Clean Energy Finance

Challenges and Opportunities of Early-Stage Energy Investing

Executive Summary

National Renewable Energy Laboratory
Industry Growth Forum

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NREL NATIONAL RENEWABLE ENERGY LABORATORY | INDUSTRY GROWTH FORUM

JISEA Joint Institute for Strategic Energy Analysis

Colorado Center for Renewable Energy Economic Development

Supporting Organizations

NREL Industry Growth Forum
The premier event for clean energy startups to maximize their exposure to receptive venture capital, corporate investors, and strategic partners.

Joint Institute for Strategic Energy Analysis
Providing leading-edge, objective, high-impact research and analysis to guide global energy investment and policy decisions.

Colorado Center for Renewable Energy Economic Development
A catalyst for economic development in Colorado through clean energy and energy efficiency innovation and entrepreneurship.

Wells Fargo Bank
A provider of banking, mortgage, investing, credit card, insurance, and consumer and commercial financial services.

EY
One of the world's leading professional services organizations; helps companies across the globe to identify and capitalize on business opportunities.

The term Clean Energy (CE) is used throughout this presentation, encompassing multiple energy subsectors including renewable energy, energy storage, energy efficiency, smart grid, biofuels, and systems integration technologies.

A full reference list is provided in the complete Clean Energy Finance document.

Clean Energy Investing - Current Situation

- Clean energy investors today face an increasingly complex decision space, needing to consider economic and policy realities and multiple developmental risks such as technology, market, and team risk.

- Global investment in renewable power and fuels was $244 billion in 2012. Although this was a 12% decrease from 2011's record $279 billion, 2012's total was still the second-highest ever (8% higher than 2010) (UNEP/BNEF, 2013).

- Global investment by venture capital and private equity investors fell 30% in 2012 relative to 2011 (to $4 billion)—which is the lowest since 2005. Investment in specialist renewable energy companies by public market investors also dropped to $4 billion (61%) (UNEP/BNEF, 2013).

- A large proportion of recent clean energy investment has been driven by growth in emerging markets, particularly in China. There was a shift in activity from developed, to developing, economies (UNEP/BNEF, 2013).

- Solar photovoltaic technology has experienced a significant reduction in costs from 2011 to 2012. This decline contributed to an 11% fall in the dollar value of overall solar investment even though capacity installed increased significantly; indeed, 2012 marked a record year for PV capacity installed at 30.5 GW (UNEP/BNEF, 2013).

- Policy uncertainty was a major contributor to a decline in investment in the U.S., which was down 34% at $36 billion in 2012 (UNEP/BNEF, 2013).

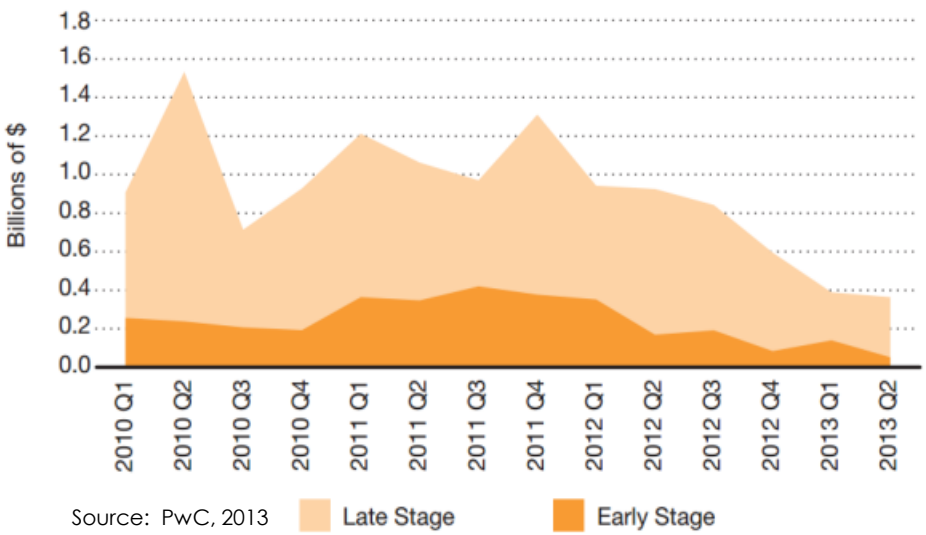
Key Insights

- Funding gaps in technology innovation between the angel and venture capital investment stages, as well as in the growth stage between the pilot project phase of development and full-scale commercialization, have resulted from decreased venture capital investments.
- CE is frequently compared to the investment cycle for IT, but it relates more accurately to the chemical and pharmaceutical industries as they are commodity markets with strong incumbent players and high cost of capital for project and technology development.
- Challenges to CE investment range from economic and policy obstacles to development risks such as technology, market, and team.
- Opportunities to increase early-stage investing include improved government policies, partnerships, business model innovation, and multiple financing mechanisms including Program Related Investments, efficient government loan and grant awarding, and SEC rule changes.
- Interviewed investors provided numerous insights into the current realities of early-stage CE investing, ranging from development challenges, policy positions, and opportunities including partnerships, business model innovation, and innovative financing mechanisms.

Clean Energy Venture Capital

- Venture capital has typically existed in the form of high risk capital provided by institutions or wealthy families to aid early-stage businesses. Such capital is often provided when there is no other viable source.
- Investing opportunities fluctuate over time, shifting from sector to sector as industries mature.
- Venture capital investment in emerging U.S. renewable energy companies grew significantly in the late 2000s.
- VC investment in renewable energy has been declining since 2009.
- The decline in 2012 came as VC/PE investors faced challenging global economic conditions, supply overcapacity, declines in product prices, natural gas competition, and continued policy uncertainty.

Clean Energy Funding by Stage Each Quarter, 2010-2013



Source: PwC, 2013

VC New Investment in RE by Sector (2004 to 2012 $bn)

Source: (UNEP/BNEF 2013)

Technology Investing Stages + Funding Gaps

The classic investment stage progression for technology investing, including funding sources and development processes/activities (IRENA, 2013; UNEP, 2013), is shown below.

Process	Technology Research		Technology Development	Manufacturing	Rollout (project finance)
Activity	Basic R&D	Applied R&D	Demonstration	Market Development	Commercial Diffusion
Funding Source	Government and University Labs	Angel Investment	Venture Capital	Private Equity	

There are now funding gaps between the angel investment round of funding and that of venture capital (the technology "valley of death"), and in the growth stage (the commercialization "valley of death").

Process	Technology Research		Technology Development		Manufacturing		Rollout (project finance)
Activity	Basic R&D	Applied R&D	Demonstration		Market Development (Scale-up)		Commercial Diffusion
Funding Source	Government and University Labs	Angel	**Technology Valley of Death**	Venture Capital		**Commercialization Valley of Death**	Private Equity

Policy Complexity

Policy affects market demand, which in turn affects technological innovation. Government support in the U.S. is complicated by a complex framework of varying federal and state incentives and financing mechanisms, which can easily be changed or repealed depending upon the political winds.

Stage of Development	R&D Innovation	Demonstration	Targeted Deployment	Untargeted Diffusion	Market Independence
Objective	Encourage innovation and entrepreneurship	Prove concept at scale	Support diversity of scalable technologies	Support resource efficiency and competitiveness	Stable and securing ongoing growth
Policy/Tax Mechanisms	• National targets • National research agendas • Fiscal incentives	• Regulatory and legal framework for specific developments/projects • Investment tax incentives	• Feed-in Tariffs • Portfolio standards • Grid development •Targets for specific industries/resources	• Technology neutral renewable energy targets • Carbon taxes • Carbon trading • BAT requirements	With or without: • Carbon taxes • Carbon trading
Examples of Public Finance Mechanisms	R&D Grants	Project Grants	Guarantees and insurance products		
			Soft Loans		
	Incubators		Mezzanine Finance		
			Credit Lines		
	Public/Private VC Funds		Public/Private PE Funds		
		Technical assistance			

Source: Adapted from UNEP SEFI (2008); UNEP & Partners (2009); and UNEP SEF Alliance (2010)

Complex Risk Environment

There are a wide variety of risk types companies face in the clean energy space. They include categories such as: market, technology, and team.

MARKET: CE technologies mainly sell into highly regulated and entrenched marketplaces. Thus, the returns and investment horizons of clean energy are somewhat unique.

•It is not a market that can provide enormous (10x) returns at a quick pace; the internet software industry is not the right analogy.

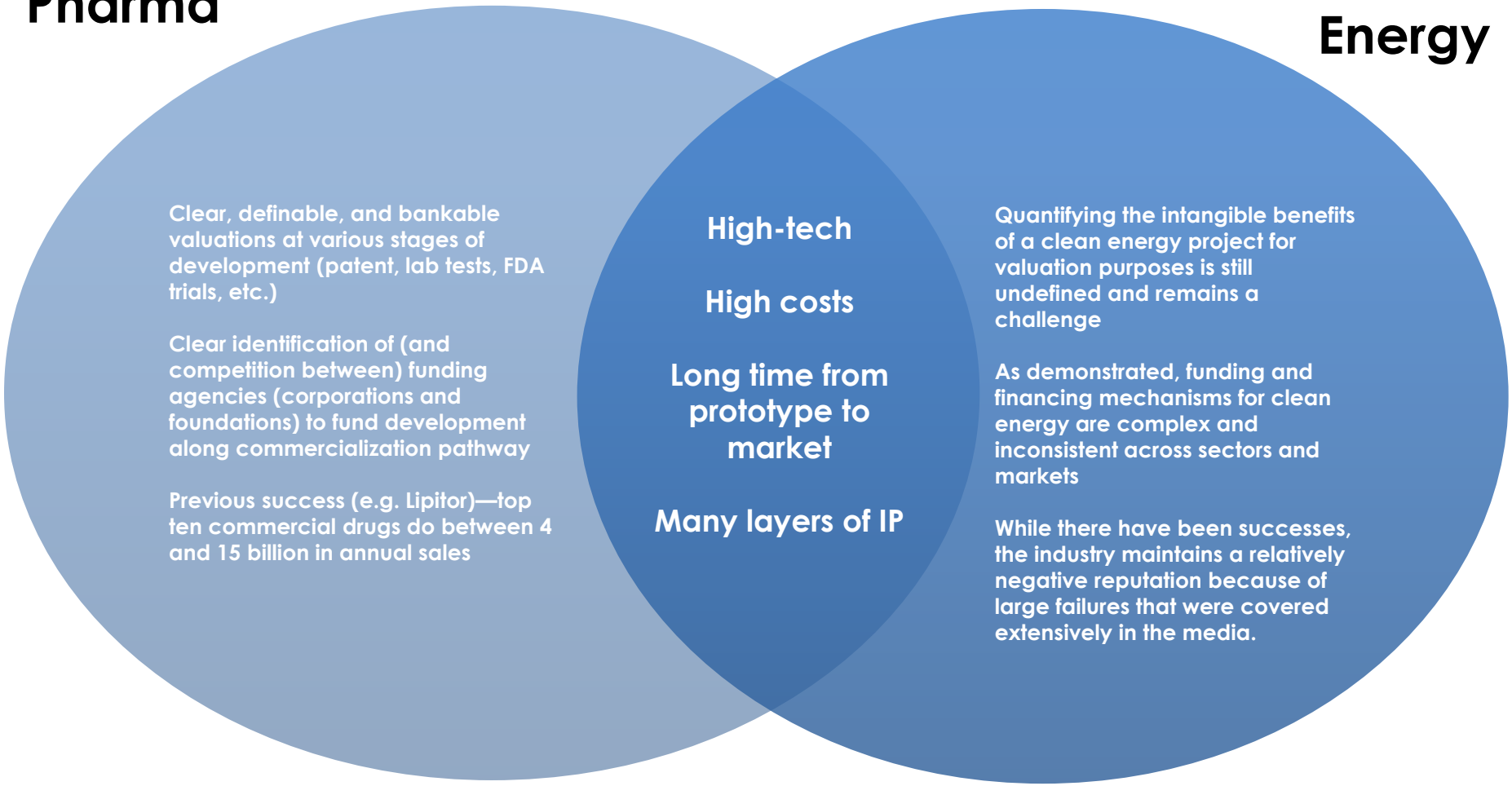
TECHNOLOGY: Conveying a compelling value proposition is critical. Technology development is a long-term proposition.

•Environmental stewardship is primarily considered a public initiative, and private investors are incapable of reaping all the returns innovative CE technology might offer to the public.

TEAM: A delicate balance between group dynamics and overall expertise must be found within the teams at small companies. It is widely viewed as disadvantageous to install outside members to the team in order to execute an investment round.

•A vast majority of company founders are unable to scale the growth of the company through IPO as the skillsets needed for growth are fundamentally different from those needed to start the company (Sangani, 2013).

Industry Comparison: Pharmaceuticals



Lesson Learned: Clear, definable, and bankable valuations are critical for reducing risk, especially for long-term, capital-intensive projects, and proven successes help reduce risk perception.

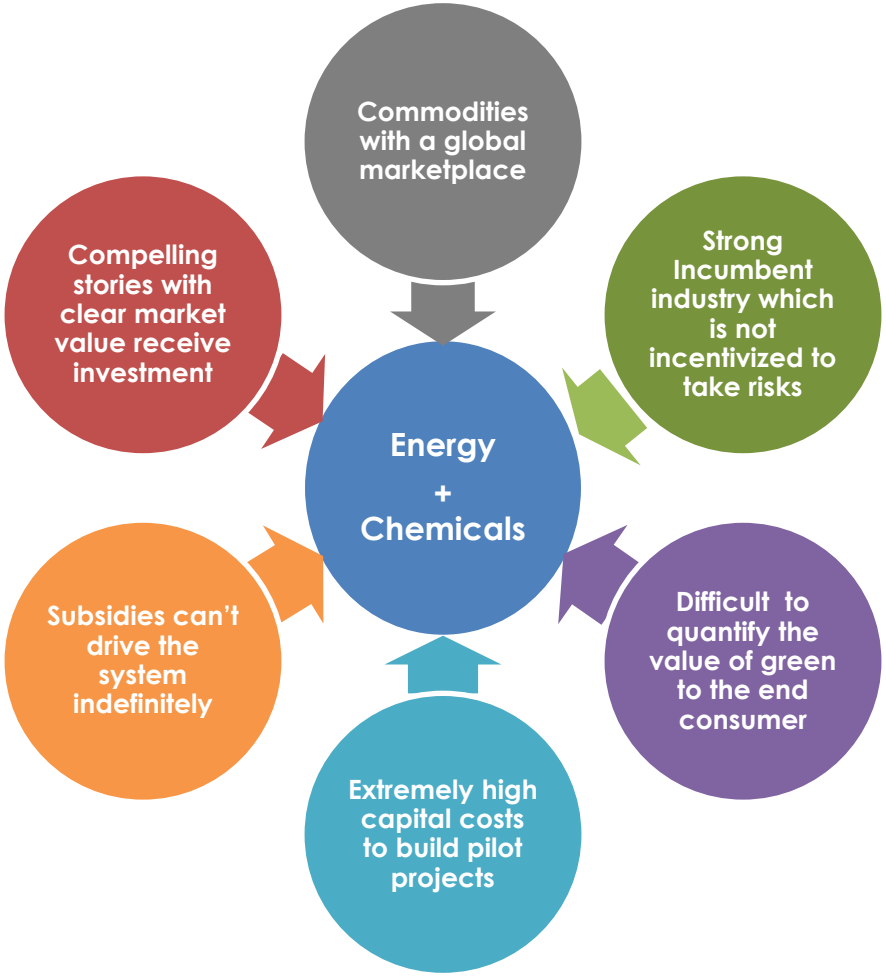
Industry Comparison: Pharmaceuticals

- The current state of cleantech can be compared to the biomedical and pharmaceutical industry of the late 1990s and early 2000s.
- During this era, it was quite reasonable for companies to raise significant amounts of capital with a firm IP position and demonstration that the drug or device resulting from the IP was effective.
- Quickly it became clear that, even with defensible IP and an effective product, a company could still fail to become profitable without a clear reimbursement strategy.
- Questions arose. Who would use the device or drug, and who would pay for it? Medicaid? Insurance? Local government programs? Out of pocket?
- Biomedical companies showed that, without a clearly defined reimbursement pathway, a technology based business could have significant trouble scaling or raising future funding rounds.

Lesson Learned: To be successful in 2013, cleantech companies no longer need just exciting technology, defensible IP, and a compelling value proposition. Successful companies need to have a clear path to a reasonably large addressable market from the get outset of fundraising.

Industry Comparison: Chemicals

The energy industry compares accurately to the chemical industry.



Lessons Learned:

- Providing educational opportunities and access to information for all stakeholders increases transparency and enhances market confidence.
- Effectively communicate and quantify the benefits of green.
- Promote green alternatives through appropriate regulations and supporting policies. Subsidies and financial incentives can help promote initial market entry, but they will not drive the system indefinitely.

Opportunities – Government Policy

Contrary to undermining innovation, governmental policies can stimulate innovation. The various mechanisms should complement each other, be aligned with the public interest, and lead to mature markets that ultimately don't need the policy assistance and therefore become more politically sustainable (CPI, 2011).

Policy Mechanisms Should…

Be "loud, long, and legal"

Loud

Clearly improve the economic bankability of projects or technologies

Legal

Confidence in the government's ability to ensure compliance and due diligence

Long

Duration should coincide with the financing horizons.

Incentivize Market Demand

Incentivize Indirectly

- Real Estate Investment Trusts (REITs)
- Master Limited Partnerships (MLPs)
- Property Assessed Clean Energy (PACE)
- Income Trusts and Securitizations

Incentivize Directly

- Investment Tax Credit (ITC)
- Production Tax Credits (PTC)
- Feed-in Tariffs (FiTs)

Government as a Consumer

- Purchase clean energy technology and components for use on government property and facilities.

Opportunities – Partnerships

Considering the market and technological challenges that CE investors face, partnerships frequently are attractive strategies as they allow for risk-sharing and the opportunity to leverage combined resources.

Universities and National Labs

- Innovative hubs that can de-risk technology development.
- Capitalize on technology transfer capabilities via mechanisms by which private industry can license or purchase academic or lab IP.

Corporate Strategic Partners

- Ability to handle a longer investment horizon.
- Capital and revenue streams to make large capital investments.
- Industry know-how: supply chain, manufacturing, customer base, industry track record.
- Low cost scaling and path to market.

Government Partners

Department of Defense

- Largest single user of energy in the U.S.
- Quantifies value beyond cost (security, reliability, resiliency).
- Congressional mandates (i.e. must meet a 25% target of total facility energy use from renewable sources by 2025. (NDAA, 2010)
- SERDP and ESTCP programs promote partnerships to develop innovative, cost, effective, and sustainable solutions

Department of Energy

- Continue or re-establish agency programs…

ARPA-E → formed in 2007 via the American Recovery and Reinvestment Act and has funded over 275 projects for nearly $1 billion (DOE, 2013).

DOE Section 1705 loan program → $34B and more than 60,000 jobs created between 2005 and 2012 (US DOE LPO, 2013).

Opportunities – Financing Mechanisms

Bridging the gaps in clean energy funding will require the use of a broad range of financing tools, with roles across many multiple stages of the technology lifecycle.

Program Related Investments

- Change IRS rules to allow Clean Energy as a charitable purpose.
- Allow tax exempt organizations to make investments in for-profit enterprises.
- Over $600b available in private foundations and family offices.

Government Loans + Grants

- Match government funds to private investment.
- Keep the government from picking winners and losers.
- Expedited process, with action in weeks, not months or years.
- Government input should not exceed $50m per investment.

SEC Rule 506

- Allows a company to sell securities to an unlimited number of accredited investors and raise an unlimited amount of funds.
- Additionally can sell to sophisticated non-accredited investors .
- Financial statement requirements.