



# MAKING OUR WAY TO ENERGY STORAGE

## Jimmy Buffett, The Holy Grail and The Manhattan Project

By Rick Phelps

*“Clichés. Good ways to say what you mean ... mean what you say.”*

-Jimmy Buffett, 1975

I hadn't thought about the Holy Grail since an old Indiana Jones movie and was a little surprised when someone said that it was becoming a cliché to refer to energy storage as the Holy Grail of renewable energy. My mind immediately recalled the lyrics of an old Buffett song and I realized Jimmy may have it right: say what you mean ... mean what you say. When it comes to the future, energy storage IS the Holy Grail. Without storage, flexibility is lost and progress stalls.

But what is energy storage? Storage includes batteries large and small, compressed air, pumped water systems, fly wheels and a host of other ideas, both new and old. All generally work, but the limiting criteria are cost and scale. The cost question is whether it costs less to store a kilowatt than it does to generate it. The scale issue relates to the application, but generally refers to the amount of energy needed to be stored. For example, large lead-acid batteries might work fine for a home with a 4-kilowatt load, but not so well for a utility-sized wind project with a capacity of 25 megawatts.

To put the energy storage issue in perspective, think about its impact on remote communities in the Eastern Sierra. Electricity could be stored locally and additional distribution lines — at a cost of millions — would be unnecessary.

Private sector companies, the U.S. Department of Energy (DOE), and the Defense Advanced Research Projects Agency (DARPA) are making progress on



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energy storage cost and scale, but there are not yet any major breakthroughs, and the need for more storage in renewable energy continues to grow.

The quest for this Holy Grail is critical for at least three compelling reasons.

First, two major forms of renewable energy — wind and solar — are intermittent and not necessarily generated at the same time there is electricity demand. Often the actual capacities of wind and solar projects are less than 50 percent of stated capacity and said capacity needs to be backed up from conventional sources such as natural gas or coal. If the energy generated could be stored economically for later use, the renewable projects would be more economically viable as they could always “sell” their capacity and might be able to reduce their invested capital with a more efficient operation. Plus the land use footprint for wind and solar might be lessened.

Second, if renewable energy is more efficient due to effective storage, there will be less need to ensure that conventional generation capacity is available as backup. Fewer conventional power plants will need to be built and transmission capacity might be reduced if large electricity imports were not necessary to meet the demands of a high-renewable region, if production was not up to capacity.

Third, energy storage can be

used to make the grid more efficient and optimize transmission and distribution capacity. This gets complicated, but the easiest way to explain it is that if inputs into the grid are predictable, it's a lot easier and economic to manage. In that way, the grid and storage become a lot like our own financial budget — when we know what's coming in, it's a lot easier to manage what goes out.

If energy storage is truly the Holy Grail, where are the speeches demanding that we triple our capacity by 2020 or that the United States become the energy storage technology center for the world? You don't hear those speeches because energy storage is pretty dull stuff and certainly neither sexy nor photogenic, but if we were to solve the problem, storage would indeed be the Holy Grail, which brings us to The Manhattan Project.

To the baby boom generation the Manhattan Project is well known, but to those lucky enough to be younger, it's a little more obscure and even ancient history. The Manhattan Project had its start in 1939 when Albert Einstein wrote to President Roosevelt warning him that the Germans were likely developing a nuclear weapon with great destructive power, and the United States

should counter the German effort with its own initiative. President Roosevelt accepted this challenge and committed the government to this endeavor and by 1942 the Manhattan Project was well underway.

The Project culminated with the successful test of the first nuclear weapon in July 1945 and, following the bombs dropped on Hiroshima and Nagasaki in August 1945, the end of World War II. Over 125,000 scientists and staff at no fewer than 30 sites around the country had fathered this technology and spent \$22 billion in today's dollars. Solutions were found to problems thought at that time to be unsolvable.

The Manhattan Project is symbolic of what can be accomplished with an all-out effort and many, including Bill Gates, have called for a “Manhattan Project” in renewable energy, regardless of the cost or risk. This seems a worthy idea, but wouldn't it make more sense to first solve the “critical-path” issue of energy storage? Otherwise, what are we going to do with all that renewable energy once we have it?

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The Manhattan Project helped create American's first nuclear bomb

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