



Harnessing the Sun's energy to improve Health Care delivery in Health Centres in Uganda

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Introduction – Location of Uganda in the World, Africa and East Africa

- ❑ Uganda is a land locked country in East Africa bounded to the East by Kenya, to the North by South Sudan, to the West by Democratic Republic Congo and to the South by Tanzania & Rwanda.

- ❑ It straddles the Equator and lies between;
 - 4° N and 1.5° S Latitude, and
 - 28° E and 35° E Longitude

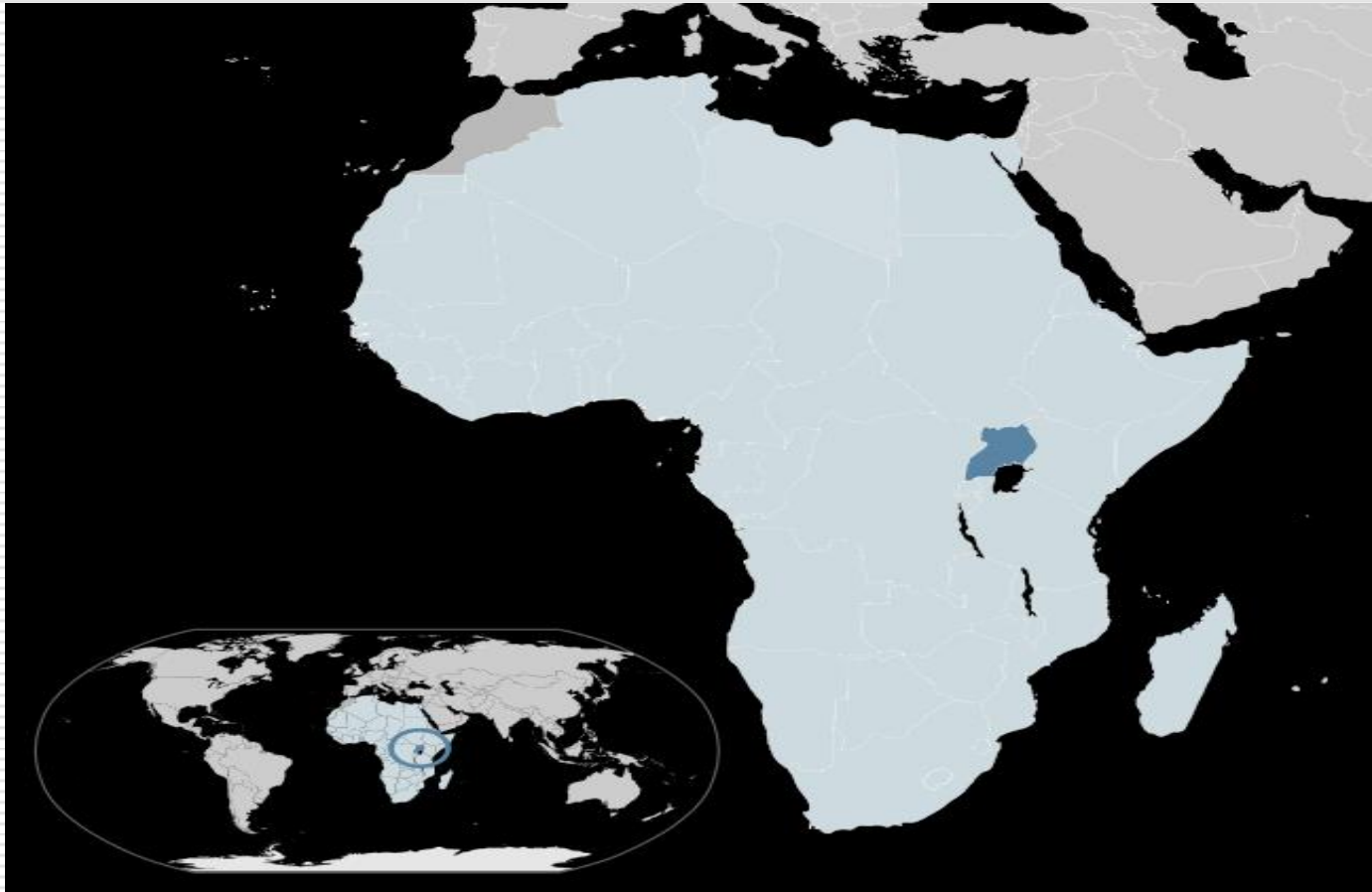
Map of Uganda



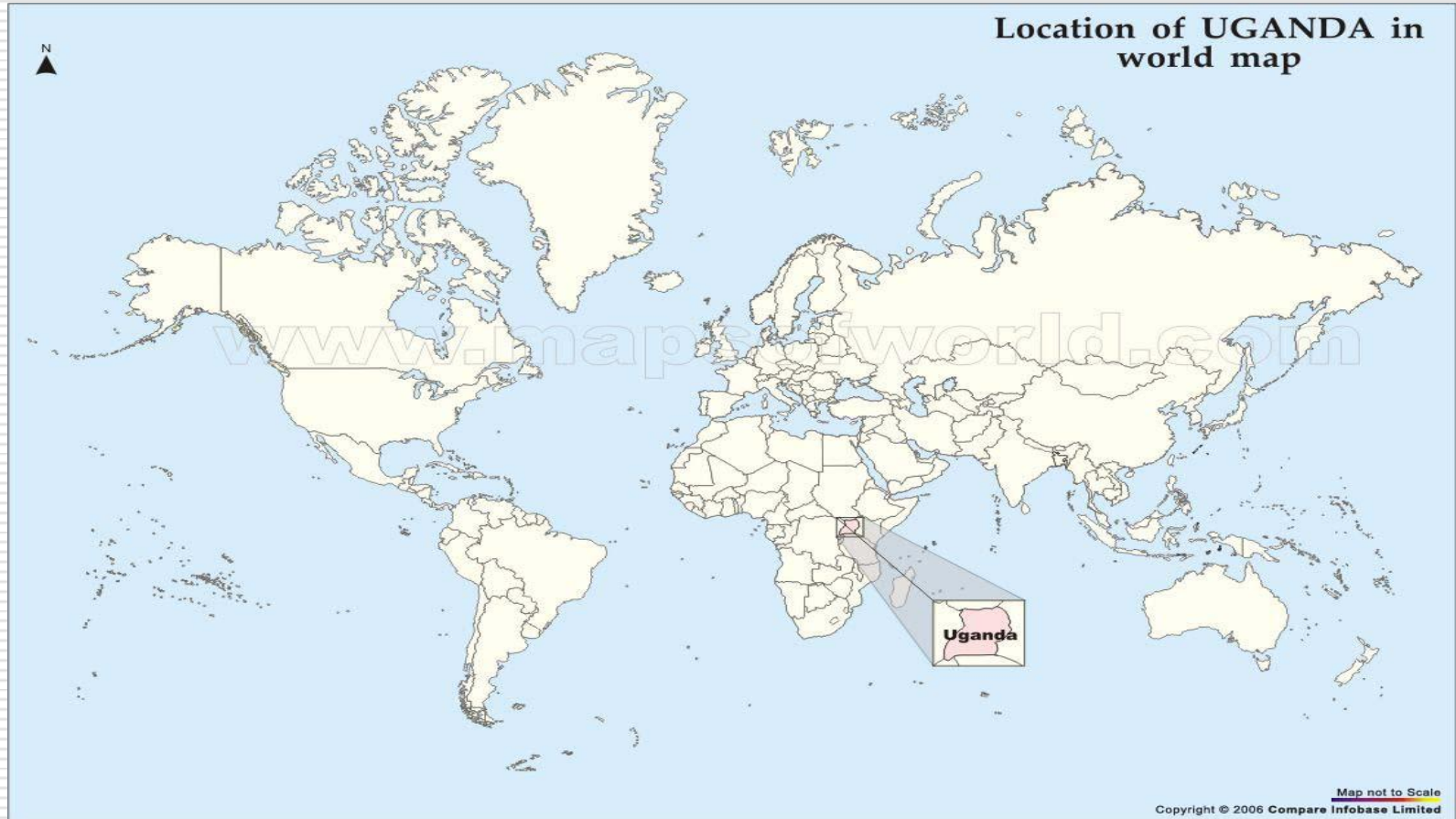
Location of Uganda in East Africa



Location of Uganda in Africa



Location of Uganda in the World



The Uganda National Health System

Levels of Health Care

Ministry of Health

- National and Regional Referral Hospitals

District Health Services

- General Hospitals and Health Centres IV, III, II

The Uganda National Health System

– cont'd

- **HC II** offers only Out Patient Services, except in strategic locations.
- **HC III** offers continuous basic preventive, promotive and curative care and provides support supervision of HC IIs facilities under its jurisdiction.
- **HC IV** and **General Hospitals (GHOSP)** offer basic preventive, curative and rehabilitative care and provide a second level referral services for the HSD including surgical and obstetrical emergency care.

The Uganda National Health System

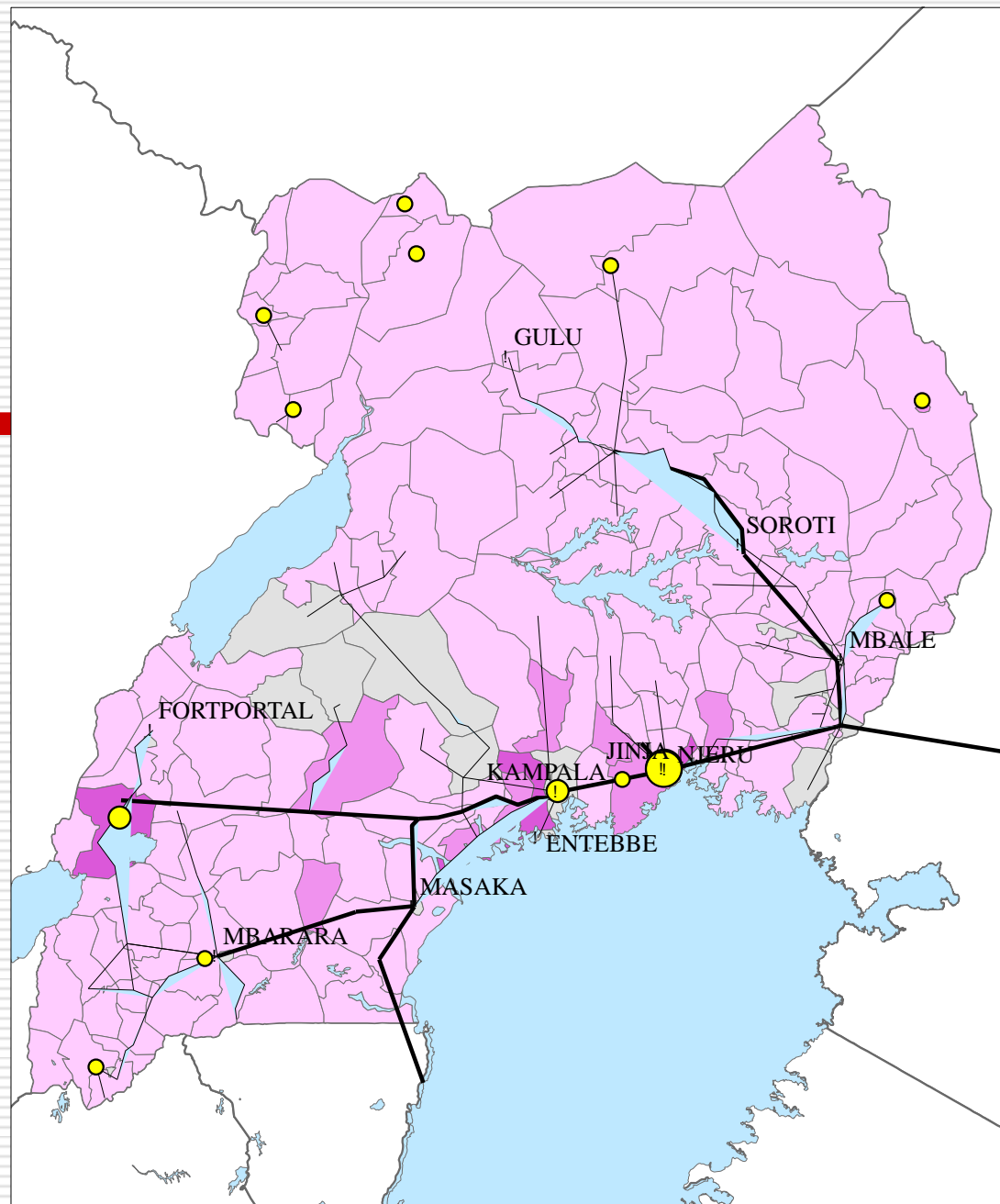
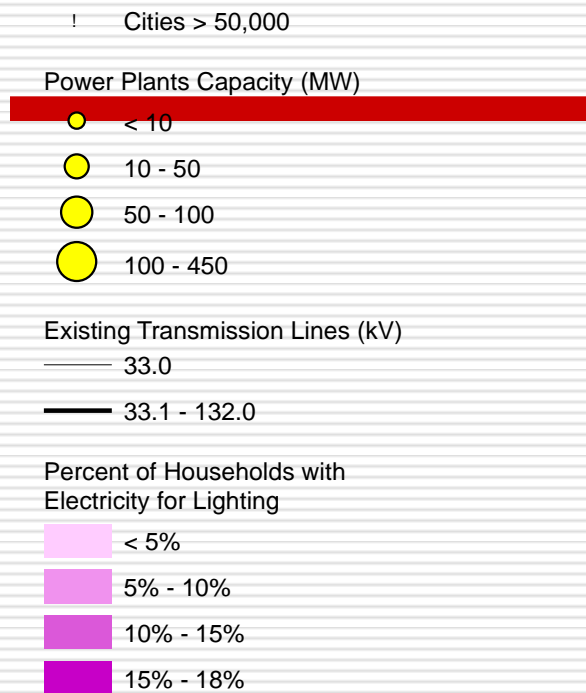
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- ***Regional Referral Hospitals (RRH)*** in addition to the services offered at the general hospital, offer specialist services such as psychiatry; ear, nose and throat (ENT); radiology; pathology; ophthalmology; higher level surgical and medical services, including teaching and research.
- ***National Referral Hospitals (NRH)*** in addition to the services offered at the regional referral hospital, provide comprehensive specialist services and are involved in teaching and health research.

Grid Electricity supply in Uganda

- ❑ Current grid electricity access in Uganda stands at 10% of the population
- ❑ As of 2009, energy consumption in Uganda per capita was a **mere** 69.5 kWh compared to Africa at 578 kWh and the World at 2572 kWh per capita
- ❑ Hence, the need for other forms of available and reliable electricity sources

Access to Electricity - 1991



Access based on 1991 Population and Housing Census.
Data on housing characteristics not available for all counties.
Power plants from PLATTS World Power Plants Database,
2006. Transmission lines generated from Electricity Network
Map included with AERDP report, 2004.

Conception of the ERT Project

- ❑ Government in 2002 conceived the **E**nergy for **R**ural **T**ransformation {ERT} Project to predominantly use solar photo voltaic systems for off Grid facilities
- ❑ Is a multi-sectoral project with Ministry of Energy as overall coordinator and to give policy guidance
- ❑ The ERT Programme is a **rural** electrification Programme funded by Government of Uganda, The World Bank (IDA, GEF) and The Nordic Development Fund
- ❑ The ERT Program – Health Component is implemented **only** at the Health Centre Level (i.e. HCII, III & IV) off Grid

Introduction to the ERT Program

- Implementation in 2 Phases:
 - Phase 1: 7 years (August 2002 - March 2009) – Implementation support for design and actual implementation. ***A learning process***
 - Phase 2: 4 years (June 2009 - June 2013) - To increase investments and accelerate implementation of solar packages to all HC IVs up to 1 km as well as 65% HC IIIs and 50% HC IIs within 500 m ***from*** the national grid.

Criteria for selection of Districts and Health facilities

- ❑ National grid coverage – districts not connected to the grid prioritised
- ❑ Status of Health Infrastructure – presence of infrastructure in good condition
- ❑ Packaging of Districts to increase attractiveness and volumes to benefit from economies of scale for maintenance
- ❑ Geographical balance and equitable distribution of districts + health facilities
- ❑ Staffing and equipping status of health facilities – better staffed and equipped prioritised

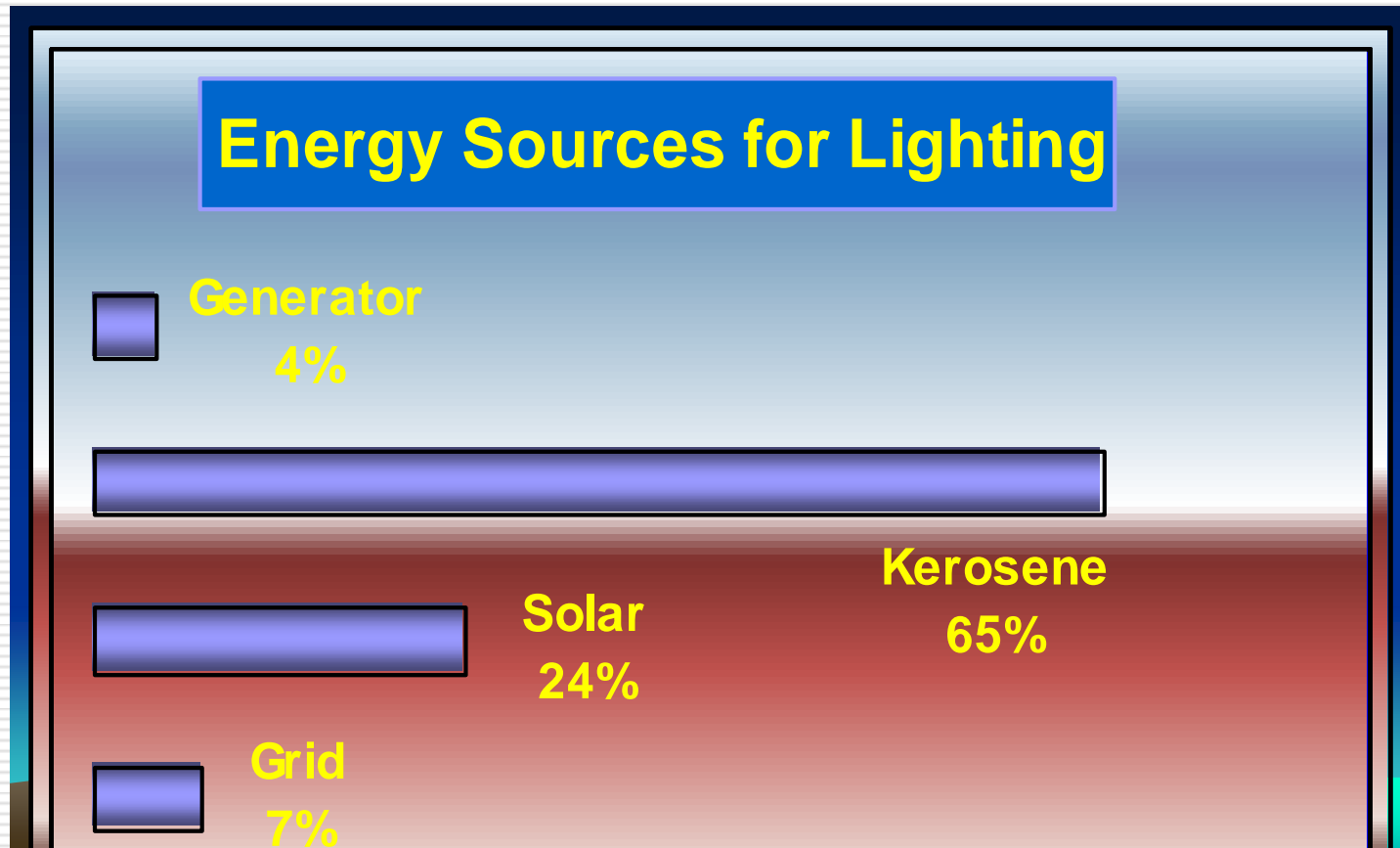
Criteria for selection of Health Facilities

- ❑ Selection done in collaboration with Districts based on criteria above
- ❑ Selected Health facility to be surveyed by Ministry Of Health Engineering Team to:-
 - *ascertain concurrence with set criteria,*
 - *determine actual energy needs*

Baseline survey of energy sources in target districts' Health facilities

- ☐ Carried out in 2004 prior to commencement of project
- ☐ To determine sources of lighting in target districts' health facilities
- ☐ Below are the Survey results for 362 Health facilities in the 20 target districts.

Energy Situation in HCs in June 2004 (S=362 HCs in 20 districts)



ERT Health Component Objectives

- ❑ To improve quality of Health Services delivery in rural Health Centres through increased access to modern energy services
- ❑ To improve working conditions and environment in Health Facilities
- ❑ To attract and retain qualified staff in rural Health Units

IMPLEMENTATION

STRATEGY, PLAN AND EXECUTION

STRATEGY

Implementation Strategy

- ❑ Focus on **rural** Health Centres (which make up $\geq 95\%$ of Health Facilities)
- ❑ Utilize most feasible and optimal Energy options available – **Grid Connection, Solar, Wind** – *wind option not in wide application*
- ❑ Focus on providing modern energy for essential Health Services namely;
 - ✓ **Lighting** - Medical and Staff buildings
 - ✓ **Cold Chain** – Vaccines, Lab reagents and Blood storage
 - ✓ **Diagnostic Services** – Microscopy, exam lights e.t.c

Implementation Strategy – Contd..

- ❑ Integrate Solar PV with already existing energy sources.
- ❑ Design of Solar PV systems should take into account security of the system.
- ❑ Develop standard solar PV Packages by Health Care Level and per building thereat.
- ❑ For sustainability, sign Maintenance Contracts with Supplier.

Physical Infrastructure at each Health Centre Level

HEALTHCARE LEVEL	PHYSICAL INFRASTRUCTURE	BED CAPACITY
HCII	OPD and Staff Houses	2
HCIII	OPD, Maternity/General Ward & Staff Houses	14
HCIV	OPD, Maternity, General Ward, Theatre & Staff Houses	24

Solar PV System Design Approach

System Configuration:

- ❑ DC System for lighting with a decentralised Inverter for AC loads (***only for staff houses with ≤ 3 rooms***)
- ❑ AC systems for lighting and operation of other small power consuming appliances (***for all medical buildings and staff houses with > 3 rooms***)
- ❑ Standardized stand alone Solar PV systems for buildings depending on usage and size (e.g. OPD, Maternity, Ward, Laboratory, Administration, Theatre)
- ❑ Centralized Solar PV/Generator Hybrid system for HCIV.

PLAN

Proposed Implementation Plan

- ❑ ERT Phase **1** was implemented in 15 districts in West Nile, Eastern Uganda and the Karamoja region in 155 Health Centres
- ❑ Energy packages totalled 117.14 kWp
- ❑ ERT Phase **2** – IDA funded - targeted all HC IVs and 75% of HC IIs & HC IIIs off grid in 24 (now 33) districts
- ❑ Energy packages expected to total 693.44 kWp

Proposed Implementation Plan – cont'd

- ERT Phase 2 **by design** targeted Northern Uganda – to contribute to the Northern Uganda Recovery Programme
- The Nordic Development Fund (NDF) planned for 100 Health Centres in 6 (now 8) districts.
- Proposed Implementation schedule was as per Tables below.

Proposed Implementation Plan – cont'd 2 – IDA and GEF funding

Batch Number	Number of Districts	NUMBER OF HEALTH FACILITIES				PERIOD
		HC II	HC III	HC IV	TOTAL	
1	8	107	62	14	183	2009-10
2	8	71	49	9	129	2010-11
3	8	76	60	16	152	2011-12
TOTAL	24	254	171	39	464	

Proposed Implementation Plan – cont'd 3 – NDF Funding

Number of Districts	NUMBER OF HEALTH CENTRES			TOTAL
	HC II	HC III	HC IV	
6	44	48	8	100

Total number of Health Facilities Planned

- The total number of Health Facilities planned for provision of Energy (both IDA + GEF and NDF) was therefore **564** (298 HC IIs, 219 HC IIIs and 47 HC IVs) in 30 (now 41) districts

ACTUAL EXECUTION

Execution of ERT Phase 2 - Batch 1

DISTRICT	NUMBER OF HEALTH FACILITIES						TOTALS	
	HC II		HC III		HC IV		PLAN	ACTUAL
	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL		
Kibaale	11	15	12	16	2	2	25	33
Mubende/Mityana	21	18	14	20	3	2	38	40
Kabale	35	23	8	14	5	6	48	43
Rukungiri/Kanungu	19	15	14	12	1	2	34	29
Luwero/Nakaseke	21	28	14	13	3	1	38	42
TOTALS	107	99	62	75	14	13	183	187

Execution of ERT Phase 2 - Batch 2

DISTRICT	NUMBER OF HEALTH FACILITIES						TOTALS	
	HC II		HC III		HC IV		PLAN	ACTUAL
	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL		
Adjumani	13	18	8	8	1	1	22	27
Amuru/ Nwoya	9	18	6	10	1	1	16	29
Kitgum /Lamwo	11	11	10	15	1	3	22	29
Dokolo	5	7	3	3	1	1	9	11
Kaberamaido	6	10	7	5	1	1	14	16
Nakapiripirit/ Amudat	8	7	3	4	2	2	13	13
Moroto /Napak	6	7	5	7	0	0	11	14
Apac /Oyam / Kole	13	11	7	15	2	2	22	28
TOTALS	71	89	49	67	9	11	129	167

Execution of ERT Phase 2 - Batch 3

DISTRICT	NUMBER OF HEALTH FACILITIES						TOTALS	
	HC II		HC III		HC IV		PLAN	ACTUAL
	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL		
Bundibugyo + Ntoroko	12	15	5	3	3	2	20	20
Masindi + Kiryandongo	16	19	10	10	2	0	28	29
Sironko + Bulambuli	7	6	18	13	3	1	28	20
Bukwo	5	10	3	3	1	1	9	14
Mbale	5	5	10	4	2	1	17	10
Mayuge	16	20	3	3	2	2	21	25
Amuria	10	13	7	9	2	2	19	24
Katakwi	5	13	4	7	1	1	10	21
TOTALS	76	101	60	53	16	10	152	163

Execution of ERT Phase 2 - NDF

DISTRICT	NUMBER OF HEALTH FACILITIES						TOTALS	
	HC II		HC III		HC IV		PLAN	ACTUAL
	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL		
Moyo	10	9	9	9	1	1	20	19
Buliisa	6	7	2	1	1	1	9	9
Gulu	7	24	7	12	2	2	16	38
Amolatar	8	8	2	3	0	1	10	12
Soroti + Serere	5	15	15	11	3	2	23	28
Pader + Agago	8	32	13	13	1	0	22	45
TOTALS	44	95	48	49	8	7	100	151

Summary of Beneficiary Districts – PLAN vs. ACTUAL

ERT 2 BATCH	NUMBER OF HEALTH FACILITIES						TOTALS	
	HC II		HC III		HC IV		PLAN	ACTUAL
	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL		
Batch 1	107	99	62	72	14	13	183	184
Batch 2	71	89	49	67	9	11	129	167
Batch 3	76	101	60	53	16	10	152	164
SUB – TOTAL	254	289	171	192	39	34	464	515
NDF	44	95	48	49	8	7	100	151
GRAND TOTALS	298	384	219	241	47	41	564	666

Variance between planned numbers and numbers in actual Tenders

- Overall 102 Health Centres more than planned will receive solar power
 - ✓ 86 HC IIs more than planned
 - ✓ 22 HC III more than planned
 - ✓ 6 HC IVs less than planned

Reasons for the Variance between plan and actual Tenders

- ❑ HC IIs and HC IIIs more because:
 - ✓ more HC IIs and HC IIIs were constructed in Northern Uganda as part of Recovery from the war
 - ✓ actual buildings on the ground smaller than the standard ones
- ❑ HC IVs fewer because:
 - ✓ the Rural Electrification Agency (REA) extended the Grid and more HC IVs are within 1km of grid

Key Achievements

- Have Designs and Specifications for the Standard Solar Energy Packages – *17 No. medical packages and 8 No. staff house packages.*
- Completed Phase 1 covered 15 Districts:
 - ✓ 155 Health Centres (8HCIV, 68HCIII and 79HCII) installed with Solar PV systems.

Key Achievements – cont'd

- ❑ Phase 2 was planned to cover 30 new Districts:
 - ✓ 24 [now 33 districts funded by IDA + GEF]
 - ✓ 6 [now 8 districts funded by NDF]to cover **564** HCs (**298** HC IIs, **219** HC IIIs and **47** HC IVs)

- ❑ Actual Tenders cover **666** HCs (**384** HC IIs, **241** HC IIIs and **41** HC IVs)

Key Achievements – cont'd 2

- ❑ Status of ERT Phase 2 implementation as follows:
 - Batch 1 - completed
 - Batch 2 – contracts signed and shipment of solar equipment started
 - Batch 3 – IDA approval of Bidding documents received and Tender process started
 - NDF - NDF approval of evaluation received and draft Agreements with Solicitor General for clearance

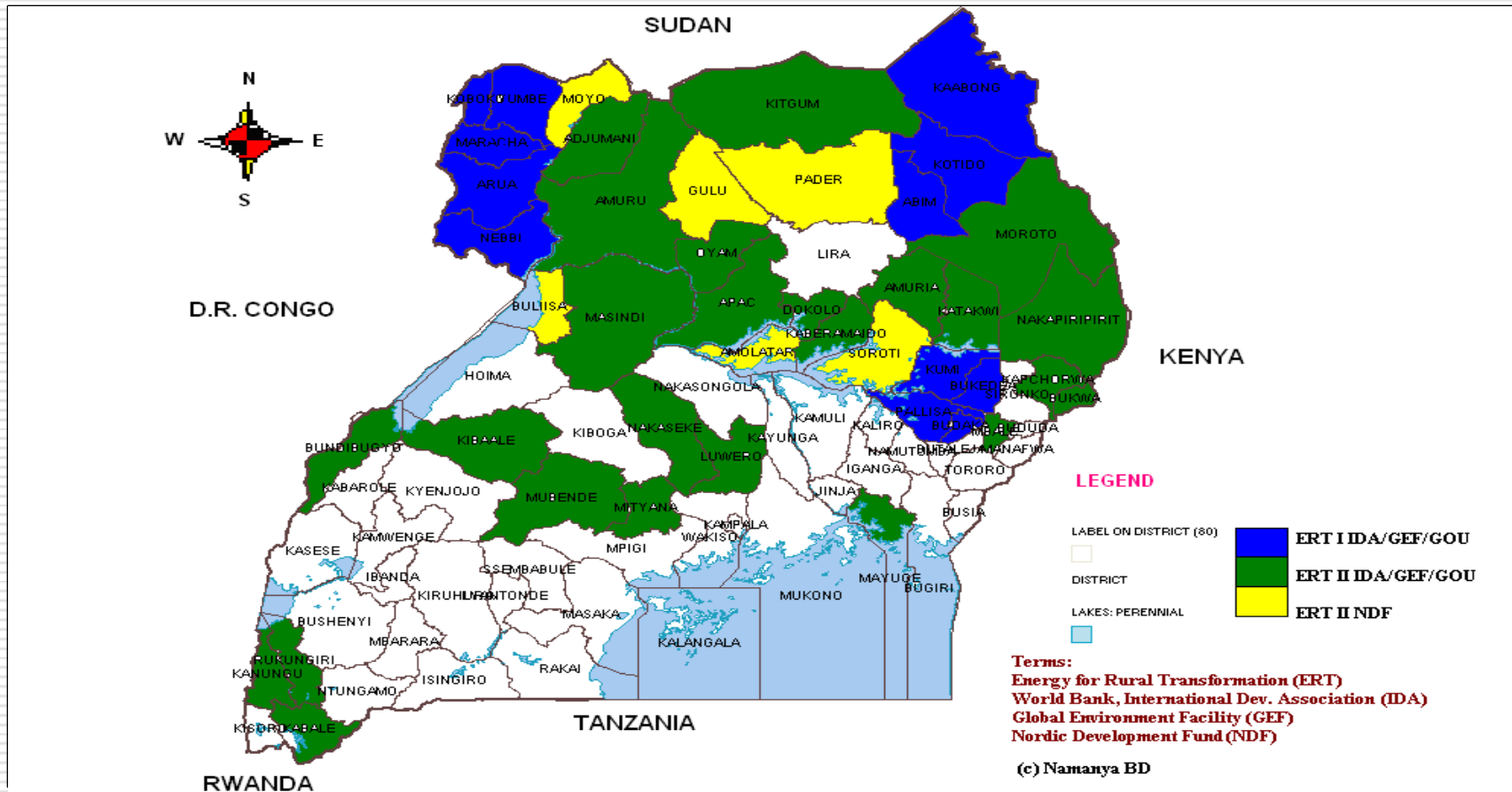
Key Achievements – cont'd 3

- ❑ Implementation of ERT Phase 2 – Health Component is currently largely on the schedule as per plan at conception.
- ❑ Other Sector components lagging
- ❑ Consequently, at recent IDA supervision Mission the ERT Health Component was allocated more funds to implement in additional **14** districts {**222** HCs – 121 HC IIs, 81 HC IIIs and 20 HC IVs} as per Table below:

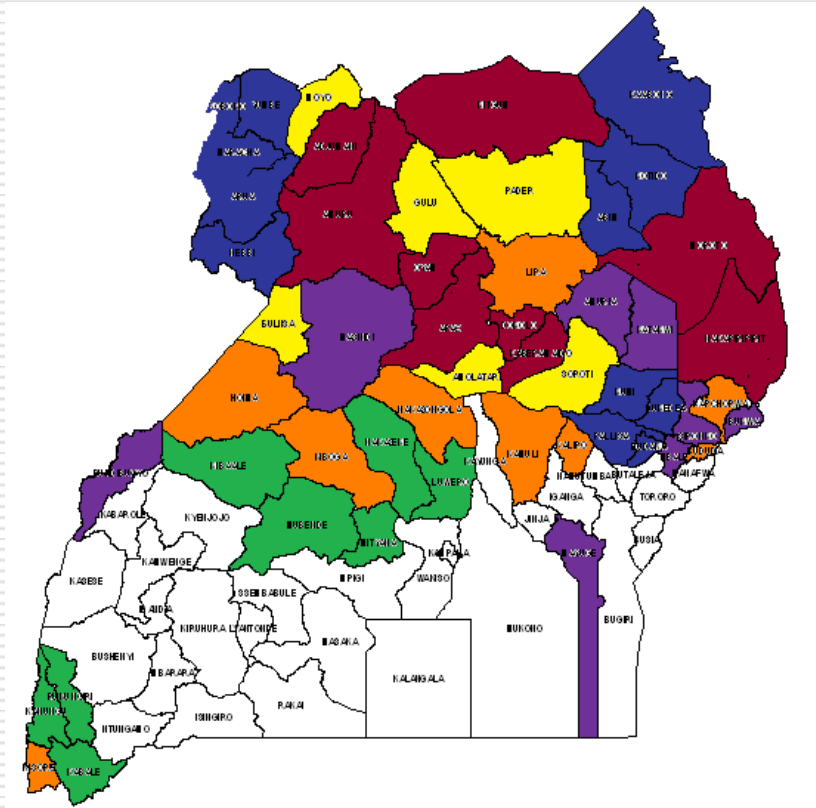
Planned Health Centres in additional Districts – Batch 4

DISTRICT	NUMBER OF HEALTH FACILITIES			TOTALS
	HC II	HC III	HC IV	
Kiboga / Kyankwanzi	28	9	2	39
Kisoro	8	11	3	22
Hoima	14	14	3	31
Nakasongola	10	7	2	19
Lira/ Otuke / Alebtong	14	14	5	33
Kapchorwa / Kween	11	7	1	19
Kaliro	6	4	1	11
Kamuli / Buyende	26	10	3	39
Bududa	4	5	0	9
TOTALS	121	81	20	222







Map showing Districts covered by ERT (Phases 1 and 2)



Map after completion of entire Phase 2 and NDF funding



LEGEND

-  ERT 1
-  ERT 2 BATCH 1
-  ERT 2 BATCH 2
-  ERT 2 BATCH 3
-  ERT 2 NDF
-  ERT 2 ADDITIONAL DISTRICTS

Immediate Outcomes

INDICATOR	OUTCOME	BENEFIT
Cost of energy for lighting	<ul style="list-style-type: none"> Pakwach HCIV reduced generator operation time from 21 hours a week to 6 hours Staff with solar systems no longer spend money on Kerosene 	<ul style="list-style-type: none"> Pakwach HCIV is saving about UGX 200,000 per month on diesel (74% expenditure reduction) Health workers save at least UGX 15,000 a month on kerosene and phone charging (about 4% of salary for Health Assistants).
Staff motivation	<ul style="list-style-type: none"> Staff in HCs with solar PV systems for lighting happy and better motivated 	<ul style="list-style-type: none"> Staff expressed willingness to stay in HCs with solar systems and unwilling to be transferred to a HC without lighting facilities.
Security	<ul style="list-style-type: none"> Staff and patients feel more secure at the HC with lighting 	<ul style="list-style-type: none"> Staff are more confident to stay at the HC and work at night

Examples of immediate outcomes – recent installations 2011

Solar power used to watch TV by HC Staff



Solar lighting in theatre at Bugangari HC IV



Lessons Learned

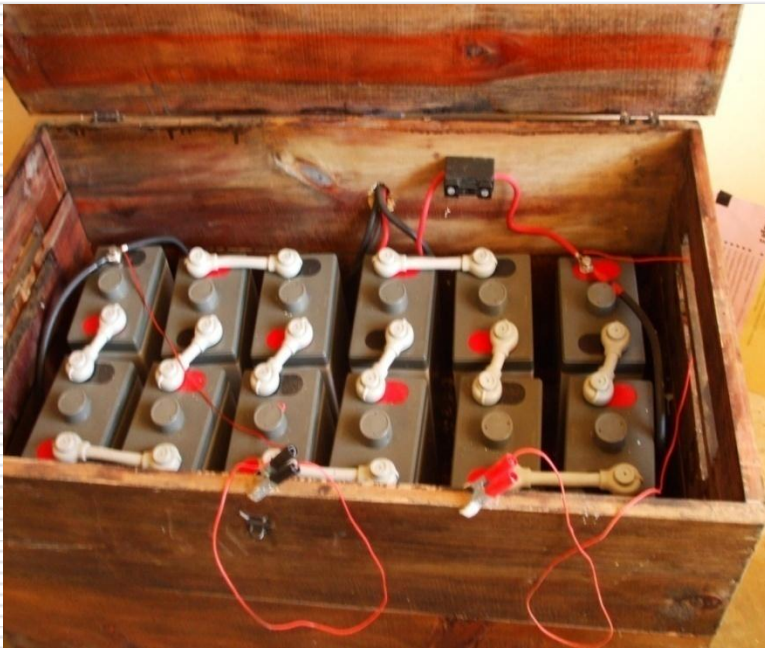
- ❑ Some in house technical capacity is necessary even when you have Technical Assistance.
- ❑ Staff have been motivated by clean power at home and the work place, listen to radio, watch TV and some have obtained higher qualifications through distance learning online.
- ❑ Provision of samples of some equipment for testing prior to placing final equipment orders sometimes necessary.

Challenges in operation of solar photo voltaic systems in Uganda

- ❑ Theft of solar panels despite riveting them on the support frame.
- ❑ Most solar Companies do not have good experience with maintenance of fridges.
- ❑ Data collection for effective monitoring and evaluation of the performance of solar systems.
- ❑ Abuse of solar systems (especially phone charging).

Examples of abuse of solar systems

**Cables for charging
batteries from outside**



Phones on charge !!



Security lights left on during day



Conclusions

- ❑ Component progressing steadily despite some avoidable delays
- ❑ Good progress by health Component has enabled more funding to cover an additional 222 Health centres in 14 districts
- ❑ By end of second phase, objectives will have been more than met for target health and all of Northern Uganda covered as per objective
- ❑ Uganda's lying astride the Equator is benefitting Healthcare delivery in the Country.

THANK YOU



FOR GOD AND MY COUNTRY
