Linking Productive Activities in Rural Areas to Energy Services-A Case for Micro Hydro

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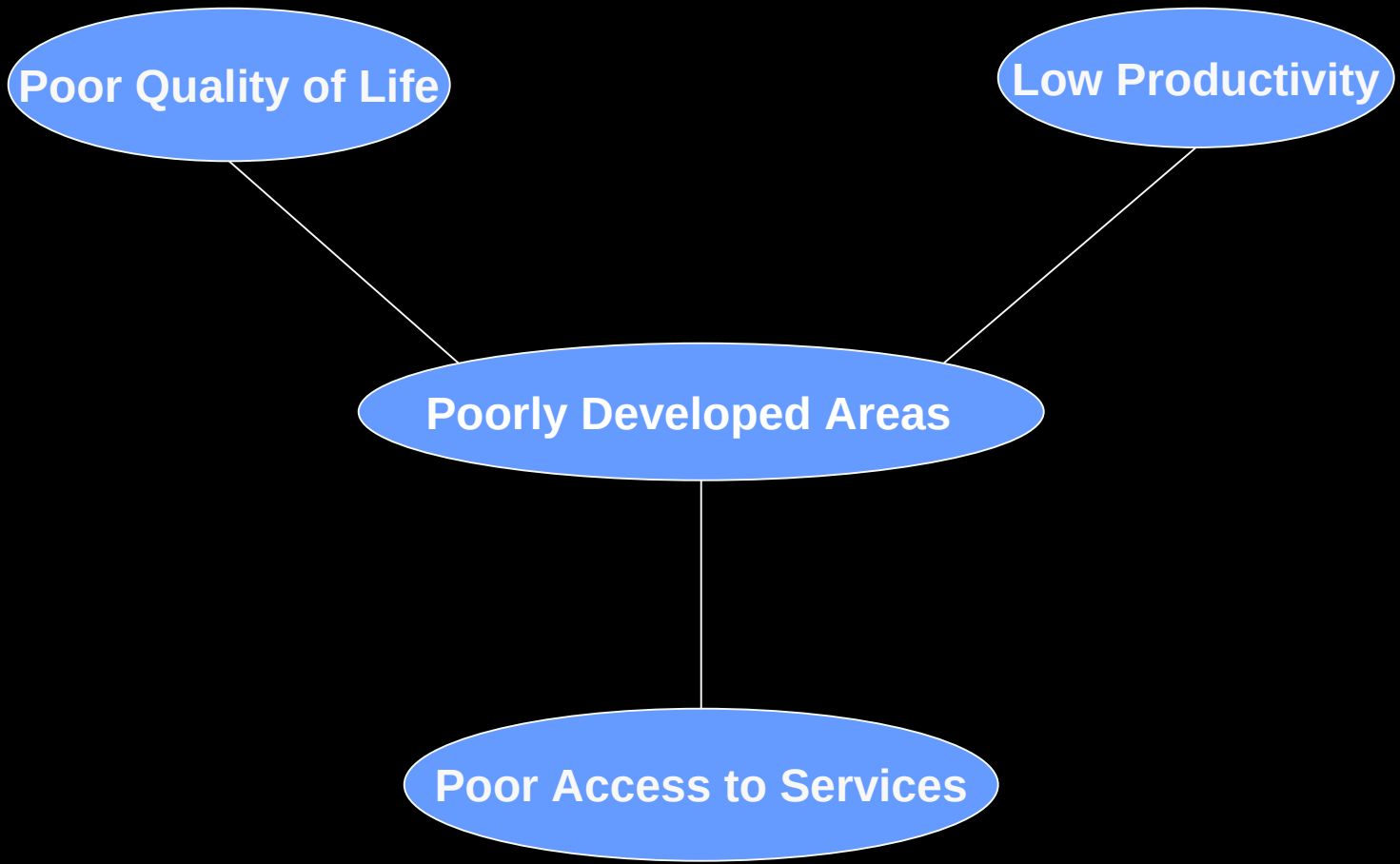
General Conditions in Rural Communities



Main Arguments in this Paper

- Sustainable development interventions in rural communities require financing arrangements which target the poor and low-income groups with a broad outlook combining micro enterprise support with energy service provision
- Integration of micro hydro into water resources development can generate more affordable energy and encourage environmental responsibility within communities

Challenges in Providing Energy Services to Remote Rural Areas

- Low per capita energy consumption
- Dispersed loads
- Ability and sometimes willingness to pay for services is low

➢ In general development need is high but this cannot be realized by addressing the energy problem in isolation from other pressing needs

Approaches to Meeting Rural Community Energy Needs

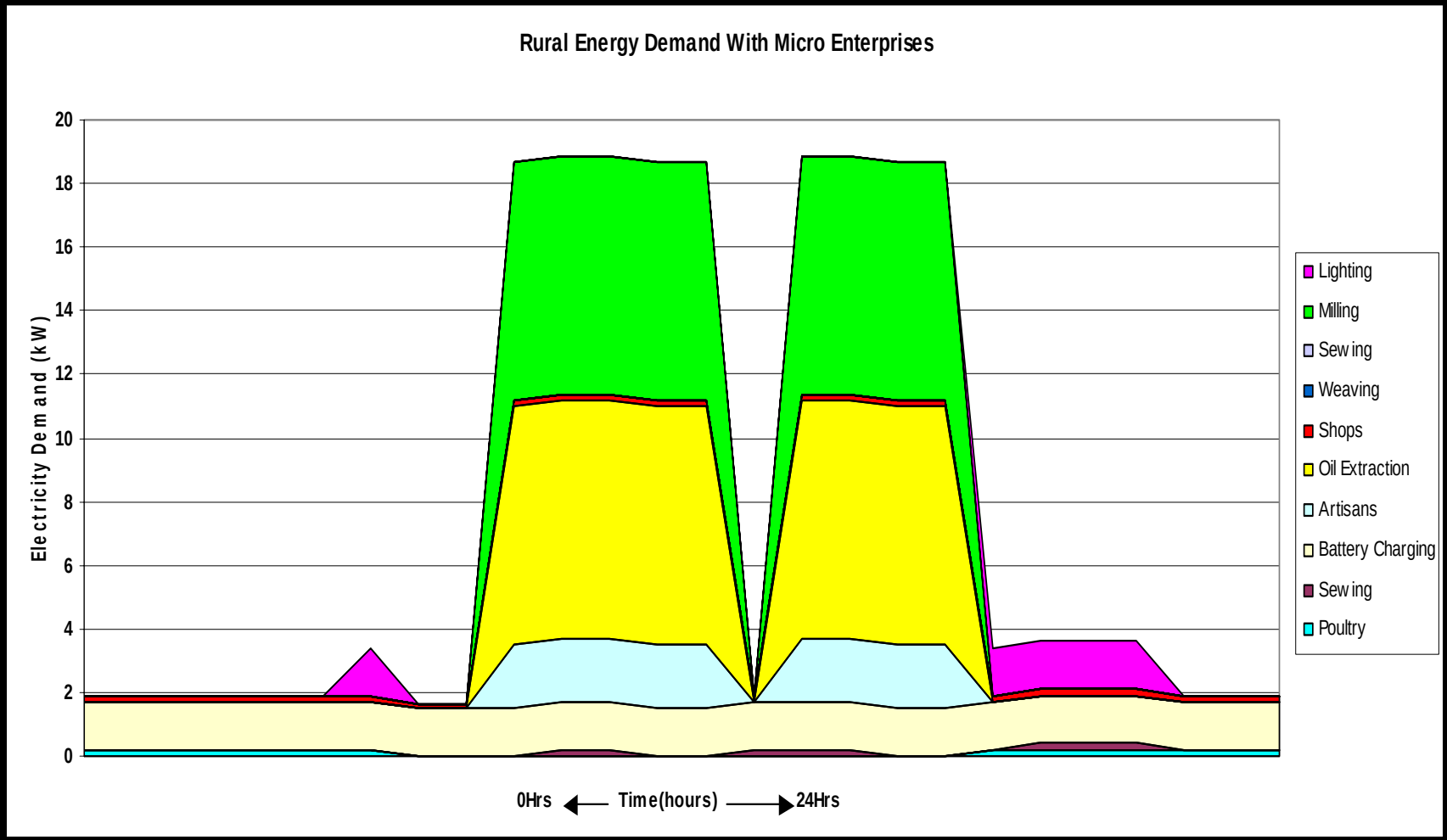
- Participatory assessment of:
- opportunities for productive activities in communities
- energy requirements for domestic, institutional and productive activities
- available local resources
- ability and willingness to pay for services
- institutional conditions etc

- Integrate energy assessment into assessment of other services
- Communicate clearly limitations of current practice

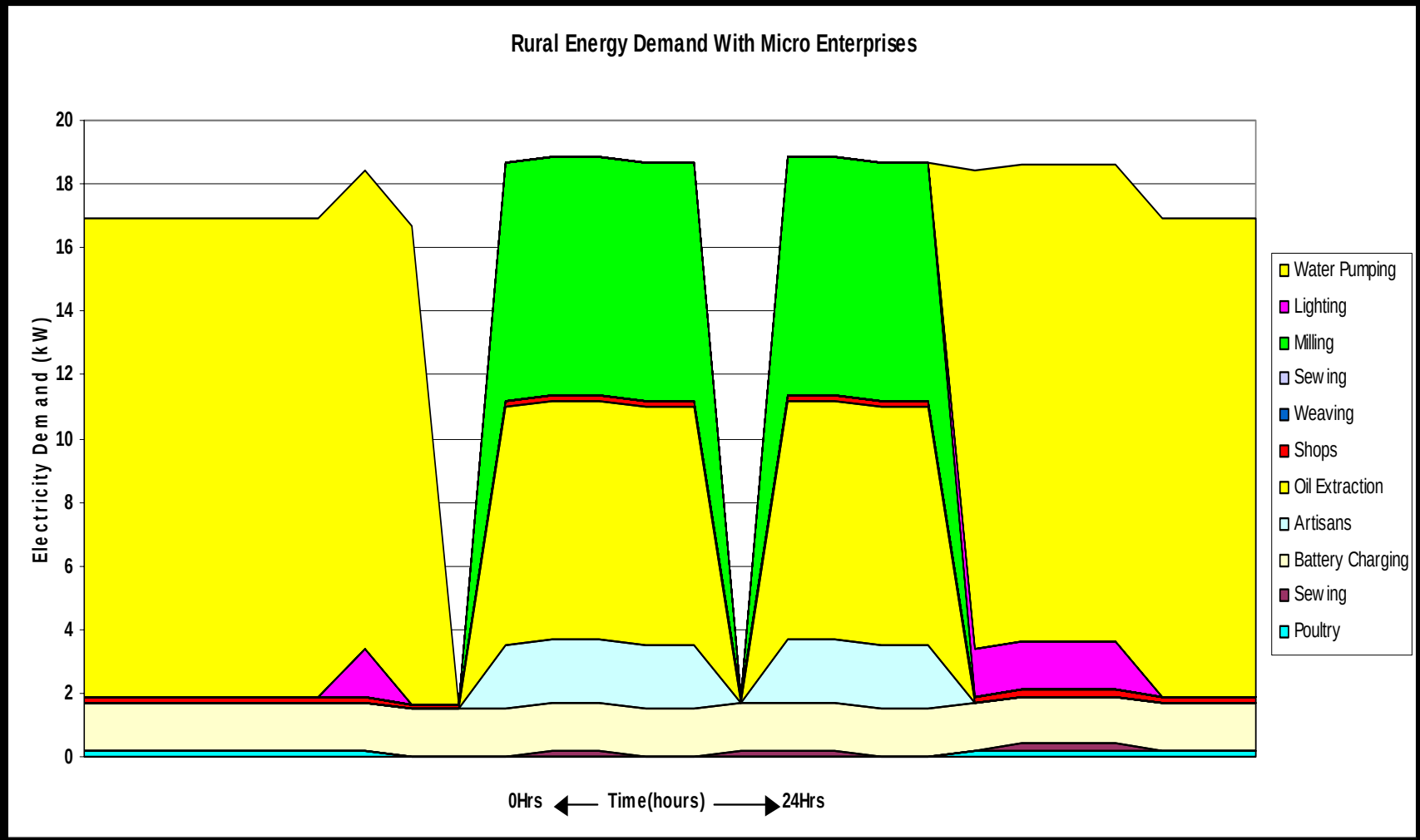
Energy Requirements of Selected Micro Enterprises

- Grain milling (7.5kW)
- Sewing (0.2kW)
- Weaving (0.2kW)
- Poultry (0.2kW)
- Battery charging (1kW)
- Oil extraction (7.5kW)
- Peanut butter making(0.5kW)
- Artisans/Metal workers (2kW)
- Shops(0.2kW)

Typical Daily Energy Demand Profile With Micro Enterprises



Typical Daily Energy Demand Profile With Micro Enterprises and Water Supply



The Case of Micro Hydro Power

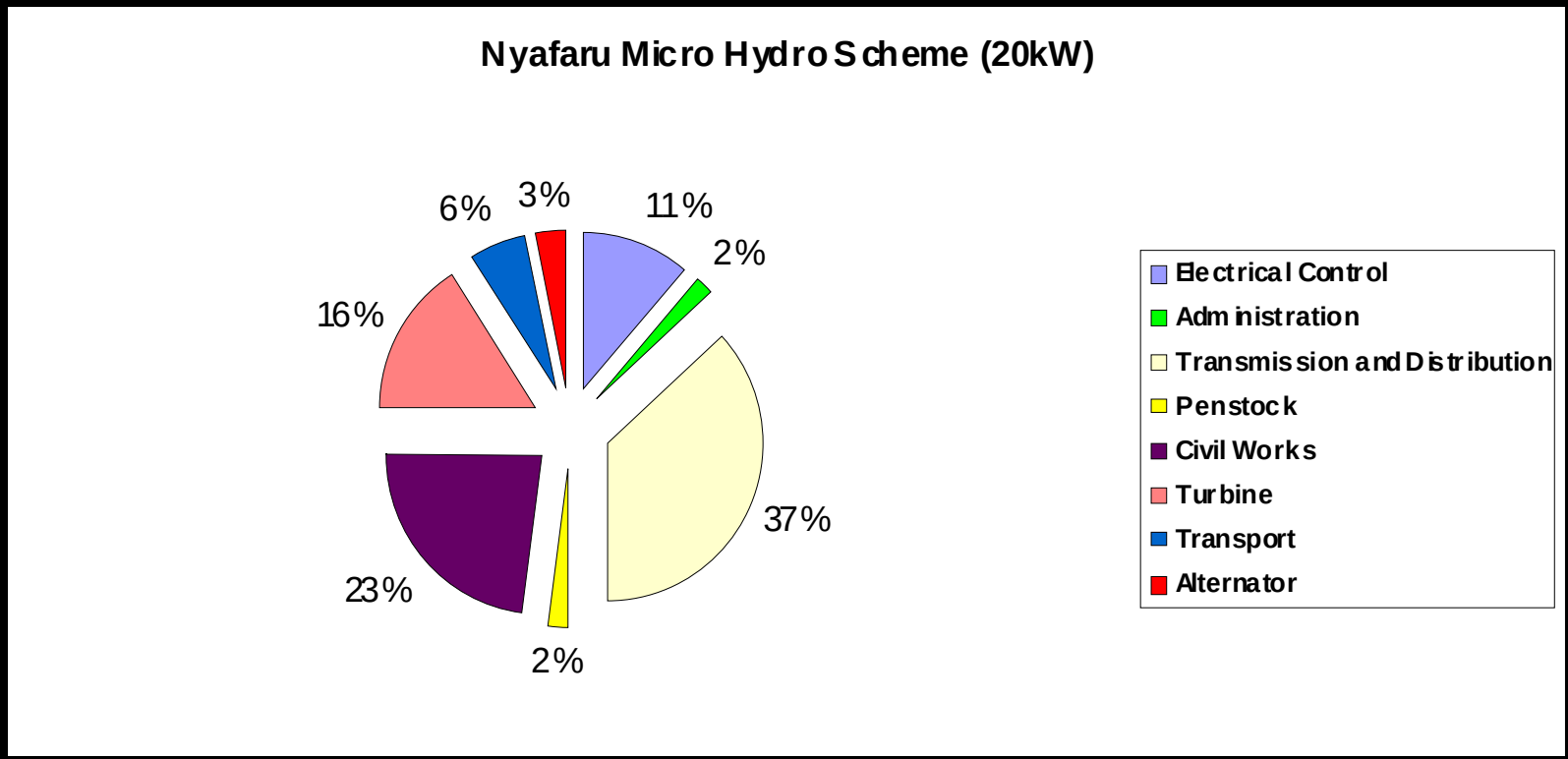
- Significant volume of continuously flowing water
- Considerable fall for the water
- Labor
- Materials
- Finance

Availability of Good Quality Continuously Flowing Water

- Perennial streams
- Water harvesting
- Prime-movers for water harvesting in rural areas are: Irrigation and water supply for domestic use and livestock

➢ Available head and flow can sustain micro hydro without affecting water supply to users

Example: Distribution of Capital Investment



Capital Expenditure Profile

- Transmission costs depend on distance from generator to load center
- Distribution costs depend on spread of load
- Civil works and penstock are influenced by topography and may be reduce through cost sharing if integrated into water supply
- Turbine,alternator and electrical controls comprise a lower but significant cost
- Integrity of all these components is important for the system to give low maintenance cost and long operating life

➢ Typical plant costs could be lower than R10 000/kW if cost sharing with water supply

Operating Costs Profile

- De-silting operations –quality of water influenced by upstream activities
- Lives of penstock and turbine affected by quality of water
- Clearance servitude for transmission and distribution lines- risk of fires and interference
- Monitoring system inputs and outputs
- Operation and maintenance costs are sensitive to quality of management deployed
- ➢ Environmental monitoring/awareness and environmental responsibility

Micro Hydro Operation, Maintenance and Management

- Operation and maintenance costs are sensitive to finance and quality of management deployed
- Quality of management depends on local institutional capacity
- ➢ Monies for management, O&M are best met through tariffs

Micro (Hydro /Enterprise) Interface

- Purely domestic users especially when supported by remittances can afford power for lighting and entertainment but prefer other energy services for cooking
- ➢ Micro enterprise applications can use much more power than the domestic load

Micro (Hydro /Enterprise) Interface cont'd 1

- micro credit mechanisms targeting the poor and low-income groups are still evolving, with considerable diversity in institutional arrangements among countries
- energy is still not considered an essential component of micro enterprise development

➢ micro enterprises in rural areas require special financing arrangements for the poor and low-income groups

Micro (Hydro /Enterprise) Interface cont'd-2

- In India energy-intensive enterprises financed by micro credit mechanisms achieved enhanced income levels of 30-40% over enterprises not featuring significant energy inputs.
- These micro enterprises have lead to a number of social benefits, such as improved access to health and educational services, strengthening of communal spirit and new capacity for spin-off ventures.

Micro (Hydro /Enterprise) Interface cont'd-2

- to achieve high income levels micro hydro requires a high load factor
- in order for increased productivity to turn into revenue there is need to improve access to the markets for the goods/services

➢ Support to micro enterprises can produce incremental benefits if extended to micro hydro

Observations

- Admittedly the bottom poor borrowers are very difficult to reach. This is perhaps because energy becomes a relevant input to income-generation only when a certain economic capacity beyond sheer subsistence is reached.
- Micro enterprises can generate positive trickle-down economic effect, which can reach the bottom poor.