

Energy Resilience for Climate Adaptation Project

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Activities

- Activity 1: Hydrological Modeling of the upper Macal Watershed
- Activity 2: Installation of hydro-meteorological stations and rain gauges in upper Macal catchment
- Activity 3: Upgrade in network of meteorological stations
- Activity 4: Integration of radar products into BEL's power dispatch
- Activity 5: Acquisition of a Lightning Detection System

Activity 1: Hydrological Modeling

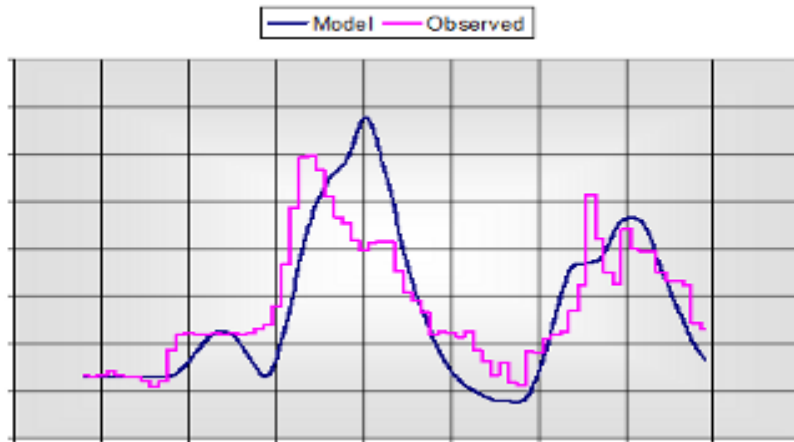


- Presently the estimation methods for hydro-electric potential, production and water management are not based on empirical methods.
- Climatological rainfall averages are used as guidance for such estimates.

Activity 1: Hydrological Modeling

- More recently BEL has turned to the three month seasonal outlook as produced by the National Meteorological Service as providing some direction. However these projections are probabilistic in nature and not site specific to the Chalillo dam and supply catchment area
- Projections do not reflect quantum of rainfall nor do they indicate input flow from the supplying streams into the reservoir.

Activity 1: Hydrological Modeling



- BEL urgently needs that a hydrologic model be developed and operationalized in order to forecast the input flows into the Chalillo reservoir. This would provide realistic values to be used for the prediction of input, storage and dispatch at the hydro-electrical facility.

Activity 1: Hydrological Modeling



- This model would be concentrated on the catchment area of direct influence on the Chalillo, Mollejon and Vaca facilities.
- Integrated with the model will be forecast rainfall generated by Weather Research and Forecast (WRF) model run by NMS and radar observations.
- Timeline 180 days over a period of 12 months. (1st July 2016)

Activity 2: Installation of hydro-meteorological stations and rain gauges in upper Macal catchment

- An integral part of developing the hydrological model is obtaining real time observations of hydro-meteorological variables in the catchment as input to the model.
- This activity Involves the installation of hydro-meteorological stations and rain gauges in the Macal catchment for input to hydrologic model
- Specific siting to be determined by hydrologic modeler.
- Starting date: 90 days over a 6 month period (1st July 2016)

Activity 3: Upgrade in network of meteorological stations

- The NMS needs to upgrade its network with automatic weather stations.
- This upgrade will provide data to be used for the calibration of the radar (to be discussed in Activity 4)
- Stations will be meteorological automatic stations. Therefore placement will have to be agreed to between the NMS and BEL.

Activity 3: Upgrade in network of hydro-meteorological stations

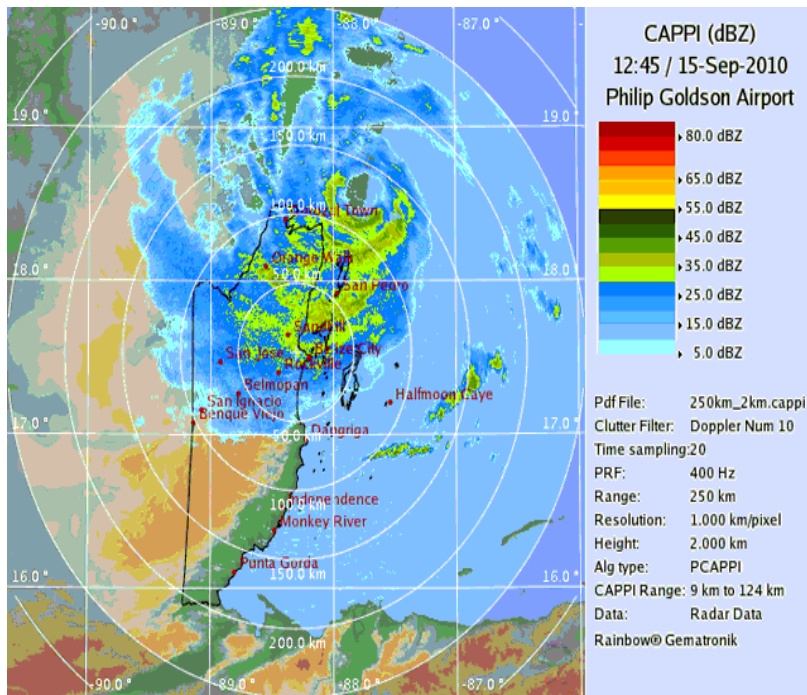
- Installations to be done by NMS staff. Therefore no contract will be issued.
- Starting date: 1st July 2016

Activity 4: : Integration of Radar products into BEL power dispatch

Transfer of near real-time radar data from NMS to
BEL Dispatch Center

- i. Physical link between the NMS office and BEL Ladyville (nearby) substation
- Timeline: 1st August 2016 to 30th September 2016
- li. Purchase of radar generation, processing and display software
- Starting date: 1st October 2017

Activity 4: : Integration of Radar products into BEL power dispatch



- iii. Training- usage of the radar data in BEL's Dispatch Center would be limited without proper training in image interpretation.
- One week training on radar image use and interpretation.
- Starting date: November 2017

Activity 4: : Integration of Radar products into BEL power dispatch

- iv. Radar calibration: observations to be used as input to hydrologic model.
- Calibration entails adjusting the radar observation to accurately reflect rainfall as observed- hence the need for a sufficiently dense network of observation stations as outlined in Activity 3.
- Starting date: January 2018

Activity 5: Acquisition of a Lightning Detection System



- A lightning detection system would allow the NMS to monitor storm formation and tracking in real-time as a supplement to radar observations.
- Four sensors would be considered ideal for Belize

Activity 5: Acquisition of a Lightning Detection System

- Automated alerts would enable advanced warning for severe weather approaching certain areas of the BEL operational grid so that operational staff can be notified.
- Allows for field technicians to prepare and act more quickly than if they were only reacting to the outage after it had occurred
- Starting date: 1st July 2016

Thanks for your attention

