



Cambodia From Power Importer to Self Reliance:

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Sector Highlight: Energy Sector

Operating in a country with extraordinary social needs, RFC likes to find investment opportunity where possible in projects which deliver not only an excellent financial return to investors but also an above average 'utility' return to local people. The power business has the potential to deliver on both fronts. Hard to imagine but the whole of Cambodia has only 800MW of installed generating capacity-that's what, probably enough to run a section of Central on Hong Kong Island? Point is of course, there is a structural deficit of this most necessary commodity and with the right take off agreement, the demand inelastic business of power generation and distribution can be highly profitable AND deliver tremendous social advantages to people. We are currently looking closely at a couple of interesting Small to Medium Scale Power Projects (SPPs) and Transmission and Distribution projects. Here, RFC Capital gives a brief explanation of just why it looks so interesting.

Cambodia's energy sector is at a critical stage of development. Despite expansion of the electricity supply since 1995 when the rehabilitation of the national power system began, capacity is still significantly below the rapidly growing demand. Electricity costs in Cambodia are among the highest in the world, while the electrification rate remains one of the lowest in Asia. Currently, less than 20% of Cambodian households have access to the public electricity grid, and tariffs generally range from \$0.15 to \$0.50 per kilowatt hour. Rural Cambodians off the grid at best may have access to small community generator sets which may charge car batteries for household use at rates of up to \$1.00 per kilowatt hour. In 2015 60% of the country has been electrified, in terms of hydroelectricity projects till date 7 hydro projects have brought in FDI worth USD2.4bn the government didn't have to borrow and bear liability. There are now totally 14 BOT PPP power (hydro, Thermal and transmission lines will bring in FDI worth 3.7bn in FDI into the country's power projects. The poor families who paid 4000 Riels (USD1/Kwh) now pay only 1050 Riels/Kwh (0.25cents/Kwh) now in 2015. in 2016 this is slated to go down to just 800 Riel/kw (0.20 cents/Kw) and it will go down further as new projects are able to generate. There is increased supply, increased reliability and cost reduction. Professionals from both side of border are trying to reconfigure how they will sell some for the 80MW surplus electricity that will be produced in Rainy Season in Cambodia. Recently due to protest Areng Valley Dam has been cancelled so Cambodia has to find alternative energy such a hybrid systems using solar, wind and bio fuels around 108 MW by 2018 as per the master plan in the power sector. There is need for building a smart grid system to distribute properly the surplus power that is wasted today amounting to USD74mn lost revenue in 2015 Grid Unification is a serious challenge that we at RFC is scanning for potential partners to execute sustainable smart LED grid and ensure steady risk premium for the investors a complete ring of 230 KV and 115kv transmission network will be around the Tonle Sap river by the end of 2018. Here we need USD3-4bn FDI in terms of BOT PPP project investment. Large scale photovoltaic Production the adjustment in billing system and day and night and seasonal variation has to be adjusted with the national grid in Cambodia to usher a new era of greening the power sector.



The domestic electricity supply is fragmented, consisting of 50 to 125 small isolated power systems that primarily rely on diesel or heavy fuel oil. In 2014, the capacity output of the Electricité du Cambodge was approximately 805 megawatts and 1,100 gigawatt hours. By 2024, required capacity is expected to approach 3,050 megawatts and 16,250 gigawatt hours.

The Royal Government of Cambodia has targeted hydroelectric generation as a priority and estimates that Cambodia has the potential to generate more than 10,000 megawatts from hydro sources. There are currently several hydroelectric dam projects under development by Chinese firms with plans to add more than 2,000 megawatts of large scale power generation projects over the next ten years. As a stopgap measure, Cambodia plans to import up to 260 megawatts from Vietnam, Thailand and Lao PDR over the next three to five years. Several transmission projects for this are now under construction and majority have been completed with funding by development finance institutions.

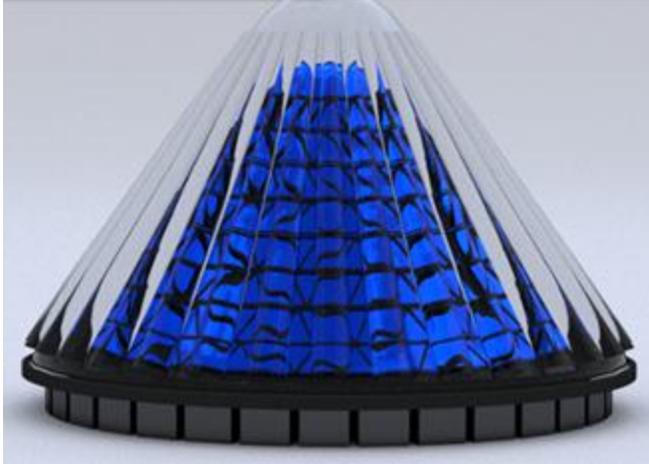
Large scale power plants fueled by gas or coal has been introduced in Cambodia if recent local resource discoveries prove commercial and extraction commences it could further boost power plants investments. However, these projects will require significant investment in expanding the national grid system.

Cambodia is committed to rural electrification and has set a goal of providing quality electricity services to 70% of the rural population by 2030. It is estimated that only 13% of rural households have access to electricity today. The limited national grid system will require significant expansion of the domestic transmission and distribution system as well as innovative small power generation projects to ensure electrification of rural communities and emerging commercial centers.

Investment opportunities in the power sector are numerous and include both power generation and transmission. Greenfield projects for medium to large scale hydropower, coal, solar, biofuel and gas plants are available. There is also the potential to acquire smaller oil-fueled plants that are currently operating inefficiently but have attractive power purchase agreements with Electricité du Cambodge. Cross-border transmission lines as well as domestic transmission and distribution systems may offer attractive returns contingent on the agreements investors are able to negotiate with Electricité du Cambodge.

Given the unusually high cost of electricity from traditional sources, Cambodia offers unique opportunities for alternative energy projects that would minimize or avoid the negative environmental impacts of generating power from oil, coal or hydroelectric dams. Leopard Cambodia is currently researching several options including underwater current driven turbines along the Mekong River, biomass, biogas, solar, and wind. These projects could initially target rural towns off the national grid. Price competitiveness of solar power plant is the key and

It's important to note that V3Solar's Spin Cell is still at the prototype stage, and one has to assume that some calculations will change as the product is refined and enters production. But speaking to [Clean Technica](#), a source at V3 seemed optimistic, to say the least: "We are excited. We think we can go below that [8 cents/kWh], but we want to stay conservative." Additionally, a third-party solar expert, Bill Rever, has [conducted a technical analysis](#), and his findings support those of V3.



<http://inhabitat.com/v3solars-spin-cell-cones-could-produce-electricity-for-the-insanely-low-cost-of-eight-cents-per-kwh/>

Researchers at the University of New South Wales and the Australian renewable energy agency (ARENA) have cracked the 40% mark in a photovoltaic system without using concentrator technology. To increase the amount of sunlight converted into electricity, they combined modern, stacked solar cells with three layers of semiconductors and 3 p-n junctions with simple silicon solar cells. The researchers also captured parts of the solar spectrum that are normally lost in standard PV cells. They do this by separating the light into various slices of the solar spectrum which are then diverted to the silicon solar cell. "This approach has achieved a higher efficiency than what is physically possible with a triple junction cell alone," says ARENA CEO Ivor Frischknecht. During field tests in Sydney, Australia, the researchers achieved 40.1% efficiency. The record was independently confirmed by the National Renewable Energy Laboratory (NREL) in the United States.

<http://www.renewablesinternational.net/australians-break-through-the-40-efficiency-mark/150/452/84150/>

<http://inhabitat.com/raytons-new-super-efficient-affordable-solar-panels-could-trump-fossil-fuels/>

A new silicon-based solar panel which utilizes holographic foil is reported to be nearly twice as efficient as standard panels. Referred to as a "game-changing technology," the panels were developed by the Dresden-based Apollon GmbH&Co.KG and Solar Bankers LLC from Arizona. The technology is based on holographic optics which allow the new solar modules to be manufactured at a much lower cost than conventional solar panels. The system can achieve 28 percent efficiency, which is significantly higher than the average 17 efficiency of currently used solar panels, according to the company. The holographic foil is printed on the cover glass and filters the sunlight. The distance between optic and solar cell is only a few millimeters and filters only the desirable wavelengths of the light. The sunlight is then concentrated on the solar cells, preventing significant energy losses. Thanks to the printing process, modules can be cheaply duplicated, thus saving time and resources.

"Our solution addresses the major downsides that make today's photovoltaic (PV) technologies unprofitable. These disadvantages arise mainly from the material silicon as well as from efficiency losses, which result e.g. through heat occurring from concentration," said Alfred Jost, CEO of Solar Bankers.



The new technology continues to use silicon as the solar cell material. However, the amount of silicon in the new modules account for less than three percent of the total module area. "With the holographic optic a 20- to 30-times concentration of the desirable wavelengths of the light makes a silicon needs reduction by over 90 % compared to the amount of silicon used in standard solar modules possible", explained Jost.

<http://inhabitat.com/new-solar-module-uses-holographic-foil-to-create-cheaper-more-efficient-panels/>

The cost of solar power has declined dramatically over the past few decades, from \$40 per watt in 1977 to \$0.74 per watt in 2013. This trend is expected to accelerate as improvements in efficiency and new technologies come online. This is good news for citizens of developed countries who want to make the switch to a cleaner and increasingly cheaper energy source. The shift to solar may be most dramatic for those living in developing countries. Thanks to inexpensive printed solar cells, 1.3 billion people currently without electricity may be able to plug in for the first time.

Read more: [Paper-thin printed solar cells could provide power for 1.3 billion people | Inhabitat - Sustainable Design Innovation, Eco Architecture, Green Building](#)

<http://inhabitat.com/paper-thin-printed-solar-cells-could-provide-power-for-1-3-billion/>

So in sum, power-related projects look to us, attractive indeed-provided sufficient returns can be negotiated. We hope to give you more concrete news in the ensuing months".

Sector Highlight: Real Estate

Under the Khmer Rouge's 1975-1979 radical regime, private ownership of property and money was abolished throughout Cambodia and land title records were destroyed. After the regime's overthrow, displaced Cambodians occupied and settled into vacant properties, resulting in a comprehensive land redistribution exercise, perhaps unparalleled in recent global history. Property rights remained fragile until the adoption of the 2001 Land Law, which clarified key issues related to transfers of private land and concessions and leases of State-owned land, and ushered in a modern system of land registration. Like almost everywhere in Asia, this law limited ownership of freehold land to local nationals or companies majority owned by locals. Foreigners are allowed to hold up to 49% of a land-holding company or may lease land up to 99 years. Many foreign investors achieve effective control of freehold land through the use of various accepted legal structures.

The new property law, followed by the introduction of mortgage loans in 2004, set the stage for Cambodia's modern day property boom. Other supporting factors were improving perceptions of Cambodia's political stability, robust economic growth, a lack of other local investment alternatives, and the global rise in property prices as the world's liquidity bubble inflated. From 2004-2008, property prices in Phnom Penh surged 200-500%, and Korean developers began advertising plans for residential towers and multi-billion dollar "satellite city" projects that promised to dramatically transform Phnom Penh's current landscape of villas and shop-houses. However, the collapse of the US subprime mortgage market and property markets globally eventually hit Cambodia in the second half of 2008, leading most major developers to scale back or delay their real estate projects.

The government and private sector in Cambodia made some important efforts to regulate and stimulate the real estate sector in the aftermath of the downturn. Real estate professionals collaborated to form two professional associations (one for valuers and the other for developers) to address challenges in the sector. The National Bank of Cambodia relaxed banking reserve requirements and property exposure limits that had been sensibly tightened in mid- 2008 near the peak of the boom, hoping to stimulate activity and confidence in the property market. Meanwhile, the Ministry of Economy and Finance, in a



noteworthy effort to protect consumers, is trying to introduce a government edict to tighten developer licensing requirements and establish reserve capital requirements for construction projects. (This move has been strongly resisted by developers seeking to preserve their cash flow in a market largely financed by pre-sales of units.) In addition, the government is preparing a law to introduce strata titling and allow foreigners to purchase condominiums above the ground floor.

At the peak of the property boom in mid-2008, top sites in Phnom Penh were reportedly changing hands at \$4,000-5,000/sqm. Since then, real estate experts have estimated property prices have fallen 30-40% but volume remains extremely thin. The market will take time to clear as many owners purchased their properties with cash and can afford to wait for market recovery, while others bought with seller financing and can at worst just hand back the property. But there was also an element of leveraged speculators and property flippers, and most of these players have been crippled by the downturn. A handful of banks that were active in the mortgage market are facing rising delinquencies, but most used 50% loan-to-value ratios based on deeply discounted valuations, and did not allocate much of their portfolio to property. Apparently, no banks have tested their foreclosure rights in the court system but we are told that one is getting ready to. Meanwhile, amidst the uncertainty, construction continues on several development projects that got underway well before the market fell; including the nearly-complete 24-story OCIC Olympia Share in the Olympic Stadium, an office cum residential building in Phnom Penh that is currently Cambodia's ultra-modern structure.

From the second to the third quarter of 2014 alone, land prices in the districts of Phnom Penh city went up by 30 per cent in commercial areas and 40 per cent in residential areas, Realty Group study found.

- **The riverfront's land on Daun Penh district has no land available for sale, on the other hand some strip a couple block after riverfront's, had a wider variation in prices, with residential land priced from \$2,000 to \$6,000 per square meter.**
- **In Prampi Makara district, the home of high-rises and shopping center such as Phnom Penh Tower and City Mall, commercial land prices increased between 20 and 25 per cent in the third quarter of 2014. Within the district, prices along street 163 are between \$6,000 and \$10,000 per square meter.**
- **Phnom Penh's land prices jumped in 2014 due to a number of factors: better customer knowledge following the financial crisis, renewed political stability, strong economic growth, and an influx of overseas investors into the market as Cambodia prepared for ASEAN economic integration.**
- **Khan "Chamkarmon alone, especially Boueng Keng Kang1 Area where most of foreigners living, land prices went highest from \$4,000 or \$5,000 per sqm last years, in current market prices now are increasing between \$8,000 to \$9,000 per sqm,"**
- **But despite the price increases in Cambodia, Still remains affordable to the investors for comparing to other ASEAN countries. CT02**
 - ▶ Barely out of the ground and residential units already gone
 - ▶ Sat, 13 December 2014
 - ▶ Sum Manet

 - ▶ *Even though it will be another four years before The Bridge is completed in 2018, 100 per cent of the development's 762 apartments, penthouses and residential units have already been snapped up*
 - ▶ Residential units in The Bridge residential and office tower have sold out – almost four years before development in Tonle Bassac is scheduled to open its doors.



Long term, the outlook for Cambodia's real estate sector is underpinned by the country's youthful demographics and current undersupply of most property segments. For example, while Siem Reap is well supplied with hotel rooms, it still has few residential units for hotel managers and other expatriates. In Phnom Penh, it is still difficult to find quality office and retail space, or recreational and entertainment facilities. And on Cambodia's scenic coastline and islands, boutique resorts and villas are needed. LHI will continue to look for unfilled niches in property as one of its various investment strategies.

Sectoral Highlight: Microfinance Investment Opportunities in an under-banked Cambodia

In recent years, the Cambodian banking sector has experienced dramatic growth due to annual GDP expansion of more than 7.5 percent in 2014 and to increasing bank penetration. Bank deposits have grown from \$382 million in 2000 to more than \$8.5 billion today while bank loans have increased from \$310 million in 2000 to more than \$5.5 billion. However, Cambodia still remains relatively "unbanked" with total bank assets less than 40 percent of GDP as compared to approximately 160 percent in Korea and 120 percent in Vietnam.

Most Cambodian commercial banks have traditionally focused on the top 20% of the economic pyramid and have overlooked rural communities which comprise more than 80% of the overall population. This is where Microfinance institutions (MFIs) have stepped in with great success.

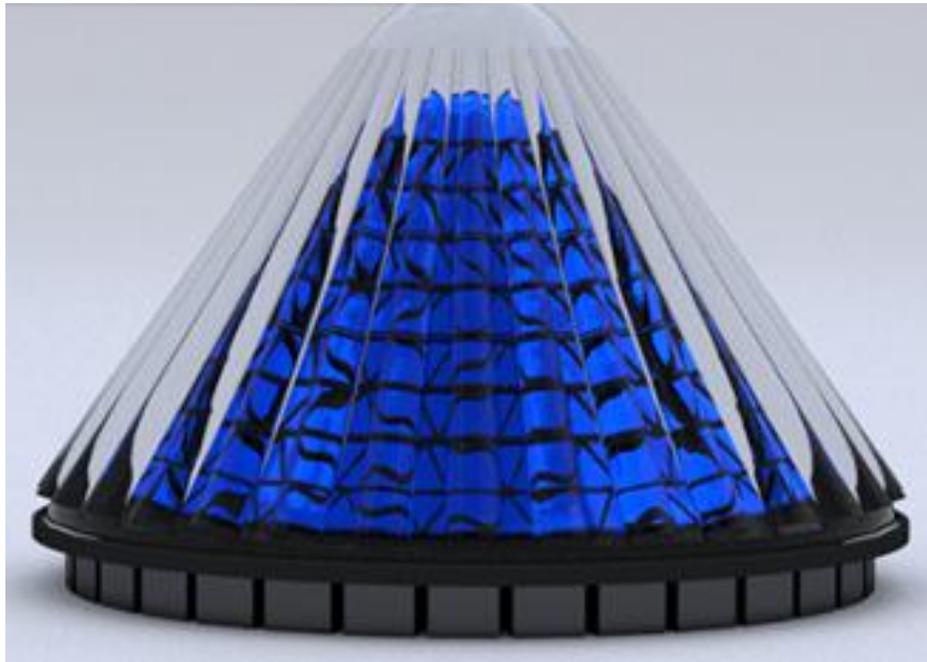
The Cambodian microfinance sector is generally considered a model microfinance industry and is widely studied by academics and banking professionals. Five Cambodian MFIs are included in the *MIX Global 100 Composite Rankings* of the top 100 global MFIs. Only India has more MFIs in the index. At the end of 2013, Cambodia had 32 licensed MFIs, up from six MFIs in 2003. Microfinance loans increased by 61% in 2012 and are still expected to grow at a healthy 10 to 20% in 2012 although funding costs could rise as foreign investors scale back their emerging market investments and nonperforming loans will also likely increase as a result of slower economic growth. In 2013, the number of MFI borrowers exceeded two million, up from 970,152 in 2007: healthy growth across the board.

Rainforest Capital LLP (RFC) expects consolidation in the banking sector over the coming 12 to 20 months as a result of the National Bank's tripling of the minimum capital requirement in September 2012. Capital requirements were increased for commercial banks from KHR 50 billion (\$12.5 million) to KHR 150 billion (\$37.5 million) and for specialized banks from KHR 10 billion (\$2.5 million) to KHR 30 billion (\$7.5 million). All banks have met the new capital requirements. This combination of tremendous growth and of consolidation presents investors with several exciting opportunities and at RFC we are currently evaluating several options to invest in the sector including participating in any pre-IPO capital raising by a



leading MFI, acquiring an existing MFI or merging an existing MFI with a smaller commercial bank. The rather unique history of Cambodian MFIs and into their structure and RFC also looks at the tremendous scope for future growth.

Picture of the Month



Solar Power costs slated to go down to [8 cents/kWh]
V3Solar's Spin Cell



BR

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