



FAIR SOLAR PROGRAM

Opportunities and Conditions for the
Fair and Sustainable Development of
Distributed Photovoltaic Electricity
Generation on Efaté Island

Port Vila, Vanuatu | May 9th 2014



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URA's Notice of Request for Comments and Public Consultation, case U-0002-14, titled: "Investigating and Implementing feed-in tariffs and net-metering scheme for renewable energy in Port Vila" (April 2014)

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EXECUTIVE SUMMARY

Summary of key comments and recommendations

1

URA must clarify that the remaining solar absorption capacity of the Efaté grid is very limited in the short-term and is slated to become non-existent as soon as already committed solar projects are put in operation. This expectation should be set in a transparent manner with the general public, the Government and any other stakeholders. It should also be made clear that Unelco will define any future intermittent capacity openings based on a fair and balanced process so it cannot offer any guarantees as to whether distributed solar will or will not be the best technology to meet Efaté's needs in the future and to what extent it should be incorporated into the energy mix.

2

URA should consider finalizing economic calibration of the PV solar schemes only once the 2014 rate case has been completed, in particular if URA anticipates that it would like to discuss any material changes to the tariff formula, tariff structure or tariff levels. Changes in tariff structures and levels could further aggravate cross-subsidies or create other unanticipated issues. Changes in the tariff formula, in particular if there is any modification in the accounting of behind-the-meter PV solar could have an impact on customer prices and Unelco. Having 2015-2020 rate case decisions before the final PV solar program calibration would provide Unelco and other stakeholders with appropriate foresight and regulatory clarity.

3

Unelco agrees with the general scope of types of tariffs and individual installed capacity levels that could become eligible for a standard distributed PV Solar trial. As mentioned in point #1, Unelco however has strong reservations regarding the timing and the size of the trial. Unelco heard the feedback provided to URA during the public hearing from installers, requesting some lead-time (which is consistent with recommendation #2 above) and that the trial period should be 1 year in length. Unelco would agree that because of seasonal variations of PV solar generation, the results would be more meaningful if the trial were 1-year in length rather than 6 months.

4

URA must re-calibrate the level of the access fee of its "adjusted net meter" scheme to the level of the Fair Access charge proposed by Unelco to avoid creating an unfair and unsustainable cross-subsidy between customers and create

substantial tax shortfall for the Government. URA's current calibration would shift 9,000,000 Vatus of fixed system costs per year or 225,000,000 Vatus over the lifetime of solar panels from PV solar customers to other customers. This figure, although already quite large, is only taking into account the 75 participants in URA's proposed trial, not any subsequent larger roll-out

5

URA must create a Fair Access charge in the “bi-directional metering” scheme to avoid creating an unfair and unsustainable cross-subsidy between customers and create a tax shortfall for the Government. The Fair Solar Program table following this list describes the Unelco's recommendations to correct and avoid this unfair and socially regressive transfer.

6

URA must clarify the pre-existing legal and contractual frameworks that will impact any of the considered schemes. Unelco has a production monopoly that applies to any grid-connected generation. Unelco is eager to optimize production on Efaté in order to bring down energy costs and will therefore consider all options. However, it will only delegate production rights to third parties if the program proposed is in coherence with a sustainable long-term energy strategy and the sound equity and fairness principles set out in this document. In Unelco will maintain the final right to approve all generation applications.

7

URA must clarify that only the Government of Vanuatu has the power to approve tariffs, whether consumption or feed-in tariffs. During the public hearing URA committed to providing a detailed analysis of the impacts on the other customers and stakeholders, in particular the level of embedded cross-subsidies in URA's proposal. The Government of Vanuatu should have this information, as they should be consulted in matters of fairness and equality of treatment between customers.

8

URA must make it clear that the final scheme will be completely financially neutral for Unelco: Unelco is not looking to profit from this scheme and is committed to passing on 100% of the real net economic benefits to the system. If the final scheme and calibration proposed by URA, and approved by the Government of Vanuatu, were to create, despite their best efforts to avoid them, any over- or under-collection for Unelco, an over-payment or a cross-subsidy between customers, Unelco is committed to tracking it, transparently publishing the figures and will demand full recovery of any shortfall. The above includes the incentive and pricing mechanisms to PV solar generators as well as any and all of the new costs associated to the introduction and maintenance of this program (designing and managing the trial and any subsequent roll-out).

9

URA must provide guidance as to the control and compliance process it is recommending for these schemes. Unelco cannot endorse the introduction of a new mechanism that doesn't exhibit a minimal risk, mitigation, control, and compliance analysis.

Anatomy of recommended Fair Solar Program (trial)

		Fair Net Metering	Fair Bi-directional Metering
Eligible customers, tariffs and capacities	<i>Types / Tariffs</i>	“Other Low Voltage” (OLV) tariffs	“Commercial” and “High Voltage” tariffs
	<i>Capacity</i>	1.1 to 19.8 kVA (max KWp installed = kVA subscription)	1.1 to 19.8 kVA (max KWp installed = kVA subscription)
Electricity bill components (pre-tax)	<i>Fixed charge</i>	<i>Unchanged from current</i>	<i>Unchanged from current</i>
	<i>Fair Access charge</i>	65 x P x Installed Solar Capacity	20 x P x Installed solar Capacity
	<i>Energy charge</i>	<i>OLV tariff x net consumption amount shown by meter</i>	<i>Relevant tariff (“commercial” or “high voltage”) x total consumption amount from network</i>
	<i>Feed in credit</i>	If consumption is negative: Credit equals Negative Consumption Amount x Substitution Price of Fossil Fuels (varies monthly with fuel cost). Credit can be used to offset fixed charge and Fair Access charge	Credit equal to the Total amount of energy fed into the network x Substitution Price of Fossil Fuels (varies monthly with fuel cost). Credit can be used to offset fixed charge, Fair Access charge and energy charge.
Other stipulations		No negative bills, No monthly carry over of negative balances	No negative bills, No monthly carry over of negative balances

1. Introduction

Unelco has been a promoter and a champion of the development of renewable energy on Efaté Island for many years with in particular the development of coco-fuel (currently 17% of total generation), wind energy (9%) and solar generation (1%).

With the objective of further reducing dependence on costly fossil fuels, Unelco is actively pursuing the development of these and other renewable technologies in accordance with the Efaté Energy Road Map (EERM). In particular, up to 2,800 KWp of solar capacity should come online in the next 2-years based on the projects that have either been totally or partially funded by donor agencies.

Unelco welcomes the opportunity to examine any further options for the development of renewable energy through individual solar generation and has therefore given careful consideration to URA's ideas regarding individual solar generation.

The rapid decrease in the cost of solar panels over the past several years has created an opportunity for photovoltaic electricity generation at fossil fuel production cost parity or below. This opportunity to decrease energy dependence and to decrease the overall energy expenditure for electricity generation is attractive in an insular context such as Efaté.

PV Solar generation is by no means a new development and international programs over the last 10 to 15-years offer a wealth of examples of successes and cautionary tales from which URA, the Government and Unelco can draw lessons in considering schemes and deployment options.

In the broadest of terms, the key takeaway from past experience is that any policy regarding distributed generation must carefully weigh the technical, commercial legal/regulatory and economic considerations that the proposed changes will have for each stakeholder of the electric system: the distributed generators, all the other customers, the utility, the government, and other suppliers.



Based on feedback from all the prior distributed generation programs and taking into account the Efaté context, Unelco believes that any distributed generation mechanisms should respond to the following objectives (concurrently and in no particular order):

1. **Safeguard the technical integrity and safety** of the electrical system and its users
2. **Improve the long term economic value provided by electrical system and be coherent with a “going concern” energy strategy**
3. **Provide a fair and true price signal to potential distributed generators.** There should be no unjustified shift of system costs between PV solar customers and non participating customers or towards other stakeholders
4. **Comply with standard regulation and electricity retail founding principles:** compliance with laws, regulations, contractual obligations as well as the principles of fairness, transparency, simplicity, legibility, continuity, economic and social rationality and overall coherence.
5. **Ensure the scheme has the appropriate checks and balances**

URA’s Staff Report and Preliminary decision was analyzed based on all the above principles.

2. Opportunities, constraints, risks and benefits of solar in the context of Efaté

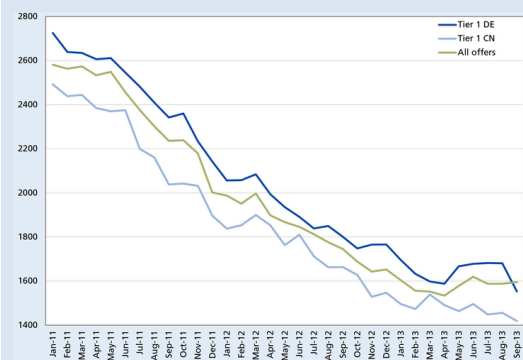
a. The opportunities presented by distributed solar generation

Economies of scale and technological improvements in efficiencies and manufacturing have led to a steep decrease solar panel prices: from 8 USD/Solar Watt installed ten-years ago, prices for utility scale projects have now decreased to around 2.5 USD/ Solar Watt¹

In Vanuatu and on a residential scale, installation costs should be around 400 to 600 Vatus/Solar² Watt installed which results a cost of solar production around 18 to 24 Vatus/KWh³.

Solar panel system price (Euros/KWp)

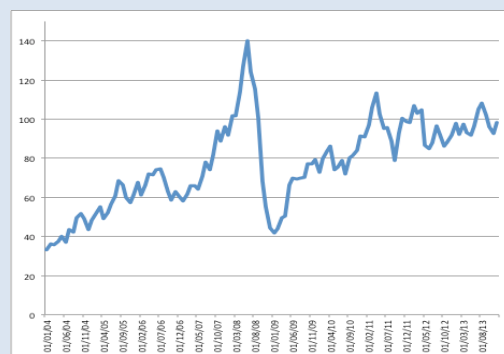
| A continuous drop ...



Source: PV Trade Magazine

Price of Oil (WTI USD/BBL)

| A steep rise ...



Source: Bloomberg commodity financial data, Unelco analysis

At the same time as prices of solar panels have decreased 70%, the price of fossil fuels has skyrocketed from around 30 USD/barrel ten years ago to 145 USD/Barrel in 2008 and has been hovering around 100 USD/Barrel for the last 3 years.

This results in a marginal production cost from fossil fuels, in an island context such as Efaté in Vanuatu, around 21 to 26 Vatus per KWh⁴.

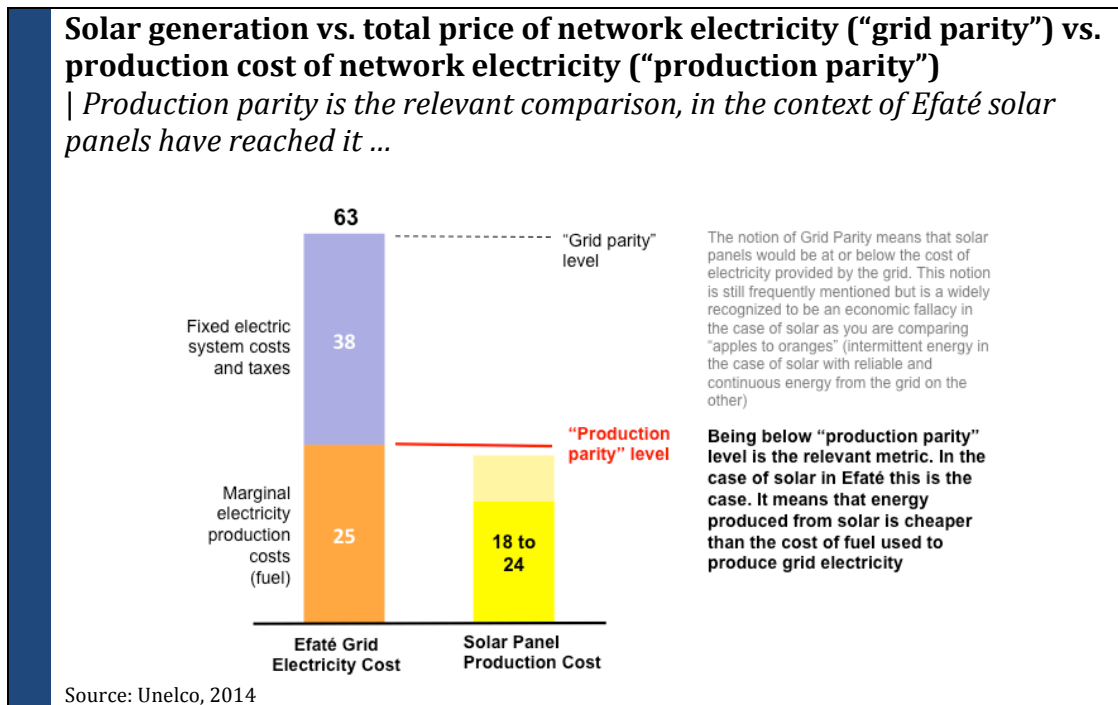
¹ Price of a fully installed solar array, including the panels, the mounts, the inverters, meter, connection and the associated installation labor. These figures are those witnessed in a mainland/continental context, naturally in an insular context prices would be slightly higher.

² Based on local prices as provided by URA

³ The range depends on whether a financing cost is included or not.

⁴ Price of fossil fuels vary monthly based on international markets. The value also depends on whether it includes excise tax or not

As a result of these divergent price dynamics, in most electric systems PV solar has reached “grid parity” (this is when solar production cost is the same price as electricity delivered from the grid) and even “production parity” (also called “generation parity”) in many non-interconnected islands (when solar production cost is inferior to other production costs), as is the case in Vanuatu.



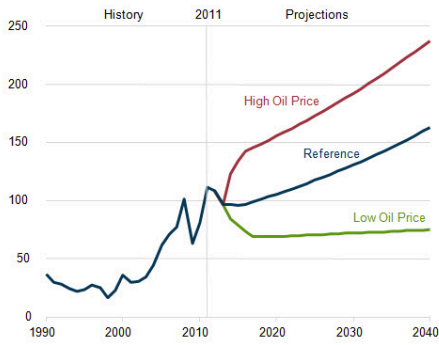
The great news for the Efaté customers is that barring the other technical limitations associated with the PV solar technology and the characteristics intrinsic to insular grids, described hereafter, solar panels do not require subsidies to be competitive in Vanuatu and there is no reason for the Government, URA or the other customers to subsidize them.

This fact is already true today, as shown in the graph above, and should become increasingly true in the next few years as the business case for solar continues to improve relative to fossil fuels.

Fossil fuel and solar panel prices should continue to diverge

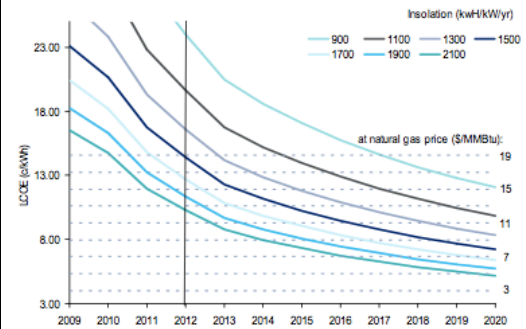
| *Solar panels should be increasingly competitive, gone are the days when they required subsidies in island contexts where they are competing with fossil fuels*

Predicted price evolution scenario for Brent crude oil spot price (USD/Barrel)



Source: Energy Information Administration (EIA), 2012

Predicted evolution in the cost of electricity production from solar depending on the number of sunshine hours (US cents/KWh)



Source: Citibank, 2013

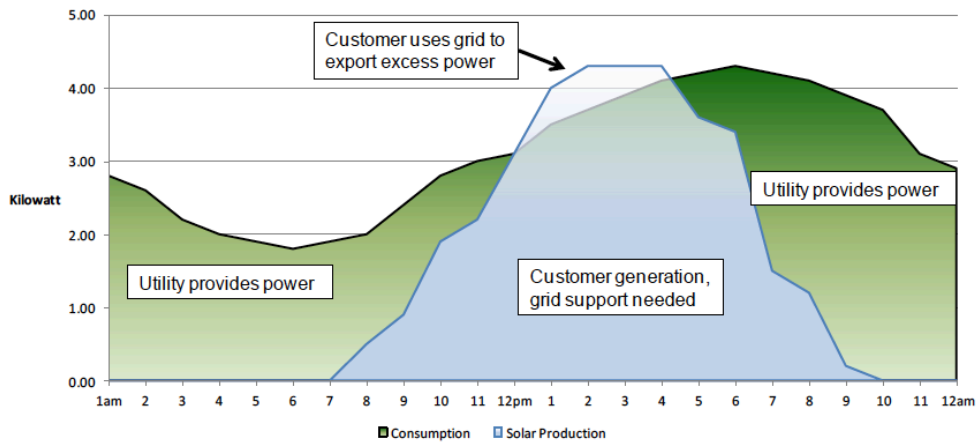
b. The technical constraints that must be considered in the context of distributed solar generation

There are unfortunately strong limitations and constraints to solar generated electricity in an island context.

The first is that solar electricity production is intermittent (its production varies depending on time of day, cloud cover, temperature, second by second) and therefore cannot replace reliable grid provided energy. PV solar must be seen as a complement to the electricity delivered from the grid, not as a substitution. As a result, the PV solar customers would need to be connected to the grid in order to continue receiving the continuous electricity supply required to meet their energy needs.

Profile of a typical domestic customer with solar panels

| The necessary cohabitation of grid-supplied power and solar self production to continuously meet customer energy needs ...



Source: Edison Electric Institute, 2013

In this example, representative of an average domestic customer consumption and production pattern, the customer needs energy provided from the grid except from noon to 4 pm. In reality this is a simplification and the customer generation curve is smoothed as any cloud passage can decrease load self-production by more than 80% thereby requiring the grid generators to instantaneously kick in to supply the difference.

The second constraint is that the penetration of intermittent renewable energy in an electricity network must be capped to avoid destabilizing the entire network (which could lead to a blackout). In an insular electric system the percentage of installed intermittent renewable energy should generally not exceed 30% of the peak demand⁵.

In practice, the penetration rate of intermittent energy can be lower or slightly higher than this threshold as it will depend on:

- the configuration of the network,
- where the intermittent assets are located on the grid,
- the size and configuration of the grid,
- the existence of backup or load leveling storage on the grid,
- whether the intermittent assets are:
 - PV solar – these generation sources have almost no inertia; production can decrease/increase 80% from second to second (if

⁵ This is a generally accepted good practice and a legal limit in some countries. For example, France has legally limited the percentage of intermittent generation in its overseas island territories at 30% to preserve the technical viability of the network.

- 100% of intermittent energy were PV an insular network could accommodate about 10% of peak demand in PV solar),
- Wind - which has some limited inertia,
 - Small-scale hydroelectric - whose inertia depends on the characteristics of the river and whether there is a retention dam,
 - the mix of the above assets
- the nature of the grid-backup power assets (number, nature and speed of the generation assets that will need to ramp up instantaneously to compensate for variations in intermittent power generation), amongst other factors.

In the case of Efaté, and taking into account all the factors mentioned above, the grid's intermittent potential will be reached⁶ once the already committed solar projects are put into operation. These installations include, the:

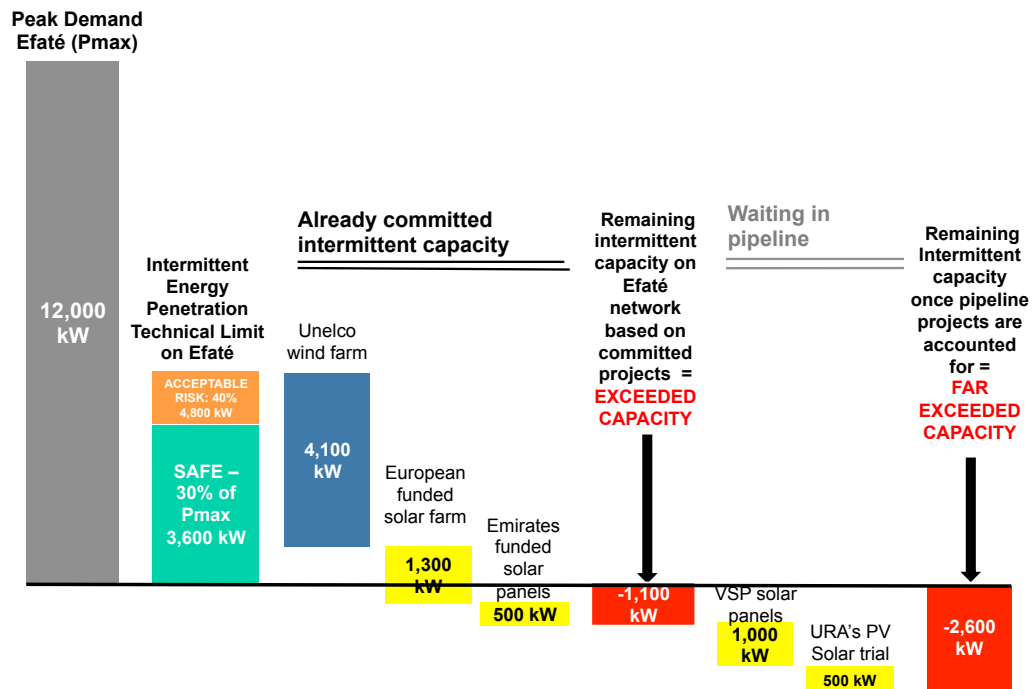
- “Devil’s Point” wind farm (installed capacity: 3,000 kW and scheduled additions: 550kW + 550 kW = total of 4,100 kW),
- “European funded” solar farm (1,300 kWp),
- “Emirates funded” solar project (500 KWp),

Since these projects are either existing or strongly committed, and have typically been completely or partially donated, they are obviously first in line to be integrated into the grid as they provide disproportionate benefits to the economics of the system and/or the Government of Vanuatu.

⁶ Per the graphic above, the capacity will actually be exceeded but Unelco estimates that since there will be some demand growth in the lag between commitment and the time the resources come online, the network should be just about « at capacity »

Analysis of Efaté's electric network's capacity to welcome intermittent renewable energy sources

| *The safe intermittent capacity cap will already be reached with the projects that are scheduled to be put in operation. Solar PV trial capacity would have to be put in the queue.*



Source: Efaté Energy Road Map (EERM) – Unelco, 2013

Additional solar projects in the pipeline would account for 1,000 kWp additional capacity. Unelco will probably need to stagger PV project implementations (ex: implement the capacity in phases, delay adoption until demand catches up, or maintain it as a backup).

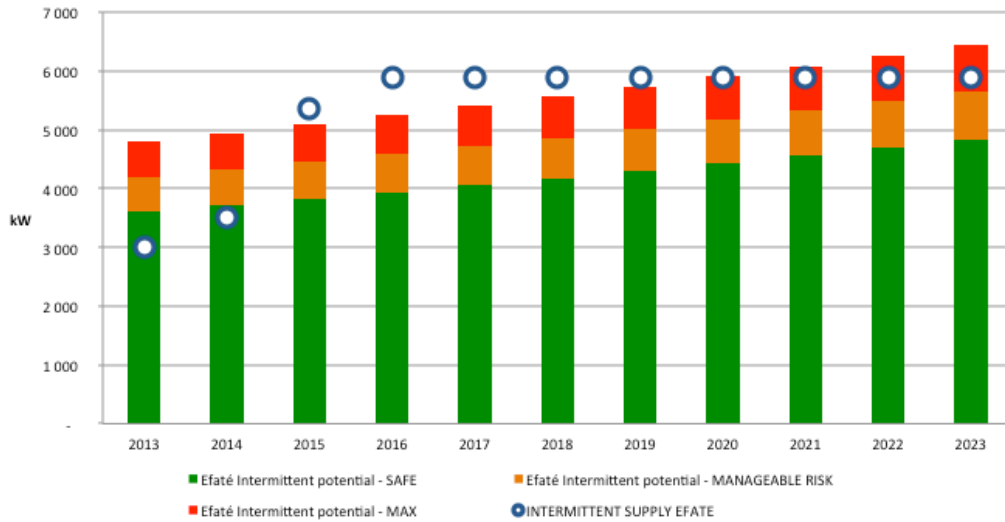
As a result, there is currently no possibility to accommodate additional intermittent production on the Efaté grid, whether that intermittent energy where to be produced centrally or through individual decentralized projects.

URA's proposal, in which they propose that 75 customers participate in a trial, would therefore exceed the network's capacity to integrate renewable energy from the onset. To put the proposed trial in perspective, should the 75 customers correspond to the average cases assumptions URA provided in its estimates, this would mean:

- 50 "domestic" customers with 4.4 KWp solar panels installed: total 220 KWp,
- 15 "commercial" customers with 9.9 KWp: 149 KWp, plus
- 10 "high voltage" (MT) customers with 19.8 KWp: 198 KWp.

... this would require a total of 567 kWp intermittent capacity, just to accommodate the trial. It will take time (see graphic below) to start incorporating individual solar into the grid and will depend on the physical infrastructure and demand evolutions.

Evolution of intermittent potential on Efaté and intermittent supply from already existent or planned wind and solar generation projects



Source: Unelco, 2014

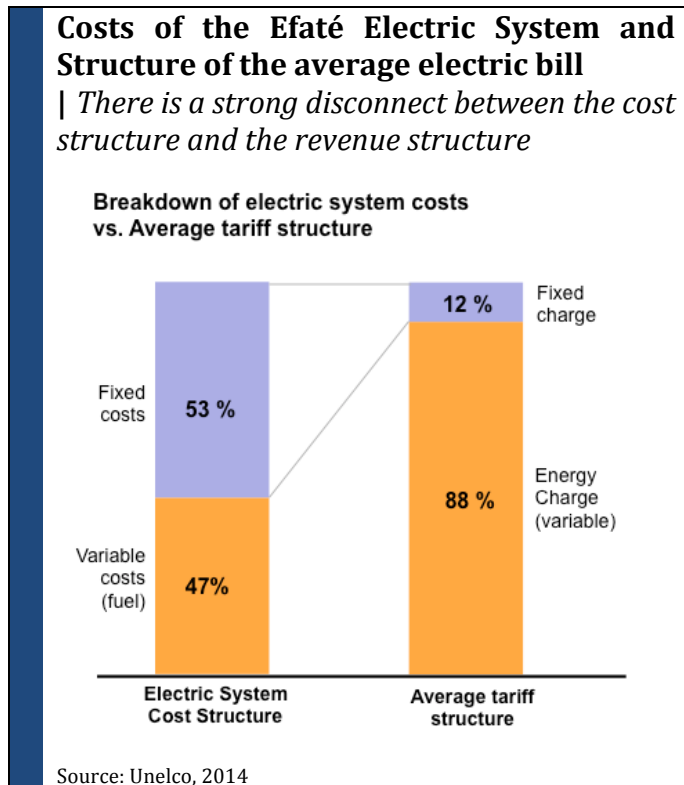
(NB: Dots only show committed intermittent renewable projects, they do not include the pipeline: 1,000 kWp solar + 500 kWp for URA's distributed PV proposed trial)

c. The risks of improperly managed distributed generation development | Economic impact for the all the other stakeholders of the electric system

Development of PV solar, whether centralized or decentralized, will be a strong asset for Efaté and is part of the ongoing energy transition.

Its development must however be properly managed as uncontrolled PV solar development would mean that solar generators would be free-riding on the back of all the other customers by artificially transferring to them their share of the fixed costs of the electric system.

In the case of Efaté, the fixed costs of the electric system, ie. the costs that do not decrease if the number of KWh sold decreases, represent roughly 53% of the total electric bill.



These fixed costs include: electricity generation costs (except fuel), transmission and distribution costs (asset management, transmission lines, distribution lines, transformers, etc. – “the network or the grid”) and customer service costs (customer service, reading the meter, billing, etc.).

By contrast, the fixed charge (subscription) in customer bills represents on average only 12% on Efaté; the 88% remaining percent being a variable energy charge based on the amount of KWh consumed.

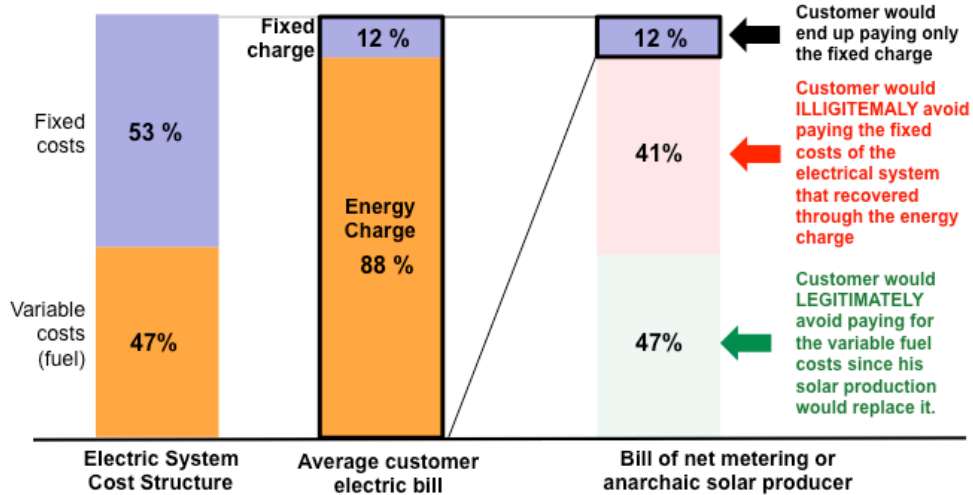
As result of this disconnect between the revenue structure (heavily skewed towards variable) and the electric system cost structure, should grid connected customers be left to generate part of their own power without an adapted tariff system or with a straight net metering system, those people could avoid paying the entire energy charge (88% of typical electric bill).

While it is legitimate that they would avoid the 47% corresponding to the fuel costs, since they would no longer require fossil fuel to be burned to produce their energy, they would also illegitimately avoid paying the 41% fixed systems costs that are covered by that energy charge (see graphic hereafter).

Electric bill of the average customer vs. the bill of an unmanaged solar customer

| Solar customers would illegitimately avoid paying the 41% of their energy charge that is collected to cover the fixed costs of the electric system

Efaté electric system costs vs. Average customer electric bill vs. Anarchaic Solar producer bill



Source: Unelco, 2014

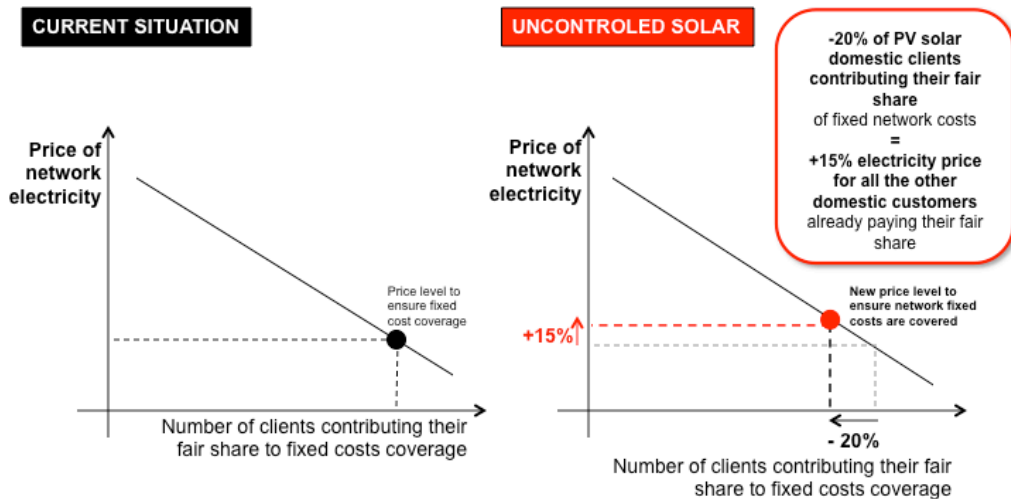
As a result of this under-collection, the fixed electric system costs avoided by solar customers would have to be covered on the other customers. In the example hereafter, if just 20% of customers installed solar panels in an uncontrolled or straight net metering scheme, this would increase electricity prices for everyone else by 15%.

Wouldn't it be fair that solar customers contribute less to the coverage of fixed costs? The simple answer is "No", because PV solar customers will still be using the grid to supply their power.

In electricity networks, it is peak demand that defines the infrastructure requirements and peak demand for domestic customers usually occurs in the evening, when by definition the sun is no longer shining. As long as the customer is still connected to the grid and requires the grid to provide continuous power, even the PV solar customer must contribute a fair share to finance the infrastructure on which he relies.

Inflationary effect of uncontrolled development of solar panels on network electricity prices

| *There would be a strong impact on electricity prices if solar clients were not compelled to continue paying their fair share of fixed electric system costs*

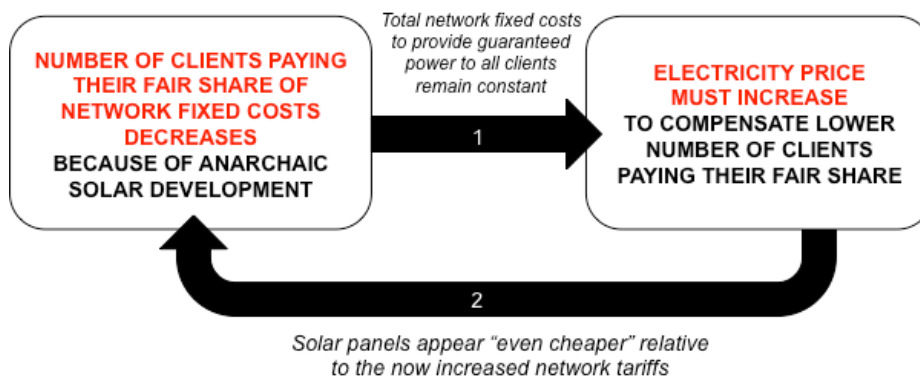


Source: Unelco, 2013

In addition to this direct effect, not only would every PV solar customer transfer costs to the other customers in the form of higher electric bills, but the mechanism would feed on itself, making solar panels artificially more and more attractive relative to network electricity costs.

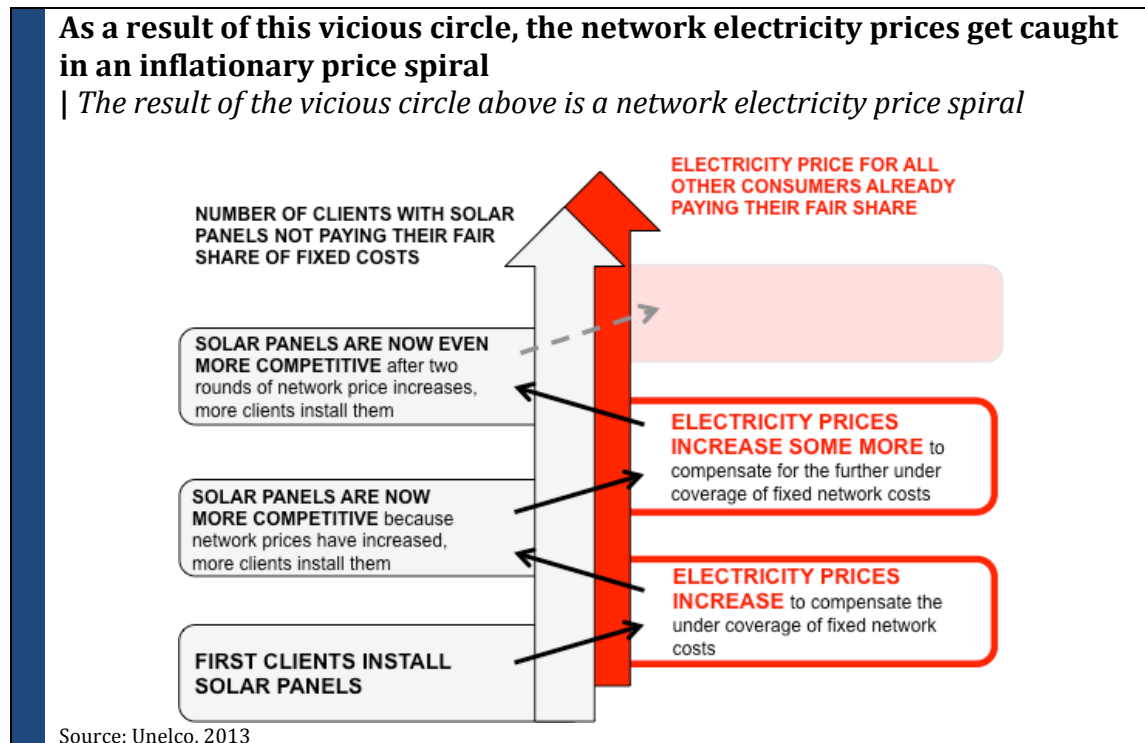
The vicious cycle and feedback loop associated to the uncontrolled development of solar panels (or a straight net metering scheme)

| *Not only will electricity prices increase but this will compel more customers to install solar panels and the price will increase for all others in a vicious cycle*



Source: Unelco, 2013

This vicious cycle will lead to higher and higher network electricity prices that will be borne by the customers that do not have the capacity, financial or physical infrastructure, to install solar panels.



In order to avoid launching this detrimental dynamic, the PV solar pricing and incentive scheme must be properly calibrated from the onset. This is all the more important that any pricing decisions will typically commit the regulator, the utility and other ratepayers for the physical life of the solar panels (25 years).

In this regard, Vanuatu is lucky enough to be able to learn from the successes and mistakes that were done elsewhere in the last 10-years and to be able to create a system in which incentives are properly calibrated to match the real economic benefits and could thereby avoid the risks presented above.

3. Analysis of URA's Staff Report client cases and Unelco recommendations

The analysis published by URA, conducted on several typical clients, is accurate and representative of the average benefits that could be expected by distributed generators under the assumptions and rational of their scheme.

However URA's analysis is incomplete, as it does not exhibit the impact of their scheme on all the other stakeholders of the electric system. In fact, focusing the analysis only on the few customers that may have the opportunity to install individual solar generation masks the fact that most of the "savings" these customers would see would actually be paid for by all the other customers under URA's scheme.

Hereafter Unelco has conducted a more complete and thorough analysis, using the same assumptions and client cases as URA, to illustrate the impacts of URA's proposal on all the stakeholders of the system (customers without solar panels in particular).

This analysis, conducted for each of the three customer types URA chose (one domestic, one commercial and one high voltage customer) is structured in four parts:

- (i) Reminder of URA's assumptions and its outputs,
- (ii) Analysis of URA's proposal for the solar generator,
- (iii) Analysis of URA's proposal for the other stakeholders,
- (iv) Recommended adjustments to create a Fair Solar program

a. « URA Annexe I : Example of a net metering customer (Domestic) »

i. Reminder of URA's assumptions and outputs

Table 7: Payback calculation for Other Low Voltage Customer using Net Metering with Access Fee

Metric	Definition / calculation	Example
Typical monthly consumption (C)	Calculate the average consumption in kWh from historic bills. $C = \frac{TC}{N}$ Where: TC = Total consumption in kWh from historical electricity bills N = Number of historical bills used in calculation	TC = 4,536 kWh N = 12 bills C = 378 kWh
Bill without system (B ₁)	P = 55.90 vatu Subscribed power = 4.4 kVA Fixed charge = 5 x P x kVA = 1,230 vatu Consumption charge = 1.21 x P x C = 25,568 vatu	B ₁ = 26,797 vatu
Installed capacity (IC)	Rated peak capacity of the installed solar panels, in kW.	4.4 kW (4,400 W)
Peak hours per month (P _h)	Average utilisation rate of the solar panels, taking into sunlight efficiency	110 hours
Typical monthly generation (G)	$G = IC \times P_h$	484 kWh
Net consumption (NC)	$NC = C - G$	-106 kWh (a negative number means that overall more energy is
		supplied to the network than drawn from it)
Bill with system (B ₂)	Fixed charge = 5 x P x kVA = 1,230 vatu Access fee = 30 x P x IC = 7,379 vatu Consumption charge = 1.21 x P x C (for positive consumption) = 0 vatu Feed-In = 12.59 vatu x NC (for negative net consumption) = 1,335 vatu	B ₂ = 7,274 vatu
Monthly bill saving (S _M)	$S_M = B_1 - B_2$	19,523 vatu per month
Annual bill saving (S _A)	$S_A = S_M \times 12$	234,279 vatu per year
Installation cost (I)	Total upfront cost of the solar system	1,665,511 vatu *
Annual repairs and maintenance costs (M)	Average annual cost of repairs and maintenance of the solar system	0 vatu *
Payback period (PB)	$P_B = \frac{I}{S_A - M}$	7.1 years

All information is for illustration only. Customers should consult with experts to perform their own payback period calculations.

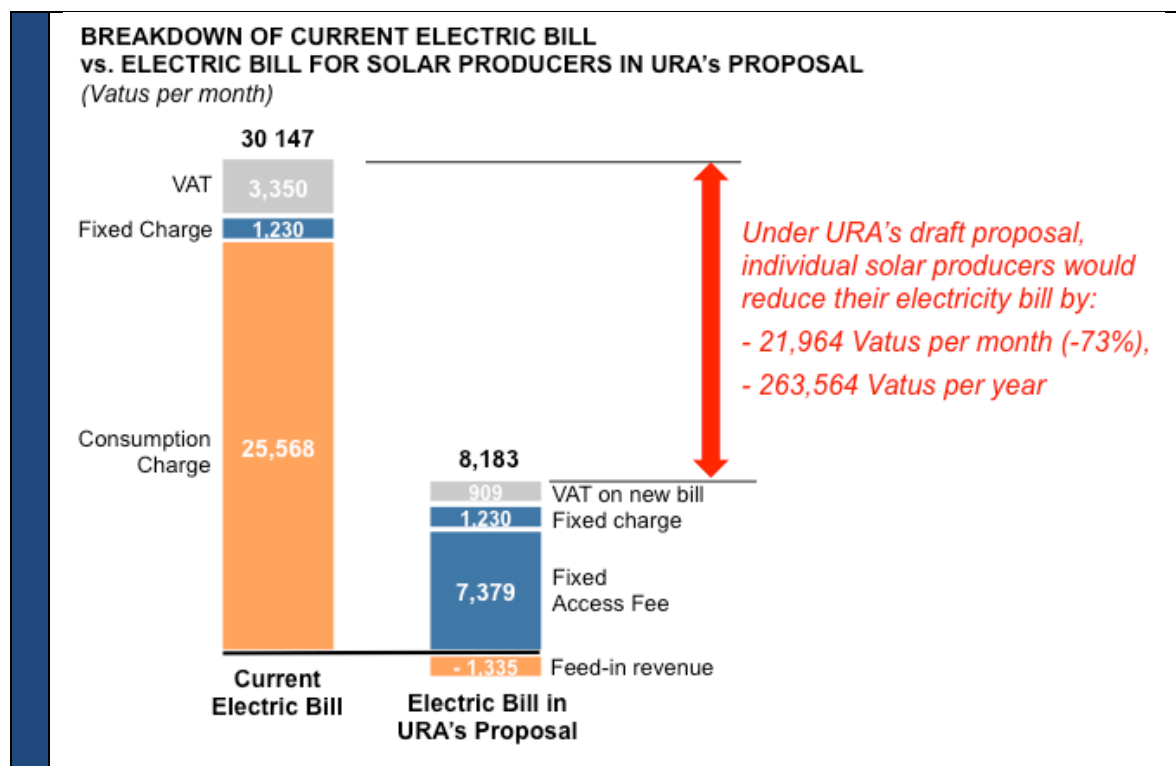
** Installation costs (I) and annual repairs and maintenance costs (M) are estimated based on indicative information received from local suppliers of solar products, and will vary for each individual installation.*

Source: URA, April 2014

ii. **Analysis of URA’s proposal for domestic PV Solar generators**

URA’s analysis is accurate before tax but omits the consequential VAT effect. Solar customers would avoid the majority of their previous electric bill’s VAT, which would increase the net benefit to the customer to 21,964 Vatus per month, rather than 19,523 Vatus per month.

This discount, totaling 263,564 Vatus/year, would represent a 73% decrease in from their previous network electric bill. Taking into account the avoided VAT, the domestic solar customer payback period would therefore be 6.3 years, better still than the 7.1 years as presented by URA.

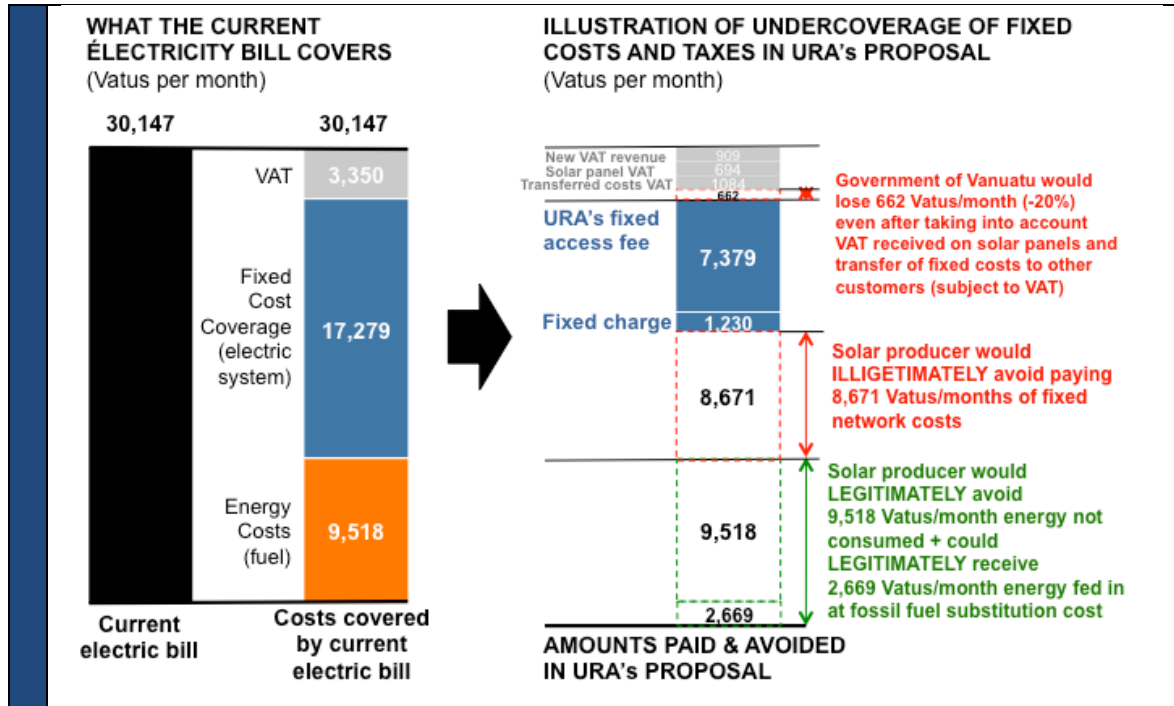


iii. **Completed analysis of impact on other system stakeholders**

The key question that may strike the reader at this point is: How can the domestic PV solar customer reduce their bill by 73% under URA’s scheme when the price of PV solar generation is only 5 to 20% below that of fossil fuel generation (cf. chapter 2 analysis)?

The answer is that URA’s proposal legitimately provides the PV solar producer the full price difference between PV solar and fossil fuels generation but also provides them with a substantial subsidy.

This subsidy is neither financed by URA nor by the Government, it is a cross-subsidy between clients. This means that clients without solar panels would not only not receive the legitimate benefits of PV solar but they would also start paying more in order to finance a subsidy received by the PV solar customers.



As shown in the graphic above, the independent solar generators should legitimately save the fossil fuel cost equivalent of their solar generation (12,147 Vatus per month⁷) but they also illegitimately 9,333 Vatus per month that they should be paying to cover the fixed costs of the electric system and Government VAT (8,671 Vatus of fixed system costs and 662 Vatus of VAT).

At first glance it could appear normal that a customer that consumes less energy from the grid would also pay less of the electric system fixed costs, however these fixed costs are not function of the total energy consumed, they are function of when a client consumes ...

⁷ Under URA's scheme they would not receive the full 12,147 Vatus, they would receive slightly less : 10,853 Vatus because URA's feed-in tariff is inferior to the substitution value of solar energy.

... You can think of the electric system - composed of the generators, cables, substations, transformers, lines, etc. - as a road ...



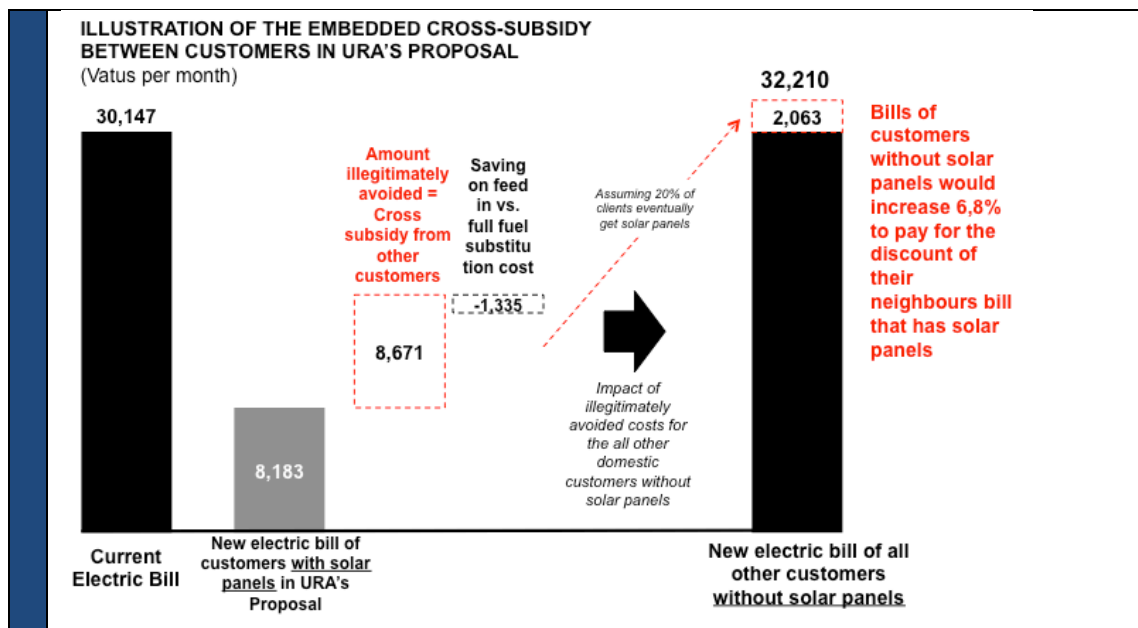
... it is dimensioned for rush hour, ie. peak demand ...



... even if at times, in the middle of the night for example, it is not fully utilized.

The domestic customers' peak electricity demand is in the evening, after the work day, when the sun is no longer shining. As a result, whether or not they have PV solar panels will not change how much energy they require at peak time from the network and will therefore not decrease the "traffic jam" and the infrastructure investments required to build the capacity required to address those times.

This is why the "fixed electric system costs" are incompressible and why, if we were to subscribe to URA's scheme, thereby allowing PV solar customers to avoid paying 8,671 Vatus/month of fixed costs, these costs would have to be transferred to all the other customers that do not have solar panels, thereby increasing their bills.



URA's draft has a proposed trial that would include 50 residential customers.

Based on the assumption that the average domestic customer participating in the study corresponds to URA's example (4.4 kWp installed solar panels), this would mean that non-solar customers would be subsidizing these clients by about 5 M Vatus per year and 124 M Vatus over the life of their solar panels.

The amount and the scale of this subsidy should alarm customers, the Government and even URA as this simulation is only considering the 50 domestic customers and any program expansion thereafter would linearly increase this amount and the increase that it will lead to on the bills of all other customers without solar panels

Annual cross-subsidy from customers without solar panels to those with solar panels

Cross-subsidy per month per solar domestic customer:
8,253 Vatus⁸

= Per year per solar domestic customer (x12): 99,036 Vatus

= Per year for all domestic solar customers in trial (x50): 4,951,800 Vatus

= Over the lifetime of these customers solar panels (x 25 years): **123,795,000 Vatus**

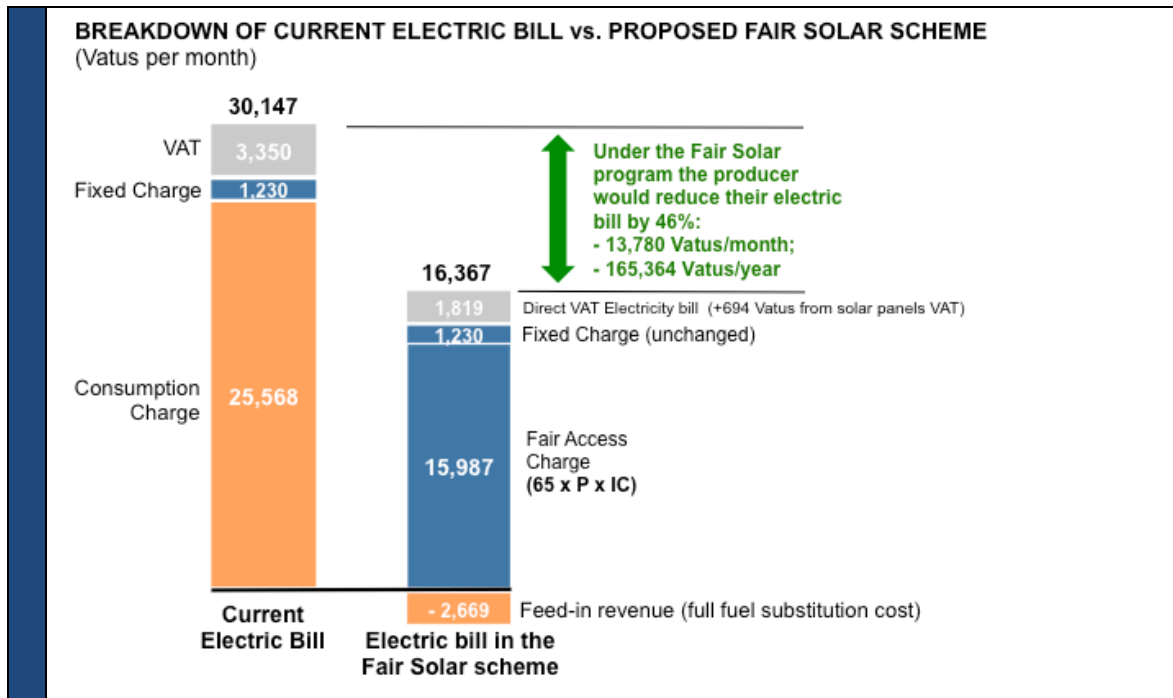
iv. Unelco's recommended modifications to the scheme calibration

To avoid the cross subsidy illustrated prior, that is not grounded in an economic requirement or have a defensible social fairness basis, URA should recalibrate their proposed "access fee". The fact that the utility could procure fed in electricity at 50% of fuel substitution cost is greatly insufficient to compensate the under-collection of fixed costs (cf. previous graphic)

The access fee is precisely meant to ensure that PV solar customers continue to pay for the fixed electric system costs. As such, the principle of the access fee is good but the level was simply set too low in URA's draft version.

Instead of $30 \times P \times \text{Installed Capacity}$, the graphic below illustrates that this access fee should be set at $65 \times P \times \text{Installed Capacity}$ for domestic customers with a single classic meter. This would constitute the Fair Net Metering calibration.

⁸ $(8,671 \text{ Vatus/month avoided fixed costs minus the benefit linked to underpaying for the electricity fed in } 1,335 \text{ Vatus/month}) \times (1 + \text{VAT})$



This level of access fee would ensure neutrality for all the other electric customers and provide a fair and true price signal to all customers considering distributed generation; customers considering distributed generation would reap 100% of current and future price benefits of solar production versus the evolution of fossil fuel production but would not create a financial burden for other customers.

Taking into account this fairly calibrated access charge, the PV solar payback period would be 10 years. This means that for the remaining 15 years of the expected lifespan of the solar panels the customer will essentially receive “free energy”.

In addition, based on the predicted cost evolution of solar panels, which is anticipated to be 25% cheaper in the next 2 to 3 years, coherent with the timeframe when intermittent capacity could open on the network, the customers that would invest then would enjoy a payback closer to 7.5 years.

b. « URA Annexe II : Example of a bi-directional customer – Commercial Customer »

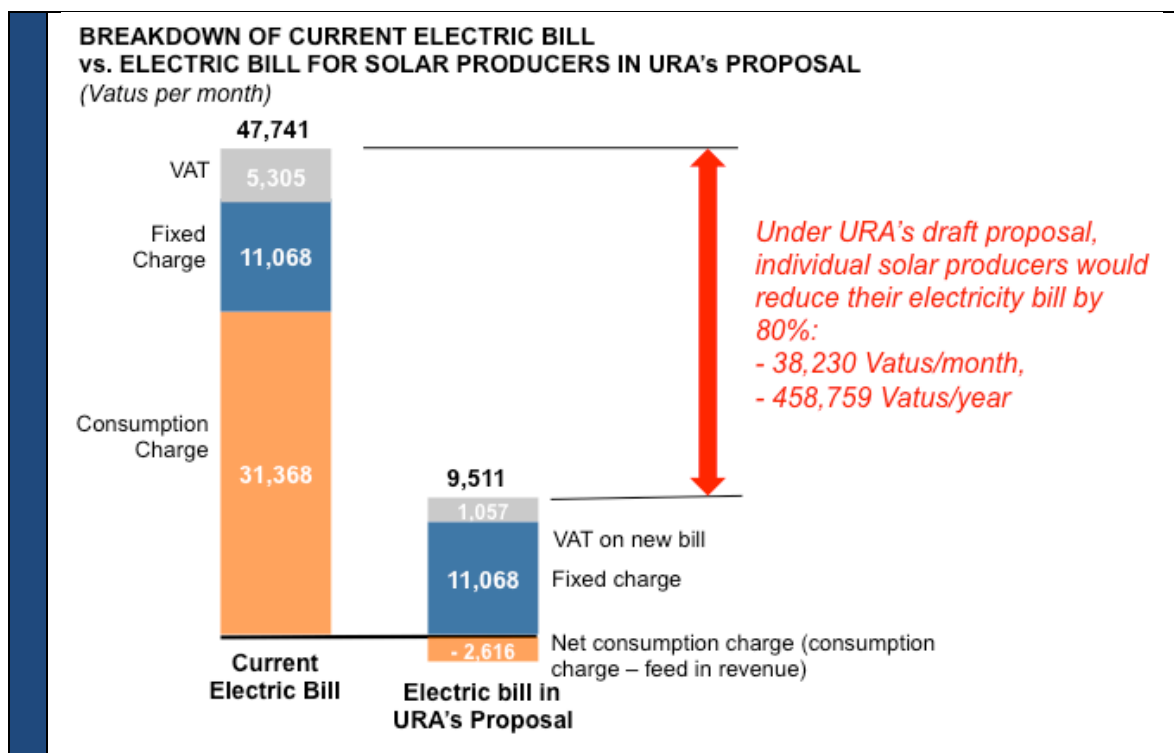
i. Reminder of URA's assumptions and outputs

Metric	Definition / calculation	Example
Typical monthly consumption (C)	Calculate the average consumption in kWh from historic bills. $C = \frac{TC}{N}$ Where: TC = Total consumption in kWh from historical electricity bills N = Number of historical bills used in calculation	TC = 7,740 kWh N = 12 bills C = 645 kWh
Bill without system (B ₁)	P = 55.90 vatu Subscribed power = 9.9 kVA Fixed charge = 20 x P x kVA = 11,068 vatu Consumption charge = 0.87 x P x C = 31,368 vatu	B ₁ = 42,436 vatu
Installed capacity (IC)	Rated peak capacity of the installed solar panels, in kW.	9.9 kW (9,900 W)
Peak hours per month (P _h)	Average utilisation rate of the solar panels, taking into sunlight efficiency	110 hours
Typical monthly generation (G)	$G = IC \times P_h$	1,089 kWh
Maximum self-generation factor (SG _f)	The power generated by the solar installation will not always occur at the same time as consumption. There is likely to be a maximum proportion of generation that will be used directly by the customer.	70%
Self-generated consumption (SG)	SG _f applied to either G or C, whichever is lower	452 kWh
Feed-in energy (E _f)	$E_f = G - SG$	638 kWh
Energy used from grid (E _g)	$E_g = C - SG$	194 kWh
Bill with system (B ₂)	Fixed charge = 20 x P x kVA = 11,068 vatu Grid energy charge = 0.87 x P x E _g = 9,410 vatu Feed-in energy = 18.89 vatu x E _f = 12,039 vatu	B ₂ = 8,439 vatu
Monthly bill saving (S _M)	$S_M = B_1 - B_2$	33,997 vatu per month
Annual bill saving (S _A)	$S_A = S_M \times 12$	407,964 vatu per year
Installation cost (I)	Total upfront cost of the solar system	3,347,460 vatu *
Annual repairs and maintenance costs (M)	Average annual cost of repairs and maintenance of the solar system	0 vatu *
Payback period (PB)	$P_B = \frac{I}{S_A - M}$	8.2 years

ii. Analysis of URA’s proposal for commercial PV solar generators

URA’s analysis is accurate before tax but omits the consequential VAT effect. Solar customers would avoid the majority of their previous electric bill’s VAT, which would increase the net benefit to the customer to 38,230 Vatus per month, rather than 33,997 Vatus per month estimated by URA.

This discount, totaling 458,759 Vatus per year, would represent a 80% decrease in from their previous network electric bill. Taking into account the avoided VAT, the domestic solar customer payback period would therefore be 7.3 years, better still than the 8.2 years presented by URA.

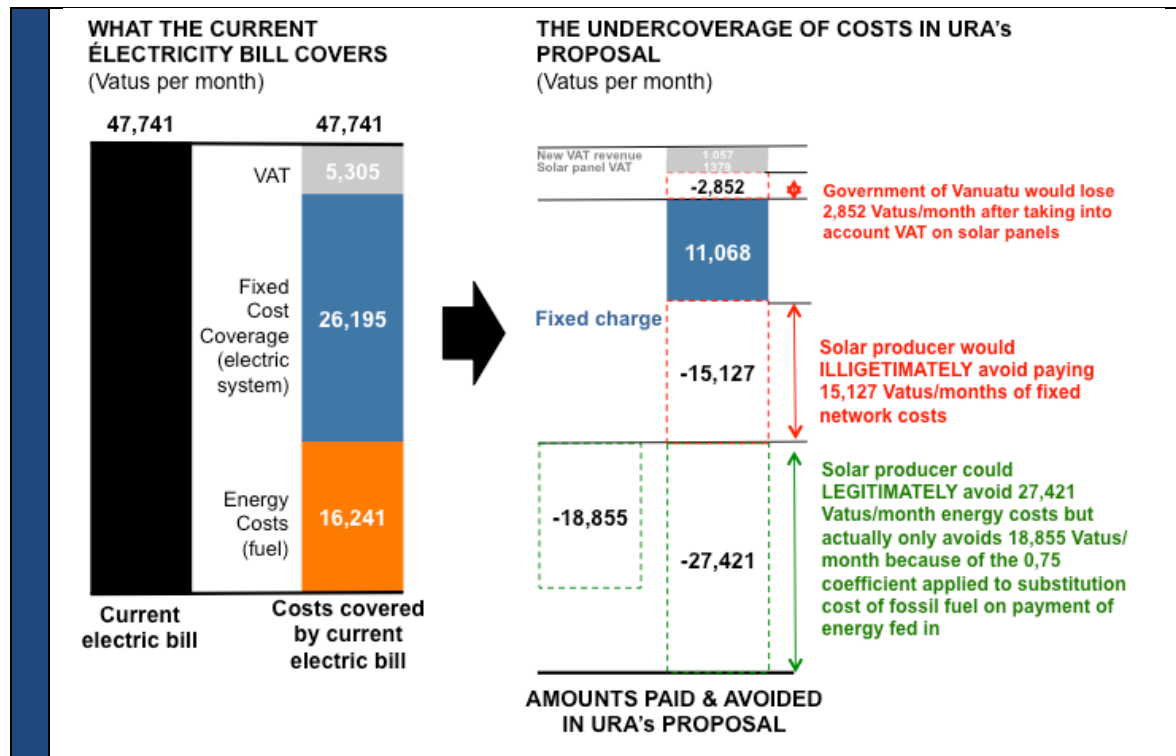


iii. Completed analysis of impact on other system stakeholders

As per the domestic customer example, the key question is: How could the commercial PV solar customer reduce their bill by 80% under URA’s scheme when the price of PV solar generation is only 5 to 20% below that of fossil fuel generation marginal costs (cf. chapter 2 analysis)?

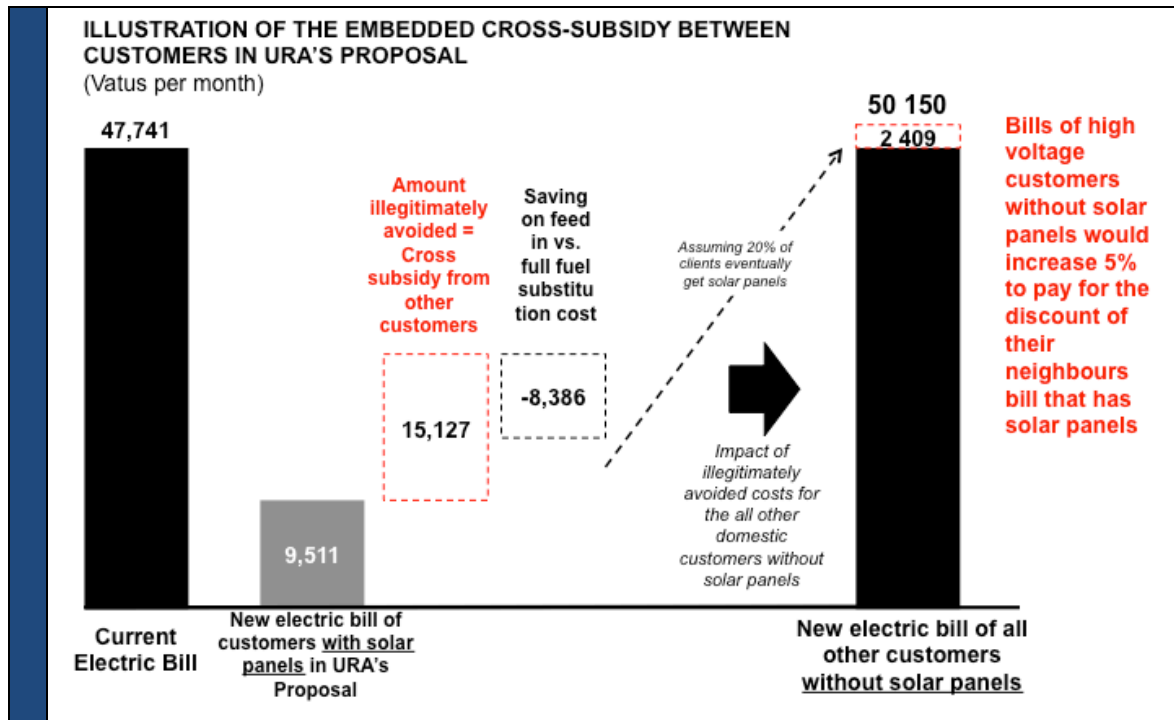
Despite the fact that the price mechanism is different for commercial customers, “bi-directional metering” instead of “adjusted net metering”, URA’s proposal would provide these PV solar customers with a substantial subsidy.

As with the domestic customers, the subsidy is neither financed by URA nor by the Government, it is also a cross-subsidy between clients: customers without solar panels would pay more for electricity so customers with solar panels could pay less.



As shown in the graphic above, the commercial PV solar generator:

- Would legitimately save the fossil fuel cost equivalent of their solar generation 18,855 Vatus
- but they would also, additionally, illegitimately save approximately 17,000 Vatus per month that they should be paying to cover the fixed costs of the electric system (15,127 Vatus of fixed costs and 2,852 Vatus of VAT).



URA's draft includes a proposed trial of that would include 25 "high voltage" and commercial customers. The analysis hereafter was conducted assuming that 15 of those customers are commercial customers.

Based on the assumption that the average commercial customer participating in the study corresponds to URA's example (9.9 KWp installed solar power), this means that non-solar customers would be subsidizing these clients by 1.9 M Vatus per year and 43 M Vatus over the life of their solar panels.

The amount and the scale of this subsidy should alarm customers, the Government and even URA as this simulation is only considering the 15 commercial customers and any program expansion thereafter would linearly increase this amount and the increase that it will lead to on the bills of all other customers without solar panels.

Annual cross-subsidy from customers without solar panels to those with solar panels

Cross-subsidy per month per solar commercial customer:
9,637 Vatus

= Per year per solar commercial customer (x12):
115,641 Vatus

= Per year for all commercial solar customers in trial (x15):
1,734,615 Vatus

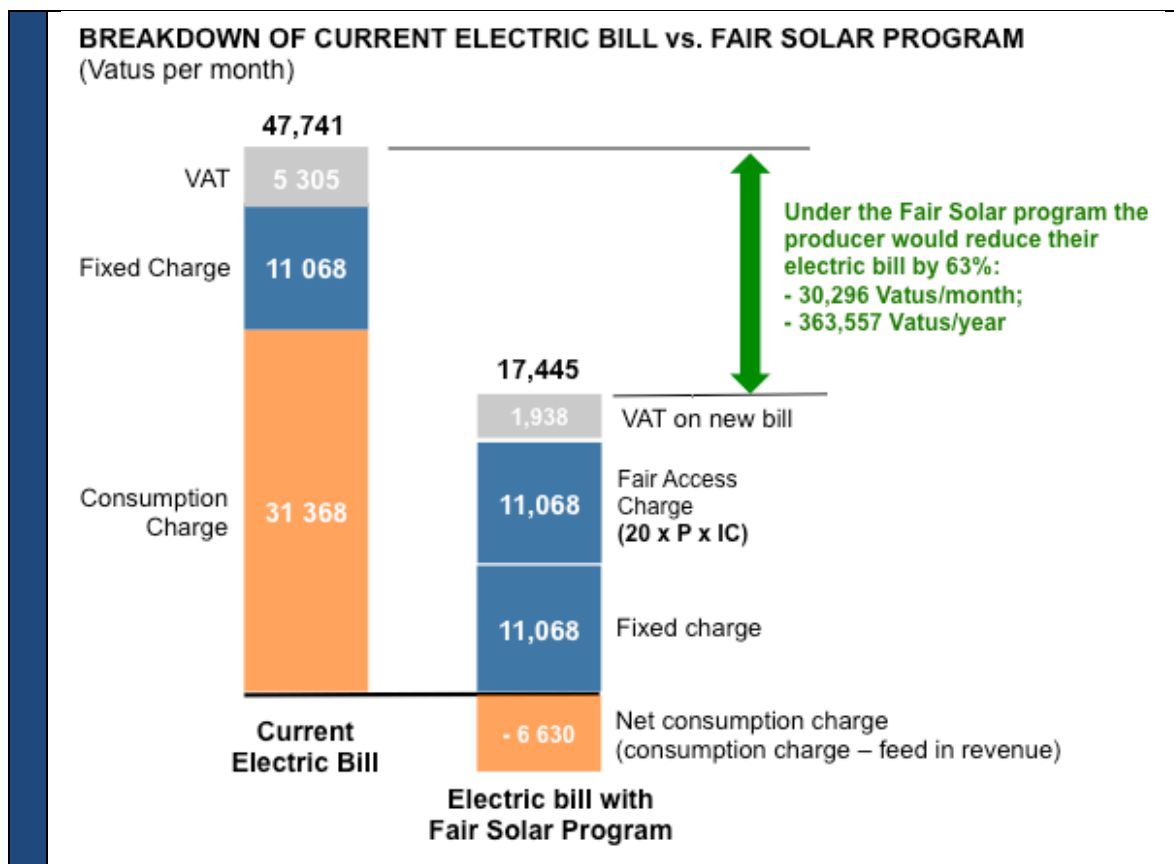
= Over the lifetime of these customers solar panels (x 25 years): **43,365,375 Vatus**

iv. Unelco’s recommended modifications to the scheme calibration

Contrary to the domestic “adjusted net metering” scheme, URA’s “bi-directional metering” scheme for commercial customers does not include an Access Fee. As shown prior, in the absence of a fairly calibrated access fee, a significant cross-subsidy mechanism will ensue between clients. The fact that the utility could procure fed in electricity at 75% of fuel substitution cost is greatly insufficient to compensate the under-collection of fixed costs (cf. previous graphic)

Unelco recommends that URA add a Fair Access charge equal to $20 \times P \times \text{Installed solar capacity}$. The Fair Access charge would cancel out the cross subsidy between clients, making the system neutral for all the other clients without solar panels.

The financial case for the customers considering installing solar panels would remain very attractive as their electricity bill would be reduced almost 63% vs. current level. Their payback would be 9.2 years, meaning that the energy component of their bill would be essentially free for the following 156 years of the solar panel expected life. This payback should improve to around 7 years for the clients that make the investment in the next 2 to 3 years, based on the predicted price drop of solar panels.



c. « URA Annexe II : Example of a bi-directional customer – High Voltage Customer »

i. Reminder of URA's assumptions and analysis

Table 9: Payback calculation for High Voltage Customer using Bi-directional metering

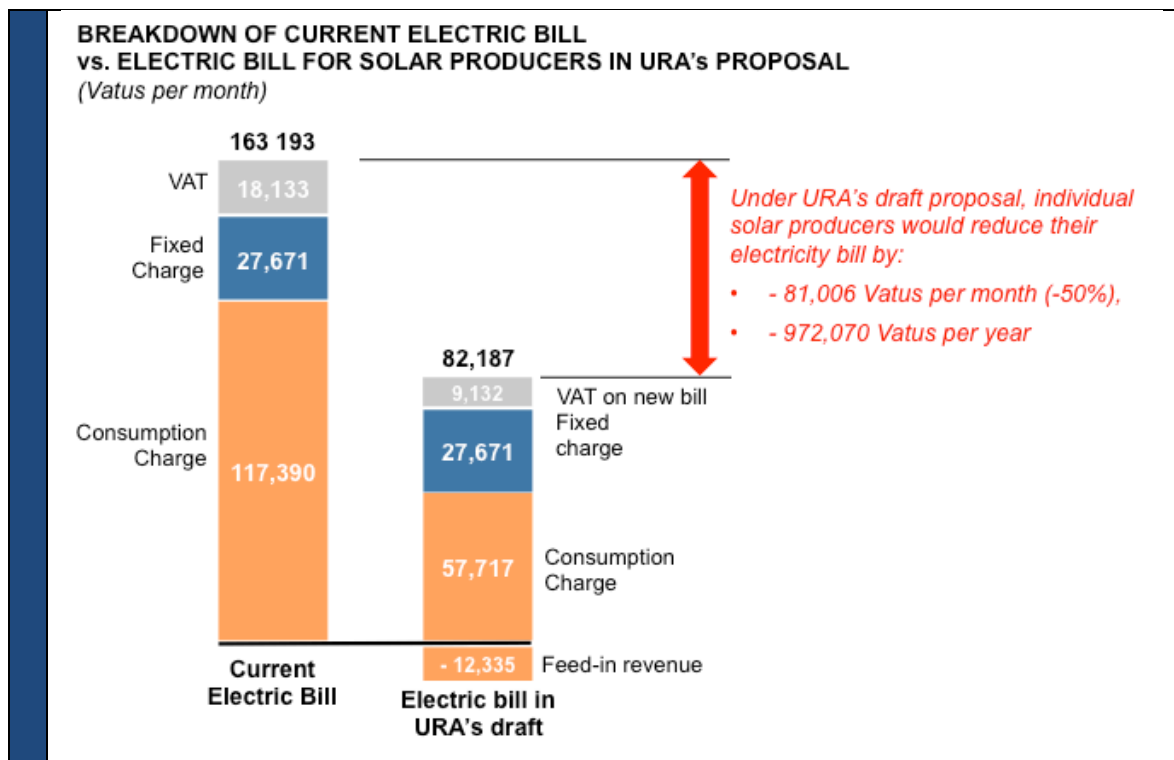
Metric	Definition / calculation	Example
Typical monthly consumption (C)	Calculate the average consumption in kWh from historic bills. $C = \frac{TC}{N}$ Where: TC = Total consumption in kWh from historical electricity bills N = Number of historical bills used in calculation	TC = 36,000 kWh N = 12 bills C = 3,000 kWh
Bill without system (B ₁)	P = 55.90 vatu Subscribed power = 19.8 kVA Fixed charge = 25 x P x kVA = 27,671 vatu Consumption charge = 0.7 x P x C = 117,390 vatu	B ₁ = 145,061 vatu
Installed capacity (IC)	Rated peak capacity of the installed solar panels, in kW.	19.8 kW (19,800 W)
Peak hours per month (P _h)	Average utilisation rate of the solar panels, taking into sunlight efficiency	110 hours
Typical monthly generation (G)	$G = IC \times P_h$	2,178 kWh
Maximum self-generation factor (SG _f)	The power generated by the solar installation will not always occur at the same time as consumption. There is likely to be a maximum proportion of generation that will be used directly by the customer.	70%
Self-generated consumption (SG)	SG _f applied to either G or C, whichever is lower	1,525 kWh
Feed-in energy (E _f)	$E_f = G - SG$	653 kWh
Energy used from grid (E _g)	$E_g = C - SG$	1,475 kWh
Bill with system (B ₂)	Fixed charge = 25 x P x kVA = 27,671 vatu Grid energy charge = 0.7 x P x E _g = 57,732 vatu Feed-in energy = 18.89 vatu x E _f = 12,339 vatu	B ₂ = 73,063 vatu
Monthly bill saving (S _M)	$S_M = B_1 - B_2$	71,997 vatu per month
Annual bill saving (S _A)	$S_A = S_M \times 12$	863,965 vatu per year
Installation cost (I)	Total upfront cost of the solar system	6,374,969 vatu *
Annual repairs and maintenance costs (M)	Average annual cost of repairs and maintenance of the solar system	0 vatu *
Payback period (PB)	$P_B = \frac{I}{S_A - M}$	7.4 years

Source: URA, April 2014

ii. Analysis of URA’s proposal for High Voltage (MT) PV solar generators

As for the previous examples, URA’s analysis is accurate before tax but omits the consequential VAT effect. Solar customers would avoid the majority of their previous electric bill’s VAT, which would increase the net benefit to the customer to 81,006 Vatus per month, rather than 71,997 Vatus per month presented by URA.

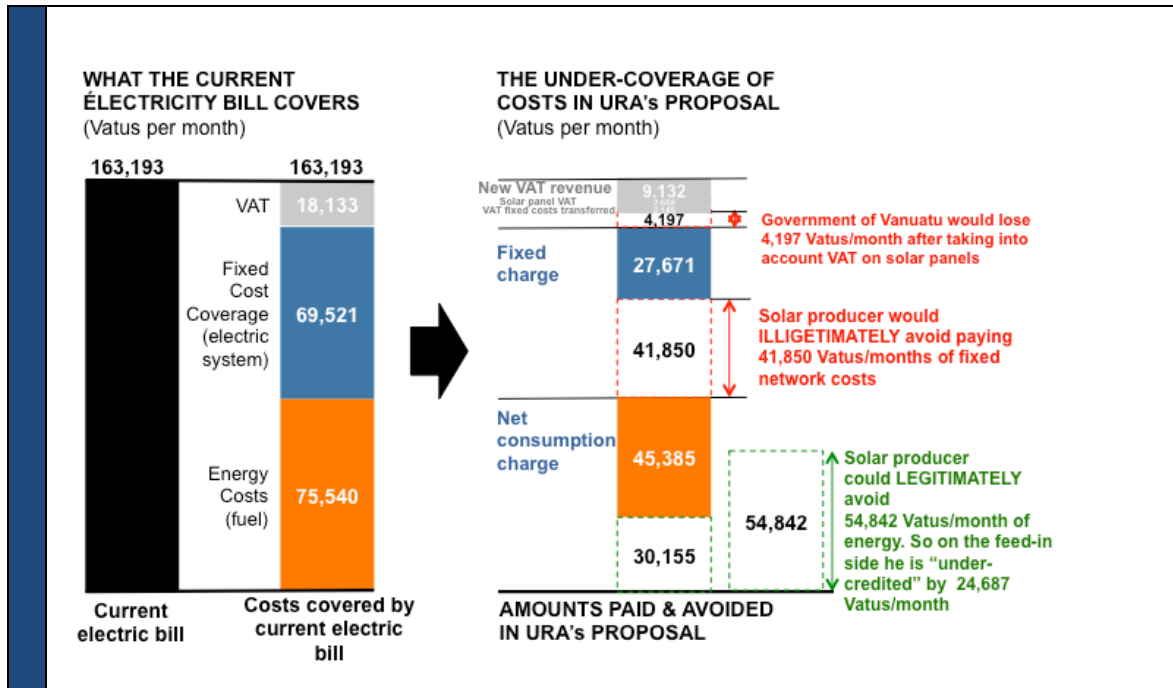
This discount, totaling 972,070 Vatus per year, would represent a 50% decrease in from their previous network electric bill. Taking into account the avoided VAT, the domestic solar customer payback period would therefore be 6.6 years, better still than the 7.4 years presented by URA in their analysis.



iii. Completed analysis of impact on other system stakeholders

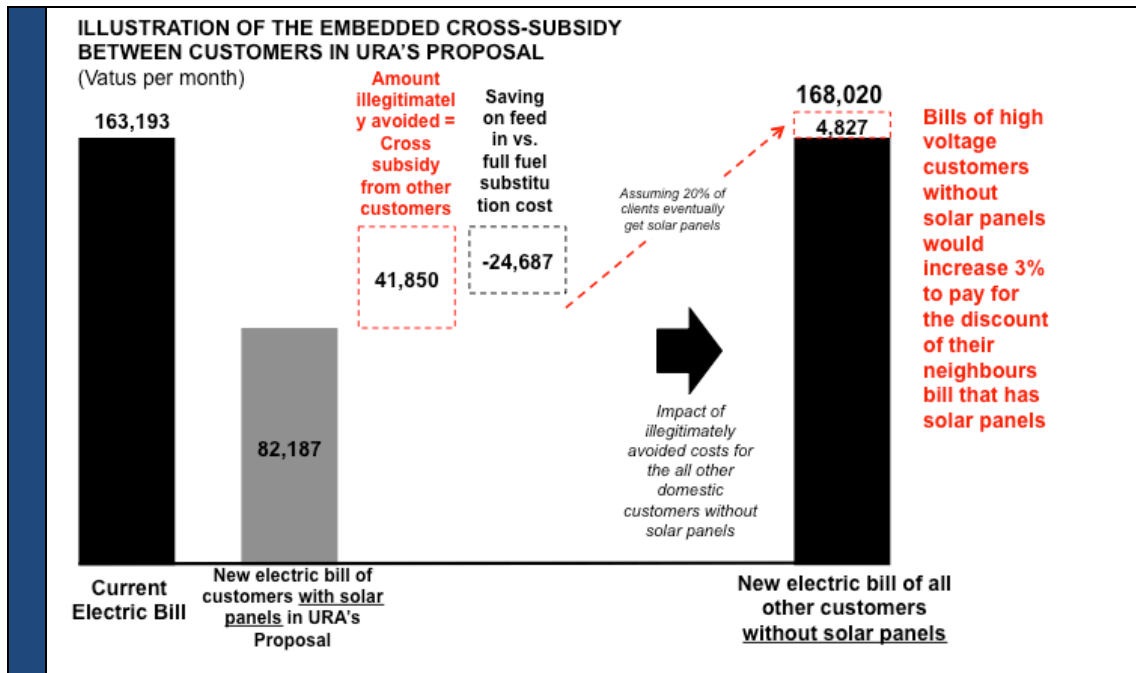
As with the domestic and commercial customer examples, the 50% discount on the network electric bill is hard to reconcile with the fact that the cost of PV solar is only 5 to 20% below the marginal cost of fossil fuel generation: URA’s proposal would also provide these PV solar customers with a substantial subsidy.

As with the other PV generators examples, this would be a subsidy from customers without solar panels, who would pay more for electricity, towards customers with solar panels, so they could pay even less.



As shown in the graphic above, the commercial PV solar generator:

- Could legitimately save the fossil fuel cost equivalent of their solar generation (54,842 Vatus per month at fossil fuel substitution value but in reality only avoids 30,155 Vatus per month)
- but they would also, additionally, illegitimately save approximately 46,000 Vatus per month that they should be paying to cover the fixed costs of the electric system and VAT (41,850 Vatus of fixed costs and 4,197 Vatus of VAT).



URA's draft includes a proposed trial of that would include 25 "high voltage" and commercial customers. The analysis that follows takes the assumption that 10 of those customers would be "high voltage".

Based on the assumption that the average high voltage customer participating in the study corresponds to URA's example (19.8 kVA installed power), this means that non-solar customers would be subsidizing these clients by 2.3 M Vatus per year and 58 M Vatus over the life of their solar panels.

The amount and the scale of this subsidy should alarm customers, the Government and even URA as this simulation is only considering the 10 high voltage customers and any program expansion thereafter would linearly increase this amount and the increase that it will lead to on the bills of all other customers without solar panels.

Annual cross-subsidy from customers without solar panels to those with solar panels

Cross-subsidy per month per solar high voltage customer: 19,308 Vatus

= Per year per solar high voltage customer (x12): 231,701 Vatus

= Per year for all high voltage solar customers in trial (x10): 2,317,010 Vatus

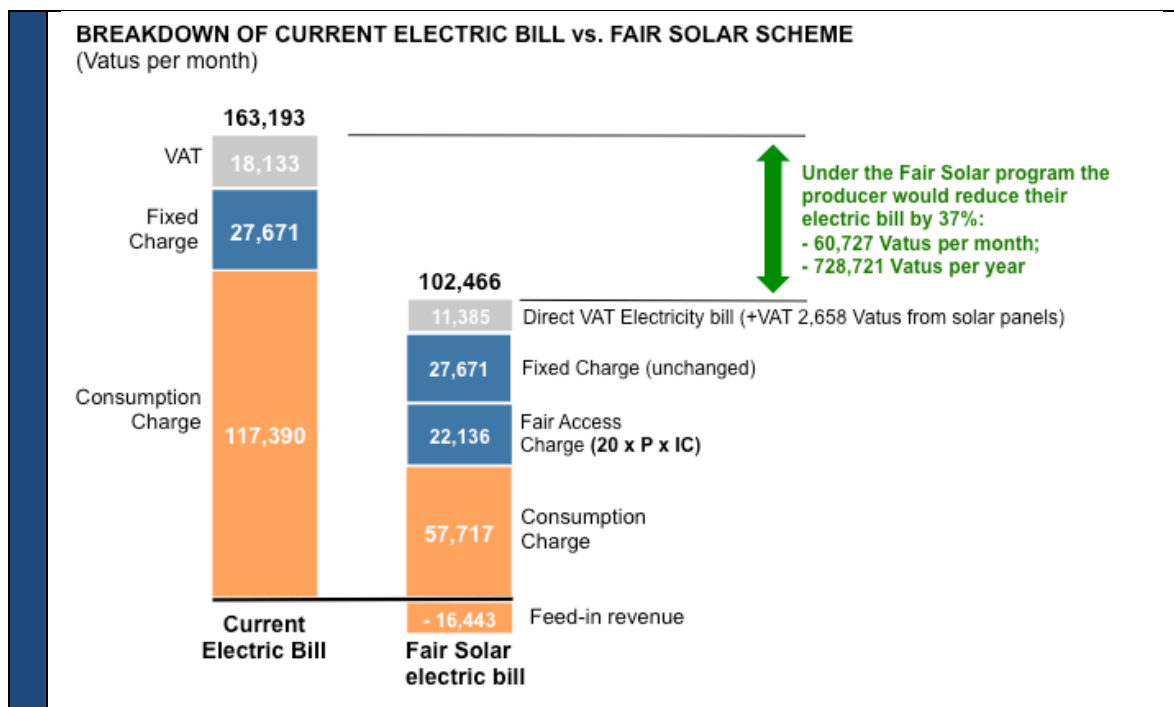
= Over the lifetime of these customers solar panels (x 25 years): **57 925 125 Vatus**

iv. Unelco’s recommended modifications to the scheme calibration

Contrary to the domestic “adjusted net metering” scheme, URA’s “bi-directional metering” scheme for High Voltage (MT) customers does not include an Access Fee. As shown prior, in the absence of a fairly calibrated access fee, a significant cross-subsidy mechanism will ensue between clients. The fact that the utility could procure fed in electricity at 75% of fuel substitution cost is insufficient to compensate the under-collection of fixed costs (cf. previous graphic)

Unelco recommends that URA add a Fair Access charge equal to $20 \times P \times \text{Installed solar capacity}$. The Fair Access charge would cancel out the cross subsidy between clients, making the system neutral for all the other clients without solar panels.

The financial case for the customers considering installing solar panels would remain very attractive as their electricity bill would be reduced 37% vs. current level. Their payback would be 8.8 years, meaning that the energy component of their bill would be essentially free for the following 16 years of the solar panel expected life. This payback should improve to around 6.6 years for the clients that make the investment in the next 2 to 3 years, based on the predicted price drop of solar panels.



4. Additional remarks regarding URA's Preliminary Decision and Staff Report

Any quotes and page numbers are in reference to the URA's document published in April 2014. The titles of the sub-chapters that follow refer to the ones in URA's document

a. PRELIMINARY DECISION AND STAFF REPORT - Title pages (pages 1 and 5)

Unelco would like URA to clarify, in coherence with the content of the document, that the scope being considered is Efaté Island (not just Port Vila) and that the scope of technology considered at this time is only grid-connected solar generation, not “renewable energy” in general. This is consistent with what URA is considering in the rest of the document so changing the title to reflect this would seem appropriate to set public expectations appropriately.

b. STAFF REPORT - “1.5 Legal context” and “2.2 Principles and Objectives” (p. 8-9)

Unelco believes that the representation that is being made of the legal context is incomplete and could be misleading to the general public.

Unelco would like URA to complete its description of the legal context with the description of the relevant contractual obligations that link UNELCO to the Government of Vanuatu. In particular, Unelco would like URA to indicate the following⁹:

Under the Convention Relating to the Concession for the Generation and Public Supply of Electric Power in Port-Vila dated 15 August 1986 (“the Convention”) between the Government of Vanuatu and UNELCO, as amended from time to time (“the concession contract”), UNELCO is granted the exclusive right to generate or manufacture electricity and supply electricity within the boundaries of the electricity concession of Efate.

Section 1 paragraph 1 of the Convention between the Government and UNELCO provides:

“Under the conditions set forth in this Convention and its appended Specifications the GRANTOR shall concede to the CONCESSIONAIRE the right to generate and supply electrical energy to the public for all purposes with the CITY of PORT-VILA...”

Further, section 1 paragraph 2 of the Convention provides:

⁹ This is a summary of legal opinion by Minter Ellison provided on 21 April 2011

The CONCESSIONAIRE shall fulfill the obligations arising from the exclusive right to generate electricity for all purposes for selling to government bodies, the public and other bodies or private individuals during the term of the Concession within its limits. Therefore, the Concession shall confer upon the CONCESSIONAIRE the exclusive right, within the said limits, to construct and to maintain on or under public thoroughfares and their easements, any facilities necessary for the public supply of electricity, including supports, conduits, lines and cables, in accordance with the Convention and the Specifications hereto and in compliance with current and future regulations.”

Furthermore, section 8.9 of the Agreement Varying Concession dated 25 September 1997 provides:

“The Grantor and/or the Government shall not issue to any person other than the Concessionaire any authority or permission to provide, at any time during the term of this Concession, the right to manufacture and supply electric current for lighting and power within the supply areas of Port-Vila and Luganville held by the Concessionaire.”

It is clear from the above provisions of the concession contract that UNELCO has the exclusive right to generate and supply electricity within the electricity concession of Efate.

The concession contract overrides the *Electricity Supply Act [CAP 65] as amended* (“the Act”) where there is any inconsistency between the concession contract and the Act, as section 2 of the Act provides:

(1) The provisions of this Act are subject to the terms of the following respective contracts of concession entered into between the concessionaire and the government, as amended from time to time:

- (a) The contract of concession for Port-Vila dated 15 August 1986;*
- (b) The contract of concession for Luganville dated 23 January 1990;*
- (c) The contract of concession for Tanna dated 14 July 2000;*
- (d) The contract of concession for Malekula dated 14 July 2000.*

As such, on the basis of the above sections of the concession contract and section 2 the Act, UNELCO could object to any other company generating electricity within the electricity concession of Efate. If any other company or individual were to generate electricity within the electricity concession of Efate, the only person it would be able to sell such electricity generated to is UNELCO, who would be under no obligation to purchase that electricity.

c. STAFF REPORT – “2.1 Scope and market context” (p. 8)

URA’s characterization of “excess capacity” is misleading and should be replaced by “spare capacity”. Indeed, insular utilities, because of the absence of interconnection to other networks (to continental ones and amongst islands of an archipelago) have the constraint of having to provide power by their own means, at every moment.

This necessarily creates a need for redundancies and all islands have higher than continental average capacity buffers.

d. STAFF REPORT “3.2 Availability and capacity constraints” (p. 11)

The first paragraph is vague regarding the capacity constraints; Chapter 2 of this response provides the facts and limitations.

Unelco would like URA to specify that as Unelco will analyze and define the capacity made available at each stage, pursuant to its contract and contractual obligations. Defining the solar capacity made available will result of both the analysis of technical constraints but also a long term costs for service optimization. As such, distributed PV solar will “compete” with centralized solar, wind, hydro for intermittent capacity and overall with the array of available options at any given time.

e. STAFF REPORT - “3.2 Initial trial period” (p. 11)

In this response, in our Chapter 2, Unelco has already described the intermittent capacity limitations that are inconsistent with the immediate launch of a trial.

Regarding URA’s assurances towards impacts on Unelco’s financials. Unelco deems them insufficient and not appropriately worded. Furthermore they are currently not reflected in the Preliminary Decision, only in the Staff Report.

Unelco seeks neither to financially profit nor to be penalized by this initiative. As such it would like URA to specify that: “Before the launch of any PV solar trial and any possible re-conduction or expansion of the scope of the PV solar scheme thereafter, URA and Unelco must agree on a fair and balanced accounting method to measure any profit impacts of the scheme on the Utility. If this accounting reflects a profit gap, whether a windfall or shortfall, both parties agree that it will be re-integrated into the Utility’s rate fixing mechanism, at full value, so it can be fully corrected by additional collection or restitution through the tariff level setting”. Furthermore, if URA follows Unelco’s recommendations, and the Government of Vanuatu subsequently approves them, regarding the calibration of the access fees, the amount of the cross-subsidy between clients should be very limited and any adjustment required through the above mechanism should be minimized.

If, consistent with Unelco’s recommendations, URA makes its final decision regarding the trial after the next tariff review, that is set to begin in a few months, this accounting tracking mechanism could be defined in that context.

f. STAFF REPORT - “3.3.1 Adjusted net metering ” (p. 12)

The access fee, as calibrated by URA, is not sufficient and not coherent with the objective stated in the Preliminary Decision “Commission also shall endeavor to establish a scheme that minimizes the revenue impact on the utility and the other customers”. The calibration recommended in Chapter 3 of this response should fulfill URA’s objective.

Unelco is opposed to the idea of moving to a quarterly billing schedule for PV solar generators because (1) meter readings are geographically optimized and it does not make sense to introduce exceptions, (2) the same result can be achieved by allowing customers to carry forward a negative balance for up to 4 months, which could be found acceptable if the access fees are calibrated according to Unelco’s recommendations, (3) the risk of fraud is increased with PV solar approval, it calls on the contrary for enhanced visits, not reduced frequency.

g. STAFF REPORT - “3.3.2 Bi-directional net metering ” (p. 13)

URA should specify that pursuant to the objective of ensuring fair cost coverage, any additional costs incurred by Unelco associated to the procurement, installation, replacement/repair, disposal, management, and administration of the meter should be covered by the customer.

Regarding the access fee, same comment as previously.

h. STAFF REPORT - “3.3.3 Avoided fuel cost” (p. 15)

Unelco agrees that the table published reflects the historic cost of fossil fuel production. However, this total cost includes an excise tax imposed by the Government of Vanuatu, currently set at 15 Vatus per liter. This signifies that the 25.18 Vatus/KWh average calculated by URA over the last 12-months includes approximately 3.75 Vatus per KWh of excise tax. Since solar is currently not contributing to the Government of Vanuatu’s budget through an excise tax, and to make the economic comparison valid, the current fossil fuel substitution value of PV solar should be presented as $25.18 - 3.75$ (fossil fuel excise tax) = 21.43 Vatus per KWh.

i. STAFF REPORT - “3.4 Safety and reliability” (p. 16)

Prior to the implementation of any standard (or trial) PV solar program, Unelco would indeed publish mandatory technical specifications and prerequisites associated to the grid connectivity of any PV solar installations.

Unelco will estimate the additional cost of defining and administering this trial, (then the possible steady state), the management of the individual application process, the first and subsequent inspections, and any other additional costs. Unelco will track and expect full recovery of these costs. Unelco recommends, that in coherence with the fairness principles that have guided all the recommendations in this report, URA decide to amortize these costs into a single or annual

administration fee for PV solar generators (rather than pass on the costs to all the other customers).

Within the “3.4 SAFETY AND RELIABILITY” chapter, URA added only one sentence on compliance. Unelco believes this deserves its own separate chapter, as control and compliance are crucial elements to avoiding the pitfalls of uncontrolled solar development (presented in Chapter 2 of this response)

In this regard, Unelco believes that the emphasis on control and compliance in URA’s draft is not sufficient. Good practices in the implementation of any new policy such as the one proposed dictates, for the technical and financial security of the system, that strict controls and compliance be put in place.

In practice, this signifies that URA should spell out the rules, the different types of risks, the mitigation actions put in place, the processes, the means by which they these will be controlled as well as the penalties and remedial actions taken in case of non respect.

Most issues can intellectually be anticipated or deducted from the wealth of foreign experiences in PV solar, URA should therefore provide an initial framework even if it would be fair to assume that it could be completed after the trial period. This will set the path and it will make clear what obligations underpin the system for each stakeholder.

j. Additional issues not addressed by URA papers

PV Solar Contact

URA should specify that any grid-connected solar generation installation will be contingent upon the signature of a contract with UNELCO, as is standard practice.

Unelco will create standard contract conditions within the scope of clients eligible for the general scheme. These contracts would need to include: the individually approved installed capacity, the financial conditions of the contract, the length of the agreement, the PV solar generator obligations, the means of control, the penalties for fraud or non compliance, safeguard clauses, amongst other clauses.

Tariff formula safeguards

Unelco has provided its analysis and recommendations based on the assumption that there would be no change to the price calculation formula and that behind the meter PV solar quantities and prices would not affect formula calculated price levels.

Should URA anticipate that it will propose any changes to the tariff formula to account for behind the meter solar PV, Unelco strongly recommends that



calibration of the economics of a PV Solar trial be set during or after the 2014 rate case.

Tariff structure safeguards

Unelco has provided its analysis and recommendations based on the current rate and tariff structure. It thereby assumes that the rate conditions and tariff structures will not substantially change for the coming rate period.

Should URA anticipate that it will propose any material changes to the tariff structure, Unelco recommends that calibration of the economics of the PV Solar trial be set during or after the 2014 rate case.

5. Concluding summary of key points

1

URA must clarify that the remaining solar absorption capacity of the Efaté grid is very limited in the short-term and is slated to become non-existent as soon as already committed solar projects are put in operation. This expectation should be set in a transparent manner with the general public, the Government and any other stakeholders. It should also be made clear that Unelco will define any future intermittent capacity openings based on a fair and balanced process so it cannot offer any guarantees as to whether distributed solar will or will not be the best technology to meet Efaté's needs in the future and to what extent it should be incorporated into the energy mix.

2

URA should consider finalizing economic calibration of the PV solar schemes only once the 2014 rate case has been completed, in particular if URA anticipates that it would like to discuss any material changes to the tariff formula, tariff structure or tariff levels. Changes in tariff structures and levels could further aggravate cross-subsidies or create other unanticipated issues. Changes in the tariff formula, in particular if there is any modification in the accounting of behind-the-meter PV solar could have an impact on customer prices and Unelco. Having 2015-2020 rate case decisions before the final PV solar program calibration would provide Unelco and other stakeholders with appropriate foresight and regulatory clarity.

3

Unelco agrees with the general scope of types of tariffs and individual installed capacity levels that could become eligible for a standard distributed PV Solar trial. As mentioned in point #1, Unelco however has strong reservations regarding the timing and the size of the trial. Unelco heard the feedback provided to URA during the public hearing from installers, requesting some lead-time (which is consistent with recommendation #2 above) and that the trial period should be 1 year in length. Unelco would agree that because of seasonal variations of PV solar generation, the results would be more meaningful if the trial were 1-year in length rather than 6 months.

4

URA must re-calibrate the level of the access fee of its "adjusted net meter" scheme to the level of the Fair Access charge proposed by Unelco to avoid creating an unfair and unsustainable cross-subsidy between customers and create substantial tax shortfall for the Government. URA's current calibration would shift 9,000,000 Vatus of fixed system costs per year or 225,000,000 Vatus over the lifetime of solar panels from PV

solar customers to other customers. This figure, although already quite large, is only taking into account the 75 participants in URA's proposed trial, not any subsequent larger roll-out

5

URA must create a Fair Access charge in the “bi-directional metering” scheme to avoid creating an unfair and unsustainable cross-subsidy between customers and create a tax shortfall for the Government. The Fair Solar Program table following this list describes the Unelco's recommendations to correct and avoid this unfair and socially regressive transfer.

6

URA must clarify the pre-existing legal and contractual frameworks that will impact any of the considered schemes. Unelco has a production monopoly that applies to any grid-connected generation. Unelco is eager to optimize production on Efaté in order to bring down energy costs and will therefore consider all options. However, it will only delegate production rights to third parties if the program proposed is in coherence with a sustainable long-term energy strategy and the sound equity and fairness principles set out in this document. In Unelco will maintain the final right to approve all generation applications.

7

URA must clarify that only the Government of Vanuatu has the power to approve tariffs, whether consumption or feed-in tariffs. During the public hearing URA committed to providing a detailed analysis of the impacts on the other customers and stakeholders, in particular the level of embedded cross-subsidies in URA's proposal. The Government of Vanuatu should have this information, as they should be consulted in matters of fairness and equality of treatment between customers.

8

URA must make it clear that the final scheme will be completely financially neutral for Unelco: Unelco is not looking to profit from this scheme and is committed to passing on 100% of the real net economic benefits to the system. If the final scheme and calibration proposed by URA, and approved by the Government of Vanuatu, were to create, despite their best efforts to avoid them, any over- or under-collection for Unelco, an over-payment or a cross-subsidy between customers, Unelco is committed to tracking it, transparently publishing the figures and will demand full recovery of any shortfall. The above includes the incentive and pricing mechanisms to PV solar generators as well as any and all of the new costs associated to the introduction and maintenance of this program (designing and managing the trial and any subsequent roll-out).



URA must provide guidance as to the control and compliance process it is recommending for these schemes. Unelco cannot endorse the introduction of a new mechanism that doesn't exhibit a minimal risk, mitigation, control, and compliance analysis.

APPENDIX | Glossary and definitions

Adjusted net metering	<p>“Adjusted” net metering is a net metering scheme (see definition below) but in recognition of the fact that:</p> <ul style="list-style-type: none"> • the relative weight of the energy charge pays for part for the fixed electric system and • the PV solar generator remains dependent on the grid for guaranteed power, <p>... an Access Fee (sometimes called capacity charge) is added to the PV Solar’s electric bill to offset the fixed electric system costs.</p>
Bi-directional metering	<p>Bi-directional metering requires a different kind of meter, one that counts all the net inflows of energy from the electric grid (consumption) and all the net outflows of electricity to the grid (feed in). Each flow can then be priced differently.</p>
Distributed generation	<p>Distributed generation (often abbreviated DG) is when power generation units are placed at or near the point of energy consumption. Distributed generation is differentiated from traditional “centralized” generation systems where the power is generated in a large central plant, then sent through the electrical grid to customers.</p>
Excise tax	<p>The Government of Vanuatu imposes a 15 Vatus per liter excise tax on fossil fuel used to generate power on Efaté. The values of the term (Gf) in Table 6 of URA’s Staff Report include the excise tax.</p>
Fair Access charge	<p>A fixed monthly charge for distributed solar generators to pay for the fixed electric system costs associated to the continuous electricity service still provided to them by the electric grid, as well as the capacity to feed-in and monetize any excess unused solar electricity produced.</p>
Fair bi-directional metering	<p>It is bi-directional metering (see description above) combined with a Fair Access charge that is calibrated to ensure that one persons PV solar installation remains neutral to all the other customers. (vs. increase their electricity price)</p>
Fair net-metering	<p>It is net metering (see description below) combined with a Fair Access charge that is calibrated to ensure that one persons PV solar installation remains neutral to all the other customers. (vs. increase their electricity price)</p>
Fossil fuel substitution value	<p>The pre-tax cost of a KWh generated from fossil fuels in Efaté</p>
Grid-connected solar	<p>This is used by opposition to non-grid connected solar. People that have no connection to the electric grid can produce their</p>

own power with PV solar panels and are not affected by this scheme.

Intermittent energy	<p>Intermittent energy are electricity generation sources whose output is variable and cannot be predicted (or not with accuracy). Intermittent energies include PV solar, wind and small hydro in particular. These sources are typically opposed to predictable/reliable/manageable output generation technologies such as diesel generation, coco-fuel generation or large scale hydro dams.</p>
KWp	<p>“KiloWatt Peak”. Solar panel are rated based on the maximum output they can generate in full sunlight. The actual average capacity of the solar panel will be much lower. In Vanuatu it is generally estimated that solar panels will produce: 1,300hours per year x KWp = 1,300 KWh per year per KWp installed</p>
Net metering (or straight net metering)	<p>Net metering is a scheme where customers produce and consume their own electricity. Their electric bill is calculated based on the net amount shown on their meter at the end of the month (which figuratively or literally turns both ways).</p>
P	<p>Standard price of electricity per KWh, updated every month based on the pricing formula.</p>
PV solar	<p>Refers to electricity produced from solar panels. PV solar and solar panels are used interchangeably in this response. “PV solar” is generally used instead of just “solar” to clarify that what is being referred to is electricity generation from solar energy, not “solar thermal” which is for example hot water generated from solar energy.</p>
VAT	<p>Current Value Added Tax on electricity bills in Efaté is 12,5% of pre-tax bill. This analysis assumes that VAT on solar panels is also 12,5%.</p>