SIDDAGANGA INSTITUTE OF TECHNOLOGY, TUMAKURU-572103

(An Autonomous Institute under Visvesvaraya Technological University,Belagavi)

Activity Report
on

"Exploration of Hydel, Thermal, Nuclear, Solar and Wind Power Plants"

Submitted by

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SUBJECT: Introduction to Electrical Engineering

(ESC02)

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HYDEL POWER PLANT

Sharavathi Hydroelectric Project

- **Location**: Jog Falls, Shivamogga District, Karnataka
- **River**: Sharavathi River
- **Installed Capacity**: 1,035 MW
- **Number of Units**: 10 generating units

  9 units of 103.5 MW each

  1 unit of 10 MW at Linganamakki Dam powerhouse

- **Operator**: Karnataka Power Corporation Limited (KPCL)
- **Commissioning Year**: 1964

Power Generation Statistics

- **Annual Generation**: ~5,000 to 6,000 million units (MUs) of electricity, depending on water availability.
- **Contribution**: Provides ~20% of Karnataka's total hydroelectric power.

- **Cost of Generation**: Approx. ₹0.50-₹1.00 per unit (low-cost hydropower).

Infrastructure

1. **Linganamakki Dam**:

- **Height**: 181 meters
- **Length**: 2,417 meters
- **Reservoir Area**: 300 square kilo meters
- **Total Storage Capacity**: ~4,000 million cubic meters

2. Jog Falls:

- **Jog Falls is India's second-highest waterfall, with a plunge of 253 meters.**

THERMAL POWER PLANT

Raichur Thermal Power Station

- **Location**: Shaktinagar, Raichur District, Karnataka
- **Capacity**: 1,720 MW
- **Unit Details**:
- 7 units of 210 MW each (commissioned between 1985–2002).
- 1 unit of 250 MW (commissioned in 2010).
- **Fuel Source**: Coal from Singareni Collieries in Telangana and imported coal when needed.
- **Annual Power Generation**: ~12,000–14,000 million units (MUs).
- **Efficiency**:
- Achieved **Plant Load Factor (PLF)** of ~85% during peak years.
- **Water Source**: Krishna River (used for cooling).

SOLAR POWER PLANT

Pavagada Solar Park

- **Location**: Tumakuru district
- **Installed Capacity**: 2,050 MW
- **Area**: 13,000 acres
- **Modules**: Polycrystalline silicon panels
- **Annual Generation**: ~4,500 GWh
- **Solar Irradiance**: ~5.5 kWh/m²/day
- **Efficiency**: ~17-19% (typical for polycrystalline panels)
- **Grid Connectivity**:
  400/220 kV pooling stations.
  Connected to the Southern Grid.
- **Key Role**:
  Large-scale renewable integration in Karnataka's energy mix.
  Reduction of ~3 million tons of CO2 annually.

WIND POWER PLANT

Chitradurga Wind Farm

- **Location**: Chitradurga district
- **Installed Capacity**: ~350 MW (multiple farms, major operators include Suzlon, Siemens Gamesa)
- **Turbine Specifications**:
- Capacity: 2.1 MW (average per turbine)
- Rotor Diameter: ~120 meters
- Hub Height: ~100 meters
- **Capacity Factor**: ~30%
- **Wind Speed**: ~6.5-8.5 m/s (annual average)
- **Annual Generation**: ~900-1,000 GWh

Key Role:

- Seasonal energy source complementing solar during the monsoo

NUCLEAR POWER PLANT

Kaiga Atomic Power Station

- **Location**: Uttar Kannada district
- **Installed Capacity**: 880 MW (4 x 220 MW PHWRs)
- **Fuel**: Natural uranium (moderated and cooled by heavy water)
- **Operational Since**: 2000
- **Capacity Factor**: ~85%
- **Annual Generation**: ~7,000 GWh
- **Emissions**: Near-zero CO2 emissions during operation
- **Cooling Water Source**: Kali River
- **Safety Features**:
- Emergency core cooling system.

SUMMARY

Power Source	Plant Name	Location	Capacity (MW)	Average Annual Generation (GWh)	Key Technology/Specs	Efficiency/Capacity Factor	Environmental Notes
Hydropower	Sharavathi Hydroelectric	Shivamogga	1,035	~4,000	Francis turbines, 650m head	High (>90%)	Minimal emissions, ecosystem impact
Thermal	Raichur Thermal Power Station	Raichur	1,720	~12,000	Bituminous coal, FGD units	~35%	High CO2 emissions, water-intensive
Solar	Pavagada Solar Park	Tumakuru	2,050	~4,500	Polycrystalline panels, 17-19% efficiency	Seasonal variability	No emissions, land use challenges
Wind	Chitradurga Wind Farm	Chitradurga	~350	~900-1,000	2.1 MW turbines, 6.5-8.5 m/s wind speed	~30%	Minimal emissions, potential bird impacts
Nuclear	Kaiga Atomic Power Station	Uttar Kannada	880	~7,000	PHWRs with natural uranium, heavy water cooling	~85%	Near-zero emissions, waste management needed

THANK YOU