

Grid Interconnection of Off-grid Community-based Projects

What happened when the Grid Arrived - Sri Lankan Experience

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Sri Lanka

- Island nation; 65,600 sq km; 21 m population
- The WB & GEF-assisted Renewable Energy Program:
 - ✓ Energy Services Delivery (ESD) Project (1997-2002)
 - ✓ Renewable Energy for Rural Economic Development (RERED) Project (2002-2012)
- Access to grid: 40% of households (1996)
over 96% of households at present

Policy – mid 1990s

- Private investments in the power sector were encouraged to address:
 - ✓ Growth in demand
 - ✓ Development of small hydros being administratively difficult to the Utility
- Utility willing to buy energy from small hydros consistent with its least cost generation plan
- Off-grid solutions to complement the grid or as ‘pre-electrification’ measures

ESD & RERED Projects

Key Programme Components

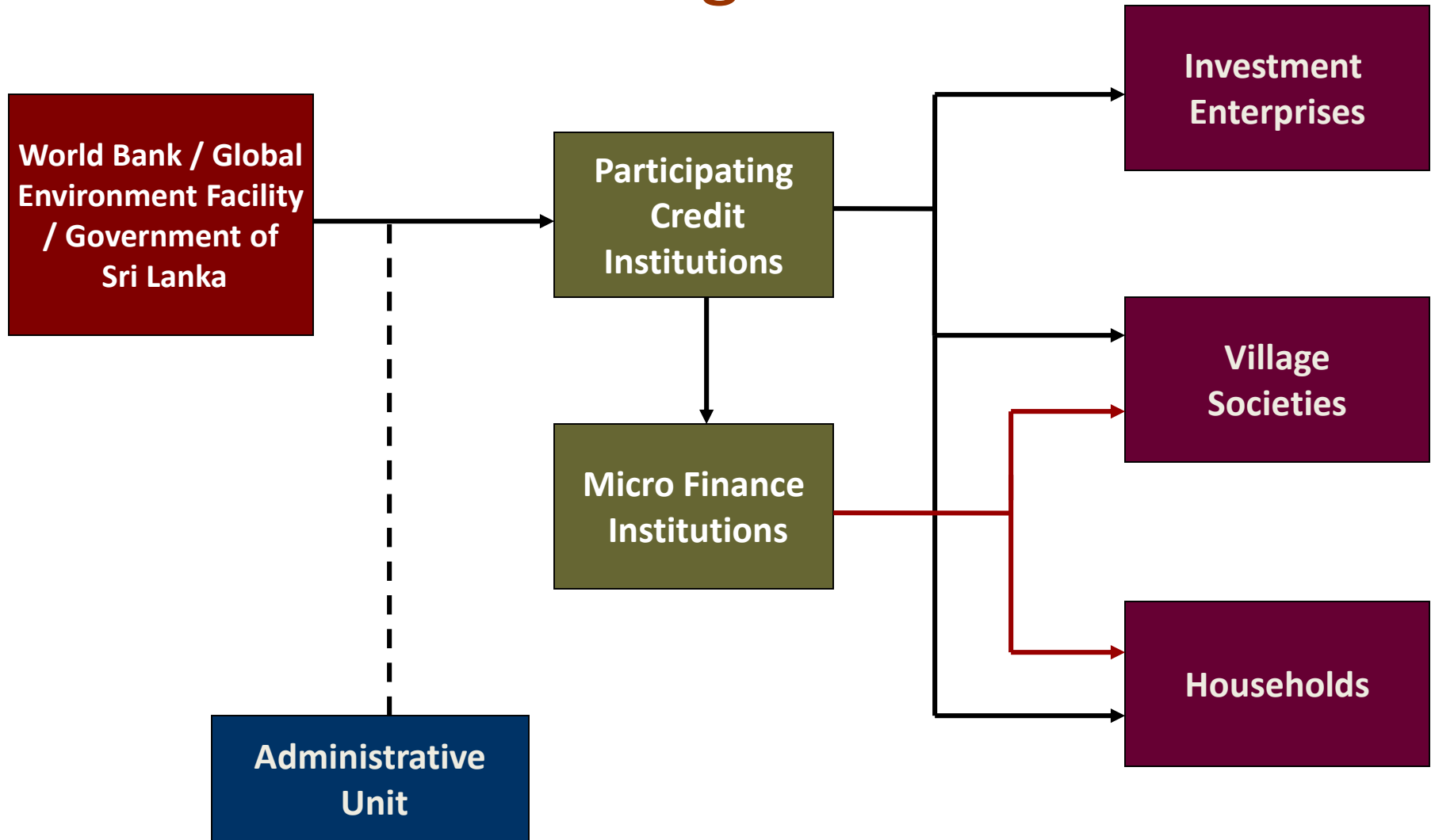
- Grid-connected
Hydro / Wind / Biomass
- Off-grid Community-based
Hydro / Wind / Biomass
- Off-grid Household-based
Solar / Wind
- Widely implemented technologies/components:
grid-connected & off-grid hydros and SHS



Business Model

- Demand driven, market based approach
- Create an enabling environment:
 - ✓ Address information, institutional, legal/regulatory and financial barriers in an integrated manner
 - ✓ Loans on standard commercial criteria
 - ✓ Output based subsidies for off-grid projects
 - ✓ Technical assistance and capacity building
- Program management by an Administrative Unit set up within DFCC Bank

Credit Programme



Off-grid Community-based Projects

Design

- Run-of-the-river schemes providing electricity through an independent mini grid: a typical 10kW scheme serves 40 HH within a 2km radius
- Built, owned and operated by the community through an Electricity Consumer Society (ECS)
- Technical specifications defined by Project
- Technical assistance and grant through GEF
- Loans on market terms, based on independent credit assessment and access to long-term funds



Regulation

- Registration of the ECS
- All consumers obtaining membership of the ECS
 - ✓ Members to appoint a working Committee including President, Secretary & Treasurer, who will liaise with all external agencies/consultants
 - ✓ Committee members elected annually at an annual general meeting
- Obtaining necessary Statutory approvals, including;
 - ✓ Central Environmental Authority
 - ✓ Local/District/Provincial authorities

- Working Committee of the ECS to regulate usage and collect tariff
- Design & implementation by a registered project preparation consultant
- Turbines tested at a well-equipped lab
- Conformity to technical standards by verification at design, installation and post-installation stages by qualified engineers
- Service and warranty arrangements

- Needs based training for consultants and equipment suppliers
- Assistance to ECSs on management aspects
 - ✓ Model constitution and organization structure
 - ✓ Basic finance and administration
 - ✓ Participatory approach
- Awareness on consumer protection
 - ✓ Clarify stakeholder roles & responsibilities
 - ✓ Complaint investigation scheme
 - ✓ Basic O&M
- Innovation Solicitation - Promote cottage level industries using electricity

Innovation Solicitation



Financing

- All members to pay a fixed monthly membership fee (site specific) irrespective of consumption
- Membership fee to cover debt servicing and O&M
- Loan is structured such that part of membership fee is adequate to service the loan
 - ✓ Approximately USD 9 per month during servicing of the loan
 - ✓ Approximately USD 2 per month once the loan is fully settled (@ 1 USD : LKR 112)
- Cross guarantees (among members)

When the Grid Arrives

Available Options

- Operate parallel to the grid electricity
 - ✓ Financial benefit of continuing to using the already developed resource
 - ✓ As a back-up in the event of a breakdown
- Sold to a mini hydro developer (> 100 kW) to enhance the capacity of an existing/proposed grid-connected mini hydro project
- To develop as a small scale grid-connected project

Connection of Community-based Projects to the National Grid

Regulation

- ECS to be converted to a limited liability company
- Energy permit by Sustainable Energy Authority
- Letter of Intent / Standard Power Purchase Agreement by the Utility
- Environmental and Local/District/Provincial approvals
 - ✓ Approvals obtained for community hydro project by the ESC are valid if the grid-connected project is of the same capacity
 - ✓ New approvals are required if the capacity is enhanced
- Projects to be > 10 kW
- Eligible for the same tariff as any other grid-connected mini hydros (> 100 kW)
- Utility to make payment on a monthly/quarterly basis

Design

- Same civil structures to be used with repairs/modifications as required
- Repairs/replacement of electrometrical equipment
- Low voltage connection to the nearest transformer (< 50 kW)

Implementation

1/2

- Initiated by an individual/group of the ECS
- An entrepreneur in the locality or Federation of Electricity Consumer Societies to acquire the site from the community as an investment
- 100% acquisition by an investor is not permitted
- Purchase consideration
 - ✓ Cash payment to the community
Approximately USD 120 per HH (@ 1 USD : LKR 150)
95% ownership to the investor & balance 5% to the community
 - ✓ No cash payment
25% to 30% of ownership to the community and balance to the investor

Implementation

2/2

- All households of the former ECS to be shareholders of the company
- A community representative to be appointed as a director
- A community member to be assigned for O&M for a fee (same as the previous off-grid model)
- An amount of the income to be reserved for O&M (same as the previous off-grid model)
- Share of community profit to be distributed equally among all households, who are shareholders of the new company

Financial

- Cost of conversion
 - ✓ USD 13,350 approx. (@ 1 USD : LKR 150)
highly site specific and also vary depending on the condition of the project assets
 - ✓ May increase further if major repairs are required on civil structures
- Investor to obtain a loan if necessary on commercial terms based on the viability of the project

Progress to -date

- 3 projects connected to the national grid (12 kW, 21 kW & 45 kW)
- 2 more projects under implementation (27 kW & 30 kW)
- Applications received for 10 more projects (all > 20 kW)
- Further potential – approximately 30 more projects



- 45 kW project connected to the national grid in 2015



- 21 kW project connected to the national grid in 2012

Performance to-date

| Project | Kudawan Dola | Malpel Dola | Kudawa Lunugalahena |
|--|---|---|---|
| Year of connection | 2012 | 2013 | 2015 |
| Capacity (kW) | 21 | 12 | 45 |
| New components | Panel Board, Induction Motor, grid connection cable and accessories | Panel Board, Induction Motor, grid connection cable and accessories | Panel Board, Induction Motor, grid connection cable and accessories |
| Supplier | Fentons Ltd. | Fentons Ltd. | Fentons Ltd. |
| Total cost (USD) - @ 1 USD : LKR 150 <i>(includes cost of household connection to national grid)</i> | 18,033 | 14,403 | 25,250 |
| Cost per kW (USD) - @ 1 USD : LKR 150 | 859 | 1,200 | 561 |
| Estimated Plant factor | 70% | 70% | 70% |
| Tariff (USD) - @ 1 USD : LKR 150 | 0.1002 | 0.0994 | 0.1177 |
| Estimated Income p.a. (USD approx.) @ 1 USD : LKR 150 | 12,903 | 7,314 | 32,478 |
| Estimated Income p.a. per kW (USD approx.) - @ 1 USD : LKR 150 | 614 | 610 | 722 |

Source: Energy Forum

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