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Common barriers to sustainable health facility electrification



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Powering Healthcare Webinar. | July 19th 2016**



Main issues with energy infrastructure in Haiti

Power Availability

- Unreliable grid
- Off grid
- Diesel generators
- Need for battery back-up systems; possible solar PV...

Power Quality

- Low voltage
- Voltage fluctuation
- Surges
- Sensitivity of laboratory equipment

Electrical Installations

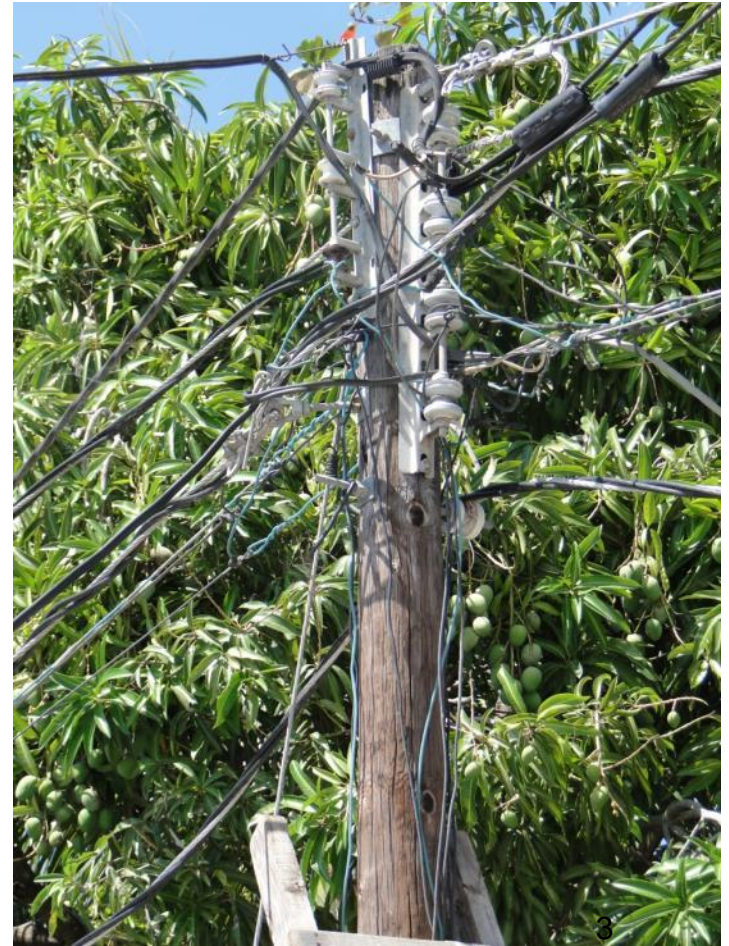
- Poor, even dangerous, wiring
- Lack of maintenance
- Bad habits
- Unskilled technicians
- Ad hoc solutions



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Poor, even dangerous, wiring



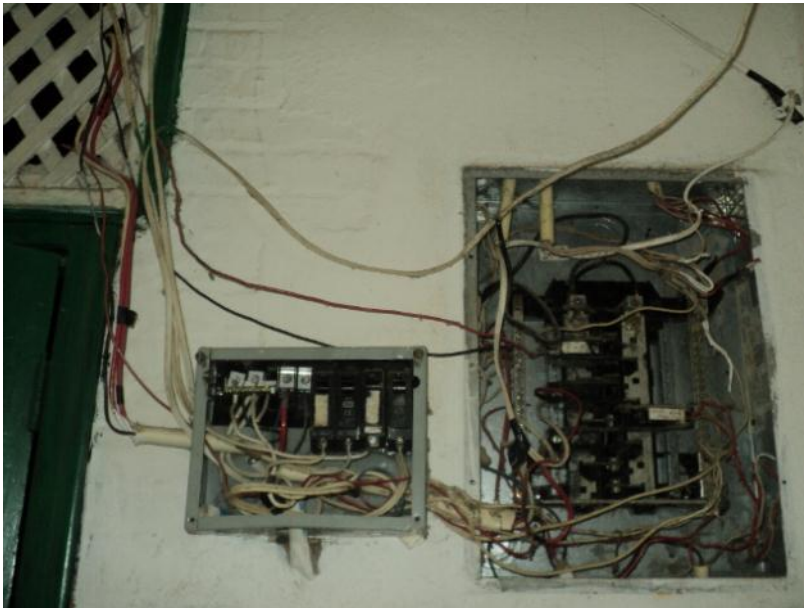


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Electrical load distribution panels: unhelpful and unsafe

The protection covers of load distribution panels are often missing and the wiring is messy.





Lack of maintenance

Batteries terminals are corroded.
Distilled water may or may not be added occasionally.



The generator room is not clean,
causing a potential fire hazard and
making it difficult to identify leaks.





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Burned generators or equipment



Example at Saint
Antoine de Jérémie
Hospital,
Grand'Anse



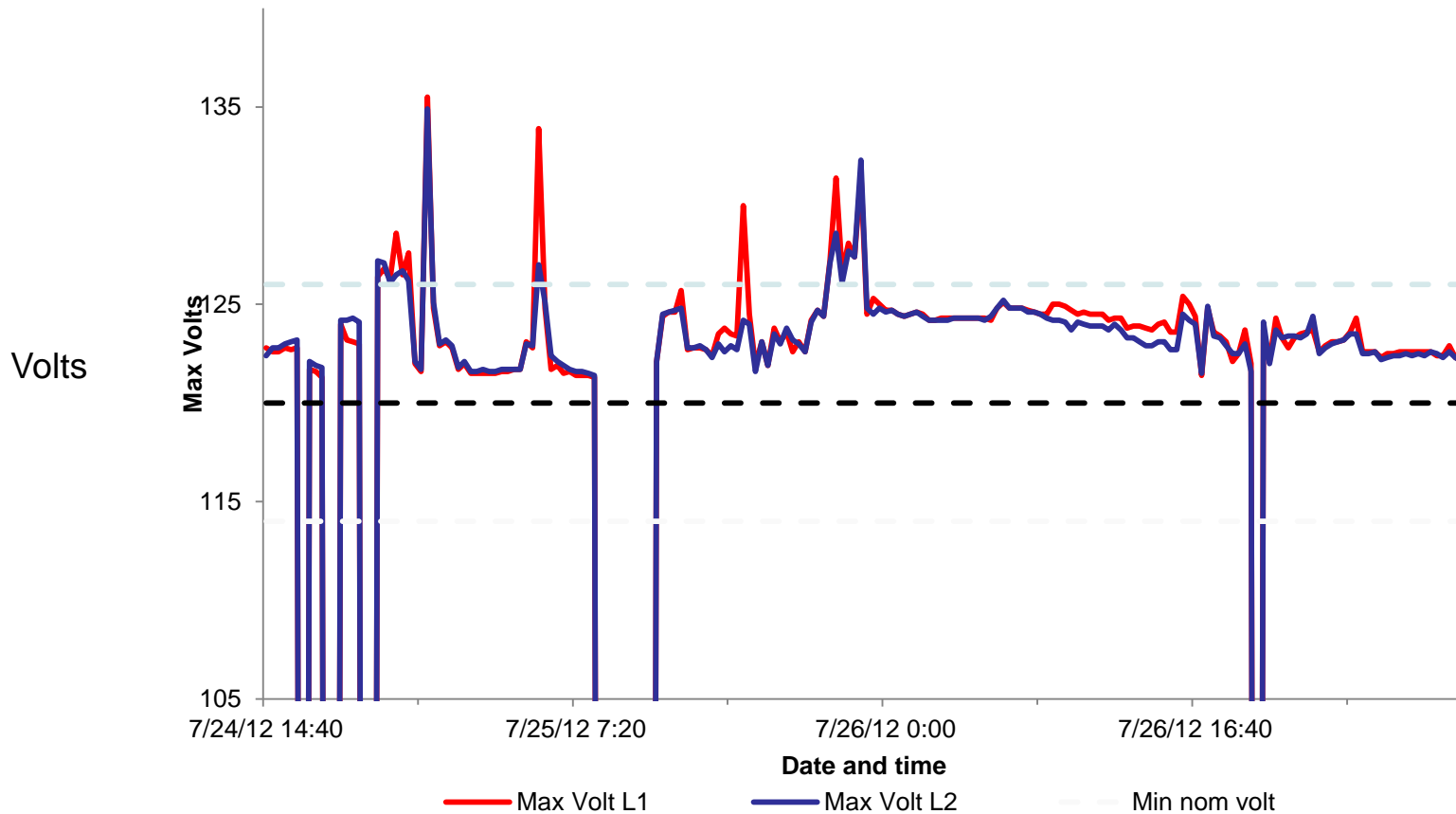
Battery rooms are often not appropriate

Need ventilation (battery gases) and access space for maintenance (add water, brush electrodes, check voltage).



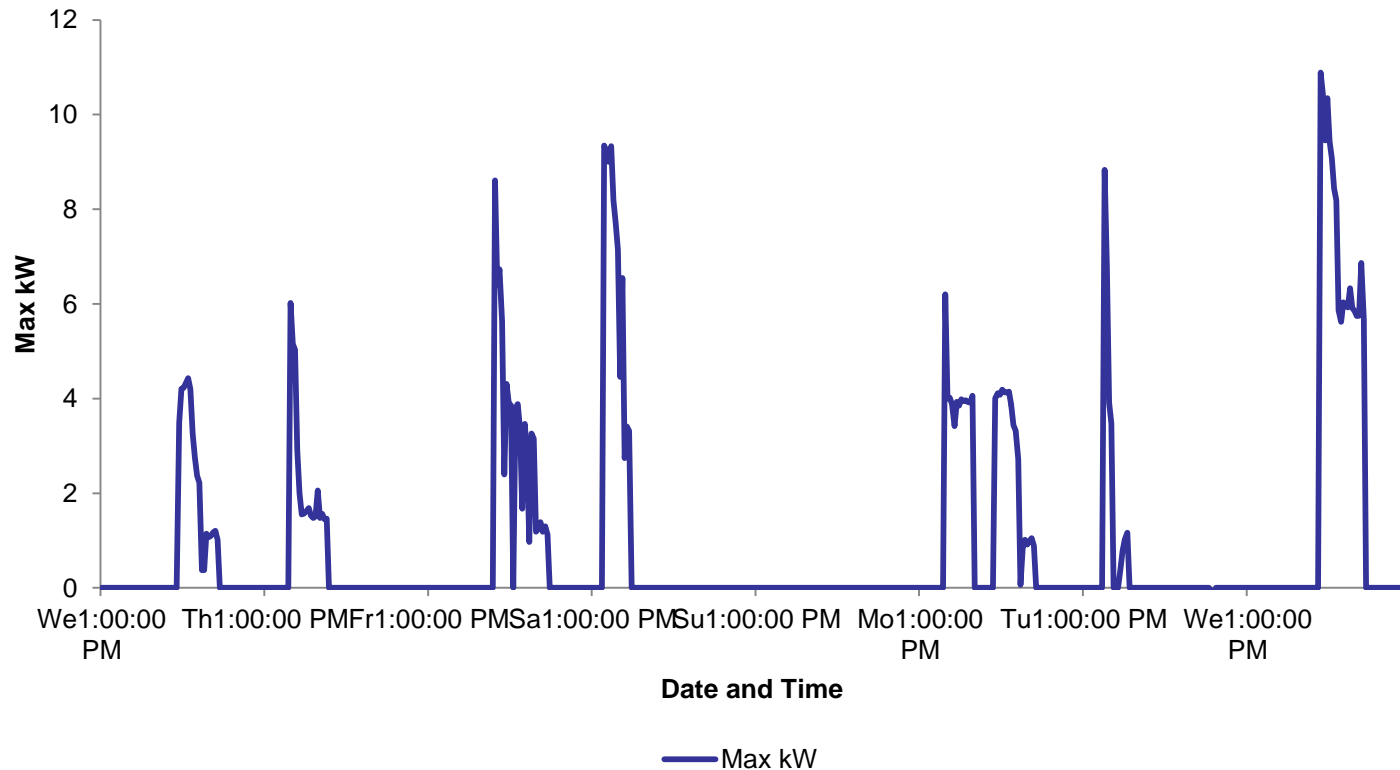


Haiti grid power – voltage variations





Haiti grid power – poor coverage over time





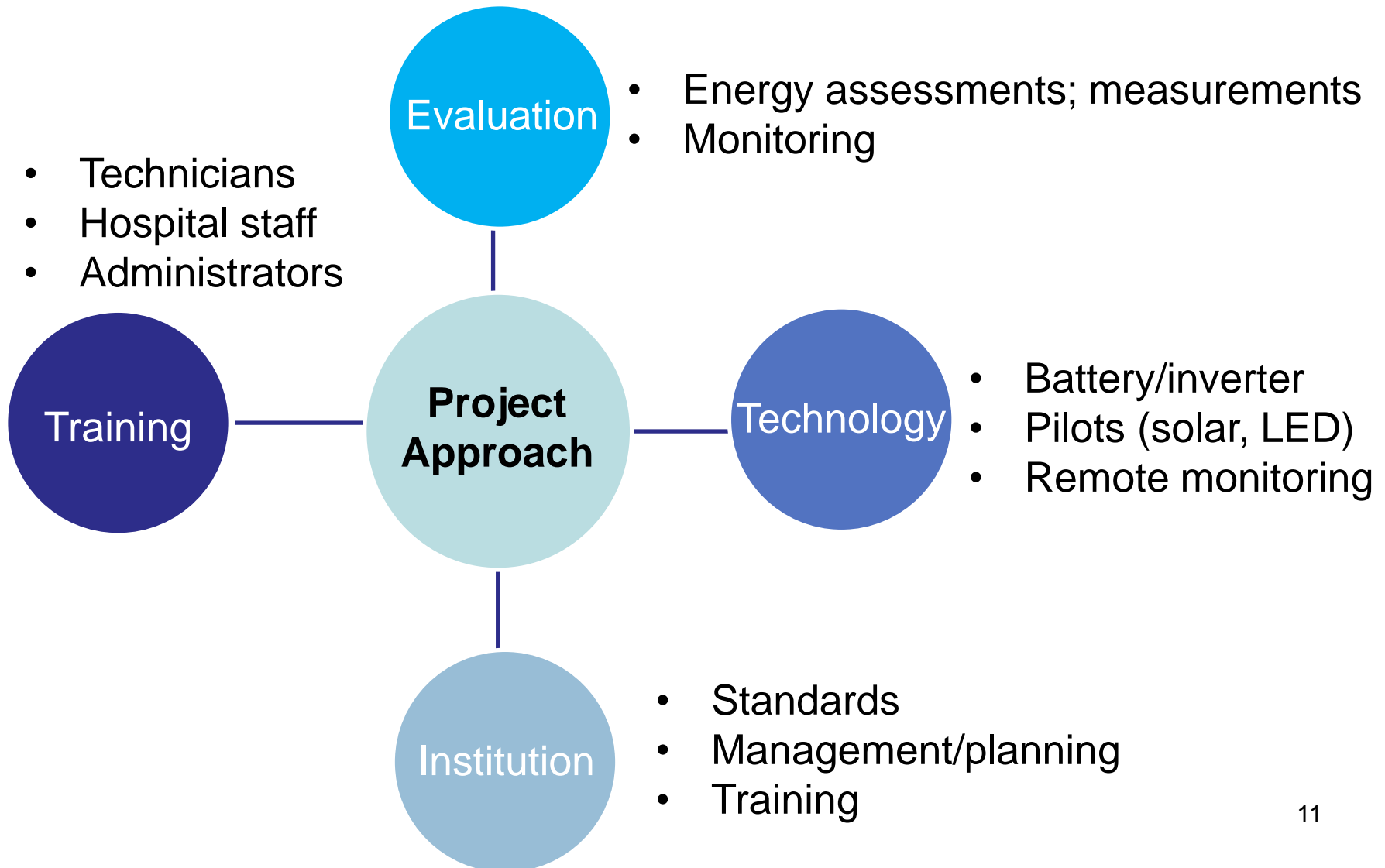
Effects of poor energy infrastructure:

Decrease in Service

- Reduced operating hrs; unserved population
- Reduced capacity for lab tests
- Nighttime safety concerns
- Decline in morale of medical/lab staff

High Cost



- Generator fuel costs
- Damage to expensive instruments
- Data loss
- Medicine spoilage
- Need to redo lab tests
- Decline in morale of technical staff





1 – Energy needs assessments

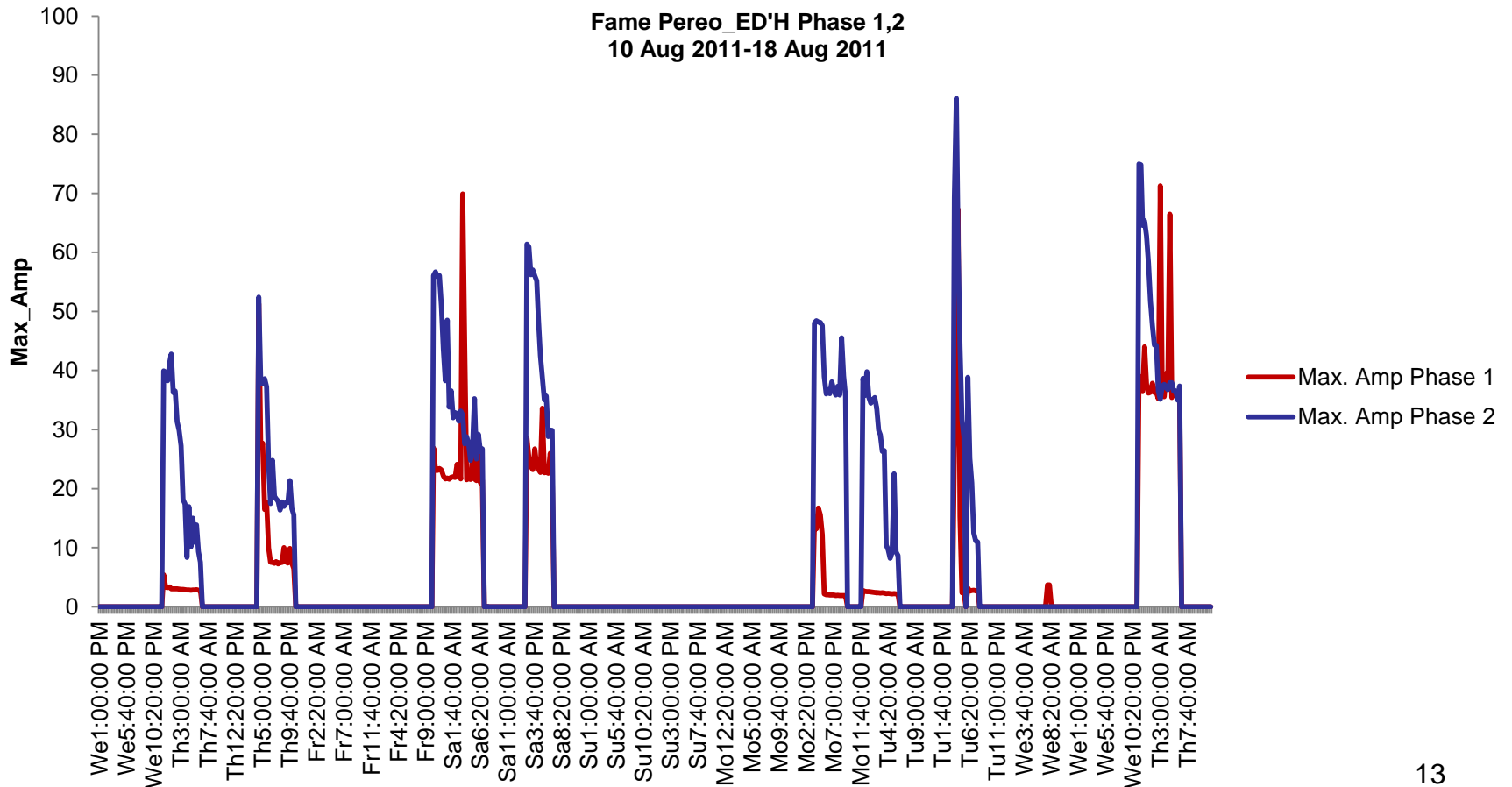


-  Assessment sites
-  New installation sites

A total of 30 health facility assessments have been completed or are under way.



Energy Assessments: actual electrical load variation





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2 - Technology

Battery-Inverter
systems



LED lighting
retrofit



Electrical wiring
improvements





Battery-Inverter backup power systems

Standard designs:

- OutBack inverters
- Rolls-Surette batteries

The inverter-charger:

- Grid (or generator) power available
→ Charges the batteries (AC to DC)
- No grid or generator power
→ Batteries provide power (DC to AC)

Contact vs. No-Contact





IHFI installed 33 battery-inverter backup power systems in 8 departments





LED lighting retrofit demo

Hôpital de la Communauté Haïtienne (HCH), Port-au-Prince

Existing lighting

- 180 T12 fluorescent lamps -- *typical*
- 24/7 lighting – *if power available*
- 44W per lamp – *high consumption*
- 66 lumens/W – *low efficacy*



4-ft LED replacement tubes

- LED international standards
- 90 lumens/W – high efficacy
- 50% reduction in electricity use
- 2-year payback





Electrical wiring improvement

Hôpital Universitaire d'Etat d'Haiti (HUEH), Port-au-Prince

Emergency room



Before



Installation of ceiling
lamps, outlets and fans



After



3 - Institutions

Partners

- Haitian Ministry of Public Health and Population
 - (MSPP)'s Project Unit (UGP)
 - National Reference Laboratory (LNSP)
- CDC



Institutional Activities

- Standard designs, ToR template
- Monitoring/communications database
- Supervision of local installation companies
- USAID environmental compliance
- US National Electrical Code compliance



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Guyana Health Facilities Intervention

- Remote hospitals and clinics
 - Two standard PV systems designed based on assessment loads – 1kW and 1.25kW
 - Local installers bid for installation at 9 sites

Results: 12 Installations completed by June 2013

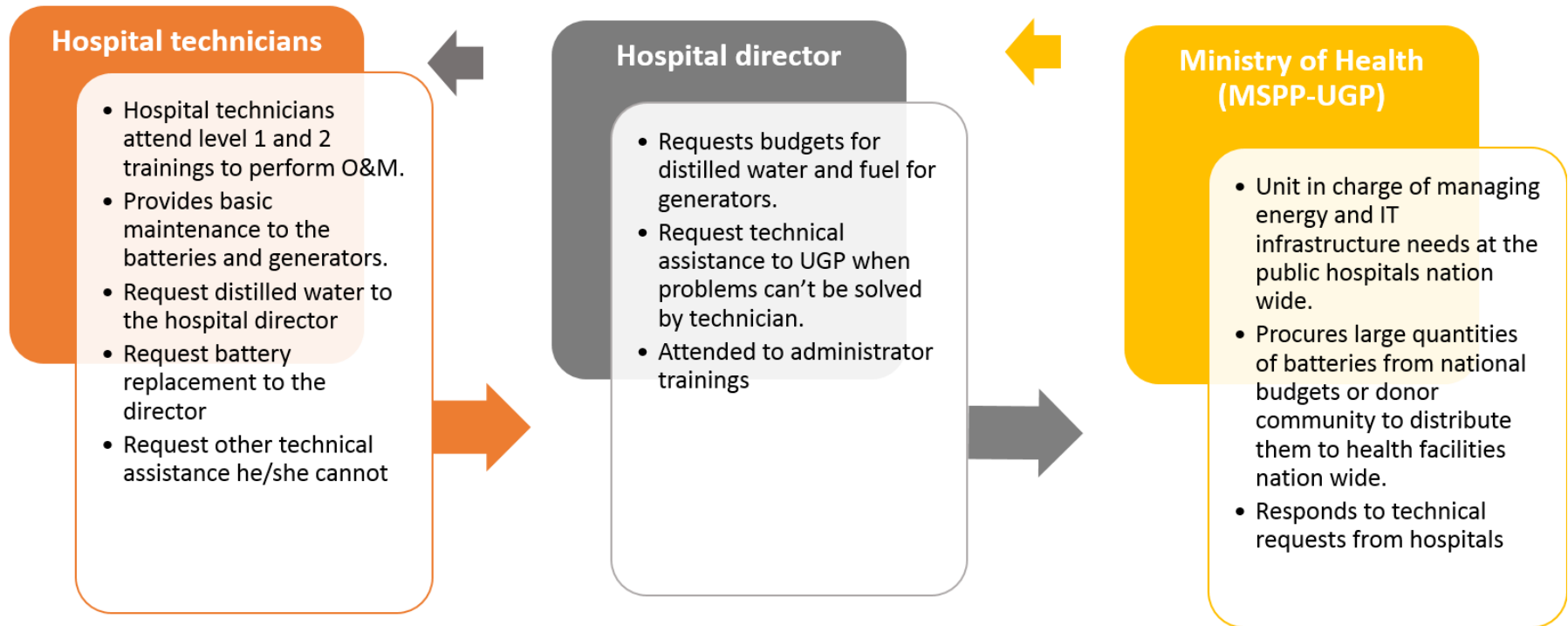
Partners

- Guyana Energy Agency (GEA)
 - Ministry of Health



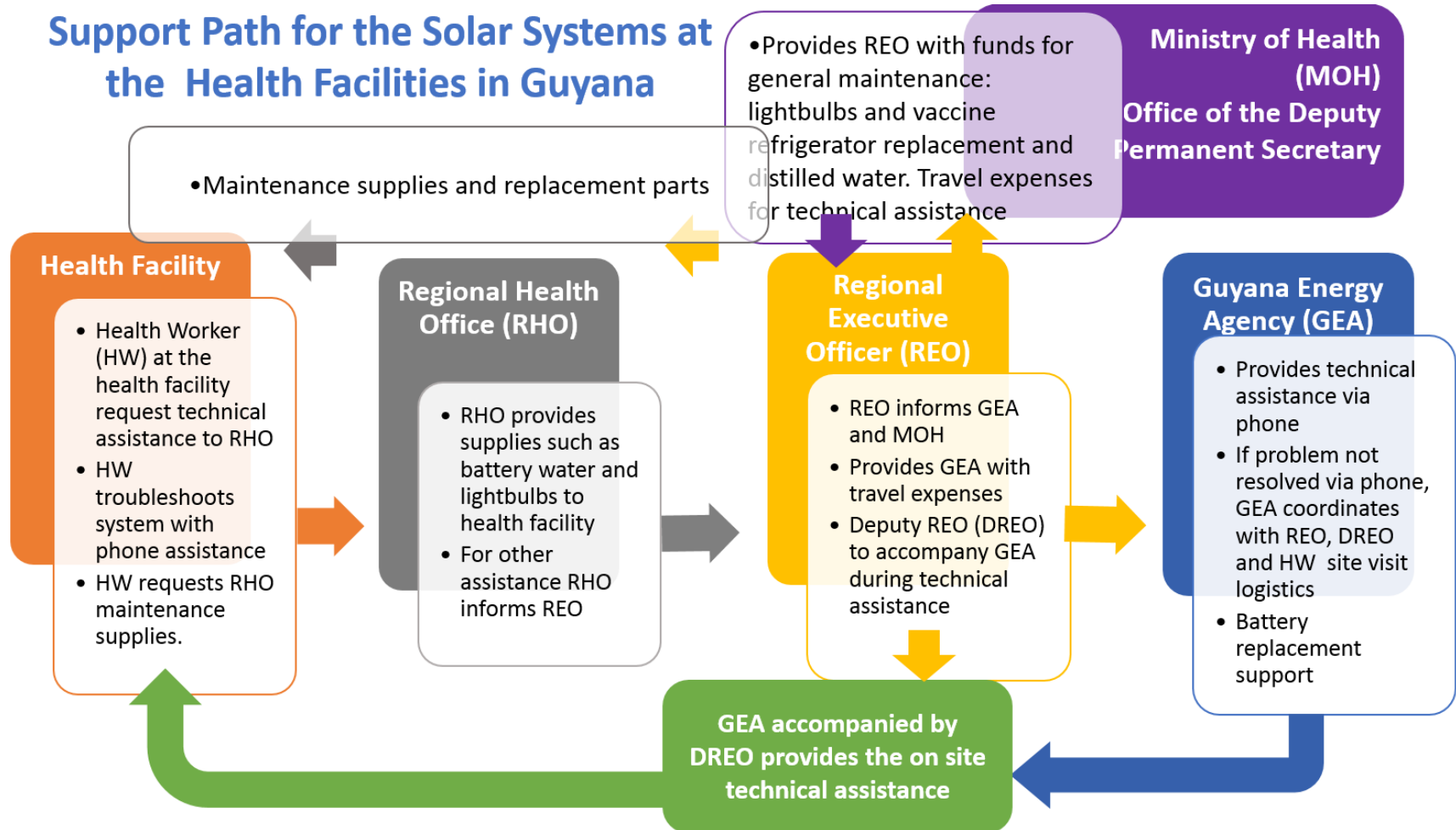


Support Path for the Solar Systems at the Health Facilities in Haiti





Support Path for the Solar Systems at the Health Facilities in Guyana

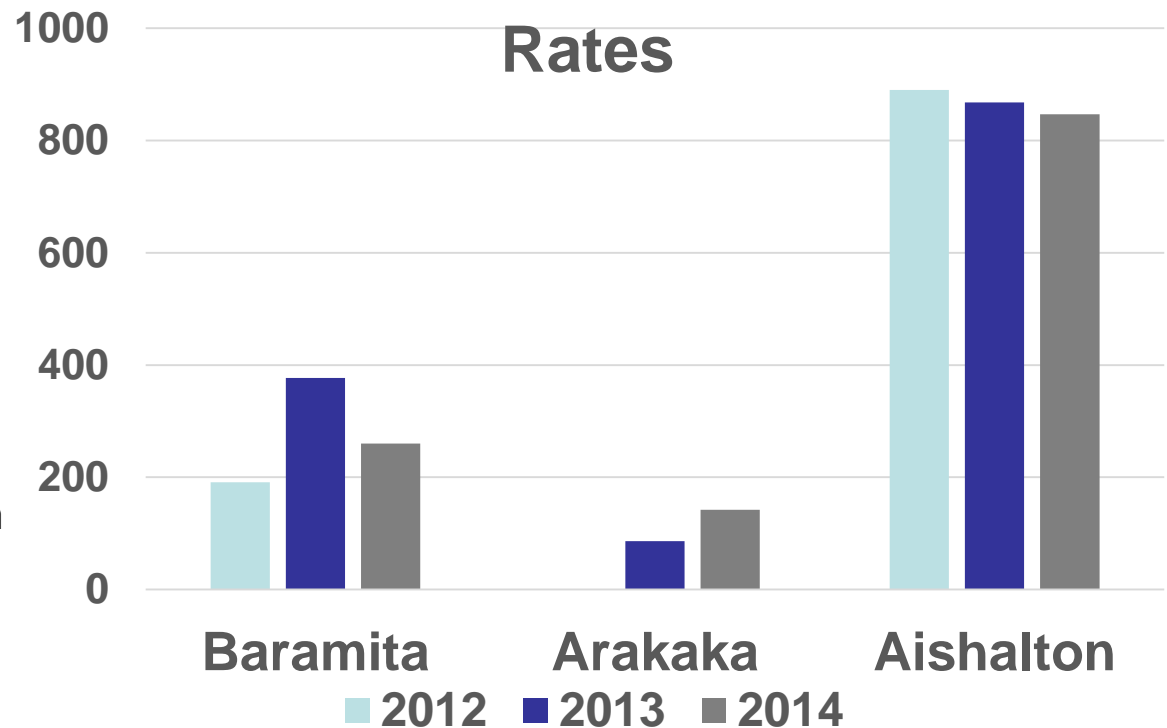




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- Data collected from posts records published by the Ministry of Health.
- 1 to 3 year old population chosen for more constant vaccination rates through the years
- Pre PV system the vaccines were administered the day they were delivered. Post PV system the vaccines are administered on demand.
- PV system impact can not be measured through vaccination rates data from ministry, as this depends on actual vaccine supply and not refrigeration

Pre and Post Vaccination Rates





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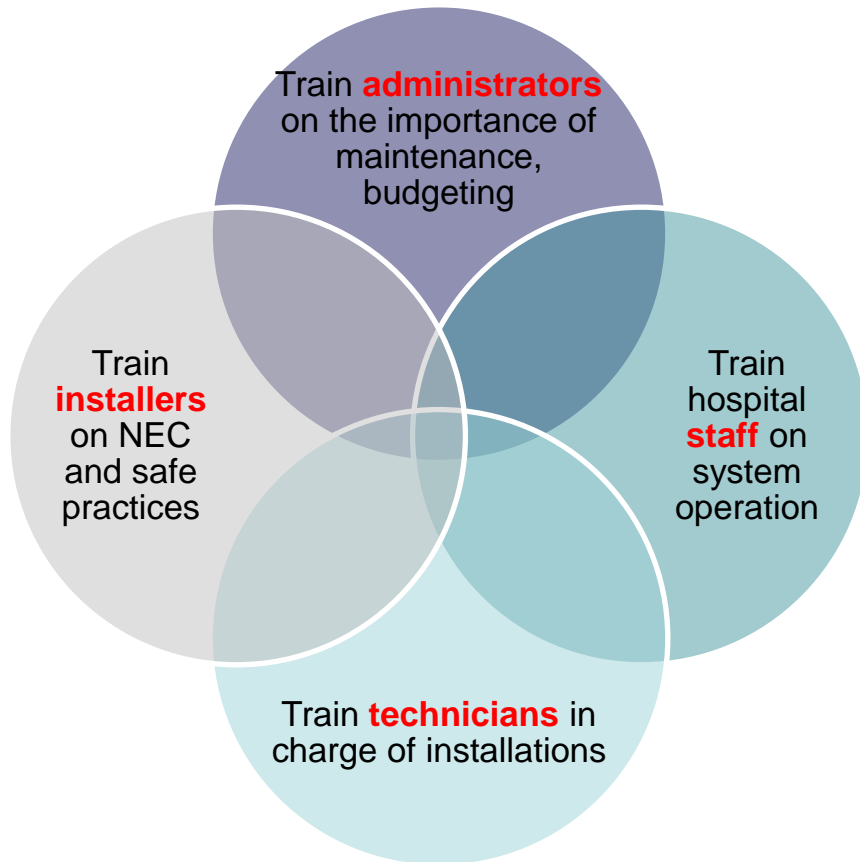
Guyana Health Facilities Lessons Learned

- Load simplicity contributed to system longevity and lower maintenance levels
- Load complexity is required for higher Energy-Health impact/ remote areas health staff retention
- Partnering with an energy agency has been highly effective on system endurance
- Facility maintenance staff in within the Ministry of Health has not been responsive
- Health (vaccination) statistical data is affected by other factors that do not allow a fair measurement energy impact





4 - Training program





Training activities

- 150 technicians, installers and administrators trained
- 9 Technician training sessions (5 days)
- 2 Hospital Administrator training sessions (1 day)
- 1 Installer training session (2 days)
- 20 on-site medical/lab staff training (1h)





IHFI Data Logging and Management

Health Facility

Trained technicians
closer to their
equipment

Technicians

- Maintain equipment
- Log operating data
- Deliver data logs to Administrators

Administrators

- Manage technicians
- Budgeting
- Submit data logs to data center staff

UGP / MSPP

Data center staff

- Store data
- Analyze data

Project future needs;
Optimize available
infrastructure

More responsibility
for their energy
infrastructure

IHFI Training



Knowledge Management

- Monitoring
- Evaluation
- Reporting
- Information dissemination
- www.poweringhealth.org
- Facebook page
- YouTube videos
 - Training/information
 - Documentation

The screenshot displays the 'POWERING HEALTH' website interface. At the top, there is a navigation bar with 'Home', 'About', 'Topics', 'Resources', 'Countries', and 'Community'. Below this is a map of Haiti with several project sites marked. A callout box over the map says 'EXPLORE SITES IN HAITI' and 'Get in-depth and learn more about USAID project sites with our interactive map'. The main content area is divided into three columns. The left column features a 'Welcome to POWERING HEALTH' message and a list of resources including 'technology resources', 'exclusive tools', and 'the latest on projects in Haiti and Guyana'. The middle column contains 'What's New' articles, such as 'IHFI Completes Guyana PV Installations' (dated Friday, 26 April 2013) and 'World Immunization Week, the Cold Chain, Energy and the Environment' (dated Tuesday, 23 April 2013). The right column includes 'Stories blog', 'Top Stories' (listing 'Nanotechnology in Solar Sterilization breakthrough' and 'IHFI Completes Guyana PV Installations'), and 'Upcoming Events' (listing holidays like Christmas, Haitian Holiday, and Independence Day).



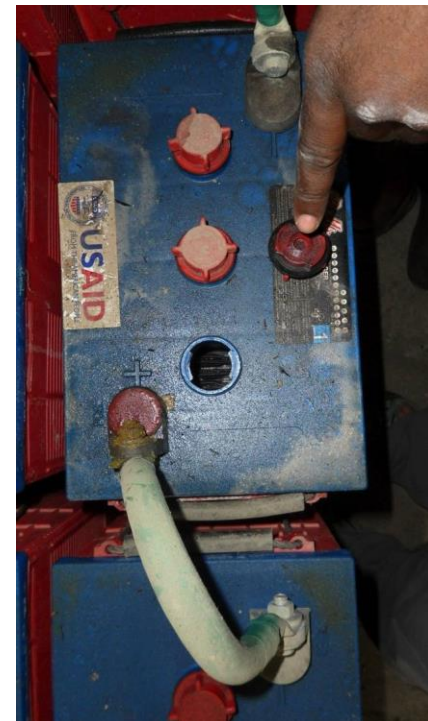
Project achievements

- 32-35 backup power systems operating by 2015
- Network of trained technicians
- Close collaboration with Haitian government UGP
- Rewired installations for safety and patient comfort
- Several capable local electrical installation companies
- Introduction of knowledge of NEC, environmental aspects



Questions on some decisions taken...

- Standardization of equipment
 - Pros: ease of procurement, installation, training
 - Cons: obsolescence, lack of broader familiarity; sustainability?
- Use of grid, instead of going off-grid (i.e., no solar PV)
 - Pros: more installations at lower cost
 - Cons: counting on grid improvement in the future
- Use of local contractors for installations
 - Pros: capacity building; leveraging of small IHFI team
 - Cons: slower response; bidding, negotiation
- Introduction of equipment new to Haiti (batteries)
 - Pros: bigger capacity, easier design
 - Cons: unfamiliar, high watering requirement, expensive to replace
 - Ongoing questions about “wet” vs. “dry” batteries





Strategy for sustainability

- Local team of engineers
- Programmatic approach; standard designs
- Training for 4 vocations
- Monitoring of installations; establishment of logging cycle
- Collaboration with local counterpart institutions





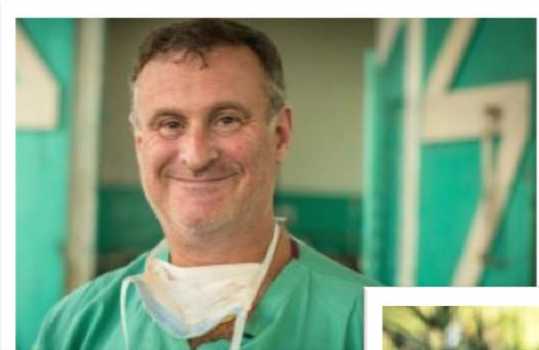
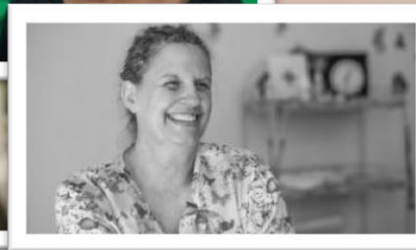
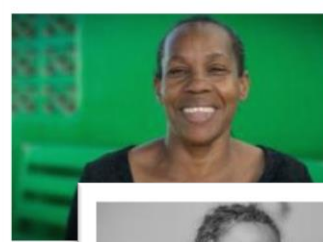
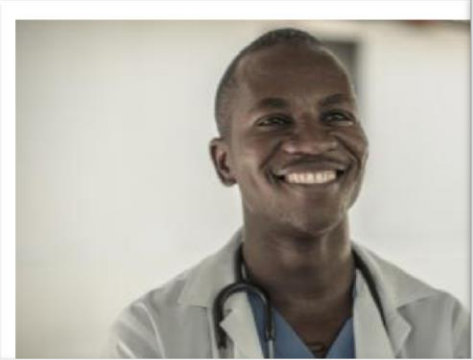
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Challenges still facing

- Unplanned loads added
- Ownership of backup power systems
- Lack of budget and/or access to distilled water for the batteries
- No budget for end-of-life battery replacement
- Institutionalization
- Inevitable load growth in health facilities





Thank you! Please visit www.poweringhealth.org

