



TERMPLUS

Tonga Energy Road Map 2021-2035

TERMPLUS Status

Update



Background



Tonga Energy Road Map (TERM) 2010-2020 was a 10-year plan:

- *Reduce Vulnerability* to Oil Price Shocks;
- Achieve an *Increase in Quality Access* to Modern Energy Services in an Environmentally-Sustainable Manner;
- The TERM (2010-2020) was a first of its kind, followed a *Least-Cost-Approach* and recommended a detailed program of activities to achieve its objectives.

The TERMPLUS (2021-2035) is a 15-year plan:

- Built around a *Consistent* Set of (quantifiable) *targets*;
- Identifying *Measures and Requirements* to achieve those targets;
- *Alignment* with targets set in other *Official Documents and Laws*;
- Includes *Transportation, Data Collection, Gender* and *Resiliency*
- New guiding document for development of Tonga's energy sector to continue from TERM; *Building upon TERM Results & Experience from Past*

Content and Structure

TERM 2010-2020:

- Policy, legal, regulatory and institutional
- Renewable Electricity
- Off-grid electricity
- Petroleum
- Energy efficiency
- Environmental considerations
- Phased approach: Phase 0, 1 and 2

TERMPPLUS 2021-2035:

- Energy Supply
- Final consumption
- Renewable Electricity, T&D
- Transportation
- Action Plans 5-10-15-year
- Updated Energy efficiency
- Cross cutting issues
 - Policy, Regulations, Legal, Incentives
 - Data collection
 - Climate Change / Resilience
 - Gender-Inclusion

TERM and TERMPLUS Objectives



TERM objectives:

Reduced vulnerability to oil price shocks, reducing price and price fluctuation

Reduced dependence on fossil fuels

Increased share of electricity generated from renewable sources to 50%

Increased access to electricity

Increased conversion efficiency of fossil-fueled electricity generation

Reduced transmission and distribution losses to below 9%

Introduction of demand side energy efficiency measures

TERMPLUS objectives:

Reduce total amount of diesel imports in 2035 by 10% compared to 2015

Increase security of supply (e.g., days of storage capacity)

70-100% electricity generation from Renewable Resources

Limit growth in oil consumption to 1% per year on average for the period 2021-2035

Limit growth in grid-connected residential end-use of electricity to 1% per year on average for the period 2021-2035

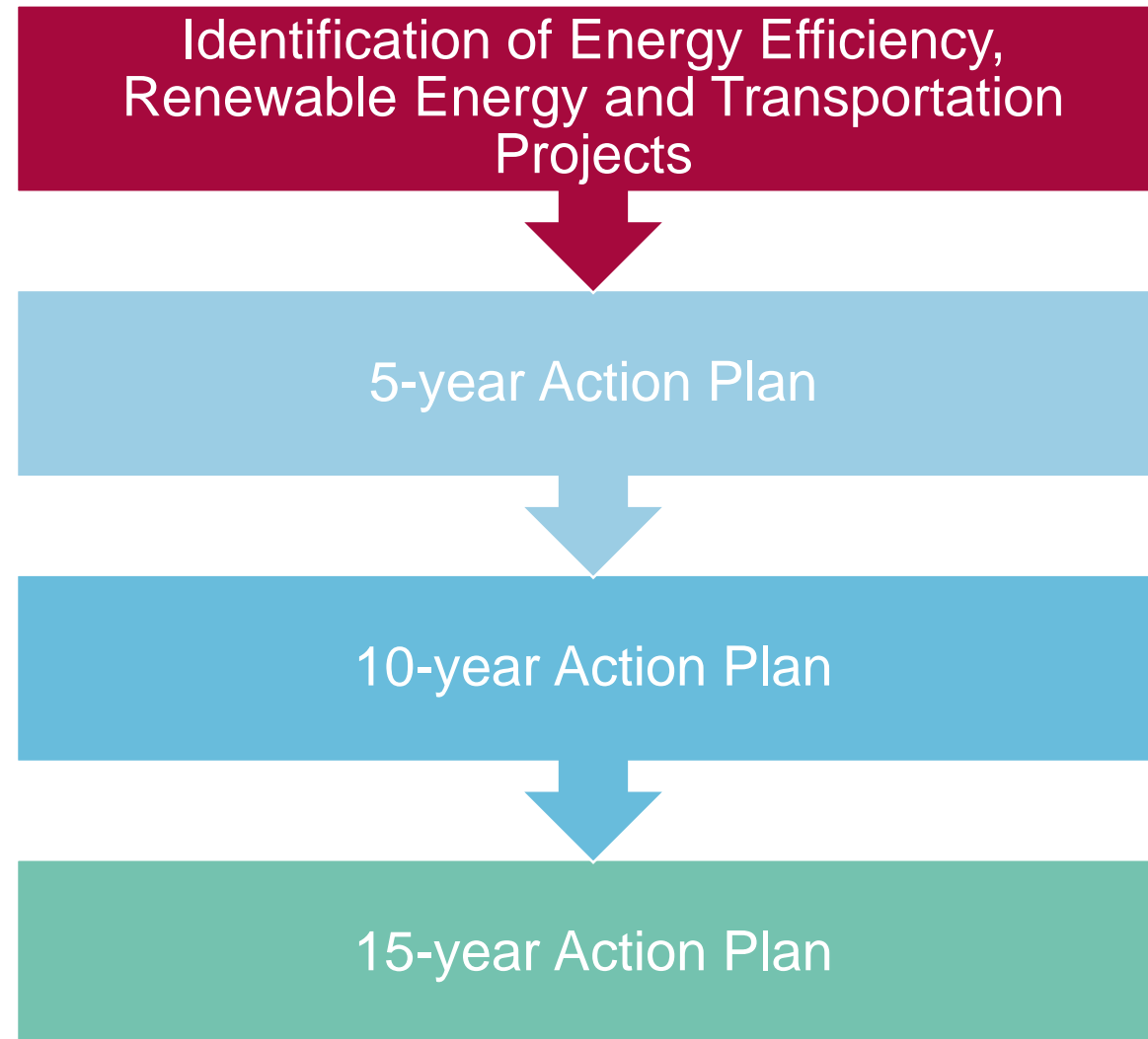
Maintain line losses at under 8%

“New” areas introduced or given more prominence in *TERMPLUS*



- Transportation
- Energy Efficiency
- Data Collection & Dissemination
- Alignment with Tonga Policies & Laws
- Resilience to Climate Change
- Gender Inclusion
- Action Plans

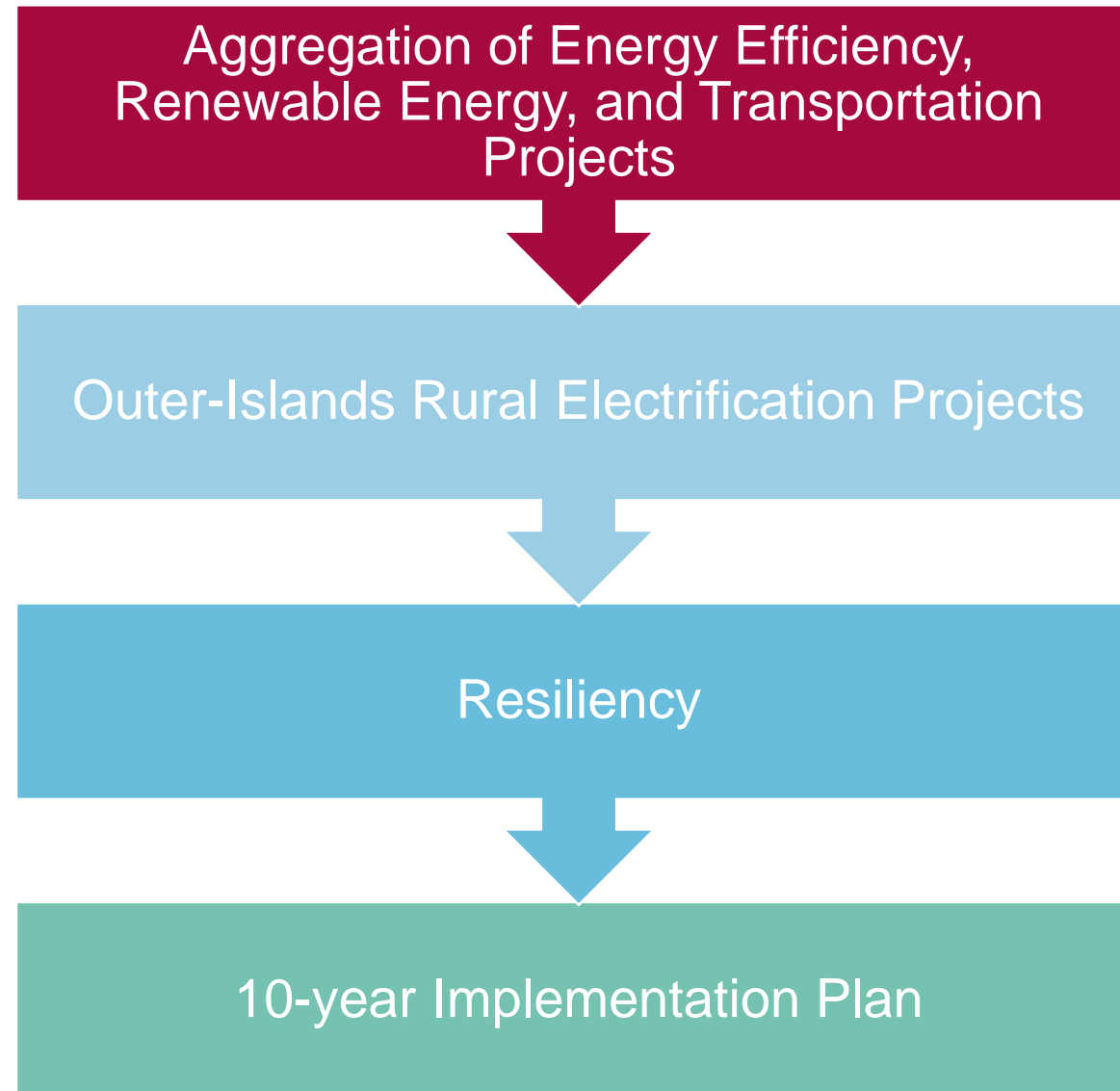
Action Plans incorporate Energy Efficiency, Renewable Energy & Transportation Projects



Resiliency

- Incorporate resilience into building codes
- Continue to harden T&D lines and power generation
- Diversify fuel choices
- Improve vehicle efficiency
- Optimize the use of appropriate vehicles

Rural Electrification and Resiliency

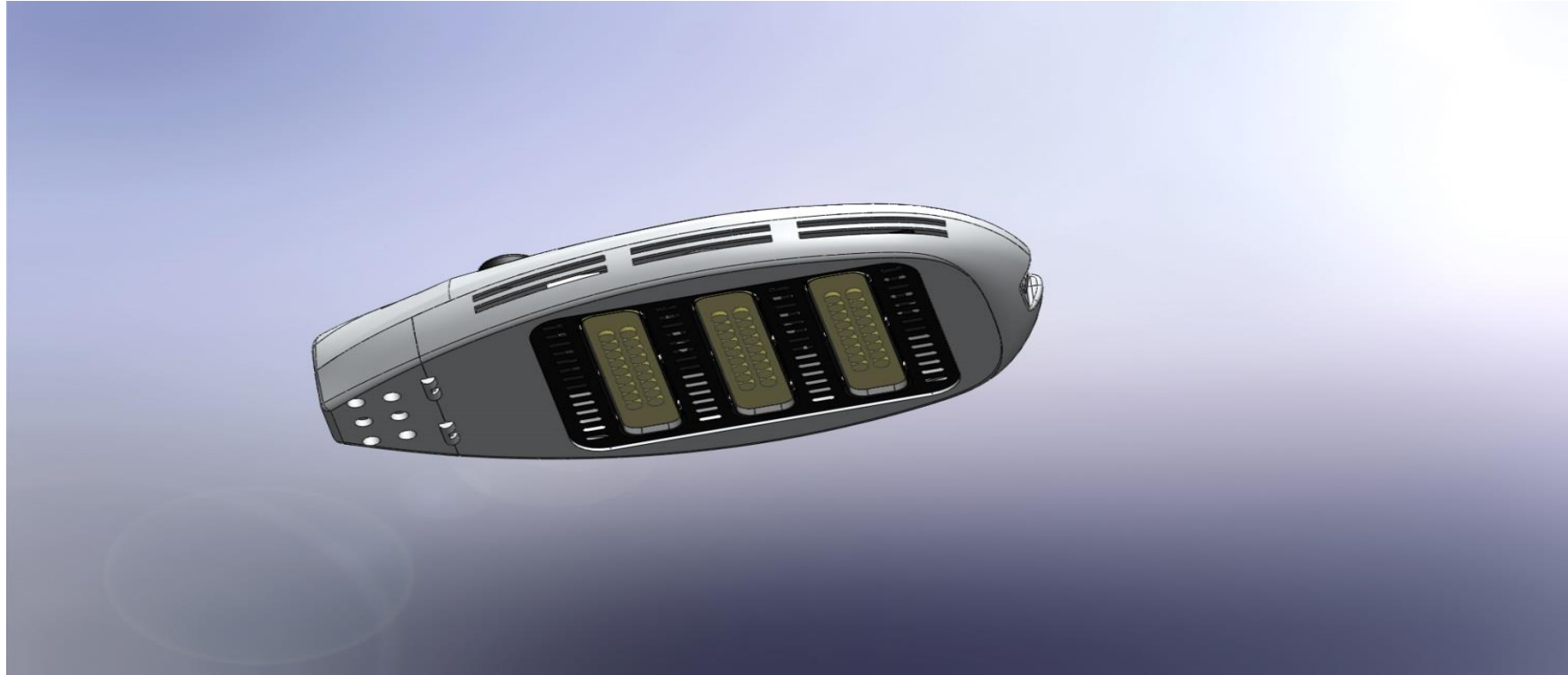


Approach - Project Criteria: Advocate & Innovate



- Quality of Life
- Return on Investment
- Economic Development
- Technical and Financial Soundness
- Cost-effective Public-Private-Partnerships

Light-Emitting-Diode (LED) Lamps



Wind Farms



On-Site Renewables





On-Site Renewables

- Efficient Buildings
- Photovoltaic Arrays + Battery
- 100% Renewable Government Centers
- Electric Vehicle Pilots
- Level 2 Chargers

Tonga 50% Renewable Pacific Island Country - Energy Leadership



RENEWABLE ENERGY ROAD MAP



- PV Tongatapu - 14 MW
- BESS Tongatapu – 1 MW
- PV Vava’u – 1.87 MW
- Bess Vava’u – 0.2 MW
- PV Ha’apai– 0.67 MW
- Bess Ha’apai – 0.66 MW
- PV Eua – 0.37 MW
- Wind Farm 1 – 1.3 MW
- Wind Farm 2 – 3.8 MW
- Wind Farm 3 – 2.0 MW
- Off-Grid Generation – 0.20 MW

Tonga 70% Renewable Pacific Island Country - Energy Leader



RENEWABLE ENERGY ROAD MAP



- PV Tongatapu - 14 MW
- BESS Tongatapu – 1 MW
- Load-Shifting BESS - 5 MW / 17.4 MWh
- Stability BESS – 5 MW / 2.5 MWh

- Grid Improvements
 - Nomuku
 - Ha’ano
 - Uiha
 - Ha’afeua

- Biofuel Production Facility – 1 MGY

- PV Vava’u – 1.87 MW
- Bess Vava’u – 0.2 MW

- PV Ha’apai– 0.67 MW
- Bess Ha’apai – 0.66 MW

- PV Eua – 0.37 MW

Transportation Initiatives

- Electric Vehicles Fleet Pilots 2021-2025
- Electric Vehicle (EV) Charging Stations 2022-2035
- Electric Buses (e-Bus) – 2022-2035
- e-Bus Infrastructure and Depot – 2024-2035
- Electric Mopeds, Bikes and Tricycles – 2025-2035
- Biofuels for Buses – 2025-2035
- Hydrogen for Transportation (Maritime Operations) – 2030-2035



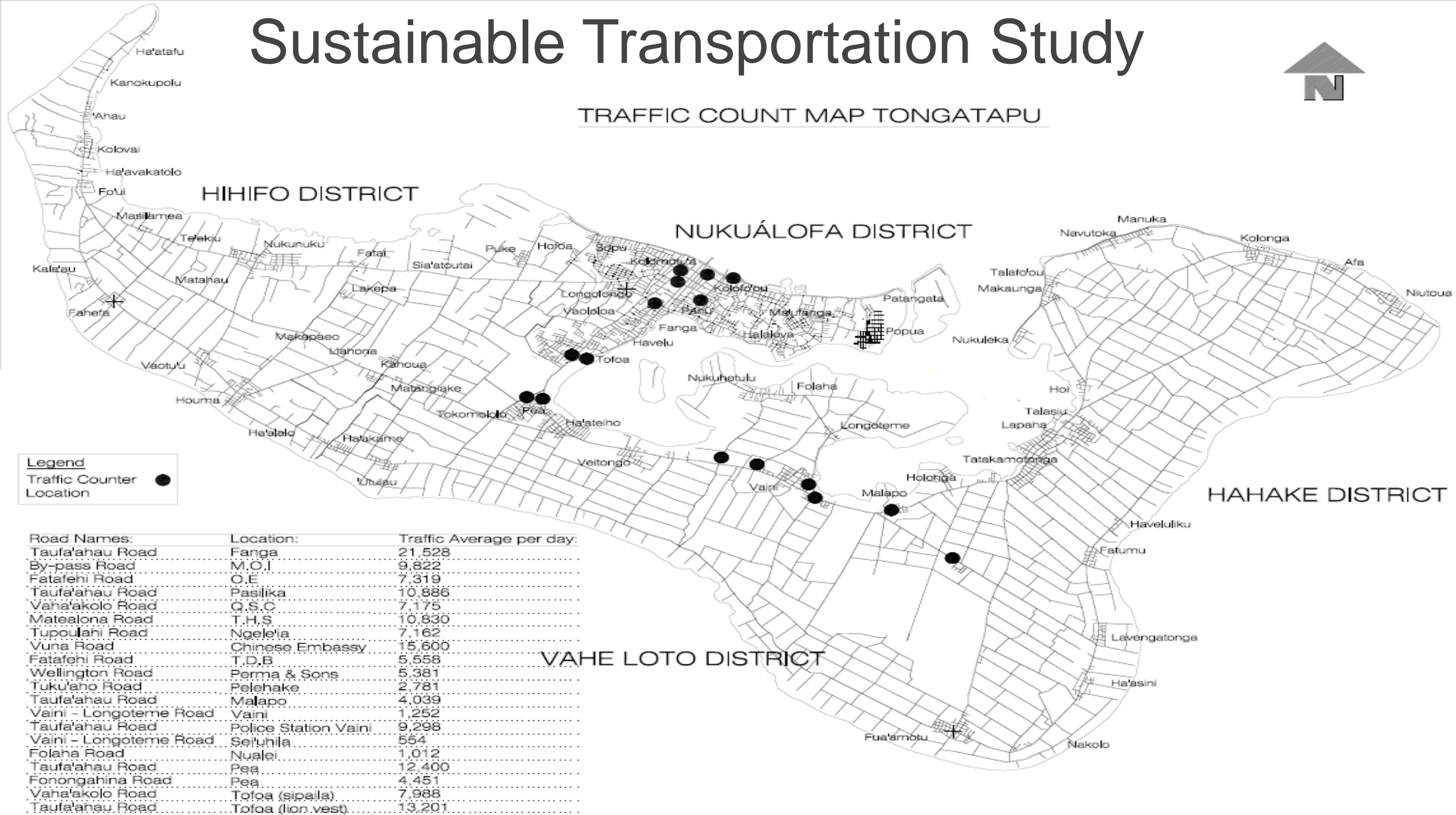
Transportation - Electric Vehicles



Sustainable Transportation Study



TRAFFIC COUNT MAP TONGATAPU



Legend
 Traffic Counter Location ●

Road Names:	Location:	Traffic Average per day:
Taufa'ahau Road	Fanga	21,528
By-pass Road	M.O.I	9,822
Fatafehi Road	O.E	7,319
Taufa'ahau Road	Pasilika	10,886
Vaha'akolo Road	Q.S.C	7,175
Matealona Road	T.H.S	10,830
Tupoulahi Road	Ngele'ia	7,162
Vuna Road	Chinese Embassy	15,600
Fatafehi Road	T.D.B	5,558
Wellington Road	Perma & Sons	5,381
Tuku'aho Road	Pelehake	2,781
Taufa'ahau Road	Malapo	4,039
Vaini - Longoteme Road	Vaini	1,252
Taufa'ahau Road	Police Station Vaini	9,298
Vaini - Longoteme Road	Sei'uhiia	554
Folaha Road	Nualei	1,012
Taufa'ahau Road	Pea	12,400
Fonongahina Road	Pea	4,451
Vaha'akolo Road	Tofoa (sipaila)	7,988
Taufa'ahau Road	Tofoa (lon.vest)	13,201

Transportation: e-Bus



Approach: Resiliency / Preparedness

- **Water Generation** - High-efficiency multi-fuel gen-sets to provide water pumping for a 3- to 7-day period
- **Emergency Operations** – Optimal Geographic Locations
- **Shelters** - Designated for public with emergency back-up generation

Accomplished & Future Energy Portfolio



2010-2020

- TERM
- Energy Department
- PV Projects Implemented
- Wind Projects Implemented
- Battery Projects Planned
- More PV + Wind Projects Planned
- Grid Improvements

2021-2035

- TERMPLUS
- PV + Wind + Battery + EV + MG Sites Implemented
- Electric Bus & Vehicle Fleets
- EV Charger Network
- LED Street & Interior Lights
- Biofuels
- Strategic-Partnerships

STRATEGIC INITIATIVES LAUNCHED

- Pacific Island Nation Leader in Renewable Trajectory to 100%
- Renewable Energy to Innovative Storage & Grid Solutions
 - Excess Renewable Generation shifted to Transportation
 - Complete Solutions : PV + Wind + EV + Grid + Battery
 - Tonga Energy Research Center RD&D
 - Island EVs & Charger Network
 - Electric & Biofuel Buses

Balancing economy, environment, culture, costs, and quality of life



❑ Vision from Tonga:

- Demonstrate 21st century technologies
- World Leader in Cost-Effective Renewable Energy
- Revive traditional “affluent subsistence”

❑ Partnership Vision:

- Sector Integration: energy, water, food, health and education systems
- Sustainable Energy Sector: Integration & Harmonizing Supply & Demand
- RE, EE, Transportation, Resiliency

❑ Vision from GGGI:

- Sustainable Energy Systems
- Tonga Energy Road Map *PLUS*
- Pacific Island Demonstration Sites



TERMPLUS Workplan 27-May to 30-August

Tonga Energy Road Map 2021-2035 - TERMPLUS WorkPlan

Outputs in Red

PHASE 0

Step 0: Agreement on November Deliverable with Tonga MEIDECC – Department of Energy: *TERMPLUS*

27-May

PHASE 1: TERMPlus: Preparation

Questions to DPE: Energy Supply & Demand, Renewable Energy Projects, any other Questions, Follow-up on Outstanding Questions

Questions for TPL on Renewable Energy and T&D Targets, Projected Cost of Electricity, Future Technologies, Transportation and Resiliency

Contact S. Bloomfield for Team Meeting on Energy Bill Insights

Contact Private Entities (e.g. Oil Suppliers) and Other Relevant Entities

PHASE 2: TERMPlus Implementation

Document Chapter - Energy Supply (5 pages?)

Overview, with oil products and renewables as the relevant fuels

Targets, including reduction of oil imports and increased security of supply

Enabling environment, including policy, legal and regulatory reform - Deliver Chapter

Document Chapter - Energy Consumption (and Efficiency) (7 pages?)

Overview, with transport, commerce and public services, and households as the main sectors for final energy consumption

Targets on reduction of oil consumption and limiting growth of electricity consumption thru energy efficiency and conservation

Thank You

MALO