Towards Universal Access to Electricity by 2030:

GEOSPATIAL, LEAST-COST ELECTRIFICATION PLANNING IN MYANMAR

WORLD BANK GROUP
Energy & Extractives

ESMAP
Energy Sector Management Assistance Program

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Outline

- Objectives and institutional arrangements
- Activities relating to setting up a system, integrating data
- Value of new results as a result of integrating spatial data across sectors
- Challenges and areas for to coordinate or collaborate
- Upcoming activities/next steps

Context

- The objective of a geospatial least cost national electrification rollout plan, is to ensure that limited resource are used **efficiently and effectively** to maximize the results in order to achieve Myanmar's target of universal access by 2030.

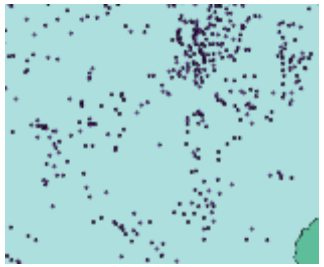
- The process and implementation of this plan are expected to contribute to the following outcomes :

- *Raising financing*
- *Informing policy*
- *Building Capacity*
- *Establishing an effective mechanism for monitoring, update and impact evaluation*

- The initiative was led by Ministry of Electricity and Energy and Ministry of Agriculture, Livestock and Irrigation with World Bank assistance.

Approach

1. **Collect input data**
   - **populated places, MV grid lines, and numerous modeling parameters**
2. **Use algorithm to plan least-cost electrification system**
   - **grid, mini-grid, off-grid (solar home systems)**
3. **Plan the sequence of grid roll-out in phases**



Populated places

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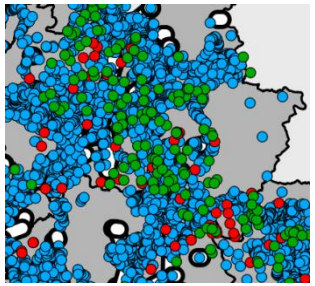
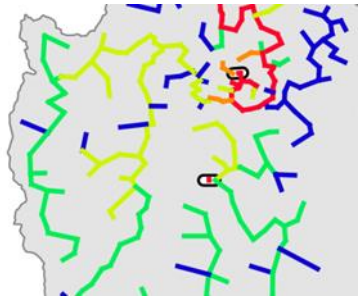
Grid lines



Select least-cost technology



Plan Roll-Out (5 Phases)

Population Data Sources (as of 2013-2014)

1. Ministry of Livestock, Fisheries and Rural Development (DRD)
   - Village Level Population Data, 2001

2. Ministry of Home Affairs, General Administration Department (GAD)
   - Additional population data for villages, cities and towns (2013)

3. Central Statistical Organization (CSO)
   - Rural and Urban Total Population and growth rates

4. Myanmar Information Management Unit (MIMU)
   - Geo-location of all villages by State (but no population data)

When combined these sources provided:

- **64,000 points for villages**
- **300 points for cities and towns**
- **rural and urban growth rates, by year, for each state / region**

Two-pronged Approach: Grid and Off-grid Rollout Plan

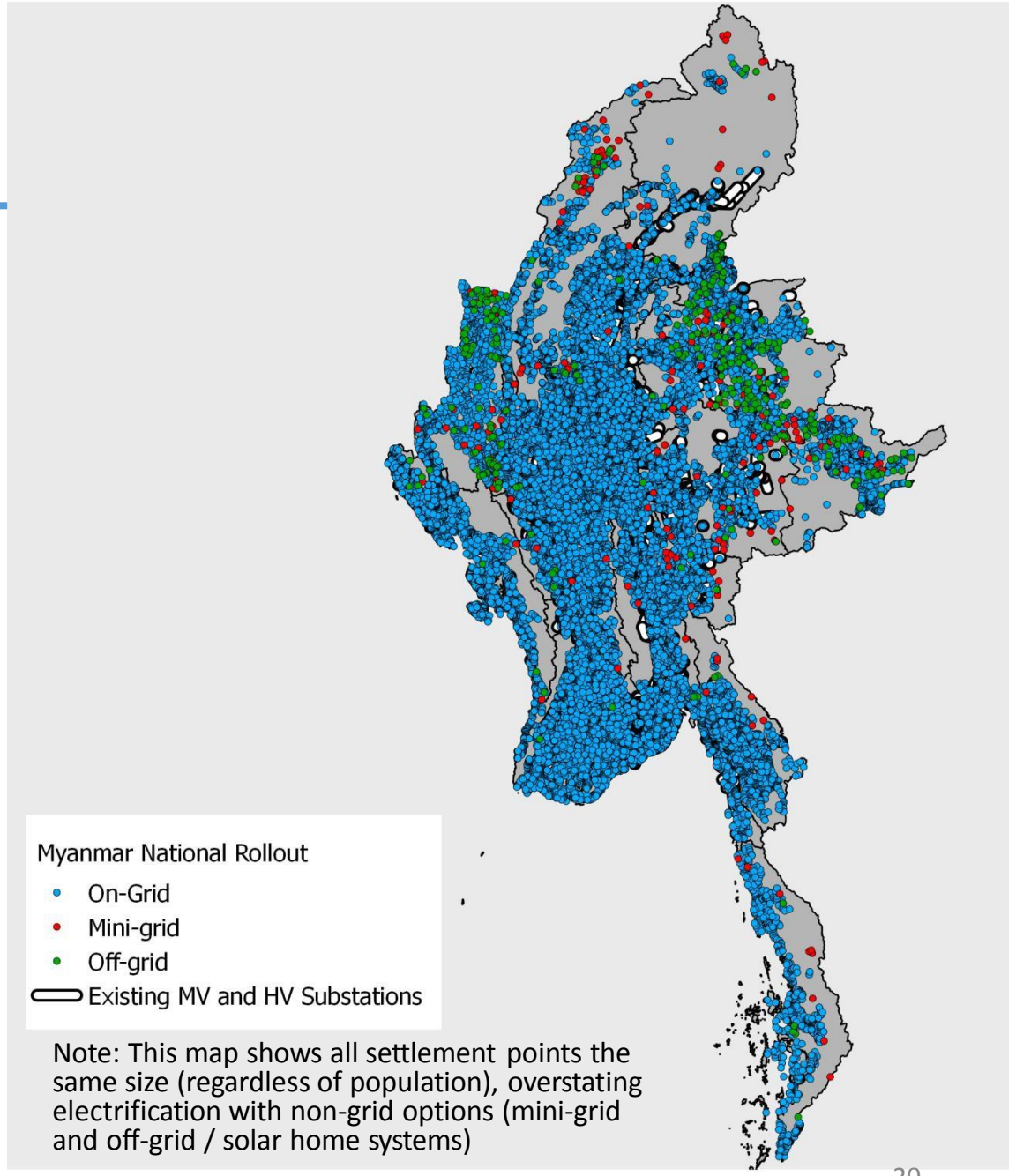
1) **Grid extension will reach some states later in grid roll-out, and these connections will cost substantially more per household**

2) **For those areas where grid will arrive late, an off-grid "pre-electrification" option can provide non-grid electricity service in the short- and medium-term**

3) **Over the long-term, grid extension is the most cost-effective option for the overwhelming majority of households**

Least-Cost Recommendation for 2030

- By 2030, the majority is **grid connections**
- This will be **7.2 million households**
- Total cost is estimated at **US $5.8 billion** (US$800 per connection, average)
- This will be in addition to investments needed for generation & transmission



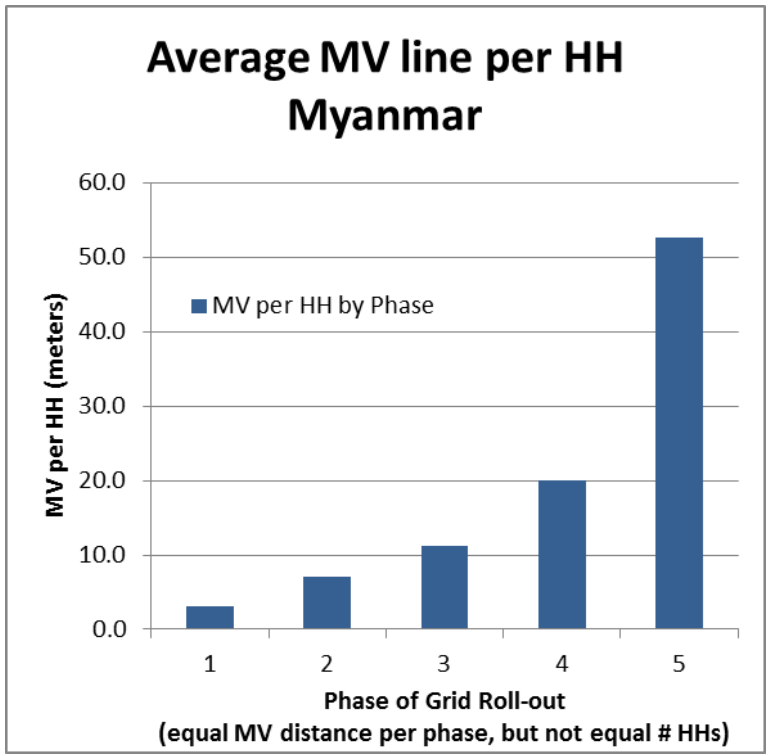
Note: This map shows all settlement points the same size (regardless of population), overstating electrification with non-grid options (mini-grid and off-grid / solar home systems)

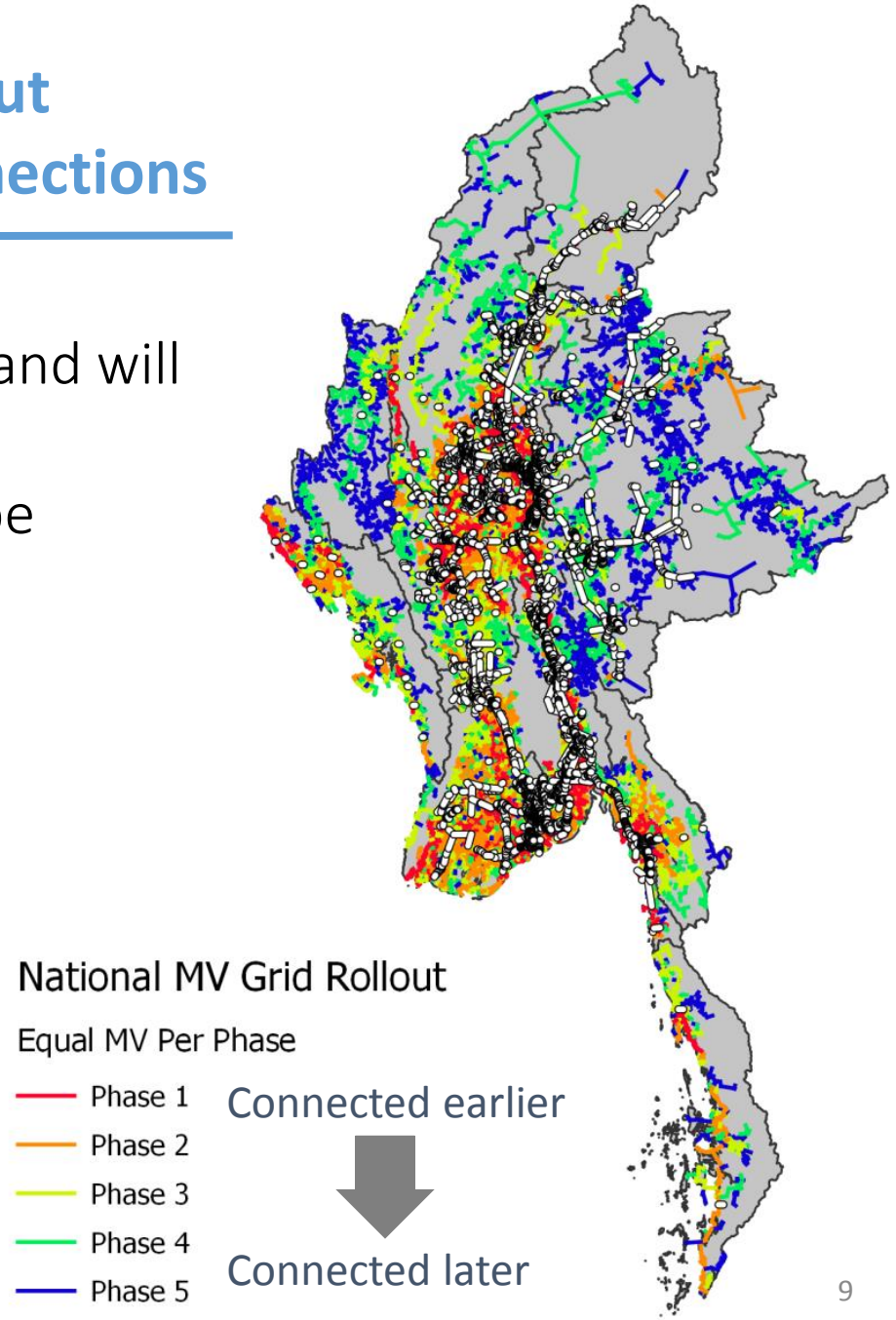
2) Grid extension will reach some states later in grid roll-out, and these connections will cost substantially more per household

(This applies primarily to Chin, Shan, Kachin and Kayah, and to a lesser extent Kayin, Sagaing, Tanintharyi.)

Recommended sequencing of Grid Roll-out proceeds from low-cost to high-cost connections

- Dense areas require less MV per connection and will be connected first
- Remote communities require more and will be connected later

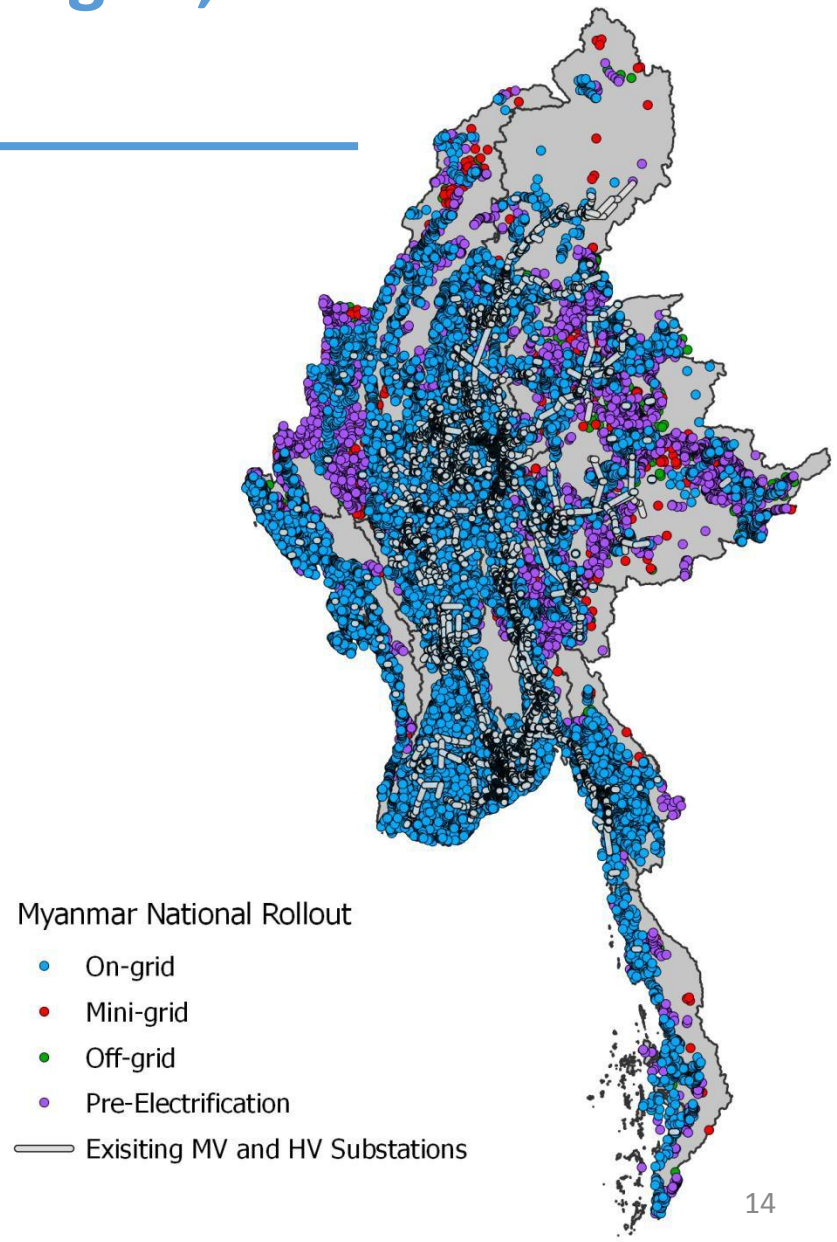




3) For those areas where grid will arrive late, a “pre-electrification” option can provide non-grid electricity service in the short term

Recommendations for a Off-grid, Pre-electrification Plan

- **Consider the last 3-4% of settlements for pre-electrification**
  - **-- 5,000 communities**
  - **-- 250,000 households**
- **Shan, Chin, Kayah and Kachin States** represent major areas for pre-electrification
- Which system is best (solar home system versus mini-grid) depends on the size of the settlement



Challenges and Lessons Learned

Initial Results:

- Mobilized $600 **million concessional financing** from World Bank and other DPs
- Informed development of the market-based IFC Lighting Myanmar Program
- JICA, KfW, GiZ, ADB, Italy, etc use NEP as common platform for their support to electrification

Challenges:

- **Local capacity in development and use of geospatial planning tools**
- **Data sharing, harmonization and update**
- User-friendly, open platform

Next Steps

- **Update the plan with new administrative divisions and population**
- **Develop capacity**
- **Integrate electrification planning, monitoring and impact evaluation**
- **Collaborate with other ministries**