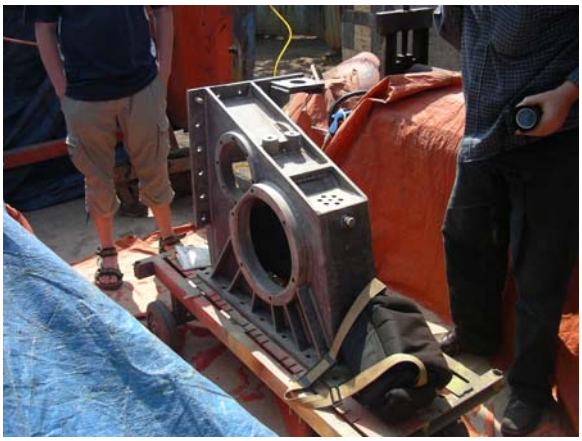
The Indonesian Mini Hydro Power Sector

"an incomplete success story ?"

1991-2008

MHP Technology Transfer

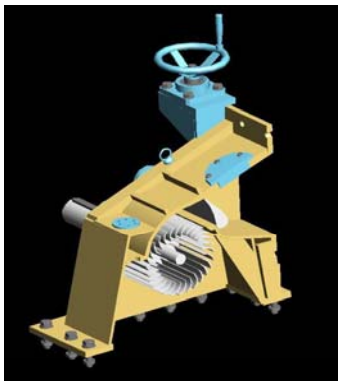
- Significant progress has been achieved in the Indonesian MHP sector primarily supporting rural electrification initiatives
- Indonesia is frequently exposed as a successful example of MHP technology transfer
- Indonesian manufacturers supply equipment for overseas projects (Europe, Asia, Africa…..)



How has this been achieved ?

1. Turbine technology transfer (Cross flow, propeller,….) in design, manufacturing, installation & commissioning
2. Development and introduction of standardized civil structure designs
3. Development of Control Technology
4. Development and introduction of appropriate institutional models

- The runner can easily be adapted to the flow, by changing its width. Thus it is easily possible to build the turbine to fit precisely the site conditions.



- The simple design allows good standardisation and manufacturing without sophisticated manufacturing facilities.
- The costs are low compared with other turbine designs.

Controller Types

- Induction Generator Controller (IGC) up to 30kW
- Electronic Load Controller (ELC) Up to 200kW
- Digital Turbine Controllers >100kW for full flow control applications

Technology Transfer

Electro mechanical equipment can now be produced locally covering a wide range of types and sizes suitable for a variety of projects (stand alone, captive, grid connected)

Stand Alone Rural Electrification

Extensive capacity building efforts sustained over a long period of time resulted in a significant improvement of the success rate of stand alone MHP rural electrification schemes in Indonesia

International Experience

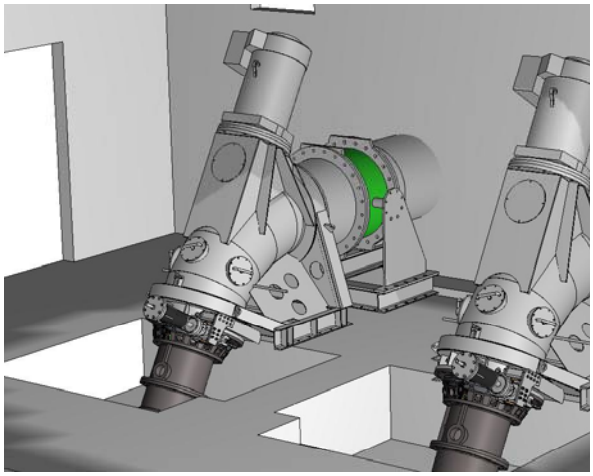
2005 - Grid Connected Project - Kurgistan

- The full design engineering for the manufacture of the mechanical equipment was carried out in Indonesia

- The first T15 - 500 turbines were produced in Kurgistan for a 3 x 200 kW MHP project

International Experience

2006 - Grid Connected Project - Switzerland

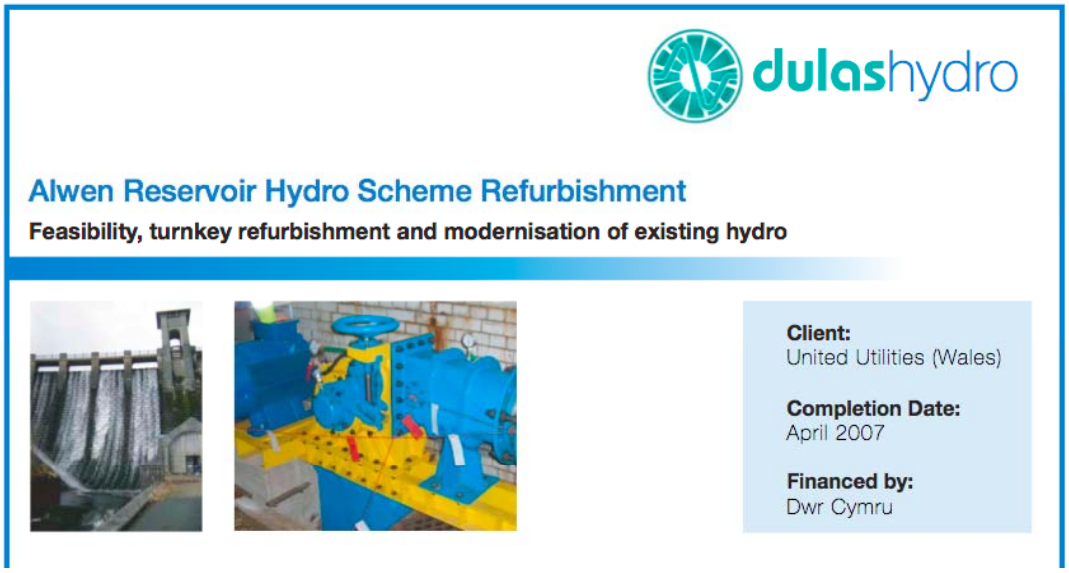


- Developed initially for 2 similar locations, Wanganaji, Central Java and Bucholz, Switzerland

- Developed in response to increasing demand for low head sites

International Experience

2006 - Grid Connected Project - UK



Re-commissioning of a hydro scheme at Alwen Water Treatment Works, Wales, UK.

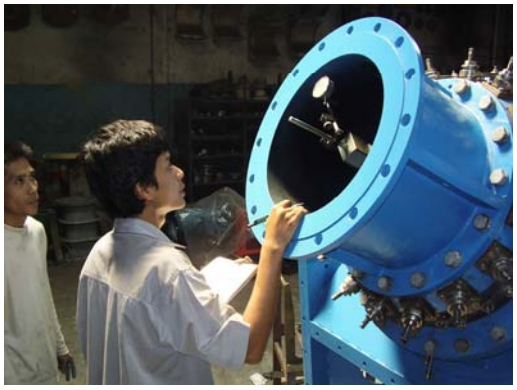
From Stand Alone to Grid Connected Schemes

Whilst stand alone projects can support rural development and contribute to poverty alleviation, their overall contribution to energy generation (kWh) of a nation is relatively low. Significant contributions to a nations power supply can only realistically be achieved through grid connection of renewable energy projects.

How far have has Indonesia progressed on this front ?

Engineering Capacity Exists

- Capability of Indonesian manufacturers of MHP equipment for schemes <1MW has been proven both domestically and Internationally
- Engineering infrastructure in the country facilitates the manufacture of high quality / performance equipment.



Ministerial Decree Number: 1122 K/30/MEM/2002

- A significant amount of Indonesia's abundant hydro potential is located within close proximity of the national utility (PLN) grid lines
- Introduction of a new Government legislation in 2002 facilitating inter connection of renewable energy projects below 1 MW to the PLN grid based on a standard power purchase agreement and tariffs

Ministerial Decree Number: 1122 K/30/MEM/2002

The most relevant features of the legislation are:

- Introduced specifically for renewable energies
- Purchase tariffs are calculated based on PLN's own production & distribution costs at medium (20kV) and low (380V) voltage. For medium voltage the tariff is calculated at 80% and for low voltage 60% of production costs
- No variation in tariffs is applied for peak / off peak hours.
- PLN issues revised production cost figures every 3 months and on going contracts are amended accordingly
- Contract period 1 year (extendable)

Implemented Projects

A number of projects were successfully development soon after the introduction of the PSK Tersebar legislation including:

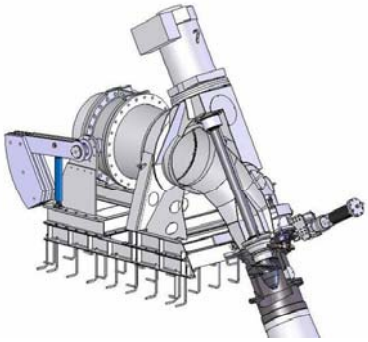
- Seloliman (50 kW)
- Cinta Mekar (100 kW)
- Melong (100 kW)
- Wanganaji (140kW)

Seloliman, East Java (50kW)

- The first scheme built under PSK. Built to supply the hamlet of Janjing and a environmental education center in 1994 - later upgraded and connected to the PLN grid (20kV).
- Owned and managed by an traditional village institution
- In operation since December 2002
- Second unit recently completed increasing the total output

Wanganaji, Central Java (2 x 80kW)

- The scheme exploits a drop structure in an irrigation network
- Due to the low head / high flow site conditions custom designed propeller turbines were manufactured for the scheme
- All equipment was manufactured in Indonesia
- Financed jointly by Government and a local Cooperative



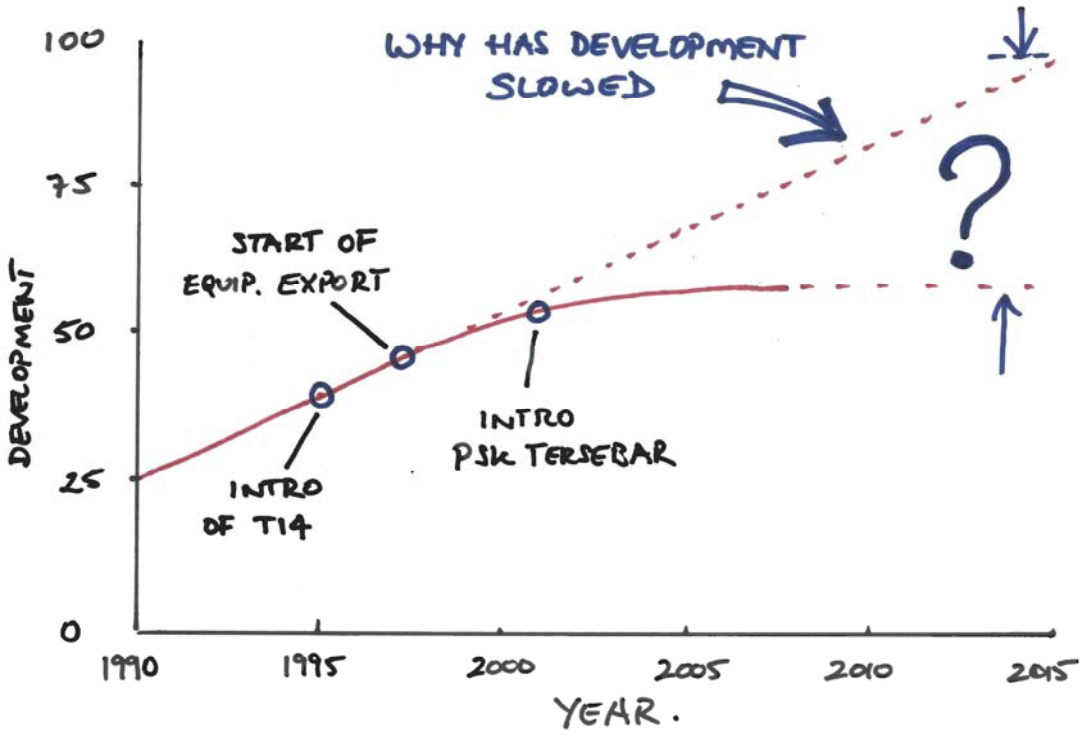
Melong, West Java (2 x 50kW)

- The Melong scheme features 2 x T15 cross turbines with runner diameter 500mm, the first to be manufactured in Indonesia
- Exploits a drop in an irrigation channel (6m)
- Many such schemes could be built in Indonesia integrated within the extensive irrigation networks which exist in the country

Where are the developers ?

Given this why is it that there are more Indonesian manufactured turbines supplying foreign grids than in Indonesia !!

Slowing Growth in MHP Sector ?



Some Reasons

- Inconsistent interpretation of the law between PLN and the Government leaves the developer in “no mans land”
- PLN tariff fixing process not transparent enough and contract period too short to provide potential investors with adequate security
- Too many “grey areas” remain within the legislation - difficult to gain a conclusive information particularly regarding authority and role of district/central government ?
- Financial institutions have little or no experience in financing MHP projects therefore mobilizing finance is very difficult.
- Most international renewable energy support programs (credit, CDM, etc) are still orientated towards larger sized schemes (>1 MW) therefore project developers in the small size range are left fully to their own resources.

Conclusions

- PLN in general are supportive of small scale private MHP projects as they enhance their systems particularly in rural areas where line losses are highest creating a “win - win” situation
- Local municipalities, village institutions & communities can be integrated into ownership and operation models providing stimulus to local economies contributing to rural development
- For MHP projects <1MW the overall “local content” of works is >80% therefore provides stimulus to local economies through employment

Conclusions

- Although the introduction of the legislation represents a step forward for the Indonesian renewable energy sector, since its introduction very few projects have materialized. Private sector is losing confidence in the program.
- This means a return to a “case by case” negotiation process with PLN for individual projects.
- This is very negative situation for small scale renewable energy projects a will strangle any development (as was the case in Europe)

Conclusions

- MHP development in developed countries has happened because of Government support programs providing genuine assistance to project developers
- Switzerland and Germany are good examples. There are currently many MHP schemes either operational or under construction.
- This is because the investment environment is secure and **tariffs** and **contract** periods attractive
- Developing MHP projects even with assistance is a difficult, time consuming and often complex undertaking therefore without adequate support programs future development will remain stagnant (slow at best)

Reccomendations

- Replace PSK Tersebar with a similar program for schemes <1 MW directly under PLN with tariffs and standard contracts provided by PLN central level removing any negotiation process at regional level.
- Invite RE support programs that are willing to implement programs addressing the < 1 MW size range
- Remove or reduce import taxes on RE components and equipment
- Develop and encourage standard ownership models which include joint ownership of municipalities and village institutions
- All of the above points can be learnt from advanced European countries who have successfully introduced and developed such approaches (Germany, Switzerland, UK ……)
- Harvest the low hanging fruits first !! - by far the most attractive RE source in Indonesia is MHP therefore more priority should be given to harnessing this resource