



Ministry of National
Development Planning/Bappenas
Republic of Indonesia

PROJECT BRIEF

SOLAR PV MAPPING
AND DEVELOPMENT
PLAN IN
JAMALI REGION

GROUND - MOUNTED PV



Project Explanation

The Solar PV Mapping and Development Project was designed by the Southeast Asia Energy Transition Partnership (ETP) to support Indonesia's energy transition by partnering with the Ministry of National Development Planning (BAPPENAS) to accelerate solar PV deployment in line with the RUKN 2025–2060 target of 49.5% renewable energy by 2060. This project also provides insight to key stakeholders, including the Ministry of Energy and Mineral Resources (MEMR) and PT PLN (Persero), to support decision-making processes.

This Ground-Mounted Project Brief presents the top-performing sites identified through a Multicriteria Decision-Making (MCDM) analysis, applying a weighted evaluation across four key parameters: Geospatial analysis (**30%**), Environmental and Social (E&S) risk (**20%**), Potential PV capacity (**5%**), and Financial Performance (**45%**). The identified sites achieved the highest overall scores among 151 shortlisted locations, representing **approximately 9% of the technically viable area** for solar PV development across the JAMALI region. To streamline implementation and minimize land acquisition complexities, the site capacity for each location is capped at 100 MW.

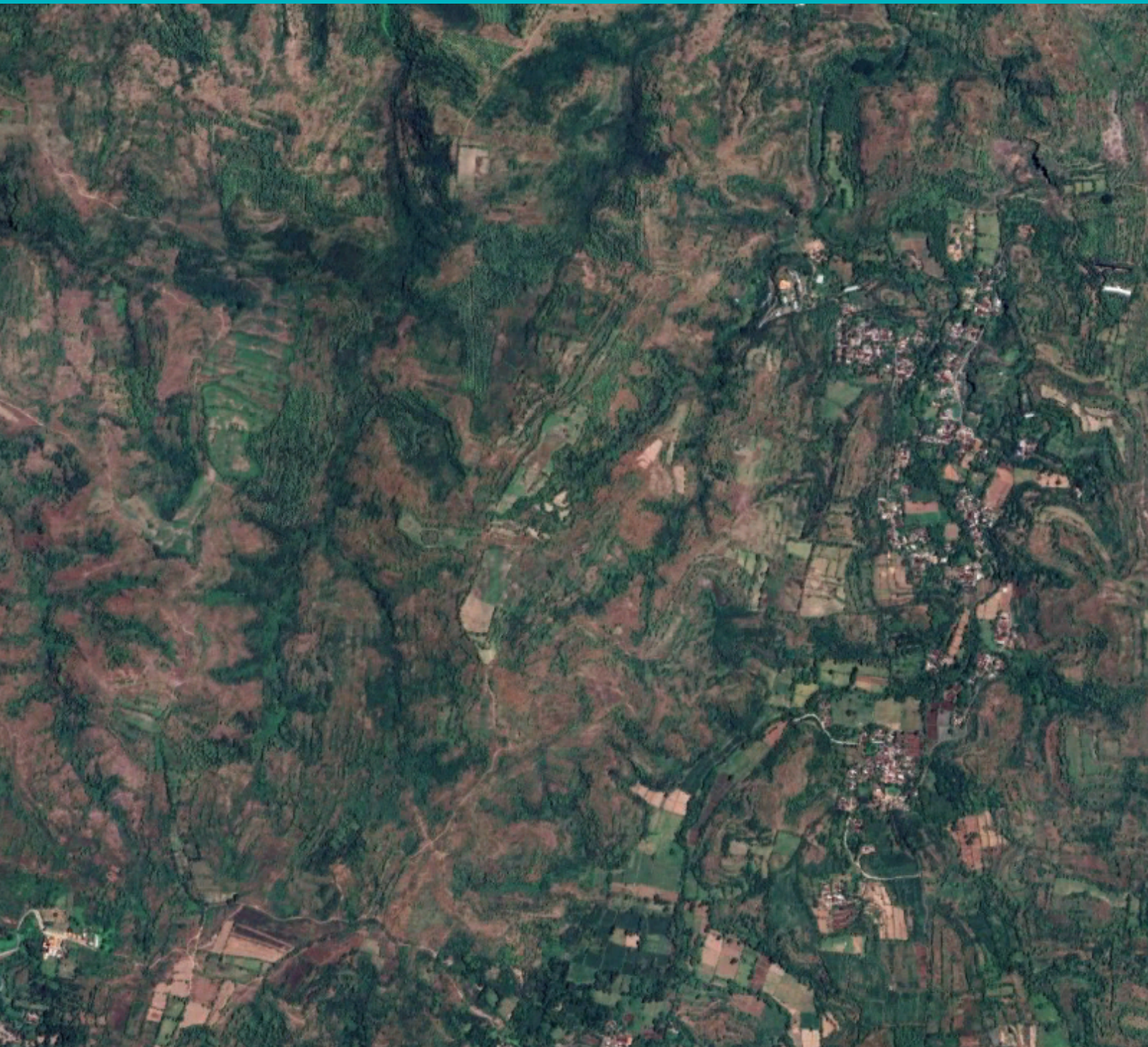
The top 5 Ground-Mounted sites are:

- (1) Panji Kidul, East Java;
- (2) Wonorekso, Central Java;
- (3) Mendoyo Dauh Tukad, Bali;
- (4) Citereup, Banten;
- (5) Delik, Central Java.

For further information about the project, please find the detailed reports on the ETP website: <https://www.energytransitionpartnership.org/projects/1-gw-solar-mapping-and-development-plan/>

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PANJI KIDUL, EAST JAVA

Panji Kidul, Situbondo

East Java



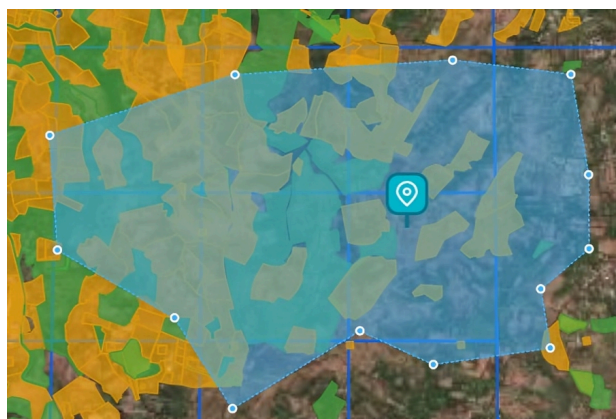
Nearest Substation:
GI 150 kV Situbondo



Distance to Substation:
2 km

Summary:

The Panji Kidul site in Situbondo, East Java is a promising location for utility-scale solar PV within the JAMALI system. Situated about 2 km from the 150 kV Situbondo substation, which has a substantial hosting capacity of 560 MW, the site spans around 230 hectares of dryland agriculture with strong solar irradiance and favorable terrain. Environmental and social considerations are assessed as manageable, with financial returns moderate but scalable. Situbondo's economy remains dominated by agriculture, particularly dryland crops, corn, tobacco, and livestock, but its proximity to East Java's industrial growth centers in Surabaya and Pasuruan provides a strategic opportunity. By enhancing supply reliability in the JAMALI grid, Panji Kidul could play an important role in supporting both regional economic development and Indonesia's clean energy transition.



Environment and Social:

Located in East Java (Situbondo) and the area falls within a regional spatial planning category designated for dryland agriculture. The landcover shows to be dryland agriculture

Risk Rating: Medium

Site with potential trigger to IFC PS5, which might need a prolonged, detailed study and a complex land acquisition process. Site may pose potential limited adverse impacts that are fewer, generally site-specific, and mostly reversible or manageable through mitigation measures

Business Case

Key assumptions are established including macroeconomic indicators, tariff structures, power generation estimates, capital and operational expenditures.

- 30 years of contract and operation
- All costs includes VAT
- Debt to Equity Ratio: 70:30
- Debt Tenure: 10 years
- Interest Rate: 8%
- Upfront cost: 1.8%
- inflation rate: 2026-2027:3.1%; 2028+:3%
- Tariff:

Tariff (cents USD /kWh)	With Government Land	Without Government Land
Year 1 – 10	6.95	6.6
Year 11 – 30	4.17	3.96

*Tariff assumptions are based on Presidential Regulation No. 112 of 2022

Disclaimer:

This analysis does not substitute for detailed, site-specific feasibility studies before investment decisions. The findings are based on data up to May 2025 and may be affected by future changes in policy, market, or grid conditions. More information can be found on bit.ly/ETP_PVDev_JAMALI



Land Area
(ha)

230.19



Assigned
Capacity (MW)

100



PVOut
(kWh/kWp)

1,657.8



Elevation (m)

112

Geospatial Analysis Score: 0.983

Geospatial Analysis:

The site offers strong solar generation potential with high solar resources, low cloud intermittency, good road access, and low tectonic risks. The only limitation is the presence of slight terrain slopes.

Financial Analysis Result

	Include Evacuation Line		Exclude Evacuation Line	
	Govt land	Non-Govt Land	Govt land	Non-Govt Land
Equity IRR	14.24%	9.48%	15.93%	10.47%
Project IRR	11.27%	8.84%	12.05%	9.38%

*) This financial analysis under a conservative approach, with the best case scenario, it offers relatively promising return.

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WONOREKSO, CENTRAL JAVA

Wonorekso, Batang

Central Java



Nearest Substation:
GI 150 kV Batang



Distance to Substation:
2.79 km

Summary:

The Wonokerso site in Batang, Central Java, presents strong potential for utility-scale solar PV development within the JAMALI system. Spanning 327 hectares of plantation and mixed-use land, the site benefits from good solar resources, quasi-flat terrain, close proximity to the 150 kV Batang substation (2.79 km), and manageable environmental and social risks. Batang's economy, historically reliant on agriculture and plantations, is now transitioning toward industrial growth, led by the Batang Integrated Industrial Estate (KITB), a major government-backed project. This shift is expected to drive substantial increases in electricity demand across the Central Java corridor. In this context, the Wonokerso PV project is well-positioned to support sustainable industrial expansion, strengthen regional power supply reliability, and contribute to Central Java's clean energy transition.



Environment and Social:

Located in Central Java (Batang), the land cover shows mixed uses, primarily plantation with minor dryland agriculture and paddy fields

Risk Rating: Medium

Site with potential trigger to IFC PS5, which might need a prolonged, detailed study and a complex land acquisition process. Site may pose potential limited adverse impacts that are fewer, generally site-specific, and mostly reversible or manageable through mitigation measures

Business Case

Key assumptions are established including macroeconomic indicators, tariff structures, power generation estimates, capital and operational expenditures.

- 30 years of contract and operation
- All costs includes VAT
- Debt to Equity Ratio: 70:30
- Debt Tenure: 10 years
- Interest Rate: 8%
- Upfront cost: 1.8%
- inflation rate: 2026-2027:3.1%; 2028+:3%
- Tariff:

Tariff (cents USD /kWh)	With Government Land	Without Government Land
Year 1 – 10	6.95	6.6
Year 11 – 30	4.17	3.96

*Tariff assumptions are based on Presidential Regulation No. 112 of 2022

Disclaimer:

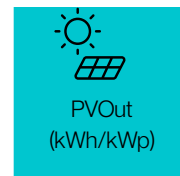
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327



100



1,509.6



70

Geospatial Analysis Score: 0.983

Geospatial Analysis:

The site exhibits strong solar energy generation potential due to its high solar resources, low cloud intermittency, nearly flat terrain, nearby grid infrastructure, low tectonic risk, and good road access. No significant disadvantages have been identified.

Financial Analysis Result

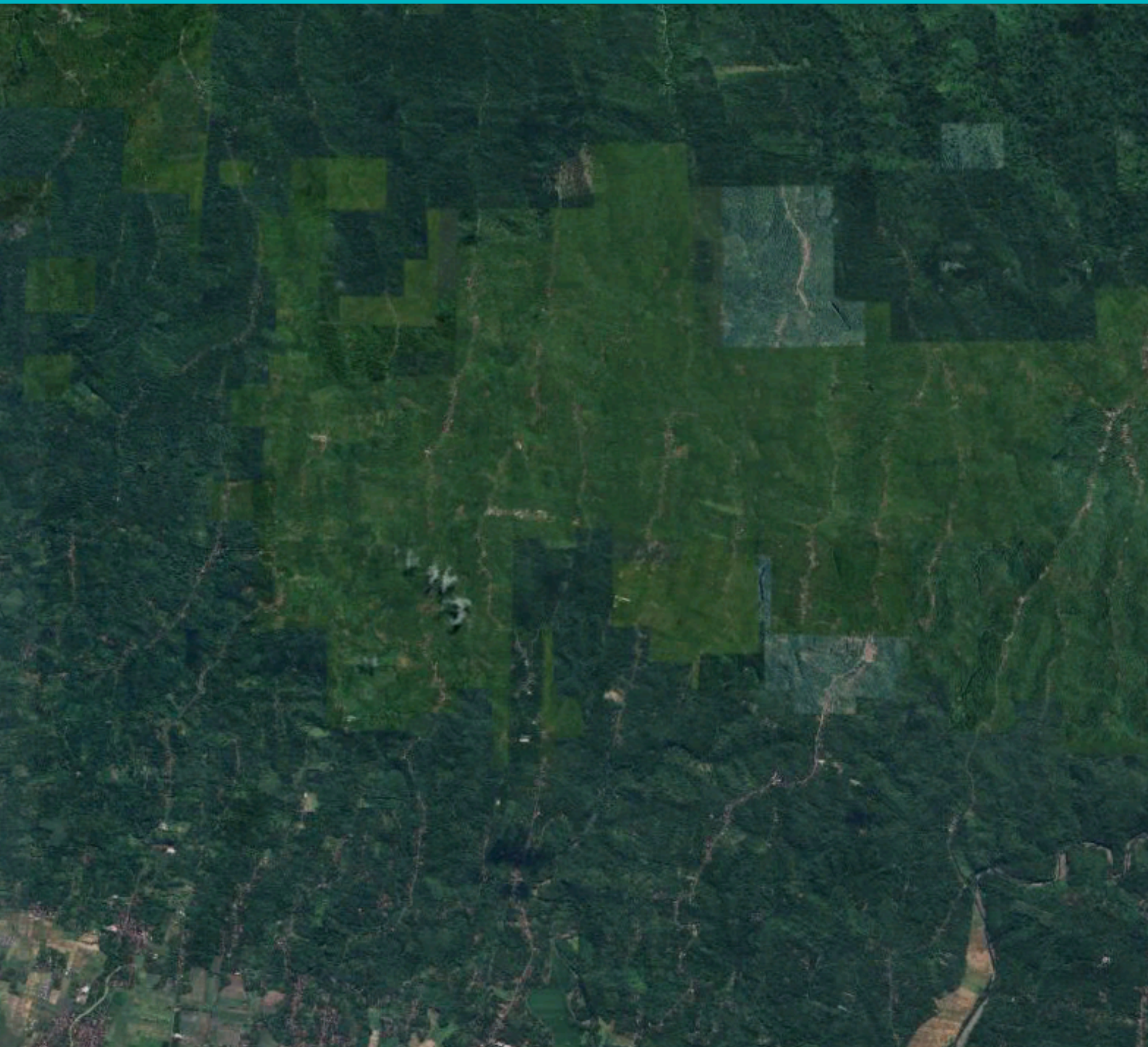
	Include Evacuation Line		Exclude Evacuation Line	
	Govt land	Non-Govt Land	Govt land	Non-Govt Land
Equity IRR	10.49%	8.44%	12.40%	9.84%
Project IRR	9.38%	8.25%	10.35%	9.03%

*) This financial analysis under a conservative approach, with the best case scenario, it offers relatively promising return.

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MENDOYO DAUH TUKAD, BALI

Mendoyo Dauh Tukad Pekutatan, **Bali**



Nearest Substation:
GI 150 kV Negara



Distance to Substation:
4.65 km

Summary:

The Mendoyo Dauh Tukad site in Jembrana, Bali, offers strong potential for utility-scale solar PV development, with a hosting capacity of 350 MW and proximity to the GI 150 kV Negara substation (4.65 km). Spanning 412 hectares of dryland agriculture and plantation, the site benefits from above-average solar resources, good accessibility, and low tectonic risks, though slight terrain slopes and possible biodiversity sensitivities warrant further study. Bali's economy, driven by tourism and services with a population of around 4.3 million growing at 0.7–0.8% annually, faces rising electricity demand due to tourism recovery and infrastructure expansion. This project could strengthen Bali's energy security, reduce reliance on imports from Java, and support the island's clean energy transition goals.



Land Area
(ha)

412



Assigned
Capacity (MW)

100



PVOut
(kWh/kWp)

1,509.6



Elevation (m)

85

Geospatial Analysis Score: 0.851

Geospatial Analysis:

The site presents a favorable solar resource and potential for PV power generation, medium-low cloud intermittency, convenient road access, and minimal tectonic risks. However, there are some drawbacks, including slight terrain slopes and minor shading effects caused by the terrain

Environment and Social:

Located in Central Bali (Pekutatan), the land cover shows to be dryland agriculture and mixed plantation. It poses a presence of a global critical habitat, indicating possible threatened species.

Risk Rating: High

The site has the potential to trigger IFC PS 6 and IFC PS 5, which might need further detailed study on biodiversity and a detailed study and social restoration management and plan, respectively. The site may pose potential significant adverse impacts (environmental, social, or financial) that are often diverse, irreversible, or unprecedented

Business Case

Key assumptions are established including macroeconomic indicators, tariff structures, power generation estimates, capital and operational expenditures.

- 30 years of contract and operation
- All costs includes VAT
- Debt to Equity Ratio: 70:30
- Debt Tenure: 10 years
- Interest Rate: 8%
- Upfront cost: 1.8%
- inflation rate: 2026-2027:3.1%; 2028+:3%
- Tariff:

Tariff (cents USD /kWh)	With Government Land	Without Government Land
Year 1 – 10	6.95	6.6
Year 11 – 30	4.17	3.96

*Tariff assumptions are based on Presidential Regulation No. 112 of 2022

Disclaimer:

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Financial Analysis Result

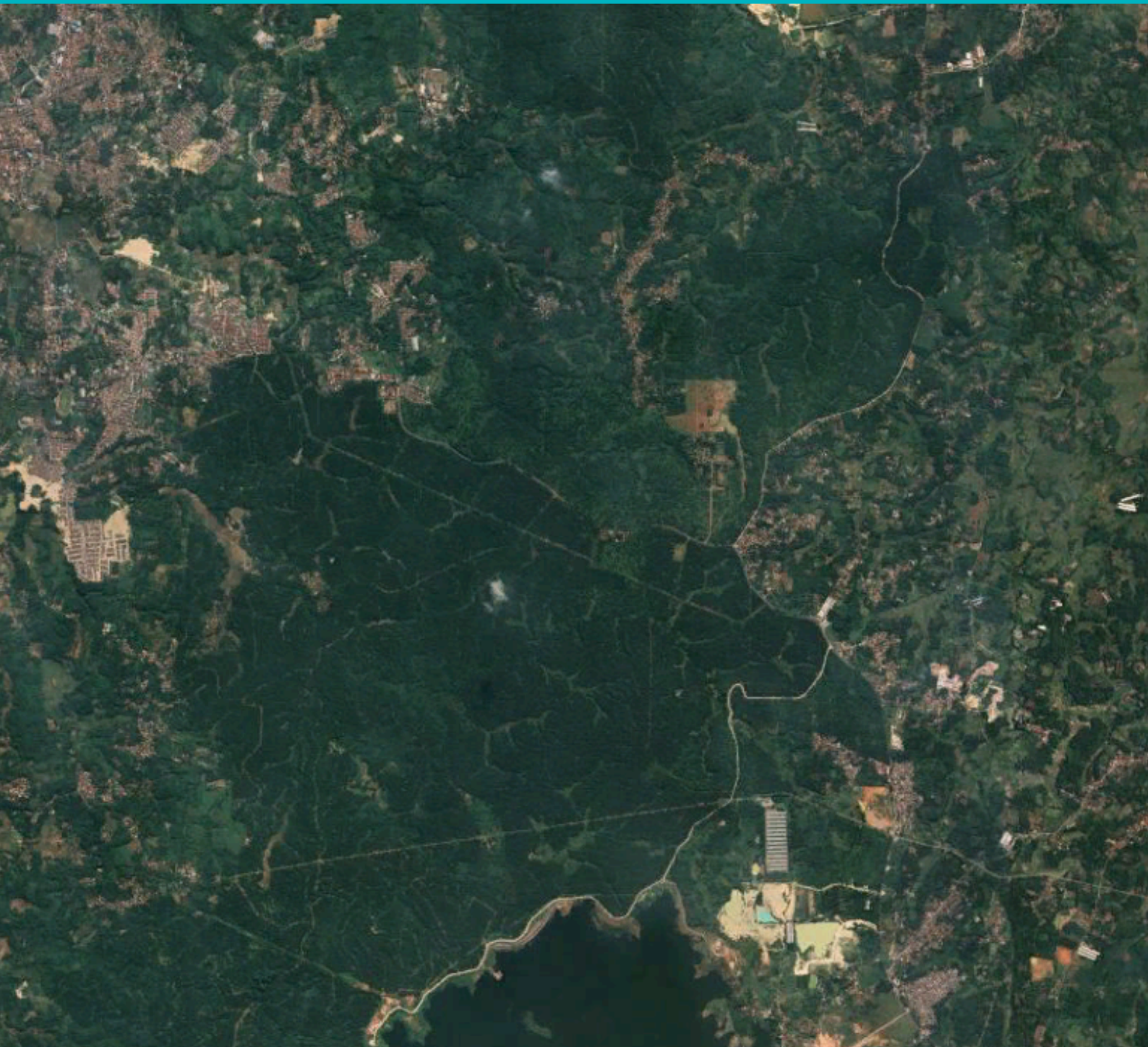
	Include Evacuation Line		Exclude Evacuation Line	
	Govt land	Non-Govt Land	Govt land	Non-Govt Land
Equity IRR	8.11%	7.95%	10.85%	10.43%
Project IRR	8.06%	7.97%	9.56%	9.34%

*) This financial analysis under a conservative approach, with the best case scenario, it offers relatively promising return.

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CITEREUP, BANTEN

Citereup, Penimbang Banten



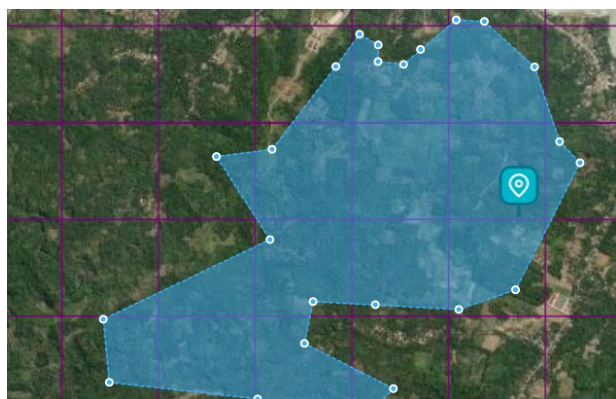
Nearest Substation:
GI 150 kV PLTU Labuan



Distance to Substation:
1.00 km

Summary:

The Citereup site in Penimbang, Banten, presents strong potential for ground-mounted solar PV, with a maximum hosting capacity of 480 MW and excellent proximity to the 150 kV PLTU Labuan substation (1 km). Spanning nearly 382 hectares of horticultural and plantation land, the site benefits from low cloud intermittency, accessible grid infrastructure, and good road connectivity, though relatively lower solar resources and seismic activity risks must be considered. Banten, with a population of around 12.5 million growing at ~1% annually, is among the fastest-developing provinces in Java, hosting major industrial hubs, ports, and energy-intensive industries. Electricity demand is projected to grow steadily, driven by industrial expansion and urbanization.



Environment and Social:

located in Banten (Penimbang), the area falls within a horticulture area under regional spatial planning. The land cover consists of dryland agriculture mixed with plantations.

Risk Rating: Medium

Site with potential trigger to IFC PS5, which might need a prolonged, detailed study and a complex land acquisition process. Site may pose potential limited adverse impacts that are fewer, generally site-specific, and mostly reversible or manageable through mitigation measures

Business Case

Key assumptions are established including macroeconomic indicators, tariff structures, power generation estimates, capital and operational expenditures.

- 30 years of contract and operation
- All costs includes VAT
- Debt to Equity Ratio: 70:30
- Debt Tenure: 10 years
- Interest Rate: 8%
- Upfront cost: 1.8%
- inflation rate: 2026-2027:3.1%; 2028+:3%
- Tariff:

Tariff (cents USD /kWh)	With Government Land	Without Government Land
Year 1 – 10	6.95	6.6
Year 11 – 30	4.17	3.96

*Tariff assumptions are based on Presidential Regulation No. 112 of 2022

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Land Area (ha)	Assigned Capacity (MW)	PVOut (kWh/kWp)	Elevation (m)
381.93	100	1,363.9	25

Geospatial Analysis Score: 0.781

Geospatial Analysis:

The site offers benefits such as reduced cloud intermittency, proximity to grid infrastructure, and easy road access. However, it faces challenges due to lower solar resources and PV generation potential, as well as risks from seismic activity.

Financial Analysis Result

	Include Evacuation Line		Exclude Evacuation Line	
	Govt land	Non-Govt Land	Govt land	Non-Govt Land
Equity IRR	8.72%	7.86%	9.14%	8.21%
Project IRR	8.41%	7.92%	8.64%	8.12%

*) This financial analysis under a conservative approach, with the best case scenario, it offers relatively promising return.

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KENCONOREJO, CENTRAL JAVA

Kenconorejo, Tulis

Central Java



Nearest Substation:
GI 150 kV Batang



Distance to Substation:
6.00 km

Summary:

The Kenconorejo site in Tulis, Batang Regency, Central Java presents strong potential for ground-mounted solar PV development. It benefits from high solar resources, low intermittency, reliable road access, and lower tectonic risks. Importantly, the site is located only around 6 km from the 150 kV Batang substation, which has an estimated hosting capacity of about 1,050 MW, making it favorable for large-scale integration into the grid. The site spans 196 hectares within an industrially designated zone, though the slight terrain slopes and exposure to high water risk will require careful planning. Strategically, its proximity to the Batang Integrated Industrial Estate (KITB), a flagship project expected to attract major industrial and logistics investment, positions the Konsorejo area as a key enabler of Central Java's industrial expansion.



Environment and Social:

located in Central Java (Tulis), the area falls within industrial designation areas and face high water risk

Risk Rating: Medium

Site with potential trigger to IFC PS5, which might need a prolonged, detailed study and a complex land acquisition process. Site may pose potential limited adverse impacts that are fewer, generally site-specific, and mostly reversible or manageable through mitigation measures

Business Case

Key assumptions are established including macroeconomic indicators, tariff structures, power generation estimates, capital and operational expenditures.

- 30 years of contract and operation
- All costs includes VAT
- Debt to Equity Ratio: 70:30
- Debt Tenure: 10 years
- Interest Rate: 8%
- Upfront cost: 1.8%
- inflation rate: 2026-2027:3.1%; 2028+:3%
- Tariff:

Tariff (cents USD /kWh)	With Government Land	Without Government Land
Year 1 – 10	6.95	6.6
Year 11 – 30	4.17	3.96

*Tariff assumptions are based on Presidential Regulation No. 112 of 2022

Disclaimer:

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Land Area (ha)	Assigned Capacity (MW)	PVOut (kWh/kWp)	Elevation (m)
196.38	100	1,535.6	60

Geospatial Analysis Score: 0.941

Geospatial Analysis:

The site shows significant potential for solar energy generation due to its abundant solar resources, minimal cloud cover, robust grid infrastructure, easy road access, and low tectonic risks. However, the site is somewhat limited by slight terrain slopes.

Financial Analysis Result

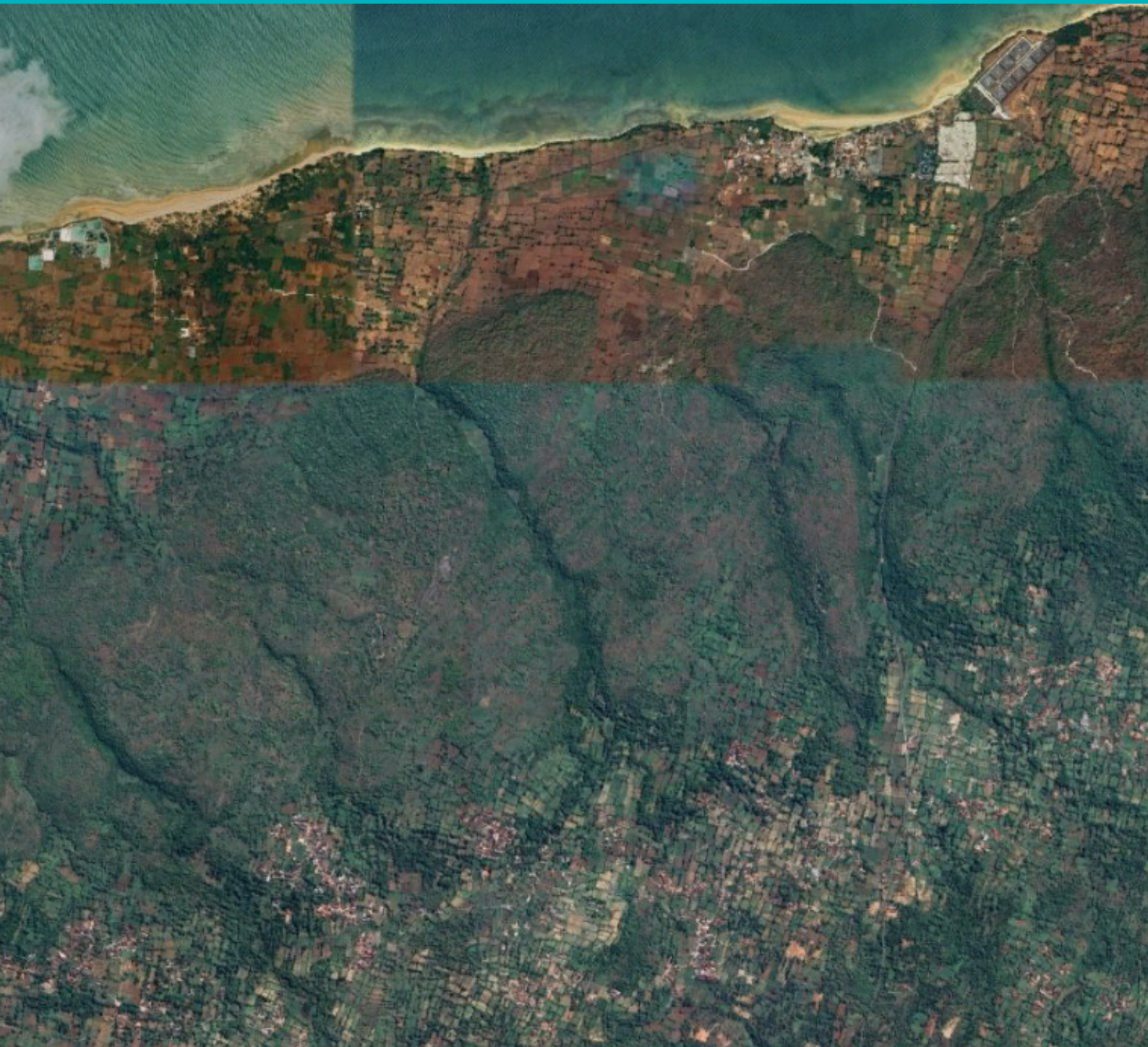
	Include Evacuation Line		Exclude Evacuation Line	
	Govt land	Non-Govt Land	Govt land	Non-Govt Land
Equity IRR	9.13%	7.46%	12.95%	10.31%
Project IRR	8.64%	7.68%	10.63%	9.28%

*) This financial analysis under a conservative approach, with the best case scenario, it offers relatively promising return.

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DASUK TIMUR, EAST JAVA

Dasuk Timur, Sumenep

East Java



Nearest Substation:
GI 150 kV Sementuban



Distance to Substation:
38 km

Summary:

The Dasuk Timur site in Sumenep, East Java demonstrates strong potential for ground-mounted solar PV development, supported by high solar resources, favorable terrain, and accessible grid infrastructure. The site spans 442 ha and is located about 13 km from the 150 kV Sementuban substation, which has a hosting capacity of around 240 MW. While geophysically stable, the area experiences medium to higher cloud intermittency and falls within a designated water catchment zone, requiring careful consideration of land-use and environmental priorities. Sumenep Regency, with a population of around 1.2 million and steady growth, relies heavily on agriculture, fisheries, and salt production but is gradually diversifying toward industry and services.



Environment and Social:

located in East Java (Sumenep), the area falls within a water catchment area, which is prioritized for maintenance and replenishment. Land cover consists of dryland agriculture mixed with plantations.

Risk Rating: High

The site has the potential to trigger IFC PS 6 and IFC PS 5, which might need further detailed study on biodiversity and a detailed study and social restoration management and plan, respectively. The site may pose potential significant adverse impacts (environmental, social, or financial) that are often diverse, irreversible, or unprecedented.

Business Case

Key assumptions are established including macroeconomic indicators, tariff structures, power generation estimates, capital and operational expenditures.

- 30 years of contract and operation
- All costs includes VAT
- Debt to Equity Ratio: 70:30
- Debt Tenure: 10 years
- Interest Rate: 8%
- Upfront cost: 1.8%
- inflation rate: 2026-2027:3.1%; 2028+:3%
- Tariff:

Tariff (cents USD /kWh)	With Government Land	Without Government Land
Year 1 – 10	6.95	6.6
Year 11 – 30	4.17	3.96

* Tariff assumptions are based on Presidential Regulation No. 112 of 2022

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Land Area
(ha)

442.42



Assigned
Capacity (MW)

100



PVOut
(kWh/kWp)

1,526.8



Elevation (m)

97.0

Geospatial Analysis Score: 0.986

Geospatial Analysis:

The site exhibits strong solar energy generation potential due to its high solar resources, low cloud intermittency, nearly flat terrain, nearby grid infrastructure, low tectonic risk, and good road access. No significant disadvantages have been identified.

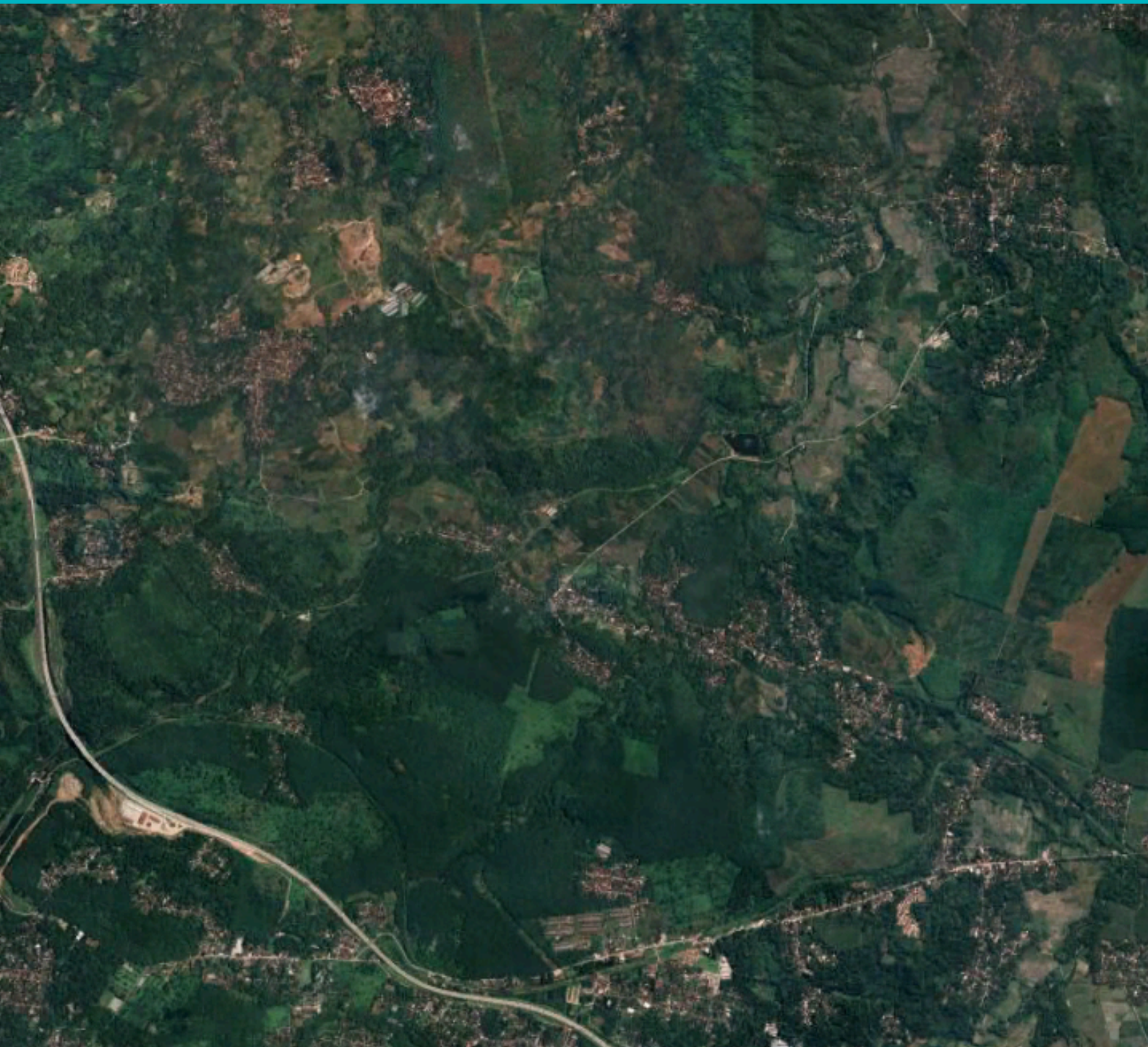
Financial Analysis Result

	Include Evacuation Line		Exclude Evacuation Line	
	Govt land	Non-Govt Land	Govt land	Non-Govt Land
Equity IRR	6.05%	5.84%	12.89%	11.85%
Project IRR	6.81%	6.68%	10.60%	10.09%

*) This financial analysis under a conservative approach, with the best case scenario, it offers relatively promising return.

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DELIK, CENTRAL JAVA

Delik, Semarang Central Java

Summary:

The Delik site in Semarang, Central Java, offers promising potential for ground-mounted solar PV, located just over 1 km from the 150 kV Jelok substation with a hosting capacity of 180 MW. The site spans around 627 ha and benefits from above-average solar resources, reliable grid access, and manageable environmental and social risks. While terrain complexity is a minor limitation, the site's strategic location near Semarang's industrial and urban growth corridor strengthens its value, as electricity demand in the region is projected to grow steadily in line with industrial expansion and urbanization.



Environment and Social:

Located in Central Java(Semarang), the area falls within a plantation area. The land cover shows mixed uses (major farm/plantation with minor bushes). Need the high-level assessment for critical habitat data.

Risk Rating: Medium

Site with potential trigger to IFC PS5, which might need a prolonged, detailed study and a complex land acquisition process. Site may pose potential limited adverse impacts that are fewer, generally site-specific, and mostly reversible or manageable through mitigation measures

Business Case

Key assumptions are established including macroeconomic indicators, tariff structures, power generation estimates, capital and operational expenditures.

- 30 years of contract and operation
- All costs includes VAT
- Debt to Equity Ratio: 70:30
- Debt Tenure: 10 years
- Interest Rate: 8%
- Upfront cost: 1.8%
- inflation rate: 2026-2027:3.1%; 2028+:3%
- Tariff:

Tariff (cents USD /kWh)	With Government Land	Without Government Land
Year 1 – 10	6.95	6.6
Year 11 – 30	4.17	3.96

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Nearest Substation:
GI 150 kV Jelok



Distance to Substation:
1.02 km



Land Area
(ha)

627



Assigned
Capacity (MW)

100



PVOut
(kWh/kWp)

1,478.1



Elevation (m)

459

Geospatial Analysis Score: 0.823

Geospatial Analysis:

The site has a solar resource and PV power generation potential that is higher than average. It experiences moderate cloud intermittency, has a robust grid infrastructure, convenient road access, and low tectonic risks. However, there is a slight terrain complexity, which is indicated by a low terrain slope score.

Financial Analysis Result

	Include Evacuation Line		Exlude Evacuation Line	
	Govt land	Non-Govt Land	Govt land	Non-Govt Land
Equity IRR	10.95%	6.87%	11.66%	7.28%
Project IRR	9.62%	7.33%	9.98%	7.57%

* This financial analysis under a conservative approach, with the best case scenario, it offers relatively promising return.

The full report and more information is accessible through ETP Website or through the link below:



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Ministry of National
Development Planning/Bappenas
Republic of Indonesia



ENERGY
TRANSITION
PARTNERSHIP

Powering Prosperity and Enabling Sustainability in South-East Asia



UNOPS



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