

**SOLAR ENERGY TECHNOLOGY**



**ETC ENERGY**

**Solar Energy Delivery Models**  
**> Financing Mechanisms and Case Study**

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 Indonesia

Training Course on Renewable Energy Part II - MEMR  
 CASINDO

**The “Financial Route” to expand SHS** **ETC**

Financing through:

- Banks, non-banking finance companies, micro credit lenders, co-operatives, ...
- Typically: 1 to 3 year loan at 18 % to 36 % interest (examples: SEEDS, Sri Lanka; Grameen Shakti, Bangladesh)

“Fee for service”:

- Payment approximates a “lease”, charging a flat monthly rate or a metered rate for the use of the Solar Home System which is used and owned by a service company (examples: Total Energie, Indonesia; Shell-Eskom, South Africa)

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**The “Social Route” to expand SHS** **ETC**

Money from national governments and international aid organisations (USAID, German Bank for Reconstruction (KFW), UNDP/GEF, World Bank ...) is used to buy down investment costs and interest rates in loan schemes or “fee for service” models from PV rural electrification.

Examples: more than 1 Million Solar Homes in the Chinese Brightness Programme, the Photovoltaic Market Transformation Initiative by IFC/World Bank in India, Kenya and Morocco, 300,000 Solar Homes supported by the South African Department of Mines and Energy...

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**The “Commercial Route” to expand SHS** **ETC**

Example: Kenya

- 4 Million rural households
- 5 % have access to grid electricity
- 5 % have bought solar electricity systems

Annual sales: 20,000 to 30,000 solar modules for household application

⇒ Solar electrification grows faster than grid electrification, a national scheme of solar component importers, local manufacturers of batteries and components as well as hundreds of retailers has evolved.

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**Worldwide Installations of SHS** **ETC**


Total number of Solar Home Systems installed during the year 2002:	500,000 Systems
Photovoltaic modules used for Solar Home Systems in 2002:	20 MW
(Solar photovoltaic module production in 2002:	500 MW)
Number of households not electrified in 2002:	300 Million

A long journey is ahead of us. The history of solar rural electrification has just begun.

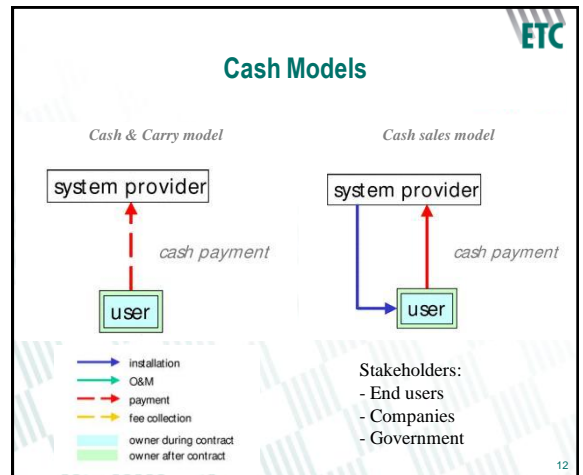
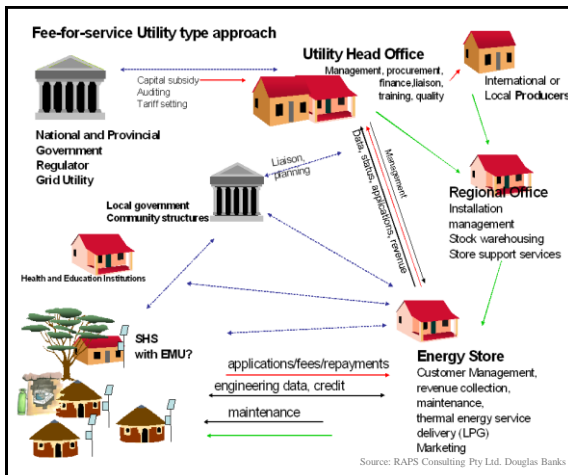
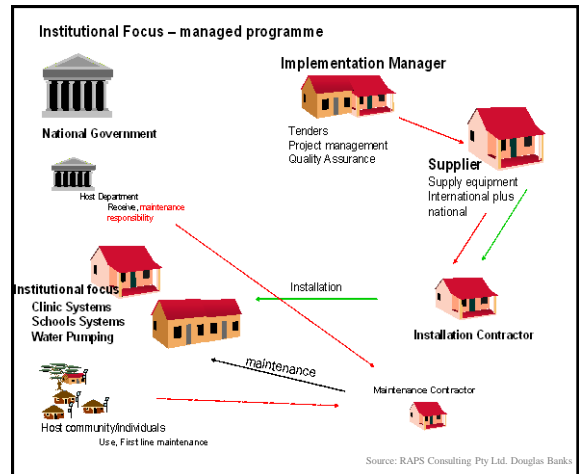
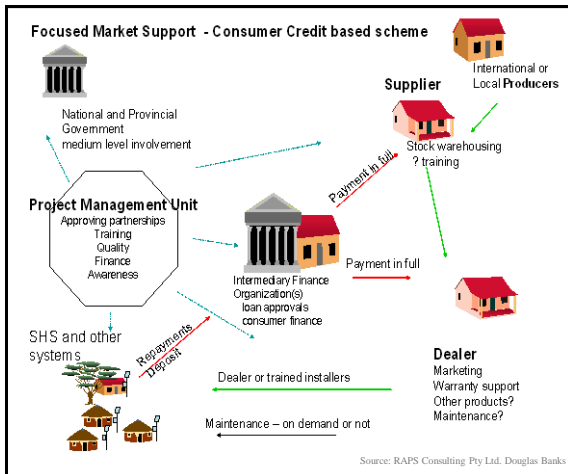
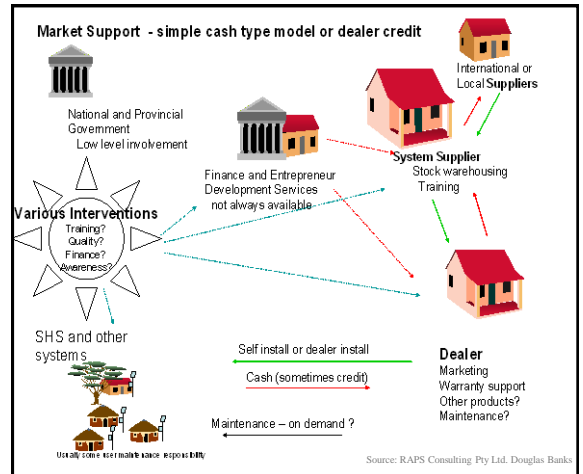
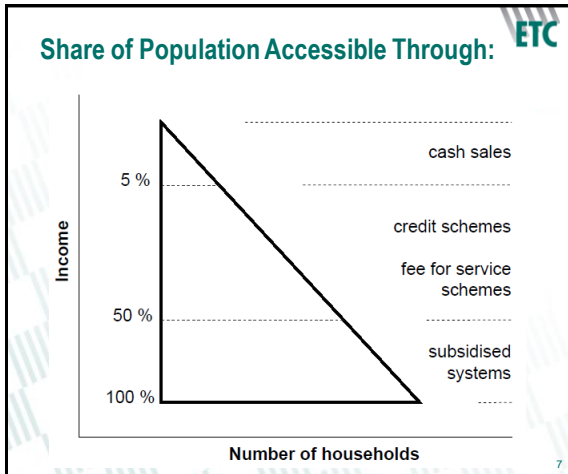
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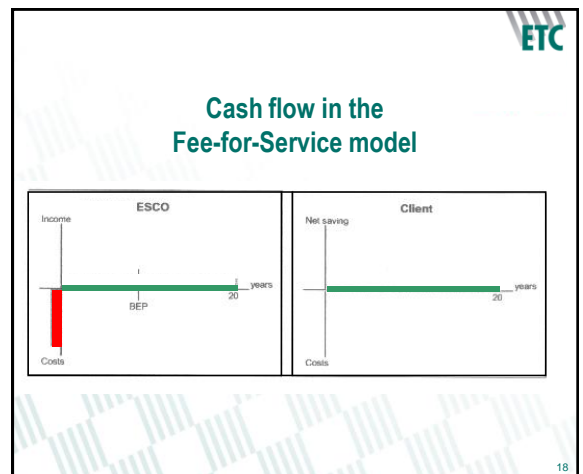
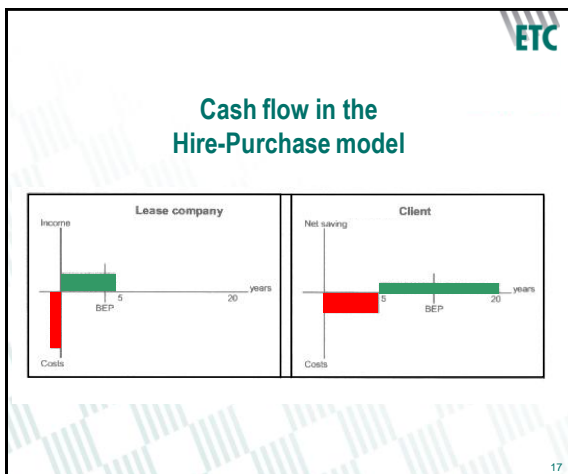
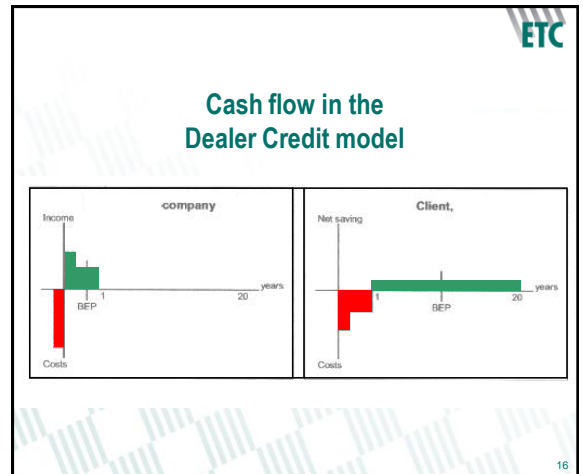
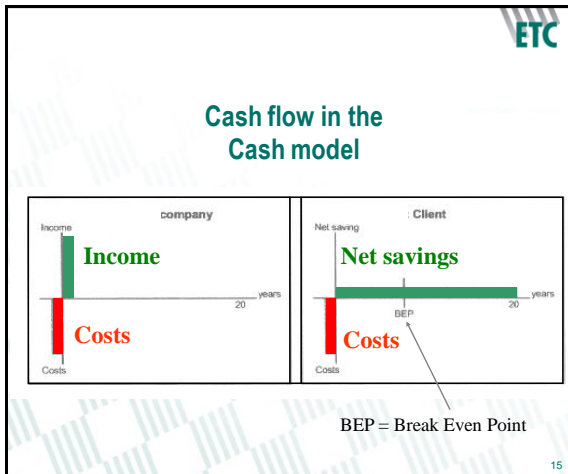
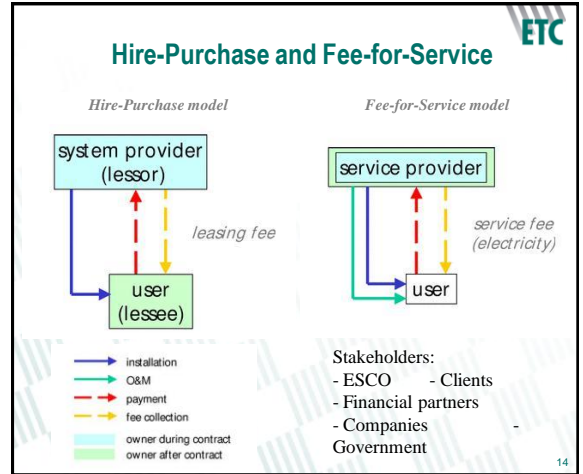
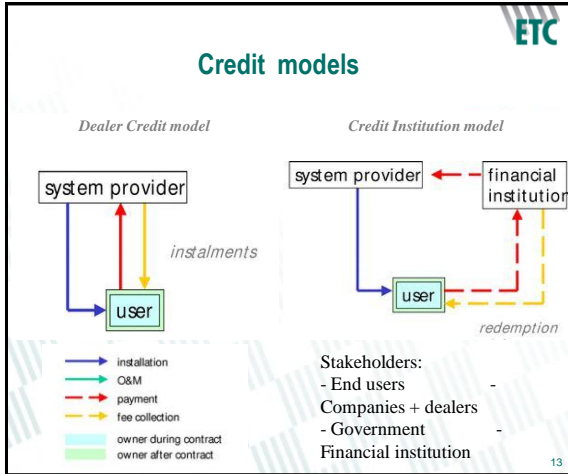
**Financing Mechanisms** **ETC**

- Donations
- Cash
  - Cash & Carry
  - Cash sale
- Savings
- Lay-by
- Credit
  - Dealer credit
  - Credit institution
- Hire-purchase Lease
- Fee-for-Service



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### Cash model

**Advantages:**

- Minimum number of stakeholders
- Fast implementation
- Low demand for capital
- Private sector takes initiative

**Disadvantages:**

- Limited market
- Little influence on how systems are installed
- Users responsible for maintenance, little user training
- Use of low quality materials

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### Dealer Credit model

**Advantages:**

- Main barrier for client is removed
- Single entity can handle financial and technical
- Consumer credit is often widespread
- Little government involvement required

**Disadvantages:**

- Credit scheme is expensive for the client
- Credit scheme absorbs a lot of working capital
- Most companies are not equipped to run technical and financial
- Good infrastructure required for collection and retrieval

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### Credit institution model

**Advantages:**

- Company does not need to allocate budget
- Credit institution much better to manage the credit scheme
- Little government or other external involvement required

**Disadvantages:**

- Extensive infrastructure required
- Difficult to find suitable collateral for the credit
- Two separate structures are needed to handle the financial and the technical work => costly

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### Hire-Purchase model

**Advantages:**

- Longer period => Lower down payment and instalments
- Maintenance at high standard
- Good quality products

**Disadvantages:**

- Ownership not with users leads to maltreatment
- Absorbs a lot of working capital
- Companies are not equipped to handle technical and financial
- Extensive infrastructure needed

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### Fee-for-Service model

**Advantages:**

- Lower financial barrier for client
- Good quality maintenance and repair
- High quality of systems
- Recycling of components centrally organised

**Disadvantages:**

- High financial risk, long pay-back periods
- No ownership of the user => maltreatment
- Expectations to user are often set too high
- Collection of fees is time-consuming and expensive
- Extensive infrastructure required

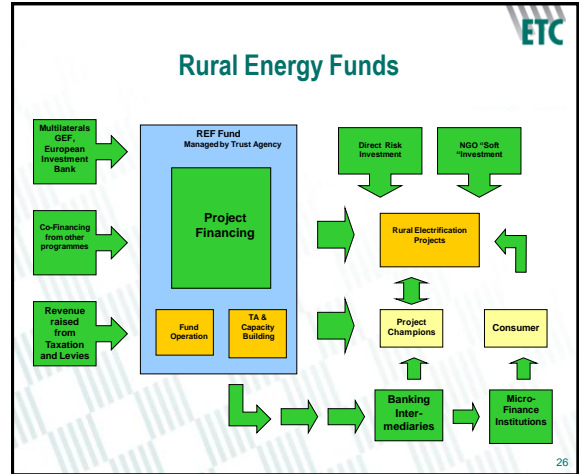
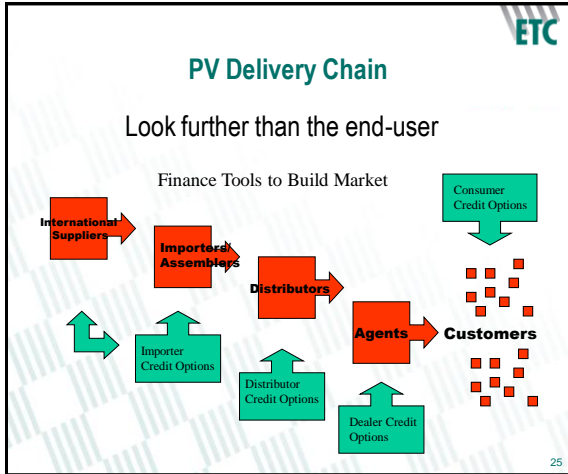
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### Bottlenecks of Financing Mechanisms

- **Cash Sale and Lay-by:** lack of consumer capital for the desired service
- **Savings and Credit:** high administrative cost and access to credit schemes generally limited to high income households
- **Fee-for-Service:** high fee-collection and servicing cost, and lack of user care because user doesn't own the system

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### SHS Financing in Indonesia

**Segmentation for consumers of SHS:**

- > Segment 1, for under developed area. GOI provides SHS, transportation to site and installation
- > Segment 2, for the area where the consumers are able to buy SHS by installment for 10 years, GOI contributes for training, transportation fee, installation and interest rate. The consumers have to pay a down payment for balance of system. The SHS is provided by GOI
- > Segment 3, the customers are able to pay the installed system by installment within 1-3 years. The SHS will be marketed by dealers (private companies).

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### SHS Financing in Indonesia

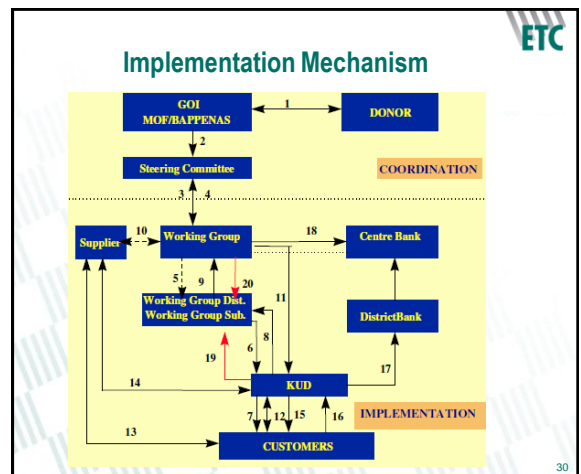
- ❑ **Scheme 1**, this scheme is designed for consumers in the first segment and the scheme is as follows:
  - All the cost will be paid by GOI
  - The consumer begin to pay installment after 2 years
  - Cooperative Village Unit will do the technical and financial management
  - Down payment will be used for the first investment of the management
- ❑ **Scheme 2** is for village with s ratio 1-3, the scheme is as follows:
  - Use lease and purchase contract for 10 years
  - The consumers only pay the hardware
  - The installation, transportation and interest are paid by GOI
  - KUD is responsible for technical and financial management
  - The monthly payment is paid to BPPT

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### SHS Financing in Indonesia

- ❑ **Scheme 3** is directed for segment 3 and it is considered as semi commercial, the scheme is as follows:
  - The down payment is between 20% to 30% of total cost
  - Use lease and purchase contract
  - Payment period is between 1 to 4 years
  - Marketing strategy depends on the dealer policy
  - The interest rate follows the local commercial rate
  - There is some contribution from GEF ( US \$2/Wp)

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## PV Hybrid Systems in Indonesia

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The PV-Diesel Hybrid System have been installed in Indonesia and several demonstration project have been developed.

- Under an Ausaid program 14 units were installed in South East and Central Sulawesi.
- Under a Central Gov. (60%) and Local Gov. (40%) program 1 unit was installed in Gorontalo
- The design concept is to optimize the fuel consumption and increase the electricity services.
- Typical design of Ausaid program, 8 KWp Solar Generator, 25 KVA Diesel Engine, 650 Ah Battery Bank to electrify 200 - 250 houses (50 W, 100 W, and 200 W).
- Typical design of Hybrid System in Gorontalo: 24 KWp Solar Generator, 125 KVA Diesel Engine, 1500 Ah Battery Bank to electrify 400-500 houses (450 watt (R-1)).

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## PV Hybrid Systems in Indonesia

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- The Hardware will be funded by the Central Government or Local Government or sharing by both Institutions
- Consumers paid a specified installment fee for electricity connection in their own house
- Each house will get a choice of 3 electrical power connection level of 50 watt, 100 watt, or 200 watt
- The energy payment uses prepaid systems (BaDIKa or Smart Card) at an agreed electricity tariff
- Technical and financial management is carried out by Local Government or Local Cooperative Unit (KUD)

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## Overview Energy Delivery Models

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	Capital need for RE-Company	Access for poor clients	Infra-structure need	Government policy	Installation and maintenance
<b>Cash model</b>	Low	Lowest	Lowest	Not needed but helpful	User is mostly responsible
<b>Consumer Credit model</b>	Medium, consumer credit expertise is required	Medium	High, technical and financial combined	Credit activities are generally regulated	Mostly user responsible, possibly or RE-company
<b>Lease model</b>	High, expertise in leasing required	Medium to high	High, technical and financial separate or combined	Lease constructions and related tax issues	Initially technicians from RE-company
<b>Fee-for-Service model</b>	Highest, if the RE-company creates the ESCO	Highest	High, technical and financial combined	Concessions to sell energy, Liberalisation of the electricity market	Full responsibility for ESCO

## Bottlenecks per Delivery Model

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- Cash Sale:** lack of consumer capital for the desired service
- Credit:** high administrative cost and access to credit schemes generally limited to high income households
- Fee-for-Service:** high fee-collection and servicing cost, and lack of user care because user doesn't own the system

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## Lessons learned from analysing Energy Delivery Models

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- ALL elements are important and must be in order**
- Involvement of local actors essential**
- Flexibility in implementation is important**
- There is no single best delivery model**

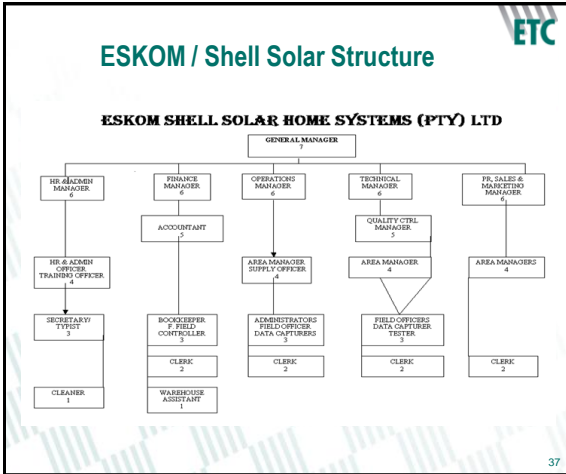
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## Shell-ESKOM Case Study

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- Joint venture between Shell and ESKOM
- Aim: 50.000 SHS in 3 years
- Eastern Cape and Kwazulu Natal concession area
- Fee-for-Service basis

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## Requirements

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- Provide a quality product with delivery and support
- Prevent theft of the system components
- Ensure payment for the use of a system

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## Design Features

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- Security in each of the components of the system to render them worthless if stolen
- Provide a means of revenue collection on a regular basis to fund the investment

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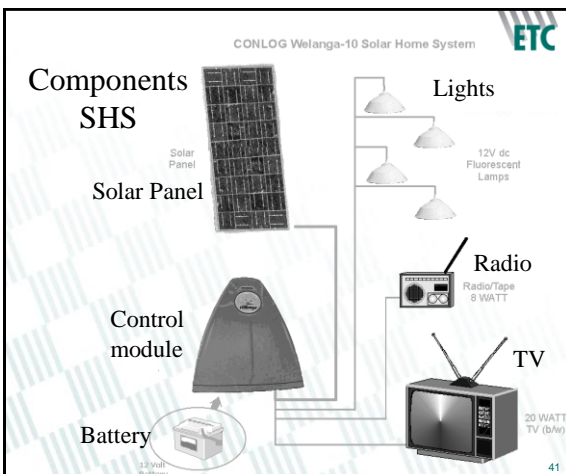
## Package Offering

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**A secure integrated system**

- Complete Quality Product
- Management
- Financing
- Training
- Distribution
- Implementation

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## Power House SHS

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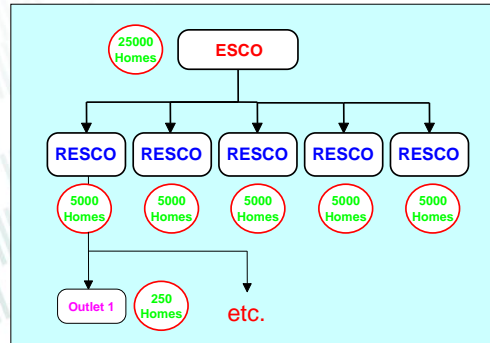
- Easy to install and maintain
- Tamper proof
- Pre-payment technology
- Security technology
- Charge controller and battery technology

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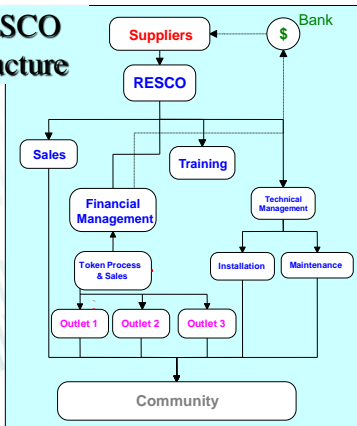
### Organisational Structure

- Procurement of equipment
- Supply of equipment
- Management of the business
  - General
  - Technical
  - Financial
- Distribution outlets

### Organisational Structure



### RESCO Structure



### Money Collection

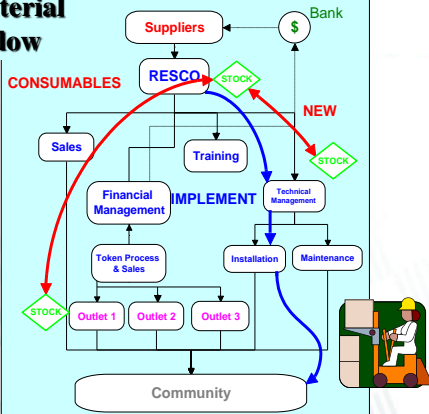


**Costs**  
R150 deposit,  
R52/month

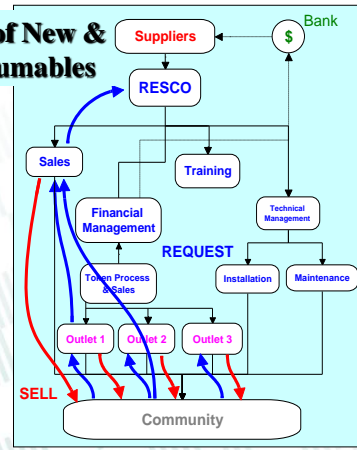
**Payment rate**  
varied between  
40-60%



### Stock and Material Flow



### Sales of New & Consumables



### Problems due to fast Expansion of the Project

- Low number per village => insufficient income and practice for installers
- Too long travelling time in pilot phase
- Insufficient time to develop project
- No time to evaluate experiences
- No time to take corrective action

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### Negative Factors

- Initially technical problems
- Pace of implementation too high
- Insufficient training
- Insufficient density
- Insufficient incentives
- Fraud
- Initially lack of subsidies

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### Positive Factors

- Good concept:  
Complete system with plug-and-play cabling, anti-theft, pre-payment with shut-off
- Strong partnership, massive approach
- Enthusiastic staff

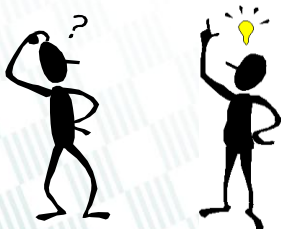
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### Ideal Energy Delivery Model

- Meets customer demands
- Efficient and effective delivery of affordable energy
- Integrated part of rural electrification
- Promotes development of viable commercial renewable energy sector
- Promotes access to information
- Active customer awareness
- Promotes close collaboration public and private sector
- Allows for cost-effective standardisation

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### QUESTIONS ?



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