Finally available: The Vanadium-Redox Battery

Large-scale storage of electric power takes one big step ahead as the first systems become commercially available. A European companyoffers modules that store 100 kWh of actually available power

To make the matter more transparent, we have put together some (simplyfied) business models how this technology could be used commercially.

Mini-hydro

Many industrial corporations cover a part of their electric power needs with their own mini-hydro powerplants. These powerplants usually are run-of-the-river installations that provide low-cost power for almost the full year, day in, day out. So what is the typical way of using these powerplants?

During the time when the industrial company is working, the electric power is normally used to substitute or reduce the power that is purchased from the power utility, saving lots of costs by own production. So if the company works for two shifts on workdays, this amounts to 16 x 5 x 50 hours per year (taking a rough discount for holidays). In the best case there are 4.000 hours per year where the best use is made from the directly owned powerplant. What about the other 4.000 to 4.500 hours where the powerplant is operating, but the power is not used internally?

Some of the power will be used for lighting the factoy and parking, but most will eighter go unused (or not be produced at all due to switchng of the turbines) or it will be sold to the public power grid. The price that can be received from this will be only a few cents per kWh, typically not more than 25-30% of the price that has to be paid as a customer if the same amount of power is purchased from there.

Storing this power in vanadium-redox batteries would mean to cover a higher proportion of the own power consumption of the factory. With the costs of the battery coming down, many installations will already be profitable or will be profitable shortly with always rising energy costs. Since there are no costs that are linked to the price of oil or electric power any more, this leads also to a practical freeze of the cost of electric power from the own production, avoiding the inflation spiral for the next 20 or so years.

Example: Mini-Hydro					
Current installation			**With installation of battery for 8 hours**		
Capacity	250	kW	Battery capacity needed	2.000	kWh
Operating hours p.a.	7.900		Investment battery	2.000.000	EUR
Total production	1.975.000	kWh/a	Total production	1.975.000	kWh/a
Direct consumption	1.000.000	kWh/a	Direct consumption	1.000.000	kWh/a
			Energy buffered p.a.	624.000	kWh/a
Feed in	975.000	kWh/a	Feed in	351.000	kWh/a
Total consumption (grid + own power)	2.000.000	kWh/a	Total consumption (grid + own p	2.000.000	kWh/a
Amount purchased from grid	1.000.000	kWh/a	Amount purchased from grid	376.000	kWh/a
Tariff for feed-in	3,5	EUR ct/kWh	Tariff for feed-in	3,5	EUR ct/kWh
Tariff for power purchased	19,5	ct/kWh	Tariff for power purchased	19,5	ct/kWh
Income from feed-in	34.125	EUR	Income from feed-in	12.285	EUR
Cost energy purchase per year	195.000	EUR	Cost energy purchase per year	73.320	EUR
Net cost power from grid	160.875	EUR	Net cost power from grid	61.035	EUR
			Savings p.a.	99.840	EUR
			Depreciation battery	100.000	EUR
At the very moment, when the power from the grid costs more that 19,5 ct, the installation will become profitable					

Prices of Energy for different Inflation Rates

Year #	2%	3%	5%	10%
1	100,0	100,0	100,0	100,0
5	108,2	112,6	121,6	146,4
10	119,5	130,5	155,1	235,8
15	131,9	151,3	198,0	379,7
20	145,7	175,4	252,7	611,6

Other Business Models

Wind + PV for private autonomy: combine photovoltaics and small wind turbines with a power storage to cover 100% of household consumption. This makes even more sense, if windpower is used to drive heatpumps. Autonomous systems come still at a premium, but independence has its price and an increasing number of households will rather invest in this that into a new car.

Windfarms: windfarms usually have a lot of excess power that may lead to a complete cutoff from the net, if too much power is fed into the grid. Or it may lead to turbines that have to be switched off, although they could be productive. Large-scale batteries could help here to smooth the production curve and to reduce resistance against more windpower due to bad managability of production swings.

Real time pricing: As the pressure to introduce real-time pricing increases, many big customers (especially industry) will look to shift their consumption from peak to off-peak time to save costs. Already now there are big differences in the price of off-peak and peak power that is traded between power companies. 10 or even 20 ct in difference are easily possible. The difference could pay for the storage system, if the power is purchased at the lowest night-tariff and used at the noon-peak. A seond cycle can be installed in the afternoon and evning low and high of prices.

Power trading on spot markets: With sufficient capacity at hand (which of course means high investments) a power producer could cut his output at low-price times and shift the supply to the top-price time. It could prove to be much more efficient than to build new powerplants to cover peak load or to switch on gas-turbines to cover peak demand.

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Beck & Partner KG is an independent business consulting firm. They provide management and coordination services for renewable energy projects and innovation management. Key activity is to match ideas, innovation and technology with the business and financing world.
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