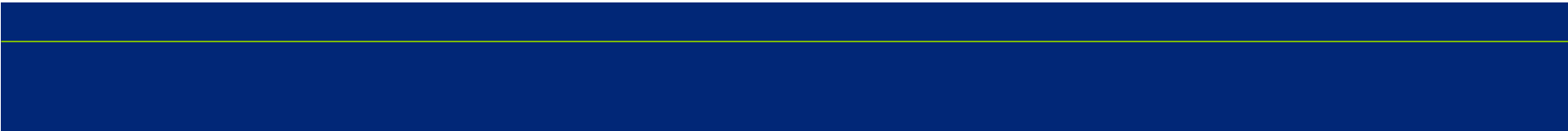




# Financing Low-Carbon Development through the Capital Markets

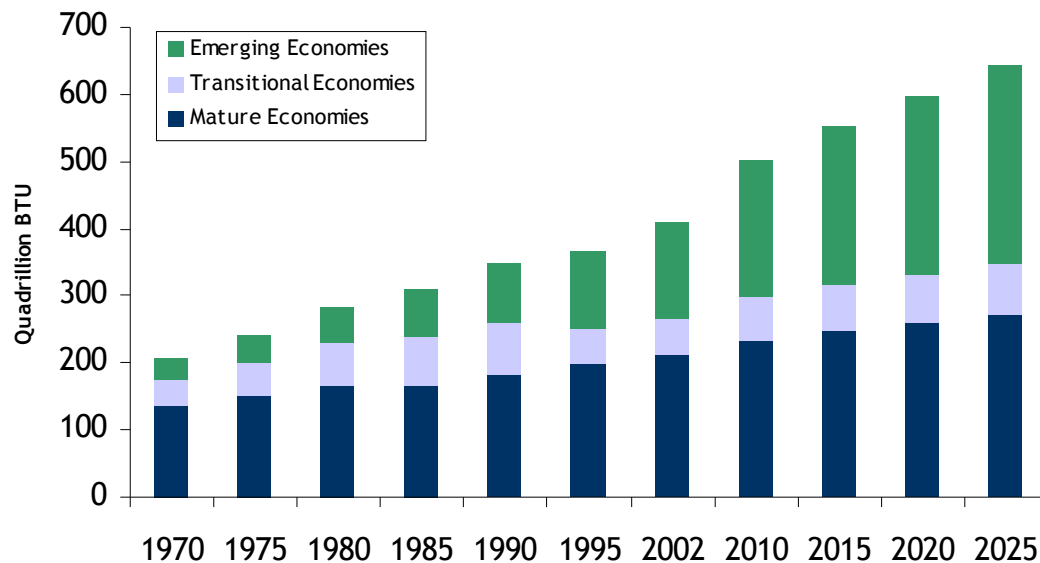
Russell Read, Ph.D., CFA  
Chairman, C Change Investments  
17 June 2010



# Backdrop: Energy Market Outlook

Global energy demand is growing rapidly—Asia took center stage beginning around 2000

Forecasted Global Energy Use (1970 - 2025)



- Total world consumption of marketed energy is expected to expand from 412 quadrillion British thermal units (Btu) in 2002 to 645 quadrillion Btu in 2025, or a **57-percent increase** over the 2002 to 2025 time period
- The emerging economies, driven by China, India, and others in Asia will account for nearly **two-thirds** of the increase in world energy use, surpassing energy use in the mature market economies for the first time in 2020.

**Approximately \$17 trillion in new investment will be needed over the next 20 years to meet future fuels demand alone**

Source - Energy Information Administration

# Capital and Innovation in Energy- and Materials-Related Private is the Most Promising It's Been in Decades

- All aspects of the system from the wellhead to pipelines and tankers to drilling rigs to refineries are at or near 100% capacity.
- Slack supply capacity for most energy and materials has evaporated since 1980 (e.g., petroleum: from 17 mBPD to 1-3 mBPD)
- Massive capital requirements to upgrade energy infrastructure
  - \$17 trillion for Fuels
  - \$44 trillion, all energy
  - \$100 trillion, existing but problematic infrastructure



Source - Simmons & Company International

# Risk of Not Investing—Green Investing as a Super-Theme

- Opportunity: Pervasive across asset classes
- Risk of Missing Theme: Investment opportunities and returns are likely to be disproportionately represented by green investments
- Transformation in Capital Markets: Major dislocations and shifts in opportunity can be expected by geography and asset class

# Clean versus Cleaner

- Clean
  - Alternative energy technologies intended to have minimal impact on the natural environment
  - Examples: wind, solar, geothermal, hydro, tidal
- Cleaner
  - Focused on transforming the inherent inefficiencies associated with traditional energy production
- Efficiencies from source to use: Coal (<20%), Solar (<15%), Petroleum (<15%)

# Critical Sectors for Funds and Funds of Funds Investors

- Cleantech
  - Promoting the revolution in new technologies
  - Venture capital, growth equity, private equity
- Infrastructure
  - Lower-risk investments associated with deploying proven but more efficient technologies into the Asian energy infrastructure
- Real Estate
  - Energy efficiencies and shared savings
  - Fully one-half of energy consumption is associated with buildings

## 7 Principles for Successful Investment in Natural Resources and Sustainability Going Forward

1. Invest with End Points in Mind
2. Benefit from New Investor/Government/Industry Interdependency
3. Incorporate Rapid Technological Change
4. Adapt to Structural Shortage in Liquidity
5. Develop New Skills Needed for Success
6. Monetize Environmental Costs/Benefits
7. Build or Find Value-Added Capabilities

## Principle I – Primacy of End Point Investing

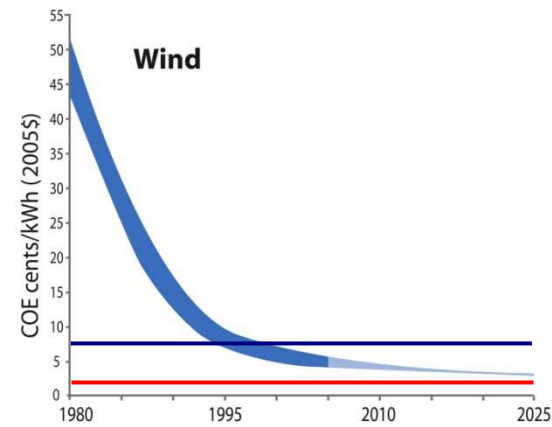
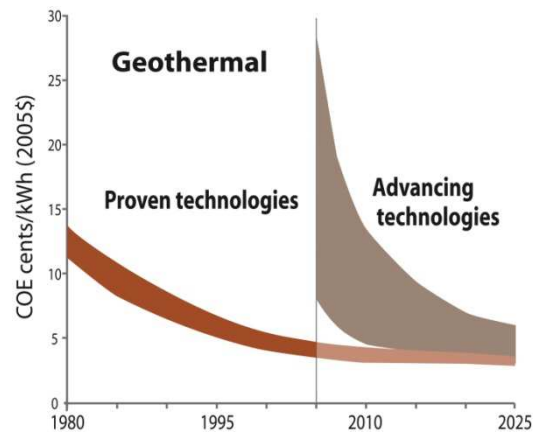
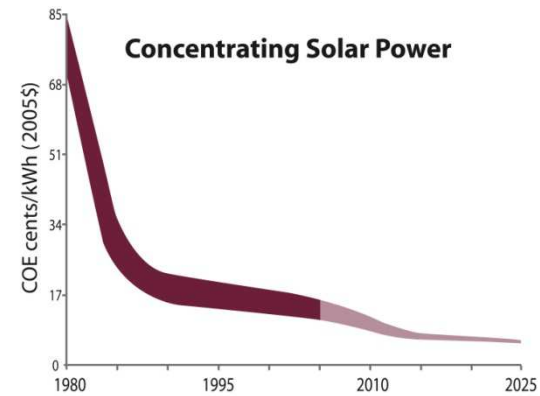
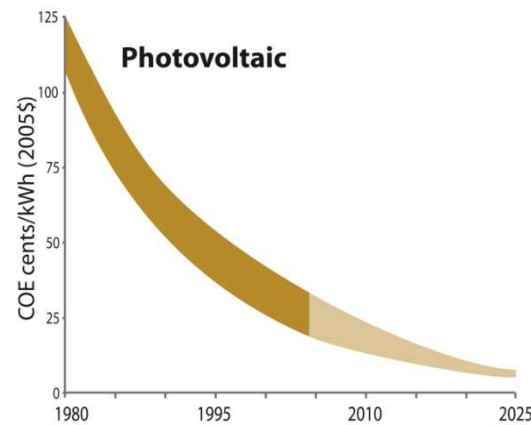
- Revolution in Clean Technologies → rapid change
- Financial, operating, and even most technological risk can be overcome by anchoring company/project cash flows:
  - Long-term Power Purchase Agreements (PPAs)
  - Industrial supply agreements
  - Government purchase agreements
- Company and project investments will generally be too risky without anchoring the cash flows—true for private market and public markets investments
  - Case: 500 competing solar technologies worldwide

## Principle II—Interdependency of Investors, Governments, and Industry

- Capital cost requirements dwarf capacity of investors alone—requires significant co-investment from governments and industry
- Governments and industry provide anchor orders and purchase agreements
- Governments can provide critical incentives
- Investor/government/industry partnerships will become ubiquitous

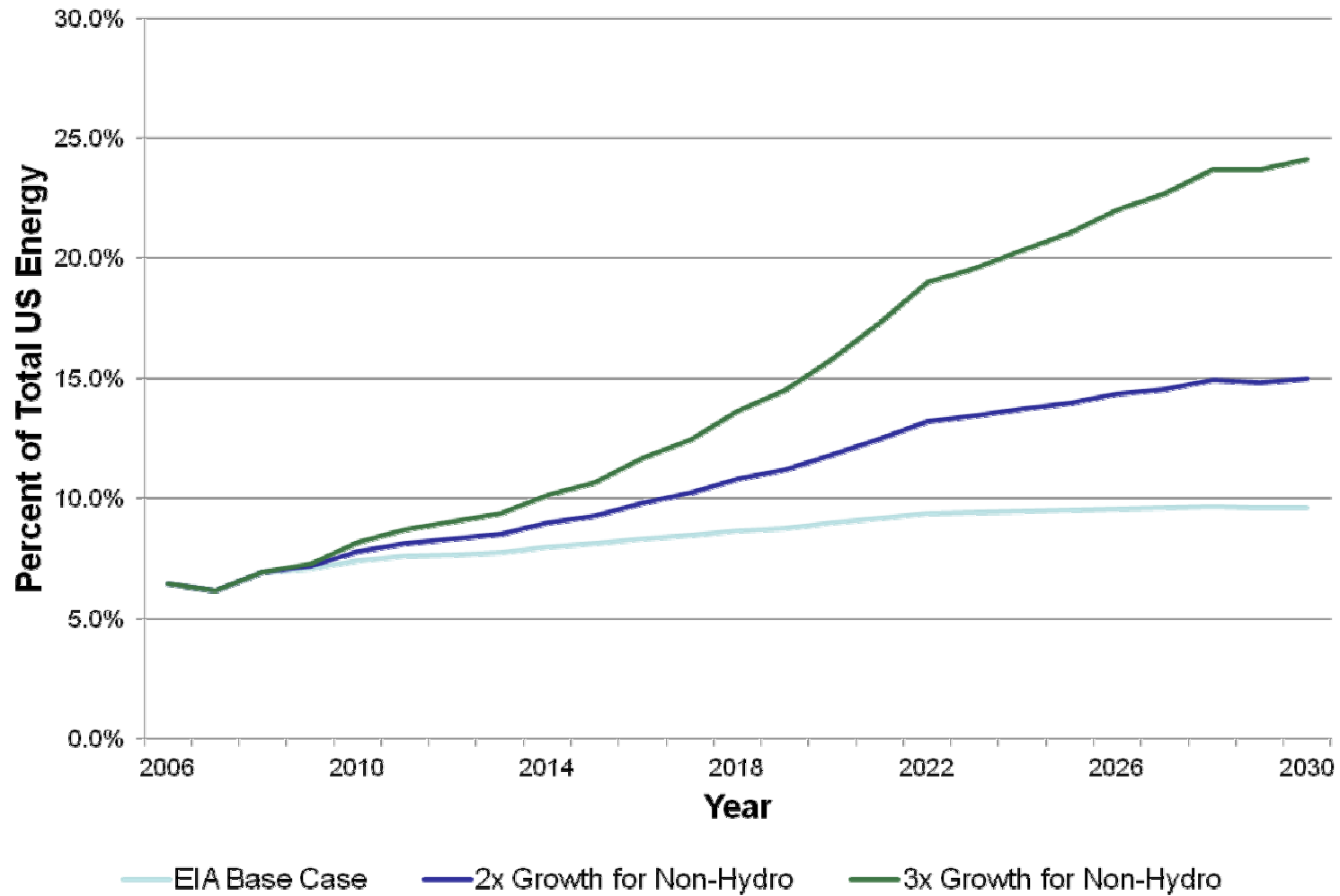
# Principle III - Technological change will fundamentally change market opportunities

**Forecast and Historical Real Cost Trends of Renewable Energy**



Source: NREL Energy Analysis Office  
Costs are based on constant 2005 dollars

# Potential Share of Renewables in US



## Principle IV—Adapt to a Shortage in Financial Market Liquidity Indefinitely

- Massive capital costs associated with clean technology, construction, energy and materials projects will swamp scarce capital
- Structural de-leveraging in the world's financial institutions will likely persist for decades to come
- Scarce liquidity and financing will become a major competitive advantage for investors with liquidity resources
- Prudent investors should demand a premium return in exchange for sacrificing liquidity going forward

## Principle V—Fund Managers Need to Develop New Skills to Capitalize on Natural Resources Going Forward

- Nearly three decades have past since last major energy & materials infrastructure investments were made
- Centrality of emerging markets and Asia rather than the OECD in the production and deployment of new technologies and infrastructure reverses practices of 1980s-90s
- Carbon pricing and the monetization of other environmental costs are new to these managers

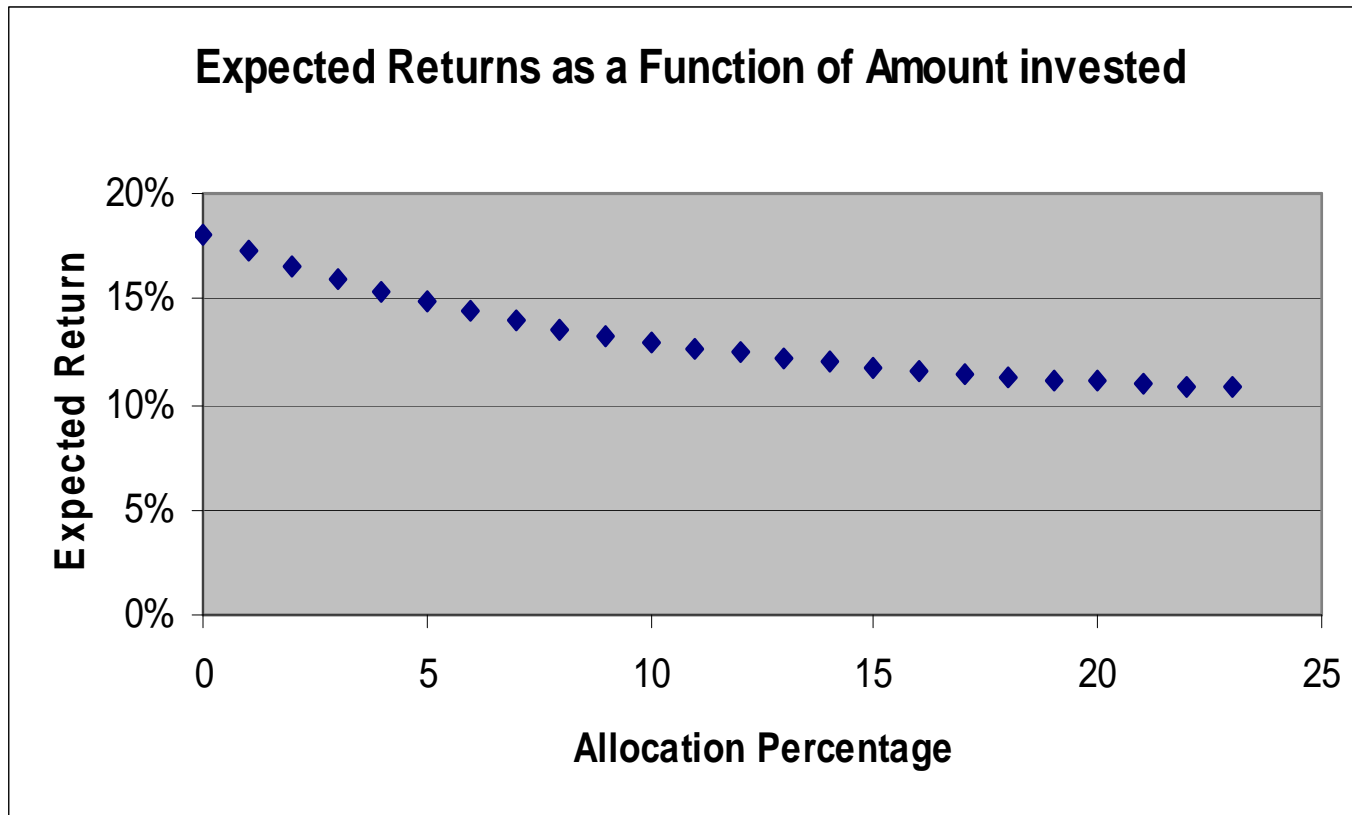
## Principle VI—Global Environmental Stress will Create Major Incentives and Opportunities for Efficiency Real Estate and Infrastructure

- Carbon pricing mechanisms and the monetization of other ecological costs/benefits will become major components of returns in projects and companies
- Emerging markets private equity will play a disproportionate role in the production, consumption, and distribution of the world's natural resources including energy, materials, and water

## Principle VII—Risk and Return Profiles for Investments in Most Asset Classes will Vary Based upon Investor Capability

- Traditional asset allocation model assumptions poorly account for expected returns, volatilities, correlations, and liquidity going forward
- Realized returns and volatilities will vary dramatically among investors, particularly in the private markets
- Building a capability for sourcing and assessing private market opportunities will become a major source of differentiation among investors
  - Case of Ontario Teachers: 25% allocation to infrastructure

Expected Returns for Private Markets will Vary by Amount Invested and Plan Capability (In Contrast to Stocks and Bonds)  $E[R]=a+b*\exp(c*\%)$



# Implications

- Opportunities are no less numerous or compelling than they were 5, 10, and 20 years ago; yet, they have shifted fundamentally in geography, sector within virtually every major asset class
- A sense of capital shortage is likely to persist for a decade or more, making liquidity considerations a permanent feature of sound allocation decisions
- New opportunities related to natural resources are likely to become increasingly important considerations for sustainable investing across every major asset class
- Green investing shouldn't mean sacrificing returns