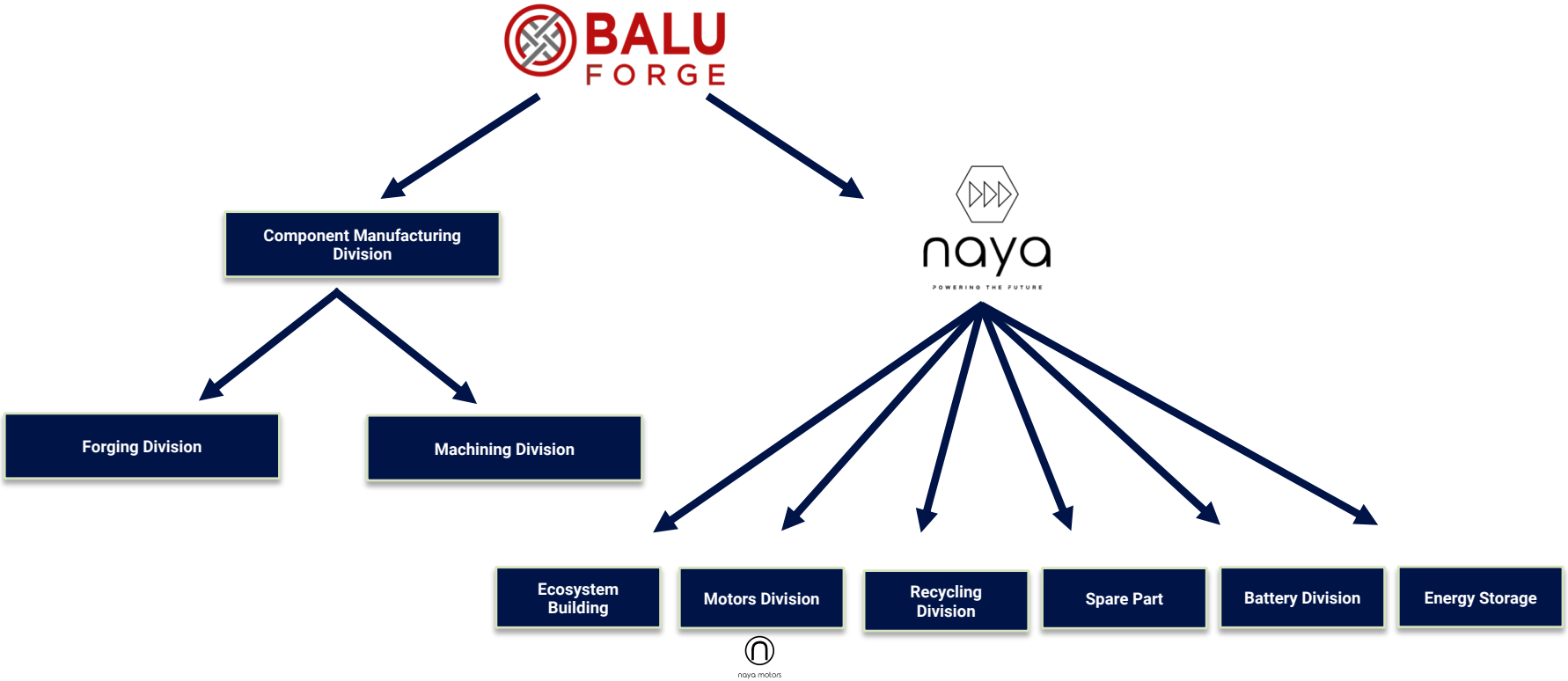
Company Profile

January 2021

Naya Energy

Company Structure



Company Structure

Balu had a humble beginning in the year 1989, in Belgaum, India. The initial set up was for manufacturing of crankshafts for single cylinder & two cylinder with a limited workforce. Within the last decade the company is supplying to OEM companies and the aftermarket presence has since expanded to over 80 countries. Three decades later Balu has gained an excellent reputation in the world market & has further ventured into multiple new verticals spread the New Energy Sector.

Naya Energy

Company Structure

Naya Energy

Battery Division

- Lithium Ion Battery Development
- Metal air Battery Development
- Development of the Proprietary Battery Management System

Ecosystem Building

- Wall Mounted Charging Stations
- Wireless Charging Stations

Recycling Division

- Lead Acid Recycling
- Lithium Recycling

Component & Spare Part Division

- Forging Aluminum Components for the Electric Vehicle Industry
- Precision Machined components for the New Energy Sphere
- Development of Electric Motors

Naya Motors

- Electric Carriage Project
- Two Wheeler

Energy Storage Solutions

- The Hydrogen Opportunity

Naya Energy

Land & Building

Existing Plant Overview

Belgaum, India

Land Area: 8 Acres

Full Fledged Built up Land approximately 200,000 Square Feet with Machinery

Mumbai, India

Land Area: 10 Acres

Full Fledged Built up Land approximately 500,000 Square Feet with Machinery

Ras Al Khaimah, United Arab Emirates

Land Area: 1 Acre

Full Fledged Built up Land approximately 20,000 Square Feet with Machinery

New Proposed Plant Overview

Belgaum

Land Area: 25 Acres

Current Status: Estimated Completion Q1 2020

Naya Energy

Key Management Personnel

Jaspal Singh Chandock, Managing Director

A Mumbai based & 2nd generation entrepreneur with decades of experience & investments in a vast sphere of industries. The Foundation for Balu was laid by Mr. Jaspal Singh Chandock under the guidance of late Mr. Prehlad Singh Chandock & the company has risen to new heights with a consistent year on year growth. The manufacturing of engine components has always been core the to the vision for Mr. Jaspal Singh & a presence in over 80 countries has led to the establishment of global brand strong in its values & integrity

Trimaan Singh Chandock, Executive Director

A young & dynamic leader with a MSc & a BSc in Management studied from H.R College, Mumbai. A 3rd genera1on entrepreneur who joined the company in 2009. A visionary with a keen interest in innovation in the field of manufacturing. The company has had incremental innova1on in the core of its practices since the joining of Mr. Trimaan Chandock. The introduction of the same led to greater productivity, flexibility & speed in the manufacturing plants. The shift to the OEM business had been undertaken after the achievement of the TS16949 status under the leadership of Mr. Trimaan Chandock

Jaikaran Singh Chandock, Director

The youngest & newest recruit who joined the business in 2014 after completion of BSc in Business Management from Cass Business School, London & MSc in Strategic Marketing from Imperial College, London. He has had Previous experience in MNCs such as Reeves & Njoy E-cigs & a notable achievement at the college level was that he was crowned the winner of an Entrepreneurship challenge amongst 50,000 participants. As entrepreneurship runs in the family, the recent addition has led to application of new technology in the company & further diversification into manufacturing of different engine parts from the diesel engine family. The recent setup of the R&D facility under his vision has set a base & laid the path of the company for the future

Key Management Personnel

The Strong Lineage of the company spreads over three generations & the growth story has been consistent since its inception in 1989. The company has consistently built a formidable reputation & strong global presence. The company's reputation now resonates with precision & quality engineering delivering success for all its stakeholders spread over 80 Countries

Naya Energy

Certifications

Certifications

IATF 16949:2016 | ISO 9001:2015 | ISO 14001:2015 | ISO 45001:2018

Naya Energy

Research & Development

Development of New Materials

A number of new material chemistries have been worked on during the many R&D Projects to assess the material compositions & applications of newer metals. The New Energy Era has led to a number of opportunities & rise to newer applications of conventional metals with innovative manufacturing processes.
A number of key areas of R&D are as follow:

- *Fatigue Analysis of Steels (Stainless steel alloys, Aluminium, Titanium, etc)*
- *Durability & Analysis of Failure (Root Cause Analysis, etc)*
- *New Raw Material Selection & Process Development*
- *Selection of Raw Material*
- *Modelling and simulation of Heat Treatment Processes*

Product Engineering & New Product Development

Advanced & Additive Manufacturing

We use a number of additive manufacturing methodologies for rapid prototyping & New Product Development. This ensures flexibility & Speed in the New Product Development process & ensures a rapid development of New Prototypes The Use of 3D Scanning also adds efficiency & speeds up the entire design & development Process. The In-House Infrastructure for 3D Scanning can measure up to 5 Million Points in 2 Seconds & 7-20pm Accuracy.
The Additive Manufacturing Centre also formulates a good foundation for our company's foray in the Aerospace Industry with a large product portfolio that now is possible by the Additive Manufacturing Methodology. 3D printing also is a key area as part of our In-House Tool Room Strategy as key components from the Manufacturing Process can now be produced In-House in the 3D Printing Center

State of the Art Machining

The Machining Facilities are well supported with State-of-the-Art Infrastructure namely:

- *Comprehensive In-House Tool Room*
- *Metallurgical Labs*
- *Design & Process Facilities*
- *Inspection & Tests Facilities*

The R&D complements the above excellence by further enhancing the existing capability of our company. The Three Key Pillars that are now possible in the R&D Center:

New Product & Process Development
Development of New Material Chemistries for the New Energy Era | Gear Manufacturing | Assembly Services & Testing
Technology Enhancement
Ultrasonic Machining | High Speed Grinding | 4-Axis & 5-Axis Machining | Rapid Prototyping
Analysis
Tool Wear Analysis | Fracture Analysis | Grain Deformation | Force & Temp | Durability & Fatigue | Cost Saving

Forging the Future

All our facilities are being powered by Renewable Energy Sources as part of our strategy to drastically reduce our carbon footprint.

There is a continuous focus in the below areas:

- *Design and Development of new products and processes.*
- *Modelling and Simulation of Metal Forming processes.*
- *Deformation studies and associated metallurgical analysis of Alloys.*
- *Process improvements/ Cost optimization in Metal Forming Process.*
- *·Product life assessment through Fatigue & Fracture studies.*

A key focus is Aluminium as part of the light metals that have seen a surge in demand in the New Energy Vehicles.

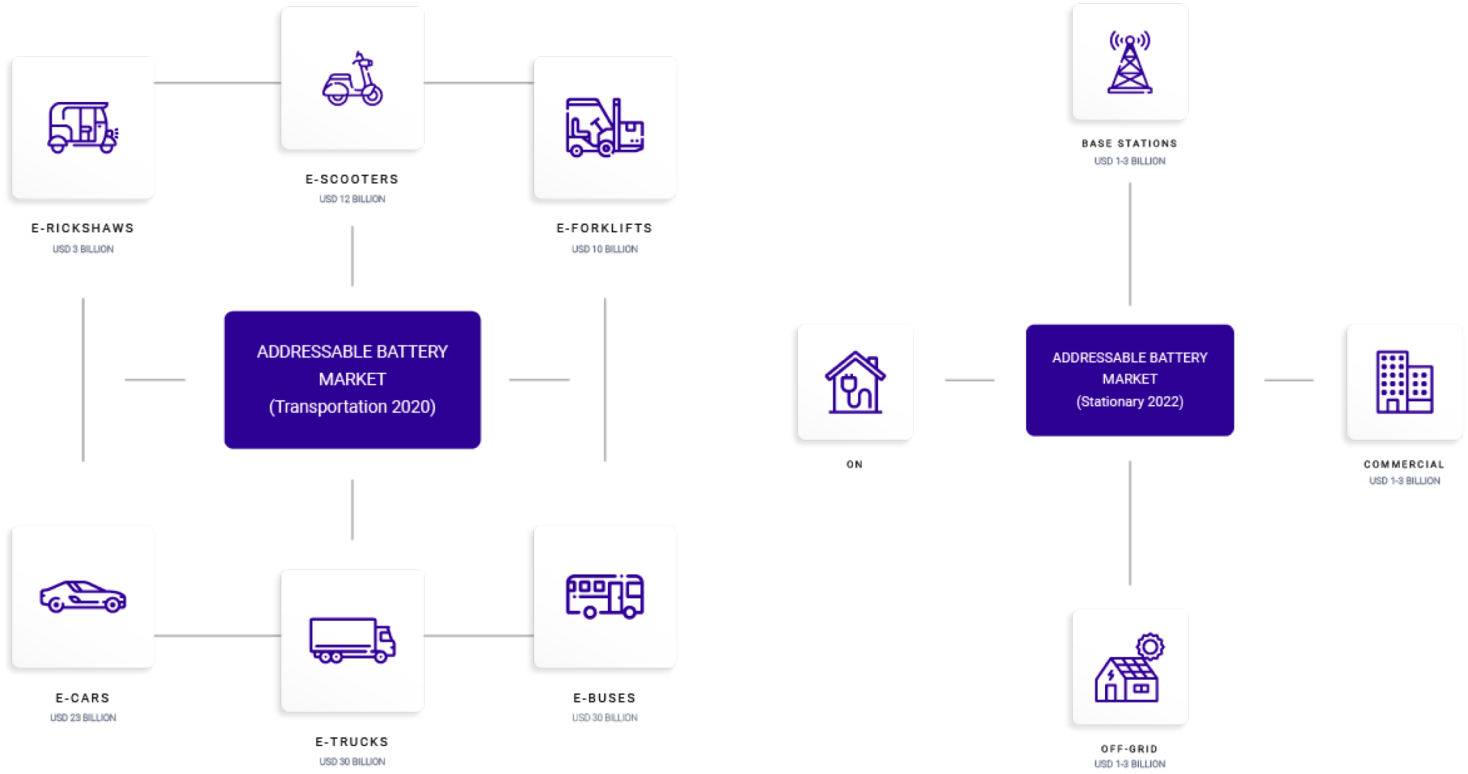
1 Battery Division

Overview

We at Naya are preparing an end to end solution from Cell Development to building a comprehensive capability to develop a plug & play module for companies aspiring to Develop BEVs both domestically & overseas. Our unique proposition & R&D Centre will assist companies from Battery Selection, Design & Module Delivery offering a ready to use solution for their vehicles. The key pillars at our Battery Division is Energy Density, Commercialization of new Battery Chemistries & to build a capability to break that USD 100/KWh barrier which is increasingly become the goal to increase widespread adoption of BEVs.

1 Naya Energy

Battery Division



Market Size

The Addressable & market size is increasingly on the rise & is expected to expand many folds in the coming years. It has become a race to not only build capacity but to also continuously innovate in the Material Chemistries & typically the Cathode Materials. The applications known today may be redundant tomorrow with newer chemistries being explored by peers globally. The goal is not only to build a company to stay ahead of the curve but to also innovate new chemistries to ultimately reach the tipping point or the so called 'Holy Grail' in battery chemistries.

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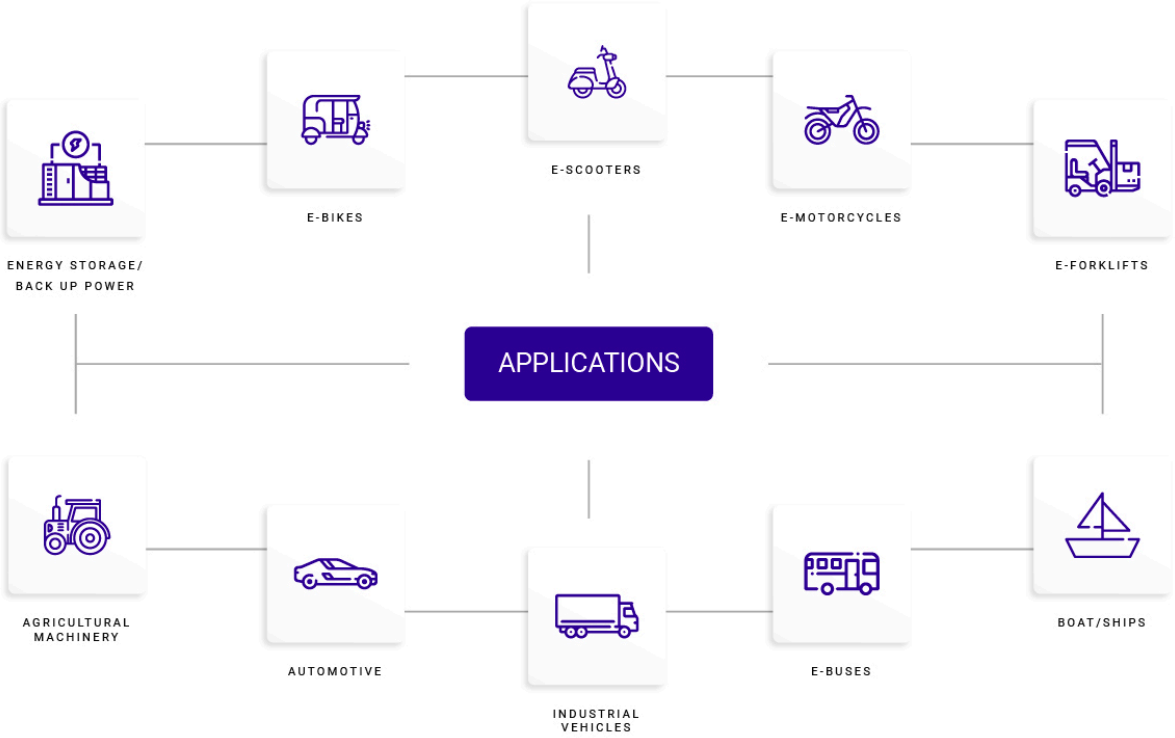
Naya Energy

Battery Division



Applications

The Use of Lithium Iron Phosphate (LFP) & Nickel Manganese Cobalt (NMC) already have a widespread usage in a number of applications spread over a number of industries. Our goal is to develop unique solutions for an increasing application to accelerate the adoption of BEVs across industries.

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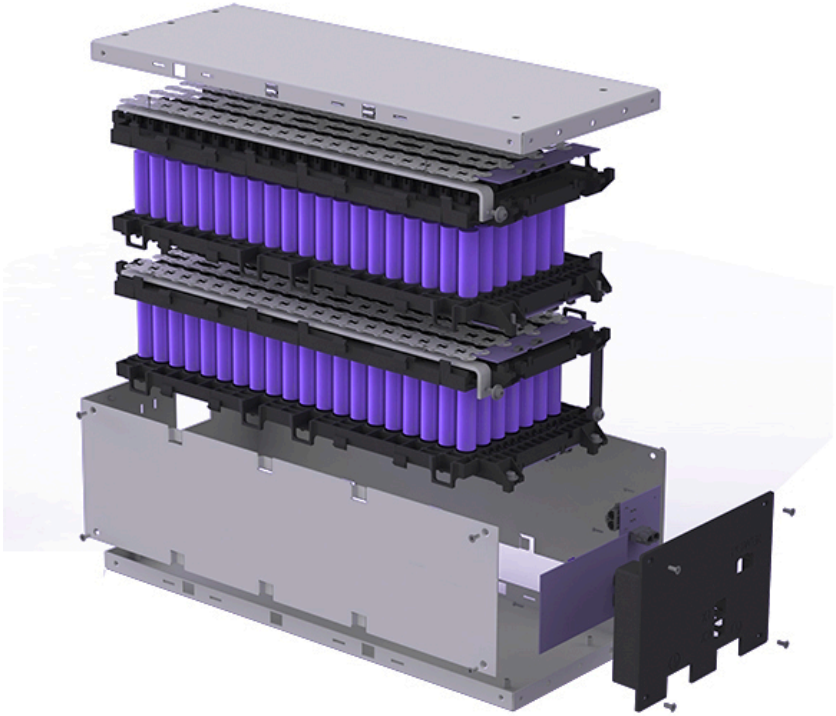
Battery Division



Battery Design & Development

We have an in-house capability to Design & Develop Battery Solutions for a large number of applications

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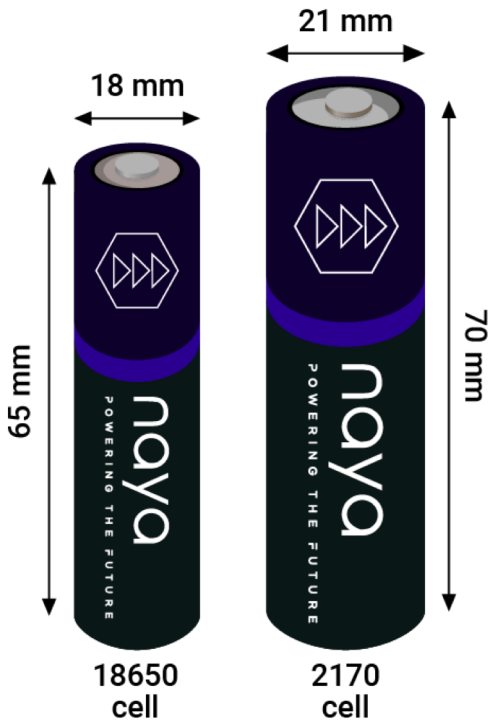
Naya Energy

Battery Division



TYPE	SIZE	CAPACITY	WEIGHT	ENERGY DENSITY
18650	Diameter 18mm Length 65mm	2200-3600 mAh	45-48g	250WH/KGS
21700	Diameter 21mm Length 70mm	3000-4800 mAh	60-65g	300WH/KGS

The Naya Cell

The Cylindrical Cells are used by a number of Industry Leaders as the most viable solution for BEVs & PHEVs . The Lithium Iron Phosphate (LFP) and Nickel Manganese Cobalt (NMC) technologies offer high powered cell performance compatible with virtually any application to deliver more power and significantly increased cycle life.

Advantages: *Low self-discharge rate I Wide working temperature I Flexibility to Increase Capacity I High charge & discharge current I Long cycle life I Superior safety I Smaller size I Lighter Weight*

The Two most commonly used Cylindrical Cells are the 18650 & 2170 types & keeping in line with the ever changing narrative, we are also working on Developing a new proprietary Cylindrical Cell inspired by the 4680 Cell Design for maximum efficiency & effectiveness.

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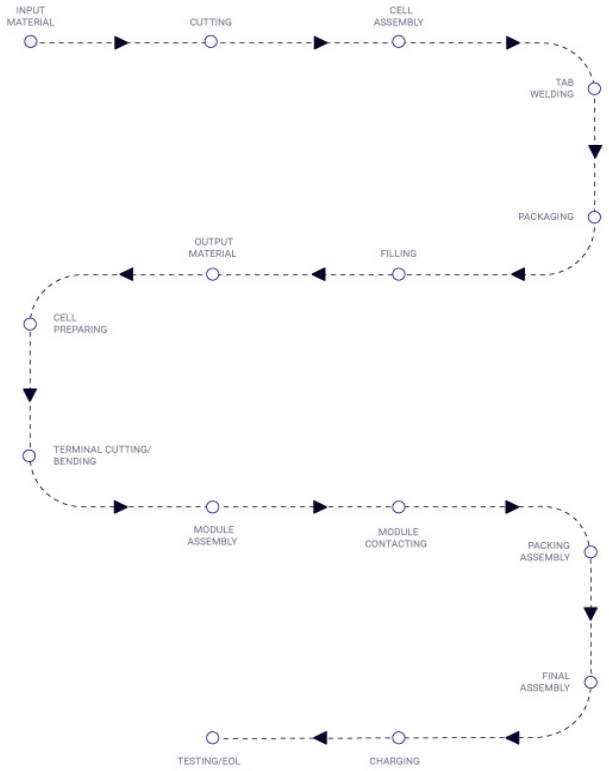
Naya Energy

Battery Division



The Production & Assembly Plant

Our State-of-the-Art battery plant is presently under construction & will offer a completely integrated solution from Cutting to Module Assembly & Testing

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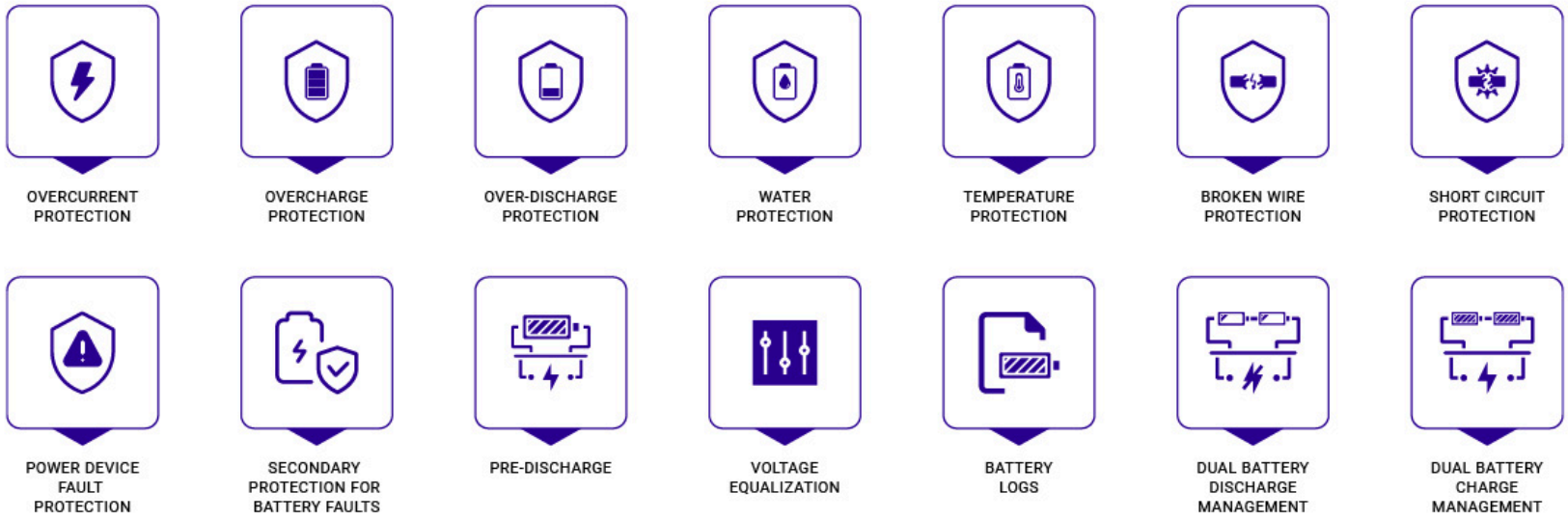
Naya Energy

Battery Division



The Naya Battery Management System (NBMS)

We have developed our home grown & locally developed Battery Management System in collaboration with a number of Universities throughout the country. This will offer a comprehensive protection to the battery.

1

Naya Energy

Battery Division

The Solid State Battery Project

The Solid-State Battery is regarded as the Holy Grail in Battery Development & Manufacturing as this would eliminate some of the major obstacles associated with Liquid Electrolyte which are used more frequently today.

Some of the key features for a Solid-State Battery are below:

- *The Liquid Electrolyte Substituted with a solid electrolyte which is mainly two systems of organic and inorganic ceramic materials, the distance between the positive and negative electrodes can be reduced to a few microns which is will largely reduce the thickness of the Overall Battery*

- *The Solid State Batteries will be both light & thin as the degree of flexibility of the all Solid Battery will be significantly improved*

- *The Overall Energy Density of the Battery will also be significantly improved as using an all-solid electrolyte, the applicable material system of the lithium ion battery will also change, and the metal lithium will be directly used as the negative electrode which will in turn reduce the amount of the negative electrode material.*

- *A Traditional lithium battery usually has the following negatives namely:*

    1. *Lithium dendrites may occur when working at high currents, causing short-circuit damage by piercing the diaphragm.*
    2. *Side reactions, oxidative decomposition, gas generation, and combustion occur at high temperatures. In an all solid-state battery technology, the above two problems can be directly solved*

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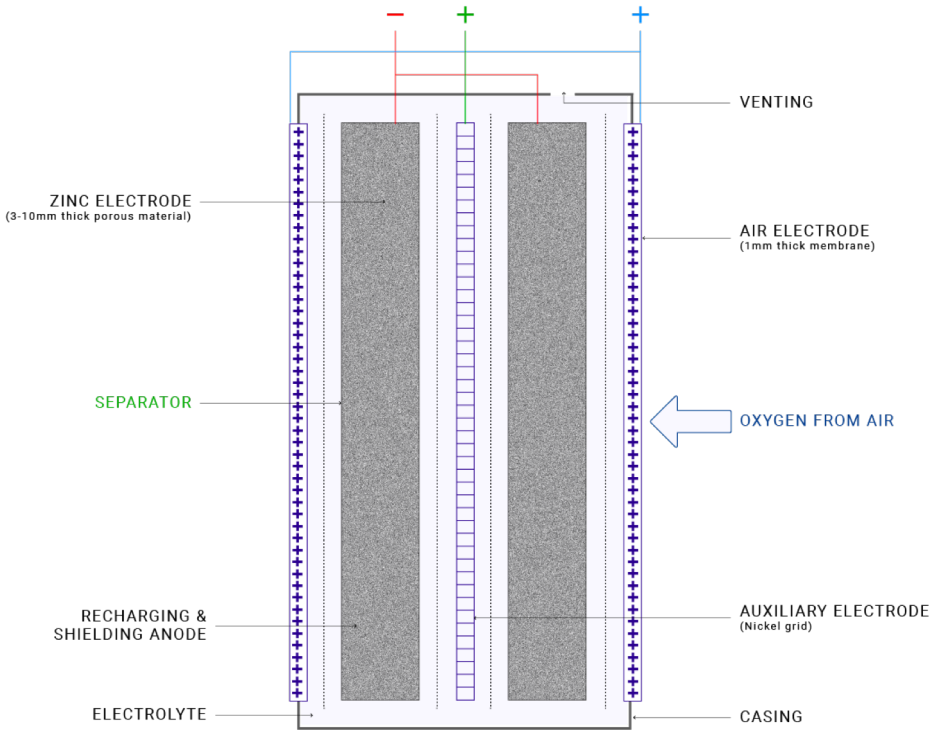
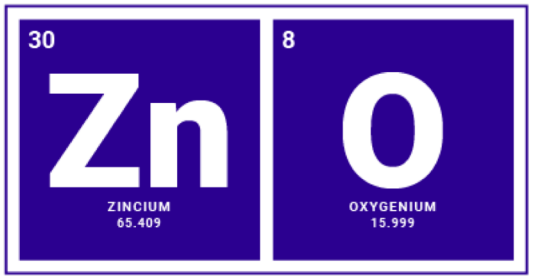
Naya Energy

Battery Division





The Metal-Air Battery Project

We have extensively developed solutions for the ultimate viability of Metal Air compositions with the most suited being Zinc-Air.

Advantages of Zinc Air: A fraction of the price of competing batteries (almost 10 times) I Cost between USD$ 25 – USD$ 35 per kWh(90% Cheaper than I Lithium-Ion & 70% Cheaper than Lead Acid) I Safest & Clean I High Energy Density I Very suitable for the Warm Climatic Condition

Potential of Zinc Air: Zinc Air technology has been around for years, but cycling has remained an unfeasible challenge, until now. Blending this low-cost technology with the capability of recharging, this has brought about a paradigm shift to the biggest battery markets in the world: Lead-Acid and Lithium-Ion. These batteries are cheaper, greener, and safer than their counterparts, Lithium-Ion and Lead-Acid.

Cell **Development:** The below illustration is a typical Zinc Air Cell we have been working on to better understand the potential in this metal air solution

2 Ecosystem Building

Overview

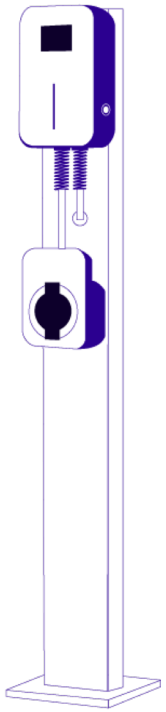
It is imperative for any disruption to be complemented & supported by an ecosystem ready to support that revolution. We have highlighted an aggressive approach to build complete solutions to expand the network of Charging & Fuelling Stations. The key areas we are addressing at Naya is a network of Wall Mounted Chargers, Wireless Charging Stations & Hydrogen Fuelling Stations.

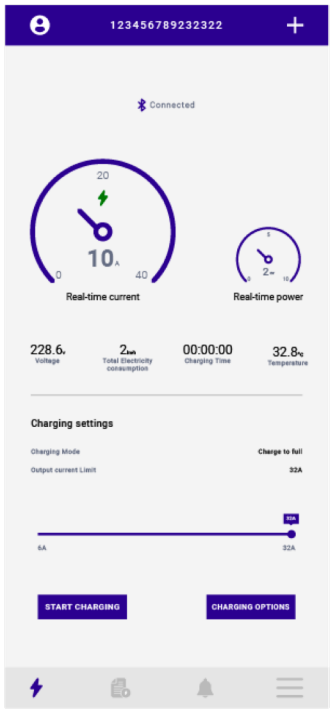
2

Naya Energy

Ecosystem Building

Customizable	RFID swiping card function enabled Adjustable Currents 8A/ 10A/ 16A/ 32A/ 40A Easy to Assemble
Charging Standards	SAE J1772 2009 (Type 1) North American standard Meet IEC 62196-2 (Type-2) European standard High compatibility with T1/T2 vehicle
Charging Currents Avaliable	3.6KW 16A 1 phase 7.5KW 32A 1 phase 11KW 16A 3 phase 22KW 16A 3 phase





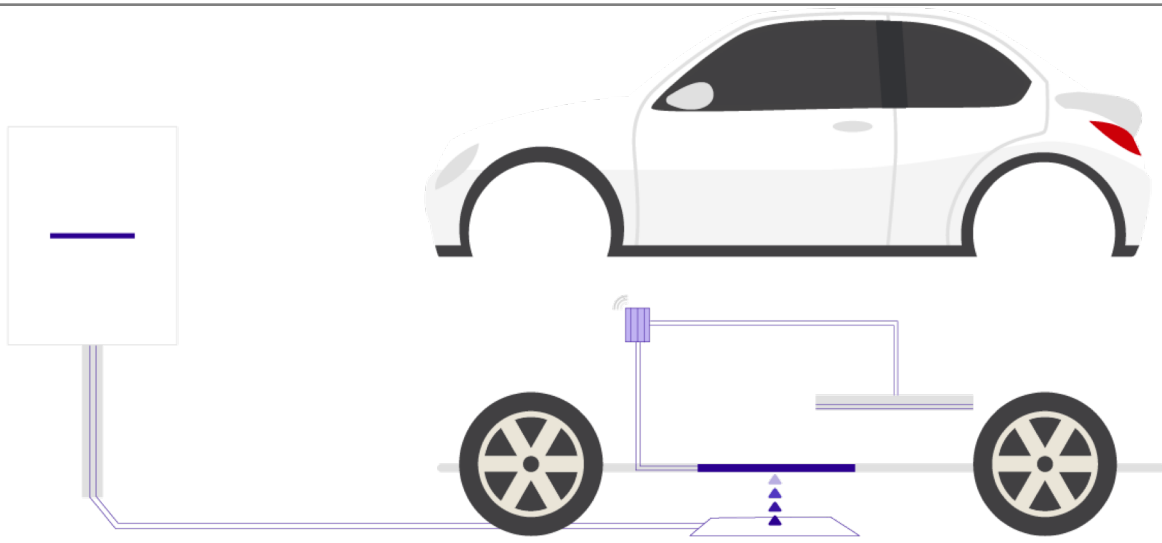
Wall mounted Chargers

We are working on a range of Charging Stations Conforming to Bharat EV AC Charger (BEVC-AC001) & Bharat EV DC Charger (BEVC-DC001) norms. We have also developed a number of solutions as per the EU Regulations for Charging. This includes a product mix consisting of Fast & Super Chargers with a capability of charging at 350 KW. Our R&D team is working on further expanding this capability to make our charging stations suitable for Heavy Duty CVs up to a capacity of 1.2 MW. *We have developed our very own application available on both the android & IOS platforms. These enables better monitoring for Micro Utility Companies/Owners as well as Fleet/Vehicle Owners*

2

Naya Energy

Ecosystem Building



Technology	The potential customers fit their vehicles with receivers that pick up signals from in-ground charges
Market Opportunity	There is an opportunity to sell the receivers to vehicle makers, fleet owners, car owners for existing models as well as future government projects for installations
Charging Currents Avaliable	The receiver matches the frequency of the plate, the way a radio scans for a usable station, then starts to charge the car

Wireless Charging Stations

Our team is hard at work in building novel solutions for Wireless Charging Stations. We have signed a number of MOUs with local authorities in the region of India. There are a number of pilot projects in the works to offer wireless charging stations on National Highways suitable for both passenger vehicles & Heavy Duty Commercial Vehicles.

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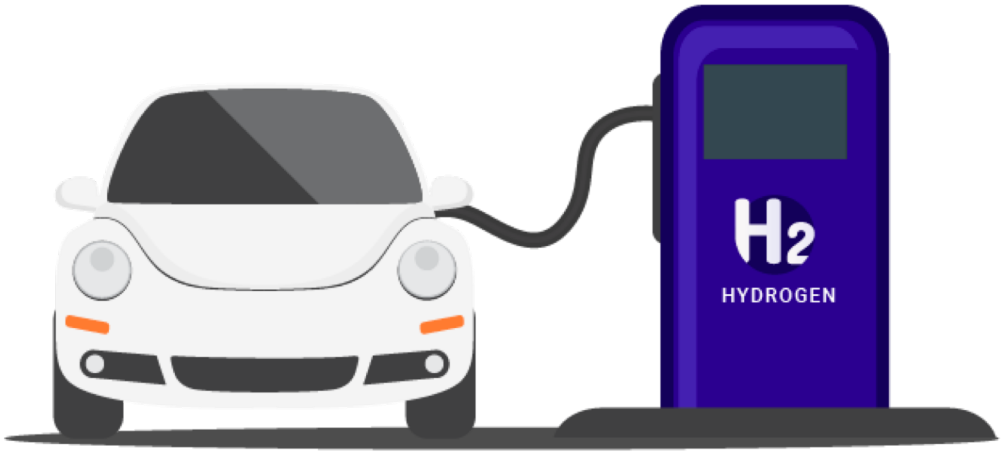
Naya Energy

Ecosystem Building



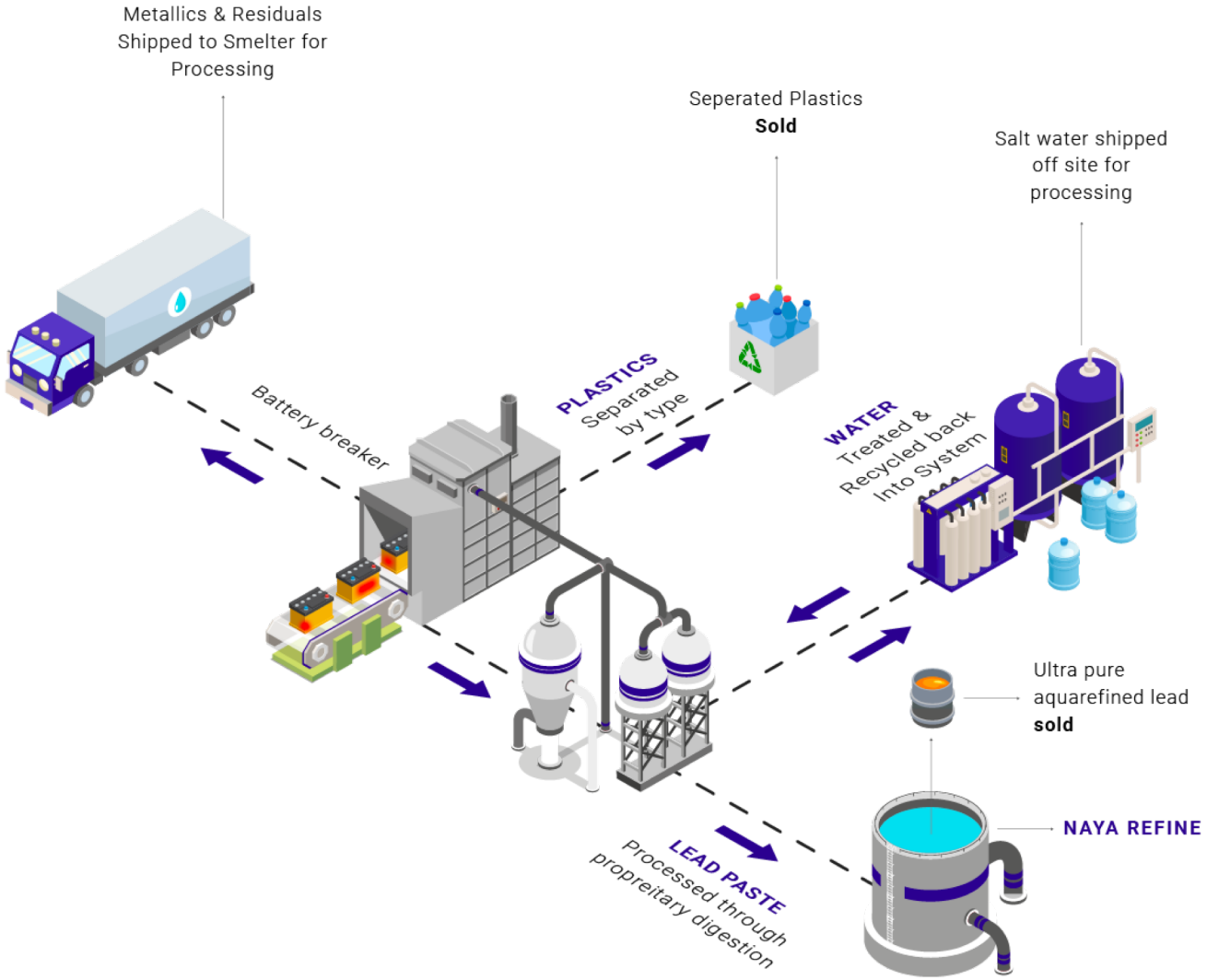
Hydrogen Fuelling Stations

We are working on Hydrogen Fuelling Stations & our pilot project is presently underway to establish the first Hydrogen Fuelling Stations for fuel cell vehicles. We have successfully removed the hindrance largely associated with Hydrogen Storage & this can now benefit a large fuelling opportunity. With the ever increasing market share for fuel cell vehicles especially in the Heavy Duty Segment, a presence of Fuelling stations is equally important. We wish to spearhead in this segment as one of the early movers to prepare the ecosystem for the New Energy Revolution. This includes electrolysers & onsite Hydrogen Storage.

3 Recycling Division

3 Naya Energy

Recycling Division



3

Naya Energy

Recycling Division

Lead Recycling

We are working on a proprietary technology, NayaRefine to deliver ultra-pure lead while reducing the Environmental footprint related to Lead Production.

The Problem:

Lead Production is very polluting & it is imperative we keep up with the rising demand & at the same time we follow the strict Environmentally Friendly Parameters. Lead is a key component in over a billion electrical storage devices used across the globe including every car and truck, hybrid and electric vehicle. Lead based batteries provide backup power for hospitals, electrify households and are the primary mode of energy storage for buildings & Data Centres. Over Ninety-six percent of all rechargeable batteries are lead-based but Lead is a finite resource & for this reason recycling is critical to keep pace with growing energy storage needs.

Market Opportunity:

- *Lead acid battery market expected to grow to $85.5 B in 2025*
- *Lead batteries are the only 100% recyclable batteries available.*
- *80% of the lead used to manufacture new batteries is recycled.*
- *Recycling is critical to keep pace with growing energy storage needs.*

Key Goal: *Finding a cleaner and more cost-efficient lead recovery and recycling methodology which is critical for the process of lead recycling going forward.*

The Lead Solution: NayaRefinePb

We are in the process of patenting our domestically developed Refining Technology, NayaRefine. We want to increase the production of lead to keep up with the rising demand without increasing emissions. We have locally developed a very modular design which can be conveniently deployed at stand-alone facilities namely existing battery recycling facilities enabling a circular economic model.
NayaRefine will utilise a water-based process combined with non-toxic, biodegradable organic elements to produce lead which will be 99% Pure. Our goal is to negate the use of Mining & reduce the cost of production & reducing the environment footprint in the process. One Module deployed can roughly produce 3-3.5 Tons of pure lead every day.

3

Naya Energy

Recycling Division

Lithium Recycling

The Problem:

The conventional methodology applied to Lithium Recycling is that the Spent Batteries often end up at a Recycling Plant where the raw material is incinerated, and copper and nickel from the batteries are recycled. But in this combustion process, the lithium is lost. We do have efficient methods for recovery of Lithium & other precious metals from these batteries.

Market Opportunity:

The lithium-ion battery market is expected to grow exponentially in the next five years in India & around the world, its recycling offers a $1000 million opportunity by 2030 in India alone as per the research reports However, recycling would gather momentum only when the Indian government brings in a well-defined regulatory and policy framework.

The lithium-ion battery market in India is expected to increase to about 132 GWh by 2030 (CAGR of 35.5%). The increasing volume of lithium-ion batteries would, in turn, lead to a growing capacity of 'spent' batteries in the ecosystem which if left untreated would lead to health and environmental hazards.

The number of electric vehicles on the world's roads will increase to 125 million by 2030 which justifies to opportunity for its recycling

The Lithium Solution: NayaRefineLi:

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4 Component & Spare Part Division

4

Naya Energy

Component & Spare Part Division

E-Mobility / New Energy Vehicle Sector

We endeavor to be ahead of the curve in the New Energy Vehicle Space with a clear emphasis & focus on Development of Efficient & Innovative Solutions for the New Energy Vehicle Sector.

We also have a Dedicated vertical, Naya with a clear focus on the Developments of the New Mobility World.

The New Era has moved from Conventional Mobility Solutions to a range of Potential Drivers for the Future may it be Hybrid/BEV/Hydrogen Powered Vehicles. It is imperative for an incumbent to have a well-defined strategy for way ahead where the changing Landscape will offer a large number of Opportunities.

In one of the Oldest Industries in the world, the laggards are the Automotive Incumbents & due to the large Capex already incurred in the Conventional Automotive space, it is generally far more difficult to shift to the New Era that is in front of us.

We see this tipping point as the single largest opportunity available for our company where we have the right balance between the Conventional Automotive & the New Era which is in front of us

It is not only imperative for companies to stay relevant but also shift their focus from their Conventional Cash Cows to Large Growth & future stars.

The Larger drivers & key pillars are Light Weight & Efficient Solutions for the New Vehicle Architectures. Being a Company with decades of experience in Precision Machining & Metal Forming, we have use this to our advantage to offer a range of products for the New Energy Vehicles.

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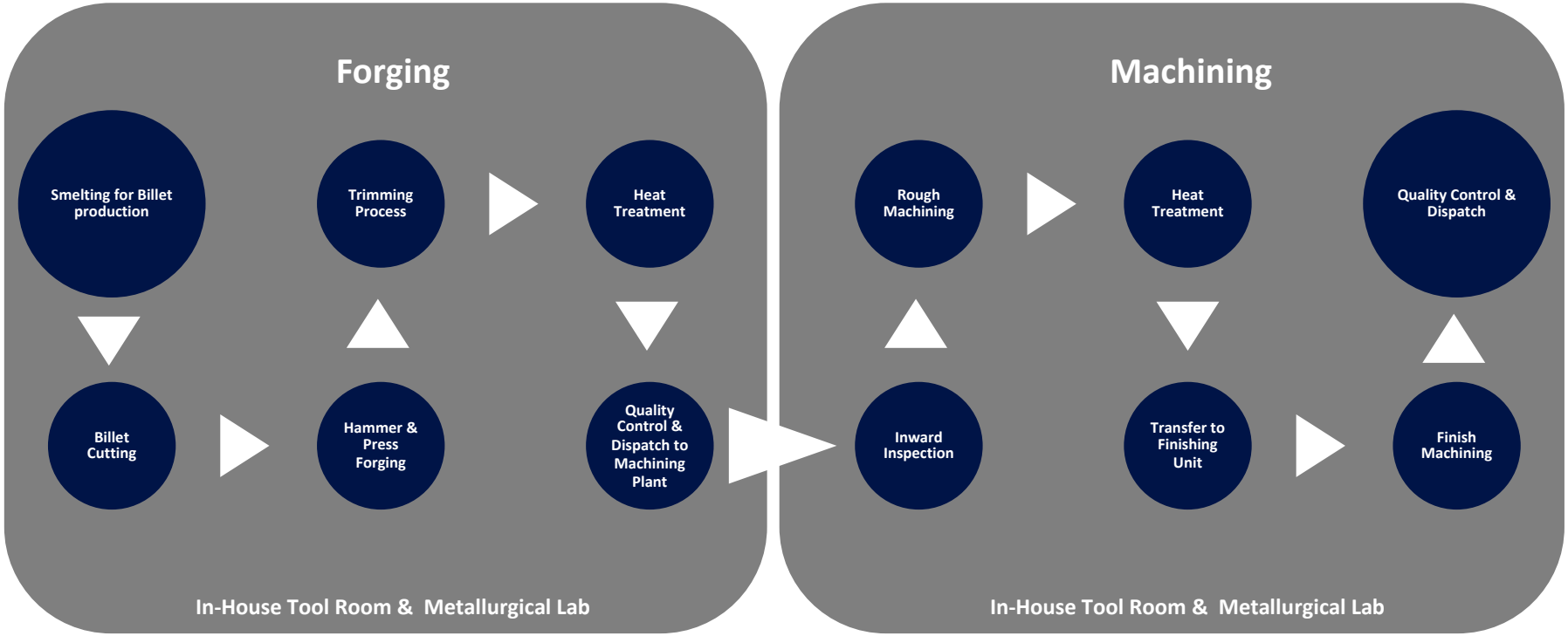
Naya Energy

Component & Spare Part Division



Infrastructure Overview

We have a Fully Integrated Forging Unit with a large product portfolio offering to our customers ranging from 1 Kg to 500 Kgs. The Forging Unit comprises Both Closed Die Forging Hammers & Presses with the largest offering being a 16 T Forging Hammer. We will be shortly commissioning a state of the art completely automotive new 6300T & 8000T Forging Press Lines. The Aluminium Forged Components are key to this manufacturing facility for the New Energy Vehicle Sector.

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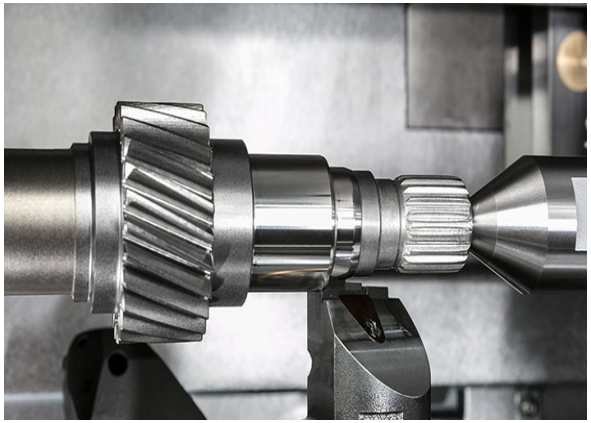
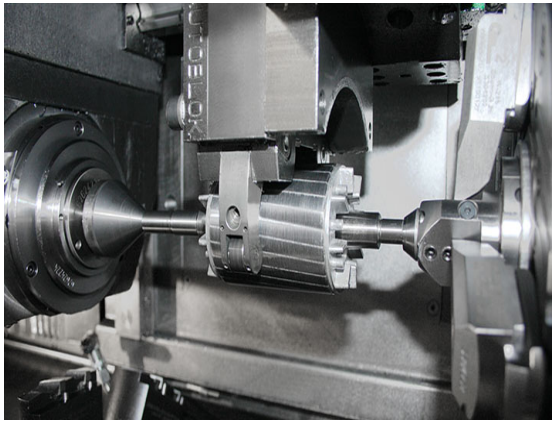
Naya Energy

Component & Spare Part Division





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Naya Energy

Component & Spare Part Division

Product Mix

Key Components
Shaft, Transmission Shafts, Drive Shafts, Rotor Shafts, Main Drive Shafts, Rotor Carrier, Toothed Shaft, Eccentric Shafts

Supply Capability
Raw Forged, Semi Finished, Fully Finished or Assembled

Applications
Electric & Hybrid Vehicles

4

Naya Energy

Component & Spare Part Division – Motors Development & Production

Overview

Naya Energy has attributed its focus on 3 types of Motors namely below:

- *Permanent-magnet Synchronous Motor (PMSM)/Brushless DC Motors (BLDC)*
- *AC Induction Motors*
- *Axial Flux Motors*

The key area of focus is the for the New Energy Vehicle Infrastructure namely: Electric, Hybrid or Hydrogen. We have dedicated team building working on Development of Proprietary Motor Technology to ensure the New Energy Vehicles can stay efficient & offer that edge to stay ahead of the curve during this Tipping Point for the New Era of the Automotive Industry.

Our project is in an advanced R&D Stage & we are expected to reach commercialisation by Q2 2021. There is a dedicated 4000 m2 infrastructure planned only for Motor Production & Testing.

4

Naya Energy

Component & Spare Part Division – Motors Development & Production

PMSM / BLDC Motors

A typical permanent-magnet synchronous motor (PMSM)/BLDC Motors uses permanent magnets embedded in the steel rotor to create a constant magnetic field. This has the most widespread usage & have been further popularised with the growth of the New Energy Industry.

There are a large number of Applications namely:

- *Computer hard drives and DVD/CD players*
- *Electric vehicles, hybrid vehicles, and electric bicycles*
- *Industrial robots, CNC machine tools, and simple belt driven systems*
- *Washing machines, compressors and dryers*
- *Fans, pumps and blowers.*

We are building a Very Modular Product Architecture which will be easily scalable for the varying capacities & applications.

The BLDC will be available in a variety of rotor magnet materials & a range of alloys. The size range will vary from 8 mm to 80 mm (0.75 Inches to 8.0 inches). We will also offer several larger sizes up to 8 inches in nominal diameter with a peak power output of up to 100 horsepower. Our Motors will have an efficient & compact design with high torque density defined by high torque relative to frame size.

4

Naya Energy

Component & Spare Part Division – Motors Development & Production

AC Induction Motors

These are the most common types of AC Motors used in everyday life. An induction motor or asynchronous motor is an AC electric motor in which the electric current in the rotor needed to produce torque is obtained by electromagnetic induction from the magnetic field of the stator winding.

There are a large number of Applications namely:

- *Water pumps*
- *Kitchen appliances*
- *Fans and air conditioners*
- *Automobiles*
- *Common industrial machinery like boiler pumps and compressors.*

AC induction motors are efficient and flexible, which allows them to match the load demand for almost any type of electrical application. We presently offer AC Induction motors ranging from Output of 6W – 150W.

4

Naya Energy

Component & Spare Part Division – Motors Development & Production

Yokeless Axial Flux Motors

One of key accelerators for the New Energy Vehicle Industry & one of its kind innovations to speeden up the shift from ICE (Internal Combustion Engines) to Clean Energy Automotive Solutions. The Key Advantage of an Axial Flux Motor is More Vehicle Range. The Traditional BLDC Motors suffer from iron losses due to the large amount of iron in the motors. In Comparison an axial flux motors come with 85% less iron cores losses and over 5 times less iron mass compared with traditional EV motors because of the absence of a yoke. This can typically result in a 25% increase in Vehicle Range in comparison to traditional motors.

The inherent Design for our Axial Flux Motors will have a very scalable product architecture ranging from small to large diameters and from low rpm to high rpm speed configurations.

We will build & offer motors of the follow characteristics:

- 50 - 300 kWp
- up to 800 V and more
- up to 20.000 rpm

5 Naya Motors

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Naya Energy

Naya Motors

The New Energy Vehicle Project

We have been working through a spectrum of Industries to develop solutions for our partners over a number of platforms. Our goal is to assist companies to develop new product architectures & solutions through an array of Vehicle Platforms. The solutions are more B2B in natures as we aim to be an end to end solution provides in the sphere of Vehicle Design & Development.

The Product Architecture

We have closely worked with a number of companies to assist in new vehicle design & Development. This is possible due to years of experience working with New Energy Powertrain & Drivetrain solutions.

The Unique & Proprietary Solution - Modular Battery System (MBS)

We have developed a Proprietary Plug & Play Modular Battery System (MBS) to provide flexibility between range of 60 km – 240 km to the Buyer of two wheelers. These work very similar to power banks & are easily swappable at a Battery Swapping Station. These enable buyers with flexibility at the time of purchase to avoid exorbitant costs generally associated with batteries

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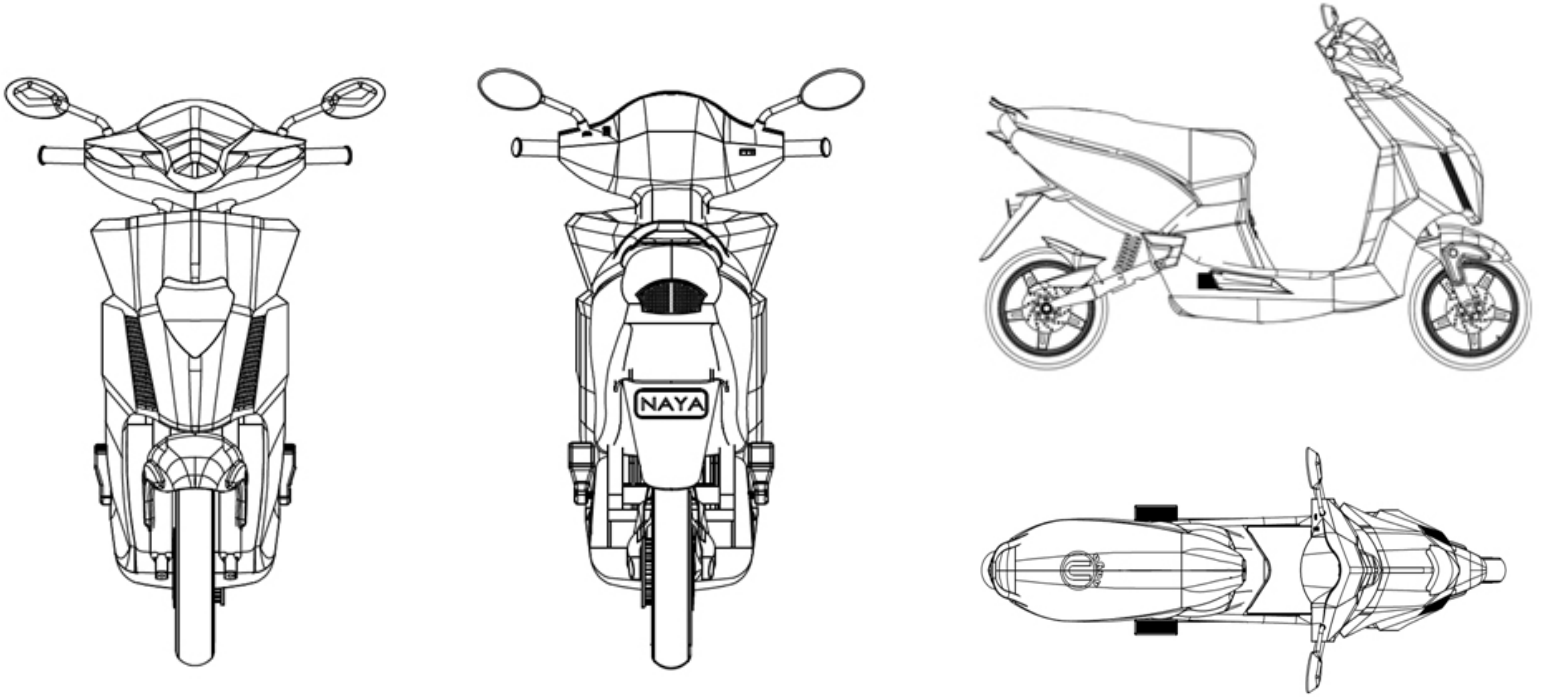

The Two Wheeler Prototype Project

We aim to be a Design & Development partner and work closely with our partners to aid them in their journey from Concept Development to Commercialisation.

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The Electric Carriage Project

We have developed a very successful Electric Carriage Project powered by an Electric Powertrain & Drivetrain. The said project showcases years of experience & relentless hard work by the Naya Team to enable & aid acceleration of Clean Mobility Solutions & Green Energy.

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The Electric Carriage Project

We have launched our very own Electric Carriages in the Sanjay Gandhi National Park as part of the Initiatives of the Government of India to ensure all Natural Parks are powered by Clean Mobility & Green Energy.
The said project is part of a much bigger vision to replace traditional horse driven Carriages in various cities of India most popularly being Mumbai & to replace these traditional carriages with the electric variants & providing gainful employment to the previously displayed Carriage Owners.
Our pilot project is presently visible in the Sanjay National Gandhi National Park & in the Streets of Mumbai. We will shortly be launching the said project extensively through over 5 Cities in India.

6 Energy Storage Solutions

Overview

Our primary focus under Naya is clean energy & accelerating the shift towards the future of cleantech. As part of the various Climate Change initiatives it has increasingly become the need of the hour. The most abundant & renewable resource available to mankind today is Hydrogen & for far too long this has not been the main focus for companies globally. At Naya we have highlighted Hydrogen as the holy grail for the New Energy Era. We have been extensively working towards building innovative solutions to provide our patrons leading technology in the industrial hydrogen, energy storage, hydrogen fueling and heavy-duty mobility industries.

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Naya Energy

Energy Storage Solutions

The Science

Hydrogen is the oldest and most common element in our universe & the first element on the periodic table. However, pure hydrogen is not a natural resource. It is stored in a compound with other molecules. Water consists of 66% hydrogen, hence the well-known symbol H2O. The hydrogen molecules can be extracted using an electrolysis process to produce electrical energy leaving the only by-product in the whole process, i.e. Water.

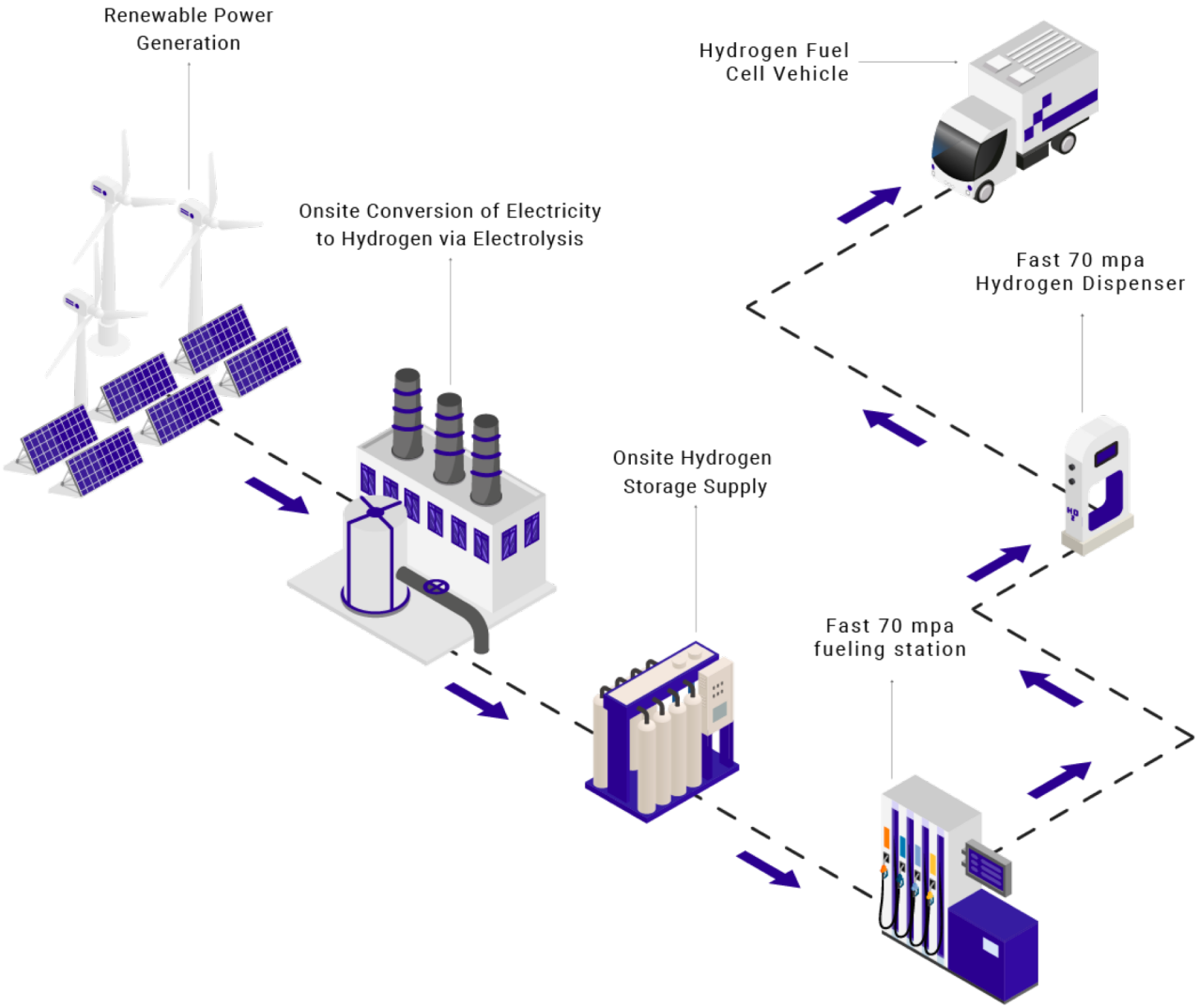
We can store hydrogen as renewable energy for a long time effectively as a 100% green energy supply. The stored hydrogen can also be used to run heavy duty mobility and everyday fuel cell vehicles. By recombining hydrogen and oxygen, a flow of electrons is created that results in electricity that can be used to run electric engines.

The Solution

We can convert Electricity into hydrogen by the process of electrolysis. The hydrogen can be then stored in the Form of Energy Storage Solutions and eventually re-electrify for Mobility or back to the grid. Over the years the hindrance has been the lack of storage solutions & transportation difficulties which has curbed the influence of Hydrogen as a major player. Today we have started to reap the benefits with years of persistence in developing Hydrogen as a key resource with a diversified product portfolio.

6 Naya Energy

Energy Storage Solutions



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Energy Storage Solutions

The Production Opportunity

Alkaline electrolysis is a more mature technology for larger systems, whereas PEM (Proton Exchange Membrane) electrolysers are more flexible and can be used for small decentralized solutions. The conversion efficiency for both technologies is about 65%-70%. The High temperature electrolysers are currently under development and could represent a very efficient alternative to PEM and alkaline systems, with efficiencies up to 90%.

PEM and Alkaline Electrolyser Hydrogen generators

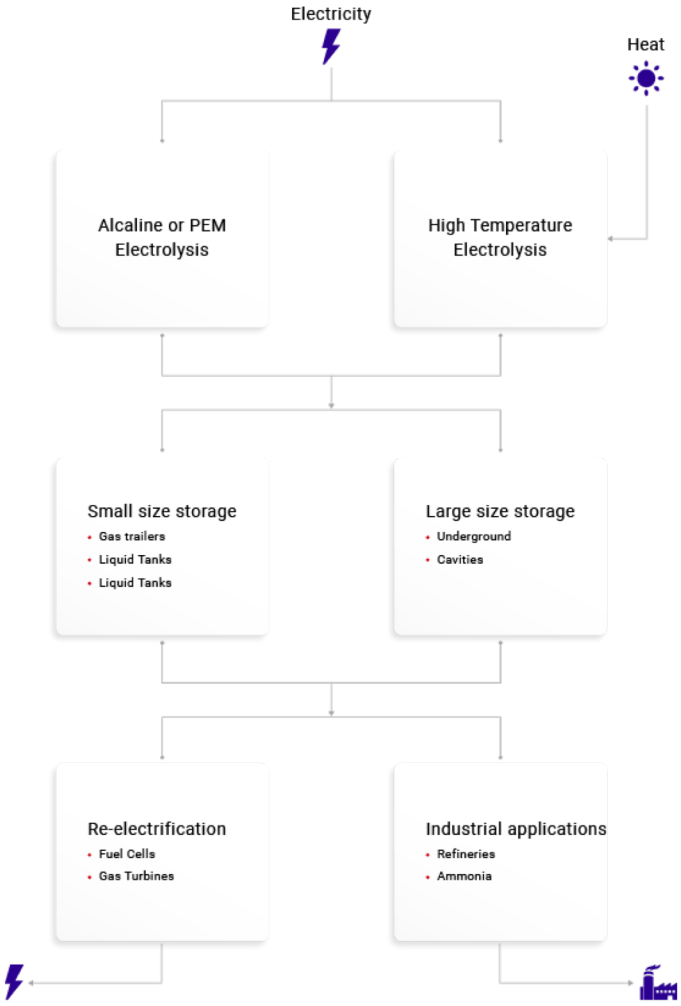
- *Hydrogen generation for industrial processes*
- *Hydrogen generation for Fuelling stations*
- *Hydrogen Energy storage and transportation*

Application of Hydrogen fuel cell power generators

- *Transportation such as trucks, urban transit buses, commercial fleets and utility vehicles*
- *Stationary applications such for continuous and backup power for hospitals, emergency services, data centres, corporate and production facilities, telecommunication and small commercial buildings*
- *Free standing electrical power plants and UPS systems*

Applications

- *Chemicals or Pharmaceutical industry*
- *Electronics and semiconductors*
- *Oil & Fats*
- *Metal Processing*
- *Glass*
- *Petroleum Industry*
- *Power Plants*



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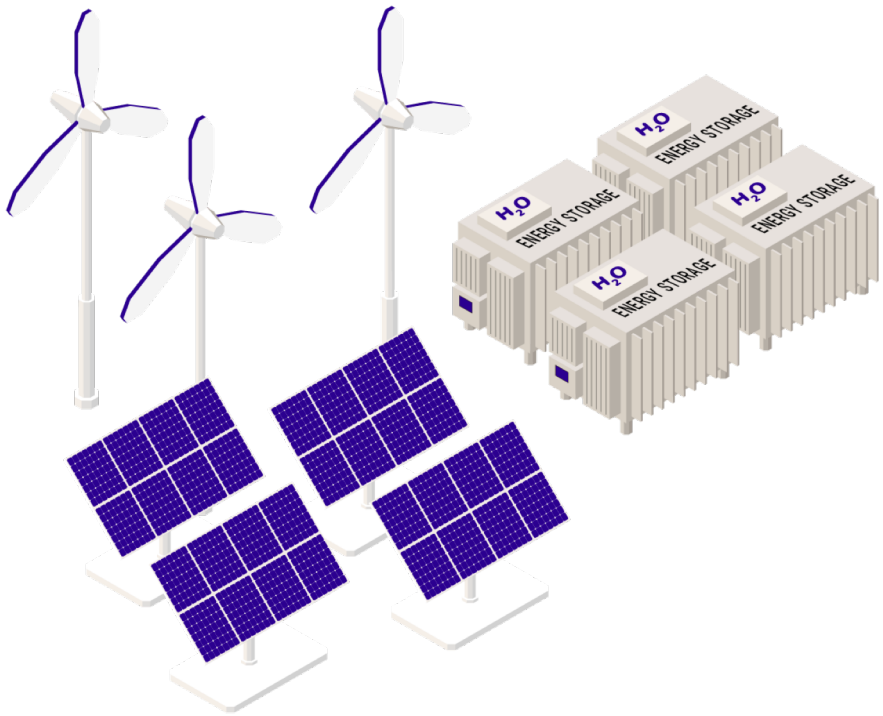
Energy Storage Solutions



The Storage Opportunity

Small amounts of hydrogen (up to a few MWh) can be stored in pressurized vessels or solid metal hydrides. The nanotubes can store hydrogen with a very high density. The much larger amounts of hydrogen can be stored in constructed underground salt caverns of up to 500,000 cubic meters at 2,900 psi, which would mean about 100 GWh of stored electricity. This will help balance the grid during peak/off peak hours & further enable access to electricity during downtime or for mobility solutions.

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Energy Storage Solutions

The Re-Electrification Opportunity

Hydrogen can be re-electrified in fuel cells with efficiencies up to 50%, or alternatively burned in combined cycle gas power plants (efficiencies as high as 60%). This opportunity can help provide storage centres as an opportunity to replace conventional Diesel/Gasoline generators.

Other Uses of Hydrogen

Because of the limited round trip efficiency, direct uses of green hydrogen are under development, e.g. as feedstock for the chemical and the petrochemical industry, as fuel for fuel cell cars or blending with natural gas of up to 5 to 15% in natural gas pipelines.
Several companies globally offer integrated hydrogen solutions for the supply of electric power to small isolated sites or islands. Demonstration projects have been performed since 2000 in Europe and the USA and commercial products are available.

The Fuel Cell Opportunity

Hydrogen Fuel cells generate electricity quietly, efficiently, reliably, and with zero harmful emissions, for various applications. They are the cleanest and the most versatile power generating devices on the market. A Hydrogen fuel cell is an electrochemical device that converts the chemical energy of a fuel directly to usable electrical energy and some heat. The electricity is created electrochemically with hydrogen and an oxidizing agent, generally oxygen. When hydrogen is used as fuel, for example in a fuel cell electric vehicle, the only by-product is water.

Hydrogen Fuel Cells offer a host of Benefits

- *Zero harmful emissions*
- *Efficiency*
- *Modular/Scalable*
- *Quick refuelling/no recharging*
- *Reliable*
- *Easy to maintain*
- *Quiet operation*
- *Versatile and renewable*
- *Wide range of applications for Hydrogen Fuel Cells:*
- *Transportation like automobiles, buses, airplanes, submarines, boats, motorcycles and bicycles, and forklifts.*
  - *Large and small backup power for data centres, hospitals, telecommunication towers, banks, businesses, industrial buildings.*
  - *Stationary power like Combined Heat and Power for houses or businesses (CHP)*
  - *Uninterrupted Power Systems (UPS)*
  - *Portable power generation for military, industries, or entertainment such as cameras and surveillance equipment, laptops, printers, smartphones*


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POWERING THE FUTURE