PROJECT IDEA NOTE (PIN)

Name of Project: Coconut oil based power generation in Samoa

Date submitted: 12th October 2012

Description of size and quality expected of a PIN

Basically a PIN will consist of approximately 5-10 pages providing indicative information on:

- the type and size of the project
- its location
- the anticipated total amount of greenhouse gas (GHG) reduction compared to the "business-as-usual" scenario (which will be elaborated in the baseline later on at Project Design Document (PDD) level)
- the suggested crediting life time
- the suggested Certified Emission Reductions (CERs)/Emission Reduction Units (ERUs)/Verified Emission Reduction (VERs) price in US$ or € /ton CO_2e reduced
- the financial structuring (indicating which parties are expected to provide the project's financing)
- the project's other socio-economic or environmental effects/benefits

While every effort should be made to provide as complete and extensive information as possible, it is recognised that full information on every item listed in the template will not be available at all times for every project.

A. PROJECT DESCRIPTION, TYPE, LOCATION AND SCHEDULE

OBJECTIVE OF THE PROJECT *Describe in not more than 5 lines*	Samoa is currently dependent on the import of diesel fuel for a significant part of its power generation. Therefore, the Samoan Electric Power Corporation (EPC) is looking into viable and cleaner alternatives that make use of an abundant local resource; coconut oil as an alternative to the diesel oil. As coconut-based exporting agro industries are struggling, it is also very timely to develop a new domestic market for coconuts. The objective of the proposed project activity is to reduce the dependence of Samoa on imported diesel oil through promoting clean energy generation and at the same time support the local agricultural industry.

PROJECT DESCRIPTION AND PROPOSED ACTIVITIES *About ½ page*	The proposed Coconut Oil Fuelled 1 MW power plant is planned to be built next to, or as part of the planned new EPC power station in Savai'i. The location is preferred over other locations due to following reasons: Ø High rural unemployment in Savai'i Ø Good coconut resource and limited commercial coconut market Ø Higher landed cost of fuel for EPC in Savai'i Ø Fitting well into the plans to build a new power station Ø Good infrastructure (ring road) for collection of coconuts Ø ***Coconut Oil Plant Logistics*** The logistics for the coconut oil production facility require attention since it consumes significant amounts of biomass (coconuts). After collection, coconuts are stored in a shed. The coconuts are then de-husked and de-shelled. The coconut water is collected separately. The copra is then dried and stored in bulk. The copra is cut and pressed to extract oil and the end-products are high protein and high fibre copra meal[1] and coconut oil. After purification, the oil is stored in tanks. The required blend is achieved through mixing the coconut oil with diesel fuel in a blending tank. The heat from the cooling systems of the EPC compression ignition engines will be fed to the dryer for additional overall efficiency. It is estimated that to produce of 660,000 litres of coconut oil, approximately 1,011 tonnes of copra or 5 million nuts will be needed. This translates into 11 truckloads of coconuts every week, or just over two truckloads per day. Another truckload of coconut meat will have to be transported to the Apia harbour or be collected by local buyers. The volume of a weeks' worth of copra meal will take up a volume of 15m^3 for which storage shelter needs to be built. The manpower required is estimated at 15 labourers and 1 supervisor / manager. This position might be combined with the position of plant manager at Saleloga. The electrical energy required is mainly to run fans, and motors for the de-husking and de-shelling machines and is estimated at 1,400 kWh per day. It is assumed this will be added to the own consumption of the power plant. Weekly, there will be 20,000 litres of coconut water, for which a market needs to be sought. This can be transported in two truckloads a week by using a

[1] http://en.wikipedia.org/wiki/Coconut_oil, Copra meal is a by - product created from the mechanical extraction of the oil from the coconut.

	stainless steel tank. It might need to be refrigerated for future use. The shells and husks can be transported in trucks by their respective buyers or used on-site in a gasifier and/or steam engine. For the Coconut Oil Processing Plant to operate efficiently and effectively over its intended life time, training will be arranged and human capacity building will be done locally.
TECHNOLOGY TO BE EMPLOYED[2] *Describe in not more than 5 lines*	The operation of the Coconut Oil Fuel plant is shown in figure 1 on the next page. The process has distinguished inputs, products steps and by-products. The potential uses of the by-products are also indicated.

[2] Please note that support can only be provided to projects that employ commercially available technology. It would be useful to provide a few examples of where the proposed technology has been employed.

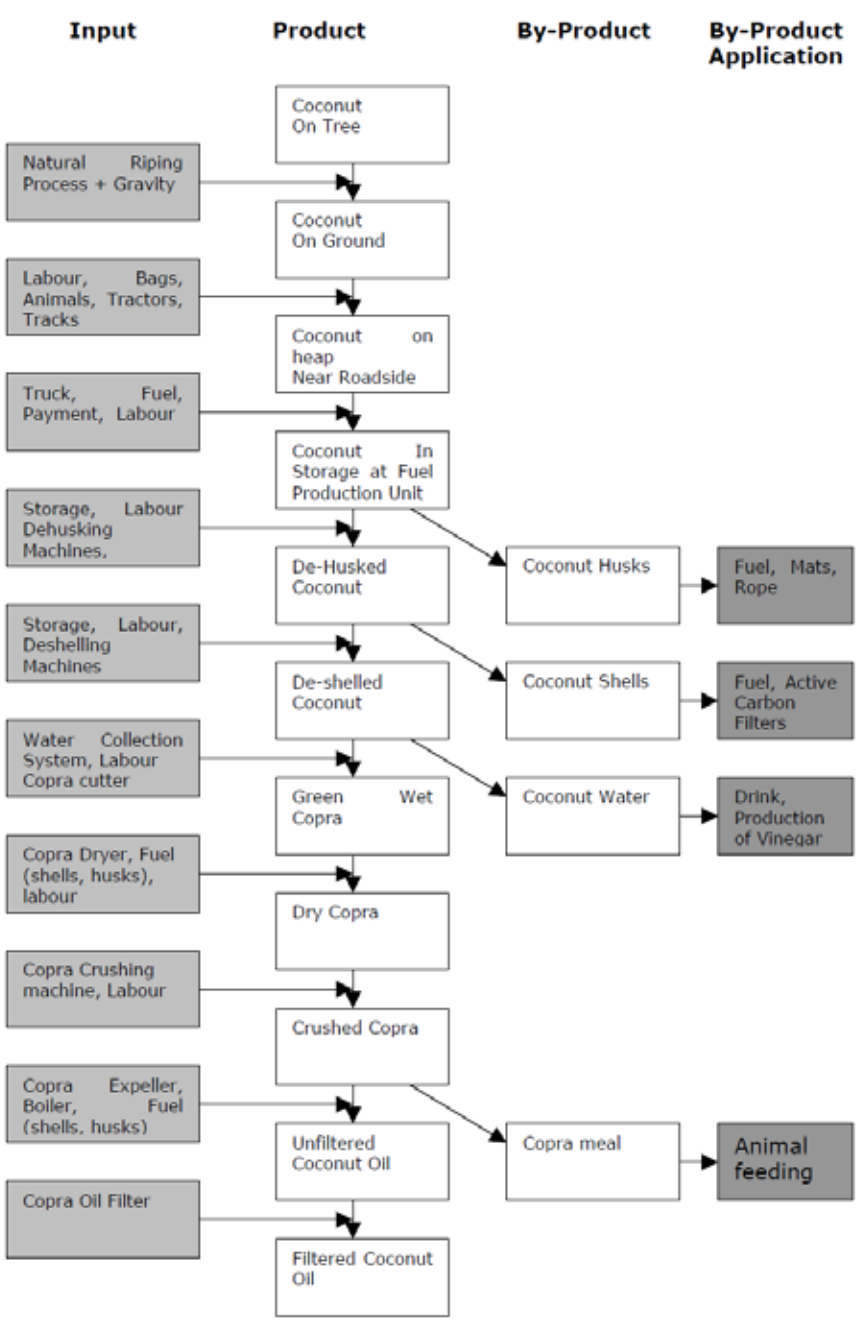

Figure 1: Operation of Coconut Fuel Oil Power Plant

Greenhouse gases targeted $CO_2/CH_4/N_2O$/HFCs/PFCs/SF_6 *(mention what is applicable)*	CO_2
Type of activities Abatement/CO_2 sequestration	Abatement
Field of activities *(mention what is applicable)* *See annex 1 for examples*	Renewable Energy : Others 11

LOCATION OF THE PROJECT	
Country	Samoa
City	Savai'i Island
Brief description of the location of the project *No more than 3-5 lines*	The proposed location for the project activity is EPC Saleloga Power station in Savai'i.
PROJECT PARTICIPANT	
Name of the Project Participant	Electric Power Corporation (EPC)
Role of the Project Participant	b. **Owner of the site or project**
Organizational category	a. Government
Contact person	Tile Leia Tuimalealiifano
Address	P.O. Box 2011, 5th Floor, TATTE Building, Sogi, Apia, SAMOA
Telephone/Fax	Telephone 685 65401/Fax 685 23748
E-mail and web address, if any	leiat@epc.ws
Main activities *Describe in not more than 5 lines*	The Electric Power Corporation of Samoa (EPC) was incorporated on 19 December 1972 and is an autonomous State-owned corporation. It has the mandate to carry out its functions as the entity responsible for the generation, transmission, distribution and selling of electricity in Samoa. The EPC now provides electricity to 96 per cent of the population of Samoa.
Summary of the financials *Summarize the financials (total assets, revenues, profit, etc.) in not more than 5 lines*	Not applicable as Government Entity
Summary of the relevant experience of the Project Participant *Describe in not more than 5 lines*	Not applicable as Government Entity
Please insert information for additional Project Participants as necessary.	
EXPECTED SCHEDULE	
Earliest project start date *Year in which the plant/project activity will be operational*	2015
Expected first year of CER/ERU/VERs delivery	2016
Project lifetime *Number of years*	10 years
For CDM projects: Expected Crediting Period *7 years twice renewable or 10 years fixed* For JI projects: Period within which ERUs are to be earned *(up to and including 2012)*	10 years fixed
Current status or phase of the project *Identification and pre-selection phase/opportunity study finished/pre-feasibility study finished/feasibility study finished/negotiations*	Feasibility study finished Available document: Feasibility Study for use of Coconut Oil Fuel in EPC Power Generation

phase/contracting phase etc. (mention what is applicable and indicate the documentation)	
Current status of acceptance of the Host Country *Letter of No Objection/Endorsement is available; Letter of No Objection/Endorsement is under discussion or available; Letter of Approval is under discussion or available* *(mention what is applicable)*	Project is being developed under voluntary market and need not apply for Letter of no Objection.
The position of the Host Country with regard to the Kyoto Protocol	Has the Host Country ratified/acceded to the Kyoto Protocol? Yes, 16 Feb 2005 Has the Host Country established a CDM Designated National Authority / JI Designated Focal Point? Yes in year 2010

B. METHODOLOGY AND ADDITIONALITY

ESTIMATE OF GREENHOUSE GASES ABATED/ CO_2 SEQUESTERED *In metric tons of CO_2-equivalent, please attach calculations*	Annual (if varies annually, provide schedule): 1,771 tCO_2-equivalent Up to and including 2012: 0 tCO_2-equivalent Up to a period of 10 years: 17,710 tCO_2-equivalent Up to a period of 7 years: 0 tCO_2-equivalent
BASELINE SCENARIO CDM/JI projects must result in GHG emissions being lower than "business-as-usual" in the Host Country. At the PIN stage questions to be answered are at least: · Which emissions are being reduced by the proposed CDM/JI project?	CO_2 is the targeted emission reductions by the project activity. In absence of the project activity baseline scenario would be use of diesel for power generation resulting in GHG emissions into the atmosphere.

Year	Emission Reduction (tCO_{2e})
2016	1,771
2017	1,771
2018	1,771
2019	1,771
2020	1,771
2021	1,771
2022	1,771
2023	1,771
2024	1,771
2025	1,771

· What would the future look like without the proposed CDM/JI project? *About ¼ - ½ page*	
ADDITIONALITY Please explain which additionality arguments apply to the project: (i) there is no regulation or incentive scheme in place covering the project (ii) the project is financially weak or not the least cost option (iii) country risk, new technology for country, other barriers (iv) other	Project additionally can be demonstrated as per "Guidelines for Demonstrating Additionally of Micro-Scale Project Activities" (EB 68, version 04)**.** As per the paragraph 2 of the guidelines: Project activities up to 5 MW that employ renewable energy technology are additional if any one of the below conditions are satisfied: a) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country. b) The project activity is an off-grid activity supplying energy to households/communities (less than 12 hours grid availability per 24 hours day is also considered as off grid. for this assessment); c) The project activity is designed for distributed energy generation (not connected to a national or regional grid) with both conditions (i) and (ii) satisfied; (i) Each of the independent subsystem/measure in the project activity is smaller than or equal to 1500 kW electrical installed capacity; (ii) End users of the subsystem or measure are households/communities/ Small and Medium-sized Enterprises (SMEs). d) The project activity employs specific renewable energy technologies/measures recommended by the host country DNA and approved by the Board to be additional in the host country According to the United Nations, Samoa is classified both as a Least Developed Country (LDC) and Small Island Developing State (SIDS)[3]. Hence proposed project, which will utilize coconut oil for 1 MW base load engine is considered to be automatically additional as per the above EB guidelines.
SECTOR BACKGROUND Please describe the laws, regulations, policies and strategies of the Host Country that are of central relevance to the proposed project, as well as any other major trends in the relevant sector. Please in particular explain if the project is running under a public \incentive scheme (e.g. preferential tariffs, grants, Official	Efficiency and Greenhouse Gas Abatement (PREGA) draft report. Samoa has some indigenous energy resources. The barriers to using these renewable energy resources are mostly technical in nature. Renewable energy resource assessment in Samoa has been limited, but some work has been done under the Pacific Islands Renewable Energy Project (PIREP). Samoa national report and Promotion of Renewable Energy, Energy Efficiency and Greenhouse Gas Abatement report, both these reports indicated a great potential for the use of biofuels such as coconut oil. The Government of Samoa's draft policy objectives for the Energy Sector are to meet growing demand by maximising the use of indigenous renewable energy resources and minimising the import of fuel Specifically, it spells out a strategy

[3] http://www.un.org/special-rep/ohrlls/sid/list.htm

<table>
<tr><td>Development Assistance) or is required by law. If the project is already in operation, please describe if CDM/JI revenues were considered in project planning.</td><td>to: “Promote alternative fuels to substitute petroleum products to reduce dependency of the economy on fossil fuels”.

(EPC) currently enjoys the monopoly to generate and distribute grid-connected electricity on the islands of Samoa[4]. The table below shows the main islands of Samoa, their population and their electricity supply.

<table>
<tr><td colspan="4">Island Areas, Population and Power Supply[5]</td></tr>
<tr><td>Island</td><td>Area (km^2)</td><td>Population</td><td>Electricity Supply</td></tr>
<tr><td>Savai’i</td><td>1,708</td><td>42,284</td><td>Diesel Generation, Grid Connected</td></tr>
<tr><td>Upolu</td><td>1,123</td><td>134,024</td><td>Diesel and Hydro, Grid Connected</td></tr>
<tr><td>Manono</td><td>3</td><td>1500</td><td>Connected to Upolu</td></tr>
<tr><td>Apolima</td><td>1</td><td>150</td><td>Diesel mini-grid</td></tr>
<tr><td>All others</td><td>1</td><td>None</td><td>None</td></tr>
</table></td></tr>
<tr><td>METHODOLOGY
Please choose from the following options:

For CDM projects:

(i) project is covered by an existing Approved CDM Methodology or Approved CDM Small-Scale Methodology

(iii) projects needs modification of existing Approved CDM Methodology</td><td>The projects under this programme fall under the scope of following methodology

Type: I. Renewable energy projects

And
Category: I.D[6] – Grid connected renewable electricity generation (I.D./Version 17,EB 61)

Scope Number: 1
.</td></tr>
</table>

C. FINANCE

<table>
<tr><td colspan="2">TOTAL CAPITAL COST ESTIMATE (PRE-OPERATIONAL)</td></tr>
<tr><td>Total project costs</td><td>Initial costs and estimates for the proposed project activity are as below (1US$=2.63 WST):

Capital Costs:
<table>
<tr><td>Items</td><td>Estimated Cost(US$)</td><td>Estimated Useful Life (years)</td><td>Annual Depreciation Cost (US$)</td></tr>
<tr><td>Buildings and Design</td><td>209,000</td><td>30</td><td>6,967</td></tr>
</table></td></tr>
</table>

[4] However under Samoa Energy Sector Plan 2012-2016 private sector is being encouraged to be more actively involved as Independent Power Producers (IPPs).
[5] Adapted from PIREP Samoan National Report
[6] http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X

Dryers,Dehusking and Deshelling Equipment	95,000	10	9,500
Expellers	152000	10	4,000
Fuel Tanks	38,000	20	1,900
Piping, Belts, Infrastructure	95,000	15	6,333
Total	589,000		28,700

Operating Costs:

Items	Estimated Annual Cost (US$)
Purchase of Coconuts (roadside)	247,000
Delivery of coconuts to Mill	38,000
Labour	34,770
Annual Maintenance	8,333
Consumables	9,500
Electricity	4,940
Other	4,560
Consumption Capital	39,900
Total Operating Costs	377,503

SOURCES OF FINANCE TO BE SOUGHT OR ALREADY IDENTIFIED	
Equity Name of the organizations, status of financing agreements and finance (in US$ million)	Information regarding project funding is not yet available.
Debt – Long-term Name of the organizations, status of financing agreements and finance (in US$ million)	Information regarding project funding is not yet available.
SOURCES OF CARBON FINANCE Name of carbon financiers that you are contacting (if any)	NA
INDICATIVE CER/ERU/VER PRICE PER tCO_2e *Price is subject to negotiation. Please indicate VER or CER preference if known.*	US$ 8 – 10 (Indicative price range only)
TOTAL EMISSION REDUCTION PURCHASE AGREEMENT (ERPA) VALUE	
A period until 2012 (end of the first commitment period)	N/A
A period of 10 years	US$ 141,680 – US$ 177,100
A period of 7 years	N/A

D. EXPECTED ENVIRONMENTAL AND SOCIAL BENEFITS

LOCAL BENEFITS E.g. impacts on local air, water and other pollution.	The project promotes use of coconut oil, which is a renewable fuel. It is clean, safe, biodegradable and free of sulphur as compared with diesel. Combustion of coconut oil in the project activity can reduce serious air pollutants such as soot, particulates, carbon monoxide, hydrocarbons and air toxics. The use of coconut oil in existing engines has been demonstrated during experiments and trial runs in various countries, including one in neighbouring country Fiji. Thus, coconut oil can be used as substitute fuel to diesel in power generation and is considered environmentally safe. It can reduce local air pollution. Further, substitution of diesel with coconut oil results in reduction of anthropogenic GHG emissions through avoidance of carbonaceous fossil fuels.
SOCIO-ECONOMIC ASPECTS	
What social and economic effects can be attributed to the project and which would not have occurred in a comparable situation without that project? Indicate the communities and the number of people that will benefit from this project. *About ¼ page*	· The collection and sale of coconuts to EPC by smallholders (households) in Savai'i will provide an opportunity for Samoa to improve income in rural areas, and thus reduce poverty. Current estimates of increased aggregate rural income in Savai'i range from WST750,000 (US$285,171) to more than WST 2 million (US$76,046) per year, depending on the price paid per coconut and the size of oil production plant ultimately chosen by the EPC. · The prices of imported diesel fuel have risen substantially in recent years and remain volatile. Substituting a portion of diesel fuel imports with local coconut oil production could help stabilise the costs of fuel input for power generation, as local coconut oil costs are unlikely to fluctuate significantly after the production facility is built · The production of coconut oil for fuel will result in the generation of considerable volumes of shell and husk, only a portion (about half) of which will be burned for drying copra. The leftover shell and husk is an available fuel source that could be used for additional power generation, through either gasification or a steam turbine. The capital and operating costs of power generation using coconut wastes have not been analysed in this report.
What are the possible direct effects (e.g. employment creation, provision of capital required, foreign exchange effects)? *About ¼ page*	The direct effects of the proposed coconut oil processing plant are expected to be strongly beneficial. Apart from creating livelihoods for small farmers that will have a market for coconuts that was previously not there, the plantations are expected to require more labour for coconut tree planting and coconut harvesting, creating local long-term jobs. During construction there will be a significant requirement for building labour and during operation, 31 full-time positions will be created.

ENVIRONMENTAL STRATEGY/ PRIORITIES OF THE HOST COUNTRY A brief description of the project's consistency with the environmental strategy and priorities of the Host Country *About ¼ page*	For any major development in Samoa, the Government requires a "*Development Consent*". This is a legal document that gives permission for using or development on a particular piece of land in Samoa. It contains written conditions and usually an endorsed plan that shows what is to be built and how the land can be used. The proposed use or development must satisfy all the conditions on the development consent of the proposed activity if consent has been granted subject to conditions (MNRE, 2005). Under the Government of Samoa, the Ministry of Natural Resources and Environment (MNRE) is the authority in charge of Environmental Impact Assessment, which is defined in government regulations as "*An examination,*

	analysis and assessment of planned activities with a view of ensuring environmentally sound and sustainable development". During the feasibility study, a preliminary study was conducted on the regulatory requirements that a coconut oil production facility and the proposed use of coconut oil fuel by EPC have to follow. The Key outcomes are : <u>Effect on other users of resources</u> The only effect on other users of the resources is slightly higher prices for coconuts in Savai'i. This competition is perceived to be healthy for the coconut production sector, which is currently in disarray. The use of local labour will have a positive effect to the economy of Savai'i. Moreover, the project will create a market for coconuts that are currently unused and left rotting in plantations. This project will enable households to sell their coconuts and to revive their pastures and grow more coconuts. <u>Sustainability</u> The sustainability of the resources used by the project will be secured if the farmers and plantation holders decide to replant (hybrid) coconut trees during the first few years of operation. If this does not occur, the supply of coconuts might be hampered in the medium term. It is expected from the newly emerging market for coconuts that this project will trigger new activities of planting coconut trees among the local people. <u>Waste Pollution</u> The waste is not expected to cause any pollution or have any impact on ground water quality. <u>Air Pollution</u> The Coconut Oil Processing plant is envisaged to produce steam, smoke from coconut shell and husk fires. The air pollution will be subject to a more detailed study based on similar operations. The overall emissions from the coconut oil production and electricity production will be lower than the baseline with diesel. <u>Solid Waste</u> Assuming all the by-products from the coconut oil processing plant will be either used for electricity generation or sold to third parties, there will be no solid waste. Therefore, either concrete plans for use of the biomass streams of coconut shell and husk are required. <u>Noise</u> The Coconut Oil Processing Plant will generate some noise comparable to a medium-sized copra mill. This noise is not expected to exceed the operation of a multi-megawatt diesel power plant. <u>Effects on the Natural Environment</u> The effects on the natural environment of the Coconut Oil Processing Plant (primary area) are assumed minimal and negligible. For any new coconut oil plantations it is planned that currently overgrown plantations will be cleaned and roads will be reconstructed.

ANNEX I - Technologies

1. Renewables
   1a Biomass
   1b. Biogas
   1c. Bagasse
   1d. Wind
   1e. Hydro
   1f. Geothermal
   1g. Photovoltaic
   1h. Solar Thermal
2. Fossil Fuel Switch
3. Energy Efficiency
   3a. Cement Efficiency Improvement
   3b. Construction material
   3c. District heating
   3d. Steel Gas Recovery
   3e. Other Energy Efficiency
4. Waste Management
   4a. Landfill Gas recovery/utilization
   4b. Composting
   4c. Recycling
   4d. Biodigestor
   4e. Wastewater Management
5. Coalmine/Coalbed Methane
6. Oil and Gas Sector
   6a. Flared Gas Reduction
   6b. Reduction of technical losses in distribution system
7. N_2O removal
8. HFC23 Destruction
9. SF6 Recovery
10. Transportation
   9a. Fuel switch
   9b. Modal switch
11. Others