



aurecon



Policy, regulatory and legislation of mini grids

Sunbird Nkopola Lodge,
Mangochi, Malawi 2015

At van der Merwe
Aurecon



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Agenda

- 1. The Broader Context of Off Grid Solutions**
 - a) Defining Mini-Grid Electrification
 - b) High Level Positioning of Various Electrification Options
- 2. Establishing Mini-Grids**
 - a) Rationale for Mini-Grid Development
 - b) Who are the players?
 - c) Barriers to the Establishment of Mini-Grids
 - d) Key Elements Required for Mini-Grid Establishment
- 3. Policy and Regulatory Environment**
 - a) Mini-Grid and Rural Electrification Policy Framework
 - b) Regulatory Principles to Consider
 - c) Who should regulate?
- 4. Business Model**
 - a) Mini-grid and Rural Electrification Business Model
 - b) Financial Model Considerations and Mechanisms
 - c) Tariff Setting Considerations
- 5. Summary of Lessons Learnt Internationally from Mini-Grid Implementation**
- 6. Some food for thought**



1.The Broader Context of Off Grid Solutions

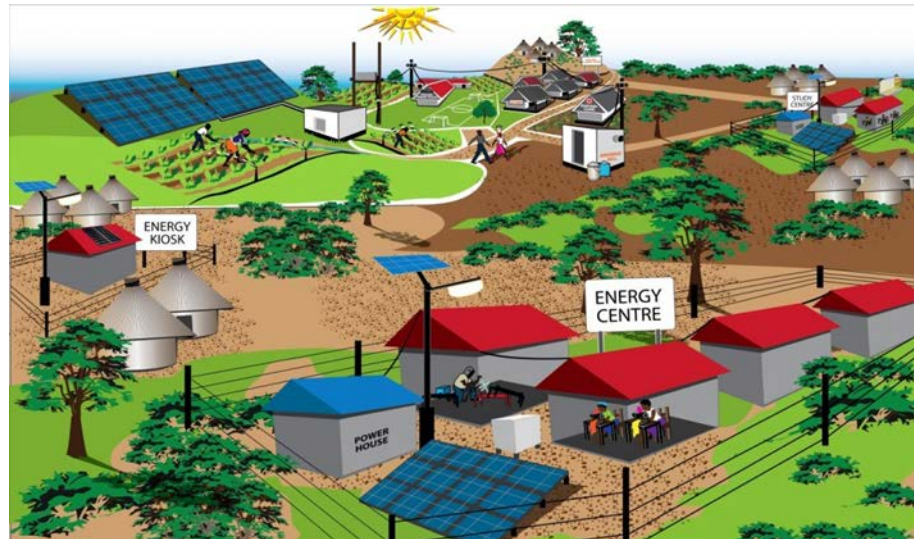


Why must we think about Off Grid solutions?

- **International Energy Agency's World Energy Outlook 2012**
 - 1.3 billion people do not have access to electricity or remain un-electrified due to poor quality of the grid
 - 84% of this target lives in rural areas
- **UN Energy Practitioners Network anticipates that 60% of additional generation capacity by 2030 will be off-grid**
 - Largest portion of this will be in sub-Saharan Africa
- **Most developing countries include rural electrification policies into their socio-political development effort**
 - Inequalities between urban and rural populations
- **Rationale for focusing on rural electrification is that of further economic development and growth**
- **Grid related extension has however remained slow**
 - High cost of grid extension with limited utility / government budgets



The Question is How?



I'VE GOT RURAL ELECTRIFICATION WITHOUT WAITING FOR THE HIGH LINE!

Plenty of Current for
LIGHTS—RADIO—
WASHER—PUMP—
IRON—SWEEPER
AT **50¢ A YEAR**
Power Operating Cost!

CHEAPER THAN THE HIGH LINE

32-VOLT 650-WATT GIANT

WINCHARGER
REG. U.S. PAT. OFF.

\$69⁹⁵

NOW ONLY \$15 DOWN 10 MONTHS TO PAY

"At the present time we are using about 20 lights, electric washer, pump, iron, and radio from our Wincharger and have plenty of power to spare." *Geo. Barlow, Simms, Mont.*

Put The Wind to Work on Your Farm. And Have Rural Electrification NOW.
Let the amazing new 32-Volt Giant use your free wind power—electricity you want away from the
broad



FREE!

Wincharger
Wincharger is made by the world's largest makers of wind-driven generating equipment, in the largest factory devoted exclusively to this product. More than 500,000 farm folks are now enjoying free electricity from Winchargers.

Sold Direct—Fully Guaranteed
Wincharger is sold direct from factory to you at a rock bottom price. You save up to \$100 by doing business this way. Every Wincharger is sold under an iron-clad guarantee. "Satisfaction or your money back." Get all the facts NOW!

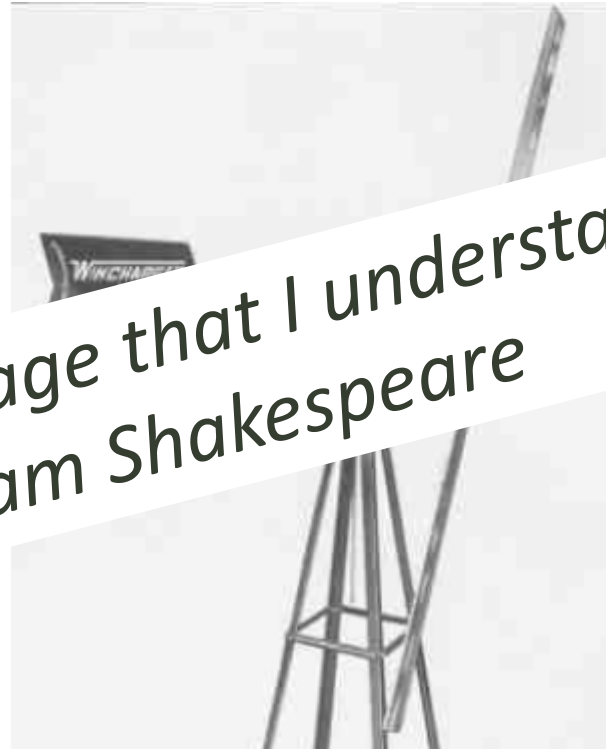
MAIL THE COUPON TODAY

WINCHARGER CORPORATION
World's Largest Makers of Wind-Driven Generating Equipment
Dept. PM6-37, Stous City, Iowa

Please tell me all about how I can have electricity on my farm at a power cost of 50¢ a year.

Name.....
P. O.....Route.....State.....
County.....
If you now own an electric plant, what makes.....

Save Postage: Paste coupon on penny postal card.



You speak a language that I understand not.
—William Shakespeare



What is Rural Electrification?

The process by which access to electricity is provided to households or villages located in the *isolated or remote areas of a country*.

- Source IEA

What is Off-Grid Electrification?

Electricity solutions which are **not connected to the main grid**. These can be implemented as stand-alone solutions (such as isolated PV) or as part of an isolated grid.

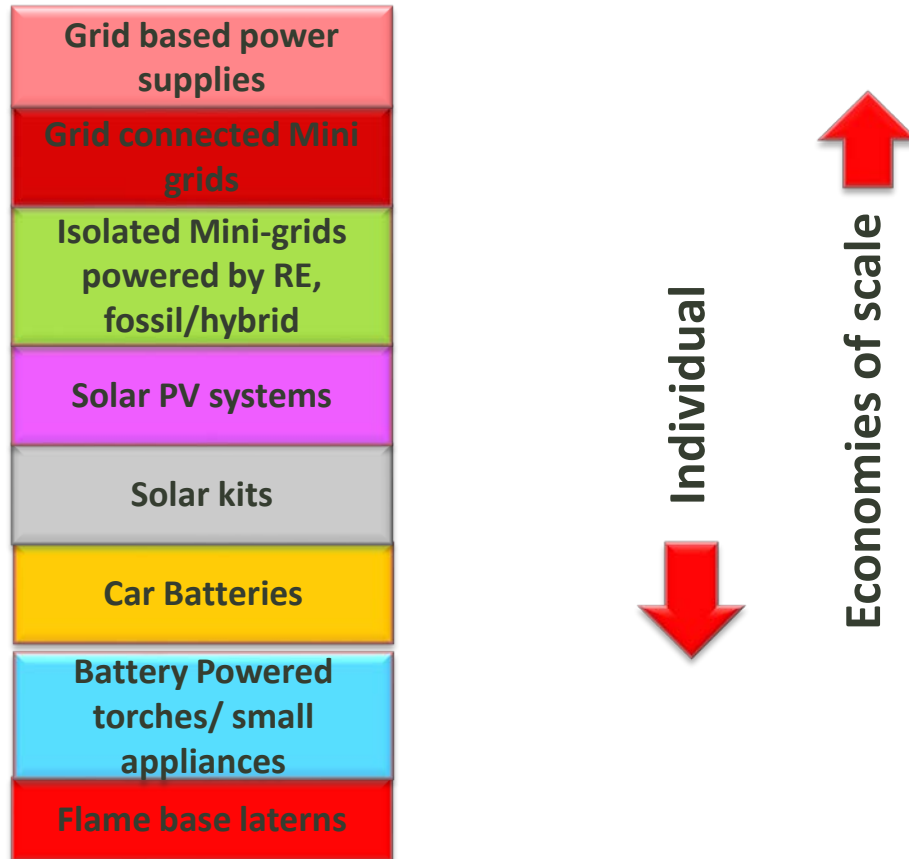
Off-grid electrification is an approach to access electricity used in countries and areas with little access to electricity, due to scattered or distant population.

What is a Mini-Grid?

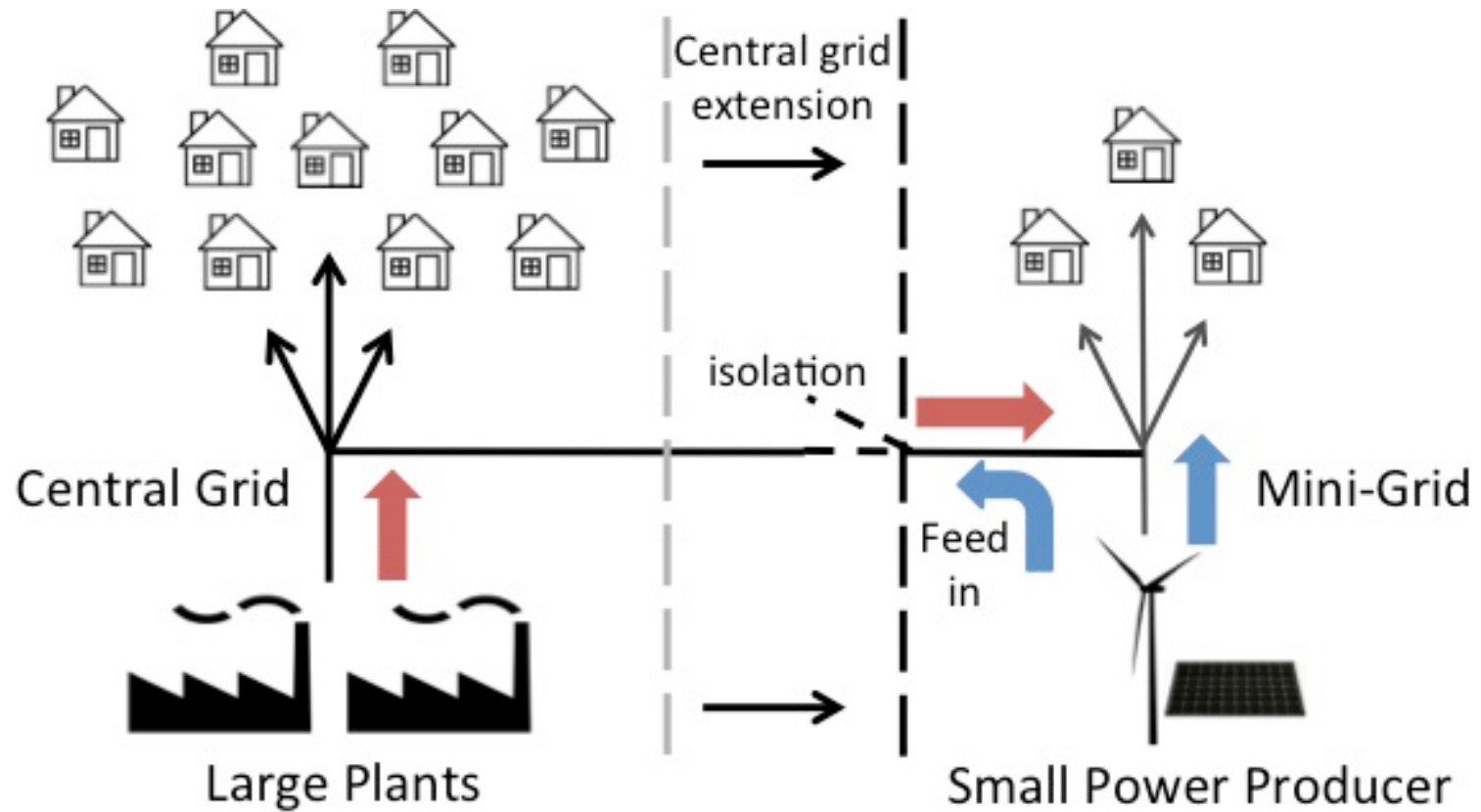
Typically mini-grids are defined as **small-scale electricity generation** (under 10 MW) and the distribution of electricity to a limited number of customers via a **distribution grid that *can operate in isolation* from national electricity transmission networks** and supply relatively concentrated settlements with electricity at grid quality level.

- Source EUEI PDF

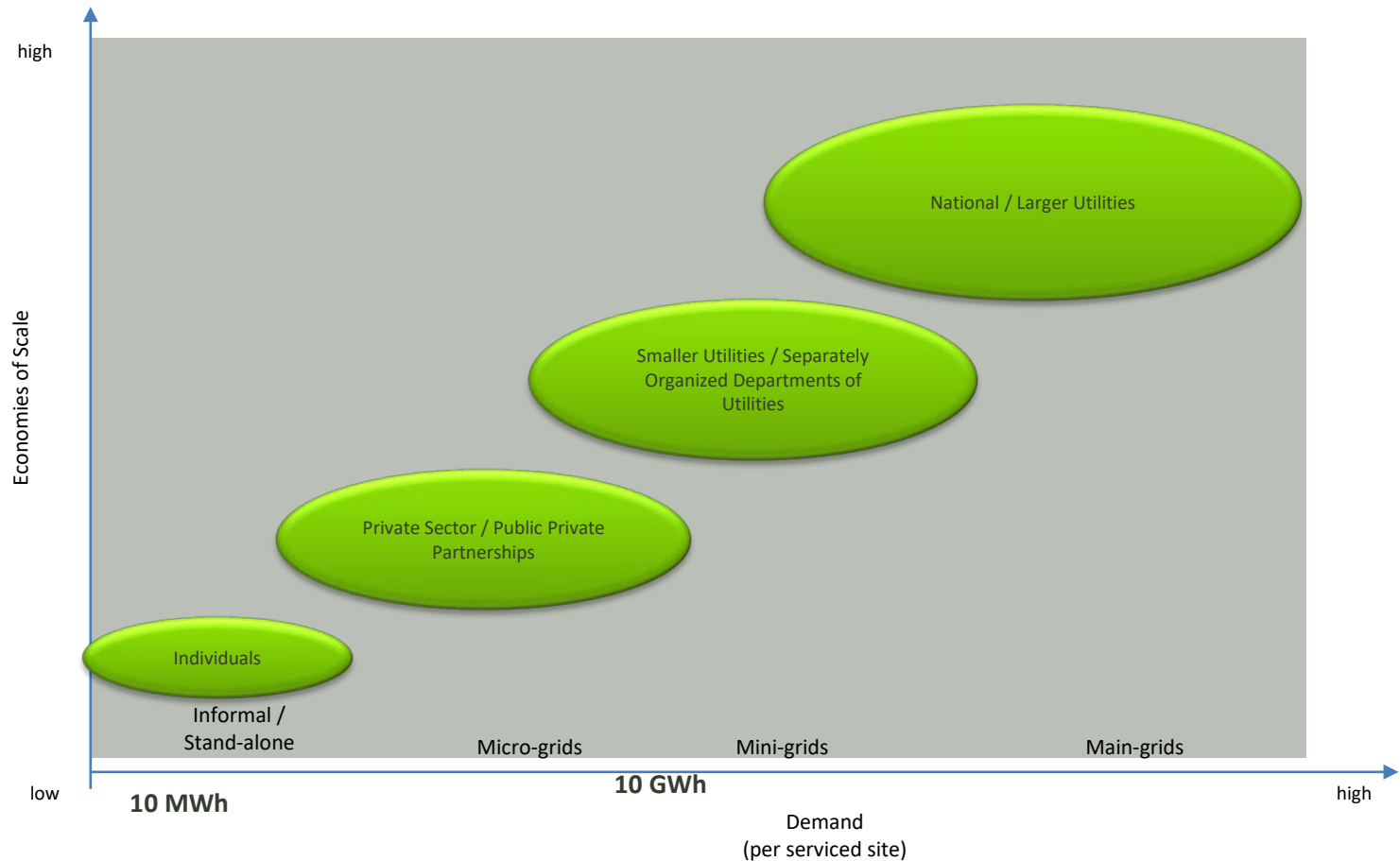
Electrification Ladder



On-Grid versus Mini-Grid



High Level Positioning of Various Electrification Options





2. Establishing Mini-Grids

Why attractive?
Who are the players?
Possible barriers to develop
The frameworks

a) Why are Mini-Grids an Attractive Option?

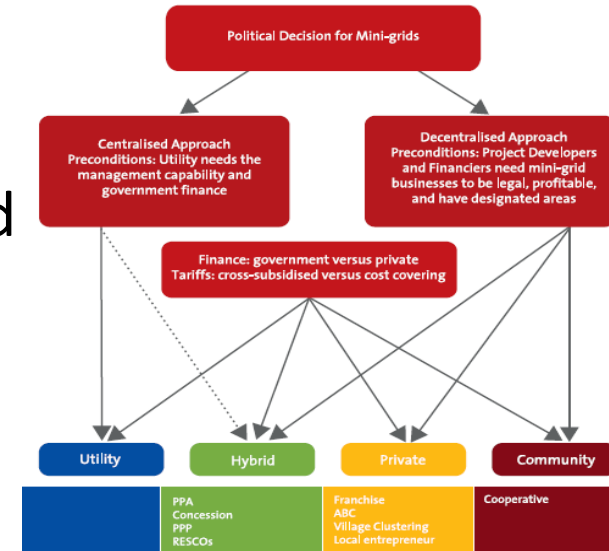


- It may not always be economically viable to supply electricity to dispersed and rural communities in remote areas
- Limited Government and Utility resources in terms of funding and capacity often delay grid extension efforts
- Mini-grids are an attractive option:
 - Various **generation technologies** (solar, diesel, hydro, hybrid models, etc.) can be integrated into the mini-grid
 - The **extensive RE resources** in Africa which, together with the recent advancements (and associated reduction in costs) of alternative generation options, make mini-grids increasingly attractive
 - Mini-grids, if developed according to the **correct standards**, can be integrated into the main grid once the grid is developed

b) Who are the players?

• The Initiator- The Centralized & Decentralized Tracks to Electrification

- The **centralized** track is a **top-down approach** because electrification is undertaken
 - by one or two national government entities such as the state-owned **national utility**, a **rural electrification** or energy agency (REA), or the **ministry of energy**, acting alone or together
- **decentralized** track is a bottom-up approach because electrification is generally carried out through nongovernmental entities such as cooperatives, community user groups, or private entrepreneurs.



• Small Power Producers and Distributors?

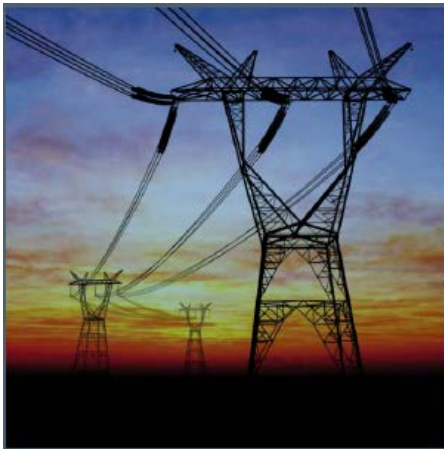
- In most developed and developing countries, a small power producer is described as a **distributed generator (DG)** or a **decentralized distributed** generator.
- Distributed generation (DG) is the generation of electricity by small-scale plants **located near the electric loads** that they serve

• Regulating SPPs



c) What are the Potential Barriers to Developing Mini-Grids?

- **Policy and regulatory environments were developed around grid connected electrification and supports grid extension**
 - Existing policy does not support establishment of mini-grids
- **Mini-grid remain expensive and require a conducive regulatory environment to attract investment**
 - Most mini-grid developments are not viable without subsidies
- **The lack of experience in mini-grids deter policy makers and investors**



GRID EXTENSION



MINIGRIDS



STAND-ALONE

d) Key Elements Required for Mini-Grid Establishment

Mini-grid / Rural electrification
policy framework

Technical and pricing regulation for
mini-grid / rural electrification

Mini-grid / Rural electrification
business model/s

So where do you start?



3. Policy and Regulatory Environment

*And I have to say, those who are involved in this process, they continually tell us the problem is not going to be private-sector financing. **The problem is going to be getting the rules right, creating the framework whereby we can build to scale rapidly.***

—U.S. President Barack Obama, speaking on electricity access in Africa, Dar es Salaam, Tanzania, 2013

The less we have to do with government, the happier we are.
—Indian micropower developer, November 2012

a) Mini-Grid and Rural Electrification Policy Framework



A clear **mini-grid policy** is an essential element to enabling its development within any country.

Policy framework should:

- Provide specific guidance on the **rationale for developing mini-grids** and define the **role of mini-grids in the electricity sector**
- Provide clear guidance to stakeholders on **Government's vision** for mini-grid development
- Reduce **perceived risks** for stakeholders

A comprehensive mini / micro grid policy and Regulatory framework should address the following:

- ***Institutional structure and governance aspects***, including the roles of various stakeholders, licencing of services and regulations, and monitoring and control, amongst others.
- ***Technical aspects***, including quality of supply, quality of service and mini / micro grid islanding and its relation to the greater system, amongst others. (QQCA Principle)
- ***Financial aspects***, including subsidies, grants and tariffs, amongst others.

A stable and clear policy environment will encourage participation in the development of mini-grids and rural electrification.

b) Regulatory Principles to Consider

Electricity regulators are usually described as economic regulators.

But this is only partially true.

- A technical decision is usually an engineering decision
- An economic or commercial decision
- Procedures

Purpose of regulation

*Ensures that the policy that has been put in place is enforced and that the **various players** within the industry **adhere** to the **guiding principles governing the industry.***

Regulation aims to **balance the needs and expectations of these **various stakeholders** in the industry**

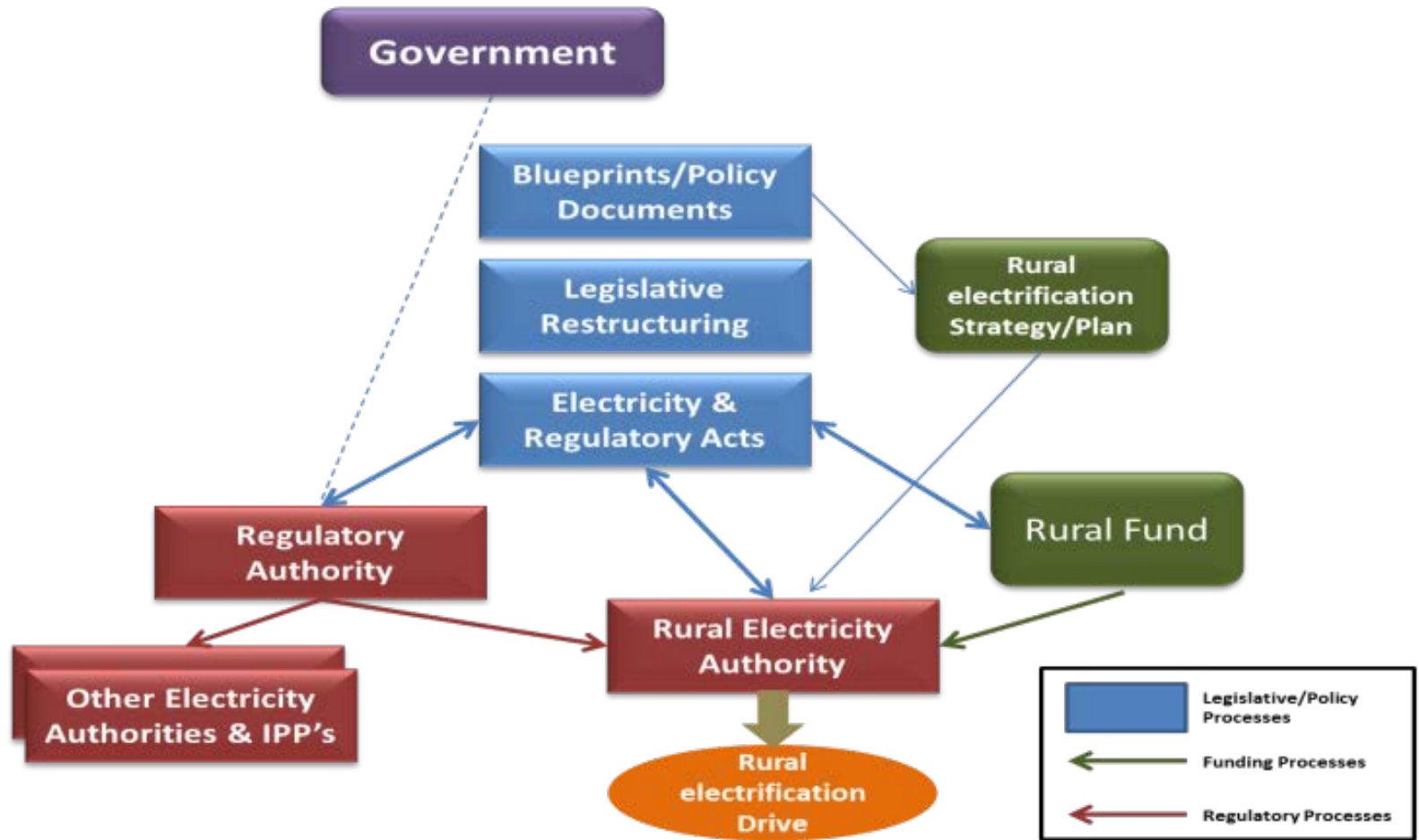
- Allows for a reasonable ROI for investor
- Ensure that consumer requirements with regard to QoS and affordability are met

c) Who Should Regulate SPP's and mini - Grids



- **Government Ministries?**
- **Separate independent bodies?**
- **Rural electrification agencies?**
- All of the above requires either a business plan or the traditional “cost of service” review
- **Community regulation of Privately Owned SPP's?**
- **Self- regulation by Community Owned Organisations?**

Typical Mini-grid / Rural Electrification Policy Environment Arrangement

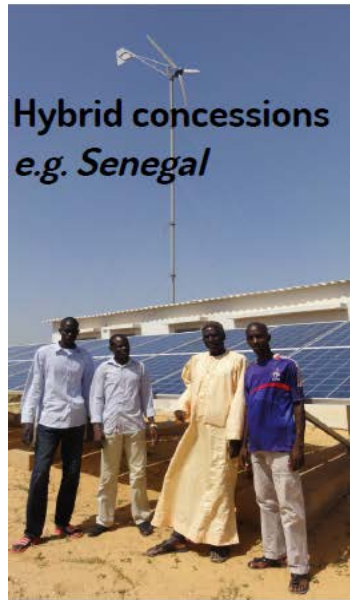




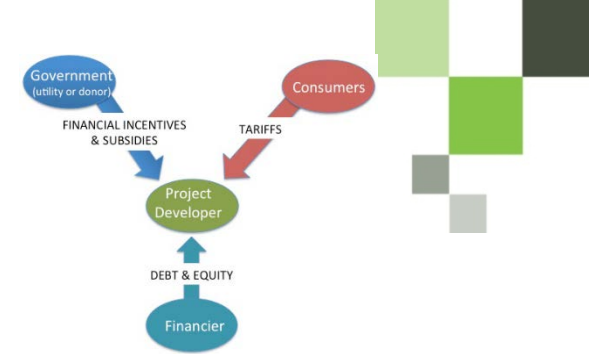
4. Business Model

a) Mini-grid and Rural Electrification Business Model

**No “best” mini-grid business model!
Context is key.**



b) Considerations for Financial Models



It is essential that a sustainable financial model supports the development of mini-grid electrification project.

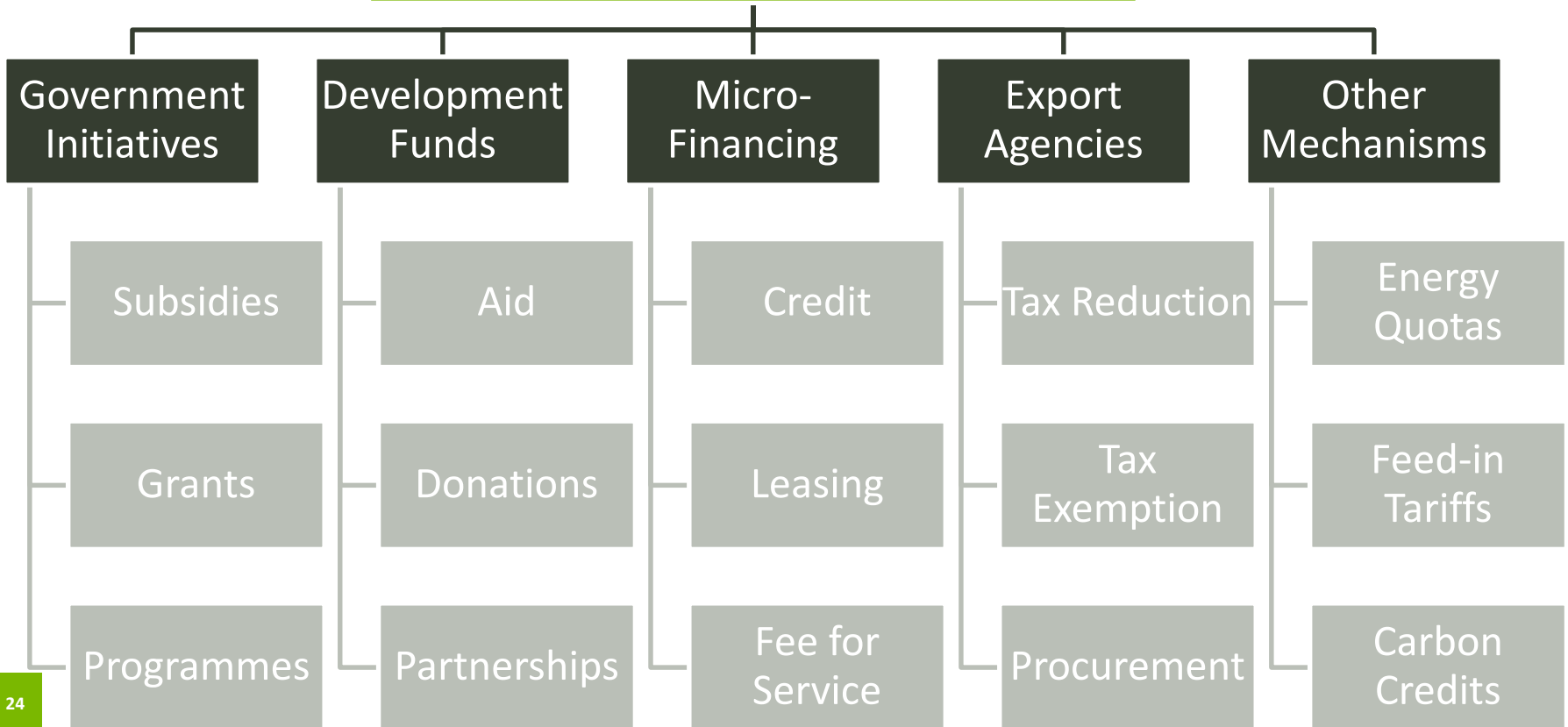
The main components of any financial model includes:

- **Public Finance** - Capital subsidies reduce project costs. Subsidies ideally need to be designed to support market development and to subsidise electricity access.
- **Project or Corporate Finance** – Capital required to build an infrastructure project is usually obtained by raising corporate or project finance. Off-grid financing is naturally cash flow-based and is thus a good option. Unfortunately project finance for mini-grids is hard to come by.
- **Equity Capital** - Private equity investors that may finance mini-grids. Most mini-grid investors will focus on development impact as well as financial viability.
- **Providers of Debt** - Debt from local and international banks, DFIs, funds and other platforms. Commercial debt is expensive and difficult to obtain due to the relatively unknown risks and operational challenges for mini-grids. A mezzanine facility can help bridge the funding gap between debt and equity, but are more expensive than the senior debt but cheaper than equity

Various mechanisms can be used to support mini-grid electrification.

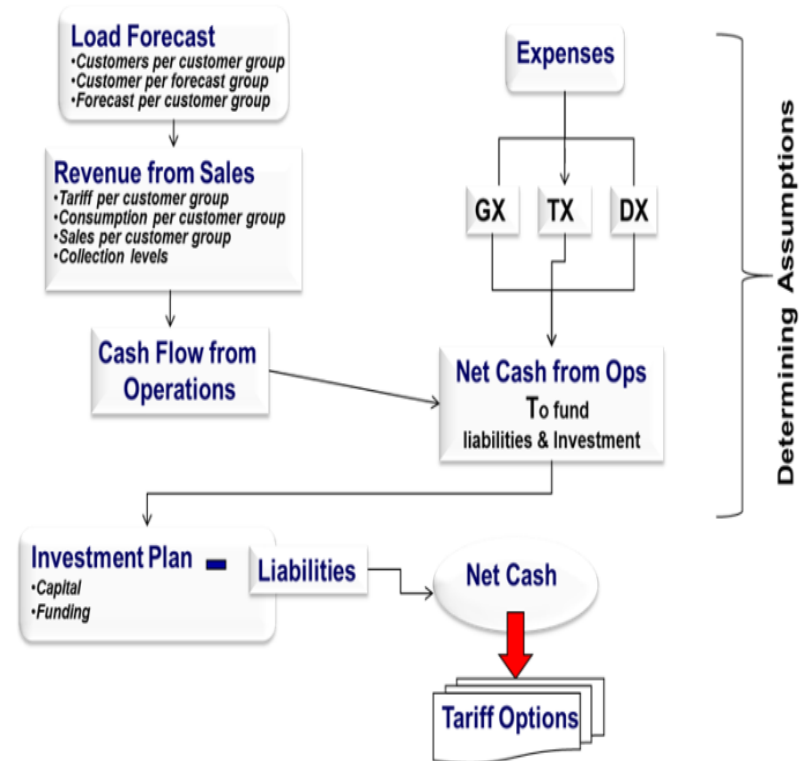


Mechanisms to Support for Mini-Grid Electrification

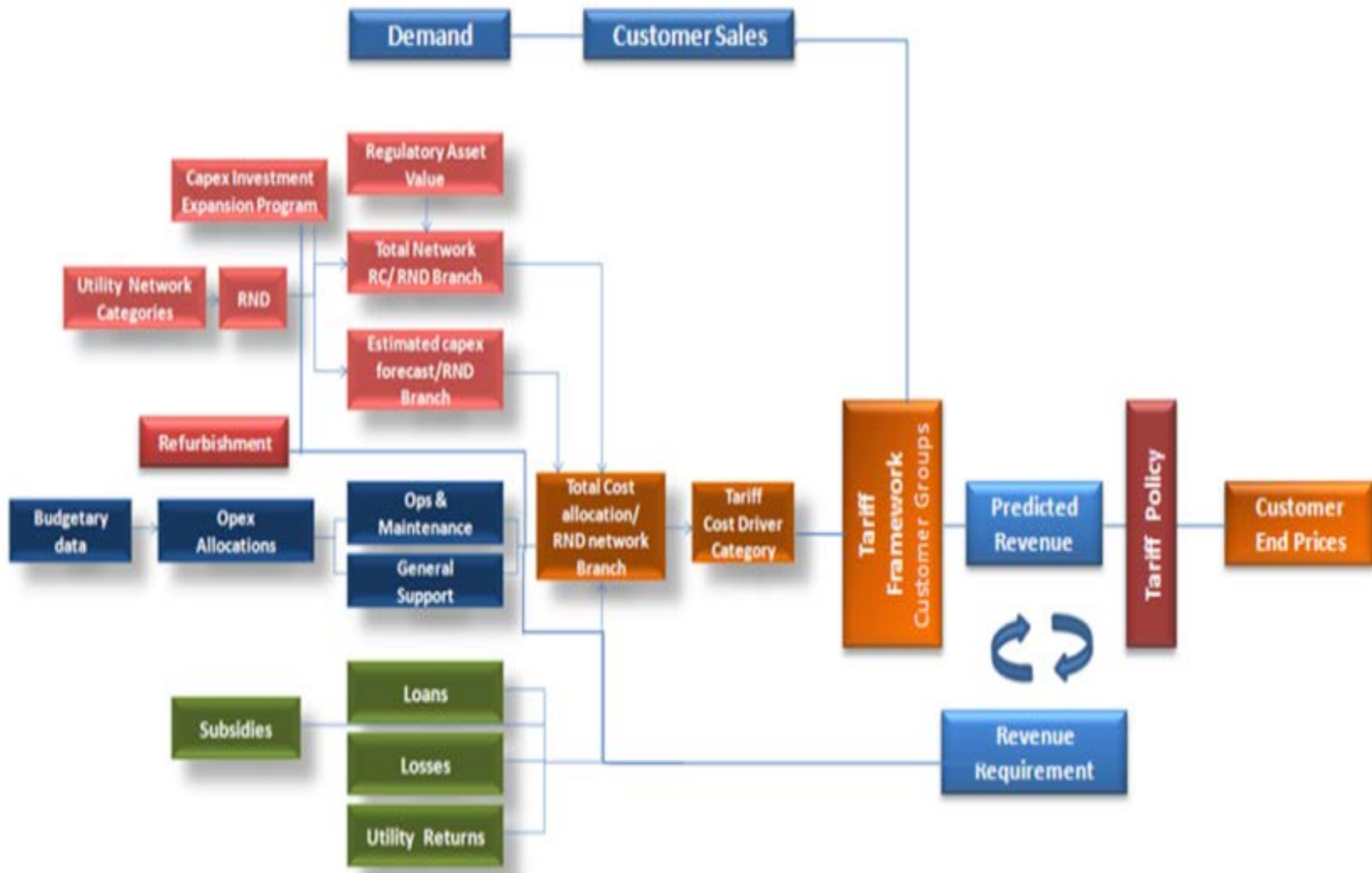


Tariff Setting Considerations for Mini-Grid Electrification

- Sustainable mini-grid development is premised around **cost reflective tariffs** that provide a reasonable ROI
- Tariffs realised from mini-grid would most likely **be higher** than on grid-electricity
 - Impact of economies of scale
- **Subsidies** may be required to make electricity viable and affordable for consumers
 - This will also increase the viability and sustainability of the development
- **Tariff level considerations** are also important in the event of the mini-grid development becoming part of the main grid through future developments



Best Practice Tariff Setting Methodology





5. Summary of Lessons Learnt Internationally from Mini-Grid Implementation

- *Show me the money!*
- *You cannot develop a long-term sustainable strategy based on subsidies and grants.*

— General Electric executive, World Bank Energy Day, 2012

Lessons Learnt



- While the economic viability of mini-grids / rural electrification has improved, it remains more expensive – requires a cost sharing mechanism

- Subsidies (donors / taxpayers)
- Tariff cross-subsidisation / layover

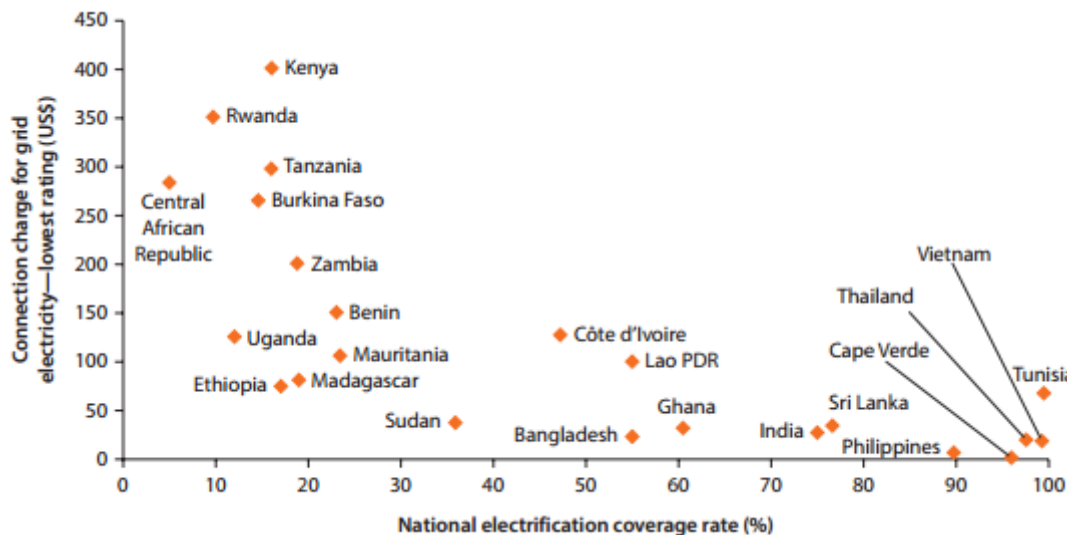
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- Benefits exist for rural grid connection but regulation should clearly address risks arising for investors



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investments

• attractive and
mental, social

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• should clearly

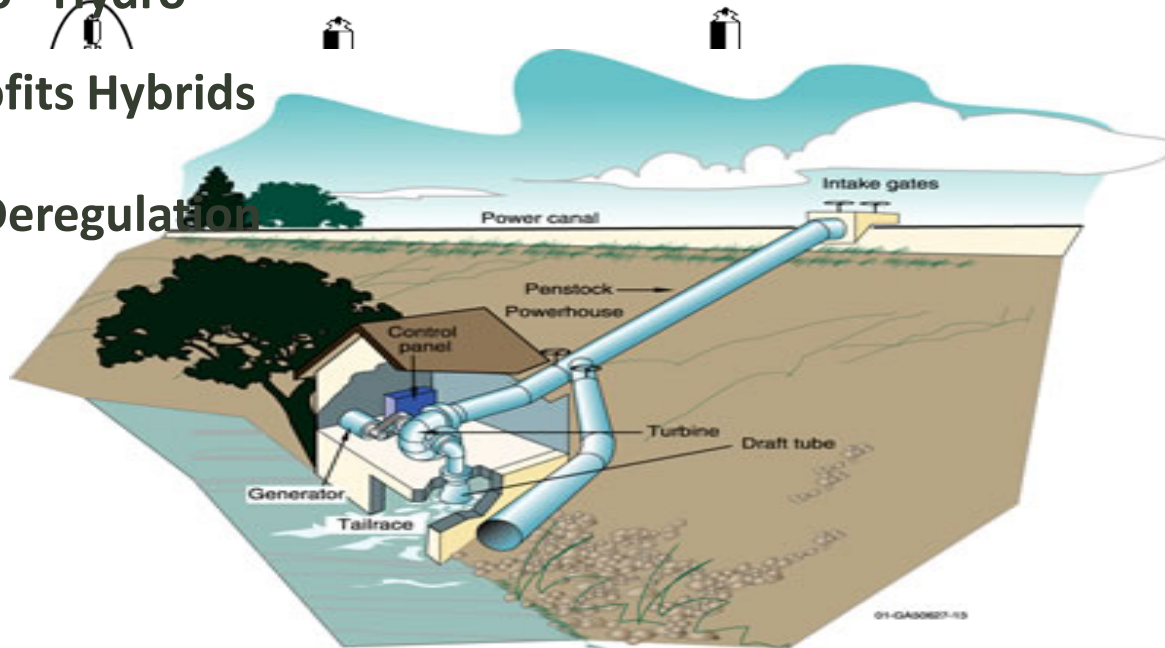
6. Some food for thought

1. SWER

2. Micro - Hydro

3. Retrofits Hybrids

4. Full Deregulation





Thank you

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