

DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

FEDERAL BUILDING PROGRAM
AND
ALTERNATIVE ENERGY DEVELOPMENT

TECHNICAL ASSISTANCE TO THE
DEPARTMENT OF DEFENSE

PURPOSE

- REDUCE EXPENDITURES FOR ENERGY
- MAKE BASES MORE SELF-SUFFICIENT WITH NONINTERRUPTIBLE ENERGY SOURCES

POTENTIAL RESOURCES AVAILABLE

- GEOTHERMAL ENERGY SYSTEMS DEVELOPMENT
- ENERGY SYSTEMS MANAGEMENT
- ENERGY CONSERVATION SUPPORT
- SOLAR SYSTEMS DEVELOPMENT
- LOW-HEAD HYDROPOWER PLANT DEVELOPMENT
- BIOMASS SYSTEMS DEVELOPMENT

GEOHERMAL ENERGY SYSTEMS DEVELOPMENT

REDUCE EXPENDITURES FOR ENERGY
NORTON AFB HEATING ONLY

have 1300 Fwells
2, @ 450.

<u>PRESENT SYSTEM</u>	<u>ANNUAL COST</u>	<u>20-YEAR COST</u>	<u>PRESENT VALUE</u>
FUEL (1979)	\$2,300,000	\$163,000,000	\$49,012,000
OPERATIONS & MAINTENANCE	<u>575,000</u>	<u>40,736,000</u>	<u>12,250,000</u>
TOTAL		\$203,736,000	\$61,262,000
 <u>GEOHERMAL SYSTEM</u>			
CONSTRUCT PLANT		\$ 25,000,000	\$ 7,500,000
OPERATIONS & MAINTENANCE	<u>\$ 866,000</u>	<u>61,350,000</u>	<u>18,500,000</u>
TOTAL		\$ 86,350,000	\$26,000,000
SAVINGS		\$117,386,000	\$35,300,000

ENERGY COSTS CAN BE REDUCED AND RELIANCE ON IMPORTED OIL CAN BE LESSENERD

HIGHLY PROBABLE GEOTHERMAL USE

SITE	1979 HEATING FUEL COST	20-YEAR PROJECTED FUEL COST	PRESENT VALUE 20-YR FUEL COST	1979 A/C ELEC. COST	20-YEAR PROJECTED A/C COST	PRESENT VALUE 20-YR A/C COST
✓ FALLON NAS, NV ←						
✓ PARACHUTE TEST RANGE, CA ←						
TWENTY-NINE PALMS, CA						
✓ HAWTHORNE AMMO PLANT, NV ←						
SIERRA ARMY DEPOT, CA						
✓ NORTON AFB, CA						
LACKLAND AFB, TX						
KELLY AFB, TX						
BROOKS AFB, TX						
MOUNTAIN HOME AFB, ID 2						

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ENERGY COSTS CAN BE REDUCED AND RELIANCE ON IMPORTED OIL CAN BE LESSENERD

POSSIBLE GEOTHERMAL USE

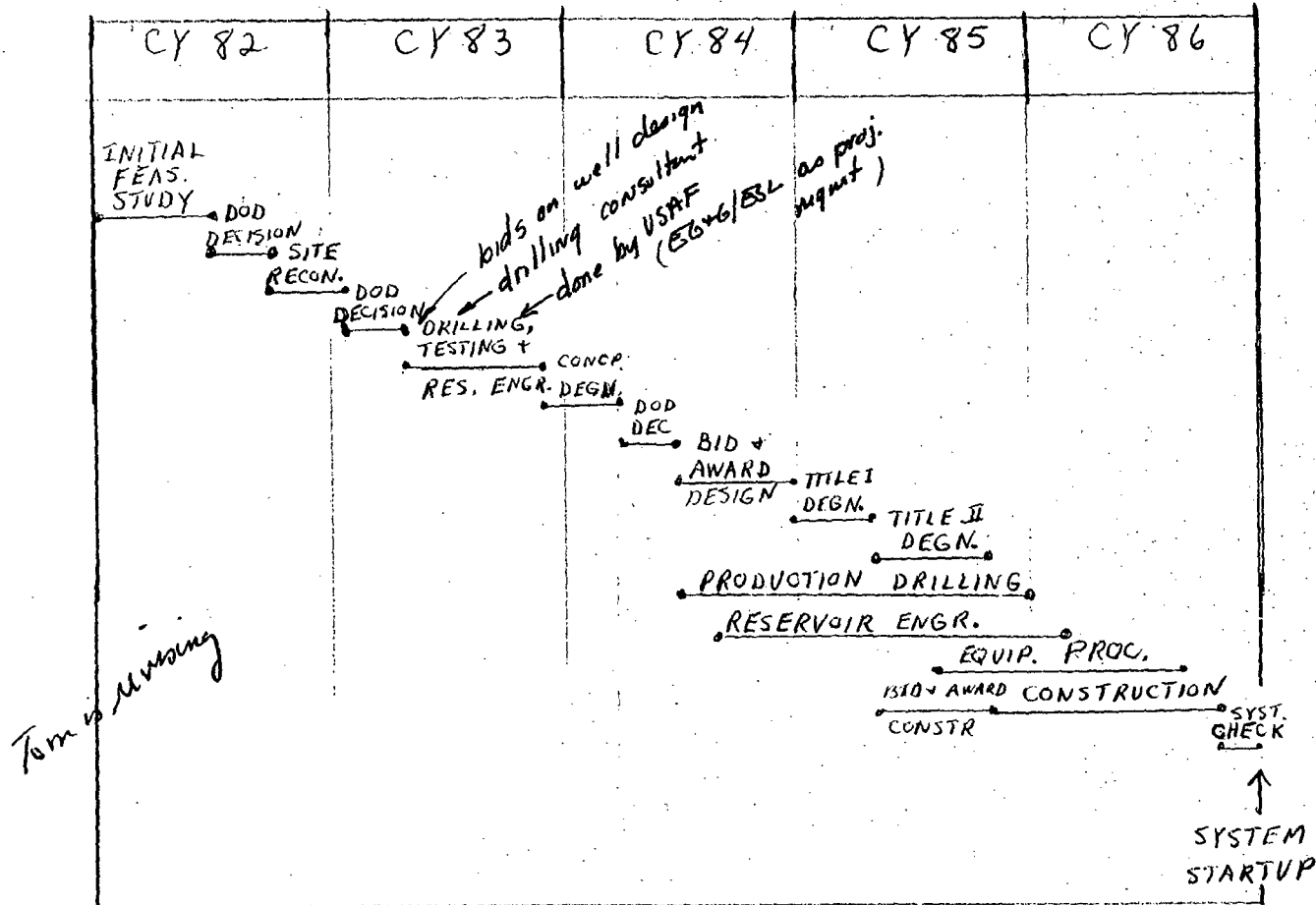
SITE	ANNUAL HEATING COST (\$)	20-YEAR PRESENT VALUE (\$)	ANNUAL A/C COST (\$)	20-YEAR PRESENT VALUE
✓ CHINA LAKE NAS, CA				
✓ WILLIAMS AFB, AZ				
✓ LYKE AFB, AZ				
DAVIS-MONTHAN AFB, AZ				
✓ NAVSTA ADAK, AK				
FORT BLISS, TX				
WHITE SANDS, NM				
TOOLE ARMY DEPOT, UT				
OGDEN DEFENSE DEPOT, UT				
NELLIS AFB, NV				
ELLSWORTH AFB, SD				
NASA/WALLOPS ISLAND, VA				
DOVER AFB, DE				

GEOTHERMAL SYSTEM DEVELOPMENT

- PERFORM ECONOMIC FEASIBILITY STUDY WITH EXISTING DATA
- LOCATE THE GEOTHERMAL RESOURCE
- DEVELOP THE GEOTHERMAL RESOURCE
- DESIGN AND CONSTRUCT THE GEOTHERMAL SYSTEM
- OPERATE THE GEOTHERMAL SYSTEM



NORTON AFB GEOTHERMAL SPACE CONDITIONING SYSTEM DEVELOPMENT SCENARIO



INITIAL FEASIBILITY STUDY

GEOLOGY

- SEARCH LITERATURE FOR APPLICABLE GEOTHERMAL DATA
- Field reconnaissance (geology and geochemistry)
- Identify
- ~~DEVELOP~~ PRELIMINARY GEOTHERMAL PARAMETERS (TEMPERATURE, WELL DEPTH, AVERAGE WELL FLOW RATE)
- Develop ^{target models and} resource exploration program

● ACQUIRE DATA ON EXISTING HEATING AND DISTRIBUTION SYSTEM

● PERFORM PRELIMINARY DESIGNS FOR COLLECTION AND DISTRIBUTION SYSTEMS

● DEVELOP ENVIRONMENTAL AND INSTITUTIONAL BACKGROUND

● PRESENT TO AIR FORCE

- Meas. T grads
- H₂O chem
- review existing
- scope expln. prog.

SITE RECONNAISSANCE EXPLORATION

- AIR PHOTO INTERPRETATION
 - PROSPECT MAPPING
 - GRADIENT HOLE DRILLING
 - RESISTIVITY MEASUREMENTS
 - LOGS
 - MODELING
- Ident anom. & test for thermal content*
- TAILORED TO TARGET MODELS AND SITE CHARACTERISTICS
 - GEOLOGICAL ~~RECONNAISSANCE~~ MAPPING
 - GEOCHEMICAL EXPLORATION
 - GEOPHYSICAL ~~RECONNAISSANCE~~ EVALUATION AND MODELING
 - THERMAL GRADIENT DRILLING

DRILLING, TESTING, AND RESERVOIR ENGINEERING

- DESIGN ~~CONFIRMATION~~
- DRILL CONFIRMATION WELL
- PERFORM WELL LOGGING OPERATIONS
- FLOW TEST UNDER DIRECTION OF RESERVOIR ENGINEERS
- PERFORM RESERVOIR ENGINEERING ANALYSES TO DETERMINE:
 - RESERVOIR SIZE
 - PRODUCTION TEMPERATURES
 - LONG-TERM PRODUCTION FLOWRATES
 - DESIGN OF PRODUCTION FIELD
 - INPUT TO SYSTEM CONCEPTUAL DESIGN AND ECONOMICS STUDY



22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS

VIEW GRAPH OF WELL WE FOLLOWED

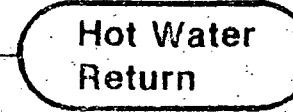
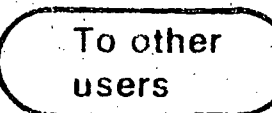
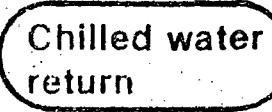
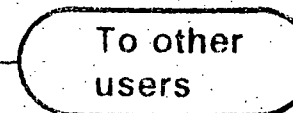
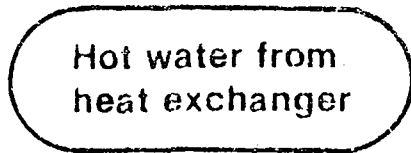
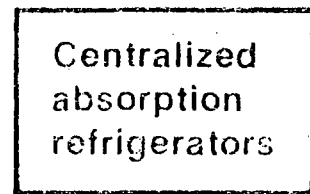
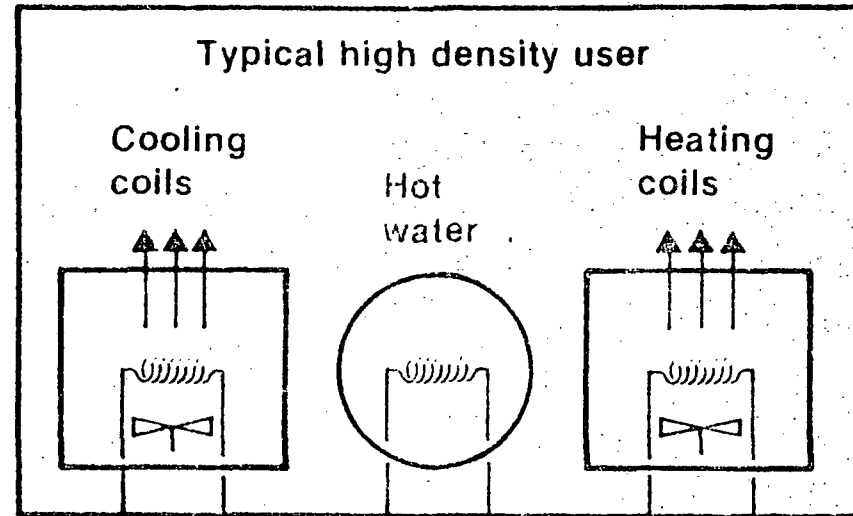
CONCEPTUAL DESIGN

- DETERMINE SYSTEM CAPACITY
- CALCULATE REQUIRED NUMBER OF PRODUCTION AND INJECTION WELLS
- SIZE SYSTEM COMPONENTS (PIPING, PUMPS, HEAT EXCHANGER, ETC.)
- DEVELOP OPERATION AND CONTROL CONCEPTS
- ESTIMATE SYSTEM COST
- PERFORM ECONOMIC ANALYSIS ACCORDING TO DOD GUIDELINES
- FORMAL REPORT

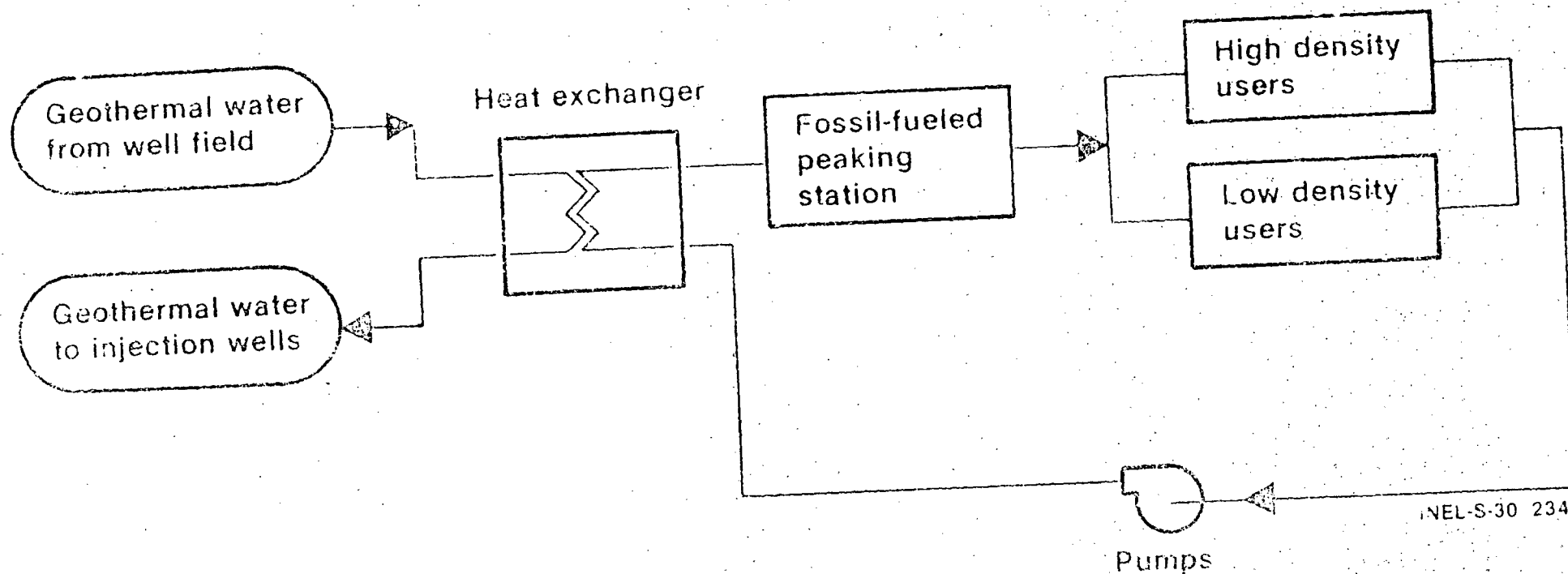
Geothermal Space Conditioning and Water Heating High Density User

Hot water
Cool return water
Chilled water

Hybrid Plant Slide



Geothermal Space Conditioning and Water Heating Peaking Station Concept



BID & AWARD DESIGN CONTRACT

*will be by USAF
procedures*

- WORK SCOPE DEFINED
- BID PACKAGE PREPARED AND TRANSMITTED
- BIDS ARE PREPARED BY AE'S
- AE SUBMITTALS ARE REVIEWED
- AWARD PACKAGE IS PREPARED
- APPROVALS ARE OBTAINED
- CONTRACT IS AWARDED

SYSTEM DESIGN

PRELIMINARY TITLE I DESIGN PREPARED

- SITE PLANS AND SYSTEM LAYOUTS DEVELOPED
- PRELIMINARY SPECIFICATIONS PREPARED
- SYSTEM PERFORMANCE ANALYZED
- IMPLEMENTATION PLAN DEVELOPED

TITLE II DESIGN

- SYSTEM DESIGN FINALIZED
- DESIGN SPECIFICATIONS DEVELOPED
- ENGINEERING DRAWINGS PRODUCED

EQUIPMENT PROCUREMENT AND CONSTRUCTION

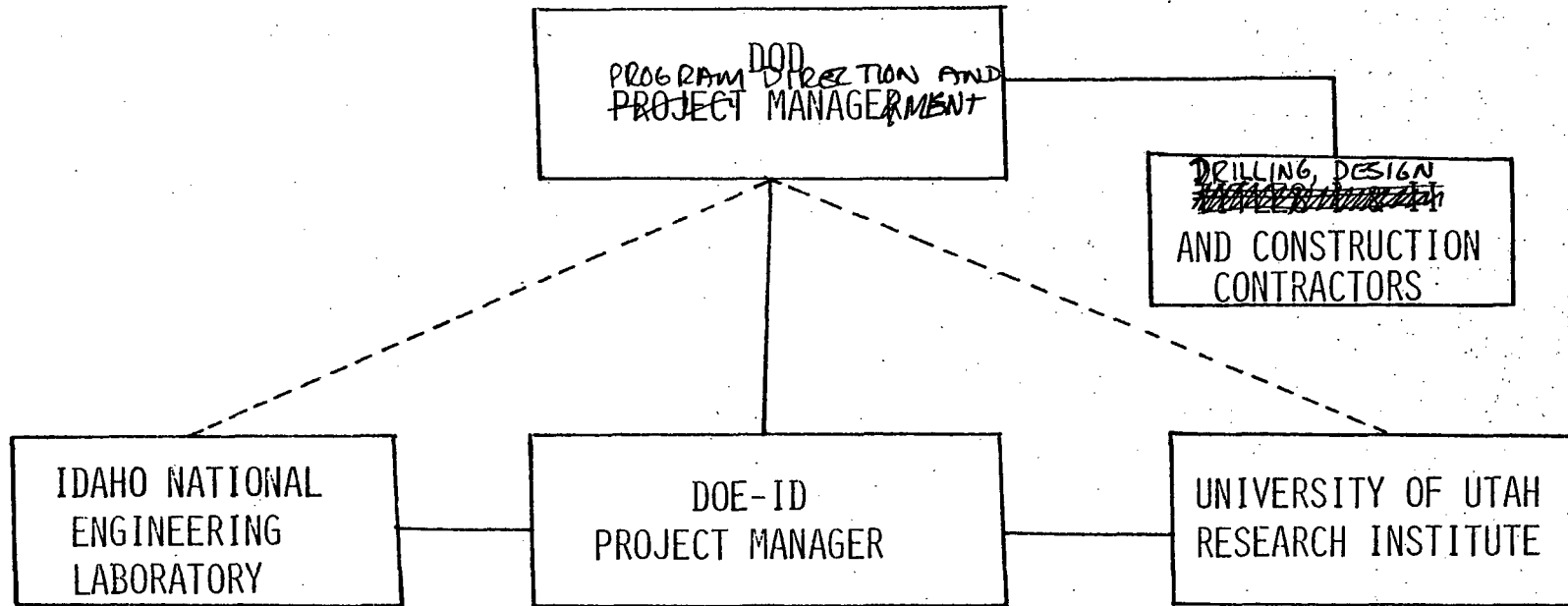
EQUIPMENT PROCUREMENT

- EQUIPMENT SPECIFICATIONS AND TESTS DEVELOPED
- BID PACKAGES PREPARED AND AWARDED
- EQUIPMENT RECEIVED

PLANT CONSTRUCTION AND TITLE III

- EQUIPMENT INSTALLED AND TESTED
- INSPECTION ACTIVITIES PERFORMED
- DRAWINGS AS-BUILT

ORGANIZATIONAL STRUCTURE



RESPONSIBILITIES

USAF (?) !!!

DOD - ESTABLISHES PROGRAM DIRECTION, Provides Program Management

DOE-ID - PROVIDES PROGRAM MANAGEMENT of INEL and UURI support

IDAHO NATIONAL ENGINEERING LABORATORY - PROVIDES TECHNICAL SUPPORT FOR SYSTEMS

UNIVERSITY OF UTAH RESEARCH INSTITUTE - PROVIDES TECHNICAL SUPPORT FOR RESOURCES

~~THE~~ IDAHO NATIONAL ENGINEERING LABORATORY ~~HAS~~
GEOTHERMAL EXPERIENCE

~~PRIME CONTRACTOR TO DOE-ID FOR OPERATION OF IDAHO NATIONAL
ENGINEERING LABORATORY (INEL)~~

PROVIDES PRIMARY TECHNICAL SUPPORT FOR:

- RAFT RIVER, ID, GEOTHERMAL BINARY ELECTRIC DEMONSTRATION PLANT
- USER COUPLED CONFIRMATION DRILLING PROGRAM
- PROGRAM PLANNING
- DIRECT HEAT FEASIBILITY AND FIELD DEMONSTRATION PROGRAMS (PRDA's, PON's)

PROVIDES TECHNICAL SUPPORT FOR:

- RESERVOIR ENGINEERING
- TECHNOLOGY TRANSFER
- GEOTHERMAL LOAN GUARANTY PROGRAM
- ELECTRIC CONVERSION TECHNOLOGY



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100 2 VIEW GRAPHS - RAFT RIVER
POND PROJECT

UNIVERSITY OF UTAH RESEARCH INSTITUTE,
EARTH SCIENCE LABORATORY DIVISION ~~###~~
GEOTHERMAL EXPERIENCE

Switzerland w/ ESR

CONTRACTOR TO DOE-ID

PROVIDES PRIMARY TECHNICAL SUPPORT FOR:

- INDUSTRY COUPLED PROGRAM - NEVADA AND UTAH
- STATE COUPLED PROGRAM - WESTERN U.S.
- EXPLORATION TECHNOLOGY PROGRAM - NATIONWIDE
- USER COUPLED CONFIRMATION DRILLING PROGRAM - NATIONWIDE

PROVIDES TECHNICAL SUPPORT FOR:

- TECHNOLOGY TRANSFER - WESTERN U.S.
- INDUCED SEISMICITY - ROOSEVELT HOT SPRINGS, RAFT RIVER
- PROGRAM PLANNING

✓ on existence



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EXPLN STRAT
@ HAFB

1 or 2 VIEWGRAPHS OF PROJECTS OF UURI

EXPERIENCED IN
PERSONNEL ARE AVAILABLE TO SUPPORT GEOTHERMAL DEVELOPMENT

} for some new title

- GEOLOGISTS
- GEOCHEMISTS
- GEOPHYSICISTS
- BIOCHEMISTS
- HYDROLOGISTS
- ALL ENGINEERING DISCIPLINES
- COMPUTER SCIENTISTS
- SAFETY SPECIALISTS
- ENVIRONMENTAL EXPERTS
- METALLURGISTS
- ELECTRONIC SPECIALISTS
- STATISTICIANS
- ANALYSTS
- INSTRUMENTATION AND CONTROL SPECIALISTS
- OPERATORS
- CONSTRUCTION SPECIALISTS
- PROJECT MANAGERS
- ADMINISTRATORS
- PURCHASING SPECIALISTS
- GRAPHIC SPECIALISTS
- PRINTERS
- TECHNICAL WRITERS

PROJECT MANAGERS WITH DISCIPLINARY SKILLS

BENEFITS

- REDUCED EXPENDITURES FOR ENERGY
- ~~REDUCED NATIONAL DEPENDENCE ON IMPORTED OIL~~
- ENERGY SELF-SUFFICIENCY AT MILITARY BASES
- ^{Continued, Enhanced} COMPLIANCE WITH THE ENERGY SECURITY ACT

new slide w/ savings - estim for 6 bases

ENLIST DOE-ID TO SUPPORT
DOD IN THE DEVELOPMENT OF
ALTERNATIVE ENERGY SYSTEMS AT
MILITARY FACILITIES