

1. INTRODUCTION

General Overview.

This paper discusses the principles of the Hydrodynamic-Power technology, its concepts and working, as well as the fundamental technical and engineering perspectives of the technology.

In order to assist in evaluating the new Hydrodynamic power innovative clean energy technology, it is important to understand the basic science of various commercialized clean energy technologies and its renewable energy source, as well as its application, as described in Section 2 of this Paper. On Section 3.6.1: Hydrodynamic-cycle process energy-boundary is described; and Section 3.6.2: Hydro-dam scheme energy boundary is described for comparison-only.

The Hydrodynamic-Power Technology principle is based on Hydrodynamic-Cycle being natural phenomena that always exists in our solar system. The technology development has taken over a decade from initial conceptual designs through to a successful test for a 20kW pre-commercial plant constructed in the Gold Coast, Queensland, Australia. The plant is situated at Mitchell Eco Industrial Estate supplying its power loads during the commissioning to a feed-in unit at Building 5 being a large industrial warehouse at the Estate.

Following the completion tests on pre-commercial plant, dedications were placed in completing full detailed designs, technical and engineering documentations for commercial utility-scale plant, as well as addressing key components materials selections and on specialized mechanical devices and systems durability and reliability.

The verifications attained for the commercial technical designs and documentations proceeded with the confirmations for technology sign-off and tick-off. This milestone is already demonstrated with the attainment of permits and project approvals for a large utility-scale plant in the State of Tasmania, Australia, being granted by the State 's Environmental Protection Authority (EPATas) as the Authority under the State Department Primary Industry Water and Environment (DPIWE) being the highest State's approving Authorities.

This project located at Davenport City, north of Tasmania is a 2-stage development with a total generating capacity of 1000MWe representing the first and largest renewable energy project in the World, generating continuous electricity on a 24/7 basis, as a base-load power station; onto Australia's eastern seaboard interconnecting systems and networks.

2. OVERVIEW ON VARIOUS RENEWABLE ENERGY TECHNOLOGIES AND ENERGY BOUNDARIES.

[Refer to Diagram 1: Various Energy Boundaries].

This picture demonstrates various renewable technologies and the renewable energy source, including Hydrodynamic-Power innovation, where this paper will be focused on. I am sure we all familiar with these renewable technologies, so let's review these information briefly,

For 50 years now: we have harnessed solar energy using various methods including PV cells, Heliostats and as a Concentrator.

We have harnessed Wind energy, Geothermal natural and hot-rocks, biomass biofuel plantations.

We have used Salinity Gradients where the rivers raw water flow is mixed with salt water in an osmotic process, to harness hydrostatic force potential energy for conversion into electrical energy. The Salinity Gradient, expressed here as 'delta-S', where the renewable energy source is the rivers raw water flow and its cycle is due to solar system that produces rainfalls.

Another technology using rivers water flow is the Hydro-Dam scheme, which is also harnessing water stored potential energy in a dam and converting its water force into electrical energy. The renewable energy source in this system is the rivers water flow and its cycle is due to rain-cycles of the solar system.

Now in Tidal and Wave, its due to height gradients water movement force potential energy that is harnessed for conversion into electrical energy. The Height Gradients is expressed here as 'delta-H'. Where the renewable energy source is water force and this cycle is again due to solar system.

We also harnessed Temperature Gradients where the variance in water depths thermal potential energy is converted into electrical energy. The process is widely known as ocean thermal energy conversion (OTEC). The Thermal Gradient, expressed here as 'delta-T', where the renewable energy source is ocean water thermal energy and its cycle is also due to solar system.

In Under Sea Current, the water movement force potential energy is converted into electrical energy. The water movement force Gradient is expressed here as 'delta-C', and where the renewable energy source is water movement as force, where its cycle is variable and once more due to our solar system.

In the Hydrodynamic-Cycle process system, due to height gradients in a water tower column, the hydrostatic pressure force potential energy is the source for conversion into: gravitational potential energy and into electrical energy by utilising a Linear Electric Generator (LEG); or into kinetic energy then

electrical energy using an Expander Turbo Fan Generator (ETFG); as well as to do work on the hybrid hydrodynamic-cycle.

The Fluid Force Displacement Gradient is expressed here as 'delta-P', and where the renewable energy source is based on fluid derived water column potential energy [FDPE]. This cycle is based on a hybrid hydrodynamic-cycle as an organic water column.

There are: Two Steps on the Energy Boundaries diagrams to be explained (by referring to Diagram 1):

STEP 1: If energy boundary is drawn around each of the renewable energy source on its natural or ambience state with a potential energy in existence, the 'coloured energy boundaries' for Salinity-Gradients has again its potential energy shown as delta-S, Tidal and Wave in delta-H, Ocean Thermal Gradients in delta-T, Under Sea Current in delta-C; and Hydrodynamic-Cycle system as in delta-P.

Now, if the potential energy existing in each of the energy boundaries is now extracted, you would agree that the delta-energy on each boundaries becomes zero.

STEP 2: if now, the probes or ports with energy-meter being attached to each of the energy boundaries are now operated: you will see on the Salinity Gradients Energy Boundary (EB) it will indicate Energy Meter (EM) as zero; due to the medium equilibration or it is in a state of equilibrium; this will also be the case with Tidal and Wave where the EM will indicate zero energy; again the same in the case for Ocean Thermal and Under Sea Current the EMs will indicate as zero energy; however on the Hydrodynamic-Cycle energy boundary each Energy Meters will yield a delta-P as the Pressure-force from the water column in the tower is still subjected to gravity and thus 'ACTIVE'.

Each of the Energy Meters will yield a delta-P relative to its heights and when these confined dynamic boundaries are applied in a system, this can be used to do various work.

The combination of delta-Ps represents a renewable energy source being applicable in the Hydrodynamic-Power Technology.

3. HYDRODYNAMIC POWER TECHNOLOGY INNOVATIONS AND PERSPECTIVES

The Hydrodynamic-Cycle process system net resultant is a product of converting hydrostatic pressure potential energy into electrical energy. It applies the same technical methodology as the traditional hydro-dam scheme plants where it converts hydrostatic pressure potential energy into electricity using a turbine coupled generator.

The Hydrodynamic-Cycle itself is a process to recycle spent working fluid reformed into a water column where a large hydrostatic potential energy exists. The

energy input as the renewable energy source is the fluid recycles derived water column potential energy [FDPE], having 67 times greater potential energy than energy output for doing various works. These process cycles involve confined-boundaries are achieved by applying new innovative mechanical devices and systems.

The Hydrodynamic-Cycle process is expressed as the confined-boundaries applied for each work-cycle in the process-system where the hydrostatic pressure boundary changes causes medium equilibration resulting in a force and a velocity presence to do work for each work-cycle. The applied boundary changes defined as dynamic-confined-boundaries, hereby named as Hydrodynamic-Cycle.

There is however a distinct differentiation in operation and processes between the traditional hydro-dam scheme and Hydrodynamic-Power technology:

3.1: The concepts of energy storage must be understood that: in hydro-dam and Hydrodynamic-Cycle water storage tower, it is generally called as hydrostatic pressure potential energy storage, that has a similar concept and function to the battery energy storage: where the energy stored depletes until it is re-charged on a one-time basis over a long period charging process; or a continuous basis on a regular sequence charging process.

3.2: Hydro-dam scheme converts hydrostatic pressure potential energy (PE): by using the "Water Mass Depletion to ATM" being released from a high elevation onto a turbine generator and into electrical energy.

The power equivalent as a product of PE conversion is expressed as: Power = Q (flow-rate: m³/s) x Head Pressure (in m) x Gravity (m/ss) = **KJ/s** or **kW** of as the renewable energy source.

The renewable energy source: "primarily" from a diverted river water flows into a storage dam, and "secondary" is water in-flows from rainwater runs-off as to refill or recharges the storage dam.

3.3: Hydrodynamic-Cycle process converts hydrostatic pressure potential energy to electrical energy: using the "Force" actuated by a small water-volume hereby denotes as a 'working-fluid' in a close-system into electrical energy, and thus "retention of water mass" (means: "no water mass depletion to ATM").

The power equivalent as a product of PE conversion is expressed as: Power = Force (N) x Velocity (m/s) = **KJ/s** or **kW** of electrical energy.

The renewable energy source: "primarily" from a pumped-water into a water storage tower/silo of some height from the ground, and "secondary" is: water in-flow from seawater or any source for make-up into storage tower; and the spent working-fluid recycles on each work-cycle which represents only less than 1.5%

of the total volume in the water storage tower.

The “secondary” water inflow refills or recharges the storage tower, the basis for the ‘fluid derived water column potential energy’ and as an energy input.

3.4: It is to be understood the concepts of the renewable energy source expressed as the energy input as derived water column potential energy; versus the energy output out of the energy boundary; that is further expressed as energy mass balance.

3.4.1: In hydro-dam scheme, the renewable energy input: is the volume of water mass in-flow into storage dam. Where the hydrostatic potential energy is expressed as: $PE1 = \text{Volume}(m^3) \times \text{density of water} \times \text{gravitational force}(m/ss) \times \text{Pressure head}(m) = \mathbf{Nm}$ or **Joules** of energy. OR it can also be expressed as: $PE1 = \text{Volume}(m^3) \times \text{Pressure}(N/m^2) = \mathbf{Nm}$ or **Joules** of energy. Pressure expressed here as: *N/m² [kN/m²] or Pascal(Pa) [kPa] per meter of water column.*

It must be stated that: PE1 is equal specifically to volume of water body in-flow; of which in reality its energy boundary rests on top of the boundary of volume of water body retained in the dam prior the “secondary” water in-flow.

The retained volume of water body here is expressed as PE0; therefore the total Potential Energy available in the storage dam is: $PE0 + PE1 = PE2$ as the potential energy available for conversion into electrical energy.

The Energy Mass Balance is therefore expressed as: $PE0 + PE1 = PE2 - \text{conversion losses experienced in the turbine and generator (and other losses including power losses due to transmission)}$.

It must be understood that: the Energy-Input as the renewable energy source continuous cycle in this scenario expressed as: $PE1 = PE2 - PE0$; or PE1 has less potential energy value compared to PE2; and that the Energy-Output potential energy is higher to the potential energy value in PE1.

On prima-facie basis therefore it is obvious from the Energy Mass Balance shows: Energy-Input has much less potential energy value, than the Energy-Output.

It is therefore must be understood that the secondary water in-flow into the storage dam denotes as “PE1” is reformed into water column of the retained water volume, with the total potential energy (TPE) is the sum of $PE1 + PE0$. In other words “PE1” is a derived water column total potential energy; being due to secondary volume of water body molecules attracts under gravitational force into the retained volume of water body in the storage dam, herewith expressed as organic water column.

However, in the event water retention in the dam does not exist, the Potential Energy available for conversion

into electrical energy will be solely the value of: PE1. In this case: Energy Input = PE1 = Energy Output (PE2) - Energy Losses. Or: $PE1 = PE2 - \text{conversion losses}$.

The Potential Energy available for conversion into electrical energy expressed previously as the Energy-Output is: $PE = Q(\text{flow-rate}:m^3/s) [\text{of } PE1] \times \text{Gravity}(m/ss) \times \text{Head Pressure}(m) [\text{total of } PE0+PE1] = \mathbf{KJ/s} = \mathbf{kW}$ in electrical energy. Noting that the $Q(\text{flow-rate}:m^3/s)$ expressed above represents at least as tens of thousands tons to be depleted as the primary source for conversion into electrical energy.

3.4.2: In Hydrodynamic-Cycle process the renewable energy input: is fresh water or ocean water in-flow to make-up the water-loss from the water storage tower (due to leakage and evaporation/condensation; but not due to water mass depletion); and the spent working fluid recycles reformed into water column. In other words as a fluid recycles derived water column potential energy (FDPE). The working fluid volume from each work-cycle is relatively small representing only 1.5% [or 1.3m³] out of the total water volume in the water storage tower [at 78m³]; and this represents the continuous potential energy renewable energy source or Energy-Input in Hydrodynamic-Cycle process.

Therefore it must be understood that the water in-flow: from fresh water source or ocean for make-up, and the working fluid re-cycle into the water storage tower has the water body molecules attracts under gravitational force onto the retained volume of water body in the water storage tower, herewith expressed as organic water column. The water in-flow described is the renewable energy source or Energy-Input.

If the water in-flows potential energy herewith expressed as: $PE1H = \text{Volume}(m^3) \times \text{density of water} \times \text{gravitational force}(m/ss) \times \text{Head Pressure}(m) = \mathbf{Nm}$ or **Joules** of energy. The boundary of volume water body potential energy presence is: $PE0H = \text{Volume}(m^3) \times \text{Total Head Pressure}(N/m^2) = \mathbf{Nm}$ or **Joules** of energy, as Total Potential Energy (TPE).

The total Potential Energy available for a specific work-cycle from the water storage tower as a result of water in-flows is: $PE2H = PE1H + PE0H$.

It is to be understood that in this instance the Energy-Input being expressed as PE1H is miniscule compared to the Potential Energy available for conversion into electrical energy; as the case is PE1H reformed into $PE1H + PE0H$ being the value of PE2H. In other words PE1H derived water column potential energy as PE2H.

The Energy Mass Balance is therefore expressed as: $PE0H + PE1H = PE2H - \text{conversion losses experienced in the turbine and generator (other losses due to transmission is avoided as generator is located proximity to the load system)}$.

It must also be understood that: the Energy-Input as the

renewable energy source continuous cycle in this scenario expressed as: $PE1H = PE2H - PE0H$; or $PE1H$ is much less in its potential energy value to $PE2H$; and that the Energy-Output will also be much higher to the potential energy value in $PE1H$.

3.5: The Conclusion.

3.5.1: The Energy Input as the renewable energy source has its potential energy much less then the potential energy for conversion as an Energy Output, this is due to the natural occurrence of reformation of molecules attractions under gravitational force in the water storage vessel. Resulting in potential energy resultant value for conversion into electrical energy.

3.5.2: In hydro-dam scheme the total potential energy including the water in-flow is used for conversion into electrical energy by depletion most if not the entire Volume of Water Body in-flow.

The Energy Mass Balance must be expressed as: Energy Input = Reformed Water Column Potential Energy.

Energy Output = Energy Input - mechanical and electrical losses.

3.5.3: In Hydrodynamic-Cycle process system the total potential energy including the water in-flow is used for conversion into electrical energy by harnessing “Force” and “Velocity” from Hydrostatic-pressure applied in a confined boundary. As a close-system, and no water mass depletion applies.

The Energy Mass Balance must be expressed as:
 Energy Input = Reformed water column potential energy (as derived water column potential energy): expressed as the total available potential energy in the water storage tower for conversion into electrical energy.
 Energy Output = Energy Input - losses.

On a typical 250kW capacity Hydrodynamic Power Plant the Potential Energy available for each work-cycle is: $PE = 77(m^3) \times Pressure(23kN/m^2) = 1,771KJ$ of energy.

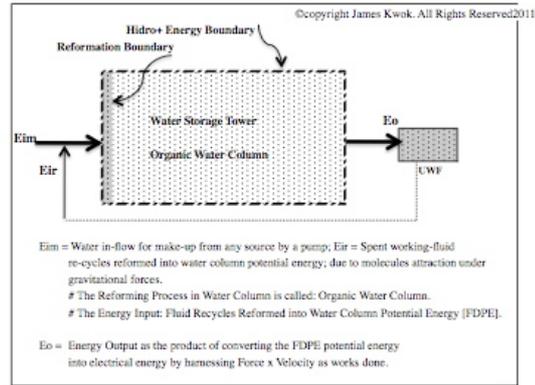
The total work to be done for conversion into electrical energy and fluid re-cycle (spent working-fluid) is: 300KJ of energy.

The Energy Mass Balance is hereby expressed as:
 Energy Input [1,771KJ] = Energy Output [300KJ] – losses.

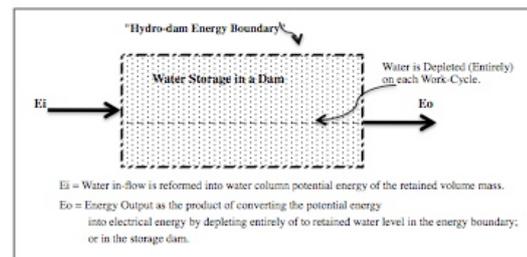
On prima facie basis it appears as inefficient, this is incorrect; as the efficiency of Hydrodynamic-Cycle optimization herein sustained and conclusive on all perspectives.

3.6: Hydrodynamic Power Technology: Energy Boundary Appraisals.

3.6.1: Hydrodynamic-Cycle Process Energy Boundary.



3.6.2: Hydro-dam Energy Boundary (for comparison purposes only).



4. THE HYDRODYNAMIC POWER TECHNOLOGY CYCLES and TYPES.

The Hydrodynamic Power technology’s renewable energy source as explained is based on Water-Energy-Storage [WES] as the primary energy stored in a water tower, and as a secondary being an organic water column due to working fluid recycles reformed into water column potential energy [or described as fluid recycles derived water column potential energy: FDPE]. Working-fluid is fluid to do work on each work-cycle.

A motorised pump is used to pump water into a tower of some 20m in height. Only less than 1.5% of the total stored potential energy in Pumped Energy Storage is used in each work-cycle that is converted to usable electrical energy or to hydrostatically operates an air-compressor to inflate a bouyant, as well as to operate a hydraulic-Pascal system to recycle the spent working fluid in the hybrid hydrodynamic-cycle; and by doing so, restores optimum Potential Energy value.

In a typical Hydrodynamic Power Plant with a 250kW generating module: water storage tower liquid volume is 77m³; and the working-fluid volume is only 1.3m³ or 1.5%; The total potential energy stored is 17,700KJ or 17.7MJ of energy, with each work-cycle uses only 300KJ or less than 1.5% of the stored energy.

The Hydrodynamic-Power innovation are patented world-wide and consists of a Type A Design-for process system on a large utility scale capacity; and Type B Design-process system for an aggregate of 1MW

capacity module. Both Types of which having the same technological-principles, each applying various differentiation's on the mechanical devices and process systems, these are also protected under separate patents.

[Refer to Diagram 2A: TYPE A PLANT :3D Perspectives; Diagram 2B: Hydrodynamic-Cycle Process P&ID; and Refer to Diagram 3A: TYPE B PLANT: 3D Perspectives; Diagram 3B: Hydrodynamic-Cycle Process P&ID].

5. RESEARCH AND DEVELOPMENT ON HYDRODYNAMIC POWER TECHNOLOGY

[Refer to Diagram 4: Hydrodynamic Power Technology Development Phases Chart].

The development phases of the Hydrodynamic-Power technology innovation has taken over a decade from its initial concept through to the completion and commissioning of a 20kW pre-commercial plant in the Gold Coast Queensland Australia.

The successful test of the Gold Coast Hydrodynamic Power Plant reaffirms the technology scalability, and addresses: critical technical and specialised mechanical-systems, material selections and detailed engineering designs to ensure plant performance's durability and reliability.

The conclusion on R&D to date includes the achievement where Hydrodynamic-Power technology has received universal consensus for this innovation being suitable for deployments as mini generators for remote and isolated areas; as well as a continuous 24/7 base-load distributed power system (DPS) for regional and metropolitan power supply; therefore providing the path forward to address the inefficiency in the macro base load power generations with an integrated and comprehensive technical solutions towards sustainable and independent clean energy security.

6. CURRENT HYDRODYNAMIC POWER PROJECT DEVELOPMENTS

[Refer to Appendix 5: Project Assessment letter from EPATas, Australia].

The current projects under development and in the pipeline includes:

- Various projects in Australia and Overseas, including Wesley Vale 1000MWe generating capacity at Davenport City, North of Tasmania, Australia. This project is the first and largest affordable renewable energy development in the world with the first stage of 100MWe has received project permits from the Environmental Protection Authority of The Australian Tasmanian State Government.

- There are various projects being planned in Indonesia including 1MW generation capacity is in the final-stage for deployment in Kerawang, Indonesia.

These projects in Indonesia will be undertaken by PT Inter Pacific Energy, as the exclusive master license partner in the Republic of Indonesia.

Importantly to mention that the collaborative thrust between Hidro+Australia and Pt Inter Pacific Energy is that the provisions for manufacturing and supplies for the plant and equipment on these projects both in Indonesia and those in Australia will be fabricated in Indonesia.

Our aims will therefore expected to deliver not only addressing clean and low-cost energy needs for people far-reaching areas but also contributes towards achieving a net sustainable development supported by manufacturing and productive capacity: Proudly as made in Indonesia, From Indonesia and For Indonesia.

7. GLOSSARY: General and Technical

ATM = Atmosphere.

BEST FITS TYPE GENERATOR = Refers to a technical solution that offered by such technology capable to deliver low cost and affordable access to electricity as well as delivering modern cooking alternatives and solutions.

COP = Convention of Parties being United Nations' annual program to combat green house gases emissions and thus working towards abating global warming and any adverse effects caused by gases emissions onto the atmosphere and above Earth's Ozone layers that protects Earth from ultra violet rays which apart from other things can raise Earth and Ocean temperatures and potentially change biodiversity and eco-system adversely to its habitats across the spectrums. This year is COP no.17.

DPS = Distributed Power System or Embedded Generator located within the load system or nearby to an existing distribution sub-station. DPS avoids power losses due to transmissions.

Delta = Refers to a net-resultant between two (2) points or vectors of the same medium in an energy-boundary, that could either be positive or negative in value.

DPIWE = Department Primary Industry Water and Environment, where EPATas part of, being the highest approving Authorities for large scale projects in the State of Tasmania, Australia.

EPA = Environment Protection Authorities; often the highest approving Authorities for power generating projects.

ETFG = Expander Turbo Fan Generator, being used in the Hydrodynamic-Power Plant Type B.

EB = Energy Boundary; as described in the energy laws and principles.

EM = Energy Meter; being applicable for a specific medium to indicate residual of gradients or a potential energy.

FDPE = (spent) Fluid Recycles Derived Water Column Potential Energy. This refers to spent working fluid being recycled and reformed into water column potential energy in the water storage tower.

Hidro+ Smart Generator = Brand Name for the Generating Plants utilising Hydrodynamic-Cycle Process.

Hydrodynamic Power Technology = is the name for the Technology.

Hydrodynamic-Cycle = Is the process principles of the technology, invented by Ing. James Kwok of Australia. The Technology is protected under granted international patents and patents pending. There are also various granted international patents and patents pending for specialised mechanical devices and systems.

Hybrid = The process that re-cycle a waste-energy as a by-product to do work; or utilisation of an energy either generated mechanically or electrically resulting from a by-product or a by-process to do work. These processes is also called as a combined-cycle, being more than one-cycle that normally called an open-cycle.

Hidro+ International Group = The principle and owner of the technology and intellectual properties.

Inert = Refers to a body of energy lacks of vigour and/or a meaningful potential energy, and thus on its own unable to do any work.

Derived/Reformed = Refers to an inert body of energy subsequent transformation due to molecules attractions under gravitational force with vigour having a meaningful and significant potential energy; and thus capable to do work.

KJ = Kilo Joule or 1000 Joules of energy.

kW = Kilo Watt or 1000 Watt of electrical energy; electricity tariff is rated as: kWh.

LEG = Linear Electric Generator being applied in Hydrodynamic-Power Plant Type A. It converts gravitational potential energy into electrical energy directly, thereby minimising conversion losses. LEG is

also a patent pending by HIA (Hidro+ International Group).

MJ = Mega Joule or 1,000,000 Joules of energy.

MW = Mega Watt or 1,000,000 Watt of electrical energy; Power generation is rated as: MWh.

MWe = Mega Watt of electrical; this is to differentiate with MWt = Megawatt Thermal as applicable in power generation having a steam-cycle.

OSMOTIC PROCESS = Refers to reversing of traditional reverse osmosis process. This process is used successfully by Statkraft of Norway to harness the potential energy from the processes involving mixing raw water from river with ocean water with high salinity.

OTEC = Ocean Thermal Energy Conversion, is harnessing the ocean thermal gradients as a natural occurrence or phenomena. The harnessing process including ORC (organic rankine cycle), where low boiling points gases or liquids are used to cause expansion and increase pressures when subject at close to ambience conditions.

PATENTS AND PATENTS PENDING = Refers to Hydrodynamic-Power technology being granted with patents protection internationally. Patents process takes 3 to 5 years, with final assessments are undertaken by panel of experts, known as the International Examiners at the International Patents Office based in Geneva.

Patents processes are very expensive and granted only for a subject matter that is: "Novel" (means none previously submitted by any others world wide having even a slight similarity or material); "Inventive-Steps" (again it means none previously submitted by any others world wide having even a slight similarity or material that shown as merely a small change or modification); "Industrial Applicability" (means it must be able to be used for industrial application as it is intended or other potential industrial uses; any subject matter perceived by the Examiners as a perpetual, is a total rejection).

Whilst: Patents Pending = Refers to patents that is still under process, whilst international protection is granted based on the priority date of submission.

This early process is very time consuming and very expensive as technical experts and competence Attorneys are driving the program that can be complex in procedures, policies, laws and jurisdictions.

P&ID = Process and Instrumentation Diagram; being the generating plant processes principle for automation, and being designed based on plant's operational logic and control philosophy.

PRE-COMMERCIAL PLANT = Refers to Hydrodynamic Power Plant proven pre-commercial

20kW capacity, constructed at Gold Coast, Queensland, Australia. Tests result at **Appendix 6A and 6B.**

PRIMARY ENERGY INPUT = Refers to the initial process for energy storage. For example: in hydro-dam scheme it relies on rain falls to fill the storage dam; in the case of Hydrodynamic-Cycle a mechanically driven pump is used to fill the water storage tower.

PT INTER PACIFIC ENERGY = The Hydrodynamic Power Technology License holder for specific Territory of Republic of Indonesia and Republic of East Timor Lestee.

PV = Photo Voltaic for solar collector system to yield a direct-current voltages suitable for storage in a battery.

R&D = Research and Development relating to Hydrodynamic-Power technology. The development phases have taken over a decade begins with bench-top prototyping, followed by a proof of concept prototype to progress onto constructing a fully designed demonstration plant with a 300 Watt capacity. Finally reaching the technical and engineering program where: materials analysis and selections conducted to define devices durability and reliability, followed by designs and detailed documentation for various specific mechanical devices and systems that are non-existent world-wide.

The success from a demonstration plant's tests have progressed onto the construction of a fully designed and technically specified Hydrodynamic Power pre-commercial plant with 20kW in capacity.

Following the successful tests of this plant in 2010; dedications were placed to complete a full technical and engineering designs and documentation. These efforts supported by many Hydro+ engineers and the inventor in Australia, including Prof Dr Ion Boldea of Polytechnic University, Bucharest Romania, Prof Rajinder Malik PhD (fluid mechanic experts previously University of Sydney Australia), Mr Tony Magey BEng previously of Queensland University (QU) Brisbane Australia, and many specialist engineers and scientists from Australia and Overseas.

SECONDARY INPUT = Refers to Renewable Energy Source as the continuous water in-flow; whereby the source itself initially in the state of "inert" having no vigour and miniscule potential energy; however it is reformed into water column potential energy, due molecules attractions under gravitational forces. Therefore the Energy Input into the energy boundary system is no longer as only water in-flow but as Total Potential Energy (TPE).

In hydro-dam scheme the water in-flow initially as "inert" and reformed into water column potential energy of the water volume and mass in a storage dam. The combined potential energy available for conversion into electrical energy is the total potential energy (TPE).

In Hydrodynamic-Cycle process system the water in-flow initially as "inert" and reformed into water column potential energy through molecules attractions due to gravitational forces with the massive water retention in the storage tower, representing the retention of massive potential energy value.

The potential energy available for conversion into electrical energy at each work-cycle is the combined water volume mass in the storage tower.

The water in-flows is the used working fluid with a volume representing only 1.5% of the total water volume in the storage tower.

Therefore the Energy Input into the energy boundary system is not merely the water in-flow, but the total potential energy. In other words as: fluid derived water column potential energy [FDPE].

UNFCCC = United Nations for Climate Change Convention. The highest World's Authorities in the international program towards combating green house gases emissions, and by doing so working towards abating Earth's and Ocean's temperatures rises, that could have a profound adverse impacts to Earth's biodiversity and eco-system and all spectrums of its habitats and survivals.

The key platform in the UNFCCC's achievements so far is the Kyoto Protocol and efforts to reach a new consensus in the way the Kyoto Protocol was, is progressing in efforts to renew the Protocol's which have reached its expiration period.

The 2009's COP15 in Copenhagen was so far the most attended UNFCCC's climate convention by State's Leaders. Regrettably COP15 only yielded a non-binding agreement, called Copenhagen Accords. The reasons for the failure to reach a binding agreement was muted due to lack of technical solutions and demonstrable sustainable development programs to combat poverty in least developed countries (LDC) and to alleviate deforestation for commercial gains as well as communities based cooking in developing countries.

USED WORKING-FLUID = Refers to spent fluid having done various work of each work-cycle. This body of fluid is in a state of "inert" after work is done. The used working fluid volume represents only 1.5% of the total water volume in the storage tower. This body of fluid represents water in-flow reformed into water column potential energy transformed due to attractions of molecules under gravitational forces. This total potential energy is the Renewable Energy Source as Energy Input into the energy boundary possessing significant potential energy of some 66.7 times of the Energy Output converted into electrical energy.

In the traditional power stations utilising fossil fuels, the spent "fuel" or potential energy from the fuel is a "waste" with no potential energy remains, nor in most cases as inert physically or chemically.

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- Appendix 5: EPA State Government of Tasmania Approvals for the Proposed Hydrodynamic Power Plant 1000MWe capacity at Wesley Vale in Tasmania.
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- Appendix 6B: P&ID and control system.

DIAGRAM 1:
Various Renewable Technologies and Energy Boundaries.

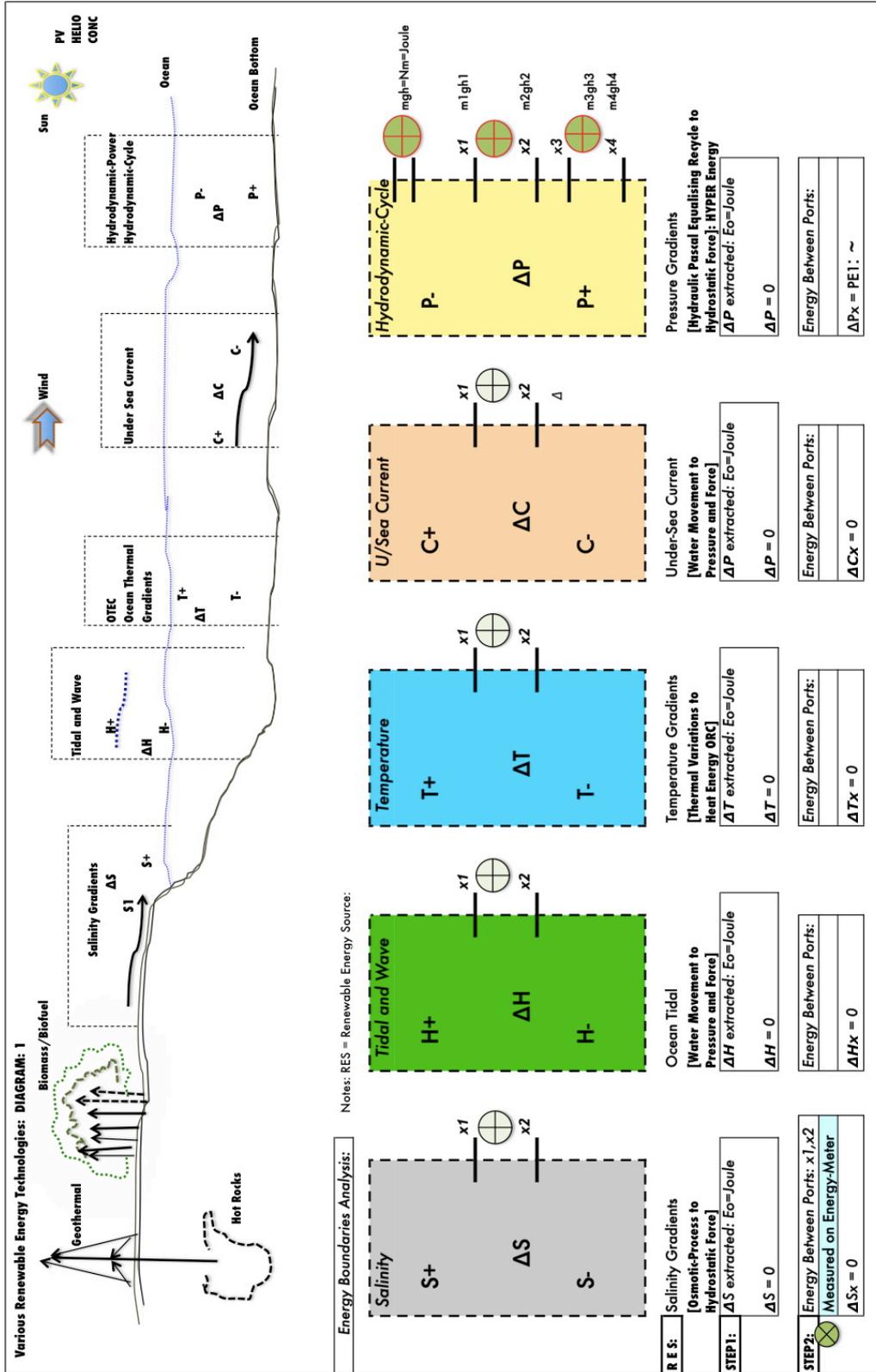


DIAGRAM 2A:
Hydrodynamic Power Technology Type A



DIAGRAM 2B:
Hydrodynamic Power Technology Type A P&ID

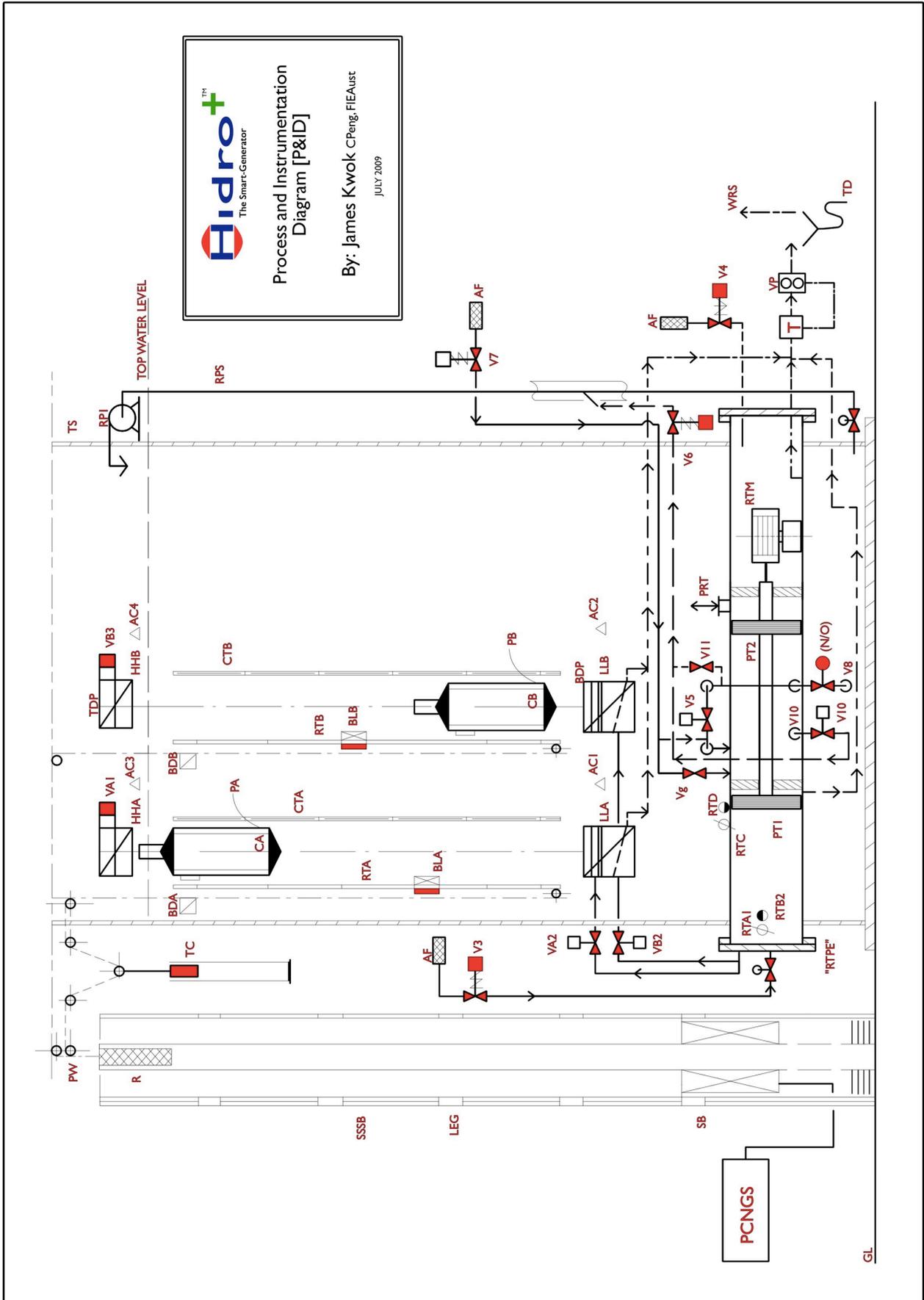


DIAGRAM 3A:
Hydrodynamic Power Technology Type B

Hydrodynamic Power Technology

