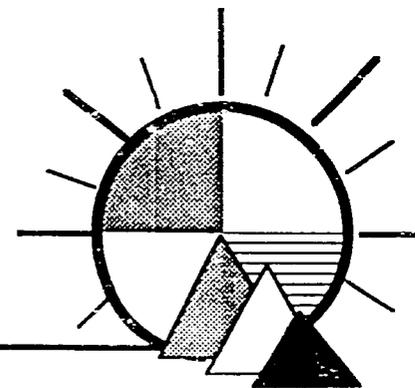


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EGYPTIAN RENEWABLE ENERGY FIELD TESTING PROJECT

TECHNOLOGY/APPLICATION OPTIONS IDENTIFICATION
FINAL REPORT PRESENTATION

FEBRUARY 1986



EGYPTIAN RENEWABLE ENERGY FIELD TESTING PROJECT

SUBTASK 2.2.1

TECHNOLOGY/APPLICATION OPTIONS IDENTIFICATION
FINAL REPORT PRESENTATION

Prepared for

EGYPTIAN ELECTRICITY AUTHORITY
Cairo, Egypt
and
U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
USAID Mission, Cairo, Egypt
(Contract AID 263-0123.2)

Submitted to

LOUIS BERGER INTERNATIONAL, INC.
Washington, D.C.

Submitted by

MERIDIAN CORPORATION
EGYPTIAN ELECTRICITY AUTHORITY
ENERGY & ENVIRONMENTAL ENGINEERING, INC.

FEBRUARY 1986
CAIRO, EGYPT

PURPOSE OF PRESENTATION

TO PRESENT:

- OVERVIEW OF THE OPTIONS IDENTIFICATION METHODOLOGY; AND
- ASSESSMENT RESULTS

TO OBTAIN:

- APPROVAL OF THE HIGH PRIORITY TECHNOLOGY/ APPLICATION OPTIONS RECOMMENDED FOR DETAILED EVALUATION IN SUBTASK 2.2.2 (TECHNOLOGY/APPLICATION OPTIONS EVALUATION)

TO DISCUSS:

- SUBTASK 2.2.2 WORK TO BE ACCOMPLISHED
- SUBTASK 2.2.2 SCHEDULE

NEED FOR TASK 2.2 RENEWABLE ENERGY APPLICATIONS ASSESSMENT

- o THERE ARE POTENTIALLY A LARGE NUMBER OF RENEWABLE ENERGY TECHNOLOGY/APPLICATIONS COMBINATIONS THAT ARE OF VALUE TO EGYPT, (IN ADDITION TO THE EXISTING 11 FIELD TEST CANDIDATES) AND NEED TO BE FIELD TESTED
- o IT IS DESIREABLE TO IDENTIFY THESE APPLICATIONS AND TO ASSESS THEIR REPLICABILITY AND PRIORITY FOR EGYPT AND TO ASSESS WHETHER THE APPLICATIONS SHOULD BE FIELD TESTED BY EEA OR OTHER AUTHORITIES.
- o THE CONDUCT OF TASK 2.2 PROVIDES USEFUL ANALYTICAL TOOLS AND ON-THE-JOB TRAINING FOR EEA STAFF TO ASSIST THEM IN CONDUCTING SIMILAR ASSESSMENTS IN THE FUTURE.

OBJECTIVES OF TASK 2.2

SUBTASK 2.2.1 - TECHNOLOGY/APPLICATION OPTIONS IDENTIFICATION

IDENTIFY PRIORITY APPLICATIONS AND DEFINE RENEWABLE ENERGY TECHNOLOGIES FOR SATISFYING ENERGY NEEDS OF THE APPLICATIONS.



SUBTASK 2.2.2 - TECHNOLOGY/APPLICATION OPTIONS EVALUATION

EVALUATE PRIORITY TECHNOLOGY/APPLICATION OPTIONS, DEVELOP SYSTEM CONFIGURATIONS, AND IDENTIFY ALTERNATE OR GENERIC SITES FOR FIELD TESTING.



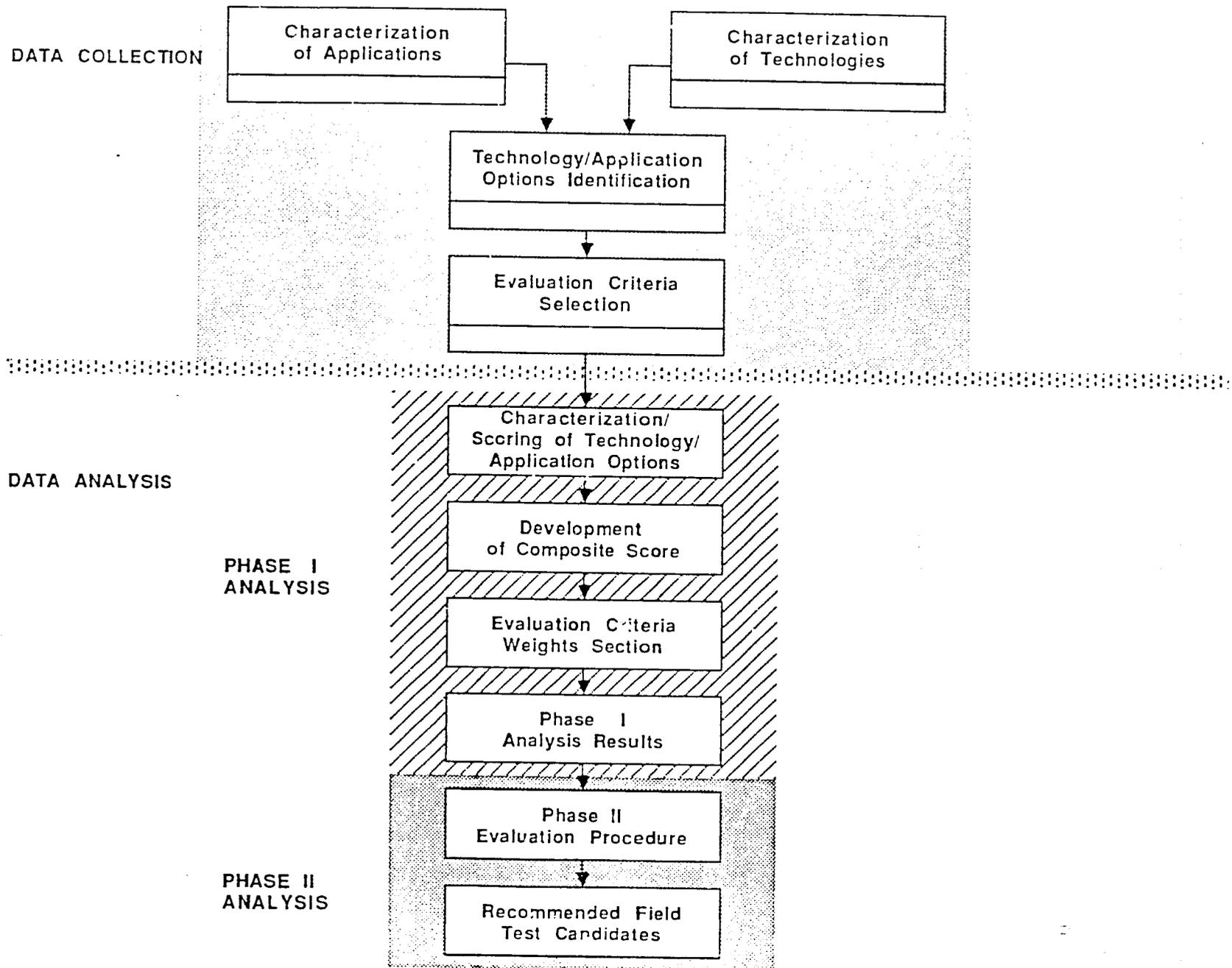
SUBTASK 2.2.3 - TECHNOLOGY/APPLICATION PROGRAM PLANS

PREPARE TECHNOLOGY/APPLICATION PROGRAM PLANS: CONCEPTUAL DESIGN & SYSTEMS ANALYSIS, ECONOMIC, FINANCIAL & MARKET ANALYSIS, FIELD TEST SITE SELECTION, PREPARE FIELD TEST DATA, BUDGETS, SCHEDULES & PARTICIPANTS, PREPARE RFP'S TO IMPLEMENT FIELD TESTS.

SUBTASK 2.2.4 - TECHNOLOGY REFERENCE NOTEBOOKS

PREPARE RENEWABLE ENERGY TECHNOLOGY REFERENCE NOTEBOOKS.

OVERVIEW OF RENEWABLE ENERGY FIELD TEST CANDIDATE SELECTION PROCESS



TECHNOLOGY/APPLICATIONS OPTIONS SELECTION

o BASIS FOR RENEWABLE ENERGY TECHNOLOGY SELECTION

- INTERVIEWS & DISCUSSIONS WITH EEA STAFF
- REVIEW OF PREVIOUS STUDIES ON RENEWABLE ENERGY TECHNOLOGIES IN EGYPT
- APPROPRIATENESS/SUITABILITY OF TECHNOLOGY FOR USE IN EGYPT

o BASIS FOR APPLICATION SELECTION

- INTERVIEWS & DISCUSSIONS WITH EEA STAFF
- REVIEW OF PREVIOUS STUDIES ON RENEWABLE ENERGY TECHNOLOGY APPLICATIONS IN EGYPT
- FIVE YEAR DEVELOPMENT PLAN PRIORITIES

o BASIS FOR TECHNOLOGY/APPLICATION OPTIONS SELECTION

- ABILITY OF TECHNOLOGY TO REASONABLY PROVIDE THE TYPE, QUANTITY AND QUALITY OF ENERGY REQUIRED BY SELECTED APPLICATION
- USE OF TECHNOLOGY IN SIMILAR APPLICATIONS WORLDWIDE
- EMPHASIZE OPTIONS NOT INCLUDED IN EXISTING 11 FIELD TESTS

APPLICATIONS CONSIDERED

- | | | |
|--------------------------|-------------------------------|--|
| 0 VILLAGE POWER | 0 REMOTE COMMUNICATIONS | 0 IRON ORE CONCENTRATION |
| 0 POWER FOR URBAN AREAS | 0 CATHODIC PROTECTION | 0 MALT BEVERAGE PRODUCTION |
| 0 IRRIGATION | 0 BRICK AND TILE PRODUCTION | 0 MOTOR CARS, TRUCKS AND BUSES MANUFACTURE |
| 0 DAIRY FARM | 0 CANE SUGAR REFINING | 0 PHARMACEUTICALS MANUFACTURE |
| 0 EGG PRODUCTION | 0 CIGARETTE PRODUCTION | 0 PHOSPHATE ROCK CONCENTRATION |
| 0 BROILER OPERATIONS | 0 DETERGENT PRODUCTION | 0 SOAP MANUFACTURE |
| 0 BEEF FEEDLOT | 0 FLAT GLASS MANUFACTURE | 0 CONCRETE BLOCK/BRICK MANUFACTURE |
| 0 LAND RECLAMATION | 0 GYPSUM PRODUCTION | |
| 0 LIVESTOCK WATERING | 0 CEMENT MANUFACTURE | |
| 0 BUILDING CLIMATIZATION | 0 HYDROGENATED OIL PRODUCTION | |

RENEWABLE ENERGY TECHNOLOGIES CONSIDERED

- 0 WIND-ELECTRIC POWER
- 0 WIND-MECHANICAL POWER
- 0 PV
- 0 PV, WIND AND/OR DIESEL HYBRIDS
- 0 SOLAR PONDS
- 0 ANAEROBIC DIGESTION OF URBAN SEWAGE
- 0 ANAEROBIC DIGESTION OF RURAL WASTE
- 0 MODERATE TEMPERATURE (< 100°C) SOLAR THERMAL
- 0 MODERATE-HIGH TEMPERATURE (>100°C)
SOLAR THERMAL
- 0 ACTIVE/PASSIVE SOLAR HEATING, COOLING
AND DAYLIGHTING
- 0 GEOTHERMAL
- 0 ANAEROBIC DIGESTION OF MUNICIPAL
SOLID WASTE (MSW)
- 0 INCINERATION OF MSW

RENEWABLE ENERGY TECHNOLOGY

APPLICATION	WIND	PHOTOVOLTAICS	WIND-PHOTOVOLTAIC HYBRID	WIND-DIESEL HYBRID	PHOTOVOLTAIC-DIESEL HYBRID	WIND-PHOTOVOLTAIC-DIESEL HYBRID	ANAEROBIC DIGESTION-MSW	ANAEROBIC DIGESTION-RURAL WASTE	LOW TEMPERATURE THERMAL (< 100°C)	MOD. TEMPERATURE SOLAR THERMAL (100-250°C)	ACTIVE/PASSIVE SOLAR AND COOLING	INCINERATION-URBAN MSW
EGG PRODUCTION	●	●	●	●	●	●		●				
BROILER PRODUCTION	●	●	●	●	●	●		●				
DAIRY FARM	●	●	●	●	●	●		●				
BEEF FLEEDLOT	●	●	●	●	●	●		●				
IRRIGATION	●	●						●				
LIVESTOCK WATERING	●	●						●				
LAND RECLAMATION	●	●						●				
CITIES							●					●
BUILDING CLIMATIZATION											●	
REMOTE COMMUNICATIONS	●	●										
CATHODIC PROTECTION		●										
FOOD CANNING								●	●			
SOAP/DETERGENT PRODUCTION								●	●			
HYDROGENERATED OIL PRODUCTION								●	●			
BEVERAGES PRODUCTION								●	●			
PHARMACEUTICALS PRODUCTION								●	●			

TECHNOLOGY APPLICATION OPTIONS SELECTED FOR EVALUATION

PHASE I TECHNOLOGY/APPLICATION OPTIONS RANKING PROCEDURE

PURPOSE: SELECT AND SCREEN PRELIMINARY SET OF APPLICATION OPTIONS FOR MORE DETAILED ASSESSMENT

PROCEDURE REQUIREMENTS

- o ABILITY TO SELECT OPTIONS BASED ON MULTIPLE QUALITATIVE AND QUANTITATIVE EVALUATION CRITERIA
- o INCORPORATE DECISION-MAKER'S PREFERENCES WITH REGARD TO RELATIVE IMPORTANCE OF EVALUATION CRITERIA
- o INCORPORATE DECISION-MAKER'S PREFERENCES WITH REGARD TO THE VALUE OF A TECHNOLOGY/ APPLICATION OPTION AS MEASURED AGAINST EACH EVALUATION CRITERIA

PROCEDURE USED IN THE EVALUATION

A MULTIATTRIBUTE DECISION ANALYSIS TECHNIQUE IS USED TO COMPUTE A COMPOSITE SCORE FOR EACH TECHNOLOGY/ APPLICATION OPTION

EVALUATION CRITERIA USED IN TECHNOLOGY/APPLICATION OPTIONS IDENTIFICATION

- o GOVERNMENT PRIORITIES
- o RESOURCE AVAILABILITY
- o TECHNOLOGY STATUS
- o ECONOMIC FEASIBILITY
- o OPPORTUNITY FOR REPLICABILITY IN EGYPT
- o CURRENT STATUS IN EGYPT
- o INSTITUTIONAL REQUIREMENTS
- o SOCIAL AND ENVIRONMENTAL IMPACTS

EVALUATION CRITERIA DEFINITIONS

o GOVERNMENT PRIORITIES

- IMPORTANCE OF APPLICATION IN GOE FIVE YEAR DEVELOPMENT PLAN. PRIMARY PRIORITIES - THOSE DESIGNATED AS HAVING MAJOR IMPORTANCE AND RECEIVING INVESTMENT ALLOCATIONS. SECONDARY PRIORITIES - IMPORTANT AREAS, BUT NOT RECEIVING SPECIFIC INVESTMENT ALLOCATIONS.

o RENEWABLE RESOURCE AVAILABILITY

- EXTENT OF RESOURCE AVAILABILITY IN AREAS WHERE APPLICATIONS WILL MOST LIKELY OCCUR

o RENEWABLE TECHNOLOGY STATUS

- COMMERCIAL STATUS, RELIABILITY AND EASE OF OPERATION

o ECONOMIC FEASIBILITY

- COMPETITIVENESS OF RENEWABLE TECHNOLOGY WHEN COMPARED TO CONVENTIONAL ALTERNATIVES

EVALUATION CRITERIA DEFINITION

o REPLICABILITY IN EGYPT

- POTENTIAL MARKET FOR TECHNOLOGY/APPLICATION OPTION IN EGYPT

o CURRENT RENEWABLE ENERGY TECHNOLOGY PROJECT ACTIVITY

- PROJECT ACTIVITIES IN EGYPT, EITHER ON-GOING OR PLANNED, THAT INVOLVE THE TECHNOLOGY/APPLICATION OPTION

o INSTITUTIONAL STATUS

- AVAILABILITY OF SKILLED LABOR, LOCAL MANUFACTURING CAPABILITY AND MATERIALS; ACCESS TO NECESSARY TRANSPORTATION AND COMMUNICATION NETWORKS, AVAILABILITY OF LOCAL GOVERNMENT/PRIVATE SECTOR INSTITUTIONS FOR DEVELOPING AND PROMOTING TECHNOLOGY USE

o SOCIAL AND ENVIRONMENTAL IMPACTS

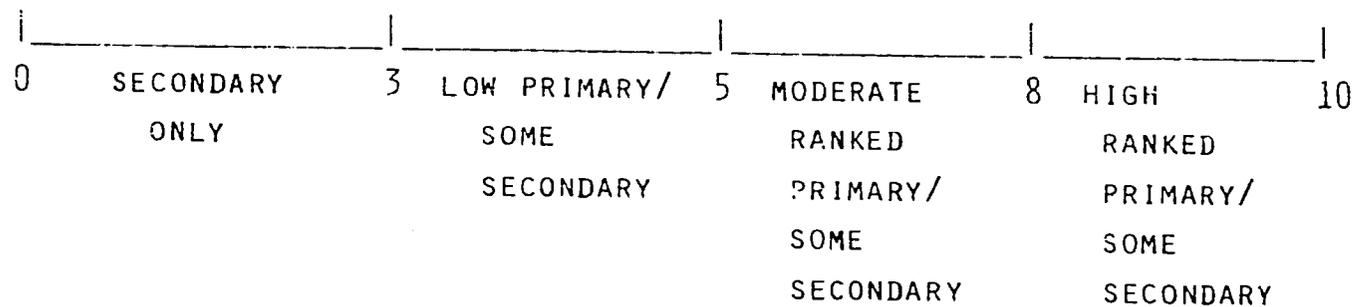
- EFFECT OF OPTION ON LIVING STANDARDS, LIFESTYLES, AND IMPACT OF AIR, WATER, NOISE AND LAND POLLUTION

EVALUATION CRITERIA SCORING

0 GOVERNMENT PRIORITIES

CONTRIBUTES
TO NEITHER
PRIMARY NOR
SECONDARY
OBJECTIVES

SATISFIES
ALL PRIMARY/
SECONDARY
PRIORITIES

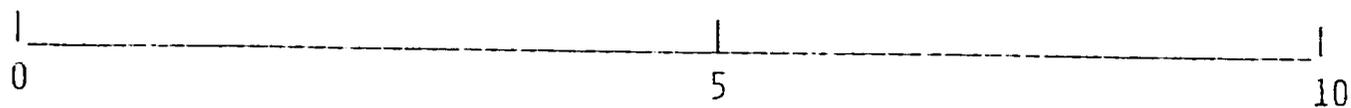


0 RESOURCE AVAILABILITY

NO/UNDEFINED
RESOURCE BASE

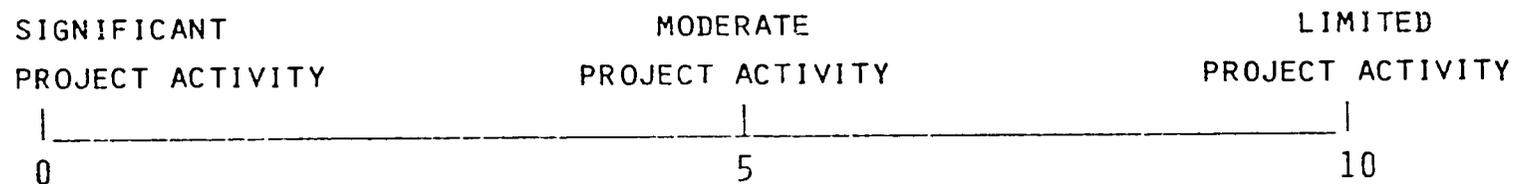
MODERATE
RESOURCE BASE

GOOD
RESOURCE BASE

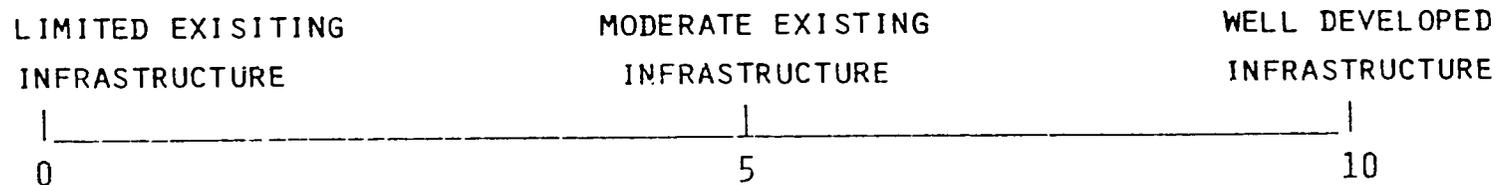


EVALUATION CRITERIA SCORING (CONCLUDED)

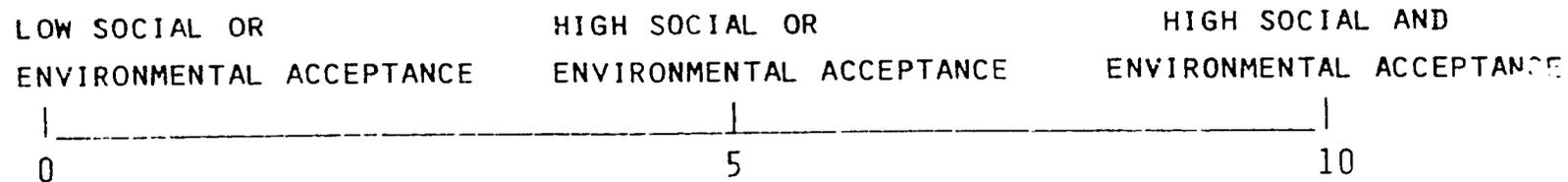
0 TECHNOLOGY PROJECT ACTIVITY IN EGYPT



0 INSTITUTIONAL STATUS



0 SOCIAL & ENVIRONMENTAL IMPACTS



EVALUATION CRITERIA WEIGHTS DETERMINATION

METFESSEL GENERAL ALLOCATION TEST

STEP 1. RANK CRITERIA IN DECREASING ORDER OF IMPORTANCE

STEP 2. DISTRIBUTE 100 POINTS AMONG THE VARIOUS EVALUATION CRITERIA

CAUTION: USERS OF THIS TECHNIQUE SHOULD ENSURE THAT THE RELATIVE IMPORTANCE OF EVALUATION CRITERIA CHANGES, IS BEING ASSESSED

PHASE I EVALUATION CRITERIA

EVALUATION CRITERIA AND CRITERIA WEIGHTS USED IN TECHNOLOGY/APPLICATION OPTIONS IDENTIFICATION

- o OPPORTUNITY FOR REPLICABILITY IN EGYPT - 25
- o TECHNOLOGY STATUS - 18
- o RESOURCE AVAILABILITY - 15
- o GOVERNMENT PRIORITIES - 12
- o ECONOMIC FEASIBILITY - 10
- o CURRENT STATUS IN EGYPT - 10
- o INSTITUTIONAL REQUIREMENTS - 5
- o SOCIAL AND ENVIRONMENTAL IMPACTS - 5

PROCEDURE USED IN THE EVALUATION

A WEIGHTED SUMMATION TECHNIQUE IS USED TO COMPUTE A COMPOSITE SCORE FOR EACH TECHNOLOGY/
APPLICATION OPTION:

$$CS_T = W_1S_{1T} + \dots + W_8S_{8T}$$

WHERE CS_T = COMPOSITE SCORE FOR T TH OPTION

S_{IT} = SCORE RECEIVED FOR I TH EVALUATION CRITERIA FOR T TH OPTION (RANGES FROM
0 (WORST) TO 10 (BEST))

W_I = WEIGHT ASSIGNED TO I TH EVALUATION CRITERIA

TECHNOLOGY/APPLICATIONS WITH A HIGHER COMPOSITE SCORE ARE A MORE FAVORABLE FIELD TEST
CANDIDATE THAN ONE RECEIVING A LOWER SCORE.

RANKING OF TECHNOLOGY/APPLICATION OPTIONS BY COMPOSITE SCORE

			COL. 1	COL. 2	COL. 3	COL. 4	COL. 5	COL. 6	COL. 7	COL. 8	COL. 9	COL. 10
WEIGHT -->			25	18	15	12	10	10	5	5	100	
SECTOR	APPLICATION	TECHNOLOGY	REPLIC. IN EGYPT	TECH. STATUS	RESOURCE AVAIL.	GOVT. PRIORIT.	ECON. FEAS.	CURRENT STATUS IN EGYPT	INST'T. REQUIR.	SOCIAL/ ENVIR. IMPACTS	WEIGHTED COMPOSITE SCORE	RANK
POPULATION SUPPORT	ELECTRICITY FOR CITIES	BIOGAS ELEC. FROM SEWAGE	9	9	8	7	8	7	8	9	926	1
INDUSTRY	PHARMACEUTICALS	SOLAR THERMAL	9	7	8	8	5	8	7	9	747	2
POPULATION SUPPORT	RESIDENTIAL BLDGS.	ACTIVE/PASSIVE SOLAR	9	9	8	5	6	3	8	8	744	3
INDUSTRY	HYDROGENATED OIL	SOLAR THERMAL	8	7	8	7	5	8	7	8	715	4
POPULATION SUPPORT	COMMERCIAL/INST'T. BLDGS.	ACTIVE/PASSIVE SOLAR	8	6	8	7	8	7	8	8	727	5
POPULATION SUPPORT	ELECTRICITY FOR CITIES	MSW INCINERATION/ELECTRIC	9	7	6	7	4	6	6	9	720	6
POPULATION SUPPORT	REMOTE COMMUNICATIONS	PV	8	8	8	6	8	4	3	9	711	7
INDUSTRY	SOAP & DETERGENTS	SOLAR THERMAL	7	7	8	7	5	8	7	8	710	8
AGRICULTURE	IRRIGATION	WIND MECHANICAL PUMPING	8	9	5	7	9	3	7	6	706	9
AGRICULTURE	IRRIGATION	BIOGAS MECHANICAL PUMPING	9	5	7	7	9	5	8	6	689	10
AGRICULTURE	IRRIGATION	WIND ELECTRIC PUMPING	8	6	5	7	8	8	5	6	682	11
AGRICULTURE	IRRIGATION	PV W/O BATTERY PUMPING	8	7	8	7	7	2	3	6	675	12
INDUSTRY	BEVERAGES	SOLAR THERMAL	6	7	8	6	5	8	7	8	673	13
INDUSTRY	FOOD CANNING	SOLAR THERMAL	5	7	8	8	5	8	7	8	672	14
AGRICULTURE	IRRIGATION	PV W/BATTERY PUMPING	8	6	8	7	5	4	3	8	657	15
AGRICULTURE	LIVESTOCK WATERING	WIND MECHANICAL PUMPING	7	9	5	5	9	3	7	6	657	15
AGRICULTURE	LIVESTOCK WATERING	BIOGAS MECHANICAL PUMPING	7	5	7	5	9	5	8	6	649	16
AGRICULTURE	LIVESTOCK WATERING	PV W/O BATTERY PUMPING	7	7	8	5	7	2	3	8	626	17
AGRICULTURE	DAIRY FARM	PV-DIESEL HYBRID	6	5	8	6	6	8	3	7	622	18
AGRICULTURE	LIVESTOCK WATERING	PV W/BATTERY PUMPING	7	6	8	5	6	4	3	7	618	19
AGRICULTURE	DAIRY FARM	BIOGAS ELECTRIC	6	5	7	6	7	5	6	6	615	20
AGRICULTURE	LIVESTOCK WATERING	WIND ELECTRIC PUMPING	7	6	5	5	6	8	5	6	610	21
POPULATION SUPPORT	ELECTRICITY FOR CITIES	BIOGAS ELEC. FROM MSW	8	2	6	7	5	9	3	8	605	22
AGRICULTURE	DAIRY FARM	WIND DIESEL HYBRID	6	5	5	6	8	8	4	5	592	23
AGRICULTURE	DAIRY FARM	WIND-PV HYBRID	6	5	7	6	5	8	3	6	592	23
AGRICULTURE	DAIRY FARM	WIND	6	6	5	6	5	8	3	6	590	24
AGRICULTURE	DAIRY FARM	PV	6	5	8	6	1	8	3	8	577	25
AGRICULTURE	EGG PRODUCTION	BIOGAS ELECTRIC	5	6	7	2	9	5	6	6	567	26
AGRICULTURE	BROILER PRODUCTION	BIOGAS ELECTRIC	5	6	5	5	8	5	6	6	558	27
AGRICULTURE	EGG PRODUCTION	PV-DIESEL HYBRID	5	5	8	2	6	8	3	7	549	28
INDUSTRY	CATHODIC PROTECTION	PV	3	5	8	7	7	6	3	8	548	29
AGRICULTURE	DAIRY FARM	PV-WIND-DIESEL HYB.	6	4	7	6	1	9	3	6	544	30
AGRICULTURE	EGG PRODUCTION	PV WIND-DIESEL HYB.	5	4	7	2	7	9	3	6	531	31
AGRICULTURE	EGG PRODUCTION	WIND DIESEL HYBRID	5	5	5	3	8	8	4	5	519	32
AGRICULTURE	BROILER PRODUCTION	PV DIESEL HYBRID	5	5	8	5	6	8	3	7	510	33
AGRICULTURE	CATTLE FEEDLOT	PV DIESEL HYBRID	5	5	8	5	6	8	3	7	510	33
AGRICULTURE	CATTLE FEEDLOT	PV	5	5	8	5	5	8	3	8	505	34
AGRICULTURE	EGG PRODUCTION	PV	5	5	8	5	1	8	3	8	504	35
AGRICULTURE	CATTLE FEEDLOT	BIOGAS ELECTRIC	5	6	7	7	7	5	6	6	503	36
AGRICULTURE	EGG PRODUCTION	WIND-PV HYBRID	5	3	7	3	5	5	6	6	499	37
AGRICULTURE	BROILER PRODUCTION	WIND	5	3	5	5	7	8	5	6	498	38
AGRICULTURE	EGG PRODUCTION	WIND	5	5	5	5	3	8	5	6	497	39
AGRICULTURE	BROILER PRODUCTION	WIND-DIESEL HYBRID	5	5	5	5	9	8	4	5	490	40
AGRICULTURE	BROILER PRODUCTION	WIND PV HYBRID	5	5	5	5	6	8	3	6	490	40
AGRICULTURE	CATTLE FEEDLOT	WIND PV HYBRID	5	5	7	5	6	8	3	6	490	40
AGRICULTURE	CATTLE FEEDLOT	WIND PV HYBRID	5	5	7	5	6	8	3	6	490	40
AGRICULTURE	BROILER PRODUCTION	PV WIND DIESEL HYB.	5	4	7	5	6	9	3	6	490	40
AGRICULTURE	CATTLE FEEDLOT	WIND	5	6	5	5	6	9	3	6	480	41
AGRICULTURE	LAND DRAINAGE	WIND MECHANICAL PUMPING	8	3	6	6	7	9	3	6	478	42
AGRICULTURE	BROILER PRODUCTION	PV	4	8	6	6	1	4	7	6	462	43
AGRICULTURE	LAND DRAINAGE	PV W/BATTERY PUMPING	4	8	6	6	1	4	7	6	461	44
AGRICULTURE	LAND DRAINAGE	PV W/O BATTERY PUMPING	4	8	6	6	1	4	7	6	459	45
AGRICULTURE	LAND DRAINAGE	WIND MECHANICAL PUMPING	4	8	6	6	1	4	7	6	459	45
AGRICULTURE	CATTLE FEEDLOT	PV WIND DIESEL HYB.	4	7	6	6	1	8	4	6	444	46
AGRICULTURE	CATTLE FEEDLOT	WIND DIESEL HYBRID	4	7	6	6	1	9	3	6	441	47
AGRICULTURE	CATTLE FEEDLOT	WIND DIESEL HYBRID	4	7	6	6	1	8	4	6	441	47
AGRICULTURE	LAND DRAINAGE	WIND MECHANICAL PUMPING	4	7	6	6	1	8	4	6	441	47

PHASE II LEADING OPTIONS RANKING PROCEDURE

PURPOSE SELECT 4-6 TECHNOLOGY/APPLICATION OPTIONS FOR FURTHER ASSESSMENT IN TASK 2.2.2

PROCEDURE REQUIREMENTS

- o ABILITY TO IDENTIFY FIELD TEST CANDIDATES FROM THE TOP 12 OPTIONS RESULTING FROM PHASE I ANALYSIS
- o INCORPORATE INTO THE ANALYSIS THE EEA SENSITIVITIES THAT COULD NOT BE ASSESSED IN DETAIL IN THE BROAD-BASED PHASE I ANALYSIS (E.G. PROJECT BUDGET CONSTRAINTS)

PROCEDURE USED IN EVALUATION

- o USED STRUCTURED CONSENSUS BUILDING TECHNIQUE TO RANK EACH OPTION USING THE EVALUATION CRITERIA

PHASE II EVALUATION CRITERIA

- o SCALE OF POTENTIAL FIELD TEST AND REQUIRED BUDGET
- o PROJECT STATUS IN EGYPT
- o COMMERCIAL STATUS IN EGYPT
- o REPLICABILITY IN EGYPT
- o RESOURCE AVAILABILITY AND DEMAND MATCH

PHASE II RESULTS: RECOMMENDED FIELD TEST CANDIDATES

<u>TECHNOLOGY</u>	<u>APPLICATION</u>	<u>SELECTION BASIS</u>
ACTIVE/PASSIVE SOLAR	RESIDENTIAL BUILDINGS	<ul style="list-style-type: none">o SMALL-SCALE SYSTEM WHICH SATISFIES PROJECT BUDGETo TECHNICALLY/OPERATIONALLY PROVENo COST-COMPETITIVEo AVAILABLE SOLAR RESOURCE IN URBAN AREAS
SOLAR THERMAL	PHARMACEUTICALS INDUSTRY HYDROGENATED OIL INDUSTRY	<ul style="list-style-type: none">o SATISFIES BUDGET CONSTRAINTSo TECHNICALLY PROVENo LARGE POTENTIAL FOR REPLICABILITY IN LOW-TEMPERATURE STEAM INDUSTRIAL APPLICATIONSo AVAILABLE SOLAR RESOURCEo LIMITED ON-GOING PROJECTS IN EGYPT
BIOGAS ELECTRIC FROM SEWAGE	ELECTRICITY FOR CITIES	<ul style="list-style-type: none">o TECHNICALLY PROVENo SATISFIES BUDGET CONSTRAINTSo LARGE MARKET FOR OFFSETTING SEWAGE PLANT ELECTRICITY REQUIREMENTS & SUPPLYING GRID POWERo NO PROJECT EXPERIENCE IN EGYPTo TAKES ADVANTAGE OF ACTIVITIES TO IMPROVE & UPGRADE URBAN SEWAGE COLLECTION SYSTEMS

PHASE II RESULTS: RECOMMENDED FIELD TEST CANDIDATES (CON'T.)

<u>TECHNOLOGY</u>	<u>APPLICATION</u>	<u>SELECTION BASIS</u>
WIND MECHANICAL	IRRIGATION	<ul style="list-style-type: none">o SMALL-SCALE SYSTEMS WHICH SATISFY PROJECT BUDGETo SIMPLE, PROVEN TECHNOLOGYo NO CURRENT PROJECT EXPERIENCE IN EGYPTo AVAILABLE WIND RESOURCE IN COASTAL & OUTLYING AREASo LARGE MARKET POTENTIAL FOR AGRICULTURE AND LIVESTOCK WATERING IN REMOTE AREAS

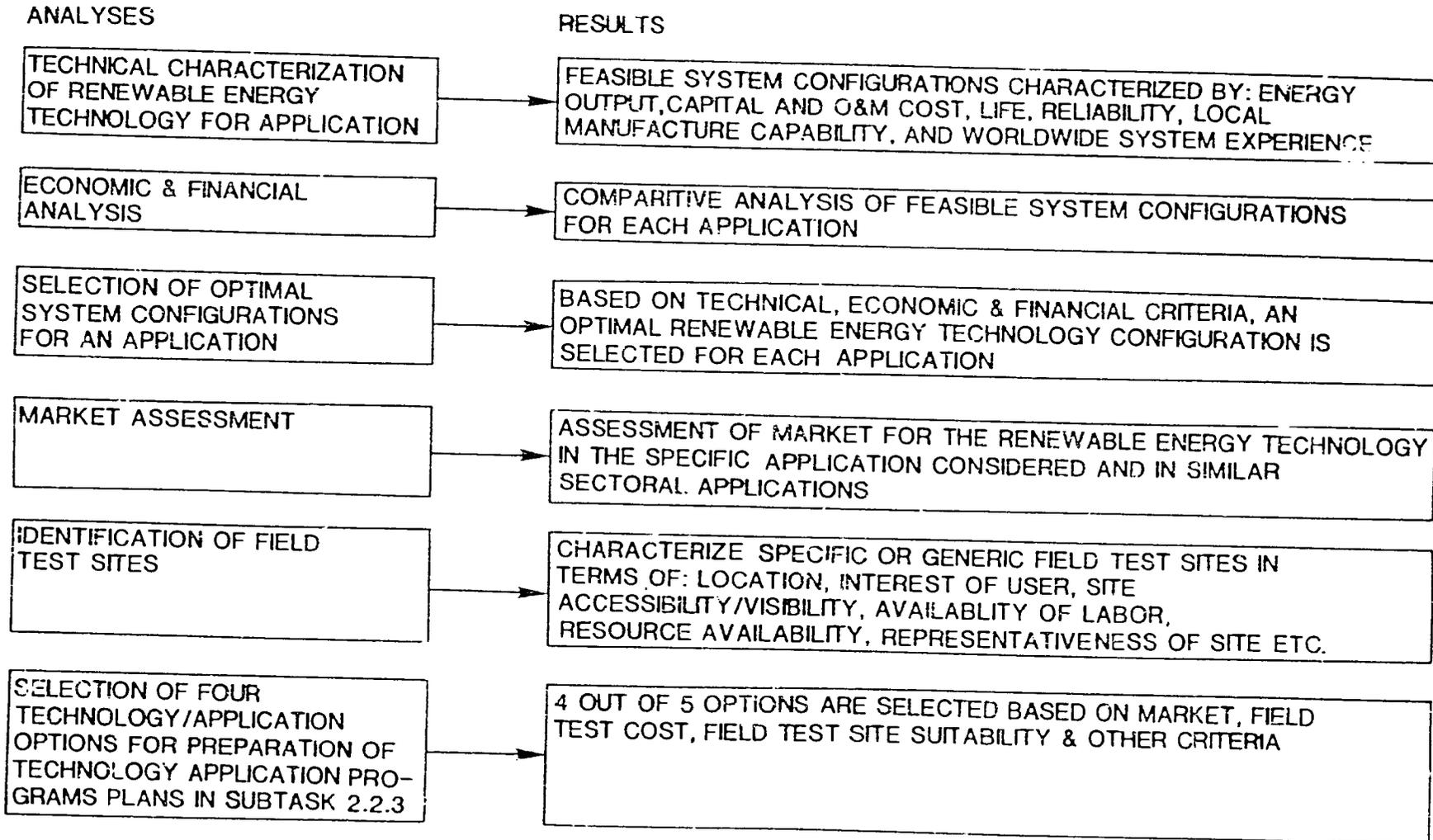
PHASE II RESULTS: OPTIONS NOT SELECTED FOR FIELD TESTING
BUT DESIRABLE FOR POSSIBLE FEASIBILITY STUDY

<u>TECHNOLOGY</u>	<u>APPLICATION</u>	<u>SMALL-SCALE BIOGAS UNITS ANALYSIS RESULTS</u>
MUNICIPAL SOLID WASTE INCINERATION	ELECTRICITY FOR CITIES	<ul style="list-style-type: none">o FIELD TEST WOULD EXCEED PROJECT BUDGET (EST. SMALLEST ECONOMIC SYSTEM COST IN U.S. IS \$6 MILLION)o ALTHOUGH IMPROVING IN SOME URBAN AREAS, CURRENT WASTE COLLECTION SYSTEM CANNOT PROVIDE RELIABLE RESOURCE SUPPLY
ACTIVE/PASSIVE SOLAR	COMMERCIAL BUILDINGS	<ul style="list-style-type: none">o EREDO BUILDING IS EXPECTED TO USE PASSIVE SOLAR FOR HEATING & COOLING NEEDS

PHASE II RESULTS: OPTIONS NOT SELECTED FOR FIELD TESTING

<u>TECHNOLOGY</u>	<u>APPLICATION</u>	<u>RATIONALE</u>
PHOTOVOLTAICS	REMOTE COMMUNICATIONS	<ul style="list-style-type: none">o COMMERCIALY AVAILABLE TECHNOLOGYo SUBSTANTIAL ON-GOING PROJECTS IN EGYPT IN MILITARY, OTHER GOVERNMENT AND PRIVATE SECTORS
PHOTOVOLTAICS	IRRIGATION	<ul style="list-style-type: none">o SUBSTANTIAL ON-GOING PROJECTS IN AGRICULTURAL SECTOR OF EGYPT
SOLAR THERMAL	SOAP & DETERGENT INDUSTRY	<ul style="list-style-type: none">o REPLICABILITY POTENTIAL NOT AS HIGH AS IN PHARMACEUTICALS AND HYDROGENATED OIL INDUSTRIES
WIND ELECTRIC	IRRIGATION	<ul style="list-style-type: none">o ONE ON-GOING FIELD TEST HAS WIND ELECTRIC WATER PUMPING AS A MAJOR COMPONENT
BIOGAS ELECTRIC	IRRIGATION	<ul style="list-style-type: none">o SUBSTANTIAL ON-GOING PROJECTS (>100) IN

PROPOSED SUBTASK 2.2.2 ANALYSES AND EXPECTED RESULTS

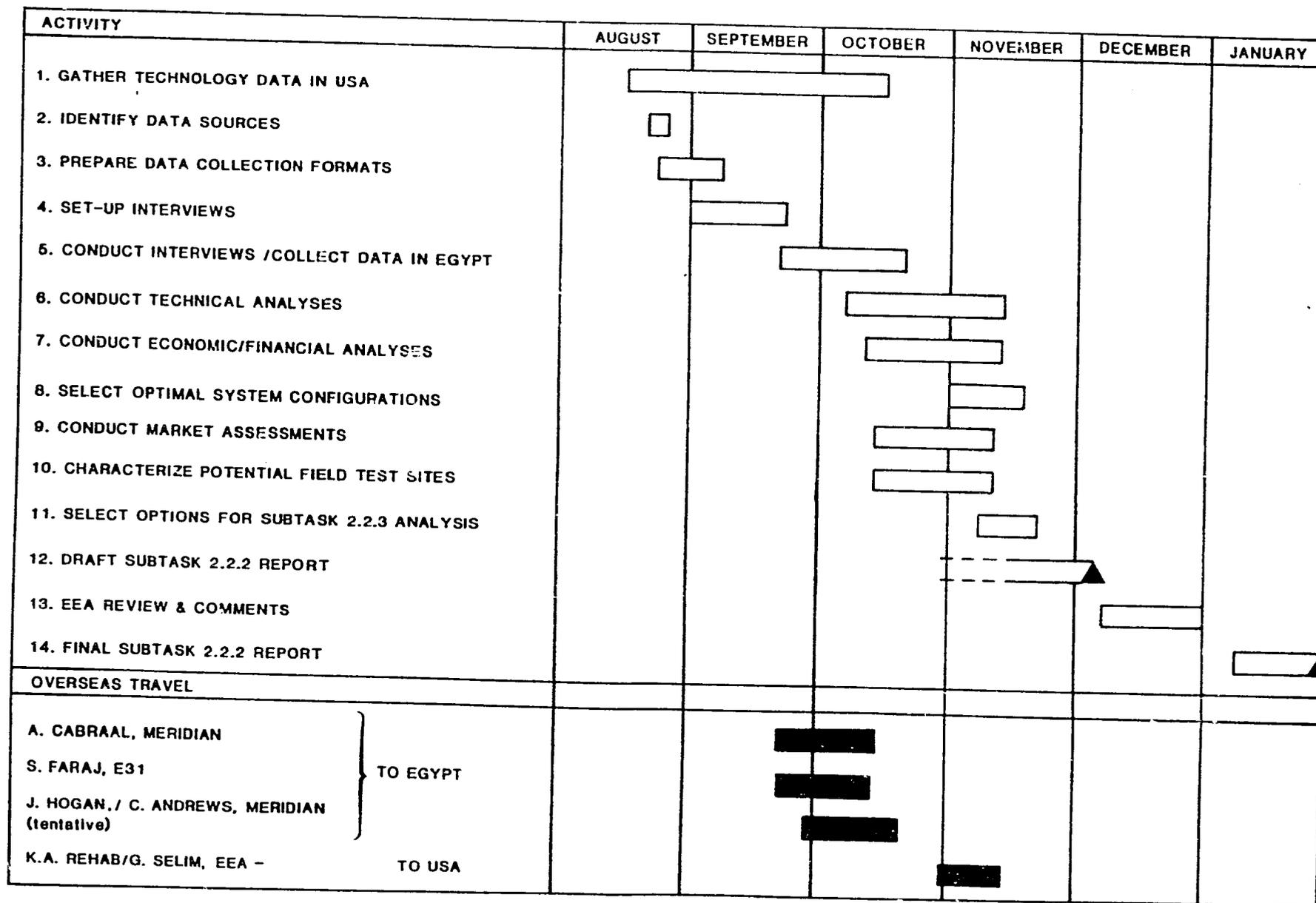


PLANNED SUBTASK 2.2.2 ACTIVITIES DURING VISIT

- o WORKSHOP ON SUBTASK 2.2.2 DATA COLLECTION AND ANALYSIS PROCEDURES
- o TECHNICAL ANALYSIS DATA COLLECTION: ENERGY USE CHARACTERISTICS, ENERGY SOURCES, PROCESS DATA, RELIABILITY & AVAILABILITY OF CURRENT ENERGY SOURCES, RESOURCE AVAILABILITY, LOCAL MANUFACTURING CAPABILITY, ENVIRONMENTAL IMPACTS, TECHNICAL FEASIBILITY
- o ECONOMIC/FINANCIAL ANALYSIS DATA COLLECTION: CURRENT AND PROJECTED ENERGY COSTS, EQUIPMENT LIFE, O&M COSTS, TYPICAL DISCOUNT/LOAN RATES, TAX STRUCTURE, ETC.
- o MARKET ASSESSMENT DATA COLLECTION (APPLICATION SPECIFIC & SECTORAL): CURRENT AND PROJECTED DEMAND, MANAGEMENT/USERS PERCEPTION & UNDERSTANDING OF RENEWABLE ENERGY TECHNOLOGY, TECHNOLOGICAL STATUS, CURRENT AND PLANNED FACILITIES, TYPICAL OPERATION SIZE, POTENTIAL SOLAR APPLICATIONS, RELEVANT LEGISLATION, DOMESTIC/EXPORT MARKET STATUS, MANPOWER SKILLS
- o TECHNICAL, ECONOMIC/FINANCIAL AND MARKET ANALYSES

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PROPOSED SUBTASK 2.2.2 SCHEDULE



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