ENERGY, WATER, ENVIRONMENT & ADVISORY SERVICES

ASTER INTEGRAL PVT LIMITED
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Innovative solutions!!

SERVICES CATALOG
ENERGY

We offer services for feasibility studies, engineering design, procurement assistance, construction supervision and project management for the following fields:

- Power generation from Solar-Photovoltaics (standalone and grid-connected power plants), Hydropower, Biomass (Wood residues and Biogasification), Wind energy
- Power transmission and Distribution (132kV, 33kV, 11kV, 415/240V voltage standards)
- Rural electrification including medium and low voltage networks as well as customer service connections
- Hybrid and Standalone mini-grid power supply schemes for isolated remote communities
- Network studies, Dynamic and Transient stability study for power networks and distributed power generation systems
- Energy efficiency, Power audits and retrofits for power factor correction
- Electrical installations for factories, commercial buildings and Residential houses
- Power market studies, Energy economics and financial analysis
- Solar-thermal technology for related applications like water heating for domestic, institutional and commercial applications
- Power backup and Uni-interruptible Power Supply systems based on online technology for commercial buildings, institutions and Residential houses

Example-1: Hydropower development and implementation

ASTER INTEGRAL is also providing various expert services for the proposed 10MW Nkusi Hpp, 1.2MW Pachwa Hpp, and 4.5MW Waki HPP including power market studies, Network studies, loadflow analysis, dynamic and transient stability studies; and technical assistance in PPA negotiations for the proposed 4.5MW Waki HPP being implemented by Hydromax (Nkusi) Limited.
Example-2: Solar PV systems (commercial, institutional, Residential and grid connected systems)

ASTER INTEGRAL was contracted by Emerging Power FZC/Z-One Holding of UAE to provide specialized services for the 15MWp grid-connected solar power plant, proposed at Bufulubi-Mayuge district.

We were contracted by Danish SunEnergy to provide services for 2x10MWp grid connected solar plants proposed at Gulu and Masindi, for Voltage-Frequency Dynamic and Transient Stability analysis of the power plant effects when connected to the national grid at Gulu 33kV substation and Masindi 33kV substation.

Our staffs are assisting Newplan Limited in construction supervision including start-up, commissioning and handover of the 635kWp hybrid solar plant being implemented by KIS, at Kalangala-Bugala Island on lake Victoria. The Plant has backup 1MVA diesel generators, 600kW grid-Tie inverters, 400kW Island bi-directional inverters with a 480x910Ah/2V with Aqua-gen Recombiner technology battery bank.

We have also implemented several commercial and institutional solar-PV projects for hybrid power supply to Kolping offices in Hoima, Kampala-Kolping Hotel at Kampala; Nile Guest House in Njeru town council, together with a large number of institutions/schools in Mukono, Mityana, Gulu, Lira, and urban homes in Kiwatule, Naguru and Wakiso district.
WATER SUPPLY

We offer services for feasibility studies, engineering design, procurement assistance, construction supervision and project management for the following fields:

- Solar-water pumping, for water needs ranging between 1m3/day to over 300m3/day powering small DC pumps and large-three phase AC pumps with electric motors requiring over 30kW power.
- Piped water supply schemes for small towns and rural growth centres
- Back-up support for operation and maintenance as well as specialized training and capacity building for water scheme operators

**Example-1: ERT-Water Project**

29.0kWp with a 22kW 3-phase AC auto-pump drive solar-water pumping system at Anaka, Kaabong and Koboko, Northern Uganda, delivering over 150m3/day. Aster Integral was contracted by Ministry of Water and Environment/DWD-Rural Water program to provide consulting services for technical planning, feasibility study, engineering design, tendering support and construction supervision and managed implementation of 33 such facilities in small towns in Northern Uganda, WestNile and Northeastern Uganda under ERT-II Water project, financed by World-Bank-IDA credit/ GEF Grants and NORDIC Development Fund

**Example-2: Solar-powered mini-piped water project for rural areas in Uganda**

Aster Integral was contracted by Ministry of Water and Environment/DWD-Rural Water program to provide consulting services for technical planning, feasibility study, engineering design, tendering support and construction supervision for decentralized piped water supply schemes for 60 rural centers in Uganda under AfDB financing.
ENVIRONMENT

We offer services for environment impact assessments for the following specialized facilities:

- Hydropower plants
- HV Power Transmission lines
- MV Power distribution lines
- MEGGA WATT-Range solar-PV grid connected plants
- Decentralized power generation plants, stone quarries and factories

Aster Integral is assisting Emerging Power FZC of UAE to carry out the ESIA for the proposed 15MWp solar plant proposed for Myanzi-Kiganda area and Mayuge area to be implemented on 250acres of land at Bufulubi village.

Aster Integral was contracted by Hydromax limited to carry out the ESIA for the 46km Power line evacuating the 9MW generated from Buseruka HPP; including the update of the Environmental Statement for the Hydropower site.

Aster Integral was also contracted by DOTT Services to carry out ESAI for the Masindi Stone Quarry as well as carry out the Environment audit for the Ssemuto stone Quarry.
ADVISORY SERVICES

Combined with our Sociology, Statistics, Economics and Monitoring & Evaluation teams, We offer specialized advisory services in the field of water and energy related to the following topics:

- Socio-economic studies
- Baseline studies
- Market studies for water and energy
- Eligibility assessment and technical appraisal studies
- Performance assessment studies
- Impacts assessment studies
- Independent verifications and audits
- Monitoring and evaluation of Water and Energy projects
- Training, Capacity building and institutional support services

Aster Integral was contracted by Hydromax (Nkusi) Limited to provided services for Socio-economic and Power Market studies during the feasibility of the 4.5MW Waki Hydropower plant.

Aster Integral as also provided baseline studies, eligibility studies, performance assessments and impacts studies for the 33 Water supply schemes implemented under the ERT-II Water project; as well as for the 60-rural water schemes to be implemented under the solar-powered mini-piped water supply project.

We are also providing specialized consulting services to MWE/DWD-Urban Water program; for the management of the O&M framework contracts for back-up support to sustainable operation of 51-solar water schemes in Northern, NorthEast and Western Uganda.
INNOVATION PRODUCTS UNDER PROMOTION

“SELF-SUSTAINING RENEWABLE HOMES™” Get relief from blackouts and realize savings on utility bills

This is a concept in which the solar engineers at Aster-Integral have packaged sustainable energy-water supply solutions that relieve a home-owner in the urban or peri-urban areas from high un-fair utility bills. The technology saves a domestic home owner nearly 90% of all utility bills, and offers nearly 99% energy and water supply reliability at affordable one-time costs. Operation and maintenance of these facilities is almost zero cost, with no need for human operator, and very limited repairs.

The Concept once implemented ensures that the utility services for electricity (such as from UMEME) and water (such as from NWSC) only act as backup in cases when nature has dictated. Energy and water supply all depend on the abundant God-given solar energy (sunshine) and rain. This gives a homeowner more comfort and value-for-money when he has no worry of utility load-shading or dry water taps.

Energy supply: Solar-panels are used to supply electricity while solar-water heaters are used for heating water. These are fully integrated, and automated in hybrid with the Utility power/water supply. System is maintenance free and requires no human operator.

Water supply: Rain water is harvested and stored in surface or underground tank. The water is then pumped to an over head tank using a solar-powered pump. Energy to the pump is supplied by the same solar system that was installed originally. No need for a new system unless otherwise specified by the engineer. (See separate brochure for details)

Applicability and costs: The “Self-sustaining Renewable Homes” products package is highly applicable in Uganda due to the abundant renewable non-exhaustible solar-energy (sun-shine) and rain water during the rainy seasons or under-ground water. The equipment is available at affordable rates on the local market; however, this requires an expert from Aster Integral to carry out engineering design, fully integrate the system components, procure the system components, install and commission the facilities.

Cost-benefit and Pay-back: The “Self-sustaining Renewable Homes” concept is cost-effective and offers reliability of supply of energy and water complementing the conventional utility services. The payback is about 24-calender months for hot water systems and 3-5 years for hybrid solar-PV systems which supply the electricity.

System maintenance: All systems are installed on the FIT & FORGET principle. They are fully automated or semi-automated on the request of the Client and are maintenance free. There is no need for a dedicated human operator, and offer flexibility for “Parental Control” by use of simple on/off electric switches.

INNOVATIVE SOLUTIONS  ©2014  www.aster-integral.com
SOLAR SUPPORTED DRIP IRRIGATION

Solar supported drip irrigation system for agri-business. Small sizes of such systems range between 240-500Wp, delivering 6,000liters per day, enough to irrigate 3 acres of land daily. Large systems have ranges above 1200Wp of solar-PV system requirements and deliver over 20,000litres per day. We can power irrigation water pumps of capacity up to 50kW delivering over 350,000ltrs of water per day.

Energy supply: Solar-panels are used to supply electricity using automated inverter systems and pump controllers to power the pump. The system starts working at 8am in the morning till 6:00pm in the evening without stalling even when there are mild cloudy conditions, except during raining period with heavy clouds.

Water supply: Rain water is harvested and stored in surface or underground tank or borehole can be drilled and water is pumped from underground borehole. The water is then pumped to an over head tank using a solar-powered pump and flows to the agricultural field by gravity.

Applicability and cost: The products package is highly applicable in Uganda due to the abundant renewable non-exhaustible solar-energy (sun-shine) and rain water during the rainy seasons or under-ground water. The equipment is available at affordable rates on the local market; however, this requires an expert from Aster Integral to carry out engineering design, fully integrate the system components, procure the system components, install and commission the facilities.

Cost-benefit and Pay-back: The concept is cost-effective and offers reliability of supply of energy and water for drip irrigation and greenhouses. The payback is about 24-calender months depending on the acrage being irrigated and the volume of agro-produce.

System maintenance: All systems are installed on the FIT & FORGET principle. They are fully automated or semi-automated on the request of the Client and are maintenance free. There is no need for a dedicated human operator.
COMPleted Projects

4.5MW Waki HPP-Interconnection design, Network study, Load-flow Analysis, Transient and Dynamic study: Consultancy services for engineering design of the HPP interconnection power line, network study, loadflow analysis including transient and dynamic stability study analysis for the 4.5MW Waki hydropower project. We are also providing technical assistance for PPA negotiations and Licensing process of the power plant – (year-2014 Completed)

Solar Water Pumping Systems under Energy for Rural Transformation: Consultancy services for implementation support of the Energy for Rural Transformation Project ERT-II water project for 41 water supply and sanitation water schemes financed by the World Bank/ IDA and NDF. Services offered included: solar resource assessment, water resources assessment, socio-economic survey, engineering surveys and designs, tender documentation, Construction supervision, capacity Building, Institutional Support, developing of IEC materials, training of water boards and private operators, information dissemination. (September 2010-2014)

9MW Buseruka HPP: Network studies and voltage and transient stability studies including technical assistance in plant commissioning and interconnection to the national grid at Kinubi-Hoima substation plus development of proposals for for grid stability and reliability to take-up the 9.0MW power to be generated at Buseruka HPP (year 2013)
Hydropower Feasibility Study-Hydrological analysis and power/energy estimations: Consultancy services for feasibility and hydrological studies of the proposed mini-hydropower projects located on river Mitano, Esia and Ndugutu; including plans for interconnecting/evacuation power lines to the national grid. (year2010-2011)

33kV power transmission line for 9MW Buseruka HPP: Consultancy services to conduct Baseline Survey, Design and EIA for 33kV power transmission line and environs from the 9MW Buseruka Hydro Power Plant. We also provided services for review and update of the ESIA for the Dam Site and Power plant. (year2008-2010)

Hybrid Power system for NILE SEC Campus: Consultancy services for Energy audit, System design and engineering services, plus tendering and construction supervision and training for the power supply improvement and UPS power system for the Nile-SEC campus of Nile-Basin Initiative. (year2011-2012)

Waki HPP-Power market studies and Load-flow Analysis: Consultancy services for baseline studies, energy demand in region, peak power demand, and conducting a load-flow analysis for the 4.5MW Waki hydropower project – (year2012-Completed)
Buseruka HPP Commissioning and Synchronization: ASTER Integral was contracted by Hydromax Limited developers of the 9MW Buseruka Hydro Power Plant to offer technical assistance and engineering expertise for the commissioning of power plant, synchronization of plant, and 33kV power line and interconnection at Kinubi Power substation for the Buseruka HPP project. (year 2011-2012)

Kitimbwa mini-piped solar water pumping scheme: Consultancy services for System engineering design, procurement and construction supervision and training for the mini-piped solar water pumping scheme at Kitimbwa, Kayunga district. Services offered: solar resource assessment, water resources assessment, socio-economic survey, engineering surveys and designs, tender documentation, Construction supervision, capacity Building

Environmental impact assessment for the quarry at Masindi: Consultancy services for EIA involving identification of environmental aspects and field investigations including assessment and analysis. The services offered include: Description of Physical and Biological Environment, Social Environment, Legal and Institutional Aspects, Environmental Impacts, Mitigation Measures, Monitoring and Recommendations (year-2009)

Environmental impacts audit for the quarry at Ssemuto: Consultancy services for EIA involving environmental aspects and field investigations including assessment and analysis. The audit and environment monitoring activities include: monitoring the physical and biological Environment (current state versus previous); description of Social Environment (current state versus previous); legal and Institutional Aspects regarding mitigation measures and effectiveness of interventions taken; environmental Impacts (air and noise pollution) mitigations and their effective; Mitigation Measures, Monitoring and Recommendations for Project affected persons/year-2009
# Project Title

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<thead>
<tr>
<th>Project Title</th>
<th>Country</th>
<th>Client</th>
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<tr>
<td><strong>10MW Nkusi HPP:</strong> Contracted by PA Technical Services and Freyer of Norway, we are providing various services including Environmental and Social Impacts Assessment, Power line design and detailed Network Studies, Dynamic and Transient Stability studies as well as, technical assistance for GETFIT Application. 2014-Ongoing</td>
<td>Uganda</td>
<td>PA Technical Services/Freyer AS</td>
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<td><strong>1.4MW Pachwa HPP:</strong> Contracted by Flow Power 1 and Freyer of Norway, we are providing various services including Environmental and Social Impacts Assessment, Power line design and detailed Network Studies, Dynamic and Transient Stability studies as well as, technical assistance for GETFIT Application. 2013-Ongoing</td>
<td>Uganda</td>
<td>Flow Power AS /Freyer AS</td>
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<td><strong>Monitoring, Evaluation and audit of Energy sector projects</strong> financed by Norwegian Government; being sub-contracted by KPMG as the main consultant. The scope of projects includes Feasibility of Isimba HPP; six 33kV power line projects for rural electrification, three HVAC power transmission lines of 132kV and 220kV including Nkenda-Hoima, Hoima-Kafu, Mirama-Kikagati 132kV and Hoima-Kafu 220kV – 2013-Ongoing</td>
<td>Uganda</td>
<td>KPMG/RNE-GoN</td>
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<td><strong>Independent Verification Agent</strong> working with KPMG for monitoring and evaluation of customer service connections implemented under the OBA program, financed by Worldbank; under the Rural electrification Agency. We are offering services for verifying the standards of service connections, numbers of services connections and their authenticity as well as their sustainability for a period of 4-years. 2014-Ongoing</td>
<td>Uganda</td>
<td>KPMG/REA</td>
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<td><strong>Maintenance framework contract for backup technical support to water schemes using Solar-PV water Pumping systems in Uganda:</strong> consultancy services for technical support to monitoring and o&amp;m management in the repair and replacement of system components of solar powered water supply systems under the ert (water component) in uganda; commissioned by MWE/DWD-Urban Water. JWTL is providing technical backup support for O&amp;M organization and management, including Condition based observation and monitoring of solar water pumping schemes, as well as Monitoring and supervision of the framework contractor for supply, maintenance and replacements; plus training and capacity building of scheme operators/technicians/MWE engineers and institutional support. 2014-Ongoing</td>
<td>Uganda</td>
<td>MWE</td>
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<td><strong>Waki HPP:</strong> Network studies and voltage and transient stability studies, including study of the interconnection arrangements to the national grid, as well as developing proposals for grid stability and reliability to take-up the 4.5MW power to be generated at Waki HPP; including assistance to GETFIT and PPA Negotiations-2012-Ongoing.</td>
<td>Uganda</td>
<td>HYDROMAX (NKUSI) LTD</td>
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<td><strong>Grid connected Solar-PV-15MWp power plant:</strong> Interconnection arrangements and ESIA for the proposed 15MWp solar-PV based power plant at Mayuge, under license to be developed by EMERGING POWER FZC of UAE. We are supporting the developer for the feasibility study and the environment impact assessments including technical assistance to PPA Negotiations (2013-Ongoing)</td>
<td>Uganda</td>
<td>EMERGING POWER FZC</td>
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<td><strong>635kWp Hybrid Solar-PV power plant:</strong> Consultancy services to NEWPLAN in the Development of a 635kWp-hybrid with 1MVA backup generators solar-PV power plant for Kalangala Infrastructure Service (KIS), including a 40km 33kV power distribution line and associated low voltage network plus customer service connections. Services</td>
<td>Uganda</td>
<td>NEWPLAN/KIS-INFRACO</td>
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<td>Service</td>
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<td><strong>offered included:</strong> geo-technical studies, socio-economic survey, engineering surveys and designs, Construction supervision, and plant commissioning.</td>
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<td>(2013-ongoing)</td>
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<td><strong>Solar Powered mini-piped water supply schemes:</strong> Consultancy services for Technical Planning, Design and Construction Supervision of Solar powered piped water supply and sanitation schemes in 60 districts of Uganda project financed by the African Development Bank.</td>
<td>Uganda</td>
<td>Services offered included: solar resource assessment, water resources assessment, socio-economic survey, engineering surveys and designs, tender documentation, Construction supervision, capacity Building, Institutional Support, developing of IEC materials, training of water boards and private operators, information dissemination. (March 2013-ongoing)</td>
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