ESTABLISHING THE REAL TIME MULTIDIMENSIONAL ENERGY MANAGEMENT SYSTEM ["RMEMS"] [ALSO KNOWN AS AN "ENERGY VAULT"] FOR THE KANNALAND LOCAL MUNICIPALITY AS THE FIRST ONE OF THE 120 IMPLEMENTATION PROJECT SITES IN SOUTH AFRICA

FEASIBILITY STUDY REPORT: EXECUTIVE SUMMARY

Submission Period: November 2018

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Project Reference:	InovaSure Energy Vault: Kannaland Local Municipality et al
Project Description:	Real Time Multidimensional Energy Management System ("RMEMS")
Service Provider:	VARIOUS (for the Kannaland Local Municipality PPP Project: INOVASURE and Collaborators)
Project No:	1

PART C: PREPARATION, REVIEW AND AUTHORISATION (for Internal Use – Quality Control)

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EXECUTIVE SUMMARY

6.1 Background

Most people recognize the importance of electricity as an essential input to manufacturing and to economic activity in general. Changes in electricity prices impact on each and every person, and this has an effect on economic activity. It is important to take cognizance of the strategic importance of the proposed development by **INOVASURE** (PTY) LTD **(INOVASURE)** in conjunction with specific Municipalities (such as the Kannaland Local Municipality) and to analyse the risk of reliance on foreign energy suppliers, the tariff hikes and the effect of perpetual power interruptions on the South African economy.

South Africa has enjoyed low electricity tariffs for a long period of time. Investors have previously been attracted to the electricity intensive sectors as a result of price competitiveness. Low electricity prices compensated for other disadvantages such as volatile exchange rates and non-flexible labour. The price of electricity was often lower than the cost of producing it. Real electricity prices decreased significantly under the price compact announced in 1991. The main objective of decreasing the real price of electricity was to increase the South African economic growth rate. However, with the high economic growth levels of 5.6% in 2007, Eskom started to face new challenges, such as higher electricity demand by customers, reserve margin problems, capacity constraints resulting in an energy crisis, and shutting down strategic economic Sectors for days on end. Eskom has requested industry to voluntarily ration electricity consumption at 10% less than historical levels of electricity demand for at least the next five years.

Eskom found itself without financial provisions to react to the need for new generation capacity as demand for electricity began to near the available supply. Eskom was forced to look abroad for loans as well as to increase electricity tariffs to much higher levels.

Insufficient electricity supply and perpetual interruptions are increasingly recognized as serious constraints for sustained economic growth.

Increasing electricity prices just after a world financial crisis and consequent slowing economic growth, resulted in many companies then and now facing challenges like maintaining and increasing their profit margins. What this translated to for the various energy intensive industries, was that in a three year period, electricity prices would have almost doubled and would increase further in the future. It would be a very difficult time for businesses and, although it was not expected to lead to a situation of closures, industries could struggle to maintain profitability levels.

It was found to be technically feasible for Renewable Energy Technologies (RET) to replace the present fossil fuel electricity infrastructure, however; economic barriers remained the primary impediment. PV has been considered a clean, sustainable, renewable energy conversion technology, whilst reducing the adverse anthropogenic impacts of fossil fuel use.

6.2 The Needs of Municipalities (including the Kannaland Local Municipality)

In developing the framework and content of this comprehensive Feasibility Report for the intended submission to the Development Bank of Southern Africa (DBSA), the needs of Municipalities were acknowledged. The needs of the Kannaland Local Municipality were initially considered for review for another 119 sites in South Africa.

To best understand the needs of Municipalities, the Kannaland Local Case is referred to in this Feasibility Report.

In the case of the proposed RMEMS (Energy Vault) development for the Kannaland Local Municipality a financial model was adopted that was purpose developed over many years with many iterations. The latter mentioned model[1] was developed in line with the original Memorandum of Understanding (MOU)[5] that was concluded with the Kannaland Local Municipality on 17 September 2012 by Sun Graft (Ltd) in order to have Sun Graft and its collaborators investigate all possible aspects of dealing with service delivery matters relating to power and water reticulation This MOU was approved by the Municipality.

The purpose of this MOU was as follows (extract from referenced MOU):

1 PREAMBLE

The purpose of this Agreement is to define the basis for the supply and funding of services and/or products to **KANNALAND** by **SUN GRAFT** concerning:

electricity, electricity generating products, electricity saving products and grey water treatment systems in all areas under the control of the KANNALAND local municipality;
(the "Field")

and whereas **KANNALAND** has a need and obligation to supply electricity and to manage grey water and the treatment thereof in all areas under its jurisdiction;

and whereas **SUN GRAFT**'s business is to critically evaluate possible solutions related to energy provision and to provide efficient energy solutions and energy saving products to clients in the areas of solar photovoltaic systems, solid state lighting, solar heating, energy-from-waste and waste treating systems;

and whereas **SUN GRAFT** is, through its leasing company, willing and able to fund the solutions and to provide these solutions and technologies to **KANNALAND** on a purchase-, take-off or lease basis;

6.3 The Involvement of INOVASURE

Sun Graft in due course transferred and delegated its rights in terms of the referenced MOU to **INOVASURE**, as the referenced "leased company" and suitable entity to perform the highly complicated tasks that the MOU required.

Following this transfer of the rights granted in terms of the referenced MOU, **INOVASURE** proceeded, in the years following the conclusion of the MOU, to carry out various Feasibility Studies with regard to the provision of electricity, potable water and other concomitant service delivery aspects such as education;

[1] [5] "Memorandum of Understanding (MOU) 1", dated 17 September 2012

During the process of carrying out the various Feasibility Studies, INOVASURE designed various integrated systems and installations in order to fulfil the requirements of the MOU in terms of its referenced Project Proposals, as set out in clause 4 of the MOU. Over time it became clear to **INOVASURE** and its collaborators that in developing the various Project Proposals, their outcomes highlighted that the various solutions and proposed implementations worked best in an integrated manner as one system, which it termed an "Energy Vault" (and a "Water Vault" respectively);

INOVASURE, once it determined that the solution to the service delivery problems with the Kannaland Local Municipality, and in fact any other Municipality, lay in the design and implementation of an Energy (and Water) Vault, proceeded to refine the operation of the said Energy (and Water) Vault and to develop Financial Models to support the various aspects of the Feasibility Studies;

The developed **INOVASURE** Energy Vault has subsequently been refined to a unique large [20MW-53MWh] battery storage device supported by balance of systems [such as electricity meters and LTE communication devices] and renewable energy sources [such as 25MW Photo Voltaic plants]), as well as smaller versions of the Energy Vault used in smaller Municipalities and also for informal settlements, and which will be installed at the Kannaland Local Municipality (where it is expected that two Energy Vaults will be implemented in phases), or in fact any other Municipality in the RSA, in fractions or multiples as according to the size and needs of the relevant Municipality.

For clarity purposes, the **INOVASURE** Water Vault is a concomitant accumulation of water purification and / or desalination and / or management devices and installations, including water meters, which operate in conjunction with the **INOVASURE** Energy Vault.

For further clarification purposes, the **INOVASURE** Thin Client Technology devices are specific devices and systems, including unique server cloud technologies, which are designed and installed by **INOVASURE** to work in conjunction with the Energy (and Water) Vault/s and which provide WIFI capability to all home users which are fitted with pre-paid electricity and water meters as part of the Energy (and Water) Vault implementations and which also provide educational content. The Thin Client Technology also operates in informal settlements in providing shack electrification and concomitant educational content.

INOVASURE, in refining its Energy (and Water Vault) systems, also investigated the various laws and regulations that govern the provision of such, and determined that the Kannaland Local Municipality, and in fact any other Municipality in South Africa, may utilise its own constitutional right to generate, distribute, transmit and buy and sell power (as well as to manage its water resources and information communication technology needs). This is encapsulated in Section 154 of the Constitution and Section 184 of the Municipal Structures Act. **INOVASURE** determined therefore that the Kannaland Local Municipality does not require a PPA (Power Purchase Agreement) with **INOVASURE** to operate is services and provide its products, nor is **INOVASURE** an Independent Power Producer (IPP).

INOVASURE has, in carrying out its Feasibility Studies for the Kannaland Local Municipality, also secured the necessary collaborators to implement its Energy and / or Water Vault installations, coupled with the Thin Client Technologies.

INOVASURE, as specifically required by the referenced MOU in clause 1, has also secured the required funding and technological underwriting from its collaborators, services providers and suppliers to enable it to facilitate the funding of the Energy (and Water Vault) combined Project Proposals and the concomitant Thin Client Technology installations at the Kannaland Local Municipality, either in part or whole.

The financial requirement of the referenced combined Kannaland Local Municipality **INOVASURE** Energy Vault project is determined by the accumulated cost of all its components, the capital expenditure to develop the Energy Vault and the working capital to allow it to become operational. Similar financial requirements apply to the Water Vault technologies which may be employed at the Kannaland Local Municipality, which will range from desalination plants of various sizes and capabilities, purification plants of various types, water management meters, water savings devices, water extraction devices and suchlike. The Thin Client Technology and installations are similarly costed to apply to the **INOVASURE** Energy Vault project at Kannaland Local Municipality. Based on the research and preparation that was done over the past 6 years at Kannaland Local Municipality, it has therefore been determined that the **INOVASURE** Energy Vault / Thin Client Technology project will cost approximately R1.03 billion per Energy Vault for a 25MW Photo Voltaic Power Plant, 20MW-53MWh battery storage device, electricity measurement and management devices (meters) in all houses (approximately 25 000 per Energy Vault), off-grid systems for the electrification of informal housing units, LTE communication devices and streaming of educational material and other systematically operational devices that

provide Energy and Education Security to **INOVASURE's** clients – the Municipalities and their citizens. Two Photo Voltaic model power plants of 25MW each are contemplated for the Kannaland Local Municipality over various phases due to the unique location in terms of irradiation for Solar Power Plants, and the fact that electricity can be exported by Kannaland to other Local Municipalities in the District as an additional revenue stream. Further multiples of the **INOVASURE** Energy Vault model may also be contemplated, should the need arise in terms of the growth of the Kannaland Local Municipality or the surrounding other Local Municipalities.

For clarity purposes (since the Water Vault is not included in this Feasibility Study but intended as a separate phase) the financial requirements of the **INOVASURE** Water Vault are determined by the current needs of the Kannaland Local Municipality and its immediate status with regard to available water resources. The approximate cost of the proposed Water Vault system for Kannaland Local Municipality is linked to the cost of the Energy Vault, since approximately 80% of the cost of water is linked to the cost of the power to supply the water.

INOVASURE has recommended to the Kannaland Local Municipality that the Energy Vault referenced above be implemented as the first phase of the Project Proposal for energy, as a PPP, starting with the full battery storage module of 53MWh, 1MW of PV power and ramping up in phases to a 25MW PV plant and then later a 50MW PV Plant for power export purposes. The envisaged Water Vault be implemented as the second phase, once the required power capacity has been implemented.

Following extensive communications and presentations and feasibility studies, Kannaland Local Municipality concluded a Memorandum of Agreement and Energy Security Management and Administration Agreement ("ESMA Agreement") with **INOVASURE** within which the project and its parameters were detailed.

It bears mention that the Kannaland Local Municipality believes that it has complied with the requirements of the Municipal Supply Chain Management (SCM) Regulation 32 of 2005 (Regulation 32) as according to the Municipal Finance Management Act 56 of 2003 in recommending that any other Municipality could also make use of the services of **INOVASURE** and its various collaborators in the provision of the ***ENERGY SECURITY*** Program.

South Africa's power utility, Eskom, has stated in writing, over the years, that it supports **INOVASURE's** energy storage program with possible rebate programs. However, **INOVASURE's** need for support from Eskom is minimal in its business strategy provided in its Feasibility Studies to Kannaland Local Municipality, primarily since **INOVASURE** is not an IPP, whilst it in turn can provide Eskom (albeit indirectly) and the RSA as a whole (when a number of the Energy Vaults similar to the ones developed for Kannaland Local Municipality are installed countrywide), with a viable "black start" capability (the ability to restart the power grid in the event that it trips) and assist to take the pressure off the need to upgrade the distribution network of many of the other Municipalities in South Africa for at least another decade, benefiting both Eskom and the RSA as a whole.

The National Treasury of South Africa, through its Government Technical Advisory Centre (GTAC) Agency, handles, amongst other things, the manner in which Public Private Partnerships (PPPs) are approved and finalized. The GTAC has indicated its support of the various initiatives of **INOVASURE**, and in particular for the **INOVASURE** Energy (and Water) Vault Program that it has been developing at the Kannaland Local Municipality, provided that **INOVASURE** partners with the Municipality as a participant in a PPP under the auspices of the DBSA. The referenced GTAC support includes specifically the period of 25 years required for the effective development, implementation and management of the proposed **INOVASURE** Energy and ICT Technology PPP projects (based on the abovementioned ESMA Agreement/s) for the implementation of the **INOVASURE** Energy (and Water Vault) Program, with the concomitant Thin Client Technology systems to provide Education Security, starting with the MOA and ESMA Agreement concluded between Kannaland Local Municipality and **INOVASURE**. The National Treasury's GTAC division has indicated its provisional willingness to approve the **INOVASURE** Energy Vault project with Kannaland Local Municipality as a PPP in the event that it requests it to register the project as a PPP under the auspices of the DBSA. In this regard, both the National Treasury GTAC PPP division and the DBSA have advised that they require suitable Transactional Advisors to carry out a due diligence process on behalf of the Kannaland Local Municipality to confirm the legal, technical and financial aspects of the proposed project to be viable and acceptable. This process has been implemented and is ongoing.

It bears mention that the African Regional Centre (ARC) of the New Development Bank (NDB) is an important contributor to sustainable infrastructure development in South Africa and is a participant in the development agenda of the continent. The ARC is the first regional office of the NDB that was established in August 2017 and as such represents the NDB in

Africa. Assisted by the ARC, the NDB works with the Government of South Africa and other strategic partners, including development finance institutions such as the DBSA, on strengthening its project pipeline, focusing specifically on sectors such as water, transport, energy and urban development. The ARC specifically works closely with the Government, public and private sector agencies, and other relevant stakeholders in South Africa to identify projects that have strong development impact to be supported by the NDB. **INOVASURE** has received indication by the ARC that Energy Vault project funding, directed through the NDB, may be managed under the auspices of the DBSA for the **INOVASURE** Kannaland Local Municipality Energy Vault project, as well as further ensuing Energy Vault projects.

The Central Energy Fund Group of Companies (CEF) is a Schedule 2 State Owned national energy utility entity with a focus on oil, gas, coal and renewable and clean energy options reporting to the Department Of Energy (DoE) as its primary shareholder. The organisation operates in South Africa with strategic partnerships in Ghana and Mozambique. The company derives its mandate primarily from the *Central Energy Fund Act No. 38 of 1977.* The Act mandates the CEF Group to contribute to the national security of energy supply through commercial operations and projects, as well as investing in developmental projects, all the while operating in a highly competitive and capital intensive environment with the need to be a profitable entity through its subsidiaries and associates. The dual mandate of Commercial and Developmental obligations requires a tight balancing act between the two imperatives given the strategic nature of the national assets that The Group holds and its obligations as defined in the National Development Plan (NDP). The CEF Group thus has to contribute towards the triple challenges of Poverty Alleviation, Promoting Equality and Creating Jobs as well as supporting the economic growth efforts of the Shareholder. The CEF Group supports **INOVASURE** in its endeavours to develop and institute the Energy (and Water) Vault Program in South Africa.

Certain matters proposed were accepted by the Kannaland Local Municipality for **INOVASURE** to fund, construct, install and operate the proposed Energy Vault i.e: The Municipality would in due course own the installed power plant (received onto its balance sheet) which would be operated by **INOVASURE** for the period of 25 years in terms of the ESMA Agreement referenced above, as suitably converted to a PPP Agreement under the auspices of the DBSA by the relevant Transactional Advisors, and the Municipality would assist with the interconnection arrangements with Eskom and **INOVASURE** would carry the cost of the connection of the substation to the Energy Vault.

It is proposed by **INOVASURE** that the case study of the Kannaland Local Municipality Energy Vault Project, introducing the financial modelling and technology, should be reviewed during the next phases of the implementation and roll-out of the InovaSure Energy Vault projects in South Africa to 119 other similar sites with funding that may be provided by institutions such as the NDB and other interested Development Finance Institutions and/or private companies.

6.4 The INOVASURE Submission

The following process is acknowledged that has been, and is being, followed by **INOVASURE** regarding the Kannaland RMEMS / Energy Vault Project:

- The formation of a Public Private Partnership (PPP) between **INOVASURE** and the KANNALAND LOCAL MUNICIPALITY, proposed to be endorsed by NATIONAL TREASURY GTAC PPP division and managed under the auspices of the DBSA, covers all aspects of the implementation of the **INOVASURE** Energy Security Program as various energy infrastructure projects and will be arranged to be funded by the efforts of **INOVASURE,** including the installation of distribution and telecommunications devices and so-called Thin Client Technology ICT (Information Communication Technology) devices, as well as management systems;
- **INOVASURE** prepared Feasibility Reports[2] in parts that were submitted to the Kannaland Local Municipality as the initial pilot implementation project partner to the proposed PPP and the application for endorsement thereof in terms of the time period by National Treasury GTAC PPP division;
- The company **INOVASURE (PTY) LTD** (South Africa) has been registered with The Companies' and Intellectual Properties Commission (the CIPC")**;**
- A Special Purpose Vehicle (SPV) is in the process of being registered as part of the proposed PPP with the KANNALAND LOCAL MUNICIPALITY i.e **"INOVASURE** Kannaland Energy Vault Holdings (Pty) Ltd.; and
- This DBSA PPDF Application[3] (which is intended to be utilised for concomitant applications to the other relevant funds managed by the DBSA) was prepared in compliance with the prescribed process with due acknowledgement of the Feasibility Reports that were prepared for the Kannaland **INOVASURE** Energy Vault project.

[2] "Kannaland Feasibility Reports: Executive Summary and Parts A, B and C", dated November 2018
[3] SADC & DBSA Project preparation and Development Facility (PPDF): Operational Guidelines", dated 8 August 2017

- Various other project specific SPVs are also in the process of being registered under the overhead umbrella of **INOVASURE Kannaland Local Energy Vault Holdings (Pty) Ltd**, being the following:
  - **INOVASURE** Kannaland PV (Pty) Ltd;
  - **INOVASURE** Kannaland Thin Client (Pty) Ltd;
  - **INOVASURE** Kannaland LTE (Pty) Ltd;
  - **INOVASURE** Kannaland Smart Meter (Pty) Ltd;
  - **INOVASURE** Kannaland Battery (Pty) Ltd;

An **INOVASURE** Community Legal Entity is in the process of being registered for the receipt of a percentage of the income of the SPVs, which entity will be utilised for the upliftment and development of various aspects of the community such as education, electrification of informal settlements, and many other community aligned projects. A suitable Co-operative is also in the process of being registered for the electrification of the informal dwellings.

6.5 Introduction to INOVASURE (PTY) LTD (South Africa)

The **LIVESURE GROUP**, a collective description for contractually collaborative entities forming a group, is the culmination of the thought leadership applied by five (5) SOUTH AFRICAN founder members i.e. Messrs. Jaco De La Rouviere, Jacques Pauw, Max Lourens, Rudie Crous and Duncan Irvine. Together they redefined the underwriting of LIVING SECURITY NEEDS as well as the approach of the insurance industry in respect of its innovative and alternative underwriting of LIVING SECURITY needs. The product range as presently offered by the insurance industry is inadequate and due for innovative changes. These seasoned businessmen and their team have vast experience in the innovation of products and services in energy, (Smart City development) and infrastructure and suchlike such as energy, water, education, governance, environment, housing, mobility, "citynomics", leisure and the "beneficiation" of real rights.

LiveSure
Ensuring Living Security

InovaSure
Ensuring Living Security

The **LIVESURE Group** is the first South African **LIVING SECURITY** entity to offer Governments, Cities, Municipalities, Special Economic Zones ("SEZ's"), Private Households, Businesses and SOCs (State Owned Companies) a custom made range of protection plan products.

INOVASURE™ **(PTY) LTD** is a proud partner to the South African LiveSure™ *Living Security* "Ensurance" and Technology Company. As an enabler, **INOVASURE** has developed unique and innovative bolt-on Underwriting, Protection, Warranty and insurance aligned ("Ensurance") Products for the Municipal Community in South Africa. The core offering is the **INOVASURE** Real Time Multidimensional Energy Management System (RMEMS), also known as the "*Energy Vault*", which provides the backbone to *Energy Security* Products and Services that will power the new dawn of *Energy Efficiency* and *Storage*.

INOVASURE operates independently in South Africa as a Master Licensee under LiveSure (Pty) Ltd as the Master Licensee for Africa. **INOVASURE (**Australia) Pty Ltd operates independently out of Perth, also as a Master Licensee of **INOVASURE**, as do various other **INOVASURE** Master Licensees such as **INOVASURE** SGL Power & Gas Mozambique LDE, **INOVASURE** Zimbabwe Ltd, etc - as part of **INOVASURE's** global roll out process.

LIVESURE, as a Licensor to global operators, has appointed **INOVASURE (PTY) LTD** (South Africa) as the Master Licensee for all its operations in South Africa, operating from Stellenbosch, George and Johannesburg.

INOVASURE (PTY) LTD (South Africa) was implemented as an initiative of collaboration by passionate key individuals with dedicated skills. They bring experience, knowledge and opportunity in line with shared goals to succeed in the task at hand - providing ***ENERGY SECURITY*** to South Africa. The management style is innovative and integrates thought leadership with practical implementation strategies.

INOVASURE's Energy Security "*Ensurance*" package consists of bolt-on insurance aligned-, Protection Plan and Warranty Products and services which are custom designed and linked to the LiveSure *Trusted Centre* ("LTC") for cost-effectiveness, sustainability, resilience, relevance and accountability.

INOVASURE generates its so-called "underwriting" ability in a self-sustaining manner from "ensurance" plans to service level agreements. Its "Seal of Excellence" represents its promise to authenticate and secure its products and services with corporate governance and to strive for service excellence in all aspects.

Energy Security Management and Administration Services Agreements ("ESMA's")

INOVASURE enters into collaborative Energy Security Management and Administration Services Agreements ("ESMAs") with selected and willing Municipalities to, amongst other things, provide them with ***ENERGY SECURITY*** and an on-going supply of reliable energy. These ESMA agreements are then embodied in Public Private Partnerships (PPPs) which are entered into with the relevant Municipalities and endorsed by National Treasury GTAC PPP division and managed under the auspices of the Development Bank of Southern Africa (DBSA).

The Product Range

The **INOVASURE** product range, under the banner of "enerGsure", consists of various services and "ensurance" (a service level agreement as incorporated in the PPP) related products and services designed to ensure *Energy* and *ICT Security* for its client base. Custom made solutions have been created subject to accreditation by the so-called LTC ("LiveSure Trusted Centre"). The LTC's role is to provide in-house Scoping and Due Diligence Client accreditation; determining client's requirements, creating a customised solution, which, upon acceptance by the Client Municipality as a PPP arrangement, is then embedded in an "Ensurance" / Protection Plan / Warranty which, as part of the PPP arrangement, is issued to the Municipality by **INOVASURE's** cell captive insurance operator, Centriq, which is wholly owned by Santam Insurance Company.

The **INOVASURE** RMEMS (*Energy Vault)* is effectively a large UPS (Uninterrupted Power Supply) and receives power during off-peak times of the day and introduces it back into the distribution network during peak times. **INOVASURE** augments the process of energy conservation and mitigation by means of integrated *Renewable Energy* dispatch resources, which is powered by means of multiple collaborative agreements with network partners in the field of renewables, disruptive technologies and other innovative forms of energy. The development of the Energy Vault implies that a systematic installation of patent and design

protected equipment and systems are performed on the property of the relevant participating Municipality at **INOVASURE's** own cost.

As Custodian and Manager, **INOVASURE** operates and manages the equipment as a service to the Municipality. Generated data will be available as a management tool to receive, meter, store, shift, shave, distribute and transmit energy, as well as to introduce dispatchable Renewable Energy – on the distribution network.
INOVASURE does not own, buy or sell the power that is managed on behalf of the Municipality, but rather acts as its agent in the process of ensuring that the facility and its operation is managed to its maximum capacity according to generally accepted global Utilities Practice and ISO (International Standards Organisation) guidelines.

The Energy Vault

The **INOVASURE** RMEMS (Energy Vault), through its metering and management systems and battery storage capability as a large UPS, allows the Municipalities / SEZs / SOEs / Corporate Clients to provide smooth production and time shift the energy.

The Energy Vault comprises storage units (batteries) and "balance of systems" components such as inverters, transformers, switchgear, so-called "Smart meters" (pre-paid distribution devices) and unique Thin Client Technology and related devices and the like, all of which have been developed and successfully deployed and tested worldwide through reputable and successful collaborators with which **INOVASURE** has secured long lasting and valuable relationships

Eskom power, as well as Renewable Energy such as solar electricity produced at noon, or hydro-electric power, can be stored and deployed into the distribution network as a stable power source at peak demand in the evenings.

The **INOVASURE** RMEMS (Energy Vault) is the cornerstone to the ***ENERGY SECURITY*** Product as well as the *ICT Security* Products and services.

The **INOVASURE** RMEMS (Energy Vault) is depicted diagrammatically below:

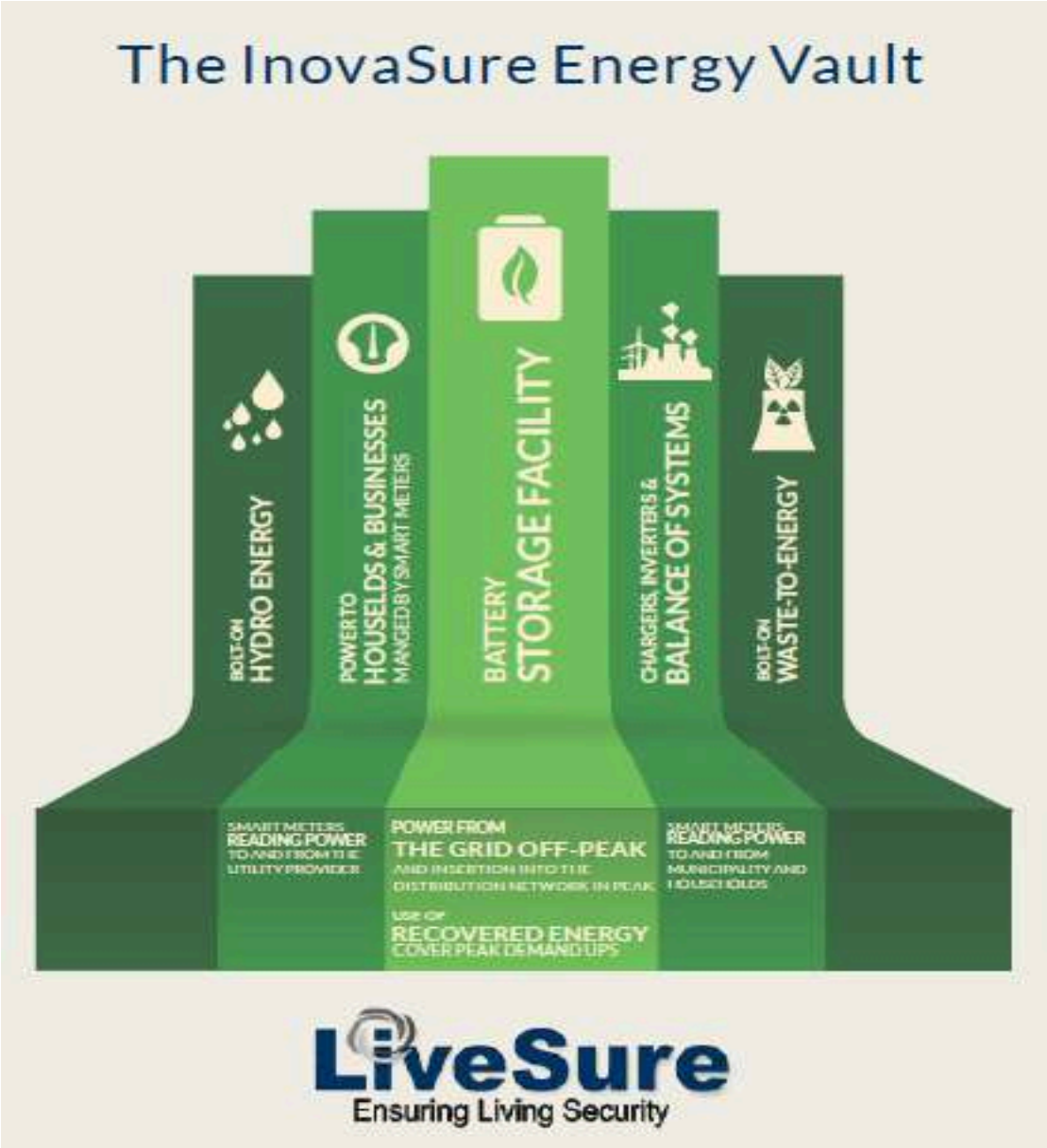

Figure 1: The INOVASURE RMEMS (Energy Vault)

6.6 The Phases of the RMEMS Development

The phases for the development of the RMEMS Concept (Energy Vault) that was identified for the Kannaland Local Municipality were identified during the feasibility process for review and further application to the other 119 sites in South Africa:

- **Stage 1: The proposed development concept**:
  - Setting up of the RMEMS Overhead Special Purpose Vehicle (SPV) and the various sub-SPV affiliates;
  - Identification of interested parties in all the SPV Projects and activities;
  - Appointment of the Project Management Team (PMU);
  - Appointment of Professional (Technical and Specialist) Teams;
  - Planning of surveys (geo-technical, cadastral/land, etc.) and assessments (EIA, etc.);
  - Confirmation of the infrastructure needs of the full Development.
- **Stage 2: Development of the Infrastructure**:
  - Determining overall infrastructure development needs;
  - Overall development and improvement of the utility services (including water and sanitation, roads and storm water, electricity, fencing, etc.);
  - Overall development of health, safety and environmental services;
  - Overall development of access, egress, surveillance and physical and security services.
- **Stage 3: Development of the prioritised first and subsequent facilities:**
  - Work Stream 1 conceptual design for facilities and services;
  - Work Stream 2 detailed design;
  - Development planning, construction and hand-over process.
- **Stage 4: Operationalisation of the RMEMS Concept:**
  - Rolling out the **INOVASURE** Kannaland Energy Vault Holdings (Pty) Ltd SPV as well as its sub-SPV's and their governance structures and processes; and
  - On-going management and growth of the Kannaland Local Municipality RMEMS.

6.7 The Feasibility Process

The Engagement Team of **INOVASURE** and its collaborators conducted the Feasibility Process for the development and implementation of the RMEMS for the Kannaland Local Municipality to provide focus to establish an Energy Vault for the Kannaland Local Municipality as the initial implementation site with an Energy Vault and 119 other roll-out implementation sites in South Africa.

The purpose of this Feasibility Study Report is to provide sufficient roll-out motivation for the business case for a proposed RMEMS Development by **INOVASURE** in South Africa. More information and documentation was sourced from identified stakeholders for analyses, stakeholder interviews, site visits and brainstorming sessions to be conducted to test the intentions for the proposed development

The following factors were tested and illustrated in the Feasibility Process in support of the business case for the proposed short and longer term RMEMS development:

- Proposed nature and extent of:
    - The intended involvement of the collaborators and other interested parties in the development of the identified RMEMS facilities and services;
    - The expected investment opportunities that presented themselves;
    - Possible and existing funding and support for the development;
- Community, political and industrial buy-in; and
- Opportunity to support the local, district, regional, provincial and national growth plans through the optional / possible development initiatives.

As part of the Feasibility Process a Financial Model was developed and applied to determine the appropriateness of proposed scenarios, cost viability, profitability and sustainability of the identified and related developments. The Model allows for an overhead Special Purpose Vehicle for each **INOVASURE** Energy Vault project, with various integrated sub-SPV's incorporated for the various aspects of Utility Scale Batteries, Smart Meters, LivPak shack electrification, PV Power, Thin Client Technology and LTE / Broadband Technology. The Feasibility Model was initially developed for the Kannaland Local Municipality, but was designed to also be extended for utilisation in the case of other Municipalities**.**

Feedback from specifically the collaborators, potential clients, the levels of government and potential investors compelled the engagement team to assess the entire value chain and introduce a package of solutions that addresses the requirements of the parties concerned.

The implementation of the proposed RMEMS Concept (Energy Vault installation in terms of the **INOVASURE** Energy Security program) in support of Municipalities is expected to contribute towards:

- Creating a range of infrastructure and empowerment projects that supports meaningful transformation across various sectors;
- The creation of low, semi-skilled and skilled employment opportunities; and
- The growth of the Gross Domestic Product (GDP) of a region.

The reports for the Kannaland Local Municipality Energy Vault Implementation Project will be reviewed further during the next phases of the implementation and roll-out of the InovaSure Energy Vault program in South Africa with funding that may be provided by institutions such as the New Development Bank (NDB), other Development Finance Institutions and private financial institutions.

6.8 The Financial Implications

The Model

A Financial Model (for CAPEX and OPEX) was developed by **INOVASURE** and its collaborators and relevant assumptions were tested during the business planning phases of the engagement.

The total investment funding that is required for the RMEMS implementation at a Municipality such as Kannaland Local Municipality is envisaged to be funded by funding institutions such the NDB. The funding of the Energy Vault that is due to be established for the Kannaland Local Municipality as the initial implementation site will be reviewed for the 119 other roll-out implementation sites in South Africa

At the feasibility phase of the development, the following indications were given of the nature and preliminary extent of the categories of investment required for the development:

- The nature and extent of capital requirements for establishing the RMEMS;
- The nature and extent of establishing and rolling out the governance structures, processes and systems of the identified and associated (SPVs);
- The impacts of generation and load management systems on system Reponses;
- The identification of scope/service gaps, potentially complimentary services;
- The optimisation of the overall solution by harmonisation of the various components; and
- Maximisation of incidental value propositions – such as the life extension of existing sub-stations by injecting supporting power on the Kannaland Local distribution network side of Eskom substations.

The Financial Parameter Assumption Inputs

The following financial parameter assumption inputs[4] were used in the financial model:

Current exchange rates		**General parameters**		
ZAR/USD	14.42	Tax rate	28.00%	
ZAR/ERO	15.87	Discount rate	15.00%	(norm for IPP projects)
ZAR/AUD	10.89	CPI	8.00%	(sculpted – projected)

Scope		**Solar**		**Smart meters**	**LTE network**	**LiveSure**	**LIvPak B4I**	**Battery Vault**
Loan term	yr	10		7	10	5	7	15
Interest rate	%	10.50%		10.50%	10.50%	10.50	10.50%	10.50%
Depreciation period	yr	3		7	10	5	7	10
Debt/equity ratio	%	70.00%		80.00%	80.00%	80.00%	70.00%	80.00%

Table 1: Financial Parameter Assumptions

Parameters are adjusted to account for the characteristics of particular technologies, and financial risk.

The Option Analysis

The Financial Model is based on income, balance sheet and cash flow projections over a 25 year forecast period, commencing with the start of operations once bulk infrastructure is in place. The projections are based on projected annual financial statements and key assumptions in terms of growth and inflation.

[4] "Feasibility Reports: Financial Model, 04.01a and 04.01b Rev G Stage 1 and Stage 2", dated November 2018

The base option is "doing nothing", which is deemed impractical due to challenges encountered by the Kannaland Local Municipality managing payments for power and trying to deal with high Eskom tariffs during peak periods, as well as penalties.

While the final configuration will have 25MWp of solar PV, and even ramp up to 50MWp when exports of power to neighbouring Municipalities are implemented, the current Eskom off-peak tariff is below the tariff required to support the solar PV portion of the project. With the Eskom tariff increases currently being discussed, this will most definitely change during the period when the Environmental Impact Assessment for the chosen site is carried out in 2018. For this reason, the solar PV is implemented in two stages; stage one implements one MWp circuit of the proposed 25MWp solar PV solution in the first Energy Vault model, allowing for the convenient expansion of the solar PV portion when justified by tariffs in further Energy Vault size increments.

From a practical perspective, the LTE network and Thin Client Technology is considered for both options as additional cost, as the network is required to communicate with the Smart Meters.

Option 1: Do nothing	**R0**
Option 2: InovaSure RMEMS Stage 1	**R523,628,041**
Solar PV Plant	R18,880,360
Smart meters	R27,783,936
LiveSure Thin Client Technology System	R3,012,000
Battery Vault	R329,894,441
LTE network	R93,669,750
LivPak B4I	R50,387,554
Option 3: InovaSure RMEMS Stage 1 + 2	**R1,039,277,822**
Solar PV Plant	R360,737,556
Smart meters	R112,156,771
LiveSure Thin Client Technology System	R22,762,000
Battery Vault	R269,894,441
LTE network	R223,339,500
LivPak B4I	R50,387,554

Table 2: The CAPEX of the Options

The implementation CAPEX requirements of the LivPak Shack Electrification communications hub systems of R35.97 million is included in the table above for 2000 implementations,

however, it is possible that there will not be that many shacks to incorporate into the Livpak program.

Comparing the benefits of the options, the cash flows from the projections are extracted to estimate the Year 1 operational expenditure. Current Eskom costs are expected to be duplicated, with the reduction in higher tariff consumption and increased off-peak consumption. With projected increased Eskom tariffs, more of the premium tariff energy is obtained from the larger solar PV system. The annual costs of the LTE network (at a capital cost of approximately R223 million), as well as Smart Meters (at a capital cost of approximately R94 million), are added to all options. For the case of the **INOVASURE** RMEMS implementation, the costs to the Municipality include reduced Eskom charges, energy costs to the generation SPVs and the Vault lease costs.

The Year 1 cost to the Municipality is approximately R1.2million, which offset by the benefits, with a saving of approximately R1.4million. The "negative energy cost" to InovaSure is additional off-peak energy purchased from Eskom and reimbursed from the Vault (which is supplied during peak periods). This reduces with more energy coming from an increases solar PV installation after implementation of Phase 2.

No project finance is required of the Municipality, and all assets are transferred to the Municipality free of charge at the end of the project.

Option	Annual cost	Annual benefit
Option 1: Do nothing	**R36,324,317**	**R0**
Eskom charges	R36,324,317	
Option 2: InovaSure RMEMS Stage 1	**R34,987,540**	**R1,336,777**
Eskom charges	R35,351,658	
InovaSure energy charges (vault + solar)	-R1,564,118	
Vault lease	R1,200,000	
Future do-nothing Eskom charges	**R49,741,455**	**R0**
Option 3: InovaSure RMEMS Stage 1 + 2	**R39,987,155**	**R9,754,301**
Eskom charges	R28,637,467	
InovaSure energy charges (vault + solar)	-R650,312	
Vault lease	R12,000,000	

Table 3: The Benefit Analysis of the Options

The Infrastructure Investment

The proposed investment in each of the Infrastructure Components is captured in Table 4 for Plant and Equipment CAPEX of approximately R805 million and Working Capital CAPEX of R254 million, i.e. a TOTAL CAPEX requirement of approximately R1 060 million, i.e. including the implementation CAPEX requirements of the **LivPak** Shack Electrification / communications hub systems of approximately R35.97 million as was stated before.

Each of the contributing components is considered as a separate SPV company ensuring that each venture is developed on a sound commercial basis. The components are:

- Development of a 25MWp **solar PV power station** – not grid-connected but supplying DC power to the battery of the Vault system;
- Roll-out of approximately 25 000 **Smart Meters** (plus 2000 in informal settlements);
- Implementation of a 20MW/53MWh **storage battery system**;
- Implementation of an **LTE communications network** for the Smart Meters as well as media/telephony solutions;
- Establishment of a **virtual machine computational facility** for Smart meter / LTE customers including educational and entertainment media; and
- The implementation CAPEX requirements of the **LivPak** Shack Electrification / communications hub systems of approximately R35.97.

The CAPEX and returns estimates are presented in table format[5]:

INOVASURE KANNALAND ENERGY VAULT PROJECT: SUMMARY OF CAPEX / WORKING CAPITAL - ONE ENERGY VAULT					
	Plant, equipment, etc.	**Working capital**	**Total CAPEX**	**IRR**	**NPV @ 10%**
Solar PV Plant	R 12,880,360	R 6,000,000	R 18,880,360	8.36%	R-1,109,489
Smart meters	R 22,745,889	R 5,038,047	R 27,783,936	12.61%	R 969,374
LiveSure Thin Client Technology System	R 2,012,000	R 1,000,000	R 3,012,000	31.41%	R 3,489,335
Battery Vault	R 219,894,441	R 110,000,000	R 329,894,441	10.60%	R 12,089,119
LTE network	R 76,669,750	R 17,000,000	R 93,669,750	8.47%	R-3,749,698
SSS B4I	R 31,054,145	R 19,333,409	R 50,387,554	12.63%	**R 8,144,662**
Combined ZAR	**R 365,256,585**	**R 158,371,456**	**R 523,628,041**	**10.56%**	**R 19,833,302**
Combined Dollars	**$30,438,049**	**$13,197,621**	**$43,635,670**		**$1,652,775**

Table 4: Infrastructure Investment Projection (Stage 1)

[5] "Feasibility Reports: Financial Model, 04.01a and 04.01b Rev G Stage 1 and Stage 2, Capex Summary" dated November 2018

INOVASURE KANNALAND ENERGY VAULT PROJECT: SUMMARY OF CAPEX / WORKING CAPITAL - ONE ENERGY VAULT					
	Plant, equipment, etc.	**Working capital**	**Total CAPEX**	**IRR**	**NPV @ 10%**
Solar PV Plant	R 245,610,697	R 115,126,859	R 360,737,556	1.40%	R-84,663,130
Smart meters	R 92,156,771	R 20,000,000	R 112,156,771	20.95%	R 20,098,503
LiveSure Thin Client Technology System	R 13,762,000	R 9,000,000	R 22,762,000	25.54%	R 13,977,326
Battery Vault	R 219,894,441	R 50,000,000	R 269,894,441	99.36%	R 1,482,470,956
LTE network	R 153,339,500	R 70,000,000	R 223,339,500	17.09%	R 72,083,485
SSS B4I	R 31,054,145	R 19,333,409	R 50,387,554	12.63%	**R 1,503,967,140**
Combined ZAR	**R 755,817,554**	**R 283,460,268**	**R 1,039,277,822**	**35.10%**	**R 1,503,967,140**
Combined Dollars	**$62,984,796**	**$23,621,689**	**$86,606,485**		**$125,330,595**

Table 5: Infrastructure Investment Projection (Stage 2)

The figures that are mentioned are supported by the detailed financial model, as well as the technical (and elements of financial) inputs of Part B of the overall feasibility report, i.e. the technical feasibility of each intervention.

The Parts to the Feasibility report and the Financial Model will be reviewed in the implementation roll-out process for the proposed development of the RMEMS for other project sites based on the experience with the Kannaland Local Municipality Project. During the financial modelling process, each of the financial modelling of each of the SPVs was conducted. The financial modelling outcomes of each of the SPVs[6] are available upon request and not included here.

6.9 The Risks Associated with the RMEMS Development

The key potential risks associated with the proposed Kannaland Local Municipality Energy Vault Program and its installation has been identified. These include risks of a technical, financial and economic nature that would mostly also apply to the identified 119 other roll-out implementation sites in South Africa:

- A key driver is the support for the Kannaland Local Municipality RMEMS Development by National Treasury, SALGA, COGTA, the SEF, the dti, GGDA, TEDA and other funding agencies, Eskom and the Kannaland Local Municipality itself;

- Besides the market development risks, it appears that all other risks can be mitigated suitably by employing and training the various SPV management teams and Kannaland Local Municipality officials to take part in the promotion and management of the implementation process; and
- The other risks associated with the establishment of the Kannaland Local Municipality Energy Vault are typical of any industrial or property development project and relate to availability of land, funds and resources to establish the whole of the Energy Vault installation in all its aspects, as well as licensing and regulatory processes that need to be completed.

Conclusions

The business planning process for the deployment of the **RMEMS** (Energy Vault) Concept for the **Kannaland Local Municipality** was undertaken in support of this **INOVASURE** final submission to the Municipal Manager and the Kannaland Local Municipality Council.

This narrative report was created for purposes of the Kannaland Local Municipality for support for the envisaged REAL TIME MULTI-DIMENSIONAL ENERGY MANAGEMENT SYSTEM (the RMEMS, also known as an Energy Vault) that is due to be established for the Kannaland Local Municipality as the initial implementation site and 119 other roll-out implementation sites in South Africa.

The OVERALL FEASIBILITY REPORT FOR THE KANNALAND LOCAL PROJECT is submitted to the Kannaland Local Municipality in support of the intention by the Municipality to enter into a Public Private Partnership (a PPP) with **INOVASURE**.

Elements of the Feasibility Study outcomes and the financial modelling that was developed for the Kannaland Local Municipality Energy Vault Project are discussed in detail in the following documents that have now been reviewed for the Kannaland Energy Vault Project:

InovaSure RMEMS Feasibility Study Report
EXECUTIVE SUMMARY
Part A: **INTRODUCTION TO INTERVENTIONS**
Part B: **FEASIBILITY OF INTERVENTIONS**
Part C: **INVESTMENT AND FINANCE**
FINANCIAL MODEL (Feasibility Study Financial Model: 04.01a and 04.01b Stage 1 & Stage 2 Kannaland Rev G)

Table 6: Feasibility Study Reports and Financial Model

The financial modelling and reports for the Kannaland Local Municipality Implementation Project will be reviewed further during the next phases of the implementation and roll-out of the **INOVASURE** Energy Vault program in South Africa with funding that may be provided by institutions such as the New Development Bank and other Development Finance Institutions.

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