Executive Summary

This part of the report outlines project profiles based on technology action plans elaborated in part III on (i) geothermal for electricity generation, (ii) biomass gasifier for off grid electricity, (iii) energy efficiency and management systems, (iv) sustainable charcoal value chain, (v)biofuels, development – biodiesel, and (vi)sustainable agriculture . The project profile briefly discusses the estimated budget, rationale, brief technology description, objectives and strategies, actors, timing and keys for success for the prioritized technologies.

1.0 Background

This part of the report outlines project profiles based on technology action plans elaborated in part III on (i) geothermal for electricity generation, (ii) biomass gasifier for off grid electricity, (iii) energy efficiency and management systems, (iv) sustainable charcoal value chain, (v) biofuels, development – biodiesel, and (vi) sustainable agriculture . The project profile briefly discusses the estimated budget, rationale, brief technology description, objectives and strategies, actors, timing and keys for success for the prioritized technologies.

1.0 Technology Action Project Profiles

1.1 Geothermal for electricity generation

Technology Action Title	Development of geothermal for electricity generation into the national grid
Estimated budget	US$ 470,000
Rationale	Zambia's electricity supply mix is predominantly hydro at 99.9%. Recent studies have indicated that runoff is expected to be affected in the future due to variations in climate change affected by drought in some critical years. This will lead to interruptions in the electricity supply. For example in the drought year of 1991/1992, there was immense load-shedding of electricity in the country which affected the economic wellbeing. Further, electricity demand in Zambia is projected to increase at 4% per annum. This will lead to exhaustion of the electricity potential estimated at 6000 megawatts in the year 2030. In view of the aforegoing, it is important that Zambia starts integrating renewable energy into the national grid aimed at broadening the energy mix and enhance make it more secure. Zambia has reasonable renewable energy resources. For example, Zambia is through a private company conducting field reconnaissance including hydrochemistry on all identified geothermal targets, geophysics on the more prospective sites and is planning to conduct preliminary drilling at its first target, a low enthalpy system in a shallow sedimentary setting.

Brief technology description	Geothermal energy is thermal energy generated and stored in the earth. This energy can be used to generate electricity using technologies such as dry steam power plants, flash steam power plants and binary cycle power plants. Geothermal uses no fuel, and is therefore immune to fuel cost fluctuations. Geothermal electricity production has been successfully developed in regions with hydrothermal manifestations (e.g., geysers and hot springs). For example the rift valley where Kenya is currently producing electricity around 250 MW. Zambia lies in the rift valley and has similar manifestations like Kenya and therefore has good potential which warrants serious investigations. Geothermal power is a stable source of energy as it is independent of weather circumstances. It is therefore a reliable source of energy and commonly has a high capacity factor of between 70 and 90% of installed capacity, which makes it applicable for both base and peak load. Geothermal power production has the environmental benefit of being a relatively clean. The contribution to greenhouse gas emission reduction from geothermal.
Objectives and strategies	The main objective of the action is to deploy geothermal for electricity generation into the national grid. The main strategies include; (i) development of framework for provision of financing for geothermal exploration, (ii) capacity development on specialized skills on geothermal exploration and development, (iii) formulation of support policies through provision of fiscal incentives and public finance, (iv) establishment of appropriate legal and regulatory framework for geothermal exploration and development
Actors	DOE, REA,ZDA, private sector, Bilateral and Multilateral organizations Geological department , NISIR, UNZA, private sector, Ministry of Mines, Energy and Water Development, Ministry of Finance, consultants and stakeholders
Timing	36 months
Keys for success	Engagement of all stakeholders and actors, monitoring and evaluation.

1.2 Biomass Gasifier for off grid electricity generation

Technology Action Title	Deployment of biomass gasifier for off grid electricity generation
Estimated budget	US$ 120,000
Rationale	Rural electrification rate in Zambia is relatively low estimated at 4%. Current efforts to increase rural electrification access focus on grid extension. Despite these efforts few of population living in rural areas of Zambia will be served by grid connections during the next decade Although, generally grid extension is possibly the lowest cost per kWh delivered for many remote populations, grid extension becomes less cost effective due to longer distances and load loads prevailing in such locations. In such situations, RE is becoming increasingly more competitive. Some of the renewable energy technologies which can contribute to increase access in rural areas serving as off-grid systems include micro/pico hydro, biogas digesters, small gasification systems, village scale mini grids/ hybrid system and solar PV. In this case, biomass gasifier has been prioritized as a technology which can contribute to increased rural electrification in Zambia, in particular to meet REAs strategic objective of "Rural Electrification for all by 2030''
Brief technology description	Biomass gasification for off grid applications involves production of gaseous fuel called producer gas used in a gas engines and modified gasoline and diesel internal combustion engines for electricity generation. Producer gas can also be used to produce steam which is then expanded on a steam reciprocating internal engines to produce electricity. Besides providing electricity to isolated areas in rural areas, it has the additional benefit of creating employment for the feedstock providers who are mostly small and medium scale farmers and foresters.