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The Energy Alternatives Study for the Lao PDR: Informing energy planning through 2030

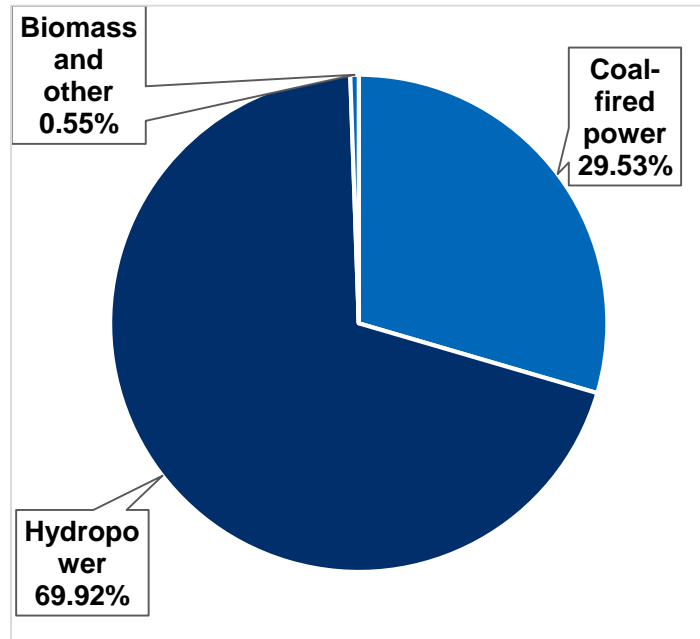
Asia Clean Energy Forum (ACEF) 2018, Manila

Mr. Litthanoulouk Laspho, Lao Ministry of Energy and Mines | June 6, 2018



Historic Power for Development – Lao Energy Sector

To ensure a secure, reliable, and affordable energy supply to power economic development, Lao PDR has historically prioritized investment in its abundant hydropower resources.



Installed electricity generation capacity in Lao PDR - 2017



Photo Credit: Nam Ngum 1, Electricite du Laos (EDL) Generation. <http://www.edlgen.com.la/project-category/hydro-power-plant/page/2/?lang=en>.

Energy Alternatives Study for the Lao PDR

Energy Alternatives Study for the Lao PDR – Goals

- To provide the Lao Ministry of Energy and Mines (MEM) with improved tools, data, and analytic capabilities to inform their energy planning activities to 2030
- To develop capacity and empower MEM with the data, tools, and expertise to comprehensively analyze opportunities for, and impacts of, future energy systems investment opportunities

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- 1 Task** Verify energy resource data for power sector planning
 - 2 Task** Assess technical potential of domestic energy resources for electricity generation
 - 3 Task** Assess levelized cost of electricity (LCOE) of these resources
 - 4 Task** Develop energy project data collection & management protocols
 - 5 Task** Identify and analyze additional energy planning objectives

Technical Potential – Methodology

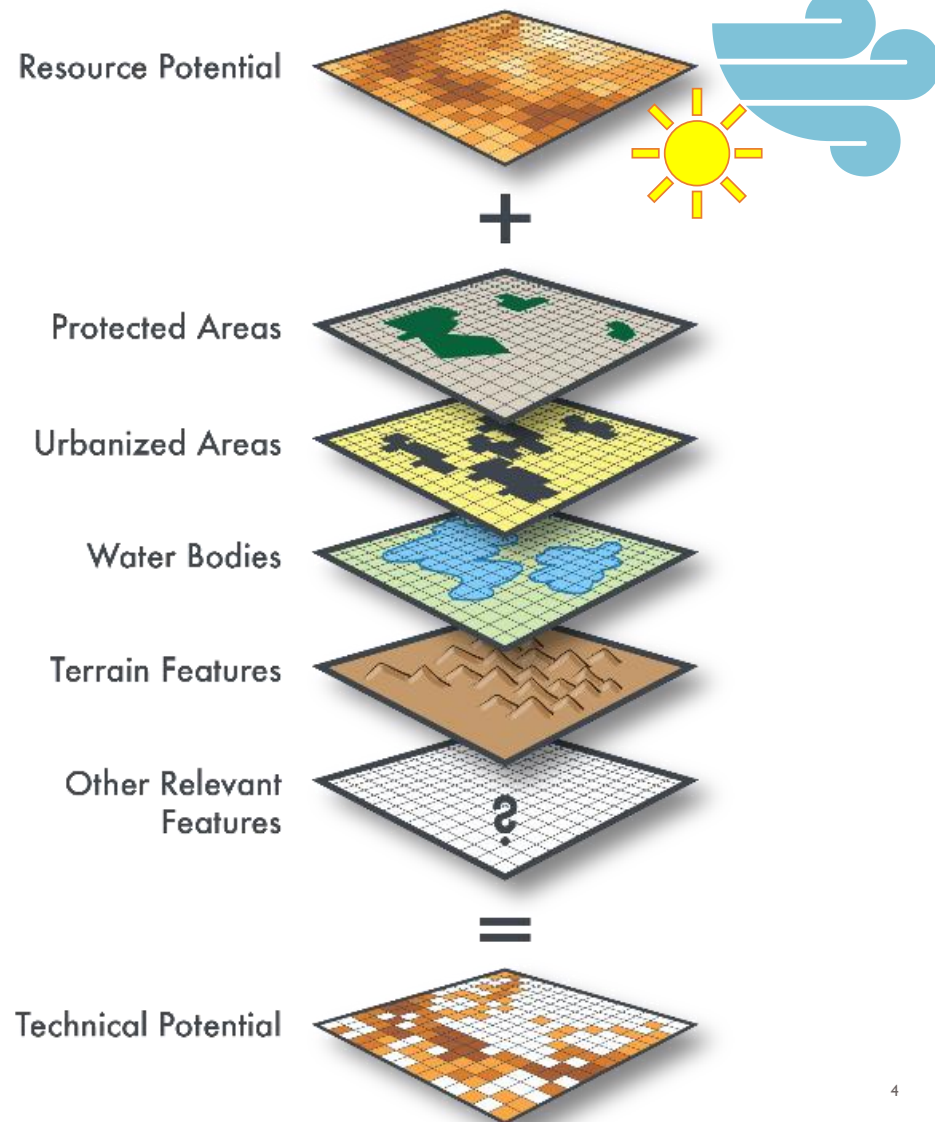
Technical Potential

The achievable energy capacity and generation of a particular technology given:

- System performance,
- Topographic limitations, and
- Environmental, and land-use constraints

– *Does not consider technology costs*

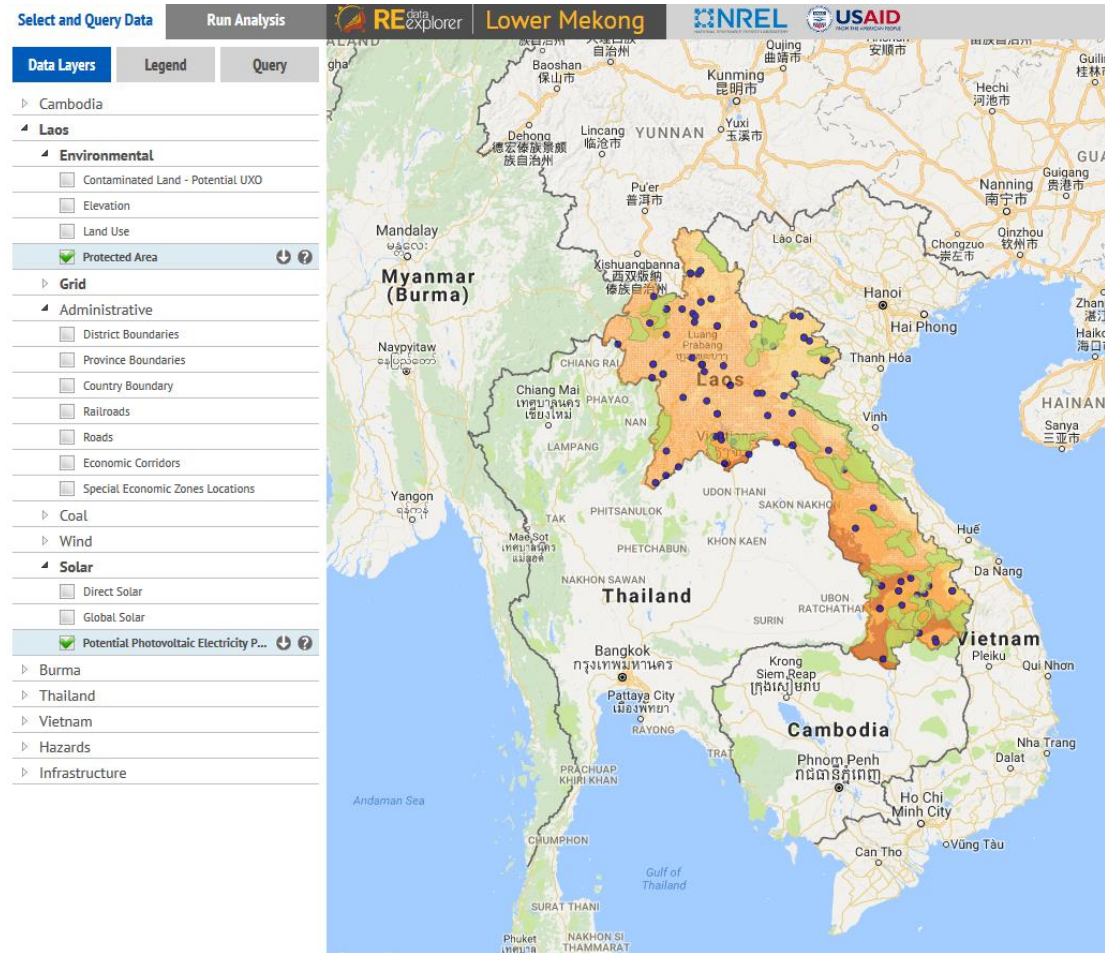
GIS-based Methodology



Technical Potential – Renewable Energy Data Explorer (RE Data Explorer) Platform

RE Data Explorer is a:

- No-cost, web-based platform for energy resource exploration and decision-making
- Tool that wraps complex spatial analysis techniques in an easy-to-use interface
- Platform for distributing publicly available GIS data (many layers are downloadable)



Technical Potential – Assumptions for Wind and Solar PV

Wind



- Utility-scale wind
- 100m hub-height turbine with a power density of 3 MW / km²
- Solar resource data is from the Global Wind Atlas (DTU)

Exclusions	Lao PDR	Scenarios			
	No exclusions or constraints	1 Relaxed exclusions	2 Scenario 1 + slope exclusion	3 Scenario 2 + forest exclusion	4 Scenario 3 + agriculture exclusion
Slope					
Greater than 20%					
Land-cover and use					
Protected areas					
Water & wetland areas					
Forested areas					
Agricultural areas					
Priority areas					
Agricultural areas					
Unexploded Ordnances					

Solar

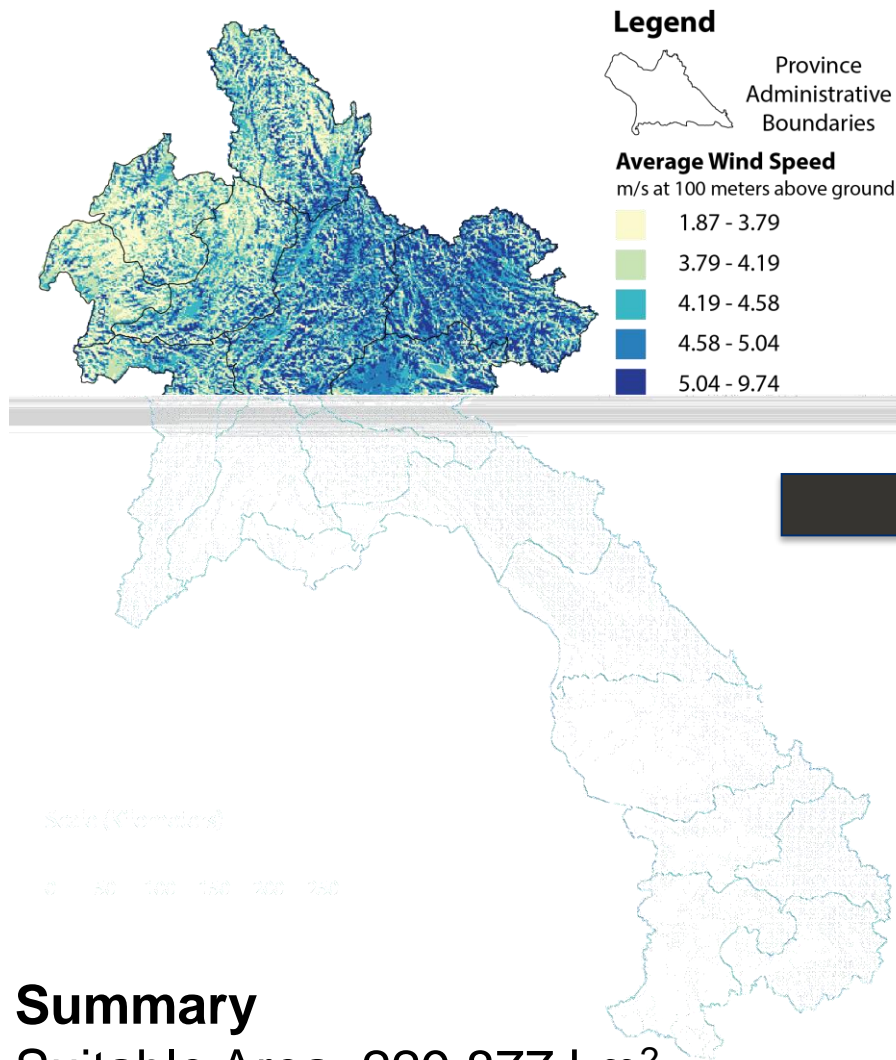


- Utility-scale solar PV
- Power density of 36 MW / km²
- Solar resource data is from the Global Solar Atlas (World Bank)

Exclusions	Lao PDR No exclusions	Scenarios			
		1 Relaxed exclusions	2 Scenario 1 + slope exclusion	3 Scenario 2 + agriculture & forest exclusions	4 Scenario 3 + urban exclusion
Slope					
Greater than 5%					
Land cover and use					
Protected areas					
Water & wetland areas					
Agricultural areas					
Forested areas					
Urban areas					
Priority areas					
Forested areas					
Unexploded Ordnances					

Technical Potential – Results for Wind

Base – Resource Potential



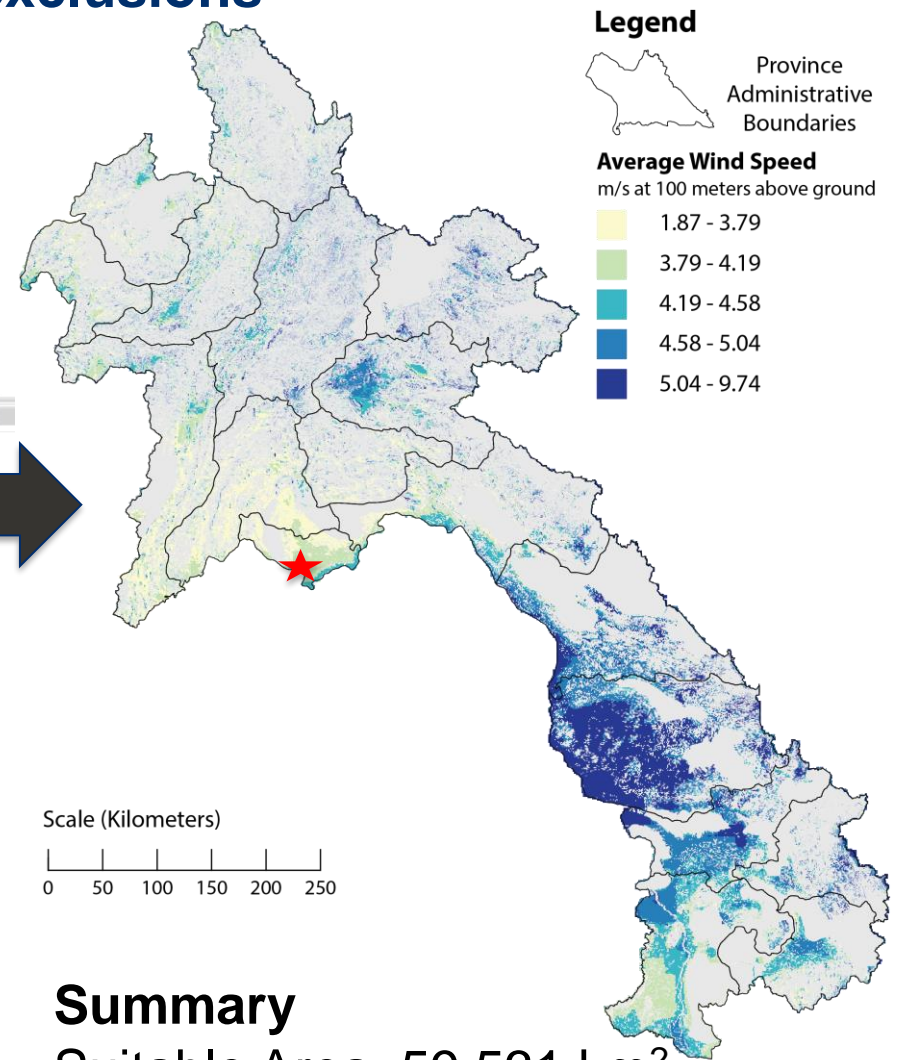
Summary

Suitable Area: 229,877 km²

Capacity: 690 GW

Generation: 842,834 GWh

Scenario 3 – All Exclusions + Forest exclusions



Scale (Kilometers)

0 50 100 150 200 250

Summary

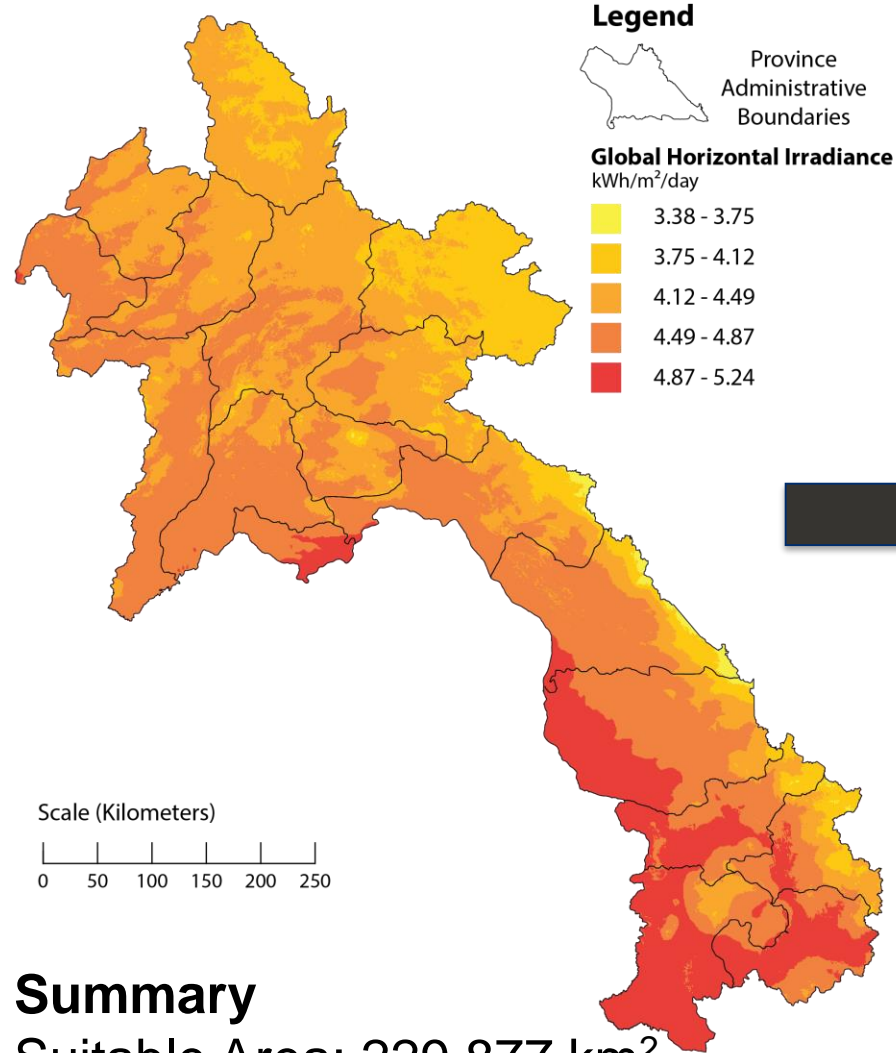
Suitable Area: 59,531 km²

Capacity: 179 GW

Generation: 223,268 GWh

Technical Potential – Results for Solar PV

Base – Resource Potential



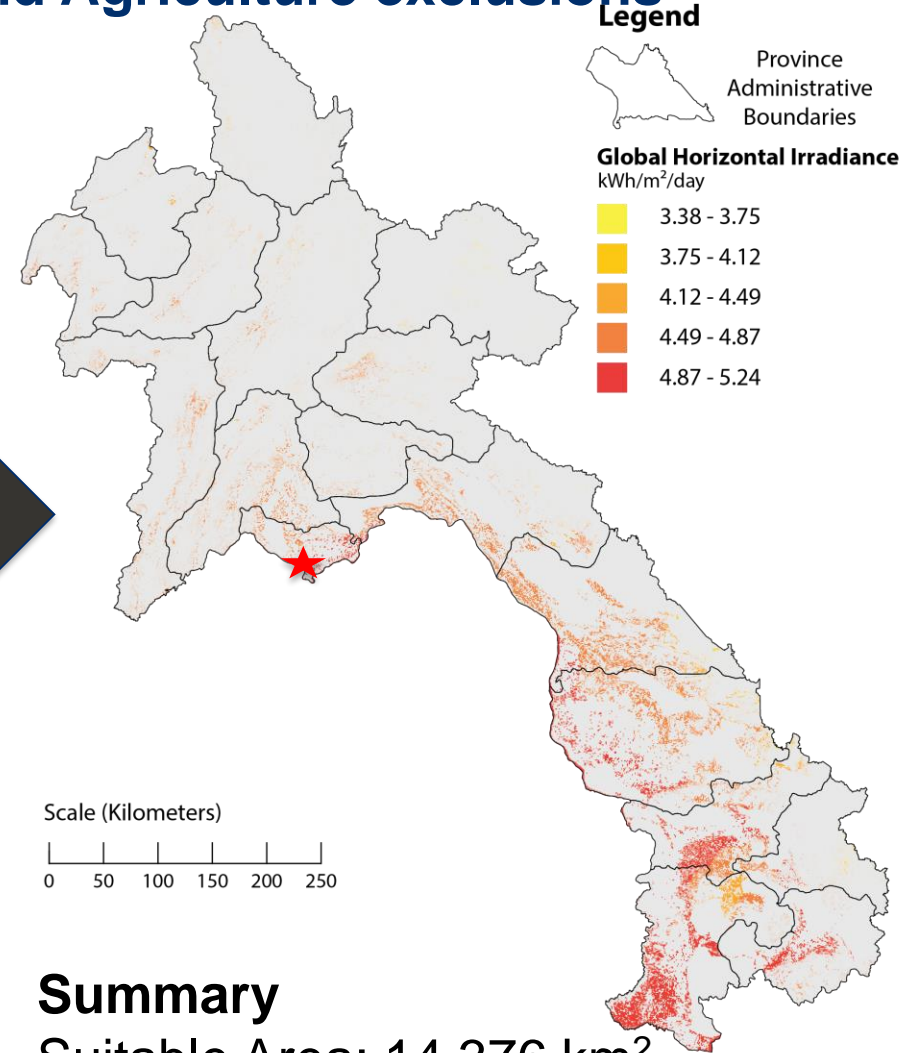
Summary

Suitable Area: 229,877 km²

Capacity: 8,276 GW

Generation: 11,139 TWh

Scenario 4 – All Exclusions + Forest and Agriculture exclusions



Summary

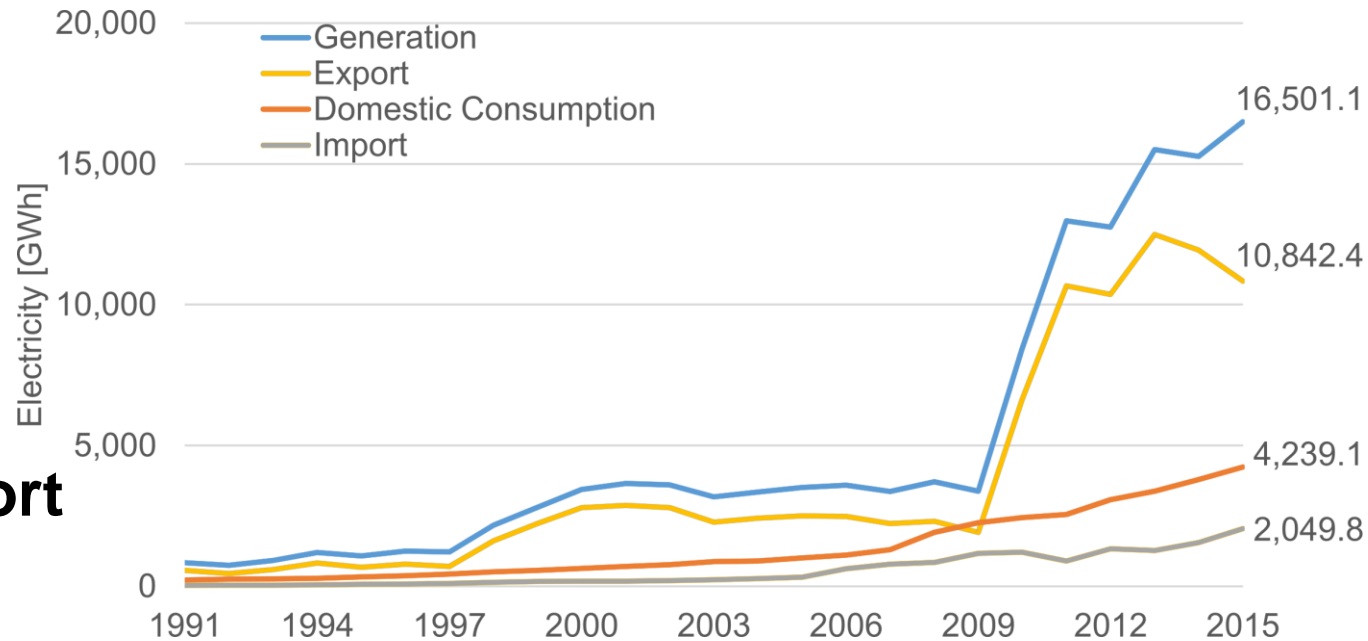
Suitable Area: 14,376 km²

Capacity: 518 GW

Generation: 731 TWh

Discussion – Energy Demand and Supply Strategies

**Electricity
generation,
consumption,
export and import**



**Projected total annual
domestic electricity
consumption for 2030
(TWh/year)**

22 to 33

**Technical potential results for
annual generation by technology
(TWh/year)**

731 to 8,997 (Solar PV)

135 to 682 (Wind)

720 (Biomass)

Looking Ahead to Resilient Power System Planning

- The technical potential results present opportunities for Lao PDR to diversify the electricity generation mix and work towards other objectives.
- Outputs from the Energy Alternatives Study will be plugged into ongoing and new planning efforts. Other outputs include:
 - Levelized cost of energy for domestic and imported energy resources
 - Data collection and management protocol to support the update and use of data for energy planning and policy activities
 - Identification of additional energy planning objective, beyond least cost
- We are working with USAID Clean Power Asia to address these issues:
 - What potential vulnerabilities does the power sector in Lao PDR have?
 - What is the appropriate method to assess these vulnerabilities?
 - What options are there to improve power sector resilience?
 - What results and information of this study can be used in implementing integrated resource and resilience planning (IRRP)?

Thank you!

Questions?



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