Energy BUSINESS

Make it happen!
Reduce your energy cost!

Energy + Storage = Saving
The economics of storing energy is very dependant on local circumstances and cost. Selecting the right combination of available energy sources is therefore very important.

Investing in sub-standard systems and configurations can tip the R.o.I. equation!

Solar energy in Greenland? Wind energy in a forest? No, everybody will understand that these options are not ideal, but fine tuning the system to your needs, local conditions and available other resources, will optimize your energy harvest and cost.

Will a 10 second power outage be an inconvenience or a major disaster for your application?
Energy
Cost factor or profit center?

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Energy Business

Energy Supply

A rapidly changing field

The last 50–60 years have seen many changes in the electricity supply industry. Since the 1950s the industry has witnessed successive plant building programmes of nuclear-, coal- and oil-fired stations followed by combined cycle gas stations. The result was the development of conventional stations of various sizes and capabilities to provide a continuous, reliable and affordable supply of electricity. Their operation has been in a centrally organised and controlled market with high-voltage grids delivering efficiencies of scale and security in the use of resources.

Since the 1990s changes brought by the liberalisation of electricity supply occurred with the focus on the environmental effects of electricity generation coupled with the imposition of associated emission controls on existing and new thermal power plants and more recently, the national targets for the exploitation of renewable energy. Likely the next 50 years will show further fundamental changes arising from different economic, political and technology developments. One such change that may be anticipated, brought about especially by the growth of generation from renewable energy sources, will be the development and use of energy storage. The supply of electrical energy cannot be considered alone, but power and energy supply requirements have to be considered together.

The main drawback of renewables is that while able to supply with reasonable assurance a certain amount of energy over a year, most are intermittent (‘variable’ is a better description), some randomly so and thus unable to supply power on demand. For this reason, they are limited in their contributions to the security of power supply. Such variations in power output may cause problems for a power network if the renewable resources penetrate the system on a large scale. Matching available renewable power to the demand in an electricity supply system requires a more detailed examination of the interaction of random intermittency of supply with power security, bearing in mind that security of electricity supply requires continuity of power delivery.
Of all the alternative energy sources, solar energy is now the most widely spread. This due it's ease of installation, the rapidly dropping cost of the PV panels and inverters and a more general knowledge about these systems.

Users of PV-installations can be divided into three groups, individual households with installation up to 10kWp, industrial users with installation up to 500kWp and community systems that are run by municipalities or other organisations that have solar fields of 1MW or more. For households, the aim should be to use the energy generated by the PV installations as much as possible by themselves. This since feeding left-over energy into the public grid does not bring big returns on investments (R.o.I.).

For industrial and community based PV-installations, there are more and better opportunities to generate a healthy R.o.I. They are often connected to the grid via larger connections that allows a different price structure of energy bought but also for energy delivered back to the grid.

Combining advanced energy storage systems with a sophisticated interface to the local power exchange and imbalance market enables delivering energy back to the grid at the moment the energy is needed most hence against the best possible price.

Further enhancements to the system such as cloud- and rain radars, wind prediction and ‘big data’ energy usage models helps further in determining when to sell energy or when to hold back in expectation of a better price in, say an hour or later that day. The typical PV-energy curve that has its peak during mid-day when power consumption is relatively low can now be stored till required. Other standard or should we say dumb PV-installations finished their supply by the time people come home, start cooking and want to charge their PEV, the ideal time to start selling your stored PV energy at a better price!

Energy storage and energy trading needs more than just good batteries. ICT and knowledge of the application are equally important. Without these even the best systems will be unable to respond to the requirements of the grid.

ATEPS Nederland bv has a network of partners with different skill-sets that enables the selection of the right solutions for most, if not all, applications.
Mid 2014 ATEPS Nederland bv was founded with one goal only; transferring fuel and energy saving technologies into marketable products that meet the customer’s demands and criteria. With two equally important products lines, ATEPS is able to offer fuel saving solutions for large internal combustion engines as found in CHP’s and direct storage of electrical energy in batteries. At first sight these technologies look very different however, the ambitious but realistic road map of ATEPS shows these products growing together in near future.

This is considered as not only important for ATEPS but also for its wide customer base since today’s energy market is constantly evolving and a broader view on the subject is good for a clearer and greener future for everybody.

Experience and good connections at both customer’s and supplier’s side enables the integration of products into a combination that offers more than the sum of its part.
The unique properties of lithium metal allow it to be used in various applications. Lithium has an atomic number of 3 and an atomic weight of 6.941. It is slightly harder than sodium but softer than lead and is extremely light with a density of 0.531 g/cm³ which is about the half of water. The wide range between the melting point of 180.5°C and the boiling point of 1336°C along with its excellent heat transferring capacity makes lithium a good medium for heat sinks or heat transfer.

Argentina, Bolivia and Chile hold the planet’s largest reserves of lithium, a key component in batteries used to power a range of technologies from cell phones and laptops to electric cars. Industrial production from the so-called “lithium triangle” is already high. Chile is the world’s leading source of the metal with around 40 percent of global supply, Argentina is another significant producer. Output from the Andes may soon rise after Bolivia – the country that holds an estimated 50 percent of the world’s lithium reserves – opened its first lithium metal production plant in January 2013.

Despite the name, most rechargeable lithium batteries do not contain any lithium metal, the lithium content in rechargeable lithium batteries is very small and only refer to lithium ions that are diluted in the electrolyte. Non-rechargeable lithium batteries as used in photo camera’s and as a backup battery in many applications however, do contain lithium metal and so do some very special lithium-metal rechargeable batteries.

Rechargeable lithium batteries come in many different electrochemical versions. Best know are the Li-Co batteries that contain Cobalt as one of the active materials and Li-NMC batteries that use a mix of Nickel, Manganese and Cobalt. LFP or Lithium Phosphate batteries are another well known type that is mainly produced for low cost applications such as electric bikes and e-Scooters.

In order to reduce losses in large scale ESS applications, the operating voltage of the battery packs is often several hundred volts. The ATEPS applications run at a nominal voltage of 700Vdc.

The advantage of this will be clear to the technically oriented users, a higher voltage will need a lower current to create the same power. Since switching high currents is relatively expensive, there is a positive trade-off in using this high voltage.

The electronics however must be able to withstand well over 100Vdc keeping in mind a margin which is safe under all circumstances.

Engineering, assembly and installation are done with safety in mind and all other devices used by ATEPS are equally suitable and protected against accidental contact for enhanced user safety.

Lithium brines in the triangle of Bolivia, Chile and Argentina

700Vdc: Shocking Business!

Energy Business
Feeding electricity back into the grid for a few cents does not do your PV-investments any justice!

Good Market

Good Job!

Late 2014 ATEPS Nederland BV received an order for the design and assembly of a small ESS that would function as a pilot plant to prove the concept of Smart Energy Management. At the end of February 2015 this pilot plant was installed and connected to the grid at a large potato farm in the north-east of The Netherlands. The system proved invaluable to iron-out any issues with regard to the already installed PV-installation. The control software monitoring the APX and imbalance markets performed better then the business model predicted.

The farmer who is highly motivated to reduce his energy cost for the cooling of stored potatoes, was convinced that this system will help him to both reduce his energy cost and become even greener. The positive experience with the pilot resulted in an order for a final system with a capacity 295kWh.

Optimised energy storage and price-triggered feedback, based on APX and real time imbalance prices, will have a major impact on the R.o.I. and your overall energy cost.
Energy storage is one thing, **smart energy storage and optimized feedback** is a totally different thing!

Real-time interfacing to the APX and imbalance markets, weather predictions, wind- and cloud monitoring and a keen eye on cost and energy consumption, all come together.

**Distributed Power**

What makes sense if you combine low PV system installation prices, high electricity rates and a low feed-in tariff? The logical next step is energy storage. Lots of people are writing about it and lots of people are asking about it. It seems that almost everyone — industry players, customers, and renewables advocates alike — is looking for a solution that will make sense financially thus igniting the powder keg of energy storage potential. But how does it look? There are plenty of options readily available despite that development is still in its early days. Therefore things can — and are likely to — change quickly, for both industrial and home users.

Are ESS only for something for large companies and organisations? Certainly not, private homes and SoHo applications can benefit too!

Although the focus in the professional press is mainly on large ESS applications, private users can benefit from energy storage too.

The ATEPS 5kW and 10kW Personal-ESS (P-ESS) storage units use high quality Lithium batteries that have a long functional life and are combined with a battery management system that protects the battery and the inverter against over- and under voltages. Remote access via internet of GSM enables the opportunity to check the unit using a smartphone or PC.
Collaborating Systems

Collaborating systems are systems that can work totally independent but still communicate and act in relation to other systems. Thereby they can better respond to both internal and external events and preempt on situations.

The Battery Controller (BC), Battery Management Unit (BMU) and Energy Management System (EMS) are just such systems. The Battery Controller inside each battery measures the battery parameters, the BMU collects the data of multiple BC’s and can react on the total of a complete rack while the EMS interfaces with the BMUs, and other, optional, controllers to optimise the system even further.

With interfaces to the Grid, CHP’s, wind- and solar power generators and DC/AC inverters, these systems can be optimised for multiple applications both on grid and off-grid.

The heart of the matter

When using large number of batteries in a single installation, the status of a single battery can influence the performance of the whole system. In order to measure and correct any differentiations in the system, each battery has its own controller, the Battery Controller, that measure a large number of parameters. All these parameters are communicated to the Battery Management Unit. This, in turn, controls the data of each BC and in addition checks current and other parameters of the system.

Depending on the size and final application, multiple BMU’s are interfaced to a Energy Management System that can be used as man-machine interface and communication controller to other devices and data loggers. All of this is build using high quality electronics and embedded software for the best possible integrity of the system.
The ATEPS Energy Management System (EMS) not only connects to the battery systems and the inverter(s) but can also control connected systems such as generators, loads and other equipment. Communication to 3rd party devices is in accordance to international standards but can also be done hard-wired.

### Applications

The EMS can be used to start and stop external devices based on user preferences and the status of the ATEPS Smart-ESS. Via a simple to use web-interface the user can set times that diesel generators are allowed to start and at what State of Charge of the batteries. Also processes that can be delayed in time can be optimized using the same interface.

By setting these windows, generators will only start at specified times when the noise is least disturbing and when the Smart-ESS has insufficient power stored for planned actions.

In a similar way, cooling of warehouses can be postponed until self-generated power is available or after connecting to the grid when the grid price is at a set level.
Modern architects have a keen eye on energy consumption and more and more private homes, offices and factories are build energy natural whereby heat is recovered and re-used elsewhere.

Light-guiding tunnels inside office buildings can help in reducing lighting cost and give people a better feeling about what is happening outside, thereby also increasing productivity.

Isolation using green roofs, with or without PV panels help in keeping the heat out or in depending on the season and add to the well-being of the inhabitants. Double doors at offices, often with a delayed action for the second door, greatly reduce the heat losses and are relatively inexpensive when taken into account during the planning and building phase.
No usage or low usage?

Despite all efforts to reduce the energy consumption, the best way to reduce your energy cost is by simply not switching devices on or changing practices so that less energy is being used from the beginning.

About LED cost

We did a return on investment (RoI) analysis on 60 watt equivalent LED light bulbs to showcase how much can be saved. LED light bulbs continue to drop in price and we were able to find 60 watt equivalent bulbs for around €10,-. Based on 8 hours use per day, you get a RoI of about 300% per year on the energy savings alone. That is an amazing return that will accrue savings faster than the price of LED bulbs is dropping. In other words, the time for waiting is over and the time for saving is now.

LED Streetlights

Who said LED lights are cold?

Seoul airport reduced its lighting usage with 70% using LED lights.
Peak shaving is not only about large applications such as container cranes, a careful analyses of your energy use can show and cure expensive energy peaks.

Off-grid use of Smart-ESS application increase comfort, reduce cost of diesel and other fuels and work silently and pollution free. Ideal for islands and holiday resorts.
Remote locations with expensive transport of diesel or other fuels, can benefit from smart storage that interact with your needs and energy sources such as wind- solar and generators.

In the western world electricity is often taken for granted. A wall socket, a cable and plug are never far away and electricity use is still rising. More and more houses are build for gas-less operation and natural gas is no longer a standard feature in newly developed housing estates.

At six o’clock, when people start coming home and start showering, cooking and charging their electric vehicles, energy consumption rises quickly. The electricity companies must be prepared for this and have their plant humming while network companies must be able to transport ever increasing amounts of power.

Using local Energy Storage Systems to dampen these peaks, will prevent the high cost of network upgrades and the associated disruptions of streets and other public areas.

In areas where electricity is not so readily available, combinations of solar, wind and generator energy can be stored in Energy Storage Systems for later use. This prevents unexpected black-outs and provides power during the evening and night. Using the advanced the ECM (Energy Control Master®) from ATEPS, the user can configure what energy source has preference over alternatives and during what time of the day.

Calculations and installations done show that the cost for solar and storage are quickly recovered compared to the high cost of fuel and electricity at these more remote areas. Also the cost of maintenance of diesel generators is a not to be underestimated factor.

With the use of the ECM, one can also prevent additional charges from the electricity company by ensuring that the ESS has enough power to support the start-up of machines and other equipment, before actually switching these devices on.

The easy way to configure the ECM enables simple adjustment of the times that devices may switch on and off, when the grid can be used and what minimum energy should be stored in the ESS. The ability to implement many different (home) automation protocols, makes the ECM software even more versatile since this allows the control of freezers, washing machines and other devices depending on available power and priorities.
EV Charging and Storage

Parking lost will change in the near future. Parking lots will be fundamentally transformed by a Second Electrical Revolution and the rapid shift in mass consciousness to an eco-friendly environment.

Second Electrical Revolution: The electrical grid was put in place nationwide only a century ago. Suddenly this grid model of central generation, transmission, and metering is changing as demand soars globally. Per capita use of electricity will quadruple by 2050! Economical electrical cars will replace their polluting and thermodynamically inefficient cousins. High efficiency heat pumps will replace natural gas for space and hot water heating. Hydrogen fuel cells will power trucks and buses, and supply buildings with both heat and electrical power. Most of the four-fold increase in electricity consumption will be needed to run electric passenger cars, electric trucks and electric buses.

Parking lots today are content to have the sun bake their asphalt and customers are happy for the parking, oblivious of the waste of solar energy. But increasingly, the incentive of stable energy prices and satisfied customers, and the issue of climate change and rising energy prices, will cause a parking lot re-design. Modern parking lots will feature electric car charging, hydrogen fuel fill-ups, solar canopies and LED lighting.

Parking lot energy harvest and storage will bring forth a new crop of integrated zero-energy commercial buildings. The best parking lot energy practices will also include electrical storage batteries, heat pump geothermal energy, and underground hot/cold thermal storage tanks.

The revolutions in electrical use and green infrastructure, are already shifting the economic playing field. The transition to mostly renewable electrical energy within a half a century looks inevitable. A new class of consumers is demanding it. Governments, universities, municipalities and even private corporations are setting carbon dioxide reduction goals. The costs of photovoltaics, wind power, and battery storage are steadily falling.

The transition from fossil fuel to gigawatts of renewable electricity will require a huge capital investment. But, the return on investment in improved health, a stable world climate, new clean tech jobs, and predictable, moderate cost energy will be huge. Excess renewable power will be beneficially used to manufacture hydrogen fuel.

Parking lots have a unique role in this renewable transition. The visibility of solar canopies and car charging stations will increase consumer energy literacy. Parking lots alone might provide megawatts of delivered power. Parking lots will host many of the charging stations needed to power huge new fleets of electrical vehicles.

With an increasing number of alternative but often intermittent energy sources, storage becomes more and more important. Charging of vehicles other than just sopping them off, still takes time and is often done at night. Using batteries to store the sunlight energy harvested during the day is a natural thing to do. During the day, these batteries are filled by the solar canopies and the batteries can be used to even-

With the increase of the number of Electric Vehicles, the need for more, public, charging points is increasing.

But municipalities, companies and private charge points all have different requierments that need to be met.
out fluctuations in the main grid. Using this capability, the batteries can generate income by using the stored power on power exchange systems like the APX and the imbalance market. Connected buildings can benefit from the peak shaving capabilities, thereby further reducing the high cost at the side of the grid-company for infrastructure.

Direct and real-time control of the batteries can bridge the gap in required and available power on local and national grids and with increasing number of installation make traditional and highly polluting central power stations obsolete.

Due to the flexible control systems designed by ATEPS for the Smart-ESS applications and the implementations of different protocols such as DNR3, ViBe and others, vehicle owners that have opted for grid support, can further enhance grid stability and reduce their vehicle’s operational cost.

Adding ATEPS the Smart-ESS help creating a positive equation for owners and operators of multi-car charging islands. By generating additional income through APX and imbalance trading, the price per kWh for the EV-customer can be adjusted downwards. This in turn will have a positive effect on the numbers of vehicles using these chargers.

Hydrogen Charging

Although the number of vehicles driving on hydrogen is still limited, this clean energy carrier has high interest in many countries. Hydrogen can be generated using surplus PV-energy and stored for later use making the cost very low.

Hydrogen can be used directly in internal combustion engines that have been adapted for this lower calorie fuel or used as fuel for vehicles equipped with fuel cell and electric motors.

Although both can be considered as 100% clean, there are differences in concept whereby the use of fuel cells gives greater freedom in design in combination with either central- or wheel-mounted electric motors.

The nett result of using hydrogen as fuel for both systems is ‘oxidized hydrogen’ or simply water!

The electrolyser needed to create hydrogen and batteries to store and use PV-energy for electrolysis at a later time, are both available from ATEPS Nederland bv.
New ideas do not automatically turn into new and successful products. In order to get to a new product, many things have to be done and in most cases a close cooperation between a number of companies is needed. ATEPS is no exception and we do this in an open way. The reason behind this is simple, it is important that you know more about us, know what resources we rely on and you must be able to see if the strategy of the whole combination of companies meets your own demands.

This enables us to sit together and discuss the project in all its details and consider your inputs and requirements directly with the specialists involved. Changes to software or firmware, that might be needed to interface to other devices in your company or application, can be directly evaluated and taken into consideration. It prevents misunderstandings and helps to get projects delivered on time and within the agreed budgets.

Obviously, we are also willing to listen to your wishes concerning other partners that can or should be tied into the project team. Be it your network supplier, a 3rd party ICT company or high voltage installation company, we meet, discuss and come back with our feedback.

An example: While discussing the installation of a large Smart-ESS, the customer indicated that he would like to get the installer of his existing 160kWp solar installation involved as well. They had done a good job in the past and ATEPS is not specialised in this part of the business. Together we discussed the integration of the Smart-ESS with the PV inverters they installed and maintained. This needed a few minor adjustments to the software settings of the PV inverters and some simple rewiring. All was done within a few hours and added virtually nothing to the cost of the system. Should new companies have been brought in, that needed to familiarise themselves with the system, the work was estimated at several days with the related labour and equipment cost.

With the combination of the existing installer, the whole PV installation can now continue to be serviced by the company that is familiar with the installation, the location and its owner.
**Engineering**

Engineering in relation to batteries and energy is specialized work. ATEPS unique knowledge of the subject ensures easy integration of your system within the bigger concept of your energy demand, energy trade and other functionality. Apart from the design, development and production, ATEPS also keeps close tabs on the market to remain in the forefront of the technology and offer the best possible solution for your application and hence the best possible price performance without sacrifices to quality.

**Open System**

The ATEPS S-ESS (Smart-Energy Storage Systems) can interface to a large number of other applications. The mastercontroller cannot only communicate via VIbe, ETSO, DNP3 and other industry standards but the system is flexible enough to quickly implement other protocols, such as interfaces to power exchanges, as well. When the ATEPS EDCS (External Device Control Software) is added to the master controller, other devices can be started and stopped and started depending on user-set parameters.

**Agents and Partners**

ATEPS works together with selected agents and sales partners that know the local conditions and energy market. Since ESS applications can be complex and need discussions with grid companies, the end-user and other parties, the complete project management is done by ATEPS. The local agent keeps involved to adds his specific knowledge of the market and local requirements. Together we form a project team that can create the required application quickly and without worries.

**You, the customer**

Systems and solutions are custom made but against series prices. Building block technologies enable a quick respond to your requirements and an optimal fit to the application. Be it peak-shaving, ESS, load-shading or electrification of boats or specialty trucks, it’s worthwhile to speak to use for a solution to your problem. Combining CHP’s and storage is a unique proposition than can further enhance the availability of energy at your site.