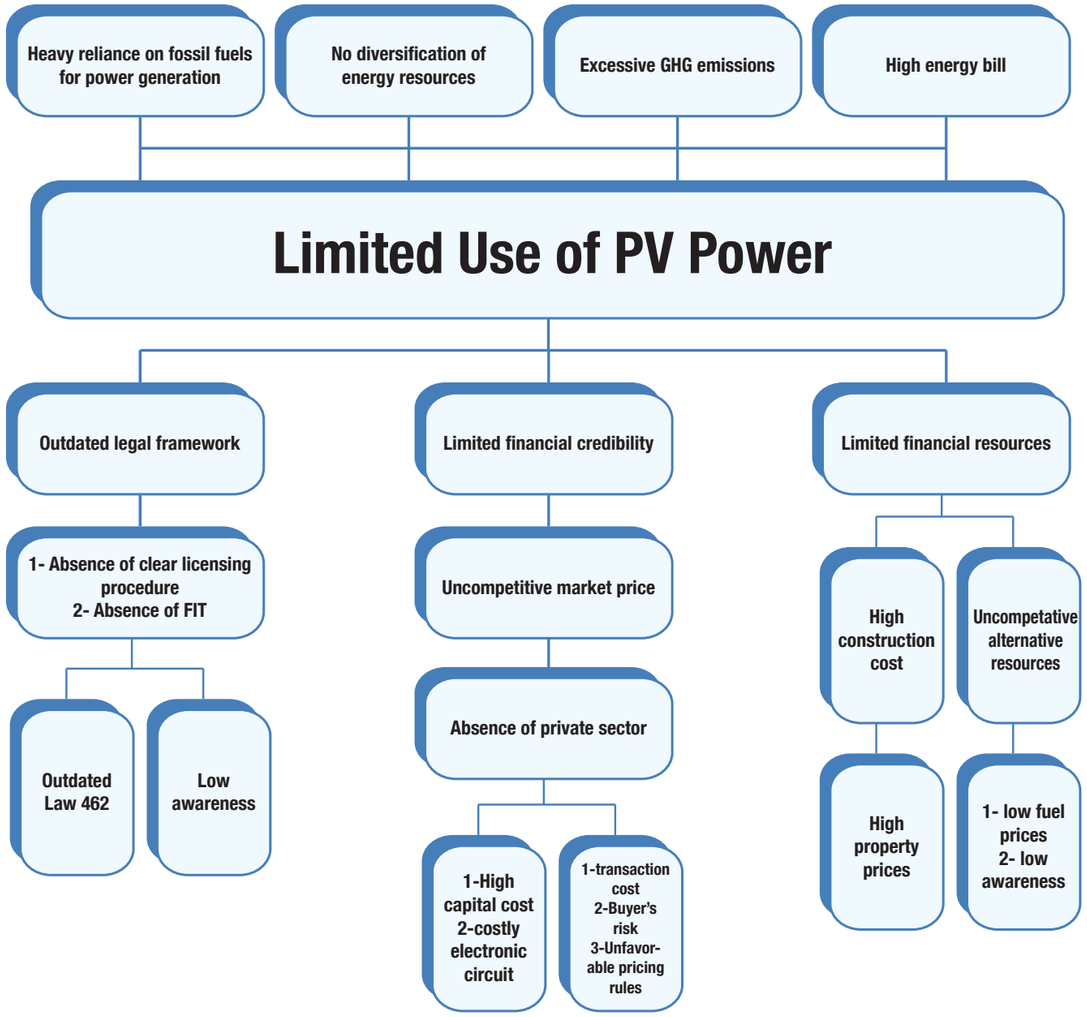

Fig. 7 - Root cause analysis for PV cells

4.6.2 Identification of measures

Knowing that PV cells currently have the highest capital cost of all listed renewable technologies, then price reforms certainly provide high motivation for private industrial end-users and household consumers to invest and to ensure that their investments will be economically feasible. Among the generic measures proposed in Table 12, financial and technical support are the most significant, and they include:

Removal of subsidies on fuel: The main objectives of tariff restructuring are to minimize the financial burden on EDL through the removal of subsidies and to ensure an adequate impact of future policies for promoting alternative and cleaner energy technologies that are currently at a cost disadvantage. Gradual tariff adjustment by GoL is expected to reach around 50% increase by 2015. This will also allow private power producers to sell at higher profit- making tariff. Moreover, tariff restructuring will lead to more rational use of electricity in the long-run leading to substantial reduction in GHG emissions.

Provision of financial incentives: Economic and fiscal incentives can be used to encourage investment. Significant support so far has been focused on promoting solar hot water heating systems, a proven technology that can make a useful contribution to GHG reduction. LCEC has been active in promoting solar thermal water heaters in the Lebanese market, providing advice on technical issues, communication and marketing. A similar momentum should be created to the PV systems. CEDRO has carried out a project for the deployment of PV cells for street lighting and for a number of schools in different regions of Lebanon.

Feed-in tariffs: For a power grid operator, PV renewable energy technology is of much higher capital cost, and therefore must be subsidized if it is to be developed by private industry in a competitive market. Even with tariff adjustment, there is an urgent need to introduce feed-in tariff to encourage investments in the field of RE. Investors need to have the opportunity to sell excess energy to the grid and consequently cash the balance.

4.6.3 Action plan for the Deployment of Photovoltaic cells

Target for Technology Transfer and Diffusion

In Lebanon, the CEDRO project has started installing PV cells in around 25 public schools and community centres in different parts of the country with a total capacity estimated between 1.2 and 1.8kW.The Council for Development and Construction is developing a pilot project farm with nominal capacity ranging between 1 and 5MW (MoEW, 2012). In conducting the generation capacity expansion till year 2015, a total of 1MW of PV cells has been considered.

The stocktaking process has identified the measures for PV technology as listed in Table 15

4.7 Technology Analysis: Hydropower

Hydropower is a combustion- free energy resource which is well established on global scale, and in Lebanon. Hydroelectric power plants have long economic lives, with some plants in Lebanon still in service for 50–100 years. Hydropower could, therefore, provide a feasible mitigation option for a limited replacement of fuel- driven thermal units since the hydro power capacity in the country could be increased by around 40MW. Hydro power has been established in Lebanon for a long time, since the 1960s, and therefore, unlike other renewable resources, local expertise is already available in hydro projects like Abdel Al and others.

4.7.1 Identification of barriers

Some of the generic barriers identified in Table 12 are more significant with regards to the deployment and diffusion of the hydropower technology, namely:

High capital cost: The capital cost for building the infrastructure needed for a hydro power plant could be very high compared to other conventional energy sources, resulting in cost-driven decisions and policies that may renounce hydro power as an economically feasible GHG mitigation strategy. The investment cost is further inflated by the rising trend of property prices in the country. The capital cost for hydropower has been estimated to USD 3.5 million in Lebanon.

Outdated legal framework: Renewable energy sources feeding into an electric power grid may not receive full credit for the value of their power. Renewable energy resources such as hydro power are often regarded as an intermittent discontinuous source whose output level depends on water availability that cannot be entirely controlled. Therefore utilities tend to regards these renewable resources are not reliable and hence reduce their purchase prices.

Inadequate water authorities regulations: In Lebanon, all water resources and rivers are considered to be a state property. In these circumstances, and in the absence of a legal framework, independent power producers will not have enough incentives and motivation to invest in hydro power facilities.

Unresolved property rights and shortage of landscape: Unresolved property rights in many regions of the country, state ownership for rivers and water resources, and dams for hydro power, may lead to restrictions on implementing such projects. Current city planning regulations may not allow for private hydro power production amongst water resources. Also they may not have established procedures for dealing with siting and permitting. Competition for land use with agricultural, recreational, scenic, or development interests, accompanied by substantial increases in property prices and scarcity of water for several months every year, can also be a barrier for the wide spread of hydro power. Fig. 8 shows the results of the root cause analysis for hydro power.

Table 15 - Technology Action Plan for Photovoltaic cells

	Measures	Priority	Objective	Responsible parties	Beneficiaries	Time scale	Monitoring and Evaluation indicators	Estimated cost (USD)	Potential Donors
General Measures	Gradual increase in tariff through fuel subsidies removal until it reaches 50% in 2015	1	- To remove financial burden from EDL. - To enhance the marketability of PV technology	The Department of Investment at MoEW	- EDL through improving the financial balance - private producers	0-3 years	- MoEW decisions and governmental decrees. - Periodical EDL reports.	2,000,000 for preparation of economical study to determine appropriate tariff.	World Bank, UNDP, USTDA, EU
	Low interest offers by the banking sector	2	- To encourage investments in PV technologies.	Banking sector	Private power producers	0-6 years	Reports by stakeholders that cover financial Information, comparison of actual financial outputs with forecasts, and project financial statements.	0	NEEREA, Commercial banks, New Market Mechanisms
	Tax exemptions/ reduction on imported PV technologies	2		GoL				0 Assuming that the amount of the tax reduced is added to the tax of fuel based technologies.	
Specific Measures	Feed- in- Tariff	1	- To facilitate power purchase from private producers. - To attract the private sector.	GoL MoEW	- EDL - Private power producers	1-3 years	- Updated Law 462. - New tariff structure. - Number windmill projects by private sector.	15,000 for economic feasibility of the energy purchase prices.	NEEREA, EU
	Updated buildings code	2	- To stimulate wide integration of PV units in buildings.	- Urban Planning Authority - Order of Engineers and Architects	-Building sector	0-2 years	- Updated building code decrees. - PV units installed in the building sector.		NEEREA EU

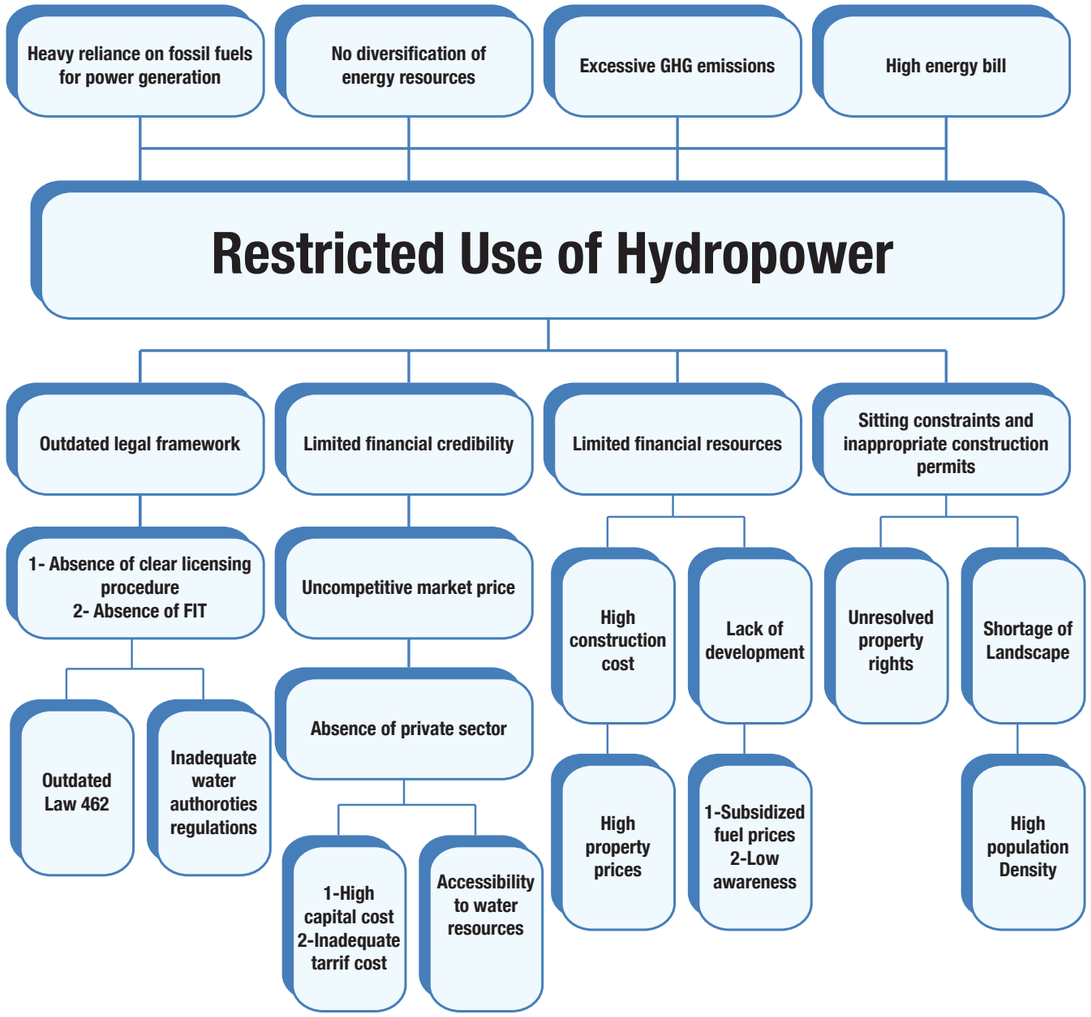

Fig. 8 - Root cause analysis for hydropower

4.7.2 Identification of measures

Among the most important measures are price reforms that would produce much substantial motivation to industrial end-users and household consumers to invest and to ensure the system operated as efficiently as possible. Measures for financial support and other measures have been discussed in Table 12, and they include:

Removal of Subsidies on Fuel: The current electricity tariff needs to be revised to reflect the actual cost of electricity production and distribution and to subsequently encourage the use of Hydropower energy technologies.

Feed-in Tariffs: due to the high capital cost of renewable energy technologies, the private sector should be encouraged to be involved in the deployment of such technologies.

Institutional reforms: they include the establishment of a clear energy strategy, clarification of roles and responsibilities of all involved entities and amend Law 462. It also includes the enforcement of safety standards, city planning intervention for setting property rights throughout the country and setting clear procedure for licensing and assessment.

Technological support: this includes the provision of training for the labor force mainly in O&M in