

# Financing The World Energy Industry Requires \$22 Trillion

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**M**eeting the world's energy needs over the next several decades represents incredibly complex challenges on many fronts.



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These include access to the resource base for fossil fuels; availability of an adequate workforce, specifically engineers and skilled tradesmen; siting every variety of energy facility; dealing with climate change challenges; stability and predictability of regulation; and attracting \$22 trillion (\$22,000,000,000,000) into the sector.

Never before, on a global basis, has the energy industry been expected to site, finance and manage the construction of infrastructure on this scale. It is doubtful that any other industry has ever been compelled to deal with this level of capital investment.

In macro terms, can this amount of finance be available? Probably, but little reason exists to inspire belief that it will be deployed in an economically efficient manner. The key question is: Will the right amount of capital find its way to the right projects, at the right time, and in the right place?

Michael Bray of KPMG properly points out that 2 billion people today lack access to commercial forms of energy, generally assumed to mean both electricity and refined petroleum products. It is hoped that economic development will bring hundreds of millions of these individuals out of poverty over the next two decades. Energy access will be needed to escape poverty, but this will place additional strains on the global supply and demand balance. Urban and rural areas must expand their energy infrastructures to fulfill these critical societal needs.

Alleviating energy poverty will occur against the backdrop of curbing carbon dioxide emissions to deal with global climate concerns. Both policymakers and the public (the industry's customers) are insisting that the energy industry act now to slow the growth of and eventually reduce emissions of carbon dioxide and other greenhouse gases.

Like most political issues, the question of who pays is paramount. Ultimately, the end user pays, whether that cost is called a carbon tax or whether society accepts a

"cap and trade" system to achieve emissions reductions.

Of the many issues swirling in this complex legislative undertaking is the concern over long-term liability. Liability is multi-dimensional: who provides assurances that reductions claimed are real reductions? Who completes a monitoring and compliance certification process? Who is responsible to assure that the CO-2 gases, compressed to form a liquid and pumped underground, stay underground at least for decades, if not centuries?

Alleviating energy poverty and addressing climate issues are difficulties that highlight the financial challenge facing the energy industry. In the U.S. context, over the next 25 years we will need to construct between 30 and 40 new nuclear plants and will need another 100 plants to replace those whose permits expire after 60 years of operation. The possibility of this costing over a trillion dollars is real.

The cost of outfitting new and existing coal-fired power plants with carbon capture and storage will be enormous, no matter how uncertain these costs may be today. Cost estimates vary so widely that they almost become meaningless. But no one expects it to be cheap.

One expert recently noted that the size of the infrastructure required to capture and store carbon dioxide from every coal-fired power plant will be more than double the size of our domestic petroleum infrastructure. Furthermore, this will need to be constructed not over a century but within a couple of decades.

No one can say with any certainty how many of the proposed liquefied natural gas (LNG) plants will be constructed in the U.S. However, even if a dozen new LNG receiving terminals are built, coupled with expanded pipeline capacity and possible major pipelines from Alaska and the Northwest Territories of Canada, the financial requirement will be staggering.

Looking at the International Energy Agency's \$22 trillion investment estimate, it is notable that the North American component is about 20%, roughly \$200 billion per year. Often, policymakers' eyes glaze over when talking about big numbers. In fact, most people have difficulty thinking in terms of billions and trillions.

To put this into perspective, U.S. oil and gas companies were investing about \$150 billion per year as of 2006. Therefore, it sounds reasonable that global oil and gas investments will need to be about \$400 billion a year. Furthermore, this level of investment is achievable in that the cost of petroleum in the

U.S. was about \$500 billion in 2007.

However, the petroleum world has changed dramatically over the past few decades in that international oil companies (IOCs) no longer control reserves. IOCs control no more than 20% of oil and gas reserves, down from 70% about 30 years ago. The remainder of the reserves are in the hands of national oil companies (NOCs). With current prices, NOCs need IOCs much less than even 10 years ago. NOCs do not need capital because most NOC investments come from internally generated funds - they can buy the technology from oil service firms and, to some degree, they can buy management expertise. It truly is a different world.

Looking at electricity investments, it is critical to distinguish regulated from competitive generation markets. Generators in regulated markets, which comprise about half of the U.S., are only going to build new nuclear or new coal capacity with regulators' blessing. While this blessing may be harder to obtain than Wall Street's blessing for new merchant plants, the likelihood of customers covering some of the potential cost overruns by assets being rate-based may reduce risks sufficiently to obtain financing.

Competitive generators, operating as pure merchant plants, whether new nuclear or new coal, have to hit the price mark to get dispatched. These units will be price takers not price makers. The role of emission credits may have a profound effect on the economics of both new nuclear and new coal plants with carbon capture and storage. Dozens of coal plants have been cancelled or deferred until certainty exists over carbon dioxide reduction regulations. Almost 10 dozen plants are in "regulatory limbo," which represent 65,000 megawatts of capacity that will soon be critically needed.

Renewables and energy efficiency will play a major role. Efficiency advocates suggest that the U.S. invested \$300 billion in 2004 and that efficiency investments could reach \$7 trillion by 2030, about one-third of investment requirements.

Another study indicated that wind could provide 20% of the U.S. power requirements. Whether you accept these premises is up to you. From my perspective, we will need every supply component, including petroleum, natural gas, coal, nuclear and renewables, as well as unconventional supplies and alternative technologies. And we will need every possible energy savings achievable.

And we need \$22 trillion. That's trillion with a "T." It is the number 22 with 12 zeroes after it. **PE&GJ**