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MLFRD/PARI Joint Workshop in NayPyiTaw

Project Overview

Research on Rural Electrification in Myanmar

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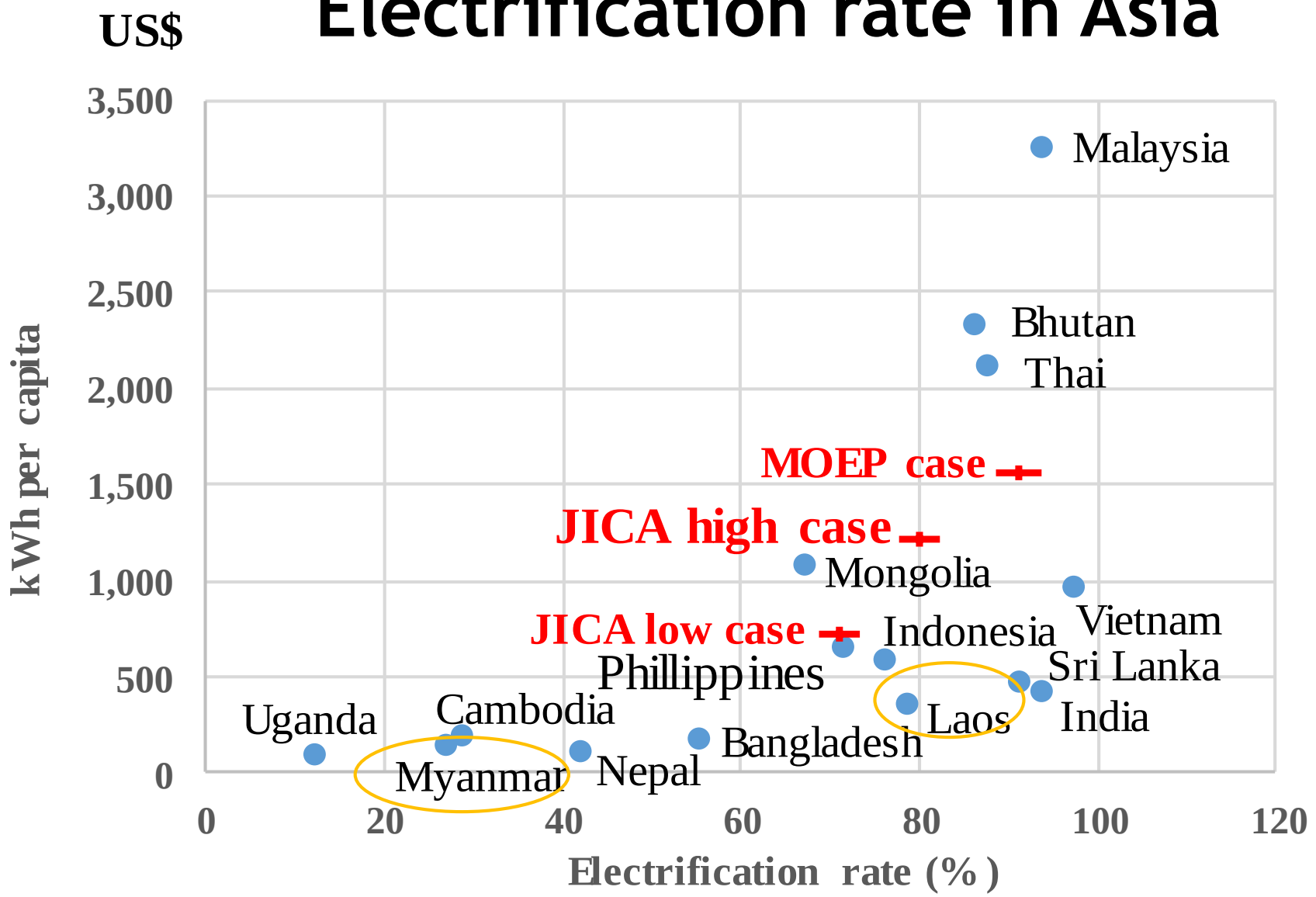
Electrification rate in Asia



(Source) Japan Electric Power Information Center (JEPIC)
(Note) The cases are estimated rate for Myanmar as of 2030 by JICA and MOEP

Challenges and concerns led by off and weak grid

Poverty

Sustainability

Social Division

Resilience

Pathway to a Bright Future for Myanmar

1948 Independence from the UK

1988 Military government
Crack down on democratic opposition

1989 Aung San Suu Kyi under house arrest

1997 ASEAN membership

2010 Release of Aung San Suu Kyi

2011
Thein Sein government
A reform drive
Transition to democracy

2012
Obama's visit and ease of sanctions
Waiver of loans by Japan
Suspension of EU sanctions

2014 ASEAN Chairmanship

2015 Launch of AEC (ASEAN Economic Community)
General elections

Increased Global Attention

History and Environment

Photo by Marcel Oosterwijk

Photo by Stefan Munder

Rich in Resources
Poor in Energy

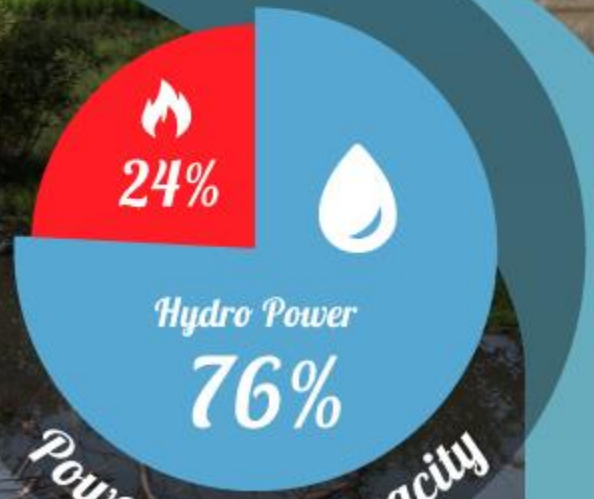


Photo by Roger Price


28%
Share of Electrified Households
Ayeyarwaddy
Yangon
Mandalay
Sagaing
Magway
Bago (east)
Rakhine
Power Grid
Hydro Power
Thermal Power
Source: Ministry of Electric Power, September 2011.
Connectivity is Needed
off-grid
off
on
near-grid
border area

Integration of Wider Energy-related Institutions

- **NEMC:** National Energy Management Committee
- **EDC:** Energy Development Committee
- **MOE:** Ministry of Energy
- **MOEP:** Ministry of Electric Power
- **MOAI:** Ministry of Agriculture and Irrigation
- **MOECAF:** Ministry of Environmental Conservation and Forestry
- **MOI:** Ministry of Industry
- **MOM:** Ministry of Mines
- **MOST:** Ministry of Science and Technology
- **MNPED:** Ministry of National Planning and Economic Development
- **MLFRD:** Ministry of Livestock, Fisheries and Rural Development
- Myanmar Engineering Society
- Renewable Energy Association of Myanmar

Tomorrow and Beyond

With Adequate Planning for Rural Areas

Without Adequate Planning

Major Visible Challenges of Myanmar in the Energy/Electricity Field

Short term:

- Stable supply of electricity
- Electricity tariff structure

Medium/Long term:

- Energy access/Electrification, particularly in rural area
- Investment environment
- Energy policy integration
- Human resource development

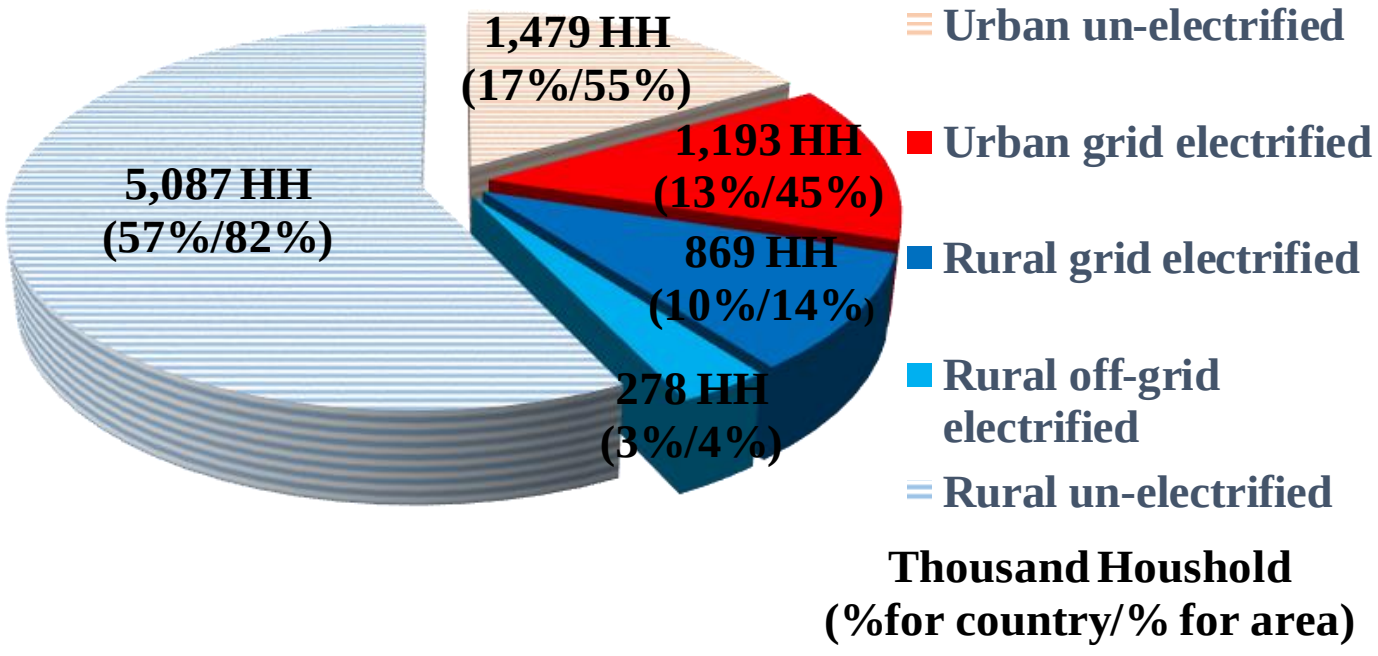
Demand projection for rural electrification

Current electrification situation

Household electrification rate is 26%

Rural household electrification rate is 18%

Urban household electrification rate is 45%



Original Project Overview

On-Grid

To improve electricity access in rural area

<Near Grid>	Off-Grid	<Border>
by expansion of the National grid	by making best use of local resources and enhancing connectivity	by building up connectivity with neighboring countries through power trade and FDI.

Bottom-up methodologies for research 2013-2014

1st stage Electricity demand forecast		
Fieldwork		
Possible power options, cost analysis, etc.	Possible small scaled renewable capacity development options, cost analysis, etc.	Myanmar's interest for power trade and FDI from Thailand, cost analysis, etc.
Case study		
(Good practices from GMS and lessons for Myanmar)	Good practices of renewables and IPPs from GMS lessons and conditions for success	Good practices of power trade and FDI from GMS, lessons and conditions for success
	Connectivity development simulation among mini-grids	
	Possible decentralized connectivity options	Neighboring perspective Thai actors' analysis
		Objective view and potential Thai investors' / power traders' analysis

Provision of common policy ground for discussion

HRD/Capacity Building

Integrated Energy Strategy

Current Project Overview

Researches on rural electricity access by other institutions

On-Grid

To improve electricity access in rural area

<Near Grid>	Off-Grid	<Border>
by expansion of the National grid	by making best use of local resources and enhancing connectivity	by building up connectivity with neighboring countries through power trade and FDI.

Bottom-up methodologies for research 2013-2014

Interim Achievements

Case study		
(Good practices from GMS and lessons for Myanmar)	Good practices of renewables and IPPs from GMS lessons and conditions for success	Good practices of power trade and FDI from GMS, lessons and conditions for success e.g. Nam Theun 2
Fieldwork		
Possible power options, cost analysis, etc.	Possible small scaled renewable capacity development options, cost analysis, etc.	Myanmar's interest for power trade and FDI from Thailand, cost analysis, etc.
Reality Check	Reality Check	Reality Check
Electricity demand forecast		
	Cost simulation among mini-grids	
	Possible decentralized connectivity options	**Neighboring perspective Thai actors' analysis**
		Objective view and potential Thai investors' / power traders' analysis

- 434 MW of off-grid power required by 2030
- 7.6b required
- Different barriers for different power sources

Provision of common policy ground for discussion

HRD/Capacity Building

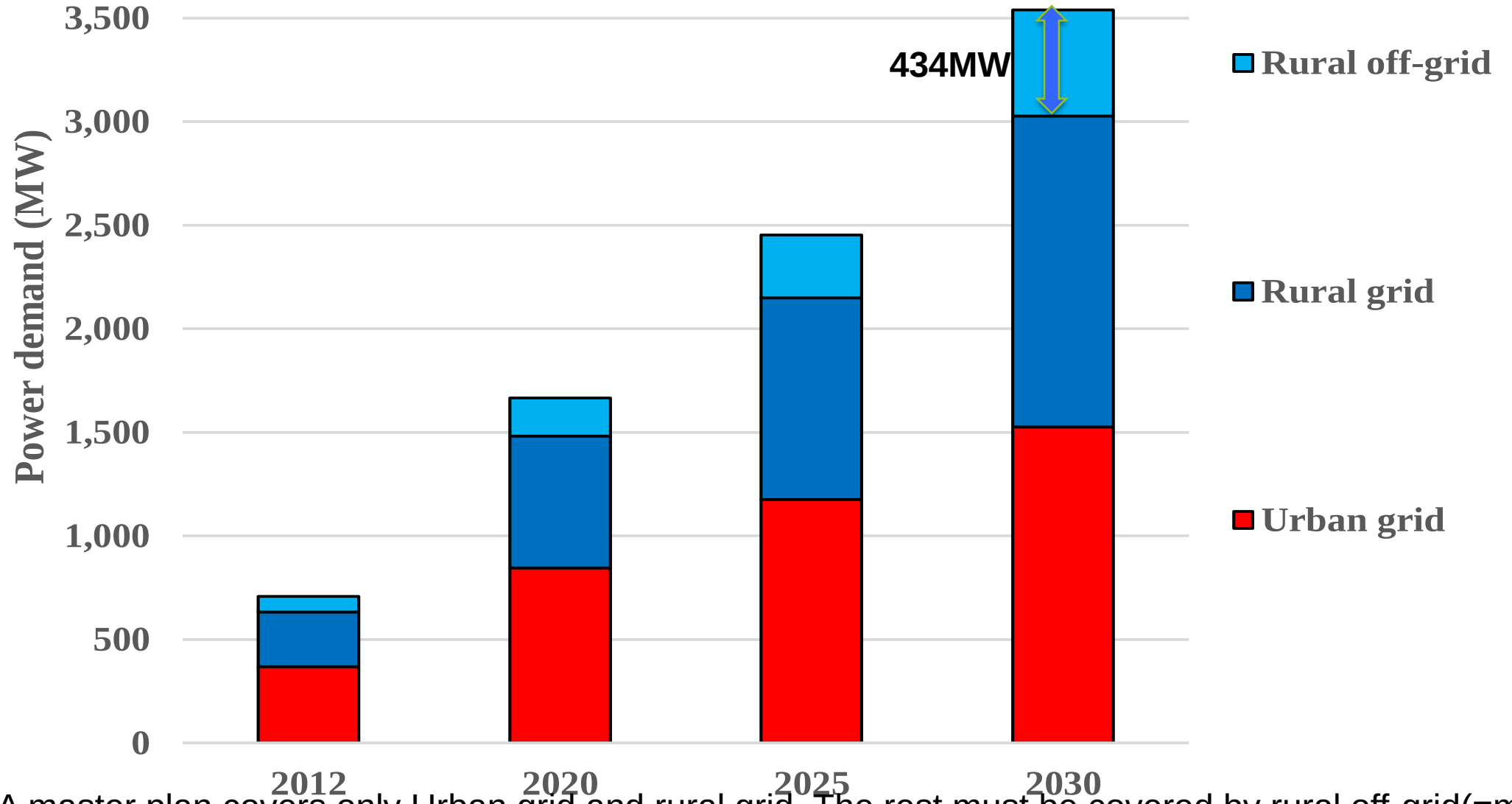
- Energy Policy Workshop (Sept. 2014-)

Integrated Energy Strategy

- A series of stakeholder's meetings and workshops

Demand projection for rural electrification

To achieve the target electrification rate of 70% for all of Myanmar by 2030, approximately 434 MW of off-grid electrification will be required



JICA master plan covers only Urban grid and rural grid. The rest must be covered by rural off-grid(=micro grid)

Unit cost for micro-grid installation in off-grid Electrification

Case	Component of micro-grid	Unit cost per micro-grid (US$/micro-grid)□Total	Micro-grid number (Electrified villages)	Electrification cost (MUS$) Total
1	PV+Dies+Biog+Bat+Con	212,258	9,989	2,120
2	PV+Dies+Biog+Bat+Con	212,258	1,110	236
3	PV+Dies+Biog+Bat+Con	766,061	2,854	2,187
4	Hydro+Bat +Con	640,603	317	203
5	PV+Dies+Biog+Bat+Con	1,943,341	1,427	2,773
6	Hydro+Dies+ Biog+Bat+Con	736,526	159	117
Total			15,856	7,636
US$ per micro-grid			—	481,584
US$ per kW			—	14,827

Total Electrification (Rural) Cost: 7,636 M USD (Tentative)

Caveats: the results depend on: hydro availability, technology costs (e.g., PV), rather large demand, coarse data resolution

Neighboring Perspective

Investment

Generation Project
Coal / Hydro

IPPs Investor
EGATi, EGCO, GPSC

Concerns

Power Trade

Civil / Local Society

Left over

EGAT
Off-take Purchase

MEPE
Domestic Supply

Finance

Lender
Public/Private Bank

Findings

	Economic Barrier	Social Barrier
Coal-fired plant	•Due to the comparably high operational cost, it is difficult to make the project bankable. •Moreover, It is difficult to get lender such as World Bank and Asian Development Bank.	•Recent environmental NGOs movement should be severer in near future. •A compensation payment attached to its relocation is not so huge as mega hydro.
Hydro Plant	•Though its initial cost is huge, operational cost is low. •With the scale of economy, huge hydro (eg 7,000mw: Tasan) should be economically feasible.	•Larger and larger hydro plants are, severer and severer social/environmental impacts are. •Also, the dam location is mostly in armed conflict areas.

Economic barriers of coal-fired plant (Focus in 2013)

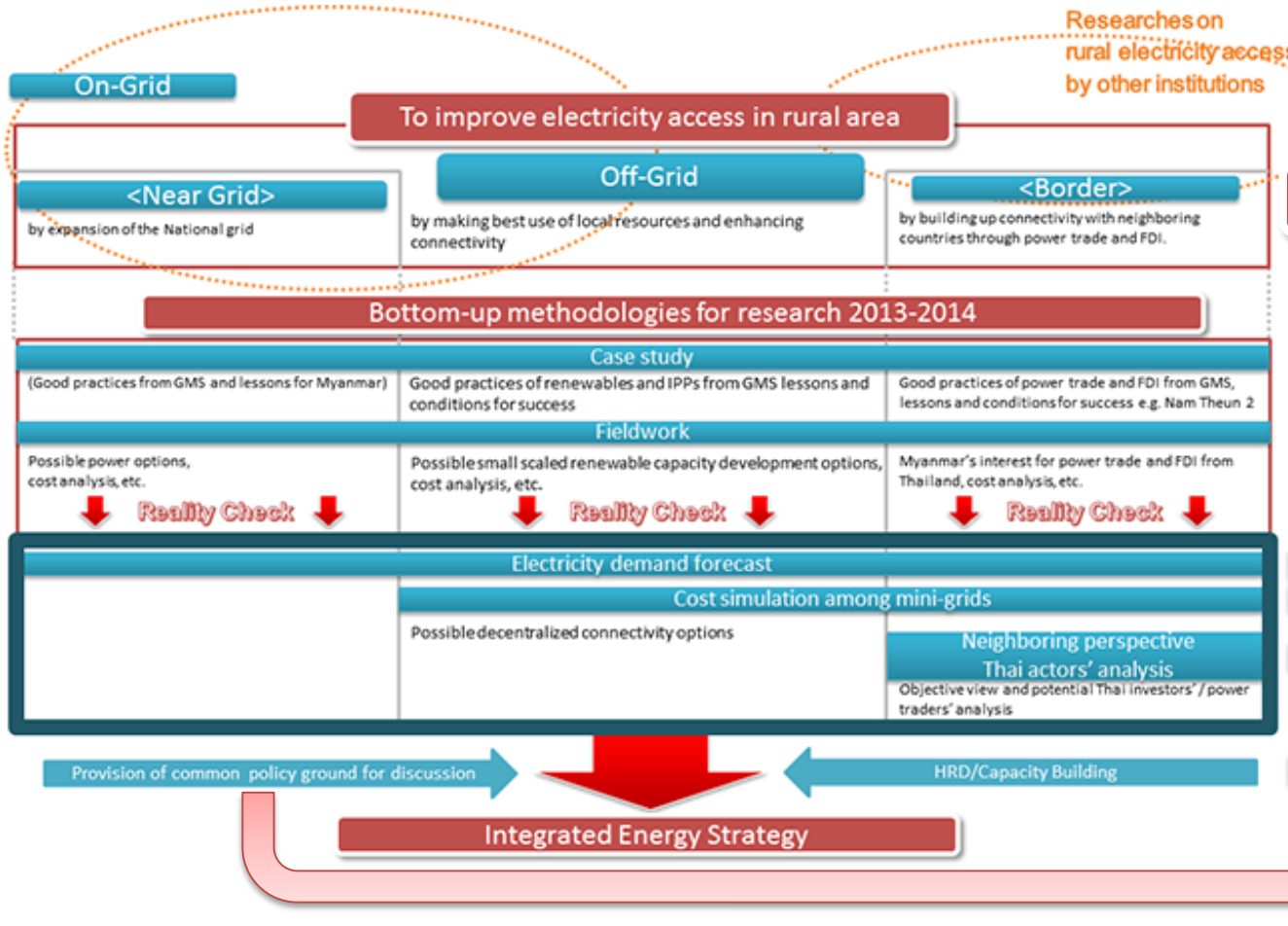
⇒ Social barriers of hydro plant (Focus in 2014)

Cooperation for human resource development

The Energy Policy Workshop 2014 (Opening Ceremony)

The Energy Policy Workshop 2014

Way Forward



Interim Achievements

2014-2015

434 MW of off-grid power required by 2030
7.6b required
→ More detailed examination/study

Different barriers for different power sources
→ Focus to move to the Chinese border, e.g. the Salween River

Energy Policy Workshop (Sept. 2014-)
→ Successful completion and next step

A series of stakeholder's meetings and workshops
→ To be steadily continued

Additional area/focus of research

Cost analysis of the interaction between near grid (grid expansion) and off-grid (independent mini grids)

→ **Scenario Development Policy recommendation**

Thank you!

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