

Digital Web Based Generation Scheduling for Stability Improvement & Merit Order Dispatch

**Load Dispatch Circle
National Load Dispatch Center
(NLDC), PGCB**

Generation Scheduling

A strategic planning of when and how to use different power generation sources to meet electricity demand effectively, considering factors like cost, reliability, and security.

Transformational Change

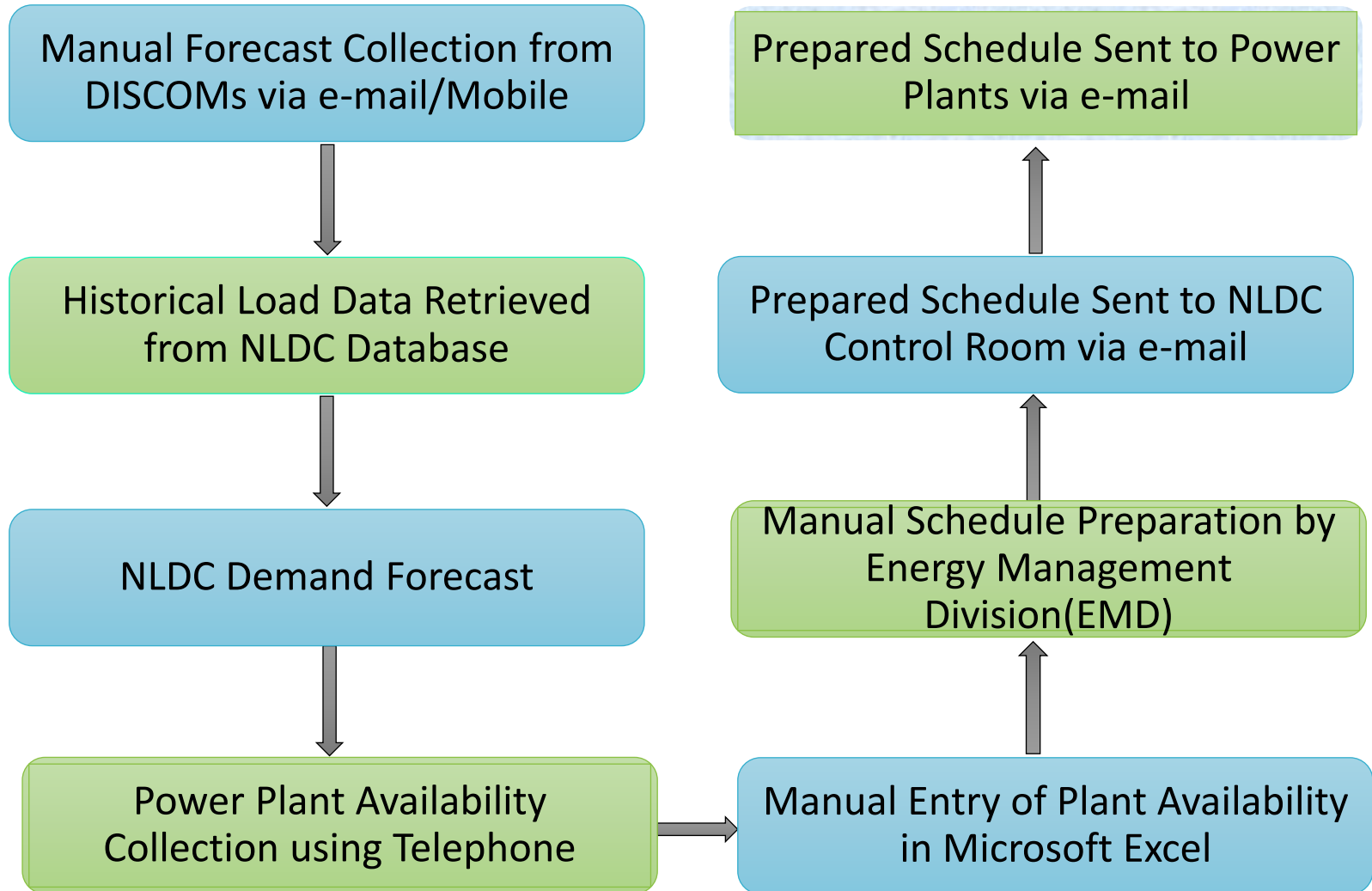
Manual
Scheduling



Software
Based
Automated
Scheduling



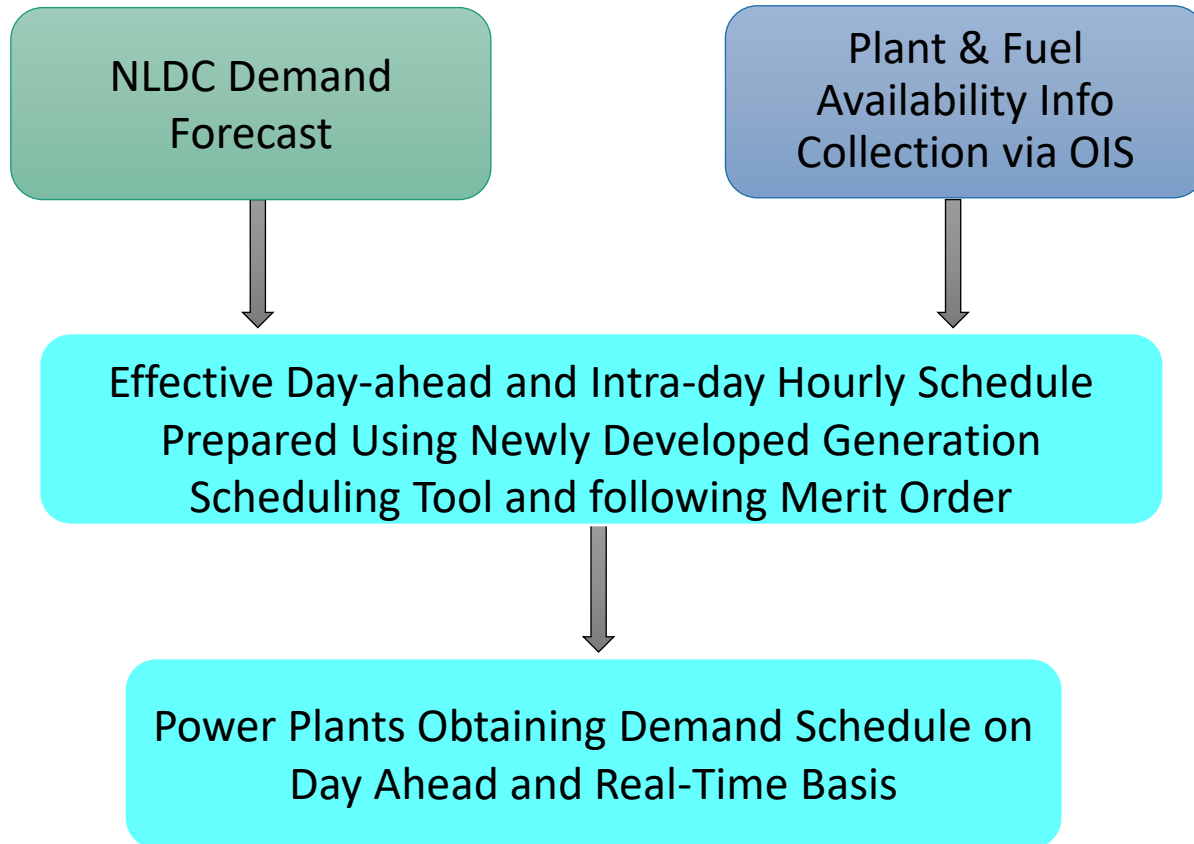
Present Scenario



The Dilemma

- A Complete Manual Process
- Daily 24-Hour Schedule Prepared with only 2 Hours of Day and Evening Peak Hour Plant Availability
- No Intra-day (Real-Time) Scheduling
- No Fuel Availability Information Available
- System Operators Struggle to Focus on Real-Time Operational Activities due to being Occupied with Manual Scheduling Tasks
- A Burden on Power Quality

The Solution



The Achievement

- Automation of Merit Order Dispatch
- Stability Improvement
- Optimized Power Plant Utilization
- Time Management Enhancements
- Reliable Power Transmission
- Quality Power Transmission (Reduced Frequency Range)
- Streamlined Power System Operation

Software Used

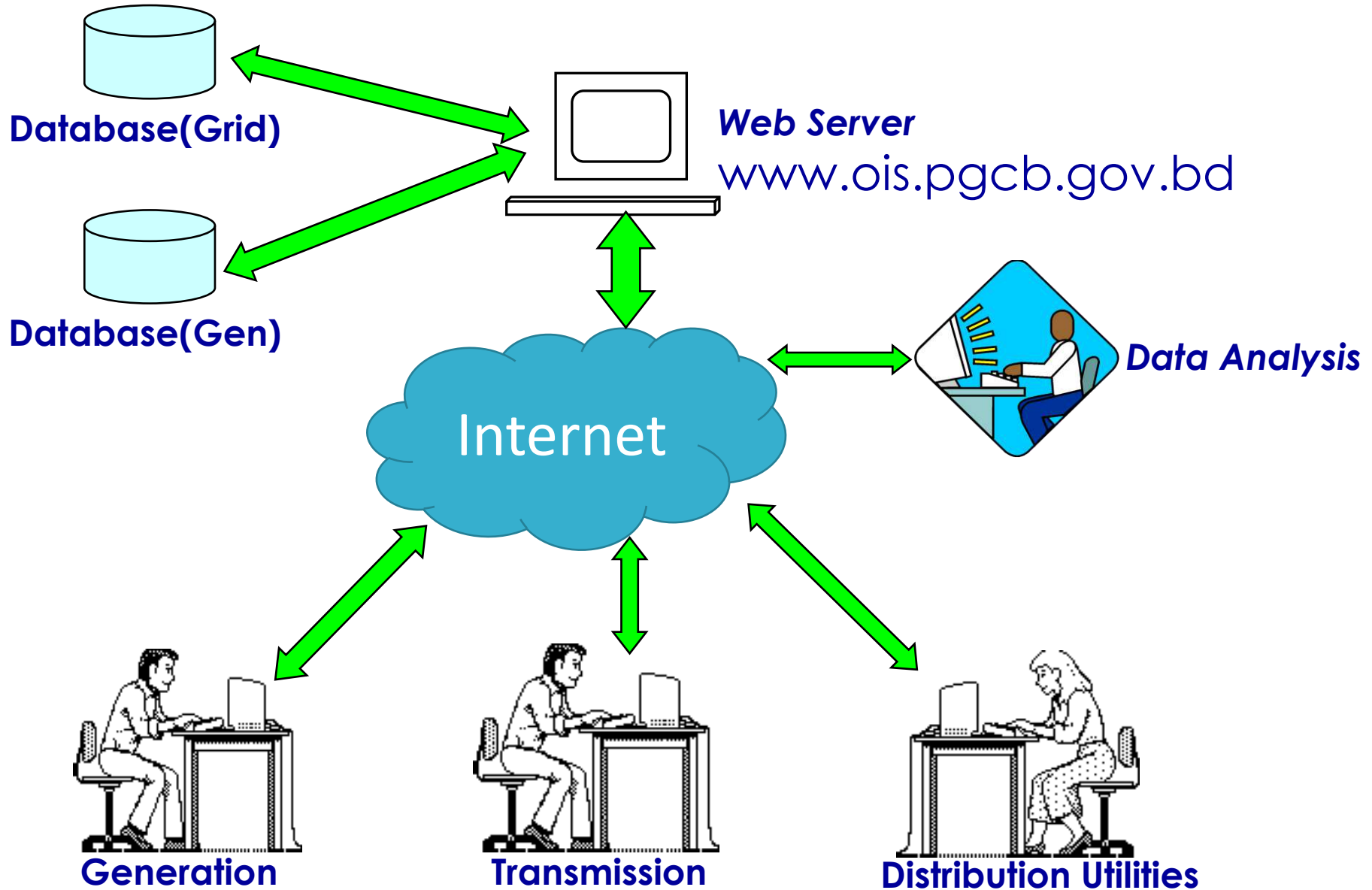
- Programming: Python
- Web Framework: Django
- Web Design: HTML, CSS, Javascript
- Database Server: MySQL
- Web Server: NGINX
- Application Server: Gunicorn
- Physical Server: DELL & HP
- Operating System: Oracle Linux

TCV Calculation (Daily)

	Before (Man-Hr)	After (Man-Hr)	Saved (Man-Hr)
Time	17 hours & 30 mins	3 hours & 45 mins	13 hours & 45 mins
Cost	120 cr.	119 cr. And 57 lac	43 lac

- Cost Calculation Formula (considering a 0.05Hz frequency reduction) :
- $0.05 \times \text{frequency bias} \times 1000(\text{kWhr}) \times 24(\text{hr}) \times \text{average fuel cost}$
- $= 0.05 \times 450 \times 1000 \times 24 \times 8$
- $= 43,20000/- \text{ (daily)}$

System Components



Demand-Generation-Load Shed



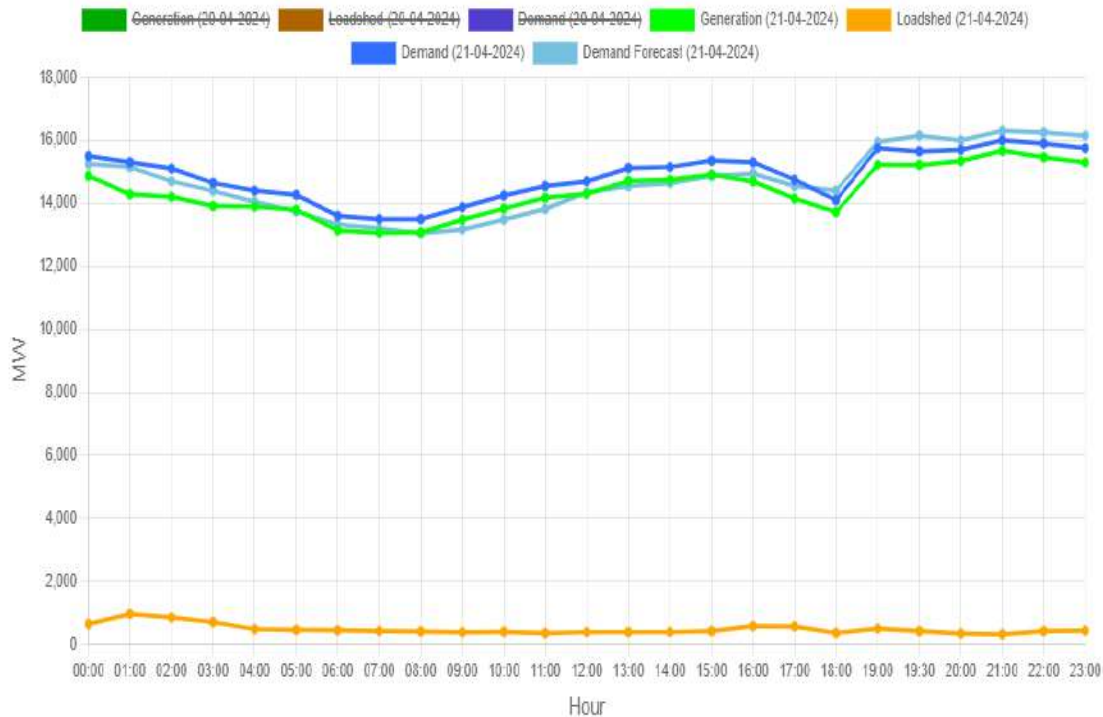
Power Grid Company of Bangladesh Limited
Operation Information System
Load Despatch Circle



System Summary ▾ Download ▾ Model ▾ Scheduling ▾ Sub-Station Power-Station About Taufique Alam ▾

Compare

DemGenLs on Apr 20, 2024 (Saturday) and Apr 21, 2024 (Sunday)



Fuel Wise Generation



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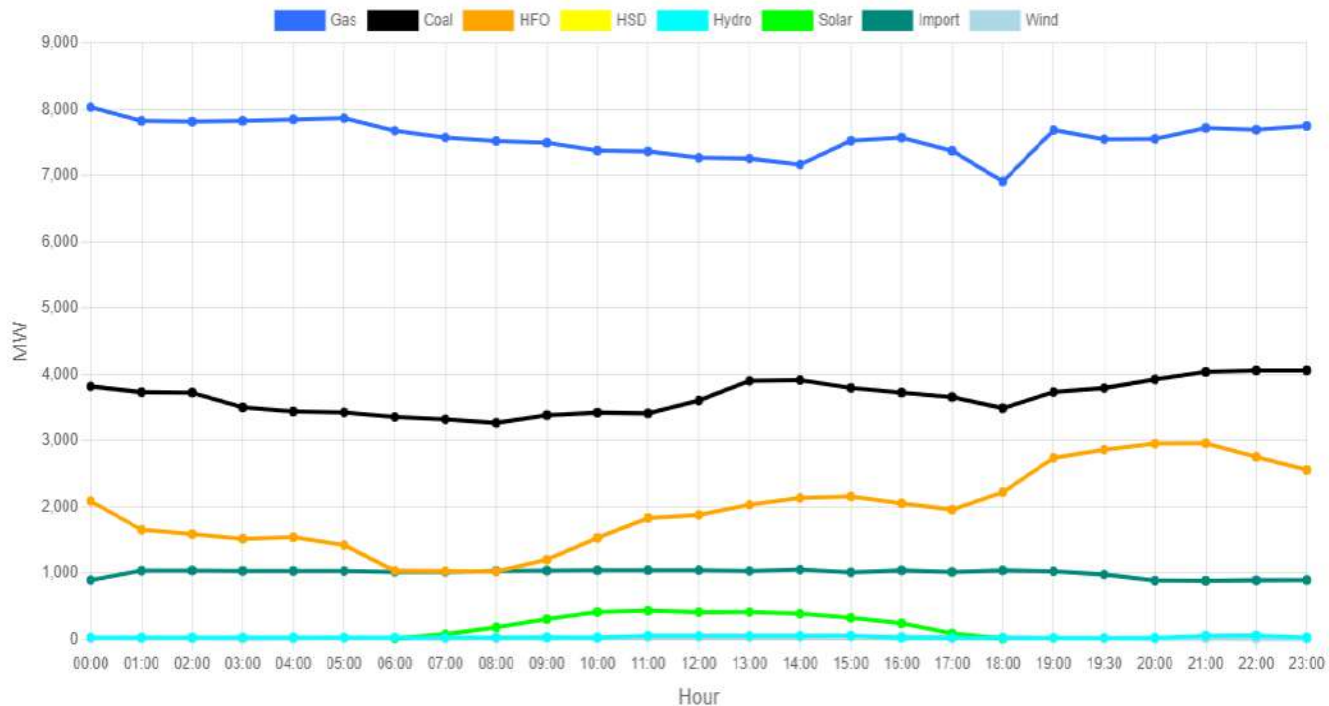
System Summary Download Model Scheduling Sub-Station Power-Station About

Taufique Alam

Select Date 21-Apr-2024

Download Download Data

Fuel Wise Generation Apr 21, 2024 (Sunday)



Load Summary



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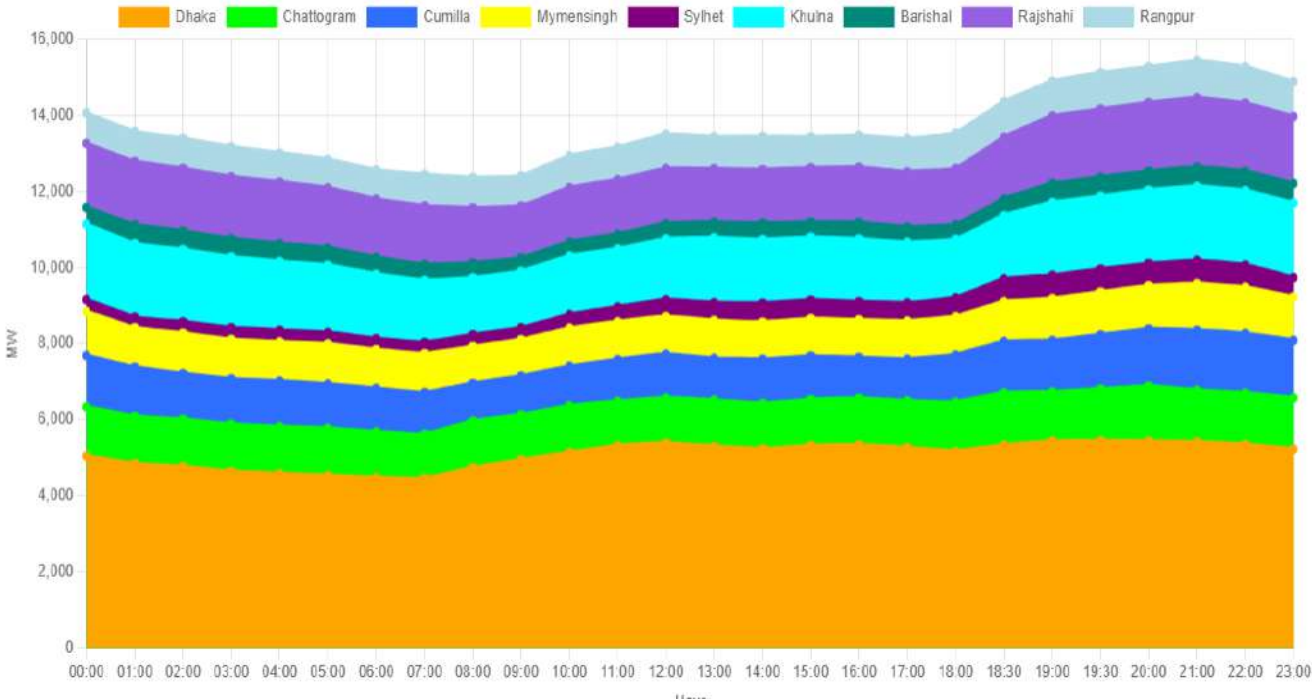
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Select: 22-Apr-2024 23:00 Submit

Mon 22 Apr 2024 23:00

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Load trend on Apr 22, 2024 (Monday) up to 23:00



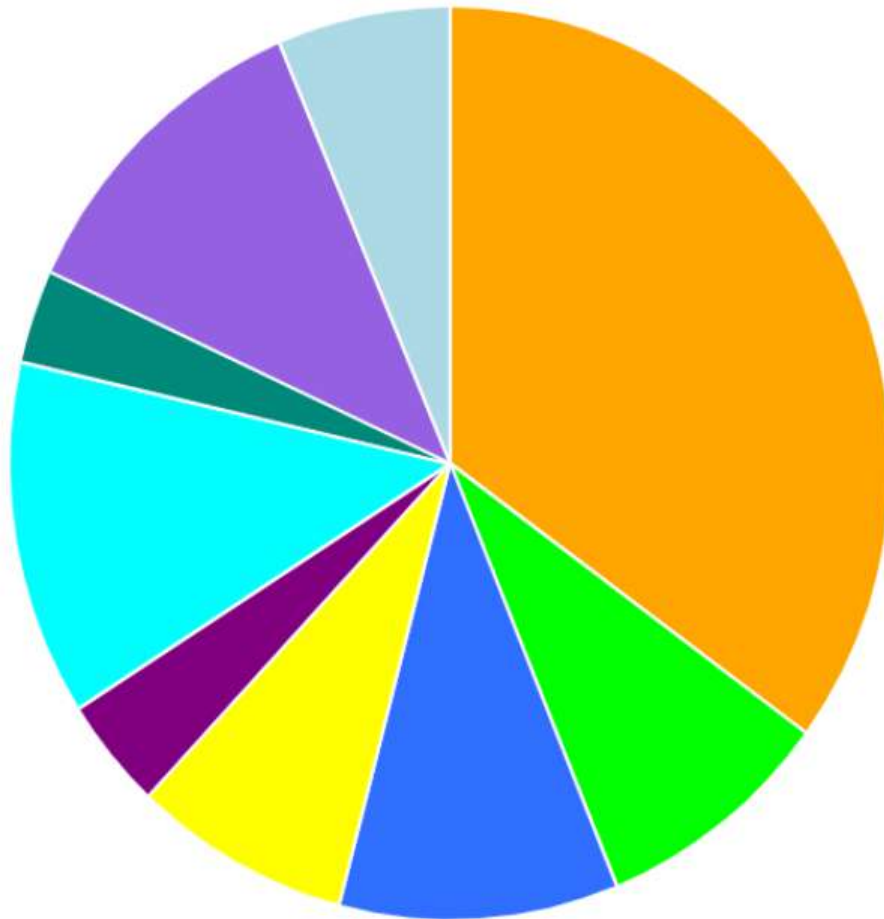
Load Summary (contd.)

Download

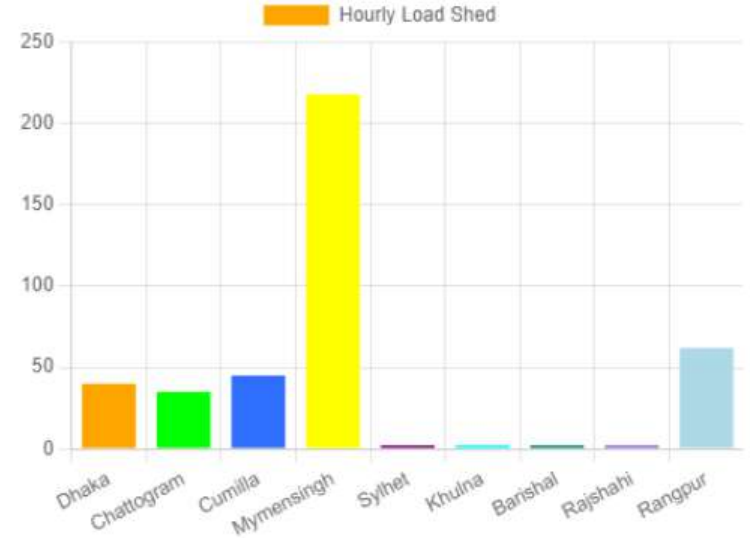
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Zone Wise Load Distribution (21:00)

Dhaka Chattogram Cumilla Mymensingh Sylhet Khulna
Barishal Rajshahi Rangpur



Zone Wise Load Shed (21:00)



Merit Order for Generation Scheduling



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Operation Information System
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Month: January 2024 Version: 4 ▾ Merit Order January, 2024 version: 4 Update

Power Station / Unit Name	Type	Zone	Fuel Type	Undeclared	Fuel Cost	VOM Cost	Marginal Cost
Bibiyana-III 400 MW CCPP	Base Load	Sylhet	Gas	-	2.65	0.03	2.68
Bibiyana South 400 MW	Base Load	Sylhet	Gas	-	2.66	0.03	2.69
NVVN Ltd. India Phase-1	Base Load	Khulna	Import	-	2.75	0.00	2.75
Sylhet 225 MW CCPP	Base Load	Sylhet	Gas	-	2.79	0.05	2.84
Sirajgonj 400 MW CCPP Unit-4	Base Load	Rajshahi	Gas	-	2.92	0.06	2.98
Haripur 412 MW CCPP	Base Load	Dhaka	Gas	-	2.88	0.13	3.01
Ashuganj 450 MW CCPP(North)	Base Load	Cumilla	Gas	-	2.79	0.22	3.01
Bibiana-II 341 MW CCPP (Summit)	Base Load	Sylhet	Gas	-	3.09	0.02	3.11
Bheramara 410 MW CCPP	Base Load	Khulna	Gas	-	2.95	0.18	3.13
Bhola Nutan Biddut BD LTD	Base Load	Barishal	Gas	-	3.11	0.04	3.15
Ashuganj 450 MW CCPP(South)	Base Load	Cumilla	Gas	-	3.06	0.12	3.18
Ashuganj 420 MW CCPP(East)	Base Load	Cumilla	Gas	-	2.97	0.22	3.19
Siddhirganj 335 MW CCPP	Base Load	Dhaka	Gas	-	3.05	0.15	3.20
RPCL 210MW CCPP	Base Load	Mymensingh	Gas	-	3.11	0.10	3.21

NLDC Forecast

Power Grid Company of Bangladesh Limited

Operation Information System

Load Despatch Circle



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NLDC Forecast for April 26, 2024 (Friday)

Hour	Utility Forecast	Yesterday Actual Demand	Similar Day Demand	Tomorrow Forecast (V-1)
	25-Apr-2024 🗓	2024-04-24	19-Apr-2024 🗓	Copy Column: 2 ▾
00:00	16983	16150	14550	16983
01:00	16353	15700	14150	16353
02:00	15967	15550	13800	15967
03:00	15824	15200	13600	15824
04:00	15673	14850	13250	15673
05:00	15264	14450	13100	15264
06:00	14792	14000	12400	14792
07:00	14713	13550	12100	14713
08:00	14956	13600	11900	14956
09:00	15410	14000	11750	15410
10:00	15819	14400	11780	15819
11:00	16095	14800	12100	16095
12:00	16357	15000	12420	16357
13:00	16654	15200	13270	16654
14:00	16780	15260	12830	16780
15:00	16879	15500	13090	16879
16:00	16862	15300	12970	16862
17:00	16792	15200	12750	16792
18:00	17024	14850	12300	17024
18:30	17343			17343
19:00	17635	16420	13950	17635
19:30	17726	16500	14180	17726
20:00	17735	16600	14260	17735
21:00	17628	16774	14520	17628
22:00	17551	16600	14600	17551
23:00	17525	16250	14800	17525

Plot Demand Trend

Plot Save Data

Percent Fixed

Change

NLDC Forecast



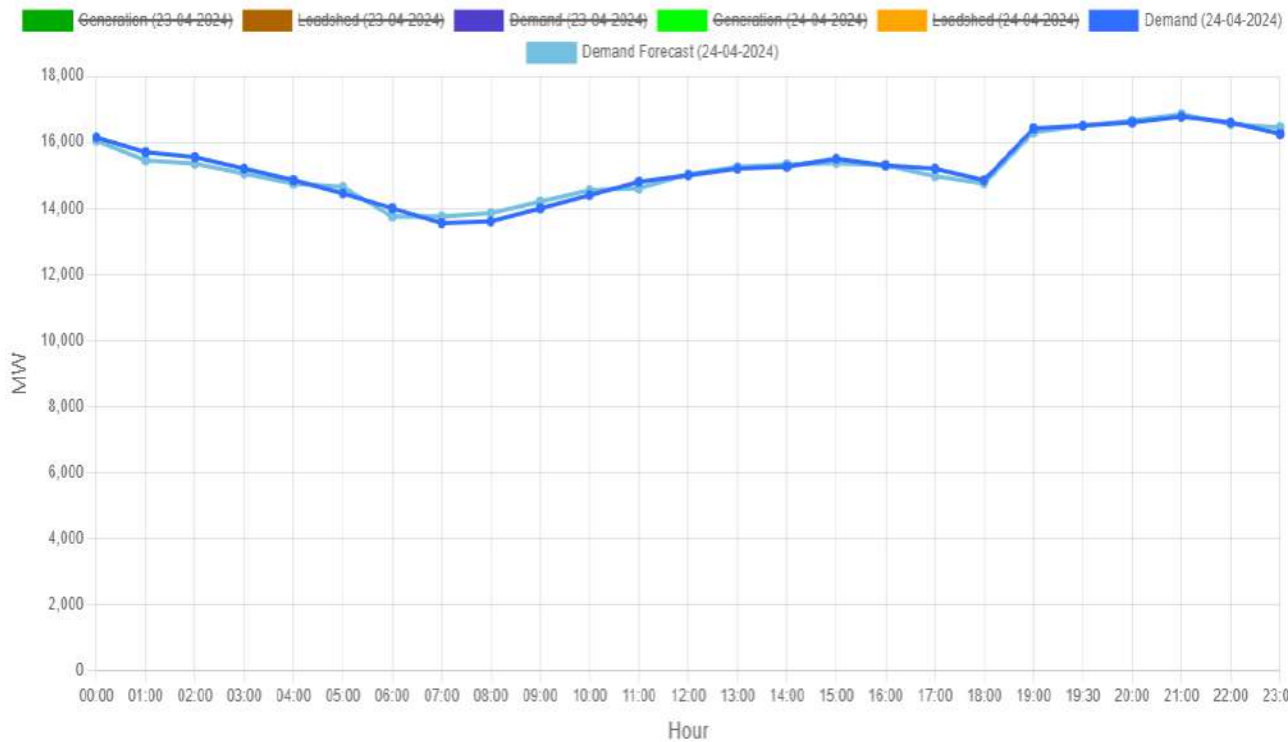
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Compare With Download

DemGenLs on Apr 23, 2024 (Tuesday) and Apr 24, 2024 (Wednesday)



Plant Availability Declaration

Adani Power Jharkhanda Ltd

Operation Information System

Powered by: National Load Dispatch Center(NLDC), PGCB

Event Data Entry Permissions Download LDC About

Toufiq Alahi

Copy First Cell: MW MVar Up Reserve Down Reserve Comment Full Load

Plant Availability on 2024-04-25

Copy Data From: mm/dd/yyyy Choose File No file chosen

[download sample file](#)

Hour	Availability (MW)	Availability (MVAR)	Up Reserve (MW)	Down Reserve (MW)	Fuel	Comment
00:00	1496.00	400.00	100.00	100.00	Coal	None
01:00	1496.00	400.00	100.00	100.00	Coal	None
02:00	1496.00	400.00	100.00	100.00	Coal	None
03:00	1496.00	400.00	100.00	100.00	Coal	None
04:00	1496.00	400.00	100.00	100.00	Coal	None
05:00	1496.00	400.00	100.00	100.00	Coal	None
06:00	1496.00	400.00	100.00	100.00	Coal	None
07:00	1496.00	400.00	100.00	100.00	Coal	None
08:00	1496.00	400.00	100.00	100.00	Coal	None
09:00	1496.00	400.00	100.00	100.00	Coal	None
10:00	1496.00	400.00	100.00	100.00	Coal	None
11:00	1496.00	400.00	100.00	100.00	Coal	None
12:00	1496.00	400.00	100.00	100.00	Coal	None
13:00	1496.00	400.00	100.00	100.00	Coal	None
14:00	1496.00	400.00	100.00	100.00	Coal	None
15:00	1496.00	400.00	100.00	100.00	Coal	None
16:00	1496.00	400.00	100.00	100.00	Coal	None
17:00	1496.00	400.00	100.00	100.00	Coal	None
18:00	1496.00	400.00	100.00	100.00	Coal	None
18:30	1496.00	400.00	100.00	100.00	Coal	None
19:00	1496.00	400.00	100.00	100.00	Coal	None
19:30	1496.00	400.00	100.00	100.00	Coal	None
20:00	1496.00	400.00	100.00	100.00	Coal	None
21:00	1496.00	400.00	100.00	100.00	Coal	None
22:00	1496.00	400.00	100.00	100.00	Coal	None
23:00	1496.00	400.00	100.00	100.00	Coal	None

Percent Fixed 10

MW MVar Up Reserve Down Reserve

Fuel Availability Declaration (Coal)

Adani Power Jharkhanda Ltd

Operation Information System

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Toufiq Alahi

Fuel: **Coal**

Fuel Required (MT) Per MWHr Generation:

Fuel Stock

Date	Quantity (MT)	Update Time	Action
2024-04-18	N/D		
2024-04-19	N/D		
2024-04-20	N/D		
2024-04-21	N/D		
2024-04-22	N/D		
2024-04-23	N/D		
2024-04-24	12345.00	2024-04-24 11:54	

Fuel Order

Delivery Date	Order ID	Quantity (MT)	Status	Action
2024-02-05	adnai104	36000.00	due	
2024-02-15	Adani102	36000.00	due	
2024-06-20	adnai105	40000.00	due	

Fuel Order [Add New +](#)

Order id

Maximum 20 characters

Delivery date*

Quantity*

Status*

Fuel stock at 08:00 AM

Date: Quantity (MT):

Fuel Availability Declaration (Gas)



Haripur 412 MW CCPP

Operation Information System

Powered by: National Load Dispatch Center(NLDC), PGCB



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From 2024-04-26 To 2024-04-27 From: 04/26/2024 To: 04/27/2024

DateTime	Required Pressure	Required Quantity	Forecast Pressure	Forecast Quantity	Actual Pressure	Actual Quantity
2024-04-27 00:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 01:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 02:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 03:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 04:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 05:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 06:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 07:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 08:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 09:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 10:00	100.000	100.000	100.000	100.000	None	None
2024-04-27 11:00	100.000	100.000	100.000	100.000	None	None

Activate Windows
Go to Settings to activate Windows

Challenges Ahead

- Capacity Development/Training
- Change Adaptation
- Data Integrity Management
- Cyber Security Enhancement
- Resource Constraints

Future Roadmap

Integration
with meter
data
monitoring
system

Reducing
Scheduling
Interval from 1
hour to 15
minutes

Introducing
Deviation
Settlement
Mechanism

Integration
with Artificial
Intelligence(AI)
for scenario
prediction

Team Members



**System Designer, Developer
& Project Supervisor:**

Md. Monzurul Islam
Superintending Engineer,
LDC, PGCB
B.Sc. in EEE(BUET)



**Database Designer &
Developer:**

Roknuzzaman
Sub-Divisional Engineer,
LDC, PGCB
B.Sc. in EEE(BUET)



**Database Designer &
Developer :**

Taufique Alam
Sub-Divisional Engineer,
LDC, PGCB
B.Sc. in EEE(BUET)



Thank you