“Western Regional Renewable Energy Management Center - System architecture, Handling of Challenges related to RE forecasting, scheduling & integration into grid and way ahead”

Sept 4 – 6, 2019
WR REMC: Overall Architecture

1. SCADA Real-Time Data
   - Real-Time Monitoring & Control System for RE Pooling stations

2. Internal Forecast Module
   - Generation of Forecast at RE pooling station Level With inputs available from weather & SCADA

3. Weather Forecast
   - Provision of day-ahead and weak-ahead weather forecast

4. Forecast Combination & Aggregation
   - Combination & Aggregation module to produce best forecast from all available forecasts.

5. FSP 1, FSP 2, FSP 3
   - Forecast from different Forecast Service Providers to be fed to combination module

6. RE Scheduling Tool
   - Dedicated scheduling tool for RE resources

7. SLDC/RLDC Scheduling Tool
   - Existing scheduling tool for overall resources

Pooling substations for evacuating RE

RE Pooling Stations

Forecasting at RE pooling station level with inputs available from weather & SCADA.

Combination & Aggregation module to produce best forecast from all available forecasts.

Real-Time Monitoring & Control System for RE Pooling stations.

Weather Forecast

Dedicated scheduling tool for RE resources
WR REMC: Communication within Control Centers

**Diagram Description:***
- **RTUs at Pooling Stations:**
  - RE Developers
  - IEC 104

**Western Region REMC:**
- SCADA
- Forecasting
- Scheduling

**Madhya Pradesh State REMC:**
- SCADA
- Forecasting
- Scheduling

**Gujarat State REMC:**
- SCADA
- Forecasting
- Scheduling

**Maharashtra State REMC:**
- SCADA
- Forecasting
- Scheduling

Connections:
- **To respective SLDC SCADA/EMS System**
- **To respective SLDC Scheduling Tool**
- **To Western Regional RLDC SCADA/EMS System**
- **To National REMC**

**Key Terms:**
- SCADA (Supervisory Control and Data Acquisition)
- Forecasting
- Scheduling
- RTUs (Remote Terminal Units)
- IEC 104
- ICCP (Inter-Control-Center-Protocol)
- RE Developers (Renewable Energy Developers)
- REMC (Regional Electricity Market Company)
WR REMC: Forecast of RE

Real-Time Data, Available Capacity, Injection Limit,

Real-Time (Dynamic) Data

Poolig Station / QCA Location Details

WSP

Location Specific Weather Forecast

Site Locations, Power Curves, Historical SCADA/ABT Data, Installed Capacity

Static Data

AI Layer

Forecast (Day-Ahead, Weak-Ahead, Intra-Day Ahead)
Scheduling of RE

Validity & Format Check

Is schedule error free?

Curtailment Check

Is proposed schedule violating constraints?

SLDC / RLDC Scheduling Tool

Prepare Schedule

Schedule DB

Collating Schedules

Schedule Acceptance by SLDC/RLDC

Prepare Schedule

Scheduling Database

Message for Error & Resubmission

Curtailment Info, Adjusted Schedule

Acknowledgement Schedule Submission

Curtailment Info, Adjusted Schedule

Yes

No

Yes

No

SLDC / RLDC

Prepare Schedule
Key Inputs & Factors

Inputs

• Static Data from PV Panels
• Static Data from Wind Turbines
• Topological arrangement of Pooling Stations
• Historical Generation Data
• Consistent SCADA Data
• Real-Time Weather Data
• Historical Weather Data

Factors

• State specific regulations
• Availability of Meters
• DSM Mechanisms
• Power Purchase Agreements
• Plant Level Infrastructure
Forecast Results
### Key Lessons Learned

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Thank You!
kiran.rasane@siemens.com