WOOD, EVEN THOUGH TREES ARE RENEWABLE. DIRECT WOOD COMBUSTION EMITS GREATER AMOUNTS OF PARTICULATES AND UNBURNED HYDROCARBONS THAN COAL FOR EACH UNIT OF ENERGY PRODUCED. OBJECTIONABLE QUANTITIES OF CARBON MONOXIDE ARE ALSO EMITTED. THUS THOSE POLLUTANTS CAUSE GREAT UNCERTAINTIES ABOUT HEALTH EFFECTS. ALSO, REMOVAL OF FOREST RESIDUES WILL DIMINISH NUTRIENTS AND ORGANIC MATTER NEEDED IN SOIL TO GROW MORE TREES. EROSION IN CLEARED AREAS CAUSES FLOODING. USING LARGE AREAS TO GROW FIREWOOD CAN COMPETE WITH FARM LAND.

TIGHTLY SEALING HOUSES AND BUILDINGS WITH INSULATION, ALTHOUGH NECESSARY, HAS INHERENT PROBLEMS THAT ONLY RECENTLY HAVE RECEIVED ATTENTION. INDOOR AIR POLLUTION IS A PROBLEM CAUSED BY GASEOUS AND PARTICULATE CHEMICALS EMITTED FROM COOKING, HEATING AND TOBACCO SMOKING; BY TOXIC CHEMICALS AND ODORS FROM COOKING AND CLEANING, BY MICRO-ORGANISMS FROM THE OCCUPANTS, BY A WIDE ASSORTMENT OF CHEMICALS FROM CONSTRUCTION MATERIALS AND EVEN FROM HOUSEHOLD FURNISHINGS. THE LATTER INCLUDE FORMALDEHYDE AND RADON, ONCE THOUGHT TO BE ASSOCIATED ESSENTIALLY WITH HIGH-RISK OCCUPATIONAL ENVIRONMENTS. VENTILATION IS THE PROBABLE SOLUTION TO THESE PROBLEMS ONCE DWELLINGS AND BUILDINGS BECOME REALLY TIGHT, BUT ENERGY MIGHT BE USED TO GET THE NECESSARY TURNOVER BETWEEN INSIDE AND OUTSIDE AIR.

HYDROELECTRIC DAMS PROBABLY ARE NOT ENVIRONMENTALLY BENIGN EITHER. SUCH DAMS CAN CAUSE SERIOUS WATER QUALITY PROBLEMS, INCLUDING LOW DISSOLVED OXYGEN, ATMOSPHERIC GAS SUPERSATURATION AND HEAVY METALS CONCENTRATION. OXYGEN-DEFICIENT WATER FROM THE BOTTOM OF THE RESERVOIR BEHIND A DAM CAN CAUSE, IT IS CLAIMED, POLLUTION EVERY BIT AS HARMFUL TO FISH AS THERMAL POLLUTION. THAT CAN BE IMPORTANT HERE IN WISCONSIN, WHERE IN 1882 THE FIRST HYDRO PLANT WENT INTO OPERATION, IN APPLETON. WISCONSIN NOW HAS 84 EXISTING HYDRO PLANTS GENERATING 1,940 GIGAWATT-HOURS OF ELECTRICITY. POTENTIALLY, IT COULD HAVE 297 WITH A CAPACITY OF 5,688 GIGAWATT-HOURS.

A LIST OF ENVIRONMENTAL AND HEALTH PROBLEMS COULD BE DRAWN FOR ALL EXISTING AND PROPOSED SOURCES OF ENERGY, A FEW EXAMPLES: RADIONUCLIDES IN COAL; TOXIC SUBSTANCES IN PHOTOVOLTAIC CELLS POSSIBLE "RED TIDE" PROBLEMS WITH OCEAN THERMAL ENERGY CONVERSION. FINDING ANSWERS TO THE HEALTH AND ENVIRONMENTAL PROBLEMS INHERENT IN ENERGY DEVELOPMENT, NOT TO MENTION THE ENGINEERING PROBLEMS IN MAKING NEW TECHNOLOGIES EFFICIENT, WILL BE A CONTINUING PROCESS. DECISIONS ON PUTTING THE TECHNOLOGIES IN PLACE WILL DEPEND ON FINDING THE ANSWERS TO THE HEALTH AND ENVIRONMENTAL QUESTIONS. REGARDLESS OF THE ANSWERS, THERE WILL BE NO SINGLE TECHNOLOGY TO EMERGE AS A PANACEA. THERE NECESSARILY WILL BE A DIVERSITY IN ENERGY SOURCES AS THE UNITED STATES MOVES THROUGH THIS DECADE AND THE DECADES AHEAD.

SYNTHETIC FUELS ARE AMONG THE DIVERSE SOURCES THE COUNTRY WILL TURN TO, INCLUDING THOSE DERIVED FROM COAL. THE USE OF COAL DOES PRESENT POLLUTION PROBLEMS. THE ENVIRONMENTAL GOALS CAN BE MET

- ONLY BY APPLICATION OF THE MOST EFFECTIVE CONTROL TECHNOLOGIES AND PRACTICES AS WE BUILD AND OPERATE SYNFUEL DEMONSTRATION PLANTS BEFORE GOING TO THOSE OF COMMERCIAL SIZE.

AN ANALYSIS DONE BY MY OFFICE FOUND THAT THERE ARE SUFFICIENT SITING OPPORTUNITIES FOR MEETING PRODUCTION GOALS OF BETWEEN 500,000 AND ONE MILLION BARRELS A DAY WITH FIRST-GENERATION SYNFUEL TECHNOLOGIES. THOSE INCLUDE SURFACE RETORTING OF OIL SHALE, INDIRECT LIQUEFACTION OF COAL -- WHICH MEANS COAL-TO-GAS-TO-LIQUID -- AND BIOMASS CONVERSION. HIGHER PRODUCTION, SUCH AS TWO OR THREE MILLION BARRELS A DAY, WOULD INCREASE THE DIFFICULTY OF FINDING SITES FOR SUCH PLANTS, BUT NOT MAKE THAT TASK IMPOSSIBLE.

SECOND-GENERATION SYNFUEL TECHNOLOGIES RUN GREATER RISKS OF UNRESOLVED ENVIRONMENTAL PROBLEMS. ONE MAJOR RISK IN UNDERGROUND OR IN SITU RETORTING OF OIL SHALE IS POTENTIAL LEACHING OF HAZARDOUS TRACE POLLUTANTS FROM WASTE MATERIALS INTO GROUNDWATER. FOR DIRECT LIQUEFACTION OF COAL, A MAJOR UNCERTAINTY CENTERS ON POSSIBLY EXPOSING WORKERS AND THE PUBLIC TO TOXIC SUBSTANCES AND CARCINOGENS.

ANOTHER PROBLEM THAT COULD MAKE REACHING THE GOALS MORE DIFFICULT, EVEN WITH FIRST-GENERATION TECHNOLOGIES, ARE REGULATIONS UNDER THE CLEAN AIR ACT AMENDMENTS, AND OTHER LAWS, THAT ARE YET TO BE WRITTEN BY FEDERAL AND STATE GOVERNMENTAL AGENCIES. THOSE PENDING REGULATIONS DEAL WITH AIR QUALITY STANDARDS, SUCH AS VISIBILITY, SHORT-TERM NITROGEN OXIDE EMISSIONS, AND NEW IMPLEMENTING RULES FOR PREVENTION OF SIGNIFICANT DETERIORATION. ALSO THERE ARE YET-TO-BE-DEFINED REGULATIONS FOR HAZARDOUS WASTES AND TOXIC PRODUCTS, UNDERGROUND

INJECTION GUIDELINES, AND WORKER SAFETY. LONG-RANGE TRANSPORT OF POLLUTANTS TO THAT LAND IN OTHER PARTS OF THE COUNTRY ARE GETTING MORE CONSIDERATION.

THE HARDWARE AND METHODS NEEDED TO CONTROL ENVIRONMENTAL RESIDUES ARE NOT NOW COMPLETELY AVAILABLE. BUT FROM WHAT IS KNOWN, IT SEEMS LIKELY THAT RESEARCH RESULTS ON ENVIRONMENTAL RISKS SHOULD BE WELL ALONG BY 1985. IN THAT CASE, APPROPRIATE CONTROLS WILL BE DEVELOPED. AN EXAMPLE INVOLVES THE EMISSIONS FROM CONVERSION PROCESSES THAT OCCUR AFTER GAS IS PRODUCED THROUGH INDIRECT LIQUEFACTION. BECAUSE SIMILAR CATALYTIC CONVERSIONS CURRENTLY ARE DONE IN PETROCHEMICAL INDUSTRIES, THOSE ADJUSTMENTS ARE EXPECTED TO HAVE A MINOR EFFECT ON THE COSTS OF SUCH SYNFUELS.

AS WORK PROCEEDS ON DEVELOPMENT OF FIRST-GENERATION TECHNOLOGIES, MUCH MONITORING WILL BE NEEDED TO IDENTIFY HEALTH AND SAFETY PROBLEMS. SUCH INFORMATION WILL HELP IMPROVE EXISTING ENVIRONMENTAL CONTROLS AND ENGINEERING SO THAT THEY WILL WORK EFFECTIVELY IN SYNFUEL TECHNOLOGIES.

AN AREA OF CONCERN IS THE PRESENCE OF KNOWN AND SUSPECTED CANCER CAUSING AGENTS IN SYNFUEL PRODUCTS. THEY COULD PRESENT HAZARDS TO WORKERS AND TO PERSONS LIVING NEAR PLANTS. WORK IS UNDERWAY TO IDENTIFY AND QUANTIFY POTENTIALLY DANGEROUS MATERIALS AND TO MITIGATE THEIR ADVERSE EFFECTS. WE HAVE IDENTIFIED CARCINOGENIC SUBSTANCES IN THE PRODUCTS AND WASTES OF ALL SYNTHETIC FUELS. THAT WAS EXPECTED. THE OVERALL PROBLEM WITH THESE CARCINOGENS, HOWEVER, SHOULD BE PLACED IN PERSPECTIVE. THE HAZARDS FROM FIRST-GENERATION TECHNOLOGIES APPEAR TO BE SIMILAR TO RISKS INCURRED IN THE PRODUCTION, TRANSPORT, AND THE USE OF CONVENTIONAL FUELS AND OTHER COMMERCIAL MATERIALS.

A LARGE SYNTHETIC FUEL INDUSTRY WILL REQUIRE MUCH WATER. IT IS NEEDED PRIMARILY FOR COOLING IN COAL CONVERSION. BUT WATER IS NEEDED ALSO FOR PRODUCING HYDROGEN USED IN THE COAL CONVERSION PROCESS ITSELF, AS WELL AS IN SUPPORT OF MINING, RECLAMATION, DUST CONTROL, AND, IN SOME CASES, FLUE GAS DESULFURIZATION. ANOTHER WATER USE MIGHT BE IN COAL SLURRY PIPELINES FOR MOVING COAL FROM MINES TO PLANTS. IN GENERAL, OUR STUDIES SHOW ADEQUATE SURFACE AND IMPOUNDED WATER FOR SYNFUELS PRODUCTION WITHOUT TURNING TO GROUND-WATER. THERE ARE, HOWEVER, INSTITUTIONAL PROBLEMS IN ALLOCATING SURFACE WATER --- WATER RIGHTS, INTERSTATE COMPACTS, MOVING WATER FROM ONE BASIN TO ANOTHER. IT SHOULD BE NOTED THAT IN ALL ITS VERSIONS THE ENERGY MOBILIZATION BOARD WOULD NOT IMPOSE ITSELF ON WATER ALLOCATION MATTERS. RATHER THOSE WOULD BE LEFT IN THE HANDS OF STATE GOVERNMENTS AND OF INDIAN TRIBES.

AS FOR WATER QUALITY, THE EFFECTS CAUSED BY MINING, CONVERSION, POPULATION INCREASES AND ASSOCIATED NON-ENERGY INDUSTRIAL DEVELOPMENT ARE EXPECTED TO HAVE ACCEPTABLE CONTROLS. INCREASES IN TOTAL SUSPENDED SOLIDS IN MAJOR RIVERS CAUSED BY SYNFUEL PRODUCTION ARE EXPECTED TO TOTAL ONLY A FEW PERCENTAGE POINTS OF ACCEPTED STANDARDS. ALSO IT IS EXPECTED THAT SYNTHETIC FUEL PLANTS, ESPECIALLY IN THE WEST, WILL NOT DISCHARGE WATER INTO STREAMS. SO WHILE PROPER DISPOSAL OF PROCESS-SOLIDS MUST BE ASSURED, DISCHARGE OF QUALITY-DEGRADING EFFLUENTS DIRECTLY INTO WATER COURSES WILL NOT BE A PROBLEM.

IN THE INTERESTS OF TIME, I HAVE BEEN SKETCHING A FEW OF THE ENVIRONMENTAL PROBLEMS WITH SYNFUEL DEVELOPMENT --- AIR AND WATER

ASPECTS, HEALTH CONSIDERATIONS. THERE ARE OTHER ECOLOGICAL CONSTRAINTS INVOLVED IN PLANT SITING, ALSO, SUCH AS PROTECTING PRIME FARMLAND, MAINTAINING HABITATS OF ENDANGERED ANIMAL SPECIES, PARKS AND DEDICATED LAND. ALL OF THESE CONSTRAINTS RANGE FROM ABSOLUTE LIMITATIONS TO DELAYS OR LIMITS TO PLANT SIZES. QUICKLY I WILL MENTION TWO MORE PROBLEMS THAT TIE TOGETHER AND WHICH REPRESENT EXAMPLES OF RESTRAINT CATEGORIES. THOSE ARE THE AVAILABILITY OF RAW MATERIALS, SUCH AS COAL, LIMESTONE, WATER, AND THE SO-CALLED BOOMTOWN PROBLEM.

OIL SHALE DEVELOPMENT IS RESTRICTED, FOR THE MOST PART, TO THE GEOLOGIC FORMATIONS WITHIN COLORADO AND UTAH. THE DEVELOPMENT WILL TAKE PLACE WHERE THERE ARE ENOUGH RESERVES -- IF ALL COULD BE USED -- TO PRODUCE OIL AT LEAST EQUAL TO ALL THE CRUDE IN EXISTING AMERICAN OIL FIELDS.

THE TRILLIONS OF TONS OF COAL THAT CAN BE STRIPPED FROM NEAR THE SURFACE OR BE MINED BELOW GROUND ARE SPREAD OVER A LARGER AREA OF THE COUNTRY, IN THE EAST, MIDWEST AND THE WEST. CONSERVATIVE ESTIMATES SHOW MORE THAN AMPLE RESERVES TO SUPPORT EASILY A SYN-FUEL INDUSTRY OF THE SIZE NOW ENVISIONED. SOME 10 TO 15 PERCENT MORE COAL EACH YEAR WOULD BE NEEDED FOR SYN-FUELS THAN HAD BEEN PLANNED JUST FOR POWER PLANTS AND BOILERS.

BUT FULL SCALE SYN-FUEL PLANTS WILL BE HUGE AND EXPENSIVE, COSTING UP TO, PERHAPS, TWO BILLION DOLLARS EACH. THAT MEANS MANY CONSTRUCTION JOBS WILL BE CREATED. THEY IN TURN MEAN CREATION OF OTHER JOBS IN SUPPORT OF THE CONSTRUCTION WORKERS AND, LATER, OF THE PERMANENT PLANT



EMPLOYEES. MANY PLANTS WILL BE SITUATED IN WHAT ARE NOW ISOLATED OR RURAL AREAS. ESTIMATES SHOW THAT AN OIL SHALE PLANT OF 50,000 BARRELS A DAY CAPACITY COULD SPAWN A COMMUNITY OF 6,600 PERSONS. SCHOOLS, POLICE AND FIRE STATIONS, HOSPITALS, PARKS, ROADS FOR SUCH A TOWN COULD COST 50 MILLION DOLLARS BEFORE FURTHER INFLATION. FOR A COAL-LIQUIDS PLANT OF THE SAME SIZE, A TOWN OF MORE THAN 10,000 MIGHT HAVE TO BE BUILT AT A COST OF 70 MILLION DOLLARS IN PUBLIC CONSTRUCTION AND OVERHEAD. SUCH COSTS WOULD PRESENT PROBLEMS FOR STATE AND LOCAL GOVERNMENTS TO SOLVE --- VIEWED AS BURDENS BY SOME OFFICIALS AND TAXPAYERS; OPPORTUNITIES BY OTHERS. TO ASSESS THOSE VIEWS CORRECTLY WE MUST AWAIT THE SELECTION OF SPECIFIC PLANT SITES AND STUDY OF ACTUAL SURROUNDING COMMUNITIES.

TO WHAT DEGREE WILL A SYNFUELS PROGRAM AFFECT CARBON DIOXIDE (CO<sub>2</sub>) CONCENTRATIONS IN THE ATMOSPHERE? TO WHAT DEGREE WILL RESULTING INCREASED CONCENTRATIONS CAUSE CLIMATIC CHANGE?

ALL FOSSIL AND OTHER CARBON-BASED FUELS SUCH AS WOOD AND OTHER BIOMASS EMIT CARBON DIOXIDE WHEN BURNED. EACH EMITS A DIFFERENT LEVEL. NATURAL GAS GIVES OFF THE LEAST, WITH A RATIO OF .75 TO OIL'S ONE. COAL'S RATIO IS 1.25. SYNTHETICS FROM COAL IS 1.75. THE COAL-DERIVED SYNFUEL'S RATIO IS HIGH BECAUSE THERE IS A DOUBLE "BURNING" OF COAL --- FIRST, POWER FOR THE CONVERSION PROCESS, NEXT WHEN THE SYNTHETIC FUEL IS USED. THE SYNTHETIC FUEL ITSELF IS REALLY NO DIFFERENT THAN MANY OIL PRODUCTS. FOR MORE THAN ONE HUNDRED YEARS SCIENCE HAS KNOWN THAT BURNING FOSSIL FUELS ADDS CARBON DIOXIDE TO THE ATMOSPHERE. THE FEAR NOW IS THAT HIGHER

CONCENTRATIONS MAY CAUSE GLOBAL WARMING, WHICH COULD ALTER EXISTING CLIMATE PATTERNS, THEREBY POSSIBLY AFFECTING OCEAN LEVELS AND FARM PRODUCTION.

MY OFFICE, WHICH HAS THE LEADING ROLE IN GOVERNMENT-WIDE RESEARCH -- INCLUDING COOPERATION WITH SCIENTISTS IN OTHER COUNTRIES -- HAS MADE AN ANALYSIS OF SEVERAL RECENT STUDIES OF THE GENERAL CO<sub>2</sub> PROBLEM AS ACCELERATED BY THE PROPOSED SYNTHETIC FUELS PROGRAM. THE CONCLUSIONS OF THAT ANALYSIS CAN BE SUMMARIZED THIS WAY:

THE AMBIENT CONCENTRATION OF CO<sub>2</sub> IN THE ATMOSPHERE IS GROWING. STATISTICAL RELATIONSHIPS INDICATE THAT MAN-ORIENTED SOURCES -- INCLUDING DEFORESTATION -- GENERALLY ARE RELATED TO THAT INCREASE. THE RELATIONSHIP BETWEEN MAN-MADE CO<sub>2</sub> EMISSIONS AND AMBIENT CONCENTRATION LEVELS AND SOCIETAL EFFECTS NEEDS FURTHER STUDY, NATIONALLY AND INTERNATIONALLY.

FOSSIL FUELS DO VARY IN CO<sub>2</sub> EMISSIONS, BUT THE UNITED STATES SYN-FUEL PROPOSALS, EVEN WHEN EXTRAPOLATED TO AN INTERNATIONAL LEVEL, CAUSE LITTLE CHANGE IN PROJECTED LEVELS OF CO<sub>2</sub> EMISSIONS. THEREFORE, SYN-FUEL PROPOSALS AND THEIR EXPECTED EFFECTS ON CO<sub>2</sub> CONCENTRATION LEVELS SHOULD NOT FORCE CHANGES IN THE PRESENT DESIGN OF GENERAL CARBON DIOXIDE RESEARCH PROGRAMS. THOSE RESEARCH EFFORTS SHOULD PRODUCE, FOR DISCUSSION, COMPREHENSIVE REPORTS IN 1984 AND IN 1989.

ANALYSTS IN MY OFFICE FOUND THAT BURNING EIGHT MILLION BARRELS OF SYNFUELS A DAY IN THE YEAR 2025 WOULD INCREASE ANNUAL US EMISSIONS OF CARBON DIOXIDE FROM FOSSIL FUELS BY SEVEN PERCENT. THE UNITED STATES FRACTION OF GLOBAL FOSSIL FUEL USE IS NOW ABOUT 27 PERCENT. A DROP TO ABOUT TEN PERCENT IS EXPECTED IN 2025. UNITED STATES' SYNFUEL CONTRIBUTIONS TO WORLDWIDE CO2 EMISSIONS WOULD BE GREATEST IN THE YEAR 2000, BUT WOULD NEVER EXCEED 1.5 PERCENT OF THE PREVIOUS PROJECTIONS OF GLOBAL CO2 EMISSIONS. TRANSLATING THOSE EMISSIONS TO LONG-TERM ATMOSPHERIC CO2 CONCENTRATIONS, AN ACCELERATED US SYNTHETIC FUELS PROGRAM WOULD INCREASE THE AMBIENT CO2 CUMULATIVE CONCENTRATION BY LESS THAN THREE-TENTHS OF ONE PERCENT BY 2000. THUS, OUR PLANNED RESEARCH REPORTS FOR 1984 AND 1989 WOULD BE TIMELY.

WHAT IF A UNITED STATES SYNFUEL PROGRAM STIMULATED GROWTH OF SYNFUELS WORLDWIDE? WE ESTIMATE THAT ATMOSPHERIC CO2 CONCENTRATION INCREASES WOULD NOT EXCEED ONE PERCENT IN 2025 OR TWO PERCENT IN 2050 WITH EMISSIONS FROM ALL GLOBAL SOURCES NOT EXCEEDING FIVE PERCENT OF THE TOTAL CO2 CONTRIBUTED BY WORLDWIDE FOSSIL FUEL USE.

WHAT IF NATURAL GAS -- THE LOWEST CO2 PRODUCER -- WERE SUBSTITUTED FOR THE PROJECTED UNITED STATES SYNFUEL PROGRAM? ANNUAL EMISSIONS THROUGH 2025 WOULD NEVER BE REDUCED BY MORE THAN SEVEN-TENTHS OF ONE PERCENT, AND LONG-TERM CO2 CONCENTRATIONS WOULD NEVER BE REDUCED BY MORE THAN TWO-TENTHS OF ONE PERCENT BY THIS SUBSTITUTION. IF INCREASED NATURAL GAS USE IN THIS COUNTRY STIMULATED A SIMILAR WORLDWIDE PATTERN, CO2 EMISSIONS WOULD DROP BY NOT MORE THAN 2.5 PERCENT AND LONG-TERM CONCENTRATION WOULD DECREASE BY UNDER ONE PERCENT THROUGH 2050.

THE PRIMARY CONCERN WITH INCREASED CO<sub>2</sub> EMISSIONS CENTERS AROUND THE SO-CALLED GREENHOUSE EFFECT. THAT'S THE CONDITION UNDER WHICH CO<sub>2</sub> DOES NOT PERMIT HEAT THAT IS RE-RADIATED FROM THE EARTH'S SURFACE TO ESCAPE INTO SPACE. EVEN THOUGH WORLD-WIDE ATMOSPHERIC CONCENTRATIONS OF CO<sub>2</sub> HAVE BEEN STEADILY INCREASING SINCE 1860, CLIMATIC FLUCTUATIONS HAVE NOT TENDED TOWARD MEASURABLE WARMING OR COOLING. WHILE MOST ATMOSPHERIC SCIENTISTS AGREE THAT INCREASED AMBIENT CO<sub>2</sub> CONCENTRATIONS WILL PRODUCE GLOBAL WARMING, A SATISFACTORY EQUATION BETWEEN THOSE TWO FACTORS AND OTHERS -- FOR EXAMPLE, LEVEL OF AIRBORNE PARTICULATES AND THE LEVEL OF INCREASED SHADING -- HAS NOT BEEN DEVELOPED WITH SATISFACTORY ACCURACY.

THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION ESTIMATES AS A WORST CASE, THAT A DOUBLING OF CARBON DIOXIDE CONCENTRATION WOULD CAUSE A WORLDWIDE TEMPERATURE INCREASE OF ABOUT TWO DEGREES CELSIUS. IT SHOULD BE NOTED THAT THE CALCULATED WORLDWIDE TEMPERATURE INCREASE SINCE 1900 IS ONE-QUARTER DEGREE CELSIUS. THAT'S LESS THAN CAN BE MEASURED WITH CONFIDENCE BY TEMPERATURE MONITORING STATIONS.

WHAT DOES THIS ALL ADD UP TO? A LOT MORE RESEARCH, WHICH IS BEING DONE. RESEARCH NEEDS TO BE PURSUED UNTIL SOME SOLID ANSWERS ARE AVAILABLE. IN THE MEANTIME, A SYN FUEL PROGRAM CAN BE PUSHED WITHOUT APPRECIABLE CHANGE TO THE CLIMATE OF THE WORLD.

THE UNITED STATES NEED NOT MAKE PREMATURE DECISIONS ABOUT THE USE OF NEW TECHNOLOGIES AS LONG AS FURTHER INFORMATION ABOUT THEIR ENVIRONMENTAL AND HEALTH CHARACTERISTICS ARE DEVELOPED

ALONG WITH THE TECHNOLOGY. THE SAME IS TRUE FOR THEIR TECHNICAL AND ECONOMIC FEASIBILITIES. THAT'S WHY IT IS NECESSARY TO DEVELOP A NUMBER OF OPTIONS. WE WOULD HAVE THE FLEXIBILITY TO TURN FROM ONE TECHNOLOGY TO ANOTHER OR FROM ONE SOURCE TO ANOTHER IF ONE OR MORE SUPPLY OPTIONS PROVED TO BE UNACCEPTABLY HAZARDOUS.

EARLY IN THE '70s, ROBERT W. FRI, THEN ACTING ADMINISTRATOR OF EPA AND LATER DEPUTY ADMINISTRATOR OF THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, A PREDECESSOR TO THE DEPARTMENT OF ENERGY, SAID:

"...WE ARE ONLY NOW BEGINNING TO UNDERSTAND THE COMPLEX WEB OF FORCES THAT DETERMINES THE QUALITY OF OUR LIFE-FORCES . . . SUCH AS LAND AND ENERGY USE, TRANSPORTATION, ECONOMIC GROWTH, URBANIZATION, POPULATION, AND THE ADVANCING JUGGERNAUT OF TECHNOLOGY. BECAUSE WE DO NOT UNDERSTAND THESE FORCES, WE STILL ACT AS THOUGH EVERY ENVIRONMENTAL ISSUE WERE INDEPENDENT OF ITS BROTHERS. WE STRUGGLE WITH EACH PROBLEM AS THOUGH IT WERE THE FIRST, AND MAKE EACH POLICY CHOICE AS THOUGH IT WERE THE LAST. THEN ANOTHER CRISIS GRABS OUR ATTENTION, AND WE START THE PROCESS ALL OVER AGAIN."

FRI WENT ON TO SAY THAT IT COULD BE DIFFERENT. "WE COULD THINK AHEAD," HE SAID.

WE HAVE DONE A LOT OF THINKING AHEAD SINCE 1973. WE ARE THINKING AHEAD NOW, LOOKING FOR INTERMEDIATE ENERGY SOURCES UNTIL A TIME WHEN WE CAN TRY OUR HARDEST TO EXHAUST THE INEXHAUSTIBLES. BUT UNTIL THEN, WE MUST LOOK AND SEE THE WORLD AS IT IS, AND TRY TO MAKE IT BETTER, SAFER, HEALTHIER.