RURAL ENERGY DEMAND

KEY POINTS

- Your community can generate electricity from Solar, Micro Hydro, Biomass, and Wind energy, depending on resource availability.
- Renewable energy (RE) systems can be on-grid, off-grid, or both. Off-grid systems can be sized for households, the community, or enterprises.
- Over the last 30+ years, over 5,000 off-grid RE systems have been developed, with close collaboration between communities and local RE entrepreneurs.
- Depending on the system size, off-grid RE can power lighting, phone charging, small appliances, cooking, water pumping, and agriculture processing.
- Micro hydro and biomass systems do not require battery storage, so they are often less costly. Off grid solar and wind energy systems require batteries, which are costly and need to be replaced. However, solar and wind water pumping systems do not need batteries.
- Financial viability, local technical capacity building, social cohesion, and the environment are important factors for long life of community-based RE.

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COMMUNITY-BASED RENEWABLE ENERGY SOLUTIONS

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SOLUTIONS

COST EFFECTIVE **SOLUTIONS** DEPENDING ON NATURAL RESOURCE AVAILABILITY

	LIGHTS / PHONE / TV	HOUSEHOLD COOKING	WATER PUMPING	AGRI PROCESSING
SOLAR	Solar Home Lighting System (household size)	Solar Home System (household size)	Solar Water Pump with Water Tank (no battery)	Community Solar Mini-grid
MICRO HYDRO	Pico (<5kW) Hydro (household or hamlet size)	Pico (<5kW) Hydro	Pico (<5kW) Hydro or Ram Pump	Micro (<100kW) or Mini (<1MW) Hydro
BIOMASS	Community Biomass Gasifier or Household Biogas	Community Biomass Gasifier or Household Biogas	Community Biomass Gasifier	Community or Enterprise Biomass Gasifier
WIND	Pico (<5kW) Wind System	Pico (<5kW) Wind System	Wind-powered Pump	Micro (<100kW) or Mini (<1MW) Hydro

TECHNOLOGY

COST EFFECTIVE **SOLUTIONS** DEPENDING ON NATURAL RESOURCE AVAILABILITY

	RESOURCE AVAILABILITY	MAIN COMPONENTS	REPEATING COSTS (Within 10 years)	LOCAL SERVICES
SOLAR	Most of Myanmar has solar potential but less during rain	Panels, Mount, Battery, Inverter Distribution Line	Battery: 5-8 years (most expensive component)	- Small construction - Operation
MICRO HYDRO	Flowing water is available mainly in hilly, forest regions	Civil works, Pipe, Powerhouse, Turbine System, Distribution Line	Bearings: 5 years (less expensive component)	- Civil Construction - Turbine Fabrication - Installation - Operation
BIOMASS	Most of Myanmar has biomass waste (e.g. rice husk)	Gasifier System, Power-house, Biomass Storage Distribution Line	Air filters: 5 years (less expensive component)	- Civil Construction - Gasifier Fabrication - Operation
WIND	Blowing wind is available mainly in coastal regions	Wind turbine system, Mount, Battery, Distribution Line	Battery: 5-8 years (most expensive) Bearings: 5 years (less expensive)	- Civil Construction - Turbine Fabrication - Operation

BEST PRACTICES

STEP 1: MOBILIZE

- Identify **electricity needs** in the community
- Identify all **RE options** for your community
- With RE suppliers' inputs, analyze pros and cons of each option
- Take community to **visit existing RE** project
- Establish **decision-making group** and process for next steps

STEP 2: DESIGN

- Measure natural **resource availability** to identify system size
- Request quotations & **select supplier**
- Find **funding sources**
- Create **finance plan**, (budget, fees, & tariff structure for RE system income and long life)
- **RE + eco-restoration** (Micro hydro watershed, No-pollution gasifier)

STEP 3: CONSTRUCT

- **Create timeline** for procuring, construction, installation, & testing
- **Plan for monsoon** time construction
- Identify technical team from the community for **hands-on training** during construction & installation, & testing
- **Involve all community** members as much as possible

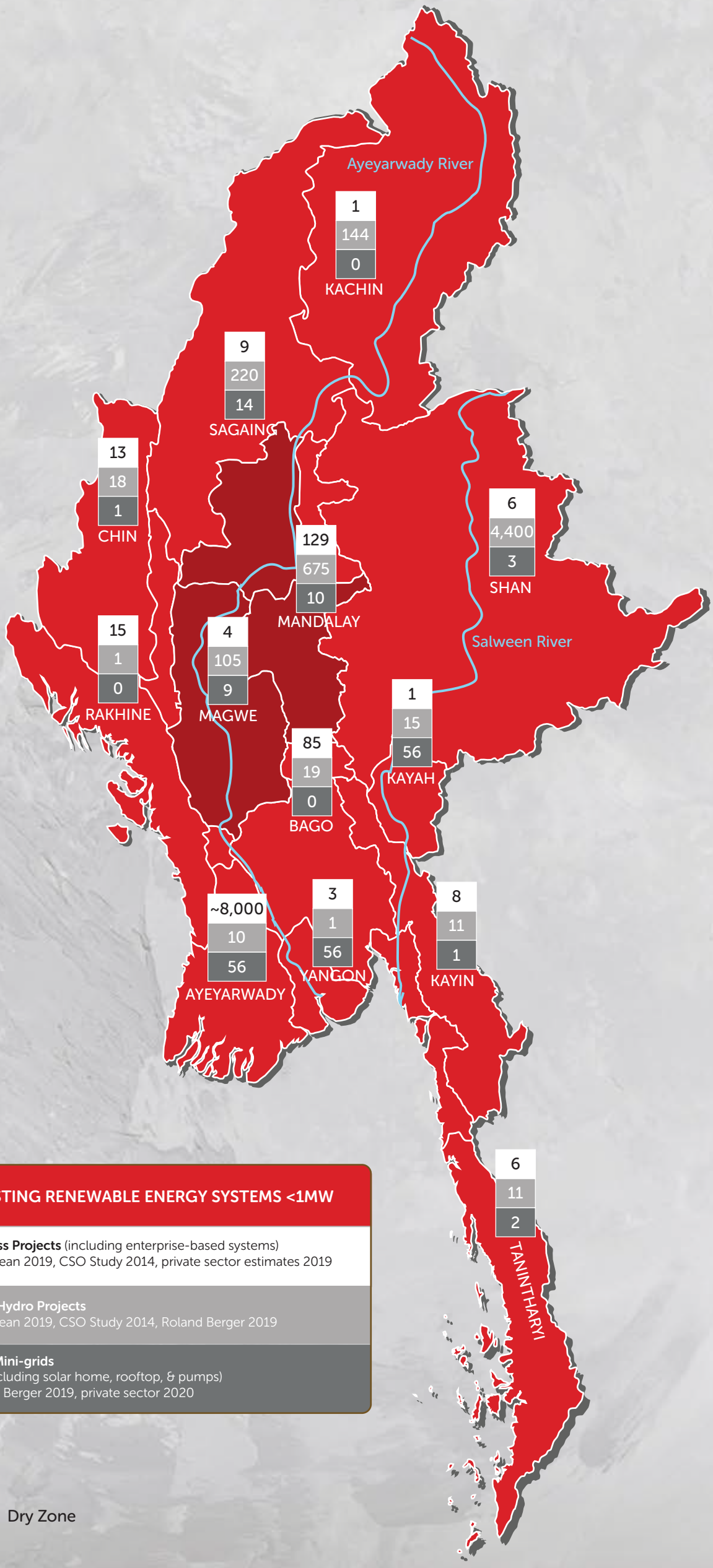
STEP 4: SUSTAIN

- Establish technical and managerial staff (local utility) for **continuous operations** (24 hrs/day)
- **Collect fees & tariff** of households, enterprises
- Develop more end use
- Creative incentives for **use during off peak** hours (discounted tariff)
- Maintain **transparent dialogue** with users

COMMUNITY-BASED RENEWABLE ENERGY MAP OF MYANMAR

OFF-GRID RE MAP, MODELS & ACTORS OF MYANMAR

Off-grid RE has flourished in Myanmar since the 1990s. In the scale of <1MW, as of 2020, 5,000+ small-scale hydro, 8,000+ biomass gasifiers, 50+ solar mini-grids, 240,000+ solar home lighting systems, 1,000s of solar and treadle pumps, and 2 wind systems have been installed. The rollout models and the actors involved in these installations provide insight on how to accelerate sustainable clean energy access.



SMALL-SCALE HYDRO MODELS

Village Electrification Committee (VEC)

- **Self-funded Example**
  Htan Hla Pin Micro Hydro, Shan State,
  Installed: 2004, Capacity: 20kW,
  Connections: ~150 households, flat tariff
  Funding: 100% VEC funds,
  Financed by: Manufacturer-Supplier,
  Status: Used for lighting, TV, phone charging
- **Government-funded Example**
  Tarlapine Micro Hydro, Thaninthayri State,
  Installed: 2015, Capacity: 50 kW,
  Connections: 60 households, flat tariff,
  Funding: 100% Government funds,
  Status: Replaced with diesel generator

Cooperative-owned

- **Self-funded Example**
  Mae Muk Micro Hydro, Shan State,
  Installed: 2012, Capacity: 80kW,
  Connections: 700 households, metered,
  Funding: Cooperatives of 30+ members,
  Financed by: Cooperative members & investors,
  Status: Upgrading to 300kW for enterprise usett

BIOMASS GASIFIER MODELS

Biomass Mini-Grid Examples

- **Self-funded Example**
  Hlaingbone Gasifier, Ayeywarwaddy,
  Installed: 2015, Capacity: 200 kW,
  Connections: 300 households, metered,
  Funding: 100% VEC funds,
  Financed by: Manufacturer-Supplier,
  Status: Operating for all end uses
- **Subsidized Example**
  Betut Village Gasifier, Ayeywarwaddy,
  Installed: 2019, Capacity: 200 kW,
  Connections: 500 households, metered,
  Funding: 60% NEP subsidy, 20% VEC,
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Enterprise-based Biomass Gasifier Example

- **Co-funded Example**
  Thein San Rice Mill, Ayeywarwaddy,
  Installed: 2019, Capacity: 200 kW,
  Funding: 60% RBF, 40% Rice Mill,
  Status: Operating

SOLAR PV MODELS

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  Status: Operating
- **Solar Pumping**
  REAM PV Pumping Revolving Fund,
  Initiated: 2018,
  Capacity: 60-250 ft. head, 2,500-5,000 gal/day,
  Financed by: A-Bank,
  Status: 10 farmers financed
- **Solar PV Cooking using Recycled Li-Ion Batteries**
  SWITCH Batteries, AMPERES, REAM, Yi-Mon Electronics,
  Installed: 2020, Capacity: 1kW,
  Funding: Modern Energy Cooking Services (MECS),
  Status: 2 battery-packs built locally

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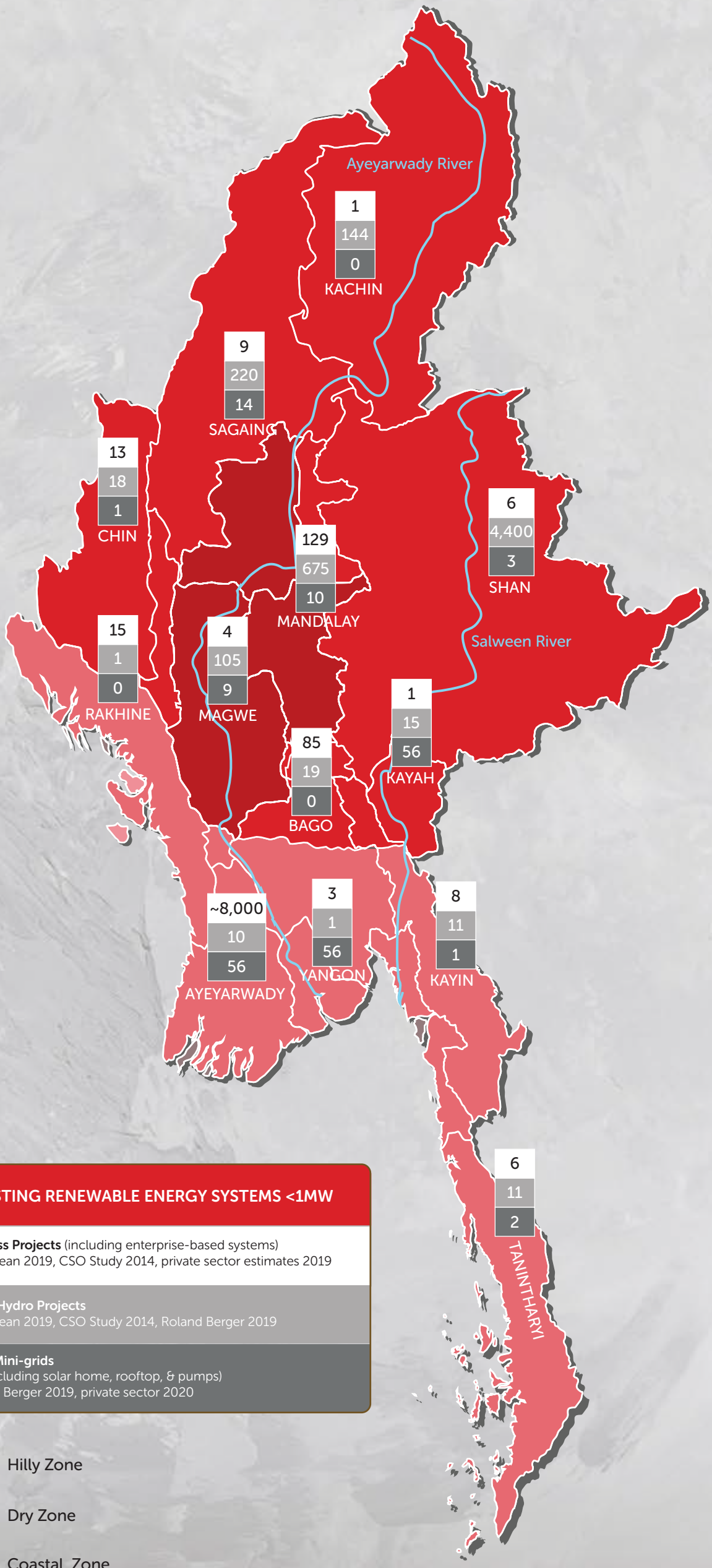

EXISTING RENEWABLE ENERGY SYSTEMS <1MW

Biomass Projects (including enterprise-based systems)
C.Grecean 2019, CSO Study 2014, private sector estimates 2019

Micro Hydro Projects
C.Grecean 2019, CSO Study 2014, Roland Berger 2019

Solar Mini-grids
(not including solar home, rooftop, & pumps)
Roland Berger 2019, private sector 2020

- Hilly Zone
- Dry Zone
- Coastal Zone

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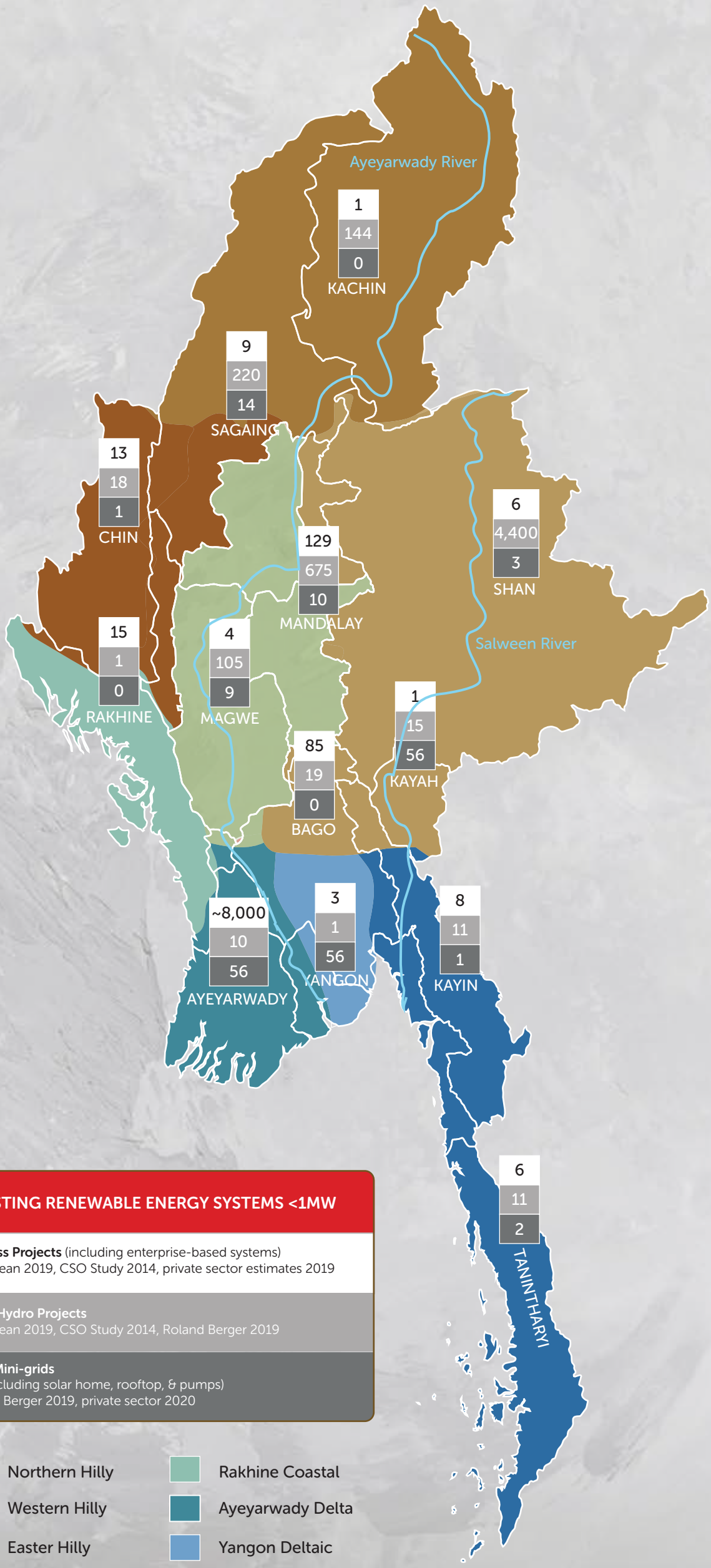

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