



Tonga

Country Energy Security Indicator Profile 2009



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of the Pacific
Community

Tonga Country Energy Security Indicator Profile 2009

**Prepared by the Energy Programme, Economic Development Division
Secretariat of the Pacific Community
Suva, Fiji
2012**

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The *Framework for Action on Energy Security in the Pacific* (FAESP) country energy security indicator report 2009 was prepared by the Energy Programme of the Economic Development Division of the Secretariat of the Pacific Community (SPC).

SPC would like to thank the European Union Energy Initiative–Partnership Dialogue Facility (EUEI PDF) for providing the funds to carry out in-country technical activities and collect the data required for the energy security indicators.

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Solomone Fifita
Deputy Director (Energy)
Economic Development Division, SPC

In August 2010 at the 41st Pacific Islands Forum at Port Vila, Vanuatu, the Forum Leaders endorsed the *Framework for Action on Energy Security in the Pacific* (FAESP): 2010–2020 as the regional blueprint for the provision of technical assistance to the energy sectors of Pacific Island countries and territories (PICTs). FAESP encompasses the Leaders' vision for an energy secure Pacific, where Pacific people at all times have access to sufficient sustainable sources of clean and affordable energy and services to enhance their social and economic well-being.

The *Implementation Plan for Energy Security in the Pacific* (IPESP) (2011–2015) is a five-year plan for pursuing the vision, goal and outcomes of FAESP. It reflects the priority regional activities that are to be collectively delivered by the participating members of the Council of Regional Organisations in the Pacific (CROP) to support, complement and add value to national efforts on energy security.

In order to better appreciate the impacts of FAESP and its implementation plan on the energy security status of PICTs, baseline energy security indicators must be established, against which performance in future years can be benchmarked.

The energy security indicators in this report derive from a consultative process involving representatives of PICTs, regional organisations, the private sector and development partners. The process culminated in the adoption of IPESP and its monitoring and evaluation framework, the energy security indicators, at the Inaugural Regional Meeting of Ministers for Energy, ICT and Transport in April 2011.

As a first attempt to improve the transparency and accountability in the energy sector, there is obvious room for improvement. Lack of access to reliable and sufficient data is a common problem, and this monitoring and evaluation tool can only get better with the kind assistance of the custodians of the energy sector data.

Solomone Fifita
Deputy Director (Energy)
Economic Development Division, SPC

Abbreviations

ADB	Asian Development Bank
ADO	automotive diesel oil
Ave.	average
CO₂	carbon dioxide
DPK	dual purpose kerosene
e.	estimate
EC	(Tonga) Electricity Commission
EPU	Energy Planning Unit (Ministry of Lands, Survey and Natural Resources)
EEZ	exclusive economic zone
FAESP	Framework for Action on Energy Security in the Pacific
FICs	(The 14) Forum Island countries (SIS and non-SIS)
GoT	Government of the Kingdom of Tonga
GDP	gross domestic product
GHG	greenhouse gases
GJ	gigajoules
HIES	household income and expenditure survey
IPP	independent power producer
IUCN	International Union for Conservation of Nature
HFO	heavy fuel oil
kWh	kilowatt hour
kWp	kilowatt peak

km	kilometre
LPG	liquefied petroleum gas
MJ	megajoules
n.a	(data) not available
N/A	(indicator) not applicable
PICTs	Pacific Island countries and territories
PPA	Pacific Power Association
ppm	parts per million
PRISM	Pacific Regional Information System (Statistics for Development, Secretariat of the Pacific Community)
RE	renewable energy
SIS	(Forum) smaller island states — Cook Islands, Kiribati, Nauru, Niue, Palau, RMI and Tuvalu. Non-SIS members are Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu.
TERM	Tonga Energy Road Map (or “the Road Map”)
TERM C	Tonga Energy Road Map Committee
TERM-IU	Tonga Energy Road Map Implementation Unit
TEPB	Tonga Electric Power Board
TPL	Tonga Power Limited
ULP	unleaded petrol (another name for motor gasoline)
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

Tonga Energy Road Map report 2010

'Energy is a fundamental building block for the Kingdom in its social and economic development and in enhancing the livelihood and wellbeing of all Tongans. It affects all businesses and every household. Accessible, affordable and sustainable electricity that is environmentally responsible and commercially viable is a high priority.....'

Hon. Dr. Fred Vaka'uta Sevele
Prime Minister of Tonga

Country	Tonga
Capital	Nuku'alofa
Capital island	Tongatapu
Population	103,977 (2009 PRISM estimate, male 51%); 101,991 (2006 Population Census)
Land area	748 km ²
Max height above sea-level	1,030 m (Extinct volcano, Kao)
Geography	Tonga consists of 176 islands of which 36 are inhabited. There are four groups of islands — Tongatapu (260 km ²), Ha'apai (118 km ²), Vava'u (146.7 km ²) and Niuas. Most islands have a limestone base formed from an uplifted coral formation and some have limestone overlying a volcanic base. The largest island is the capital island of Tongatapu.
Location	Latitude 15°–23°50' S; longitude 173°–177° W
EEZ	700,000 km ²

Climate	The climate is tropical maritime with distinct warm (December to May) and cool (May to December) seasons that are dominated by trade winds. Climate conditions between the southern and northern island groups vary a little.
Rainfall	Average of 1,775.5 mm per year; varies from 1,500–2,500 mm per annum
Mean temperature	27°C
Economic	The leading producers of income in Tonga are agriculture, tourism, fishing, remittances and financial services. Exports include squash, coconuts and vanilla.
GDP per capita	USD 3,187
Currency	Tonga Pa'anga — TOP
Exchange rate	TOP/USD — USD 0.4980 (OANDA)
Language	English and Tongan
Government	Independent Kingdom and member of the Commonwealth
Country representative to SPC	Chief Secretary and Secretary to Cabinet Prime Minister's Office Nuku'alofa Tonga Tel: (676) 24 644 Fax: (676) 23 888 / 25 515 Email: ftuita@pmo.gov.to

Energy context

In 2009, Tonga's energy consumption scenario totalled 1,734 TJ with petroleum fuels accounting for 99.97% and a renewable energy contribution from small, stand-alone solar units accounting for 0.03% (contribution from biomass is excluded in this analysis). Petroleum fuel products are currently supplied to Tonga by Pacific Energy and Total through Fiji from Singapore and Australia. In 2009, around 27.2 million litres of diesel, 11.8 million litres of petrol, 6.5 million litres of kerosene and 1.4 kilotonnes of liquefied petroleum gas (LPG) were imported into the country. Homegas Limited is the sole distributor of LPG in Tonga. LPG is imported through Fiji from Australia. Fuel import for 2009 stood in the vicinity of USD 33.8 million, with the current GDP of USD 323.4 million. The transport sector (land, maritime and air) is estimated to account for around 40% of the total fuel consumed in 2009.

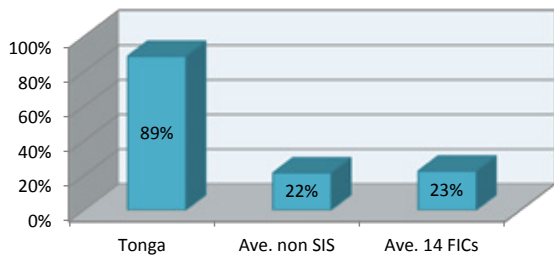
In the power sector, around 89% of households in Tonga are connected to the electricity grid network provided by Tonga Power Limited (TPL). In 2009, TPL generated 51.4 GWh of electricity, of which 43.2 GWh was sold, recording an estimated 16.03% in distribution loss. TPL has four major gridlines supplying electricity to Tongatapu, Vavau, Ha'apai and Eua islands. Around 13.4 million litres of diesel fuel were consumed for electricity generation in 2009.

The 2009 baseline energy security indicators presented in this report are compiled and structured according to the four key energy security outcomes and the seven action themes of FAESP. Graphical comparison included in the analysis provides a snapshot of Palau's situation compared to other Forum small island states and Forum Island countries.

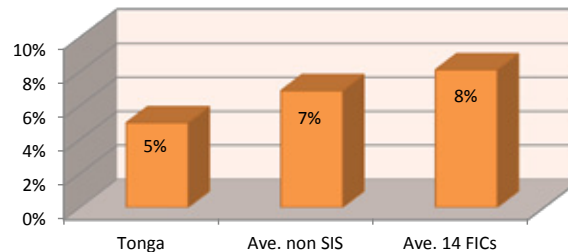
FAESP key energy security outcome 1 — access to energy

No.	FAESP indicators		Explanatory notes
1	Electrification rate (%)	89	<p><i>The indicator tracks the share of households actually connected to a utility grid.</i></p> <p>The Population Census 2006 report places the share of households with access to grid connection at around 88.88%. This is rounded up to 89% in the indicator reporting. Share of households in rural areas with access to grid-connected electricity stands at 85.54%. The share of households in the urban areas with access to grid-connected electricity in Tonga stands at 100%.</p>
2	Access to small scale power rural (%)	5	<p><i>The indicator tracks the share of rural households with access to basic electrification (solar, pico hydro, small wind, community grid).</i></p> <p>Based on the 2006 census, assumptions were made that there was no small scale power access in the Tongatapu urban area due to 100% access to grid-connected power. The share of households with access to small scale power in rural areas was 4.99%. This is rounded up to 5%.</p>
3	Access to modern energy rural (%)	73	<p><i>The indicator tracks the share of rural households with access to modern cooking and lighting, which specifically covers all forms of energy other than traditional biomass.</i></p> <p>Based on the 2006 census, access to modern forms of cooking in rural areas in Tonga is estimated at 47.48% whereas the share of households with access to modern forms of lighting in rural areas is estimated at 98.54%. When averaged, the share of households in Tonga with access to modern forms of energy in rural areas is estimated at 73.01%. This is rounded down to 73%.</p>
4	Access to modern energy urban (%)	100	<p><i>The indicator tracks the share of urban households with access to modern cooking and lighting, which specifically covers all forms of energy other than traditional biomass.</i></p> <p>Based on the 2006 census, access to modern forms of cooking in urban areas in Tonga (Nuku'alofa urban) is estimated at 100% whereas the share of households with access to modern forms of lighting in rural areas is estimated at 100%. When averaged, the share of households in Tonga with access to modern forms of energy is estimated at 100%.</p>

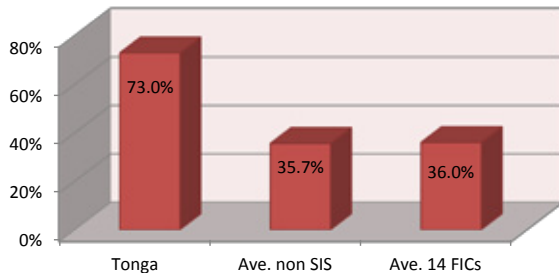
Electrification rate



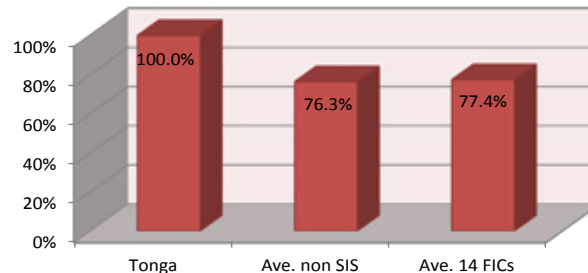
Access to small scale power rural



Access to modern energy rural

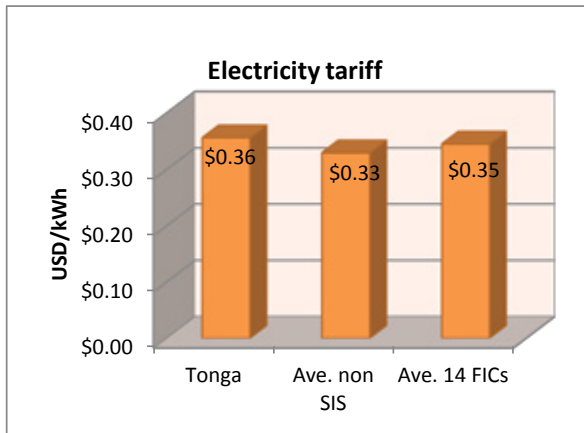
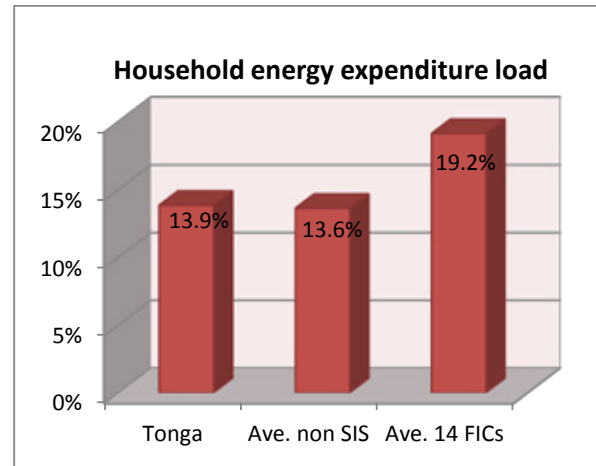
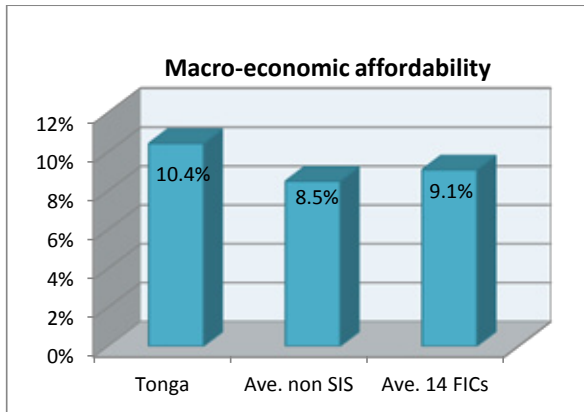


Access to modern energy urban



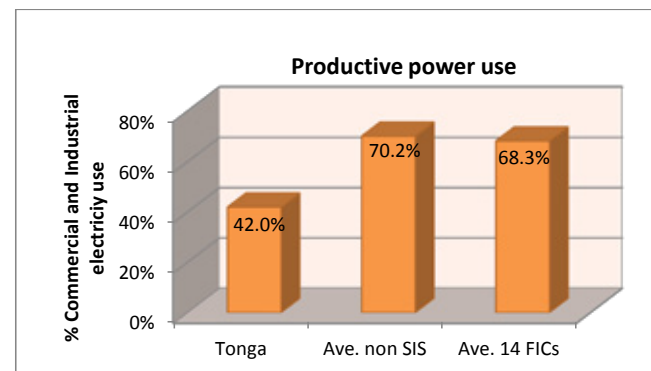
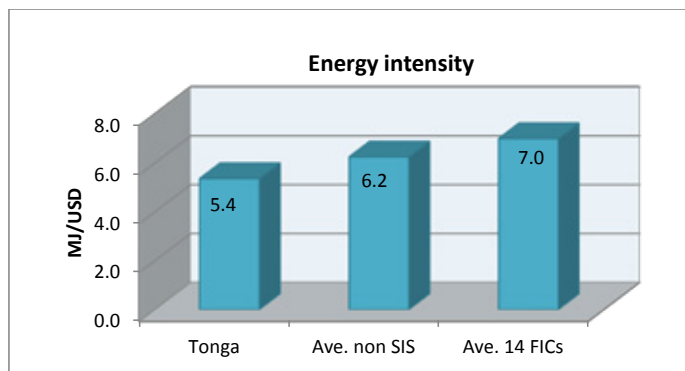
FAESP key energy security outcome 2 — affordability

No.	FAESP indicators		Explanatory notes															
5	Macro-economic affordability (percentage)	10.4	<p><i>The indicator tracks fuel imports as a percentage of GDP. The higher the figure, the more vulnerable an economy is towards world market price volatility.</i></p> <p>The macro-economic affordability is equal to fuel imports over total GDP for 2009: USD 33,778,072 / USD 323, 432,836. Referenced fuel imports are sourced from the TERM-IU whilst the national GDP in 2009 was sourced from the Tonga Bureau of Statistics.</p>															
6	Electricity tariff (USD/kWh)	0.36	<p><i>The indicator tracks average tariffs for the year (all tariff categories, i.e. residential, commercial and industrial). Requires averaging during the year as tariffs in most PICTs are adjusted several times a year.</i></p> <p>Refer to the table on the right for reference calculation of the average tariff.</p> <table border="1" data-bbox="1034 370 1501 516"> <thead> <tr> <th>Electricity tariff</th> <th></th> <th>USD 0.36</th> </tr> </thead> <tbody> <tr> <td>Tongatapu</td> <td>USD/kWh</td> <td>USD 0.362</td> </tr> <tr> <td>Vava'u</td> <td>USD/kWh</td> <td>USD 0.372</td> </tr> <tr> <td>Ha'apai</td> <td>USD/kWh</td> <td>USD 0.337</td> </tr> <tr> <td>Eua</td> <td>USD/kWh</td> <td>USD 0.337</td> </tr> </tbody> </table> <p style="text-align: right;"><i>Referenced electricity tariff calculation based on TPL data</i></p>	Electricity tariff		USD 0.36	Tongatapu	USD/kWh	USD 0.362	Vava'u	USD/kWh	USD 0.372	Ha'apai	USD/kWh	USD 0.337	Eua	USD/kWh	USD 0.337
Electricity tariff		USD 0.36																
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Vava'u	USD/kWh	USD 0.372																
Ha'apai	USD/kWh	USD 0.337																
Eua	USD/kWh	USD 0.337																
7	Electricity lifeline (%)	N/A	<p><i>Relation between average tariff and lifeline tariff if a lifeline tariff exists.</i></p> <p>Tonga's tariff rates do not include lifeline tariffs. They are mainly fixed rates applied to the island groups.</p>															
8	Household energy expenditure load (%)	13.9	<p><i>The indicator tracks average household expenditure for energy per year as a percentage of average household income.</i></p> <p>Based on the 2009 HIES. Reporting gives a breakdown of expenditure to the annual household operation expenditure and annual transport expenditure.</p>															

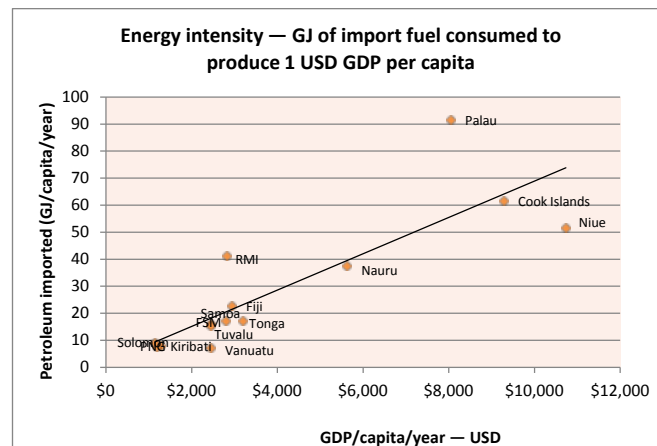
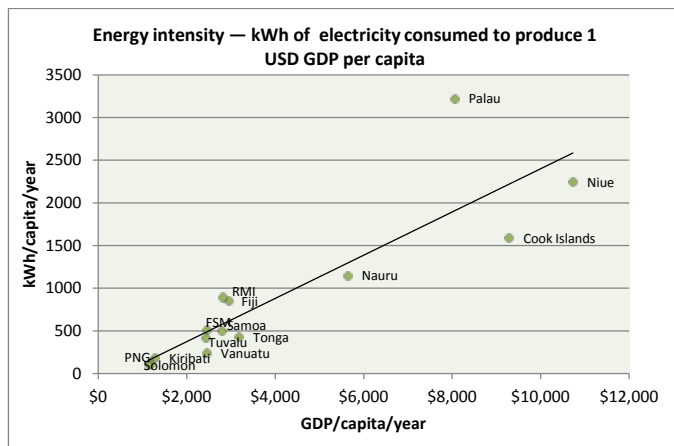


FAESP key energy security outcome 3 — efficiency and productivity

No.	FAESP indicators		Explanatory notes
9	Energy intensity (MJ/USD)	5.4	<i>The indicator tracks the amount of energy utilised to produce 1 USD of GDP.</i> Source: Energy Programme, Ministry of Environment and Climate Change
10	Productive power use (%)	42	<i>The indicator tracks the share of commercial and industrial use of electricity in total supply.</i> Source: Energy Programme, Ministry of Environment and Climate Change

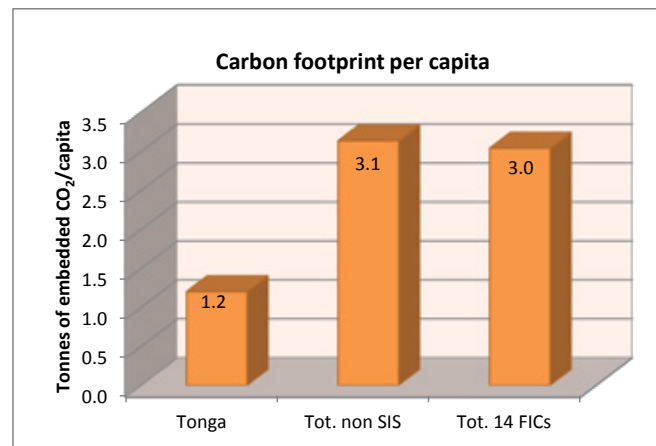
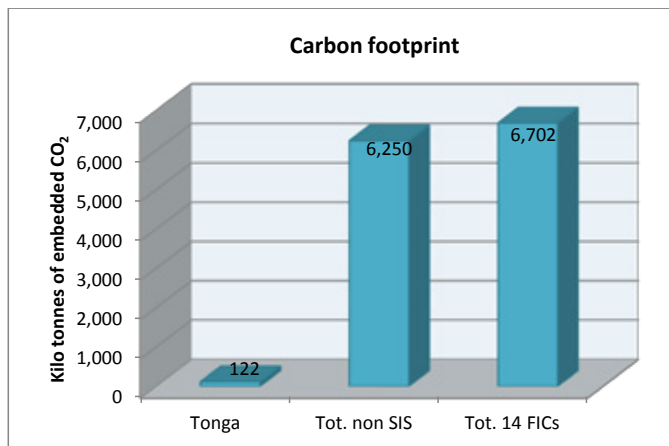


Provided below are energy intensity graphs that are presented in terms of electricity (kWh) and fuel (GJ) consumption against GDP when seen on a per capita comparison. Countries identified above the trend line are perceived to have higher than average energy consumption levels per person when compared to its corresponding economic wealth (GDP per capita). That is, countries above the trend line are considered to be relatively energy inefficient compared to countries below the trend line.



FAESP key energy security outcome 4 — environmental quality

No.	FAESP indicators		Explanatory notes
11	Carbon footprint (tonnes of CO ₂)	122,090	<i>The indicator tracks total GHG emissions using embedded carbon as a measure (not UNFCCC method). Referenced data calculated from diesel (ADO), motor gasoline (mogas /ULP), kerosene (DPK) and cooking gas (LPG).</i>
12	Diesel fuel quality (ppm S)	5,000 & 500	<i>The indicator assesses the standard for sulphur (S) content of diesel fuel in parts per million (ppm) sulphur. 5,000 ppm sulphur content sold by Pacific Energy and 500 ppm sulphur content sold by Total. 5,000 ppm sulphur mainly used by the power utility.</i>



FAESP action theme 1 — Leadership, governance, coordination and partnership

No.	FAESP indicators	Explanatory notes
13	Status of energy administration (score)	<p>2 <i>The indicator assesses the status the energy administration has in the country. (Score system: Energy ministry = 3; Energy department = 2; Energy office = 1)</i></p> <p>The Tonga Energy Planning Unit falls under the Ministry of Lands, Survey and Natural Resources. Staffed with four professionals. Mostly occupied with off-grid electrification through solar systems. Agreement with the Renewable Energy and Energy Efficiency Partnership (REEEP), aiming to strengthen the regulatory capacity of the Unit, to further implementation of the Renewable Energy Bill, and to draft an energy efficiency policy. Co-ordination of the Tonga Energy Road Map is currently through a team attached to Prime Minister's Office. The TERM-IU team actively maintains communication and information exchange through a dedicated website.</p>
14	Energy legislation (score)	<p>1 <i>The indicator assesses the status of energy sector legislation in the country. (Score system: Updated energy act = 3; Adopted energy policy = 2; Subsector act or policy = 1)</i></p> <p>There is no endorsed energy act for Tonga. In 2002, a draft energy policy document was developed but was not endorsed. In 2008, a Renewable Energy Bill was developed by EPU and endorsed by parliament in 2009. The bill covers only off-grid renewable energy applications such as solar home systems deployed in the outer islands. In 2009, the Tonga Energy Road Map was drafted and endorsed in 2010. The Electricity Act 2007 provides the governance framework for the electricity sector in Tonga and outlines the role of the Electricity Commission in regulating generation.</p>
15	Co-ordination and consultation (score)	<p>1 <i>The indicator aims to measure how decisions and directions given at regional or subregional events translate into practical action at national level. (Score system: Meetings lead to relevant national action = 1; No action = 0)</i></p> <p>Tonga actively participates in regional activities; is a utility member of the Pacific Power Association.</p>

FAESP action theme 2 — Capacity development, planning, policy and regulatory frameworks

No.	FAESP indicators	Explanatory notes
16	Energy planning status (score)	<p>1 <i>The indicator assesses the state/quality of energy planning. It distinguishes between integrated planning and subsector (i.e. power, petroleum) planning. (Score system: Whole of energy sector plan/roadmap operational with M&E framework = 3; Subsector plan operational with M&E framework = 2; Energy sector plans in preparation = 1)</i></p> <p>Tonga with, assistance from the World Bank, developed the Tonga Energy Road Map (TERM) in 2009, which was endorsed by parliament in 2010. TERM is essentially an integrated strategic action plan for the entire energy sector. It covers fuel, power, and on and off grid renewable energy, as well as energy conservation.</p>
17	Energy sector regulation (score)	<p>1 <i>The indicator assesses energy sector regulation. It measures the progress towards a regulator independent of government or regulated entities. (Score system: Independent whole of energy sector regulator established = 3; Whole of energy sector regulator established = 2; Subsector regulator established = 1)</i></p> <p>Electricity tariff regulation is done by the independent regulator (Electricity Commission) concession agreement between the Ministry of Finance and Tonga Power Limited (TPL). It outlines the power utility's operations in comprehensive detail, including how tariffs are calculated. Tonga Competent Authority (TCA) regulates fuel prices for diesel petrol and household kerosene using a pricing template with support from SPC. Jet fuel not regulated.</p>
18	Enabling framework for private sector participation (score)	<p>0 <i>The indicator assesses progress towards an enabling framework for private sector participation in selling electricity to the grid. (Score system: Standard power purchase and petroleum supply agreements operational = 3; Standard agreements for subsector operational = 2; Standard agreements in preparation = 1)</i></p> <p>No standard power purchase agreement in place. Regulator (Electricity Commission) reviews draft power purchase agreements between independent power producers (IPP) and TPL, to ensure: the technical viability of the generation system; the financial viability of the IPP (financial projections, bank references, evidence of 'paid-up equity'); the qualification and expertise of IPP management and key staff; and the reasonableness of the price proposed to be charged. The price would be determined with assistance from the Commission's Strategic Advisors and Regulatory Auditors. Hence mechanisms in place to easily develop standard agreements for IPP inclusion when the need arises.</p>
19	Private sector contribution (%)	<p>0 <i>The indicator tracks the share of electricity produced by independent power producers under a power purchase agreement.</i></p>

FAESP action theme 3 — Energy production and supply

3.1 Petroleum and alternative fuels

No.	FAESP indicators		Explanatory notes
20	Fuel supply security (days)	34.31	<i>The indicator measures the number of days a country can keep operating in case of a petroleum product supply interruption. Calculation used if actual data are not available (size of total petroleum storage (m³)/average petroleum product consumption per day). Calculated.</i>
21	Fuel supply diversity (%)	0	<i>The indicator measures the share of locally produced fuel (biofuel or fossil fuel) as a percentage of total supply.</i> No biofuel projects were undertaken in Tonga in 2009.
22	Fuel supply chain arrangements (score)	0	<i>The indicator assesses control of countries over fuel supply chain. (Score system: Joint procurement scheme operational = 2; Participation in preparation of joint procurement arrangements = 1)</i> Two companies, Pacific Energy and Total, supply Tonga with petroleum products (excluding LPG). Pacific Energy dominates the market with approximately 85% market share. In 2010, a local company (Uliti) began supplying to the Haapai group of islands. Total entered the market in 2006 when they purchased Shell's Pacific Islands business. The largest single fuel consumer is Tonga Power Limited that uses diesel for electricity generation. Jet fuel volumes are not regulated. Products include petrol, diesel and kerosene. Tonga is supplied through import on international tankers (MR or medium range tankers) to Fiji and then local coastal tanker (LCT) to Tonga. The facilities in Tonga are not currently suitable for direct import on MR vessels.

3.2 Renewable energy

No.	FAESP indicators		Explanatory notes
23	Renewable energy share (%)	0.03	<i>The indicator measures the share of renewable energy as a percentage of total supply for a given year. Referenced calculation takes into account only the RE supplied by the solar home system. Biomass used for domestic cooking is not included in the analysis.</i>
24	Renewable resource knowledge (score)	2	<i>The indicator assesses the quality of knowledge of national renewable energy potential. (Score system: Comprehensive assessment of all RE resources including cost for each source = 3; Comprehensive physical assessment of all RE resources = 2; Resource assessments fragmentary, under way = 1)</i> Indicative data on wind, solar, landfill gas and biomass compiled in the framework of the Tonga Energy Road Map. Investment grade data not yet available (except for solar PV), some data on feasibility of coconut oil as diesel substitute, economic analysis of renewable options available.
25	Least-cost RE development plan (score)	0	<i>The indicator assesses if data and information on RE have been translated into a least-cost development plan that gives priority to the most economical RE resource or application. (Score system: Least-cost development plan operational = 2; Least-cost development plan in preparation = 1)</i> As of 2009, no least-cost development plan was in place. TERM aims to supply 50% of electricity from renewable sources by 2012 and establish a least-cost development plan for the whole sector, elements of least-cost development plan for renewable energy available from TERM preparation.

FAESP action theme 4 — Energy conversion

4.1 Electric power

No.	FAESP indicators		Explanatory notes
26	Generation efficiency (kWh/l)	4.00	<i>The indicator measures the annual average fuel conversion efficiency for diesel generation in power utilities.</i> Calculated (57,000 MWh/14.19 million litres).
27	Distribution losses (%)	16	<i>The indicator compares the amount of kWh sold with the amount of kWh sent out from the power station.</i>
28	Lost supply (SAIDI) — (hours)	n.a	<i>The indicator tracks electricity outage time (hours of lost supply per customer per year).</i>
29	Clean electricity contribution (%)	0.29	<i>The indicator measures share of renewable energies as percentage of total electricity supply.</i> Contribution from solar home systems, telecommunications etc.

FAESP action theme 5 — End-use energy consumption

5.1 Transport energy use | 5.2 Energy efficiency and conservation

No.	FAESP indicators	Explanatory notes			
30	Retail fuel prices			<i>The indicator tracks retail and wholesale fuel prices for petroleum products (diesel, petrol, MPK, LPG).</i>	
		Retail price	Wholesale price		
		ADO (USD/l)	0.954	0.892	Sourced from Ministry of Labour, Commerce and Industries
		ULP (USD/l)	0.953	0.882	Sourced from Ministry of Labour, Commerce and Industries
		DPK (USD/l)	0.74	0.692	Sourced from Ministry of Labour, Commerce and Industries
		LPG (USD/kg)	2.19	1.96	Sourced from Ministry of Labour, Commerce and Industries
31	Legislative framework (score)	0		<i>The indicator assesses progress towards a comprehensive legislative framework for import of end-use devices. (Score system: Comprehensive framework covering transport, appliances, buildings = 3; Legislative for one subsector operational = 2; Preparation of frameworks under way = 1)</i> No legislative framework in place that promotes the importation of energy-efficient end-use devices in Tonga. REEEP support for the development of an energy efficiency policy is expected to transform into an Energy Efficiency Bill and a regulatory framework for energy efficiency in Tonga.	
32	Appliance labelling (score)	1		<i>The indicator assesses the state of appliance labelling. (Score system: Compulsory appliance labelling operational = 2; Appliance labelling in preparation = 1)</i> No compulsory appliance labelling programme endorsed yet for Tonga. In 2009, Tonga was identified as part of a sub-regional planning study on labelling. The study was undertaken in 2010. Appliance imports in Tonga mostly come from New Zealand and Australia, and most products sold carry Australian and New Zealand energy labels.	

FAESP action theme 6 — Energy data and information

No.	FAESP indicators		Explanatory notes
33	Availability of national energy balance (score)	1	<i>The indicator assesses the availability of national key energy data to SPC's data management unit and other regional stakeholders. (Score system: Comprehensive data sets covering energy input conversion and end-use available 6 months after end of reporting year = 3; Partial data set available within 6 months = 2; Partial data set available within 12 months = 1)</i> Draft energy balance available. Construction of energy balance requires demand site surveys.

FAESP action theme 7 — Financing, monitoring & evaluation

No.	FAESP indicators		Explanatory notes
34	Energy portfolio (USD)	18,501,100	<i>The indicator tracks the flow of funding into the country's energy sector. Grant aid commitments + loan commitments</i> Snapshot of donor portfolio as of 2011 (not 2009 baseline).
35	Availability of financing information (score)	3	<i>The indicator assesses the availability of national energy financing information to SPC and other regional stakeholders. (Score system: Comprehensive set of information covering petroleum, utility and government financing = 3; Partial information set available within 6 months = 2; Partial information set available within 12 months = 1)</i> Comprehensive set of information on funding activities available.
36	Monitoring framework (score)	0	<i>The indicator assesses if there is a national energy sector M&E framework in place. (Score system: M&E framework in place = 1, No M&E framework = 0)</i> No specific M&E framework in place in 2009. TERM 2010 includes comprehensive monitoring and evaluation framework.

Tonga energy contacts

'Inoke Vala

Tel: (676) 24794

Email: inokevala@gmail.com

Website: www.tonga-energy.to

Director

Tonga Energy Road Map

Implementation Unit

Bureau of Public Works

Ofa Sefana

Tel: (676) 23210

Fax: (676) 23216

Email: ofasefana@yahoo.com

Acting Energy Planner

Energy Programme

Ministry of Environment

and Climate Change

John Van Brink

Tel: (676) 27390

Fax: (676) 23047

Email: jvanbrink@tongapower.to

Chief Executive Officer

Tonga Power Limited

