



# On The Frontier

## Views From The Leading Edge

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### At the Cusp of a New History ©

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There are times when something fundamental changes in human affairs. We live in such a time. Many of the old familiar patterns are gone, swept away by the tumult of recent technological, military, public health, economic and political events.

Even when this disruptive cycle finally ends and a new “normalcy” returns, the world we inhabit will not be the one so recently left behind.

The great arc of two timelines, the world as it was and the world as it will be have intersected, colliding in the present. We stand at the cusp of a new history, not quite sure of where we've been and not at all certain of where we're going.

Some choose to be pessimistic about the changes taking place and some elect to be optimistic. Being an inventor, I tend to hold a positive view of change. But whether you are a pessimist or an optimist (or just don't care either way) one thing is certain - this new world will be different.

In a very real sense we have just entered the 21st Century, over two decades after the calendar event itself. Those who lived during the first years of the 20th Century could not have imagined the enormous forces of change that had been unleashed at the time.

It took two world wars and a worldwide depression in between before the true outlines of the last century became apparent. And longer still before the world we eventually came to regard as "normal" became a reality.

On The Frontier is aimed at helping readers understand some of the complexities of technological innovation. This transformative element is but one of the primary constituents making up the dynamic array of forces driving change. But innovation is not just about disruption of the old world. It is also a major agent ushering in the future now being birthed.

The topic of energy has moved to the forefront once again, with scarcity and costs leading the way. Amidst many great changes now taking place, the production of energy verges on an

enormous upheaval. With the inevitable decline of old energy production methods brought about by geologic, economic, political and environmental factors, a new and exciting era of enormous renewable energy resources and other energy technology is dawning.

In many ways, this transition period in energy production methods is reminiscent of exploration of new and uncharted territory in the American West during the early 19th Century. The pessimists among us will no doubt be quick to point out that the new era will also see many of the same kinds of follies as happened in that earlier frontier expansion.

But this new age will also be characterized by unanticipated discoveries and inexhaustible supplies of energy that will deliver a period of growth and wealth creation far greater than any in previous human history.

However unpredictable the near future may be, it's already possible to see, albeit dimly, the shape of some of the things to come. A somewhat dated online discussion of the financial outlook for solar generation recently caught my attention.

Phil LoPiccolo, Editor-in-Chief of Solid-State Technology quoted Stephen O'Rourke, then the Managing Director of Deutsche Bank Securities, who had spoken about the rise of solar energy at a New England breakfast forum in 2007.

O'Rourke predicted that the cost to produce electricity with solar PV technology would reach grid parity with traditional utility electricity generation sometime between 2012 and 2015. That change in solar energy performance envisioned by O'Rourke has long ago come to pass.

A key factor here is that the solar PV price curve has recently dropped so dramatically that the cost of solar-generated electricity has transitioned well past what is commonly referred to as grid price parity. (Also known in the power generation industry as "convergence".)

Meanwhile, average retail prices of conventionally generated electricity has continued to rise during the same period. Solar energy is now more price-competitive than fossil fuel generation.

This fundamental change has also been accompanied by a transition to electrical energy across the entire economy, particularly in transportation, increasing overall energy demand still further.

Innovative new products and services play a big role in the development of a sustainable market in any new industry.

As but one example of how new enterprises can upend markets, consider what occurred in the IT industry. When Google was just two years old, almost nobody foresaw the major force it would become in the future online market.

At that time, Microsoft ruled with an iron hand and no Internet startup could possibly challenge this hegemony. Fast-forward to today; Google has all but eclipsed Microsoft with the latter now struggling just to stay relevant.

The same thing is going to happen in the energy production sector. As the nature of energy consumption changes and the energy market adapts, companies we've never heard of will overtake and then eventually surpass today's market leaders.

Many changes are in store as the great arc of history continues its sweep into the new century, carrying us along with it. We stand, unbalanced in the present, with one foot in the past and the other not yet grounded in the future. It is no wonder that new innovation is so disconcerting to many, for it represents one of the primary forces of change.