# Encouraging CO2 cut by REUSE of lead-acid battery

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*Make difference on Global environments*

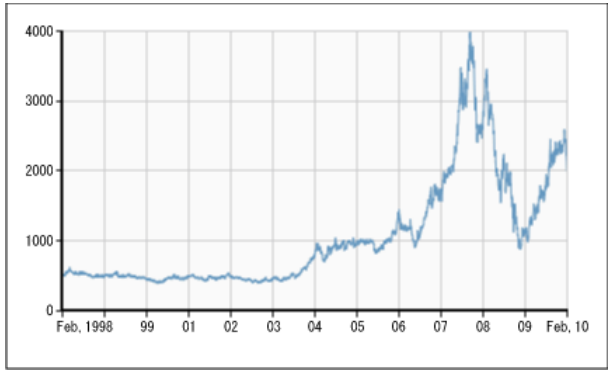
# Back Ground

1. Battery price is the KEY

   Power storage utility is taking a large amount of cost on Off-Grid application of renewable energy generation systems like Solar and Wind power, etc, also for Night power storage system for EULL.

2. Increasing LEAD price

   Market trend of Lead price at LME, it had been stable going sideways range until around 2003, but it had risen to the peak, as 8-fold of 2003 range in 2007 by demand increase by the economic development of developing countries. It dipped down to 2-fold range of 2003 range by Sub-Prime issue and Lehman shock, but it had been coming back to 5-fold range already in up trend.

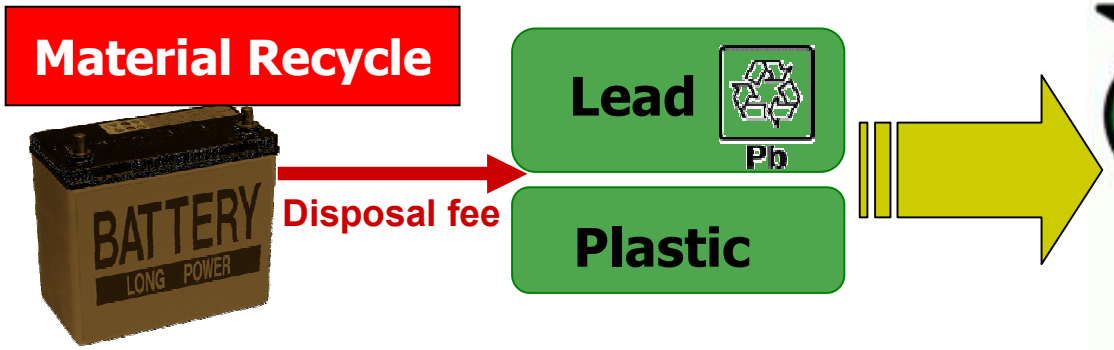


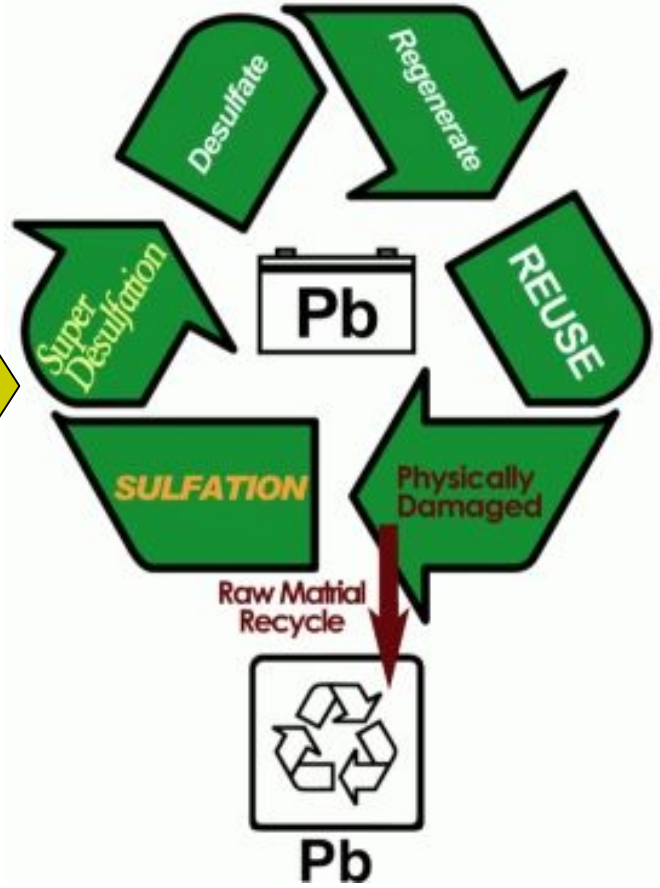

3. Encourage REUSE of battery

   Lead-acid battery has very high recycle rate, but REUSE can be possible by latest ionic product, is scientifically proofed and assured the effect.

# Reuse of lead-acid battery

We propose REUSE cycle of lead-acid battery before Material Recycling.

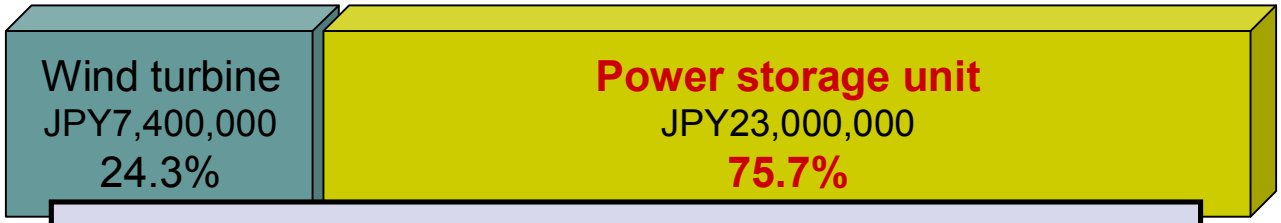


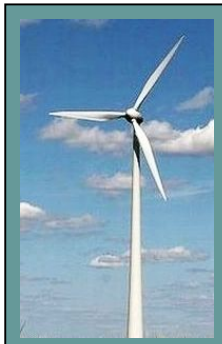

Disposed batteries annual estimation
Approx. 35million to 40million batteries
Collected rate: 95%
**Recycle rate:** 93% (year 2000)

# Cost of renewable energy system

e.g. Simulation of installation of 20KW capacity Wind power system




Estimated Initial cost of System
JPY30,400,000JPY (100%)



**Wind turbine**
Rated output 20KW

@JPY370,000/KW
（Ave.240～37,000）
Life time 17 year (expected)

370,000 x 20KW = 7,400,000 / 17 year

JPY430,000 / year

**Lead-acid batteries**
（Power storage unit)
Rated capacity
100KW･4hour

@JPY230,000/KW
Life time 15 year (expected)

230,000 x 100KW = 23,000,000 / 15 year

JPY1,530,000 / year

Ref. data: Power System Lab. (Goro Fujita Lab) Department of Electrical Engineering, College of Engineering Shibaura Institute of Technology, Tokyo, JAPAN

# Battery is the KEY for CO2 cut

## ①Renewable energy

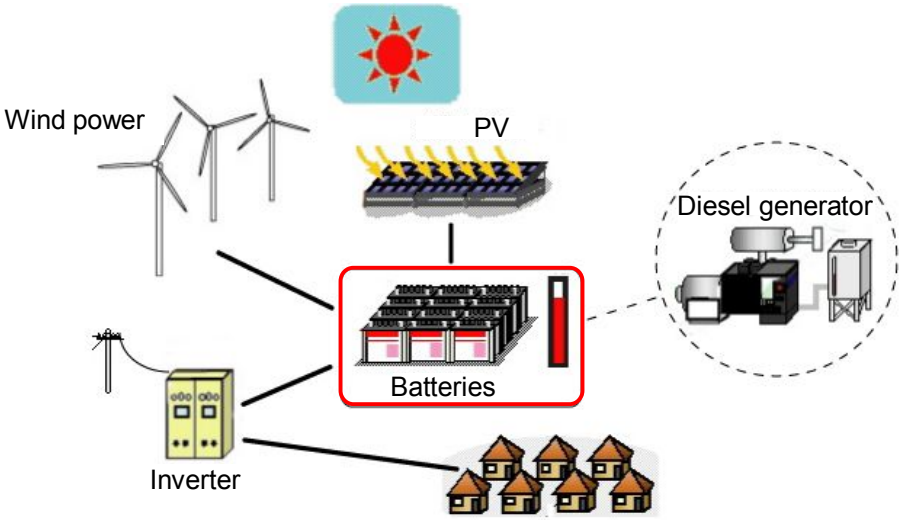
**Off-Grid**

- Reduce Transmission cost and loss
- **Peak-cut**

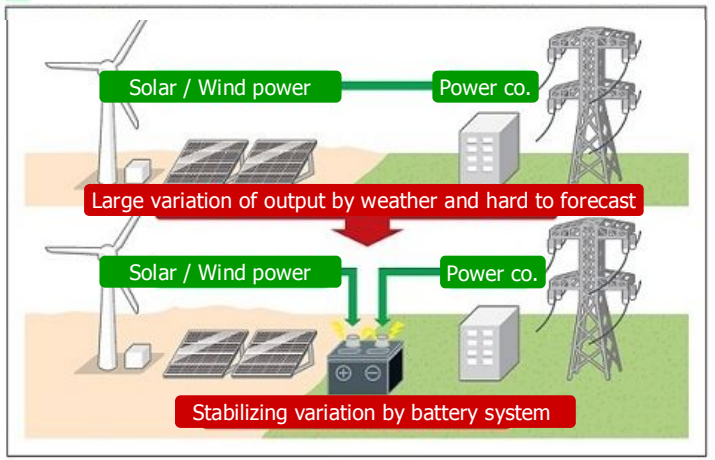
## ②Utilizing night power

**Night power ⇒ Day use**

- Reduce power bill
- **Peak-shift**

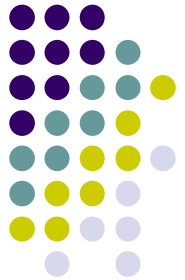



**Battery system is required for the growth of New energy**




Toyo Keizai Online（2009.3.18）

# Proposal



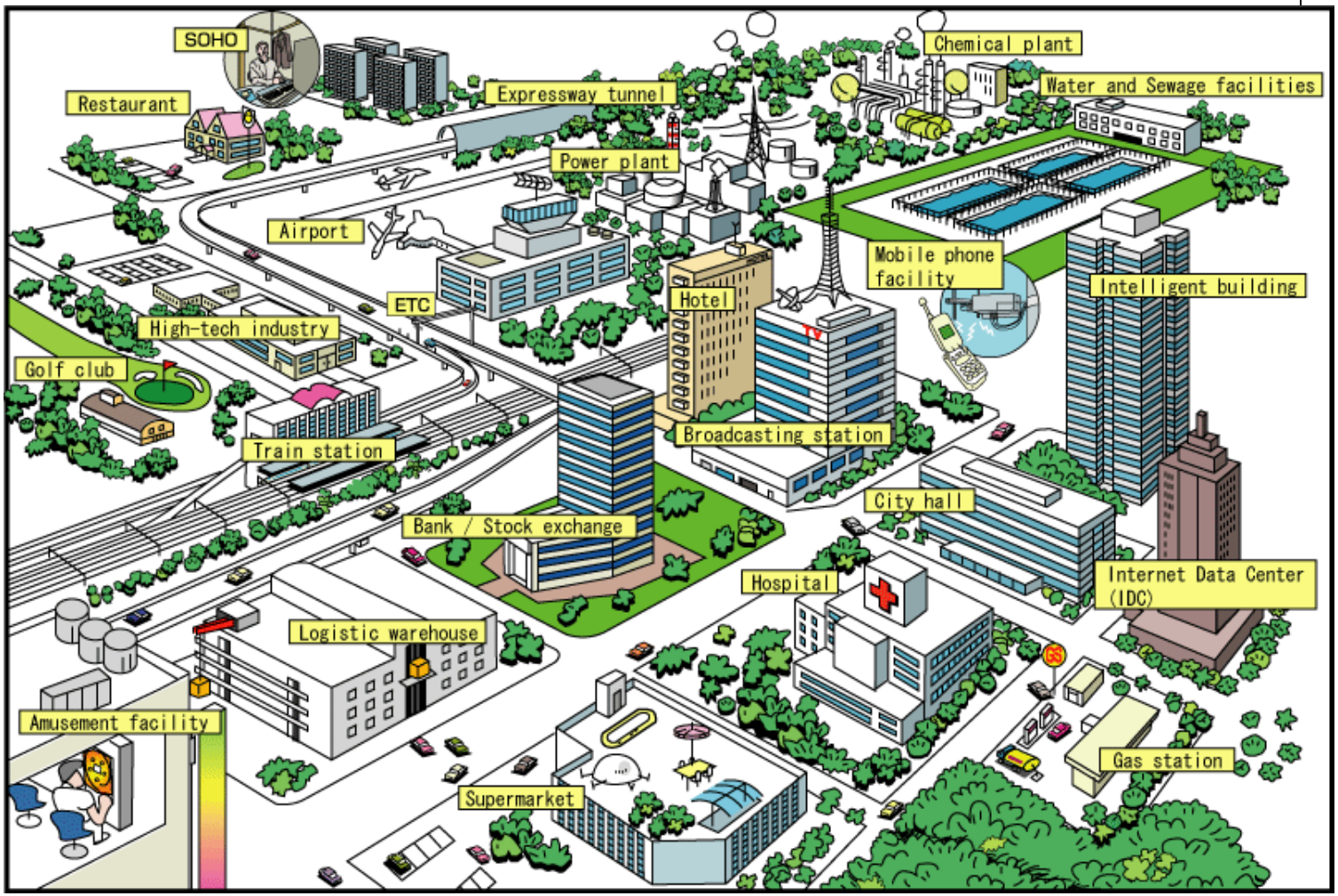
1. Due to the Emergency purpose, the batteries of UPS (Uninterruptible Power Systems) are periodically replaced and disposed in the cycle of 3 to 10 years accordance to the priority of facilities. We would like to propose establishing REUSE cycle by our JQA certified Sulfation decomposer to Revival the waste batteries from UPS then supply “REUSE batteries” to power storage market demands.

2. The Sulfation decomposer, Solvated-Electrons Solution, has been developed by Latest ionic technology, and it can revival waste battery without special equipments only following simple procedure.

3. Encourage broad use of Renewable energy generation systems and Night power storage systems for EULL by supplying low cost REUSE batteries into battery market.

4. Secondary expectations of this proposal are creating New businesses and increasing power storage capacities of local community. Also, REUSE itself would save CO2 emission of new battery production.

# Example of UPS users




【 **Statutory useful life of UPS** 】 less than 10kVA: 5 – 6 years / over 10kVA: 6 – 10 years

Ref. “Users guideline of Commodity type UPS” issued by The Japan Electrical Manufacturers' Association

# Good waste batteries from UPS

| | Start engine | Power source (Cart) | Power storage (UPS) |
|---|---|---|---|
| Management | Each User | Professional | Professional |
| Transport | Risk of Shock / Vibration | Limited risk of Shock / Vibration | No transport |
| Timing of Replacement | After occurring problems | By maintenance data | Accordance to regulations |

## Waste battery from UPS (Uninterruptible Power Systems)

1. No risk of occurring “Physical damage” on the plates
   - Room temperature is controlled (No damage caused by temperature gap
   - Stationary use (No Transport = No risk of Shock and Vibration)

2. Stationary battery of UPS is designed for “Deep discharge”
3. Well maintained by engineers professionally
4. The waste batteries are disposed as industrial waste every" Periodical replacement”

**【Statutory useful life of UPS】** less than 10kVA: 5 – 6 years / over 10kVA: 6 – 10 years

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# Activated solvated-electrons solution

# “Super Desulfation” - the Battery Vital agent

## - Sulfation decomposer

**Producing solvated-electrons**
Patent No: JP2002-069476, JP3463660

Solo stand of electrons In the solvent

Tech. Designed by Dr. N. Yamano Prof.
Tokyo Univ. Graduate school

Put into practice by
Manufacture CEO Mr. Karino

**Developed products based on the technology**

1. Anti-oxidation deep fryer oil system
2. Ionic vital solution for Lead-Acid battery
   (*JQA No.10-90026)

**Example of Academic society presentations**
Activated solvated-electron solution

**2008 49th Battery Electrochemical Symposium**
Host: Electrochemical Society of Japan
Co-host: The Chemical Society of Japan, etc.

**2005 Presentation at The Chemical Society of Japan**
Development of Environmentally-harmonize type of
Enforce battery activator

*Japan Quality Assurance
http://www.jqa.jp/english/index.html

Super DESULFATION

Sulfation discomposer with Solvated-Electrons

## Features

- Discomposing Sulfation in Charge/Discharge cycles
- Preventing damage from Self-Discharge
- Improving the electro conductance of Battery

## Application

- Battery lifetime extension (decompose and prevent Sulfation)
- Battery revival (decompose Sulfation)
- Activating Battery to upgrade the function
- Preventing damage from natural Self-Discharge

Super DESULFATION

Sulfation discomposer with Solvated-Electrons

## Points

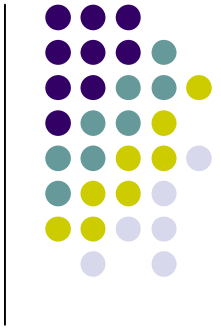
- Needs simply injecting small amount of the solution into Electrolyte and No needs of special technical knowledge
- No needs of special equipments making large investments

## Objective（All types）

- Stationary batteries for power storage like UPS, etc.
- Deep cycle battery for power source like Forklift and Cart.
- Starting battery

# Desulfation Treatment

## Discomposing Sulfation



### Revival

1. Inject Solution to already being disposed as waste battery
2. Needs to create Charge / Discharge cycle by equipments
3. Discomposing existing Sulfation

Specific gravity hydrometer
Thermometer
Dropper
Voltmeter
Charger
Discharger
(Conductance meter)

### Life extension

1. Inject Solution when considering to replace battery
2. Naturally decomposed Sulfation by keeping normal use of units
3. Discomposing existing Sulfation

Specific gravity hydrometer
Thermometer
Dropper
Voltmeter
(Conductance meter)

### Up grading

1. Inject Solution into brand new battery
2. Preventing natural discharge of 2-5% per month
3. Electro conductance of battery will be improved
4. Slowing down growing speed of Sulfation

Dropper

# Stationary power storage battery

Deep Cycle

Re = Revival
LE = Life extension
ASD = Anti-Self Discharge

1. Maintenance company of power units like UPS, DC power unit and Power storage, etc. (EL, Re）

2. Utilizing revival waste storage batteries

- UPS and DC power units are installed at many places like Telecom, Factory, Intelligent building, etc., but the stationery batteries are replaced in 3-10 year cycle whether good or bad condition due to the emergency purpose.

- By revival treatment, the batteries, which are scheduled to be replaced and become industrial waste can be reused for other application purpose of power storage, like Night power storage system, Solar or Wind power generation.

# Battery markets

Re = Revival
LE = Life extension
ASD = Anti-Self Discharge

## Deep cycle Vehicle & Cart battery

- Forklift, Golf cart sales（LE, ASD）
- Used electric vehicle dealer（Re, LE, ASD）
- Battery Maintenance company（LE, Re）
- Leasing & Rental（LE, ASD）
- Wheel chare shop（LE）

## Starting engine battery

- Auto repair shop（Re, LE）
- Used auto dealer（Re, ASD）
- Periodical use like Agriculture（LE, ASD）
- Auto leasing & Rent-A-car（LE, LE）
- Logistic tracking company (Re, LE)
- Industrial waste collecting agents（Re）

# Q & A

Q1. **What would be the battery lifetime after the treatment?**

A1. *The growing speed and amount of Sulfation are depended on condition of the way treating the battery. However, the solution decompose Sulfation by direct feed of electrons during the process of Charging, and the reacting area on plate will be cleaned as brand new. It can be confirmed by Gravity.*

Q2. **What would be the battery lifetime if injecting the solution into brand new battery?**

A2. *The growing speed and amount of Sulfation are depended on condition of the way treating the battery. According to Customers, the lifetime had been at least doubled of the battery without the solution. Also, the electro conductance had been improved as an extra advantage.*

Q3. **Does the solution has expiry date?**

A3. *There is no official expiry date, but we recommend to use within 1 year. Also, the solution shall be stored in a cool place avoiding direct sunlight.*

Q4. **What is the category of item?**

A4. *The solution is normally categorized as Functional water.*

Q5. **What can be potential risks hurting battery by solution?**

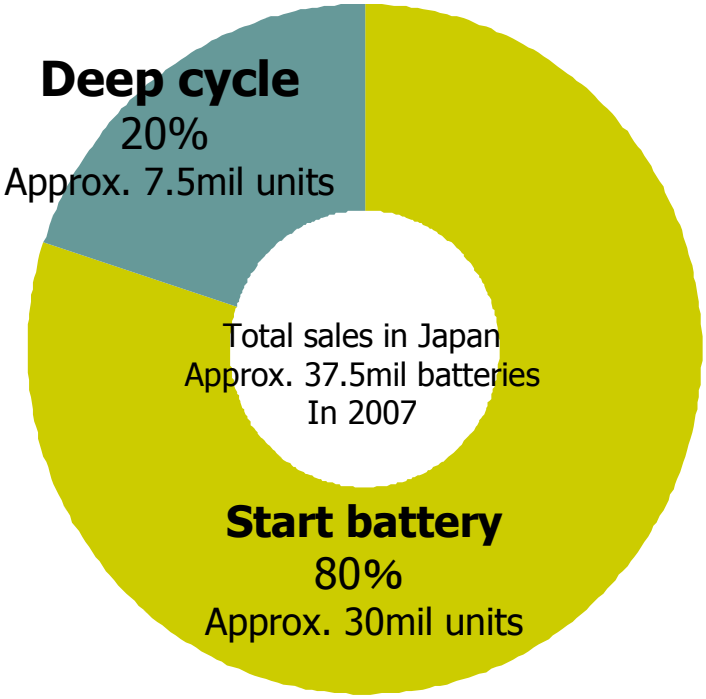
A5. *NO. The main component of the solution are mass of solvated electrons in pure water, which are the element material of battery. Also, the solution effect has been certified by JQA standard and no claim for more than 9 years on various adoption cases, UPS, DC power supply device, Forklift, Golf cart and car batteries, etc.*

appendix

# 2kinds of Lead-Acid batteries

Same principal but there are **2 kinds** (**3 purpose**) of Batteries:

**"Start battery" for high surge current**
**"Deep Cycle" for Power source purpose and Power storage purpose**




## *A) Starting (engine)*

**1. Required high surge current**

- Cycle of Battery capacity approx 20-30%
- Shallow discharge
- Thinner plates design (price competitive)
- 2V x 6 cells=12V (Standard)

## *B) Deep cycle*

**2. Power source (E. Vehicle)**
**3. Power storage (Stationary)**

- Cycle of Battery capacity approx 50-80%
- Deep discharge
- Thicker plates design
- 2V x 6 cells=12V or relay of 2V

appendix

# Study of Replacing and Revival from CO2 emission prospective

Simulation of CO2 emission on “Replacing by New batteries” and “Revival use”

Battery： MSE-1000Ah x 54 cell

+ Assumed to be same lifespan on New battery and Revival battery

| Brand New | | Revival |
|---|---|---|
| 8,007kg | 320 : 1 | Approx 25kg |
| Manuf. Process : 753kg<br>Material production. : 7,254kg | | Power consumption : 22.4kg<br>on Revival process |

Thermal power CO2 emission coefficient : 0.69kg-CO2 / KWh
Thermal power petroleum consumption : 0.227 litter / KWh

30% charge during Revival process
1000Ah x 30% x 2V = 600Wh
600W x 54cell = 32.4KWh
32.4KWh x 0.69kg = 22.4kg