Impact Assessment Report on National Renewable Energy and Biofuels Policies Zimbabwe

ICAT Initiative for Climate Action Transparency

Initiative for Climate Action Transparency – ICAT

Impact Assessment Report on National Renewable Energy and Biofuels Policies Zimbabwe

- Applying ICAT Policy Assessment Guides

Deliverable 12

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Summary of the assessment

The National Renewable Energy Policy (NREP) and the Biofuels Policy of Zimbabwe (NBPZ) are key instruments in increasing climate action in Zimbabwe. These policies are expected to have a positive impact on reducing GHG emissions in the energy sector and contribute to Zimbabwe's Nationally Determined Contributions (NDC) target and meeting commitments under the Paris Agreement. The impact assessment of these policies using the ICAT renewable energy and sustainable development methodologies, after accounting for technical, policy design, financial, and other barriers indicates that the NREP will contribute 1056 MW of renewable energy to the energy mix against a target of 2100 MW by 2030 as stated in the policy. The estimated renewable energy potential will attain 52% of the targeted installed capacity and consequently contribute to the emission reduction target. The policy Impact scenario of 1056 MW is within the revised NDC target of 300 MW of solar PV addition to the electricity grid, indicating the significance of the policy in meeting the country's emission reduction target. The Biofuels policy will attain approximately 23% of its target potential by 2030 under the policy impact scenario. Barriers to implementation of the NBPZ include an acute shortage of feedstock and a lack of financial resources for the development of biodiesel production facilities required to meet the target. From the impact assessment, it can be concluded that the availability of feedstock for biodiesel production will hinder the attainment of 2% mandatory blending in diesel, however, ethanol blending which is already under implementation with varying blending ratios between E5 and E20 is expected to significantly improve as a result of the policy, the policy advocates for of introduction of new ethanol producers to blending, complementing efforts by the current producers.

The policy impact scenario noted that the introduction of the policies increased the potential of to meet the country's GHG emission reduction target. In the NREP 2019, ZERA is to develop a robust procurement mechanism for RE technologies, no action or delayed implementation of such critical policy instruments will reduce the impact of the policy. Access to renewable energy finance remains the major barrier to meeting the emission reduction target of the policy. The major hindrance relating to the lack of financial closure for grid-tied solar projects must be urgently addressed through the development guidelines for financing projects. The biofuels policy targets are largely dependent on the availability of feedstock and the development of a robust agriculture sector to support the fuel industry. Zimbabwe is an agro-based economy that provides the necessary framework for the development of a robust biofuels sector. Institutional arrangements involves the Ministry of Agriculture, research, and academic institutions critical in the biodiesel value chain. Limited technical capacity to produce the required quantities of ethanol and biodiesel indicates that biofuels production needs to be supported by critical capacity building and technology transfer mechanisms to ensure the viability of the projects. Independent Power Producers (IPP) already feeding into the grid have experienced various challenges including currency convertibility and the existence of multiple foreign currency exchange rates that has affected their ability to meet debt repayment obligations and consequently, limiting access to financing for project expansion as evidence by the differences between the licensed capacity and installed capacity.

The assessment shows that NREP and NBPZ have a positive impact on sustainable development goals (SDG): SDG 3 (Good health and Wellbeing), SDG7 (Affordable and Clean Energy), SDG8 (Decent Work and Economic Growth) and SDG 13 (Climate Action). The report recommends the development of a robust renewable energy implementation framework, with tracking tools for monitoring, reporting, and verification of the policy impact during the implementation period and ensure transparency and accountability in policy implementation. Wider capacity building on the application of the methodologies for experts and government officials to use the guidelines for policy impact assessment is required to enhance policy formulation, review, and the development of a post-policy 2030 frameworks.

1. Introduction

The global climate change regime is changing at an accelerated pace with transformation of the energy sector and energy transition, many countries through the Nationally Determined Contributions to the United Nations Framework convention on Climate change (UNFCCC) have prioritised climate mitigation actions in the energy sector to address climate change. The 2019 UNEP Emissions GAP Report (2019) notes that greenhouse gas (GHG) emissions have continued to rise despite scientific warnings and political commitments. Fossil CO_2 emissions from energy use and industry that dominate total GHG emissions internationally, grew by 2.0 per cent in 2018, reaching a record 37.5 Gt CO_2 per year. Given this scenario, Parties to the UNFCCC and the Paris Agreement are being called upon to increase their ambition through higher emission reduction targets and related policy instruments. Zimbabwe has shown its commitment to contributing to climate action by ratification of the Paris Agreement and development of National Climate Policies and strategies. The country has been working to ensure that the country's sectoral policies are consistent with obligations under the UNFCCC which include policies in the energy and transport sectors. The National Renewable Energy Policy supports Zimbabwe's first NDC which calls for a reduction of greenhouse gases from the energy sector by 33 percent per capita by the year 2030. The policy supports investments in renewable energy sources such as the small hydropower schemes, solar water heating and grid-connected large solar plants as part of the emission reduction efforts in the more ambitious revised NDC (2021). The National Renewable Energy Policy is closely tied to the National Bio-fuels Policy, which seeks to promote the local production and consistent mandatory blending of ethanol and bio-diesel at 20% ethanol in petrol (E20) and 2% biodiesel blending in diesel (B2). Besides reducing the import bill, climate change mitigation and adaptation benefits are expected to accrue from the implementation of the policy. NREP and NBPZ supports national efforts on the transition to a low carbon economy as indicated in the Low Emission Development Strategy (LEDS), and both policies will play a pivotal role in transition to clean and sustainable energy. The declining cost of RE technologies and their potential to support sustainable development goals show the increasing need to assess and communicate the impacts of RE policies to ensure that they are effective in mitigating GHG emissions, advancing development objectives, and helping countries meet their sectorial targets and national commitments.

Detailed periodic assessments will greatly aid in advocating for policy implementation and form the basis for future projects and programmes. The UNFCCC reporting requirements through the submissions of Biennial Update Reports (BUR) and Biennial Transparency Report (BTR) from December 2024 call on countries to provide information on domestic climate change mitigation policies and measures. The Initiative for Climate Action Transparency (ICAT) renewable energy and sustainable development methodologies are designed to assist

policymakers to assess the impacts of renewable energy policies and improve their effectiveness. These guidelines can play a critical role in providing the information needed for preparing reports under the Paris Agreement's Enhanced Transparency Framework (ETF). The impact assessment of the NREP and NBPZ used the ICAT renewable energy guideline as the key assessment methodology for the policy. The selection of the guidelines used covered the key sectors targeted by the policy according to the IPCC categories as both policies are in the energy sector. In addition to the renewable energy guideline, the sustainable development guideline was selected as a secondary guideline in the assessment of sustainable development impacts, this approach concurs with national priorities and specifically the National Development Strategy 1 (NDS1), which focuses on the achievement of sustainable development goals.

Train the trainer sessions on the use of these two guides conducted between July - November 2021 by experts from ICAT and UNEP DTU Partnership to provide guidance on the application of renewable energy and sustainable development guides. The TOT was followed by a training session for government officials and industry experts on applying the guidelines conducted in August 2021 and January 2022 for the renewable energy and the sustainable development guidelines respectively.

A stepwise ex-ante approach was adopted for estimating the effects of policy design characteristics, economic and financial factors, and other barriers on the potential for renewable energy policies to achieve planned targets for the assessment period. In undertaking the assessment, casual chain diagrams on the impacts of the policy indicated the policy impact, Intermediate impacts, GHG impacts, and sustainable development impacts. GACMO model overview was provided to guide participants on how to convert this impact (expressed in terms of newly installed renewable energy capacity or generated electricity) into GHG emissions reductions. Government officials from the Ministry of Energy and Power Development (MoEPD), Ministry of Environment, Climate, Tourism and Hospitality Industries (MECTHI), Ministry of Transport, Zimbabwe Energy Regulatory Authority, biofuels producers, renewable Energy industry association and industry experts participated, provided data and expert judgment in the impact analysis. Data collection and expert analysis were done in consultation with the above stakeholders from August 2021 – to December 2021 leading to the development of a draft impact assessment report. In January 2022, the draft impact assessment findings were presented to and validated by the team based on their experience of the industry. This report is then finalised with inputs received from various stakeholders on the validation workshop.

2. Defining the Assessment

2.1. Description of the policies

The National Renewable Energy Policy (NREP) was developed under the framework laid out in the National Energy policy (2012), focusing on the establishment of market oriented measures and regulatory instruments for the renewable energy sector in Zimbabwe. The Biofuels policy of Zimbabwe guides long term sustainable development of the biofuel sector in Zimbabwe through the provision of an enabling environment. The NBPZ ensures that biofuel production, processing, distribution, and marketing in Zimbabwe will remain within the parameters of economic, environmental, and social sustainability. The policies are key instruments in the energy sector that aim at addressing the barriers to the uptake of renewable energy in the country through various provisions described in Table 1 and 2 below.

Table 1: Summary description of the policy

Information	Description	Description
Title of the policy	National Renewable Energy Policy	Biofuels Policy of Zimbabwe
Type of policy	Financial instruments including Feed-in tariffs, Tax Incentive and Auction systems	Technology development pillars
Description of specific interventions	Technology-specific financing mechanisms that are dependent on the extent of deployment and maturity of the technology in Zimbabwe. According to the policy the specific technology interventions shall be as follows: 1. Solar PV and CSP: Considering that the costs of solar modules and equipment are continuously changing, Competitive Bidding shall be the mode of procurement for all ground mounted solar PV and solar CSP. A plug and play solar park model shall be adapted for this procurement method. In this model projects will be packaged wherein government shall provide all the land, clearances and a bankable PPA. Selected developer will be required to bring in the equipment, finance and required manpower to develop and operate the project. For rooftop solar and other solar installations less than 1MW, procurement will be under the net metering regulations. 2. Small Hydropower: In line with the National Energy Policy (NEP) for small-scale hydropower (less than or equal	· Achieve a consistent and sustainable ethanol blending ratio of up to 20% by 2030 · Introduce biodiesel at a blending ratio of up to 2% by 2030 · increases the number of players in the biofuels sector

	to 30 MW) procurement is proposed to be through FiT. 3. Biomass: With low variances in costs of equipment and limited competition FiT shall be the ideal procurement method for procuring energy from biomass energy developers. 4. Geothermal Energy: Geothermal energy is comparatively new technology and therefore further resource assessments needs to be carried out. Keeping this in consideration, FiT shall be the suitable procurement mechanism to spur growth in the development of this technology. Pilot projects shall be implemented for geothermal energy to prove its sustainability and scalability. 5. Wind: Wind is a mature technology globally. However due to lack of resource assessment studies in Zimbabwe at high hub heights it will not be ideal to consider this currently under Competitive Bidding route. Detailed resource assessment studies shall be conducted at 80m hub height or above in the year 2019 and onwards. Once the resource assessment is completed, procurement of wind energy through Competitive Bidding shall apply. Therefore, for next five (5) years procurement of wind energy shall be through FiT and thereafter the Ministry responsible for Energy may recommend Competitive Bidding during the first review of policy	
Status of the policy	Policy Adopted in March 2020	Policy Adopted in March 2020
Date of implementation	March 2020	March 2020
Date of completion (if relevant)	31 December 2030	31 December 2030
Implementing entity or entities	**The Ministry of Energy and Power Development (MoEPD)** has the overall responsibility for the implementation of the policy. It is the responsibility of Ministry responsible for Energy to coordinate and collaborate with different ministries to devise the strategies. Zimbabwe Energy Regulatory Authority (ZERA) shall act as the regulator to monitor the implementation of several activities and programmes in the policy by the stakeholders. It shall also regulate different activities including tariff setting, procurement,	**The Ministry of Energy and Power Development (MoEPD)** is responsible for setting the vision for biofuel development in the country, policy formulation/review and setting of biofuel blending targets in line with its vision, feedstock availability, fuel demand and national energy strategies. Zimbabwe Energy Regulatory Authority (ZERA) issues permits

	development of on-grid and off-grid generation sites and others based on existing regulatory frameworks and the new frameworks that shall be developed. The Rural Electrification Fund (REF) shall be responsible for improving the overall electrification levels in the country. It shall also be responsible for the management of the Green Energy Fund in the initial years and coordinate with the Ministry responsible for Finance for the management of the Fund. The generation side of the industry consists of Zimbabwe Power Company (ZPC), developers and IPPs, renewables based generation and other private players. The Nodal Agency that will facilitate these entities in setting up new RE projects and the activities shall be regulated as per the regulations set by the Regulator. The policy shall facilitate in guiding the activities of these entities and provide necessary incentives for higher investment in the RE sector. Zimbabwe Electricity Transmission and Distribution company (ZETDC) has the major responsibility in the transmission and distribution of electricity to the end user. The policy provides certain relevant guidelines and activities for the transmission and distribution utilities in order to help improve the evacuation infrastructure. The utility has the responsibility to provide necessary approvals and clearances to developers in a defined time period to promote rapid generation of electricity from renewables.	for biofuel producers, issuing guidelines for mandatory blending and fuel standards for the country. Ministry of Lands, Agriculture and Rural Resettlement is responsible for elaborating programs for the production and commercialization of biofuel feedstock, productivity improvement and the development of feedstock varieties. Agricultural Extension Services (AGRITEX), Research and Specialist Services (R&SS will conduct research and development on biofuels and assist by training farmers in the proper methods of production of biofuel feedstock. The Ministry of Agriculture is also expected to issue standards on specific requirements for sustainable feedstock production and related penalties.
Objectives and intended impacts or benefits of the policy	The goal is to increase access to clean and affordable energy through addition of installed RE capacity of: • One thousand one hundred Mega Watts (1,100 MW) by the year 2025 or sixteen comma five percent (16.5%) of the total generation from RE sources, whichever is higher; and • Two thousand one hundred Mega Watts (2,100 MW) by the year 2030 or twenty six comma five percent (26.5%) of total generation from RE sources, whichever is higher. Impacts	The policy aims to achieve: • a consistent and sustainable ethanol blending ratio of up to 20% by 2030 • introduce biodiesel at a blending ratio of up to 2% by 2030 and • increase the number of players in the biofuels sector

	• Strong Institutional Framework for promoting RE up-take of RE. • Robust procurement mechanism framework for purchase of RE, thereby promoting investment in the sector. • Reduce development timelines.	
Level of the policy	National Policy	National Policy
Geographic coverage	Zimbabwe	Zimbabwe
Sectors targeted	Energy Supply (Grid Connected) • Grid-connected solar PV • Mini hydropower • Wind • Bagasse + other RE • Solar Water Heating	Blending of petrol and diesel with Ethanol and Biodiesel
Greenhouse gases targeted	CO_2	CO_2, CH_4, N_2O
Other related policies or actions	Finance Act of 2018 as well as duty free status for solar products stipulated in SI 147 of 2010 and SI 6 of 2016. Nationally Determined Contributions (NDC's) Climate Response Strategy Low Emission Development Strategy (LEDS) National Development Strategy 1 (NDS1)	Defines incentive for reduction and removal of import duty on solar products. Climate change and national development strategies supporting implementation of NREP and NBPZ

Table 2: Additional information about the policy

Information	Description
Title of establishing legislation, regulations or other founding documents	National Energy Policy of 2012 (National energy policy is the founding policy that lead to the establishment of both the NREP and the NBPZ)
Intended level of mitigation to be achieved and/or target level of other indicators	The policy does not have a specific target but references the national target of 33% emission reduction from BAU, is in support of the GHG emission reduction objectives as per the Revised NDC submissions
Monitoring, reporting and verification procedures	The MoEPD has the overall responsibility for the development of MRV procedures for the policies. The monitoring of progress in key areas will be done by responsible agencies using the proposed framework with key indicators to be monitored which include installed capacity, Energy supplied, Amount of ethanol and biodiesel blended, Accessibility, Sustainability, Employment, Industrial and Commercial development, benefits to local communities, food security, Gender equality, Health and education facilities and, children and youth participation in development activities.
Enforcement mechanisms	Mandatory Blending of fuel under the NBPZ to be enforced by the Ministry of energy and Power development through ZERA. The regulator also has the

	mandate to regulator financing mechanisms for the purchase of RE technologies.
Reference to relevant documents	*Renewable Energy resource Assessment, Sustainable Energy for all,* 1. Nation Renewable energy Policy 2019 https://www.zera.co.zw/National_Renewable_Energy_Policy_Final.pdf *2. Biofuels Policy of Zimbabwe 2019* https://www.zera.co.zw/Biofuels_%20Policy_of_Zimbabwe.pdf *3.* Finance Act of 2018 https://www.veritaszim.net/sites/veritas_d/files/finance%20act%202018.pdf *4. Zimbabwe low emission development strategy* http://www.envirotourism.org.zw/wp-content/uploads/2017/08/Zimbabwe-Low-Emissions-Development-Strategy-LEDS.pdf *5. Zimbabwe revised Nationally Determined Contributions* https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Zimbabwe%20First/Zimbabwe%20Revised%20Nationally%20Determined%20Contribution%202021%20Final.pdf
Broader context or significance of the policy	The Current energy mix mainly consists of Large hydro and coal-fired power plants, both not classified as renewable energy in the policy. The renewable energy (RE) mix in the Grid is currently less than 5% (ZERA, 2020), whilst the policy aims to rapidly expand the contribution of RE to the national grid with a target of 26.5% by 2030. Liquid fuel energy demand for the transport sector is rising, with a current national requirement of three million three hundred thousand (3 300 000) and four million three hundred thousand (4 300 000) liters of petrol and diesel per day respectively. The policy recognizes that the widespread adoption of biofuels could reduce the country's dependence on imported petroleum products; stabilize fuel prices; ensure energy security; promote rural development and investment; reduce poverty; and create employment.
Outline of sustainable development impacts of the policy	The policies are focused primarily on SDG 3 (Good health and Wellbeing), SDG7 (Affordable and Clean Energy), SDG8 (Decent Work and Economic Growth), and SDG 13 Climate Action, while also contributing to other SDGs.
Key stakeholders	Ministry of Energy and power Development Ministry of Lands, Agriculture and rural resettlement Ministry of Finance and Economic Development Zimbabwe Regulatory Authority ZESA Holdings Finealt Engineering (pvt) Ltd Independent Power Producers Consumers Farmers and farmer's organisations, Biofuel producers, Several government ministries, agencies and parastatals, Research organisations and Universities, Biofuel users (motorists association), Oil companies and fuel retailers
Other relevant information	Implementation of the policies will lead to the creation of green jobs and improved energy security for the country. Renewable will provide a quick turnaround to the deployment of energy consequently improving access to energy. If implemented the policies will lead to increased renewable energy

	generation in the country, contributing to energy security by displacing fossil fuel energy sources and fuel sources that require importation. Zimbabwe imports electricity from the Southern Africa power pool mainly from South Africa and Mozambique and imports all the diesel and petrol. The policies will ensure the use of local resources and reduction of the import bill saving the country of foreign currency to improve the balance of payment.

2.2. Assessment boundary: individual policy or package of policies

The National Renewable Energy policy and the Biofuels policy of Zimbabwe aim at increasing the use of renewable energy in the electricity and transport sector through improving the RE mix in the electricity grid and ensuring mandatory blending of the fuel sector. A package of policies will be assessed as the policies are parallel in implementation and have a common GHG reduction target and these policies therefore interact with each other. Therefore they will be assessed as a package. The NREP and NBPZ are overlapping and reinforcing as these policies interact.

2.3. Temporal boundary: ex-ante assessment

An Ex- ante assessment was conducted for the entire package of policies, both policies were adopted in March 2020 and are expected to be effective for a 10 year period up to the end of 2030. The GHG assessment period is conducted for 2020–2030 and quantification will be done for 2020, 2025 and 2030. These periods are derived from the policy review periods as the policies are effective up to 2030 with reviews scheduled in 2025 and 2030. The time frames are also in line with the 5 Year assessment of GHG emissions using the GACMO model.

3. Assessment Methodology

3.1. Impacts casual chains

3.1.1. GHG impact

The impacts and impact boundaries of the assessment were determined using the casual chain diagrams developed by experts and government officials (Figure 1). The policy actions tracked the policy using the diagram provided the policy action, immediate impact and the GHG impacts of the policies are emission reductions targeted from the increase in renewable energy share in the electricity grid through additional renewable energy capacity and replacing fossil fuel in the transport sector by biodiesel and ethanol blending.

Table 3: GHG sources for the policy

Source category	Description	Emitting entity or equipment	Relevant GHGs
Grid-connected Energy Generation	CO2 emissions from electricity generation in fossil fuel-fired power plants displaced by the project activity.	Grid-connected power plants	CO2
Emissions from the combustion and evaporation of fuel for all transport activity	Emission reduction from the introduction of Ethanol blending and biodiesel to replace a fraction of mineral petrol and diesel.	Vehicle emissions	CO2 CH4 N2O

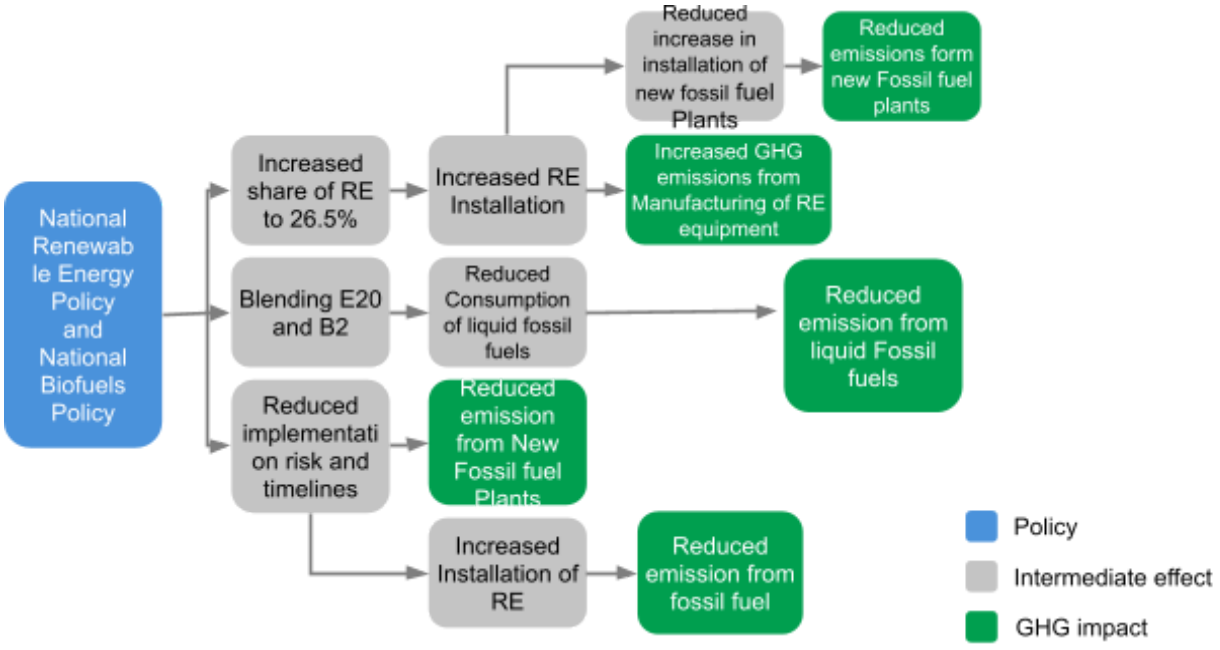


Figure 1: Renewable energy causal chain for a package of policies

3.1.2. Sustainable development impacts casual chains

Sustainable development impacts assessed included a wide variety of impacts across three dimensions: environmental impacts, social impacts, and economic impacts. All the impact categories for the assessment were identified for each policy using a separate causal chain diagram indicated below (Figure 2 and 3). The trained government officials and experts developed the casual diagram and selected the impact categories to be assessed.

Based on the casual diagram the team of experts selected sustainable development impact categories and indicators for the assessment that are to be relevant to the NREP and NBPZ objectives, sustainable development goals, and priorities of the NDS 1 and stakeholders prioritized the impact categories are significantly affected by the policy.

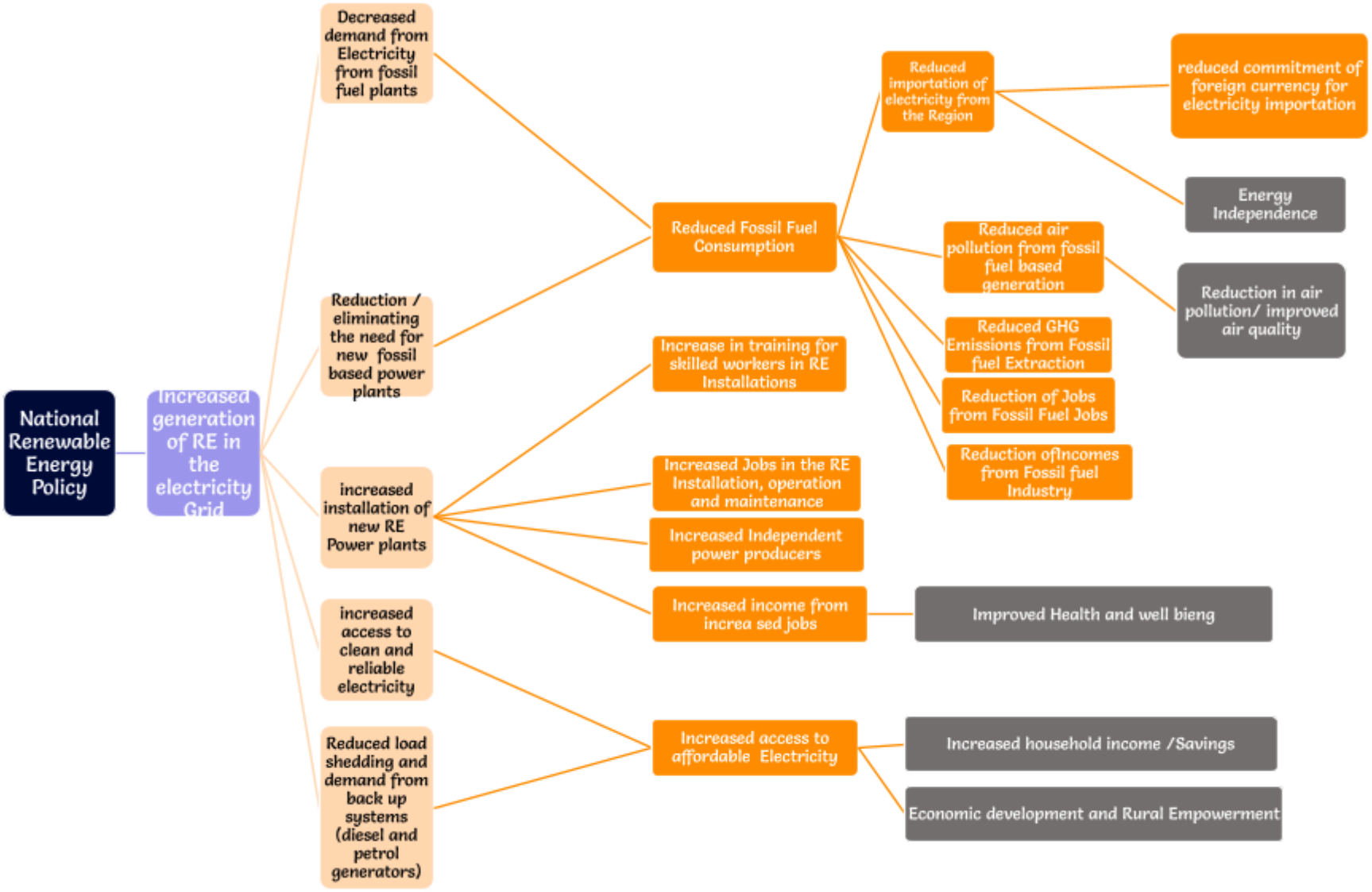

National Renewable Energy Policy
Increased generation of RE in the electricity Grid
Decreased demand from Electricity from fossil fuel plants
Reduction / eliminating the need for new fossil based power plants
increased installation of new RE Power plants
increased access to clean and reliable electricity
Reduced load shedding and demand from back up systems (diesel and petrol generators)
Reduced Fossil Fuel Consumption
Increase in training for skilled workers in RE Installations
Increased Jobs in the RE Installation, operation and maintenance
Increased Independent power producers
Increased income from increa sed jobs
Increased access to affordable Electricity
Reduced importation of electricity from the Region
Reduced air pollution from fossil fuel based generation
Reduced GHG Emissions from Fossil fuel Extraction
Reduction of Jobs from Fossil Fuel Jobs
Reduction ofIncomes from Fossil fuel Industry
reduced commitment of foreign currency for electricity importation
Energy Independence
Reduction in air pollution/ improved air quality
Improved Health and well bieng
Increased household income /Savings
Economic development and Rural Empowerment

Figure 2: Casual chain for sustainable development Impact of NRP (qualitative and quantitative)

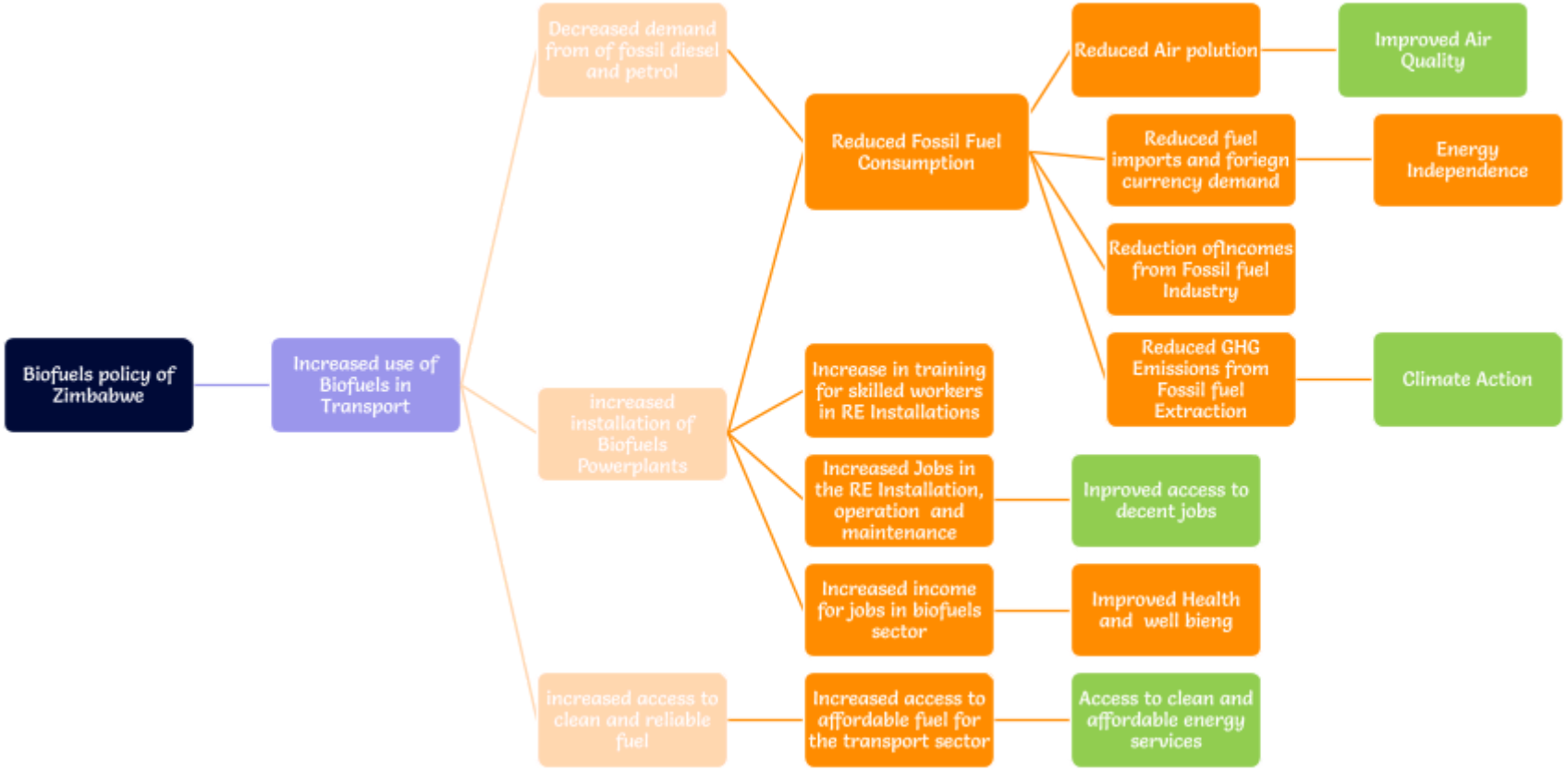


Figure 3: Casual chain for sustainable development Impact of NBPZ (qualitative and quantitative)

3.2. Impact categories and indicators

Based on the above causal chain diagrams, the impact categories and indicators for each of the policies are selected. The GHG assessment boundary was defined from the casual chain based on the potential GHG impacts derived from the intermediate impacts (Table 4). The sustainable development impact categories are indicated in table 5 and table 6 below. Table 7

Table 4: GHG impacts categories selection

GHG impact	GHG	Relative magnitude	Explanation
Reduced GHG emissions from existing and new fossil fuel power plants	CO_2	Major	The main GHG impact of NRP 2019
For biomass power plants, emissions associated with agriculture and land-use change	CO_2, CH_4, N_2O	Minor - Major	Significant for most biomass power plant
Emission Reduction for replacement of liquid fossil fuel with Bio fuels	CO_2, CH_4, N_2O	Major	The main GHG impact of the NBPZ
Reduced GHG emissions from existing and new fossil fuel power plants	CO_2,	Major	The main GHG impact of NREP

Table 5: Potential impact categories of The National Renewable Energy of Zimbabwe

Dimension	Impact category	Relevance	Significance	Rationale
Environmental	Climate Change	yes	yes	The policy is expected to significantly reduce GHG emissions by replacing or avoiding fossil energy with solar.
	Air Quality/Health	yes	yes	Reduction in GHG is expected to significantly reduce air pollution.
	Energy Access	yes	yes	Policy expected to significantly increase RE energy generation by replacing fossil fuels
Social	Access to clean, affordable, and reliable energy	yes	yes	The policy aims to ensure universal access to electricity by 2030
	Gender equality	yes	yes	The policy recommends certain key initiatives to address gender issues and move towards gender-neutral participation in RE projects
Economic	jobs	yes	yes	The policy is expected to create better job opportunities in the market for the local population
	New Business opportunities	yes	yes	The biofuels policy recommends Increases the number of Independent power producers.
	Energy Independence	yes	yes	The policy is expected to lead to significant improvement in energy

				independence by reducing imports of electricity.
	Import substitution	Yes	yes	The policy is expected to lead to significant improvement in energy independence by reducing imports of electricity.

Table 6: Potentuial impact categories of The Biofuels Policy of Zimbabwe

Dimension	Impact category	Relevance	Significance	Rationale
Environmental	Climate Change	yes	yes	The policy is expected to significantly reduce GHG emissions by replacing or avoiding fossil energy with solar.
	Air Quality/Health	yes	yes	Reduction in GHG is expected to significantly reduce air pollution.
	Energy Access	yes	yes	Policy expected to significantly increase RE energy generation by replacing fossil fuels
Social	Access to clean, affordable, and reliable energy	yes	yes	The policy aims to ensure universal access to electricity by 2030
	Capacity, skills, and knowledge development	yes	yes	
	Quality and safety of working conditions	yes	yes	The policy is not expected to look at the working conditions as this is covered in other policies
	Poverty	yes	yes	
	Gender equality	yes	yes	The policy recommends certain key initiatives to address gender issues and move towards gender-neutral participation in RE projects
Economic	jobs	yes	yes	The policy is expected to create better job opportunities in the market for the local population
	New Business opportunities	yes	yes	The biofuels policy recommends Increases the number of players in the biofuels sector.
	Energy Independence	yes	yes	The policy is expected to lead to significant improvement in energy independence by reducing imports of electricity, petrol and diesel.
	Import substitution	Yes	yes	The policy is expected to lead to significant improvement in energy independence by reducing imports of electricity, petrol and diesel.

Table 7: Selected sustainable development impact categories and indicators

Impact Categories	Specific Impacts	Indicators
Climate Change Mitigation	Reduced GHG emissions from grid connected fossil fuel-based power plants	GHG emissions (t CO2/Year)
Access to clean energy	Increased access to clean affordable and reliable energy	• Electrification rate • Availability • change in the number of users of Solar water heaters
Jobs	Increased in jobs in the RE Sector	• Number of new jobs resulting from the policy. • change of total energy sector employment (gender-segregated) in RE projects
Renewable Energy addition	Increased Renewable energy addition to the electricity Gris	• MW of RE added

4. Impact Assessment

4.1. Policy potentials

4.1.1. Technical potential

Technical potential of the policy is similar to the policy targets, it has been defined by the policy as the targets are based on resource assessments that define the technical potential of the assessment. The NREP provide technology-specific targets for renewable energy generation and the total energy mix for the years 2025 and 2030 as Table 8.

Table 8: NREP and NBPZ targets

Technology	Target (2025)	Target (2030)
Small Hydro	93 MW	150 MW
Grid Solar	977 MW	1575 MW
Wind Power	62 MW	100 MW
Bagasse	171 MW	275 MW
Solar water Heating		250 000 (units)
E 20	20% (Ethanol blend)	20% (Ethanol blend)
B 2	2% (biodiesel Blend)	2% (biodiesel Blend)

4.1.2. Policy design characteristics

Table 9: Policy design characteristics and their expected influence for the assessment period

Design characteristic	Description	Influence on Technical Potential
National project Status	Awarding of National project status to the RE projects to enable projects to be exempted from the customs and general exercise regulations.	Major
Development of Policy Instruments	Key policy actions for the Feed-in Tariff, Competitive Bidding/ Auction system are still under development. The Final architecture of these policies will impact the technical potential in the absence of these policies unsolicited bids will be used for procurement. The NREP states that these instruments shall be developed within 9 month from the date of the policy.	Major
Prescribed Asset Status to RE projects	Ministry Responsible for Energy shall recommend RE projects on case to case basis to the ministry responsible for finance for according prescribed asset status.	Major
Development of other policies	E- Mobility policy is under development with and object of introducing electric vehicles for both mass public transportation and private vehicles.	Major

4.1.3. Financial feasibility of RE technologies

Table 10: Accounting for Financial Barriers

Financial	Lack of Domestic Finance	Limited Domestic Finance for RE Projects
	Repatriation of Funds from FDI	Limited availability of foreign currency for repatriation of funds from Foreign Direct investments.
	Requires long term finance	Non-availability of long term finance on the domestic market
	High Development costs	Development costs have not been reduced especially cost for preparation including water permits from ZINWA and EMA fees
	Prescribed Assets status	Granting of prescribed asses status is for large projects

Table 11: Technology-based financial barrier

Technology	Financial Barrier	Impact
Grid-Tied Solar PV	• Limited availability of foreign currency for repatriation of funds from Foreign Direct investments. • Non-availability of long-term finance on the domestic market. • Lack of a cost-reflective tariff making fossil fuels cheaper than RE	High
Small Hydropower	• Development costs have not been reduced especially cost for preparation including water permits from ZINWA for inland dams and Environmental Management Agency fees • Limited availability of foreign currency for repatriation of funds from Foreign Direct investments	Medium
Solar water Heating	• Limited availability of foreign currency for repatriation of funds from Foreign Direct investments	High
Ethanol	• Availability of ethanol for blending • Seasonality of ethanol production	High
Biodiesel	• Limited Biodiesel production capacity	High

4.1.4. Other barriers

Table 12: Analysis of other barriers

Barrier category	Barrier description	Severity of barrier	Other policies addressing barrier	Impact factor	General level/ technology level	Overlap with other barrier(s)
Institutional	Development of a nodal agency	High	Zimbabwe Investment Authority	High		Project preparation timelines
	Distribution Monopoly of utility	Medium		Low		
	Blending Monopoly for Ethanol	Medium		Medium		

	High dependence on the agriculture sector for the production of Biodiesel	High		High		Nodal Agency
	High project preparation timelines			Low		
	E- mobility policy for Electric Vehicles	low				
Market	Lack of non-cost reflective tariff	High	ZERA Act	High	Feed in tariff/ project finance	
	Competition with Fossil fuel resource	Medium	NEP	mediu m	Electricity generation	
	Exploration and discovery of liquid oil resources	High	Minerals and mining Act	High	Biofuels	

4.2. Estimated RE addition

National renewable energy policy is a policy scenario with no cap as the policy will develop mechanisms to support the installation of 2100 MW of RE by 2030. The proposed potentials are supported by resource assessments that have been conducted under the suitable energy for all (SE4All) programme.

4.2.1. Account for technical potential

Technical potential for the policies have been defined by the policies, the objectives set a target to be achieved for both policies.

Table 13: Accounting for Technical potential

Source	Technical Potential
Small Hydro	150 MW
Grid Solar PV	1575 MW
Wind	100 MW
bagasse	275 MW
Estimated Technical potential for the assessment Period	2100 MW

4.2.2. Account for policy design

The key design characteristic of the policies are as follows:

- Policy instruments stated in the NREP and NBPZ to be developed and implemented within the prescribed timeframe in order to meet the prescribed target.
- Payment structure and design of a renewable energy procurement mechanism.
- Incentives: Government driven national project status to support project implementation.
- Utility Role: Government-Owned single buyer with guaranteed purchase to improve bankability of renewable energy projects.

- Grid access: Grid priority transmission and dispatch for renewable energy to assure power evacuation from projects.
- Policy Adjustments: no adjustments of prices over the life of the project to ensure financial and economic viability of projects.

Table 14: Accounting for policy design characteristics

Period	Technology	Characteristics
2020 - 2025	Solar	- Slow implementation and Development Auction System and competitive bidding - Currency convertibility for investors
	Wind	- No resource assessment to assist project development
	Small Hydro	- Lack of comprehensive resource assets to guide development. - Unsustainable non-consumptive water tariff not addressed by policy
	Bagasse	- Limited players in the industry
	Ethanol	- Lack of blending consistency due to seasonality of blending
	Bio Diesel	- No production plant for biodiesel currently operational
2025 - 2030	Solar	- Lack of clarity on Land acquisition procedures
	Wind	- Non-inclusion of wind power in the systems development plan
	Small Hydro	- Impact of climate change and availability of water resource
	Bagasse	- Reduction of areas under commercial plantations
	Ethanol	- Limited production facilities for consistent blending
	Biodiesel	- Limited production facilities for consistent blending

Table 15: Reviews policy potential taking into account design characteristics

		Reduction %	Estimated
2020 - 2025	Solar	20 %	1260 MW
	Wind	30%	70 MW
	Small Hydro	30%	90 MW
	Bagasse	45%	178 MW
Total			**1598 MW**
	Ethanol E20	30%	liters
	Biodiesel B2	90%	Liters
Feed-in tariff policy, Auction system/ Competitive bidding and taxes incentives will have to be developed within the 2020- 2025 period. The policies are essential to the development of the sector, the development phase of the instruments will limit progress in the period 2020-2025 as this is expected to be the development and implementation period of the instruments. The policy design characteristics will impact development of each technology differently as indicated above. The current RE development trajectory for the various technologies show a reduction in the technical potential for Technologies to a total of 1598 MW			

1598 MW 20% Ethanol Blending (70%) 2% Biodiesel Blending (10%)

A qualitative approach estimates the influence of each of the above characteristic on the technical potential within the assessment period. The users identified the characteristics at the consultation workshops and developed a rating tool for the influence on the technical potential during the assessment period of the policies. The impact of the identified characteristics was shared with experts for first-order estimates and validated at the validation workshop. The analysis reveals that the policy design characteristics are likely to affect the technical potential of both policies within the assessment period. After accounting for all policy design characteristics, the refined technical potential for the assessment period in expected to be 1598 MW (compared with 2100MW originally), 70% consistency in E20 and 10% in B2 by 2030.

4.2.3. Account for financial and other barriers

Table 16: Accounting for financial barriers

Period	Technology	Characteristics	Reduction %	Estimated
2020 - 2025	Solar	- No reviews of tariffs to adjust for inflation over the period of the project. - Financial closure of projects - Limited domestic investment in solar projects - Challenges in currency convertibility for foreign investor to repatriate profits - Capital intensive investments - Funding for power evacuation	40%	756 MW
	Wind	- Challenges in currency convertibility for foreign investor to repatriate profits	10%	63 MW
	Small Hydro	- Challenges in currency convertibility for foreign investor to repatriate profits - High Investment cost for run off river schemes - High water tariffs	30%	63 MW
	Bagasse	- Challenges in currency convertibility for foreign investor to repatriate profits	25%	134 MW
Total				**1,106 MW**
	Ethanol	- E- mobility policy		
	Biodiesel	- Exploration of Muzarabani oil (Invictus)		

Financial barriers have a major impact on the development of RE technologies, the policy provides separate technology-based procurement mechanisms with no ceiling price for the auction system. The financial feasibility assessment does not result in a downward revision of the technical potential for the assessment period. However, access to financing in the country is very limited, and only a small number of private investors are willing to invest in RE due to currency convertibility issues as PPA are denominated in USD but payable in the local currency at interbank rates. This limits the number of plants that can be constructed even for those that already have been granted generation licenses. A consultation with the regulator provides further insights on the number of projects that have been granted licenses but failing to reach financial closure within the expected timeframe. To be conservative, and given the high uncertainty, the expected RE addition of the policy for the assessment period, after accounting for financial feasibility, is refined to 1,106 MW

Table 17: Policy Impact Scenario target after accounting for barriers

Source	Policy Impact Scenario	Policy target
Small Hydro	63 MW	150 MW
Grid Solar PV	756 MW	1575 MW
Wind	63 MW	100 MW
bagasse	134 MW	275 MW
Estimated Technical potential for the assessment Period	1106 MW	2100 MW
		52% of the Target

4.3. Scenario design

To assess the emission reduction and sustainable development impact under different policy potentials, three key scenarios are defined below, taking into account of technical and financial potentials and barriers into consideration:

1. **Business As usual Scenario (BAU)** – Indicates the development trajectory could have transpired without any policy interventions, assumptions used for this scenario have been adopted from the NDC and Low emission development strategy. The scenario assumes following the current energy trajectory without the influence of the policies
2. **Policy Scenario** – Provides a scenario in which all the policy targets intended by the policies are met which will result in meeting the target of 2100 MW renewable energy target by 2030 and consistent mandatory blending of E20 and B2.
3. **Policy Impact Scenario** – Provides the anticipated development trajectory after assessment of the policies using the ICAT Renewable energy and sustainable energy methodology and accounting for the barriers for reaching the full policy potential i.e. after accounting for technical, financial , policy design and other barriers the NREP will reach 1056 MW.

4.4. GHG impacts assessment by GACMO Model

The emission trajectory method is used to determine the GHG impacts of the policies, a renewable energy target of 26.5% is targeted by 2030, and for systems with a high

variable renewable energy above 10 % the emission trajectory method is recommended. The policy has adequate data available to calculate emission reductions using emission quantification models. The GACMO model has been introduced to determine the emission reduction scenario for the revised NDCs, the model used for the policy analysis used assumptions and base year defined by the revised nationally determined contributions. In line with the NDC's projections are based on population and GDP growth assumptions taken from the NDS1, which takes into account the impact of COVID-19 on Zimbabwe's economy and its expected recovery. GHG impacts of the policy ex-ante were calculated using the Greenhouse Gas Abatement Cost Model (GACMO) to quantify the current and future greenhouse gas emissions from the three defined scenarios.

- **Assessment Steps**
  - Base year for the BAU scenario was established by the GACMO assessment using 2017 as the base year for the analysis. 2017 was selected because of the availability of data and for consistency, since 2017 been used as the base year for the Revised NDC and LEDS.
  - **Start year balance** has been provided in TJ
    - Electricity generation using coal
      - Coal – 51 118 TJ (I6)
      - Diesel for coal power plant start-up – 563 TJ (F6)
  - These are converted to ktoe in (I35) and (J36)
  - Convert the diesel and petrol to TJ
    - Diesel used and the diesel replaced at the prescribed blending levels at 10% - 24 090 000 litres = (1 litre : 0.0000342 TJ) = 824 TJ
    - Gasoline used and the Gasoline replaces at 20% blending (replaced)- 3 212 000 litres = (1 Litre: 0.000322 TJ) = 103TJ
  - **Growth** Maintained the proposed annual increases
  - Graphs of BAU derived from the model this also computes balance 2020-, 2025 and 2030
  - **Assumptions** – Use assumptions used for NDC with 2017 base year
  - The units penetrating are calculated based on the units used in CDM projects, coating for CDM has been adopted due to limited data on IPP.
  - Procedure is repeated for mains 25 and mains 30

Table 18: GHG emission BAU scenario

Sectorial split of BAU emissions				
ktCO2e/year	2017	2020	2025	2030
Total	4,942	4,776	6,561	7,975
Power	4,877	4,711	6,472	7,867

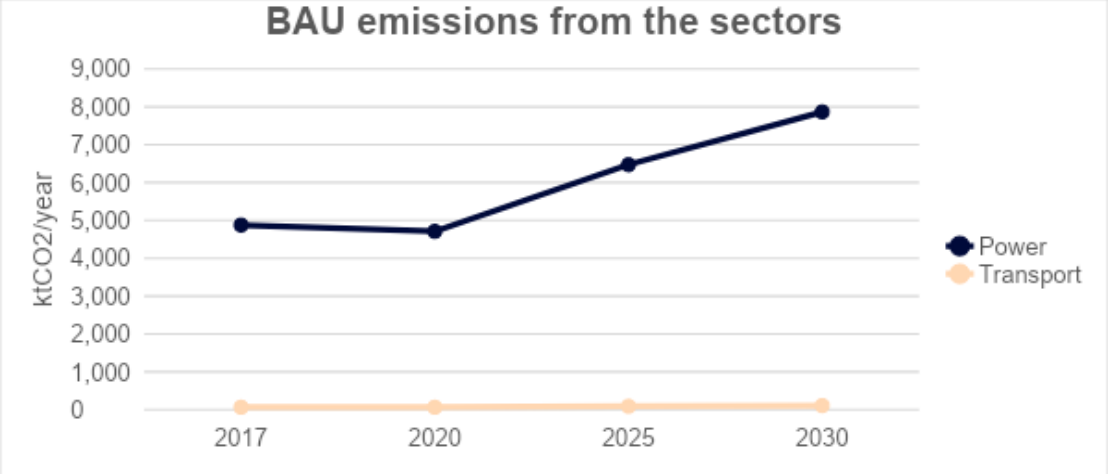


Figure 4: Business as usual emissions from the power generation and the transport sectors

4.5. Results of quantitative assessment

A quantitative assessment was conducted on parameters where data readily available. National data such as household income levels available was before the policy and will be collected during the national census period, hence such analysis with inadequate or absolute data has been omitted in the analysis.

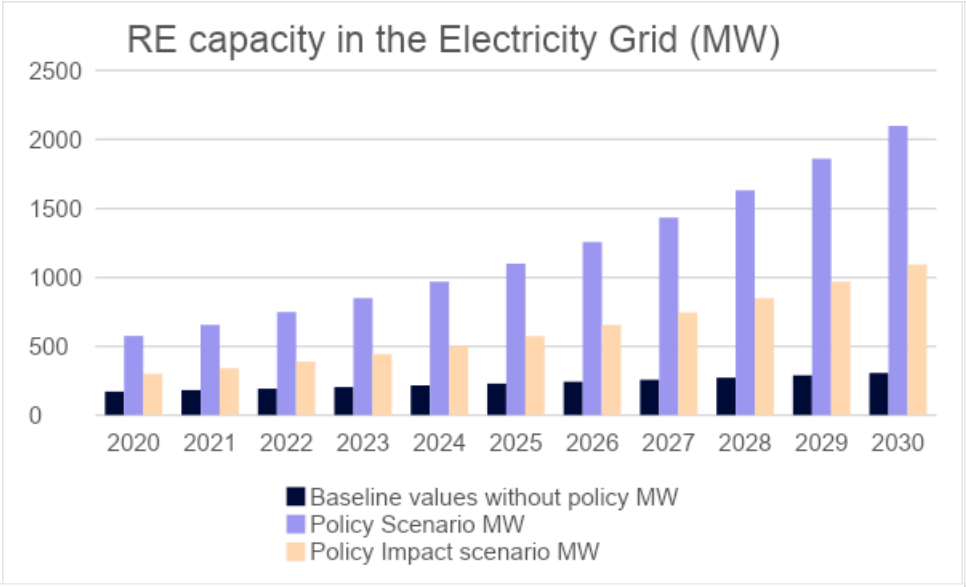
Table 19. Envisaged RE addition into Zimbabwe's Energy Mix

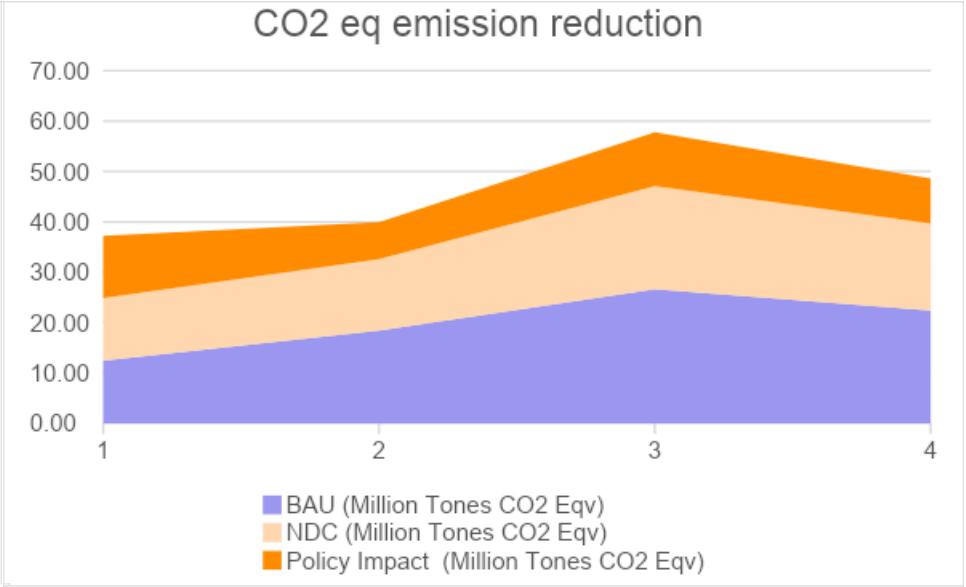
Impact category	**Energy**										
Indicator 1	Renewable energy capacity Installed (MW)										
Specific Impact	Increased Renewable Energy capacity generation by source from solar, and small hydro power										
Assessment method	Scenario Method										
Equation	Total renewable energy installed capacity (MW) = Renewable energy capacity in baseline scenario - Renewable energy capacity in policy scenario										
Parameters needed	Baseline values of total renewable energy without the policy (MW) Policy scenario values of total renewable energy with the policy (MW) per year										
Assumptions											
Assessment Period	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Baseline values without policy	170	181	191	203	215	228	242	256	271	288	305
Policy Scenario	574	654	746	850	968	1100	1257	1432	1632	1860	2100
Policy Impact Scenario	298	340	388	442	503	572	654	745	849	967	1092
% increase in RE capacity –Policy Scenario	11.3%	12.1%	13.1%	14.1%	15.3%	16.5%	18.1%	19.9%	21.9%	24.0%	26.6%
% increase in RE capacity- Policy Impact Scenario	5.9%	6.3%	6.8%	7.3%	8.0%	8.6%	9.4%	10.3%	11.4%	12.5%	13.8%

Table 20: GHG emission reduction from RE interventions

Impact category	**Climate Change Mitigation**
Indicator 2	GHG emissions (MtCO2e/year) from the electric grid
Specific Impact	Reduced GHG emissions from grid-connected fossil fuel-based power plants

Assessment method	GACMO			
Equation	GHG emission reduced from Renewable energy (MtCO2e/year) = Electricity generated from Renewable energy (MWh) x Coal generation emission factor (tCO2e/MWh) / 1,000,000			
Parameters needed	Electricity generated from installed Renewable Energy PV (MWh) Coal generation emission factor for Zimbabwe			
Assumptions	It is assumed that in the baseline scenario follows the Low Emission Development strategy that has a gradual decrease in the installation of new coal-fired power plants			
Assessment Period	2017	2020	2025	2030
BAU (Million Tones CO2 Eqv)	12.41	18.40	26.62	22.42
NDC (Million Tones CO2 Eqv)	12.41	14.17	20.50	17.26
Policy Impact Scenario (Million Tones CO2 Eqv)	12.41	7.37	10.66	8.98





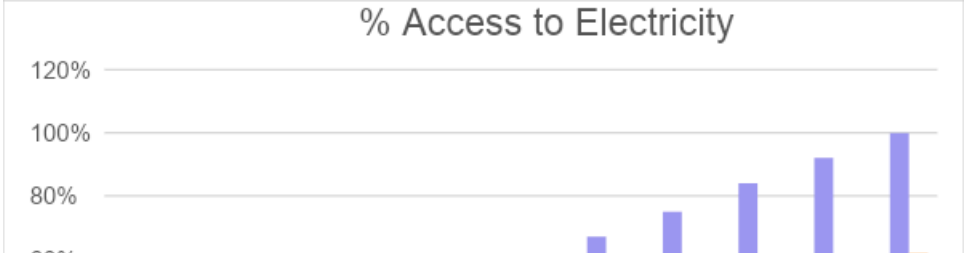


Figure 5: Sustainable Development Impact as it relates to access to clean electricity, employment and emissions reduction

Table 21: Evisioned energy access improvements up to 2030

Impact category	Access to clean, affordable, and reliable energy										
Indicator 3	Rural Electrification rate										
Specific Impact	Increased access to electricity										
Assessment method	Energy Modelling										
Equation	(Installed electricity connections/ Total possible connections) %										
Parameters needed	Electricity connection point per year in all sectors (Residential, industrial, commercial, social services, etc.)										
Assumptions	The electrification rate has been growing at an average of 2% per annum										
Assessment Period	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Baseline values without policy (BAU)	18%	20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
Policy Scenario	18%	26%	34%	43%	51%	59 %	67 %	75%	84%	92 %	100%
Policy Impact Scenario	18%	20%	22.00%	28%	35%	39%	44%	47%	52%	56%	62%

Table 22: Cumulative jobs created due to RE interventions up to 2030

Impact category	Jobs										
Indicator 4	Change in Jobs resulting from the policy (Jobs/Year)										
Specific Impact	Increased jobs in the solar PV construction and installation, and operation and maintenance sectors Increased Jobs in The Biofuels sector Reduced jobs in fossil fuel sectors										
Assessment method	Deemed estimates method										
Equation	Total jobs = Total capacity (MW) * Jobs per MW										
Parameters needed	Installation (13 jobs/MW); O&M (3.5 jobs/MW)										
Assumptions	Solar PV 23 jobs/ MW, Solar water Heating residential 8.4 Jobs/MW, Biofuels 0.01 jobs /m^3 plant capacity per year for installation, operation and maintenance										
Assessment Period	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Jobs Created BAU Scenario	3,910	4,163	4,393	4,669	4,945	5,244	5,566	5,888	6,233	6,624	7,015
Jobs Created Policy Scenario	3,910	12,552	14,393	16,260	18,497	21,039	23,946	27,247	31,018	35,315	40,193

Jobs Created in Impact Scenario	3,910	6,527	7,484	8,455	9,618	10,940	12,452	14,168	16,129	18,364	20,900

5. Monitoring Plan

5.1. Key performance indicators

Key performance indicators agreed will be used to track the progress of the policies in meeting targets. Ministry of Energy and Power Development is responsible for tracking of progress.

Table 23: Key performance indicators to monitor

Key performance indicator	Indicator description	Rationale for including
Capacity of licensed IPP	MW	Determine the appetite for developers in RE technologies
Installed capacity	MW	Number of projects that have been commissioned
Energy generated or supplied to the grid	MWh /year	The capacity factor of the installed technologies and actual Energy generated through renewable Energy
GHG emission reduction	tCO2e/year	Policy contribution to the country's NDC target.
Jobs created	Number of jobs in RE disintegrated by technology	Social impact of the policy through the creation of green jobs
Skills trained	Availability and number of capacity building initiatives Number of people trained.	Reskilling of workers to ensure a Just Transition
Electricity access	Electrification rates	Impact of the policy on SDG 7 and attainment of universal access to modern energy services for all by 2030
Increased household income	Savings in energy bill (USD/Year)	
Ethanol blending	Liters Year	Quantify the level of blending
Biodiesel blending	Liters/year	Quantify the level of blending

5.2. Monitoring plan and monitored parameters

Monitoring of Impacts indicated below is part of the MRV for the policies. The Ministry of Energy and power development is responsible for the development of an MRV framework for the policies. The monitoring frequency takes into account other MRV processes of supporting policies such as the BUR under the ETF framework to ensure coordination in data collection and analysis of the policies. Cost and data availability considerations have been assessed and a bi annual.

Table 24: Monitored parameters

Parameter	Source of data	Parameter type	Monitoring frequency
Capacity of licensed IPP	Zimbabwe Energy Regulatory Authority (ZERA)	• Number of Licenses • MW licensed	Biennial
Installed capacity	Zimbabwe Electricity Transmission and Distribution company (ZETDC)	• MW Installed and location	Biennial
Energy generated or supplied to the grid	ZETDC	MWh delivered	Biennial
GHG emission reduction	MECTHI	tCO2/year	Biennial
Jobs created	Ministry of Labour and Social Welfare	Number of Jobs Created	Biennial
Skills trained	Ministry of Labour and Social Welfare	Number of Jobs Created	Biennial
Electricity access	Ministry of Energy and power development	Electrification rates	Biennial
Increased household income	National statistics office	Household income surveys	Biennial
Ethanol blending	National Oil Infrastructure Company (NOIC)/ MoEPD	• Liters/ Year • % blending	Biennial
Biodiesel blending	NOIC / MoEPD	• Liters/ Year • % blending	Biennial
Solar water Heating	MoEPD	Number of geysers installed	Biennial

6. Conclusion

This study assesses the impact of the National Renewable Energy Policy and the Biofuels policy of Zimbabwe, by applying ICAT Impact Assessment Guides (Renewable Energy and Sustainable Development). It conducts an Ex-Ante impact assessment on the entire package of polices for the period of 2020-2030. After accounting for technical and financial potentials, policy designs, and other barriers, the National Renewable Energy Policy will contribute 1056 MW to the renewable energy to the energy mix against a target of 2100 MW by 2030, reaching 52% of the policy targeted and consequently contributing to the emission reduction potential due to the policy. The 1056 MW is within the revised NDC target of 300 MW from RE addition to the Electricity Grid. The Biofuels Policy will reach approximately 23% of the target potential due to the limited resources and seasonal nature of raw material supply for ethanol blending. The availability of feedstock for biodiesel production will hinder the attainment of 2% mandatory blending in diesel, Ethanol blending is expected to significantly improve with the potential for introducing new ethanol producers to the blending. Based on this assessment, the policy targets will most likely not be reached by 2030, hence as the policies are set to be reviewed the identified barriers in 2024 to meet the policy objectives need to be addressed.

At the meantime, although the assessment indicated a reduction in potential in the policy impact scenario, the two polices will have a positive impact in GHG emissions reduction in the energy sector and the potential GHG emissions reduction is still within Zimbabwe's Nationally Determined Contribution (NDC) target. It can conclude that the polices can contribute significantly to the country's NDC target hence a potential for the country to meet its emission reduction commitment under the Paris Agreement. Furthermore, the NREP and NPF have a positive impact on the following sustainable development goals (SDG), SDG 3 (Good health and Wellbeing), SDG7 (Affordable and Clean Energy), SDG8 (Decent Work and Economic Growth), and SDG 13 (Climate Action) as the major SDG impact categories. The analysis recommends the development of a robust Implementation tracking framework for monitoring reporting and verification of the policies during implementation to ensure transparency and accountability in policy implementation Capacity building on the application of the methodologies for experts and government officials to use the guidelines for policy impact assessment is required.

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