WELCOME TO THE WORKSHOP PRESENTATION ON CASE STUDY 1 SUTLEJ AND BEAS RIVER BASIN SYSTEM HYDROLOGY PROJECT BBMB (CHANDIGARH)
BBMB Catchments and Sub-catchments

Satluj & Beas Catchments

1 cm = 16 km

Legend
- Remaining catchment
- Beas Catchment
OBJECTIVE AND SCOPE

To develop a real time DSS including hydrological and hydraulic models, state of art data acquisition technology and advance communication system for real time management of Bhakra and Beas reservoirs in an integrated manner. The RTDSS so developed would be capable of integrating Real Time DAS, Real Time Data from External Sources, Forecast Modeling and optimization tools and analysis in a single IT system designed to meet the requirements of BBMB.
To achieve these objective M/s DHI Denmark was appointed as Consultants with the following scope of work

• identify and advised BBMB of State of the art Data Acquisition System
• Develop an appropriate RTDSS for the following functions
• Real time forecasting of snowmelt and rainfall runoff
• supporting decisions for Real Time planning and management of Bhakra Beas Reservoir and regulation of water supplies to downstream stakeholders.
• Flood forecasting and flood routing through reservoirs.
• Develop a user friendly interactive system that will allow for storage, retrieval, processing, visualization and reporting of RTDSS outputs.
• Organizing dissemination and training programmes.
• Develop RTDSS such that it will allow extension and expansion of future requirements.
Cost Component

- Consultancy = Rs. 13.00 crores.
- Equipment = Rs. 20.00 crores (DAS, Hardware and Miscellaneous)
- Civil works/Renovation etc = Rs. 2.00 crores
- Technology Enhancement & Training = Rs. 1.00 crore
- Incremental = Rs. 1.00 crore
ACTIVITES UNDER HP-II

1. MODELLING OF RIVER BASINS (SATLUJ & BEAS)
2. CALIBRATION OF MODELS WITH HISTORICAL DATA
3. UPGRARATION OF EXISTING HYDROMETRO-LOGICAL NETWORK
4. ESTABLISHMENT OF RTDSS CENTRE AT CHANDIGARH & WORKSTATIONS AT PROJECT STATIONS
5. LINKING OF DATA ACQUISITION SYSTEM WITH DEVELOPED MODELS
6. FINE TUNNING & DEVELOPMENT OF REAL TIME DECISION SUPPORT SYSTEM
An Achievement

Dams Levels on 20th - September
- Bhakra – 1678.32 ft
- Pong - 1390.01

Achieved first time in 25 Years after 1988
June to September Cumulative inflow
1988 – 12204 MCM
2013 – 12024 MCM

RELEASESE IN 1988 ARE
24SEPTEMBER=70767CUSEC
26SEPTEMBER=117170CUSEC

RELEASESE IN 2013 ARE
25SEPTEMBER=123767CUSEC
27SEPTEMBER=114156CUSEC

Flood Gates had to be opened in 1988 but better management could avoid floods in 2013
Data Acquisition System

PROPOSED STATIONS
85

SATLUJ 58

GAUGING 24

HYDRO-MET. 34

BUBBLER AND CABLEWAY 5

S.W.E. 9

A.R.G. 14

SNOW DEPTH ON IMD 5

BBMB UPGRAD. 1

GAUGING 18

RADAR 12

BUBBLER AND CABLEWAY 5

S.W.E. 0

A.R.G. 3

BEAS 27

HYDRO-MET. 0

S.W.E. 0

A.R.G. 3

FULL CLIMATE 5

SNOW DEPTH ON IMD 1
PANDOH FULL CLIMATIC STATION

PANDOH DAM
AFCS
PANDOH SPILLWAY
AWLR
OLD MANUAL AND NEW AUTOMATIC FULL CLIMATIC STAT KALPA
OLD MANUAL CLIMATIC STATION AND SWE AT RAKCHAM REPLACED BY SNOW SENSOR AND FULL AUTOMATIC CLIMATIC STATION
THE OLD RAMPUR GAUGING SITE IS UPGRADED WITH CABLE AND BUBBLER
THE HYDRO METEOROLOGICAL STATIONS AT KAZA WAS REPLACED WITH SNOW PILLOW SNOW DEPTH SENSOR AND FULL CLIMATIC STATION
THE LOCATION AND INSTRUMENTATION OF LOHAND RAINGAUGE IS ALSO CHANGED
NEW STATIONS AT CHUMAR AND TSO MURARI
Hurdle/Challenges

- INSAT Transmission/WPC License
- Cooperator sites: Approval from IMD, Independent Power Producers, ITBP, State Govt., Highway Authorities
- Installation at remote sites with inaccessibility, border area, arrangement of labour, material and land.
- Transbound condition with 2/3rd area lying in China where no Hydro-meteorological and gauging network can be established.
- Model calibration and validation is based on remote sense data. (like TRMM, MODIS)
Company Name - Jinyang Industrial Co. Ltd. Korea
Model - Jinyang WDR-205

Tipping Bucket Precipitation Gauge
Company Name – Jinyang Industrial Co. Ltd.
Korea
Model – Jinyang JY-108
Atmospheric Pressure Sensor

Company Name – Jinyang Industrial Co. Ltd.
Korea
Model – Jinyang JYB-200
Water level Bubbler

Company Name – Design Analysis YSI USA
Model – Water LOG H3553D
Company Name – Design Analysis YSI
USA
Model – Water LOG H3311
Acoustic Doppler Current Profiler (ADCP)

Company Name – Teledyne RD Instruments
USA
Model – RiverRay ADCP
Acoustic Doppler Velocimeter

Company Name – **SonTek**
   USA
Model – **FlowTracker HandHeld- ADV**
Company Name – OTT Hydromet
Germany
Model – OTT Pluvio² 200
Company Name – OTT Hydromet
Germany
Model – OTT RLS
Wind Speed & Wind Direction Sensor

Company Name - Gill Instruments Limited
UK
Model - Wind Observer - II
Snow Depth Sensor

Company Name – Campbell Scientific USA
Model – SR50A/AT
Solar Radiation Sensor

Company Name - Kipp & Zonen Netherlands
Model - CMP-11 Pyranometer
### Satellite Data Communication

- **Data Transmission through Satellite:**
  - **Raw Data Module:** Decoding Data Transmission from Stations
  - **Modeling:** Workstation, DAS Server (300GB), Database Server (1 TB), DMS/Backup Server (1 TB), Backup Server (1 TB)

### Data Viewer V2.5.3 (DBMS) - Untitled

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#### Status

- **No of Good Database:** 22
- **No of Partial Database:** 0
- **Database not Received:** 0
- **Percentage (%):** 0.0
- **No of Locked ST:** 0
- **Unknown GPS Status:** 0
- **No Reception:** 0
- **Below 10%:** 0
- **10-50%:** 0
- **50-80%:** 0
- **80-90%:** 0
- **Above 90%:** 0

**Total No of Stations:** 63
NEW REAL TIME DATA SOURCES LIKE IMD (HOURLY REAL TIME DATA FROM ARG AND AECS), RIMES (FORCAST FOR 72 HOURS), TRMM (NEAR REAL TIME PRECIPITATION FOR 3 HOUR) AND
BBMB – Control Room
BBMB DATA ACQUISITION SYSTEM

The provision of accurate and timely monitoring data of the Bhakra-Beas system for analytical and predictive analysis supporting key decisions on reservoir operations

Key Features:
• Comprehensive data coverage
• Robust automated technology
• Real time transmission of data via INSAT to RTDSS Centre in Chandigarh
• Data available at BBMB Project Offices and hand held devices – available for wider dissemination
• Integrated with other players – IMD, CWC, SASE, hydropower projects
• Complemented by real time remote sensing
Benefits of RT-DSS

- Improved state-of-the-art real time data collection
- Effective communications from field to central control
- Improved precipitation, snowmelt, runoff and inflow forecasts
- Improved reliability and precision in the decision making process
- Improved reservoir operation, hydropower generation and water supply
- Improved Flood Forecasting for better management
- Effective technology transfer for long term sustainable development
- A forerunner for advanced reservoir management technology, for transfer to other river basins in India
Benefits of RT-DSS

- Minimize the wastage of water
- Maximize the economic value of water
- Easy, effective and efficient management of the river system, reservoirs, hydropower and the various hydrologic structures

Rainfall Forecasting
Snowmelt Forecasting
Reservoir
Hydropower Management
Canal Network Optimization
Optimum Distribution
THANK YOU