

THE CONSERVATIVE APPROACH TO ENERGY RESOURCES DEVELOPMENT

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THE CONSERVATIVE POSITION

WHEN IT COMES TO PLANNING FOR THE UTILIZATION OF NON-RENEWABLE NATIONAL RESOURCES, IT WOULD SEEM TO BE IN THE BEST INTEREST OF ALL AMERICANS TO ADOPT A CONSERVATIVE POSITION. THIS MAY BE PARTICULARLY TRUE IN THE CASE OF THE UTILIZATION OF OUR ENERGY RESOURCES BECAUSE IN OUR PRESENT PLANNING WE CANNOT HELP BUT LIMIT THE OPTIONS OF FUTURE GENERATIONS OF AMERICANS.

SELF-SUFFICIENCY

THE REALIZATION THAT THE WORLD'S MAJOR ENERGY RESOURCES ARE FINITE CAME TO MOST OF THE AMERICAN PEOPLE ONLY TWO YEARS AGO. FOLLOWING THE ARAB OIL EMBARGO, WHICH RESULTED IN GASOLINE SHORTAGES, DISCUSSIONS OF THE 'ENERGY CRISIS' BECAME FASHIONABLE. DISBELIEF AND OUTRAGE FASHIONED THE NATIONAL POLICY WHICH EMERGED. THE FEDERAL GOVERNMENT WAS CALLED UPON TO ENSURE THE AMERICAN PEOPLE THAT THEY WOULD NOT BE INCONVENIENCED IN THAT FASHION AGAIN. THE WITHHOLDING OF FOREIGN OIL WAS DUBBED A FORM OF 'INTERNATIONAL BLACKMAIL'. OUR DEPENDENCY ON OIL WAS BLAMED FOR WEAKENING OUR POSITION AT INTERNATIONAL BARGAINING TABLES. MOREOVER, RISING OIL PRICES WERE CAUSING A SEVERE STRAIN ON THE NATION'S ECONOMY. THE CASH OUTFLOW WAS BLEEDING

OUR COUNTRY TO DEATH, FINANCIALLY. FIRST PROPOSED BY PRESIDENT NIXON, THE SOLUTION, WHICH HAS NOW BECOME NATIONAL POLICY CAN BE SUMMED UP IN TWO WORDS, 'ENERGY SELF-SUFFICIENCY'. IN OTHER WORDS, THIS NATION IS COMMITTED TO REDUCING ITS DEPENDENCY UPON FOREIGN NATIONS FOR ENERGY RESOURCES BY EXPLOITING ITS OWN RESOURCES AT AN ACCELERATING RATE.

ALTERNATIVES

LET US EXAMINE SOME OF THE ALTERNATIVES TO A NATIONAL POLICY OF ENERGY SELF-SUFFICIENCY. ONE ALTERNATIVE WOULD BE TO CONTINUE TO PURCHASE LARGE QUANTITIES OF FOREIGN OIL AT HIGHER PRICES. THE U.S. WILL PROBABLY BE DOING THIS TO A LARGE EXTENT IN THE NEAR FUTURE ANYHOW.

UP UNTIL RECENTLY, THE COST OF FOREIGN OIL HAS BEEN ESSENTIALLY EQUAL TO THE COST OF EXPLORATION, DRILLING, PIPELINING, SHIPPING, REFINING PLUS THE PROFITS. ONE COULD ARGUE THAT WE HAVE BEEN GETTING THE OIL ITSELF FREE BECAUSE NO VALUE HAD BEEN PLACED ON ITS REPLACEMENT. IT WAS BEING SOLD AS IF IT WERE AN INEXHAUSTIBLE COMMODITY.

THE RECENT OIL PRICES INCREASES, WHILE DRAMATIC, MAY MERELY REFLECT CHANGING ATTITUDES TOWARD THIS EXTREMELY USEFUL AND HIGH GRADE FORM OF ENERGY. EVEN WITH MAJOR FUTURE INCREASES IN THE PRICE OF FOREIGN OIL, THIS NATION MAY STILL BE GETTING A TREMENDOUS BARGAIN.

RACING TOWARD ENERGY SELF-SUFFICIENCY MAY GIVE OUR NATION MORE STRENGTH AT THE INTERNATIONAL BARGAINING TABLES, BUT IT MEANS EXPLOITING OUR OWN RESOURCES AT AN ACCELERATED RATE. THESE RESOURCES ARE ESSENTIALLY MONEY IN THE BANK FOR OUR NATION. OUR OWN RESERVES WILL NEVER BECOME LESS VALUABLE IN THE FUTURE.

CONSERVATION: THE LAST RESORT

SEEMINGLY THE LAST ALTERNATIVE TO BE SERIOUSLY CONSIDERED BY POLITICIANS, PLANNERS OR TECHNOLOGISTS IS CONSERVATION. IT IS CLEARLY THE LAST RESORT. THE CONCEPT OF CONSERVING RESOURCES FOR FUTURE GENERATIONS SEEMS PARTICULARLY LUDICROUS TO MANY WHO NOW PLAN FOR SHORT-TERM SOLUTIONS; WHO DO EVEN NOT ALLOW THEMSELVES TO THINK IN TERMS OF TIME HORIZONS AS LONG AS 50-100 YEARS. YOU'VE PROBABLY HEARD SOME OF THE FOLLOWING REACTIONS TO LONG-TERM PLANNING:

'WE'LL ALL BE DEAD BY THEN'

'WE CAN'T PREDICT THE FUTURE THAT FAR'

'THERE WILL BE NEW, AS YET UNDISCOVERED, SOURCES OF ENERGY BY THAT TIME'

THE CONSERVATIVE MUST ASK, 'BUT WHAT IF FUTURE EXPLORATION RESEARCH DOESN'T UNCOVER VAST NEW RESERVES OF CHEAP ENERGY? IT'S POSSIBLE. WHAT IF WHAT WE SEE, IS WHAT WE GOT? IN THAT CASE, HOW WILL FUTURE GENERATIONS VIEW US AND OUR PRESENT USE OF THE WORLD'S ENERGY RESOURCES? WILL THEY JUDGE US AS RECKLESS AND IMPRUDENT? WILL THEY SPIT ON OUR GRAVES?'

THE TECHNOLOGIST AND HIS PROJECTIONS

AS A PROFESSOR OF CIVIL ENGINEERING SPECIALIZING IN WATER SUPPLY, I HAVE OFTEN TAUGHT MY STUDENTS THE CLASSICAL METHODS OF FORECASTING DEMANDS FOR WATER. STARTING WITH DATA ON PRESENT CONSUMPTION AND POPULATION, WE EXTRAPOLATE, BY VARIOUS ELEGANT MATHEMATICAL METHODS; FUTURE POPULATION, PER CAPITA WATER USE, FUTURE AVERAGE CONSUMPTION, CONSUMPTION ON THE MAXIMUM DAY, AND CONSUMPTION FOR THE MAXIMUM HOUR.

BASED ON THESE PROJECTIONS, WE THEN SET OUT TO SIZE FUTURE ADDITIONS TO THE WATER WORKS. WE SIZE NEW BASINS, PIPING, PUMPING STATIONS, ELEVATED STORAGE. WE PROVIDE RESERVES FOR EMERGENCIES AND TRY TO GUARANTEE CONTINUED SUPPLY AGAINST EVERY CONTINGENCY INCLUDING FIRE AND POWER OUTAGES.

NEVER HAVE I OR ANY OF MY STUDENTS EVER QUESTIONED THE ASSUMPTION THAT WE MUST MEET THE DEMAND. AS WATER SUPPLY TECHNOLOGISTS, WE TAKE IT FOR GRANTED THAT IT IS OUR RESPONSIBILITY; THAT WATER IS THE BASIC NECESSITY FOR LIFE.

BUT ARE WE CORRECT IN THE ASSUMPTION THAT ALL DEMANDS MUST BE MET? ARE WE SUPPLYING CHEAP WATER FOR BASIC NEEDS OR FOR EXCESSES?

THE AVERAGE PER CAPITA WATER USE IN THE U.S. HOME IS AROUND 135 GALLONS PER DAY. WHAT DO YOU DO WITH YOUR 135 GALLONS PER DAY? DO YOU DRINK IT ALL? OR

DOES 50 GALLONS PER DAY GO FOR LAWN WATERING? COULD YOU GET ALONG ON 115 GALLONS PER DAY IF YOU HAD TO? IF WE AND OTHERS IN OUR COMMUNITY COULD, AND WOULD, WE MIGHT AVOID THE NEXT MULTI-MILLION DOLLAR EXPANSION OF THE LOCAL WATER PLANT.

AN EXAMPLE OF EXCESSIVE USE OF WATER IS NEW YORK CITY WHERE THE AVERAGE DAILY CONSUMPTION IS FAR HIGHER THAN THE NATIONAL AVERAGE. THE REASON? NO METERS! THE CUSTOMERS PAY A FLAT RATE. SOME CUSTOMERS RUN THE WATER TO COOL THEIR APARTMENTS DURING THE SUMMER.

IN ENERGY USE, AS IN WATER USE, WE MUST DISTINGUISH BETWEEN LEGITIMATE ENERGY USES AND THE EXCESSIVE USE OF ENERGY, I.E. 'ENERGY NEED' AND 'ENERGY GREED'.

ENERGY NEED AND ENERGY GREED

BEFORE WE GO ANY FURTHER THEN, PERHAPS EACH OF US SHOULD EXAMINE THE ENERGY USE PROJECTION CURVES SET BEFORE US BY THE TECHNOLOGISTS IN THE ENERGY PRODUCTION INDUSTRY. THEN EACH OF US MUST DECIDE WHETHER WE FEEL THAT THE NATION MUST REALLY MEET THE PROJECTED DEMANDS OR WHETHER SOME SERIOUS CONSERVATION METHODS ARE IN ORDER. SHOULD WE TRY TO SUSTAIN A 4 - 5% ANNUAL GROWTH IN ENERGY CONSUMPTION OR SHOULD WE START TO MAKE HONEST EFFORTS TO LIMIT OUR ENERGY USE TO THAT WHICH IS AVAILABLE TODAY.

NEED VS. GREED

TO DECIDE THIS QUESTION, WE OBTAIN A BALANCED ASSESSMENT OF WHAT CONSTITUTES HUMAN 'NEED' AND WHERE DEMANDS SIMPLY REFLECT HUMAN 'GREED'. MOST AMERICANS MIGHT AGREE THAT THE ENERGY DEMANDS FOR AGRICULTURE (FOOD PRODUCTION), HOME HEATING AND CERTAIN BASIC INDUSTRIAL PURSUITS SERVE LEGITIMATE NATIONAL NEEDS. BUT, THE LIST OF EXCESSES; IN INDUSTRY, IN COMMERCE, IN TRANSPORTATION, IN THE PRIVATE HOME, ARE, TO SAY THE LEAST, EXTENSIVE. THERE CLEARLY IS NO END TO THE ABILITY OF PEOPLE TO CONSUME. LUXURIES BECOME 'NEEDS'. EACH AMERICAN FAMILY NOW NEEDS TWO CARS (ONE, A STATION WAGON) A COLOR TV, CENTRAL AIR CONDITIONING, AND IN THE FUTURE, POSSIBLY A HELICOPTER.

I WOULD LIKE TO SUGGEST THAT EACH PERSON LISTENING TO THIS DISCUSSION PREPARE A LIST OF WHAT THEY PERCEIVE AS MAJOR UNNECESSARY ENERGY USES; ABUSES OF ENERGY USE IN THE HOME, THE CITY, IN COMMERCIAL ENTERPRISES, IN THE PRODUCTION OF GOODS AND SERVICES OF SEVERELY LIMITED UTILITY.

MOREOVER, I WOULD LIKE TO PROPOSE THAT EACH CONCERNED AMERICAN SHOULD PREPARE HIS OR HER INDIVIDUAL STATEMENT OF PHILOSOPHY REGARDING THE DEVELOPMENT OF ENERGY RESOURCES FOR THE FUTURE. HE OR SHE SHOULD STATE THEIR VIEWS REGARDING SELF-SUFFICIENCY, CONSERVATION AND ENVIRONMENTAL PROTECTION. MY OWN STATEMENT IS SUBTITLED: THE PRIMARY SOLUTION: CONSERVATION. IT READS, AS FOLLOWS:

THE U.S. SHOULD PURSUE THE DEVELOPMENT OF ENERGY SOURCES ONLY WITH ADEQUATE CONTROL AND REGULATION FOR THE PROTECTION OF THE ENVIRONMENT AND THE PUBLIC HEALTH.

IT SHOULD BE RECOGNIZED THAT ONLY CONSERVATION CAN BE EFFECTIVE IN THE LONG RUN IN BALANCING ENERGY USE AND AVAILABILITY. THE PRINCIPAL SOLUTIONS TO PROBLEMS OF ENERGY UTILIZATION AND CONSERVATION, THEREFORE, MUST BE SOCIOLOGICAL RATHER THAN TECHNOLOGICAL.

AT BEST, ATTEMPTS OF TECHNOLOGISTS TO MEET THE ANTICIPATED FUTURE ENERGY 'DEMANDS' WILL ONLY SERVE AS STOP-GAP MEASURES AND WILL PROMOTE CONTINUED EXCESSIVE AND UNREASONABLE USES OF ENERGY. FURTHER INCREASES IN U.S. ENERGY CONSUMPTION SHOULD BE INHIBITED BY HONEST NATION-WIDE EFFORTS AT CONSERVATION. FAILURE TO CONSERVE OUR RICHEST SOURCES OF ENERGY WILL ONLY IMPOSE ADDITIONAL ECONOMIC AND ENVIRONMENTAL BURDENS ON OUR PROGENY.

ENVIRONMENTAL EFFECTS OF ACCELERATED ENERGY DEVELOPMENT AND UTILIZATION

TO THE CIVIL/ENVIRONMENTAL ENGINEER VIRTUALLY EVERY HUMAN ACTIVITY POSES A POTENTIAL CONFLICT WITH THE ENVIRONMENT AND A THREAT TO THE PUBLIC HEALTH.

GROWING POPULATIONS AND INCREASED WATER USAGES LEAD TO MASSIVE PROBLEMS OF MUNICIPAL WASTE TREATMENT, SLUDGE DISPOSAL, THE PROTECTION OF RECEIVING WATERS, THE THE CONTROL OF DISEASE. MOUNTAINS OF MUNICIPAL REFUSE WHICH PILE UP NEAR CITIES AS A RESULT OF PACKAGING PRACTICES IN A THROW-AWAY SOCIETY WASTE LAND, AND CREATE

PROBLEMS OF SEPTIC LEACHATES OR AIR POLLUTION. EVERY INDUSTRY CONFRONTS THE ENVIRONMENT WITH A UNIQUE PROBLEM; SOMETIMES WITH HEATED EFFLUENTS, ACIDS, ALKALIS, SALTS OR ORGANIC SUBSTANCES; SOMETIMES WITH PATHOGENIC ORGANISMS, RADIOISOTOPES OR TOXIC WASTES.

EVEN MODERN AGRICULTURAL PRACTICES WHICH EMPLOY SUBSTANTIAL TONNAGES OF FERTILIZERS, INSECTICIDES AND HERBICIDES CREATE THREATS TO OUR ENVIRONMENT. THESE EFFLUENTS ARE DIFFUSE AND SPREAD OUT OVER AN ENORMOUS AREA.

LEGISLATION AND REGULATION

OBVIOUSLY, THEREFORE, THE SPECTRE OF THE ACCELERATED EXPLOITATION OF THE NATION'S ENERGY RESOURCES CASTS A FURTHER SHADOW OVER AN ALREADY THREATENING SITUATION. WHAT MAKES THE ENERGY SITUATION POSSIBLY WORSE IS THAT LEGISLATION WHICH WOULD HAVE HELPED MAKE IT POSSIBLE TO CONTROL SOME OF THE ADVERSE EFFECTS OF ENERGY RESOURCE EXPLOITATION HAS BEEN TWICE VETOED -- IRONICALLY, IN THE NAME OF ENERGY CONSERVATION.

IT WOULD BE SAFE TO SAY THAT THE STATES AND THE NATION ARE NOT CURRENTLY PREPARED WITH THE LEGISLATION WHICH MAKES IT POSSIBLE TO DEAL EFFECTIVELY WITH THE ENVIRONMENTAL PROBLEMS WHICH WILL ACCOMPANY ACCELERATED ENERGY DEVELOPMENT.

THE EXCEPTION MIGHT BE THE NUCLEAR ENERGY
INDUSTRY WHICH, BECAUSE IT HAS BEEN UNDER FEDERAL
CONTROL FROM ITS INCEPTION, HAS FAIRLY HIGHLY DEVELOPED
REGULATIONS FOR ENVIRONMENTAL PROTECTION.

FUTURE ROLE OF THE CIVIL ENGINEER

I DO NOT FEEL I CAN SPEAK FOR ALL ENGINEERS. HOWEVER, I WOULD LIKE TO SHARE WITH YOU MY HOPES AND PLANS FOR EDUCATING FUTURE GENERATIONS OF CIVIL ENGINEERS AT THE UNIVERSITY OF MISSOURI-COLUMBIA.

THIS NEXT GENERATION OF CIVIL ENGINEERS WILL HAVE TO COPE WITH THE PROBLEMS OF PROVIDING FOR THE REAL NEEDS OF SOCIETY IN THE FACE OF DECREASED ENERGY AVAILABILITY OR INCREASED ENERGY COSTS. THE CONSCIOUSNESS OF THESE YOUNG ENGINEERS SHOULD BE RAISED IN THE CROSS-CURRENT OF DIFFERING OPINIONS, VALUES AND JUDGEMENTS. TECHNOLOGISTS, ON THIS CAMPUS AND OTHERS THROUGHOUT THE NATION, ARE TOOLING UP TO MEET FUTURE DEMANDS. SOCIOLOGISTS, POLITICAL SCIENTISTS, ENVIRONMENTALISTS, CONSERVATIONISTS ARE CHALLENGING THE NEED TO MEET THESE DEMANDS. DIFFERENT GROUPS ON CAMPUS ESPOUSE DIFFERENT SOCIAL OBJECTIVES AND VALUES. THE NEW GENERATION OF CIVIL ENGINEERS MUST BE SENSITIZED TO THE FULL RANGE OF ARGUMENTS IN ORDER TO ACHIEVE BALANCED JUDGEMENTS.

CLEARLY, CIVIL ENGINEERS ARE ENORMOUS ENERGY CONSUMERS. IN TRANSPORTATION PLANNING, BUILDING CONSTRUCTION, ENVIRONMENTAL CONTROL, WATER RESOURCES MANAGEMENT AND PLANNING, AND LAND USE, THEY COMMIT A TREMENDOUS AMOUNT OF HUMAN, ENERGY AND MATERIALS RESOURCES. THEY BEAR A GREAT DEAL OF THE RESPONSIBILITY FOR USING THESE RESOURCES IN THE BEST INTERESTS OF OUR SOCIETY.

TO COPE WITH THESE GREAT SOCIETAL AND TECHNOLOGICAL ISSUES, I FEEL THAT WE MUST PRODUCE A NEW VARIETY OF CIVIL ENGINEER THAT IS MORE CAREFULLY ATTUNED TO SOCIETAL NEEDS. I CALL THIS NEW BREED, THE 'NEW MOSES'. FOR HE, OR SHE, WILL BE CALLED UPON TO LEAD OUR CITIES AND OUR SOCIETY THROUGH A PERIOD OF ECONOMIC RECESSION AND DECLINE, AND AT THE SAME TIME, TO CONVERT OUR CURRENT EXCESSES INTO PRODUCTION SO THAT WE CAN MAINTAIN AND IMPROVE THE QUALITY OF LIFE.

THIS 'NEW MOSES' MUST CONVERSE WITH DIVERSE ELEMENTS OF SOCIETY TO DETERMINE REAL AND RATIONAL HUMAN NEEDS. HE OR SHE MUST BE PREPARED TO MAINTAIN ESSENTIAL SERVICES DURING TIMES OF STRESS, SUCH AS STRIKES, DISASTERS, EMERGENCIES, RIOTS, SABOTAGE. THE NEW CIVIL ENGINEER MUST BE MORE A PLANNER AND MANAGER; MORE AN ECONOMIST THAN EVER BEFORE. THE 'NEW MOSES' MUST BE TRULY INTERDISCIPLINARY. THE DAY OF THE CIVIL ENGINEERING TECHNOLOGIST, CLOISTERED IN HIS TECHNOLOGICAL ENCLAVE AND SURROUNDED BY HIS TRADITIONAL BELIEFS, I BELIEVE, HAS PASSED.