CHUUK STATE ENERGY ACTION PLAN – REVISED FEBRUARY 2013

Priority	ACTIVITIES/PROGRAMS – PRIORITY LIST	Reference	Time frame
In Place	Management reform of CPUC	**1.1**	2010-2013
In Place	Power Generation - Restoration of 24 Hours Power Supply A. Procurement of 2no. 1 MW diesel generator to replace the old and inefficient existing ones B. Overhaul of 1no. 1 MW existing generator (as back up for 2 no. 1 MW generators in A.)	**1.2**	2012-13
In Place	Power Distribution System efficiency improvement	**1.3**	2010-13
High	Power Plant Restoration – long term power generation security	**1.2.2**	2013-2014
High	Power Distribution Restoration	**1.3.2**	2013-2014
High	Waste Heat Recovery	**1.4**	2013-15
High	Energy efficiency & conservation measures – Public awareness & Education	**2.1**	
High	Energy efficiency & conservation measures - Implement State Level Improvements	**2.2**	
High	Energy efficiency & conservation measures – Energy Auditing	**2.3**	
High	Energy efficiency & conservation measures – Establish Legislative Framework	**2.4**	
High	Northern Namoneas – Weno, Main Island Supply – Grid connect, 450 kWp on Government Facilities	**3A.1**	2012-15
High	Lagoon Island Supplies Hybrid Grid Systems: Southern Namoneas – (Grid by cable from Weno); Stand Alone Systems - CPUC: Udot; Munian; Central Wonip; Fanapanges; Fefan; Stand Alone systems – FDA: Faichuuk – 8 islands, 10 systems – Private Sector	**3A.2**	 2013-17 2009-2014 2013-2033
High	Outer Island Supplies Hybrid Grid Systems: P1 – Mortlocks; P2 – other similar islands Stand Alone Systems: P1 – Moch, Onoun, Satowan; P2 – Oneop; Lecinioch; P3 – All others	**3A.3**	 2013-14 2009 - 2016
High	Lantern Programs – on all P1 and P2 stand alone systems	**3A.4**	2013-14
High	Start Chuuk wind energy measurements in Weno, Tonoas and other Truk Lagoon islands.	**3B.1**	2013-14
High	Assess alternative fuels – coconut; LPG – to reduce diesel dependency and reduce carbon emissions	**3E.1**	2014-15
Medium	After selecting the best suitable locations, secure land through long lease agreements for wind sites	**3B.2**	2014-2015
Medium	Assessment of wave and tidal energy potential for lagoon and outer islands	**3C.1**	2014-15
Medium	Assessment of waste to energy potential for larger lagoon islands.	**3D.1**	2014-15
Medium	Secure funding for alternative fuel options - coconut oil; LPG; / Equipment selection for implementation	**3E.2/3E.3**	2014-16 / 2015-18
Low	Secure funding for appropriately sized wind farm / Select equipment and build the wind farm with interconnection to the grid.	**3B.3/3B.4**	2014-15 / 2015-16
Low	After selecting the best suitable locations, secure land through long lease agreements for ocean technology sites	**3C.2**	2014-2015
Low	Secure funding for appropriately sized ocean technology / Select equipment and build the infrastructure with grid connect	**3C.3/3C.4**	2014-15 / 2015-16

PLAN OF ACTION STATE OF CHUUK - OVERVIEW

Objectives	Outcome Measures	Activities, programs, strategies	Governance/ Responsibilities	Time frame
Provision of stable and reliable power generation in Weno for Northern & Southern Namoneas	New power plant that provides efficient and reliable electricity to all end-users in Northern & Southern Namoneas	Procurement of 2 no. 1 MW generation capacity to secure short term power supply on Weno. Refurbishment of CPUC Power Plant total 8.5 MW	CPUC	2011-12 2013-14
Improve management, operation and maintenance of CPUC	More efficient utility management (generation & distribution) Sustainable O&M schedule for power plant;	Contract outside management and maintenance consultants to train and improve management of CPUC; Increase Power output efficiency; Rationalise transformers and upgrade distribution lines; Reduce commercial losses to support cost and depreciation recovery;	State / IPIC; CPUC/OMM	2010-2014
Enhancement of power sector by Supply Side Energy Efficiency and proper revenue measurements	A more efficient-run power plant resulting in a sustainable power supply to the end-users; Supplement conventional energy with Alternative Energy in line with National targets	Measure power loads on all main supply lines; Determine energy loss by supply line and focus mitigation activities Promulgate housing codes requiring all government facilities on Weno and the outer islands to operate or install alternative energy sources; Borrow from EU, ADB, or China Exim Bank Funding for Alternative Energy	CPUC CSEW; IPIC	2011 – 2015
Efficient electricity demand management	More efficient power usage by customers;	Promulgate energy efficiency regulations for new buildings; Provide incentives for increasing energy efficiency to businesses and property owners; Undertake awareness campaigns for energy efficiency and management Engage with EDF-10 North-REP project on energy efficiency and capacity building support	CPUC; EPA; Governors office	2011-2013
Diversify Chuuk State energy mix by introducing renewable energy. -PV grid tied systems -Waste to energy -Wind energy	Supporting the energy requirements of Government Facilities with renewable energy	Study on suitable energy technologies including energy audits Prepare regulations allowing feed-in tariffs/ net-metering PEC; Italian Government; North-REP	CPUC, Public Works, IPIC	2011 – 2015
Electrification of lagoon islands and other un-electrified islands	Improved Access to electricity for all Chuuk residents and public facilities	Install hybrid grid/renewable installations (solar PV; wind; wave/tidal/biomass combinations) on the lagoon and outer islands with pre-paid meters Install PV stand-alone systems on public facilities in the outer islands as appropriate; Work with private sector players to accelerate investment and expansion of services; EDF 10; EDF 11;	CPUC, IPIC National Government	2011 – 2020

CHUUK - 5 YEAR ENERGY ACTION PLAN

OBJECTIVE 1: CONVENTIONAL ENERGY							
Activity Priority	**Activity**	**Organization(s) Responsible**		**Performance indicators**	**Budget (USD)**	**Funding Source**	**Time Frame**
		Lead Agency	**Supporting**				
IN PLACE	**1.1 MANAGEMENT REFORM OF CPUC** **1.1.1** Recruitment of management and engineering team; Capacity building for CPUC staff – revenue management; power loss reduction; operational capability	State	OIA/PPA	Return to 24 hour supply; Business viability restored; effective management process in place; Power losses reduced; customer service improved	4.6m	Compact Funds	2010-13
IN PLACE	**1.2 POWER GENERATION** **1.2.1** Restoration of 24 hour power supply A. Procure 2 new 1.15 MW medium speed generators B. Overhaul existing 1.2 MW generator as standby in advance of New Power Plant (see 1.2 below)	CPUC	ADB; DTC&I; PPA	24 hour power supply for the whole Weno Island; 15% improvement in fuel efficiency on 2010 level	A. 2.0m B. 0.3m	ADB USDOI	2012
HIGH	**1.2.2** Power plant restoration with 8.5 MW capacity - (2 x 2.4 MW; 2x1.15MW; & 1x1.4 MW);	CPUC	OIA Compact	24 hour power supply; Capacity to supply adjacent lagoon islands 15% improvement in fuel efficiency on 2012 level;	7.5m	Compact	2013-2014
IN PLACE	**1.3 POWER DISTRIBUTION** **1.3.1** Distribution system efficiency improvement ➢ Reduction of Commercial Loss - Survey and repair all cash power meters; Remove all illegal connections; ➢ Reduction of line losses - Implement tree trimming program; install tree wire in critical areas; Rationalisation of transformers	CPUC	SPC/PPA	Reduction in power loss; Financial operating surplus; Improved cash flow; Outages reduced significantly; Reduction in fuel consumption;	0.2m 0.25m	Compact	2010-13

HIGH	**1.3.2** Rebuilding of power distribution system:	CPUC	ADB OIDP Funds	Efficient operation; Reliable power supply	3m	ADB OIDP Loan	2013-14
HIGH	**1.4 WASTE HEAT RECOVERY** 1.4.1 Assessment of options to benefit from waste heat recovery/combined cycle retrofit and forward fit technology 1.4.2 Inclusion of appropriate technology in CPUC power plant design	CPUC	National Government; FSM PC	Reduced diesel fuel use Reduced/ eliminated disesel fuel use; reduced carbon emissions		No funding No funding	2013-15

OBJECTIVE 2: ENERGY CONSERVATION AND ENERGY EFFICIENCY

Activity Priority	Activity	Organization(s) Responsible		Performance indicators	Budget (USD)	Funding Source	Time Frame for Initiation
		Lead Agency	Participating / Supporting				
HIGH	**2.1 PUBLIC AWARENESS & EDUCATION**						
	2.2.1 Phase 1 - Formulate, recommend, and implement Public Awareness and Education on Energy Conservation and Energy Efficiency Measures, etc. by 2013.	IPIC; CPUC;	FSM Dept. R&D; North-REP (EDF-10)	Customers making informed purchase and energy use decisions;	0.025m	Phase 1: EDF-10 Phase 2: No funding	2013-14
	2.2.2 Phase 2 – Ongoing Public Awareness & Education 2014 onwards	IPIC					2013-15
HIGH	**2.2 IMPLEMENT STATE LEVEL IMPROVEMENTS** Formulate and recommend Directives or Regulations on energy conservation and energy efficiency on new public sector infrastructure design and construction such as schools, Public Health Services, etc. by end of 2015 ➢ Technical Assistance in formulation of Regulation or Directive ➢ Implementation of Energy Conservation and Energy Efficiency Regulation ➢ Monitoring program effectiveness	CESW/IPIC	FSM Dept R&D, AG's office (EDF-11)	Reduction in energy cost for Government use; Power generation capital expenditure deferral		No funding	2013 onwards

HIGH	**2.3**	**ENERGY AUDITING**						
	2.3.1	Energy Audit process training	CPUC	SPC N-REP			EDF-10	
	2.3.2	Perform Energy Audits on all Government Buildings and Facilities (Offices, Hospital, and residences), commercial buildings, and residences by 2015 ➢ Audit report recommendations for reference done by TA ➢ Evaluate report and recommendations	State Gov. office / FSM R&D CPUC	National Government	Reduction in Government operational cost for energy;	0.25m	No Funding	2015
	2.3.2	Provide recommendations on energy saving measure to reduce petroleum consumption ➢ Implementation of Energy Audit recommendations – capital funding required to change out inefficient appliances ➢ Start awareness campaign to government officials and other building users			Power generation capital expenditure deferral by CPUC;	1.0m	No Funding	
HIGH	**2.4**	**ESTABLISH LEGISLATIVE FRAMEWORK**						
	2.4.1	Conduct a study to formulate and recommend legislation for Energy Efficient Building Code by 2014	State Gov. office / FSM R&D	National Government	Improved customer energy efficiency; reduced costs for business; reduced costs to individuals; feedback to support growth in the local economy;	0.05m	No Funding	2014
	2.4.2	Provide recommendations and formulate legislation for Energy Efficient Building codes to improve living standards, health and education						2015
	2.4.3	Provide incentives for business and individuals to encourage use of energy efficient technologies				0.15m	No Funding	

OBJECTIVE 3 A: ALTERNATIVE/ RENEWABLE ENERGY – SOLAR SECTION

10% RE by 2015 for Lagoon islands; 30% by 2020 for Chuuk State;
RE/Fossil Fuel mix of 10:90 by 2015; through Solar PV Grid connect - 450 kWp; and Solar PV Stand alone – 150 kWp
RE/Fossil fuel mix of 30:70 by 2020; through additional Solar PV; & Wind; Ocean & Biomass where feasible
Solutions need to be economically sustainable in the long term i.e. O&M and long term replacement costs must be covered

Activity Priority	Activity	Organization(s) Responsible		Performance indicators	Budget (USD)	Funding Source	Time Frame for Initiation
		Lead Agency	Participating / Supporting				
HIGH	**3A.1 NORTHERN NAMONEAS – WENO, MAIN ISLAND SUPPLY**						
	3A.1.1 PV solar grid tied-systems to be installed on government and administration buildings up to 450 kWp: - Chuuk High School - Department of Education - CPUC Water Treatment Plant - Airport Terminal Building - CPUC Power Plant - Others as appropriate	Chuuk State IPIC / CPUC	AMU; FSM R&D Energy Division; EU NorthREP	Power supplied to the grid; Reduction in fossil fuel use;	4.5m	Italian Grant; PEC; EDF10; EDF-11;	2012 -2015
	3A.1.2 Grid Stability studies	CPUC	NorthREP;	Supply continuity	0.1m		2013-14
HIGH	**3A.2 LAGOON ISLAND SUPPLIES** **3A.2.1 Hybrid Grid Systems**						
	3A.2.1.1 Southern Namoneas - Tonoas; Fefan; & Uman; Undersea cable from Weno; Distribution system refurbishment/construction; Grid connect solar PV and wind energy; Target population – 10,000; Payment through cash power;	Chuuk State CPUC	Jica / EU N-REP PMU	A stable and affordable energy supply in the mentioned islands.	Conventional Component 13m Renewable 5m	No funding agreed No funding agreed	2013 –2017
	3A.2.2 Stand Alone Systems						
IN PLACE	3A.2.2.1 Phase 1 Udot	Chuuk State	REP-5		0.3m		2009-10
	3A.2.2..2 Phase 2 Munian; Central Wonip; Fanapanges; Fefen Sapore; Kukku;		NorthREP		0.8m		2013-14
HIGH	3A.2.2.3 FDA/PSP Concession approach - Faichuuk – FDA	FDA			22m	Private Sector	2013-43

	taking the responsibility for power service provision through private sector investment in 100% renewable energy systems – target population 10,000; 10 locations on 8 islands within Faichuuk		Private sector company				
	3A.3 OUTER ISLAND SUPPLIES						
	3A.3.1 Hybrid diesel/renewable mini grid systems	CPUC	FSM R&D, AMU SPC / EU N-REP PMU	Access to electricity for all Chuuk residents and public facilities		EU EDF-10	2011 – 2020
HIGH	Phase 1 Mortlocks – Satowan – restoration of 24 hour power capability; model for power provision in other outer islands;						2013-14
MEDIUM	Phase 2 Replication of Satowan model in similar sized municipalities;					No funding identified	2014-2020
IN PLACE	3A.3.2 Stand- alone systems on public facilities: Phase 1 Moch; Onoun; Satowan					REP-5	2009-10
HIGH	Phase 2 Oneop; Lechinioch;					NorthREP	2013
MEDIUM	Phase 3 All other outer island municipalities					No funding identified	2014-20
	3A.4 LANTERN PROGRAMS						
HIGH	3A.4.1 NorthREP standalone systems – 2 lanterns per school child	Education Dept.	CPUC			NorthREP	2013
HIGH	3A.4.2 Retrofit of REP 5 systems – 2 lanterns per school child: - Satowan; Onoun; Moch; Udot					No Funding confirmed – request made to NorthREP	2013-14

OBJECTIVE 3 B: ALTERNATIVE/ RENEWABLE ENERGY – WIND SECTION

10% RE by 2015 for Lagoon islands; 30% by 2020 for Chuuk State;
RE/Fossil Fuel mix of 10:90 by 2015; through Solar PV Grid connect - 450 kWp; and Solar PV Stand alone – 150 kWp
RE/Fossil fuel mix of 30:70 by 2020; through additional Solar PV; & Wind; Ocean & Biomass where feasible
Solutions need to be economically sustainable in the long term i.e. O&M and long term replacement costs must be covered

Activity Priority	Activity	Organization(s) Responsible		Performance indicators	Budget	Funding Source	Time Frame for Initiation
		Lead Agency	Participating / Supporting				
HIGH	**3B.1 ASSESSMENTS & FEASIBILITY** - Start Chuuk wind energy measurements in Weno, Tonoas and other Truk Lagoon islands. - When the one year data is compiled by end 2014, undertake FS for wind study and assessment.	CPUC	N-REP PMU and AMU	Gather enough data to start a more in-depth study and a wind pilot project	0.05m 0.075m	EDF10	2013 2013-14
MEDIUM	**3B.2 SITE LOCATION AND TENURE** After selecting the best suitable locations, secure land through long lease agreements for wind sites	Chuuk State		Land secured for the use of a wind farm	0.2m	No funding in place EIB or ADB	2014-15 dependant on wind assessment
LOW	**3B.3 FUNDING** Secure funding for the wind farm (Capacity to be determined)	Chuuk State			5m	No Funding in Place EIB or ADB	2014-15
LOW	**3B.4 EQUIPMENT SELECTION** Select equipment and build the wind farm with interconnection to the grid systems. Add the necessary short time energy storage to keep the grid stable.	CPUC	with private companies & contractors after bidding process	Prepare technical specs, bid out and install		No funding in Place	2015-2016 Wind turbines installed by 2016

OBJECTIVE 3 C: ALTERNATIVE/ RENEWABLE ENERGY – OCEAN ENERGY (WAVE/TIDAL) SECTION

10% RE by 2015 for Lagoon islands; 30% by 2020 for Chuuk State;
RE/Fossil Fuel mix of 10:90 by 2015; through Solar PV Grid connect - 450 kWp; and Solar PV Stand alone – 150 kWp
RE/Fossil fuel mix of 30:70 by 2020; through additional Solar PV; & Wind; Ocean & Biomass where feasible
Solutions need to be economically sustainable in the long term i.e. O&M and long term replacement costs must be covered

Activity Priority	Activity	Organization(s) Responsible		Performance indicators	Budget	Funding Source	Time Frame for Initiation
		Lead Agency	Participating / Supporting				
MEDIUM	**3C.1 ASSESSMENT & FEASIBILITY** - Select wave/tidal data for the Islands close to the reef and do energy measurements for the Lagoon islands and bigger outer islands. - Prepare a feasibility study for and technology selection.	CPUC	N-REP PMU and AMU	Gather enough data to start a more in-depth study and a wave pilot project	20,000	EDF10	2014 2014-15
LOW	**3C.2 SITE LOCATION & TENURE** After selecting the best suitable locations, secure land through long lease agreements for wave/tide sites	Chuuk State		Land secured for the use of a wave	0.04m		2015-16 depending of wave and technology assessment
LOW	**3C.3 FUNDING** Secure funding for the selected technology (Capacity to be determined).	Chuuk State			To be confirmed	No Funding in Place EIB or ADB	2015-16
LOW	**3C.3 TECHNOLOGY SELECTION** Select equipment and build the wave power plant with interconnection to the PV hybrid system. Add the necessary short time energy storage to keep the grid stable.	CPUC	Private companies & contractors after bidding process	Prepare technical specs, bid out and install			2016-2018

OBJECTIVE 3 D: ALTERNATIVE/ RENEWABLE ENERGY – WASTE TO ENERGY/BIOMASS SECTION

10% RE by 2015 for Lagoon islands; 30% by 2020 for Chuuk State;
RE/Fossil Fuel mix of 10:90 by 2015; through Solar PV Grid connect - 450 kWp; and Solar PV Stand alone – 150 kWp
RE/Fossil fuel mix of 30:70 by 2020; through additional Solar PV; & Wind; Ocean & Biomass where feasible
Solutions need to be economically sustainable in the long term i.e. O&M and long term replacement costs must be covered

Activity Priority	Activity	Organization(s) Responsible		Performance indicators	Budget	Funding Source	Time Frame for Initiation
		Lead Agency	Participating / Supporting				
HIGH	**3D.1 ASSESSMENT & FEASIBILITY** - do a solid waste characterization study and collect sewage and biomass data in Weno and look into the possibility of solid waste contribution/transportation from the lagoon islands to Weno. - Prepare a feasibility study for technology selection.	CPUC	N-REP PMU and AMU	Gather enough data to start a more in-depth study feasibility study	0.05m	EDF10	2014 2014-15
MEDIUM	**3D.2 SITE LOCATION & TENURE** After selecting the best suitable location, secure land through long lease agreements for a WtoE power plant site and look at the possibility of IPP (Independent Power Provider) set-up with a PPA (Power Purchase Agreement) in place.	Chuuk State CPUC		Land secured for the use of a WtoE power plant	0.05m		2015-16 depending on technology assessment
LOW	**3D.3 FUNDING** Secure funding for the Waste to energy technology (Capacity to be determined)	Chuuk State			5m	No Funding in Place EIB or ADB	2014-15
LOW	**3D.4** Select equipment and build the power plant with interconnection to the island grid system	CPUC	with private companies & contractors after bidding process	Prepare technical specs, bid out and install			2016-2018

OBJECTIVE 3 E: ALTERNATIVE/ RENEWABLE ENERGY – CONVENTIONAL FUEL ALTERNATIVES (COCONUT OIL; LPG)

10% RE by 2015 for Lagoon islands; 30% by 2020 for Chuuk State;
RE/Fossil Fuel mix of 10:90 by 2015; through Solar PV Grid connect - 450 kWp; and Solar PV Stand alone – 150 kWp
RE/Fossil fuel mix of 30:70 by 2020; through additional Solar PV; & Wind; Ocean & Biomass where feasible
Solutions need to be economically sustainable in the long term i.e. O&M and long term replacement costs must be covered

Activity Priority	Activity	Organization(s) Responsible		Performance indicators	Budget	Funding Source	Time Frame for Initiation
		Lead Agency	Participating / Supporting				
HIGH	**3E.1 ASSESSMENT & FEASIBILITY OF ALTERNATIVES** 3E.1.1 Introduction of coconut oil to supplement diesel component: Feasibility assessment; supply side; technical changes required; compatibility issues; 3E.1.2 Liquid Natural Gas potential Feasibility assessment; supply side; technical changes required; compatibility issues; cost-benefit	CPUC	National Government; FSMPC	Clear position on viability and cost benefit of alternative fuel options		No funding No funding	2014 2014-15
MEDIUM	**3E.2 FUNDING** Secure funding for the investment in: 3E.2.1Coconut oil storage and management; technical conversion to accept coconut oil 3E.2.2 LNG storage and management; technical conversion to accept LNG.	CPUC	National Government		5m	No Funding No Funding	2014-15 2015-16
MEDIUM	**3E.3 EQUIPMENT SELECTION/IMPLEMENTATION** 3E.2.1 Select and install equipment as appropriate:	CPUC	with private companies & contractors after bidding process	Prepare technical specs, bid out and install		No funding	2015-16 2016-18