

Integrated Master Plan Mozambique Power System Development

Hiroyuki Tomura
Japan International Cooperation Agency

1. Objectives

- (1) To formulate a “Integrated Master Plan, Mozambique Power System Development” for 25 years
- (2) To familiarize the formulated master plan to relevant government agencies and conduct technical transfer concerning the planning

Main Partners

- Electricidade de Moçambique (EDM)
- Ministério dos Recursos Minerais e Energia (MIREME)

3. Scope

	On Grid	Off Grid
Public	EDM's Main Responsibility	
Private		

Main Target of Master Plan

3. Scope

- Generation Development Plan
- Transmission Development Plan
- Distribution Development Plan in Maputo and Nampula
- Financial Analysis
etc.

4. Schedule

Period	2016			2017												2018		
	4th Q			1st Q			2nd Q			3rd Q			4th Q			1st Q		
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Study stage				Basic Research			Formulation of Draft Master Plan						Approval of Master Plan					
Study in Mozambique			■		■	■	■	■				■		■				
Joint Coordination Committee(JCC)			▲					▲						▲				
Seminar in Mozambique							▲		▲					▲				
Working Paper			▲		▲		▲		▲			▲			▲			
Training in Japan								■										
Report			▲						▲					▲			▲	▲
			INCEPTION						Interim					Draft final				Final Report

5. On-Grid Renewable Energy in Master Plan

5. On-Grid Renewable Energy

Scenario	Stage 1 : 2017 – 2023 (Separated power system)	Stage 2 : 2024 – 2042 (Integrated power system)	
		Domestic / Export	Solar and Wind power
Base Scenario 1	Domestic Oriented	Domestic Oriented	10% of domestic peak demand
Base Scenario 2			20% of domestic peak demand
Export Scenario 1-1	Solar and Wind Power : Present Generation Plan Solar : Mocuba project (40MW) Metoro project (40MW) Wind : Tofo project (30MW)	Export Oriented ; 20% of domestic peak demand	10% of domestic peak demand
Export Scenario 1-2			20% of domestic peak demand
Export Scenario 2-1		Export Oriented ; 40% of domestic peak demand Domestic Oriented	10% of domestic peak demand
Export Scenario 2-2			20% of domestic peak demand

- Export power to the region are tentatively set 20% and 40% of the domestic peak demand.
- Amount of solar and wind power are tentatively set 10% and 20% of the domestic peak demand.

5. On-Grid Renewable Energy

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Export Scenario 1-2			20% of domestic peak demand
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Export Scenario 2-2		Domestic Oriented	20% of domestic peak demand

- Export power to the region are tentatively set 20% and 40% of the domestic peak demand.
- Amount of solar and wind power are tentatively set 10% and 20% of the domestic peak demand.

6. Tentative Generation Development Plan in Master Plan

6. Tentative Generation Development Plan

[Stage 1 : 2017 –2023] Generation Development Plan in Southern system

Southern System										
Year	Peak Demand [MW]	Total Installed Capacity [MW] ⁽¹⁾	Hydro [MW]	Diesel [MW]	Gas [MW]	Coal [MW]	Required Additional Capacity [MW]	Solar [MW]	Wind [MW]	Retire [MW]
2017	622	661			40		80			-40
2018	680	727			106		50			-90
2019	800	867					140			
2020	872	937					70			
2021	951	1,187					250			
2022	1,031	1,187			400		-400			
2023	1,115	1,233			206		-190		30	
Developed Capacity(MW)			0	0	752	0	0	0	30	-130
			652							

Each number shows Assumed project and WASP proposed project

Year	Operation Start	Retire
2017	Kuwaninga (40MW)	Agreeko Beluluane (40MW)
2018	JICA CTM (106MW)	Aggreko Ressano (90MW)
2019		
2020		
2021		
2022	Temane (MGTP) (400MW)	Additional Capacity(400MW)
2023	Temane (CCGT) (100MW) CTM Phase2 (106MW) Tofo (wind) (30MW)	Additional Capacity(190MW)

6. Tentative Generation Development Plan

[Stage 1 : 2017 –2023] Generation Development Plan in Central & Northern system

Central & Northern System										
Year	Peak Demand [MW]	Total Installed Capacity [MW] ⁽¹⁾	Hydro [MW]	Diesel [MW]	Gas [MW]	Coal [MW]	Required Additional Capacity [MW]	Solar [MW]	Wind [MW]	Retire [MW]
2017	498	513								
2018	725	773					280	40		-40
2019	823	913					100	40		
2020	878	963					50			
2021	981	963								
2022	1,087	1,023					60			
2023	1,194	1,313				650	-360			
Developed Capacity(MW)			0	0	0	650	110	80	0	-40
			800							

Each number shows Assumed project and WASP proposed project

Year	Operation Start	Retire
2017		
2018	Mocuba (solar) (40MW)	Nacala Barcassa (40MW) for Mozambique
2019	Metoro (solar) (30MW)	
2020		
2021		
2022		
2023	Jindal (150MW) Nacala Coal (200MW) Tete Coal (1unit) (300MW)	Additional Capacity(360MW)

6. Tentative Generation Development Plan

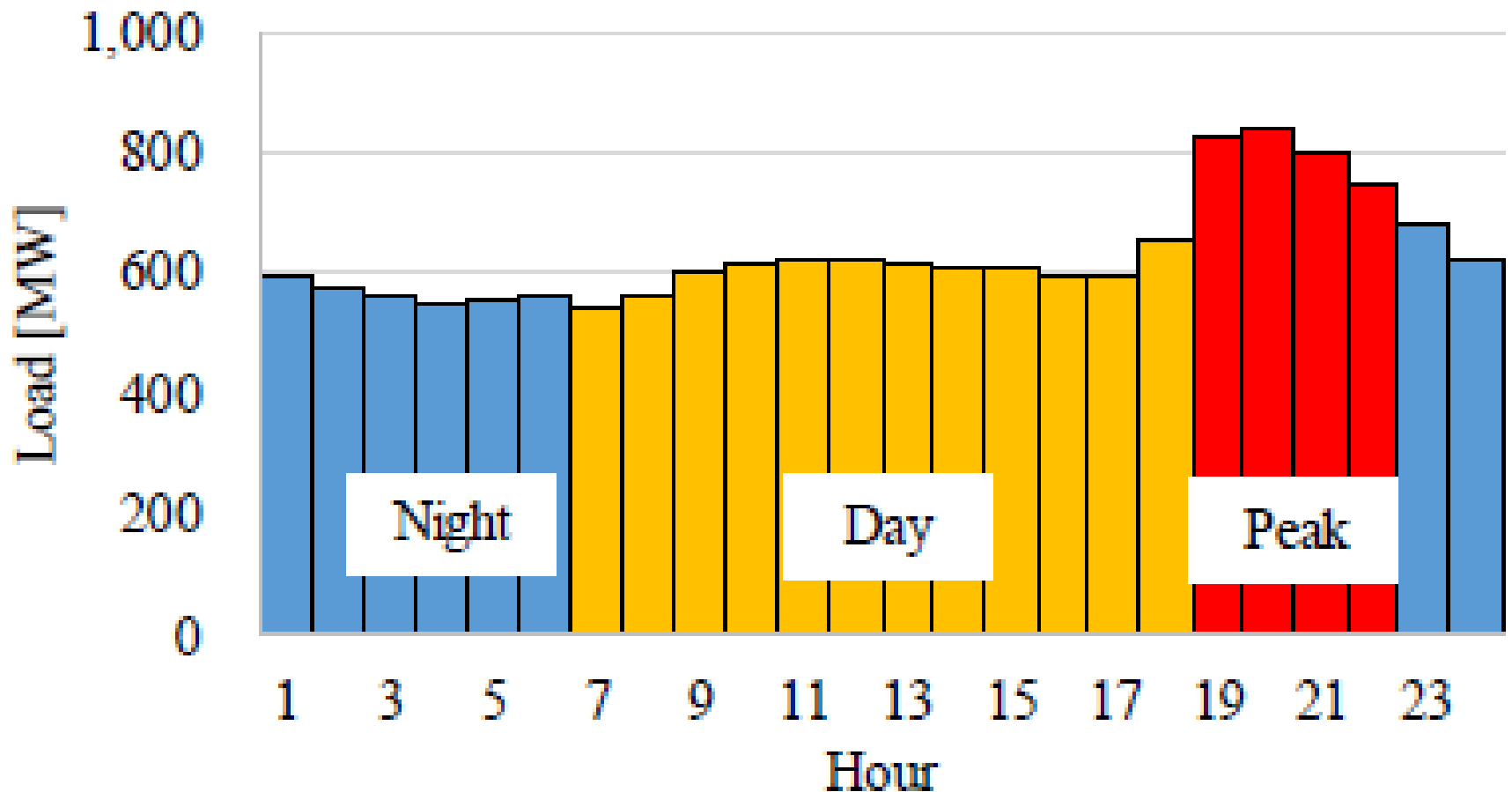
[Stage 2 : 2024 -2042] Integrated system

Each number shows Assumed project and WASP proposed project

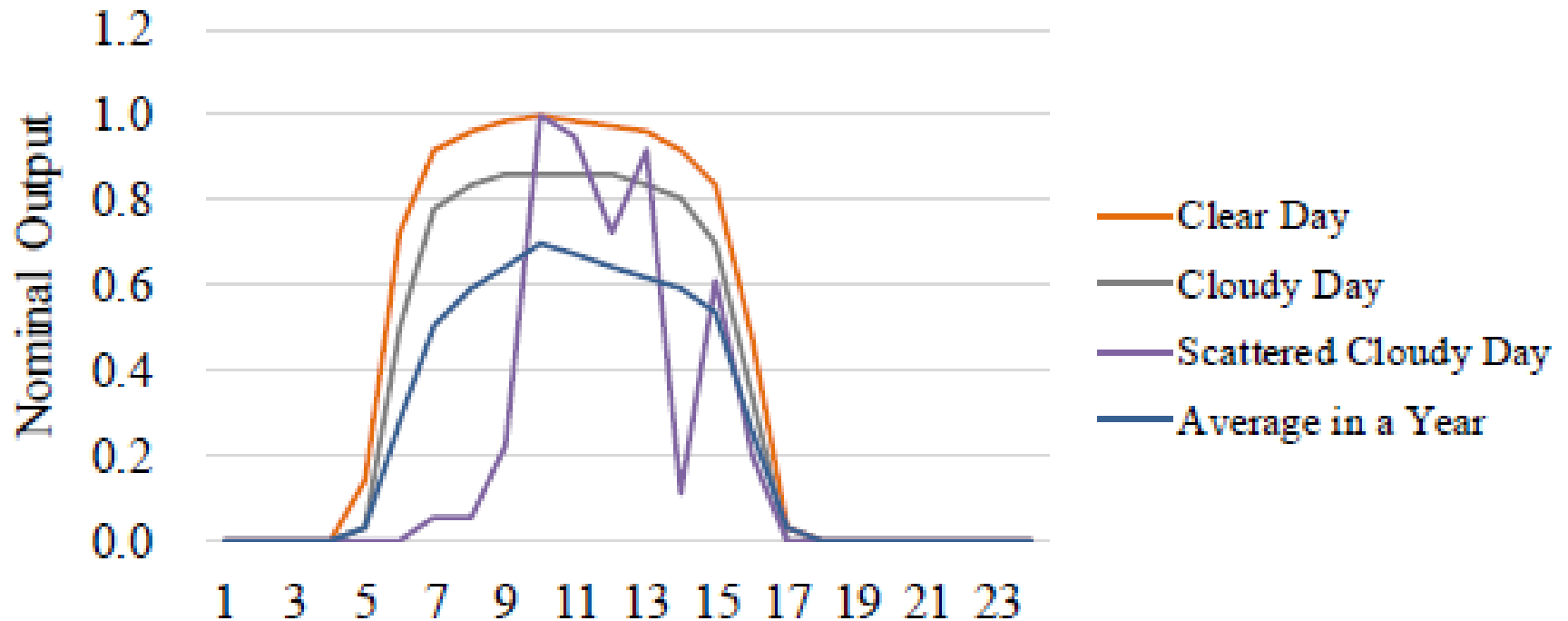
Integrated System													
Year	Peak Demand (Total)	Peak Demand (Domestic)	Peak Demand (Additional Export)	Total Installed Capacity ⁽¹⁾	Mphanda Nkuwa	Cahora Bassa North	Lupata, Boroma	Tete	Hydro	CCGT	Coal	Solar Power	Wind Power
					Hydro	Hydro	Hydro	Coal	Hydro	Gas	Coal	Solar	Wind
	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]	[MW]
2024	2,777	2,314	463	3,970	1,500							30	
2025	2,994	2,495	499	4,050					50			30	
2026	3,217	2,681	536	4,380				300				30	
2027	3,449	2,875	575	5,140			650			80			30
2028	3,691	3,076	615	5,170								30	
2029	3,941	3,284	657	6,445		1,245						30	
2030	4,201	3,500	700	6,475								30	
2031	4,469	3,724	745	6,505									30
2032	4,746	3,955	791	6,585					50			30	
2033	5,032	4,194	839	6,915					100	200		30	
2034	5,329	4,441	888	7,345				300	100			30	
2035	5,636	4,697	939	7,575					200				30
2036	5,955	4,962	992	7,905					100	200		30	
2037	6,286	5,238	1,048	8,335					200	200		30	
2038	6,629	5,525	1,105	8,765				300	100			30	
2039	6,987	5,823	1,165	9,095					100	200			30
2040	7,359	6,133	1,227	9,525						400		30	
2041	7,732	6,443	1,289	9,955						200	200	30	
2042	8,126	6,772	1,354	10,585						400	200	30	
Developed Capacity [MW]					1,500	1,245	650	900	1,000	1,880	400	450	120
					8,145								

7. Daily Peak Demand

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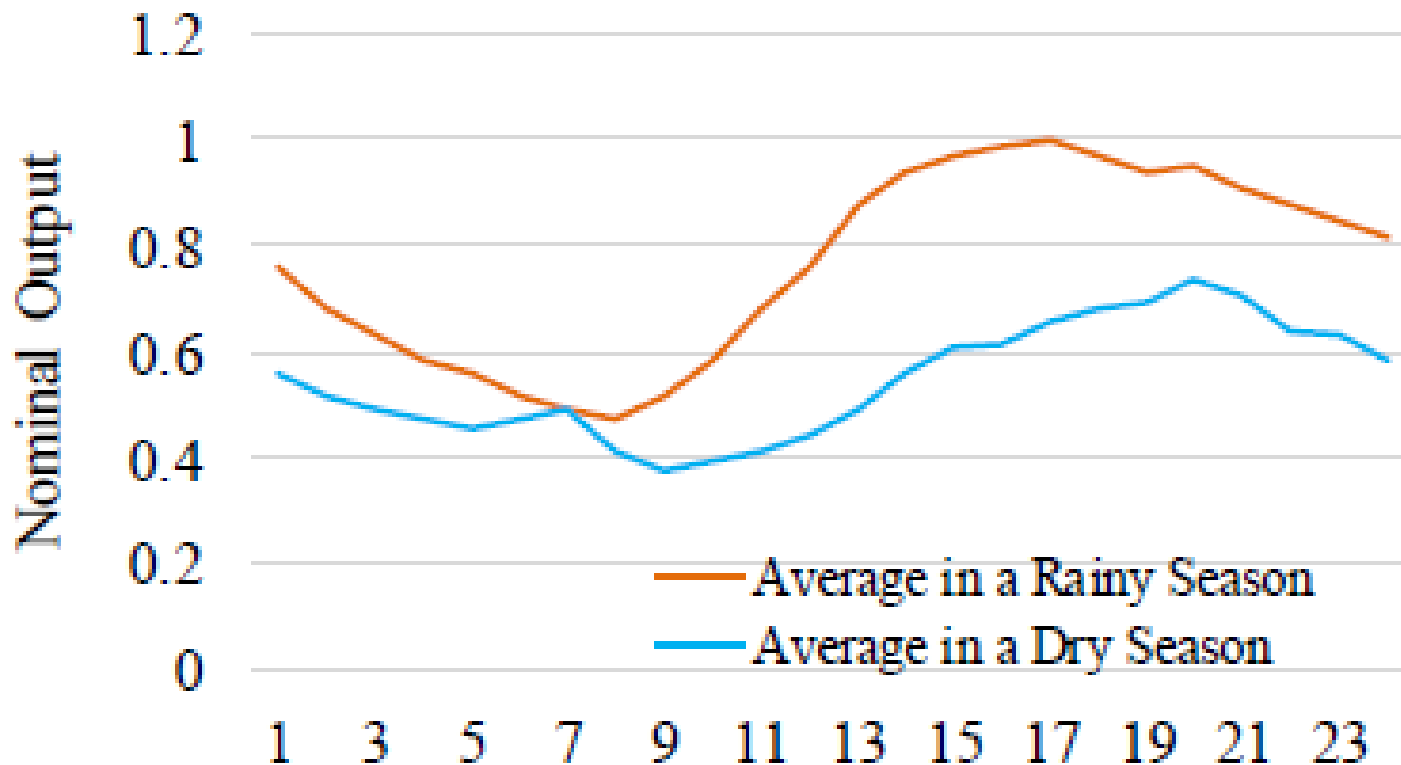


7. Daily Peak Demand



Output model of solar power (Mocuba)

7. Daily Peak Demand



Output model of wind power (Tofo)

8. Conclusion

- It is important to develop power plant by other resources to cover daily peak demand.
- Especially development of hydro power plant is very important.
- Both renewable energy and other resources are important for the national grid in Mozambique considering to the energy mix.

Muito obrigado