Market Design for the Clean Energy Transition: The Role of New Generator Finance

Resources for the Future and World Resources Institute

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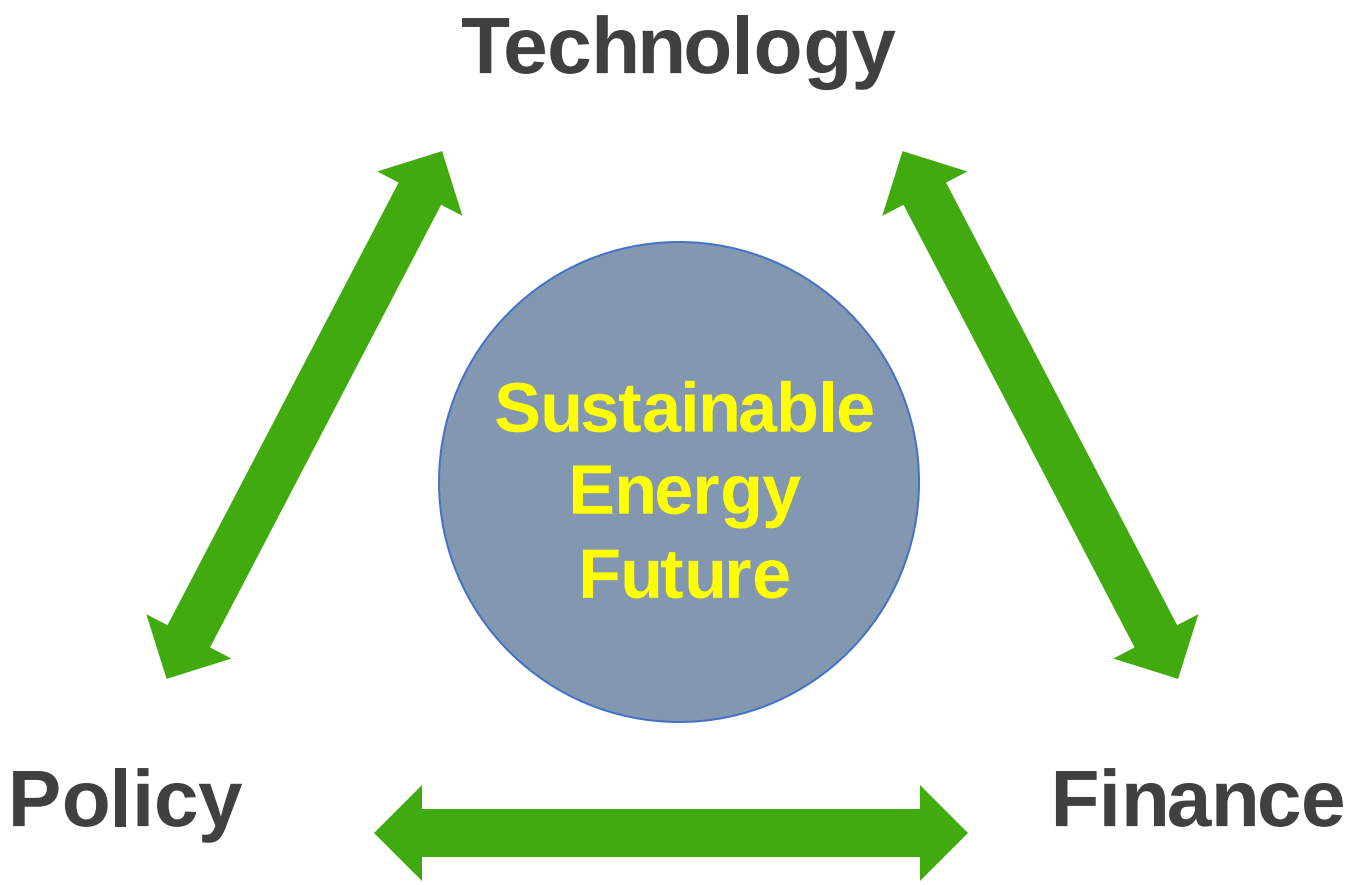
STANFORD GRADUATE SCHOOL OF BUSINESS

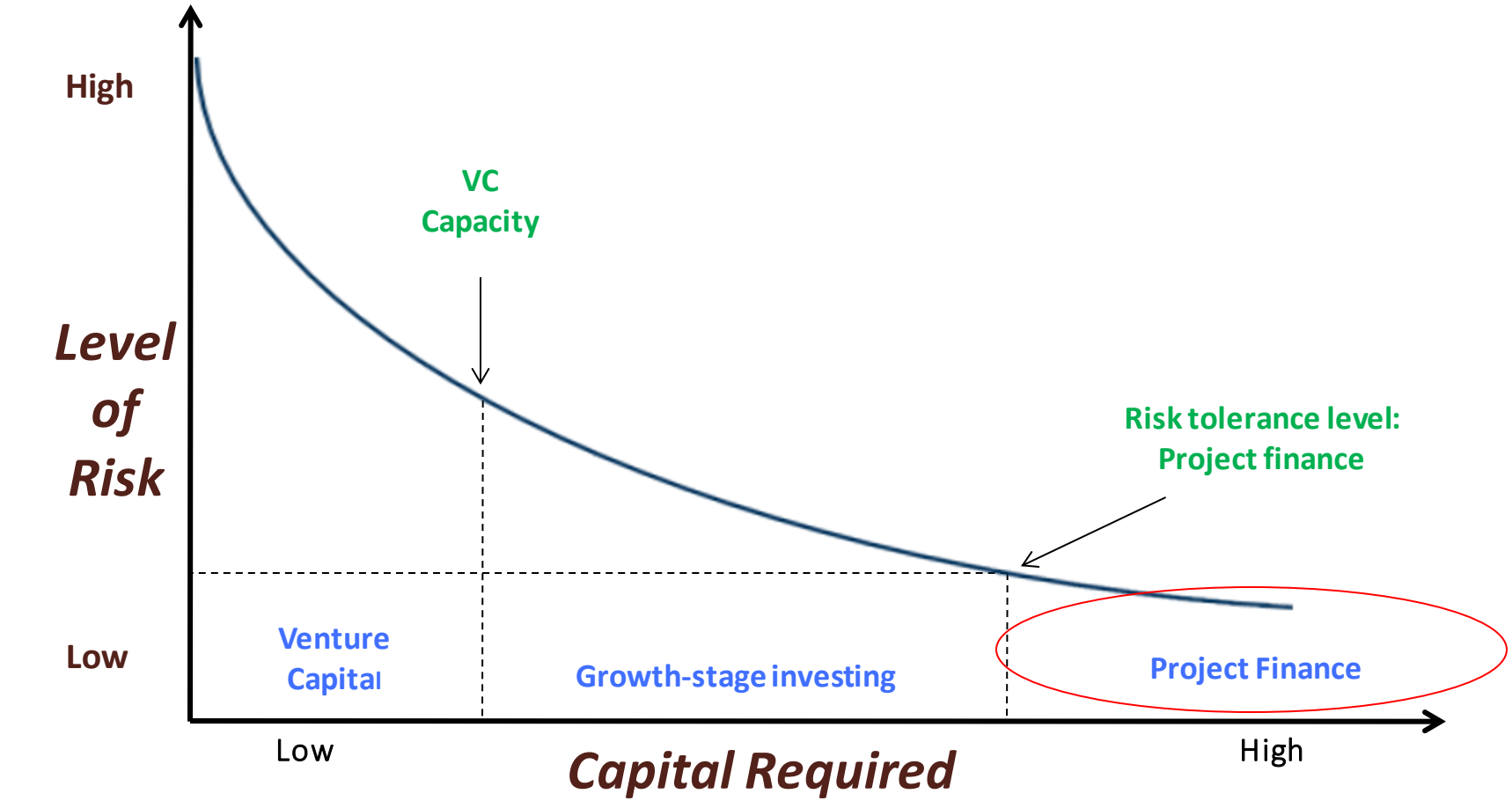
The Elements of Success



Problem Statement

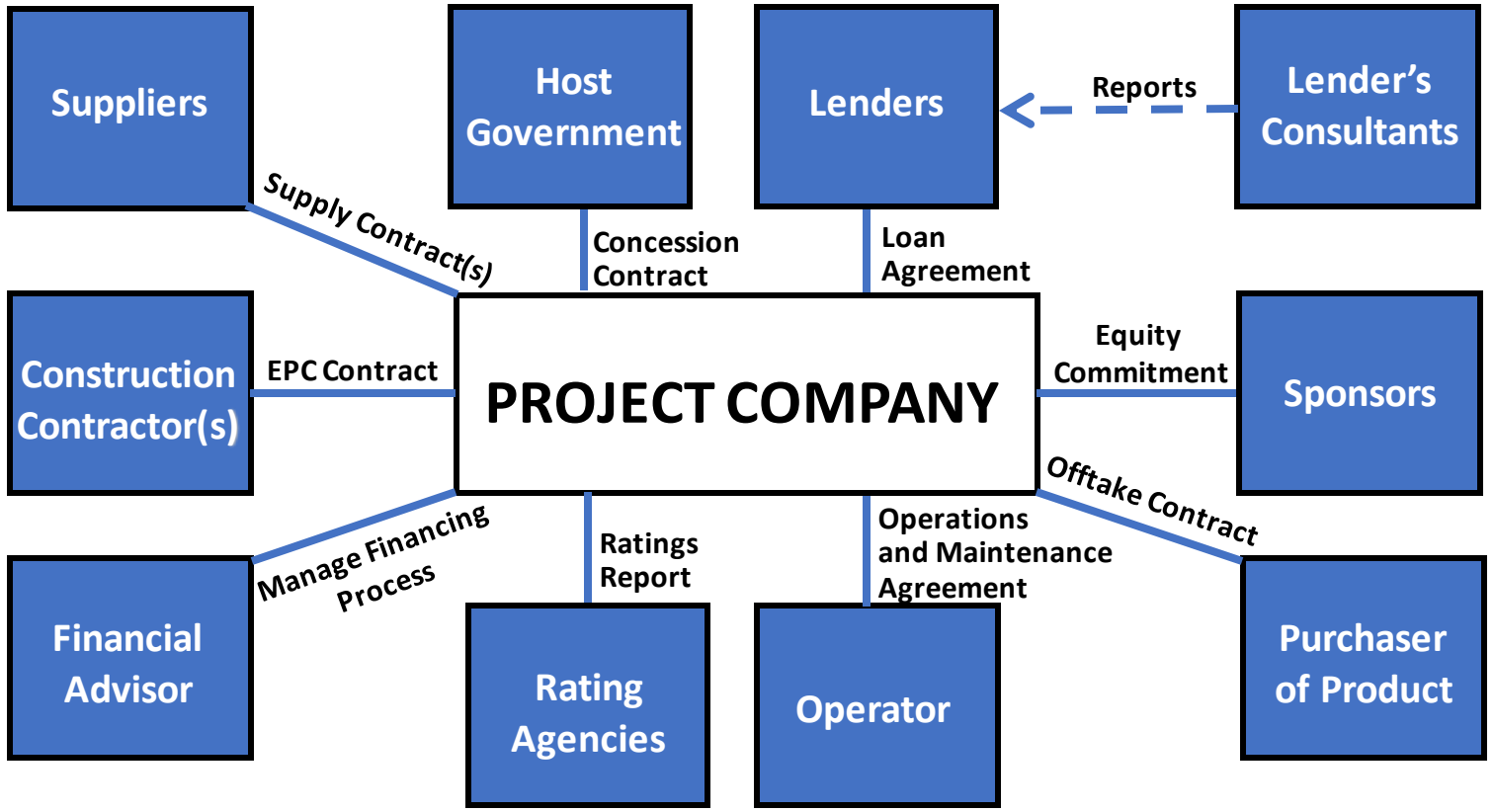
"The problem is the absence of a sufficient pipeline of bankable projects. . .[I]nvestment and finance remain constrained by serious barriers linked to market and policy failures, along with country-specific impediments, market conditions (including fossil fuel prices) and technical challenges." **OECD, 2016**

Setting the Stage

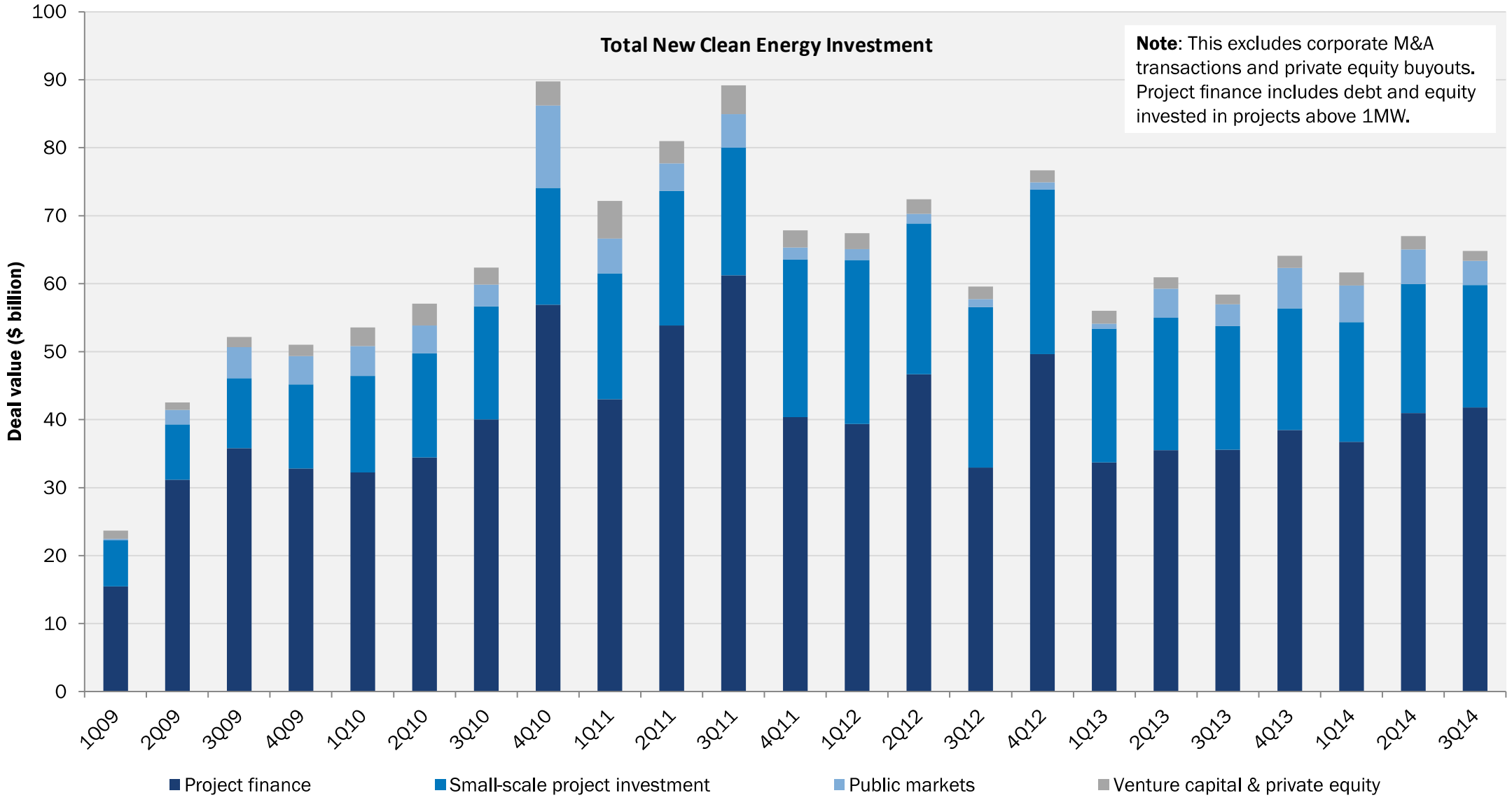


Graph Source: Tana Energy Capital LLC

Project finance: Single-asset project company, built around a web of contracts



Why is project finance important?



The Washington Post
Democracy Dies in Darkness

PowerPost

The Energy 202 • Analysis

The Energy 202: Clean energy investment needs to triple to halt catastrophic warming, finds new report

By Dino Grandoni October 31

DERISKING DECARBONIZATION:

Making Green Energy Investments Blue Chip

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Three Major Clean Energy Finance Problems

- ***QUANTITY PROBLEM:*** Current annual global clean energy investment must triple – from $0.75T to $2.25T – to keep global warming under 2°C. This would absorb ~2/3 of the world's total annual new investible capital;

- ***QUALITY PROBLEM:*** There is a serious mismatch between the conservative risk profile of most major institutional investors and high-risk nature of most clean energy projects today;

- ***LOCATION PROBLEM:*** A tripling of spending must occur within a pool of capital mostly held in OECD nations, while much of it will have to be spent in the developing world – with all the attendant risk.

Quantity Problem

IEA's Annual Spending on Clean Energy 2016-2040 by Category ($ billions/yr)				
Category of Spending	**2010-2015 Average**	**"450 Scenario" 2016-2040**	**Multiple 450 vs. Today (x)**	**Dollar Change vs. Today**
Renewables	$282	$503	1.8x	$220
Electricity Networks	229	288	1.3x	59
Other Low CO_2 (CCS, Nuclear, Etc.)	13	114	8.8x	101
Energy Efficiency	221	1,402	6.3x	1,181
Totals:	$746	$2.3T	≈3x Current Spending	$1,561

Quantity Problem cont'd

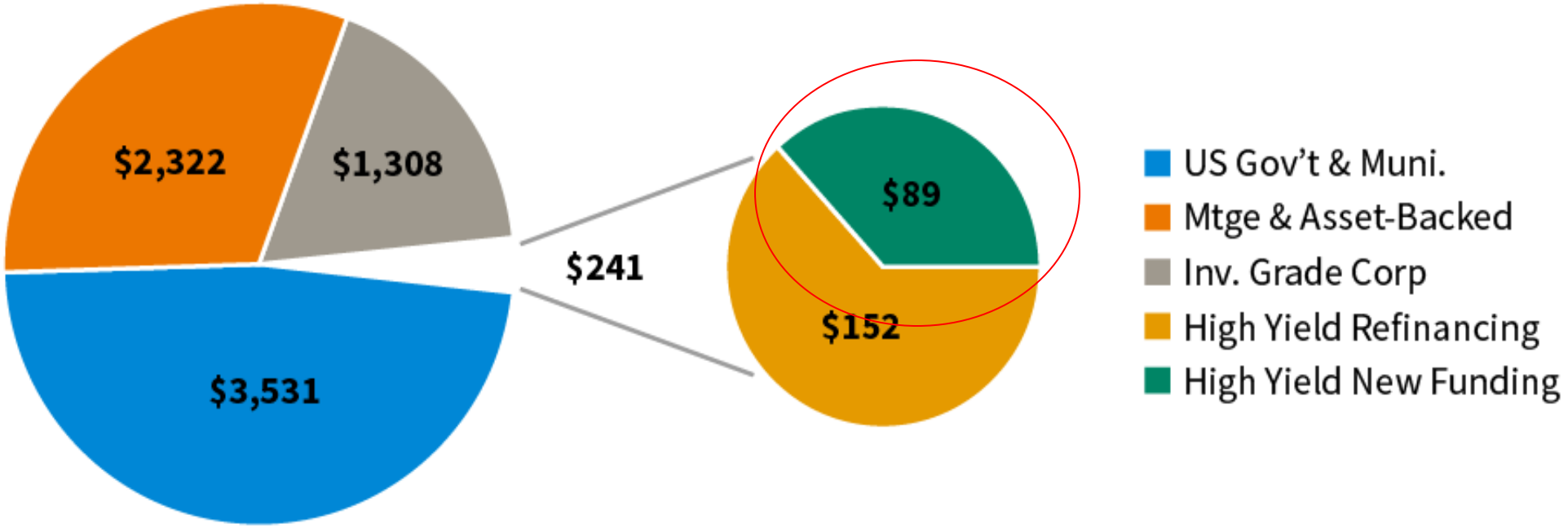
Asset Holdings and New Investible Inflows for World's Major Institutional Investors ("Stocks" vs "Flows")

Asset Holder	Assets $T 2015	1-yr Change* 2014-2015 $T	Annual Avg. Inflow 2010-2015	Source
Pension Funds	$25	$1.1	$1.0	OECD Contributions as % GDP
Insurance Companies	$23	($0.9)	$0.2	OECD Assets 2015 vs. 2014 & 2010
Mutual Funds	$37	$1.9	$1.3	ICI Tables 65 & 67 for Net Purchases
Sovereign Wealth Funds	$8-9	$0.2	$0.5	SWFI Assets 2015-16; Preqin 2011-16
Billionaires	$7	($0.6)	$0.4	Forbes 2015 vs. 2014 & 2010
TOTAL	$100	$1.7T/yr Δ	$3.4T/yr Δ	Versus $2.3T /yr Need

* Insurance, SWF, and billionaires net inflows not available—change in net assets used as proxy.

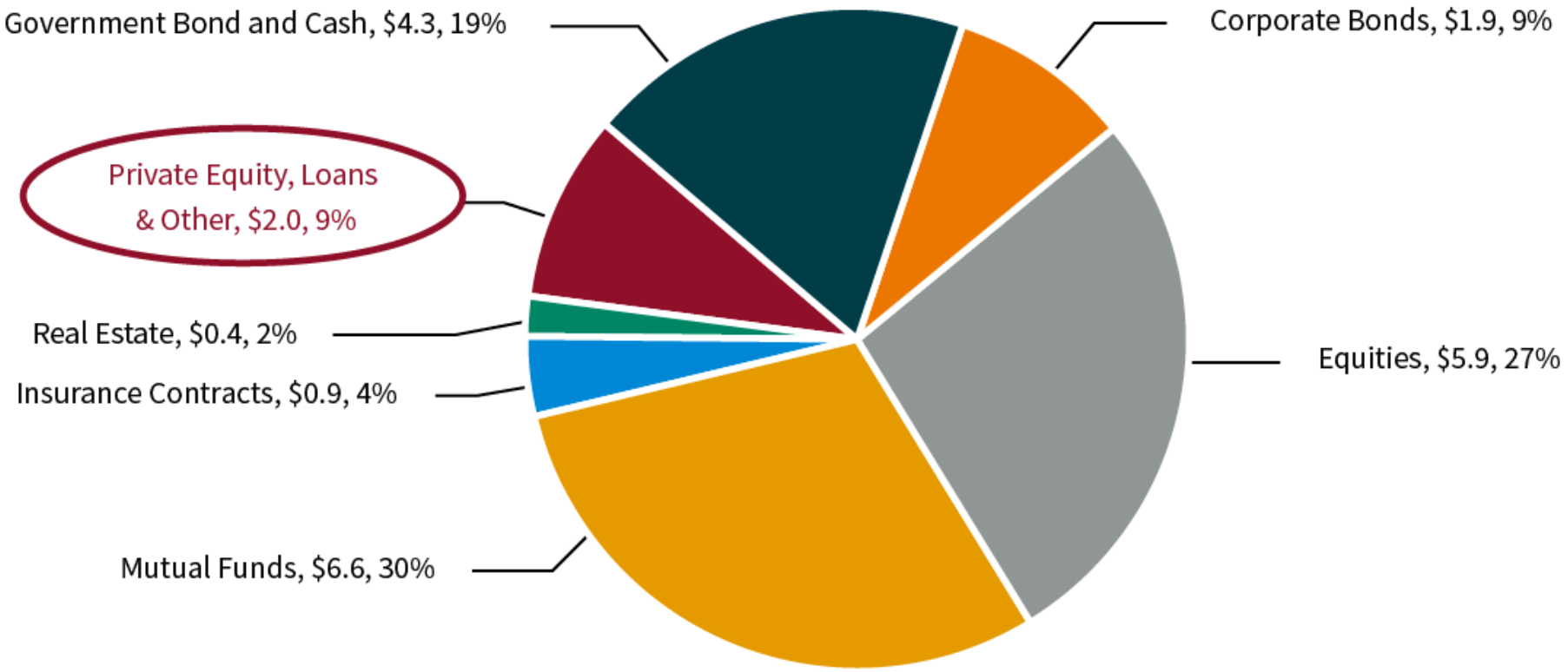
Quality Problem – Bonds
Big Need, Little Risk Appetite ($B)

"New Money" High Yield Bonds = ~1% of $7.3 trillion 2016 U.S. Bond Market (Billions).

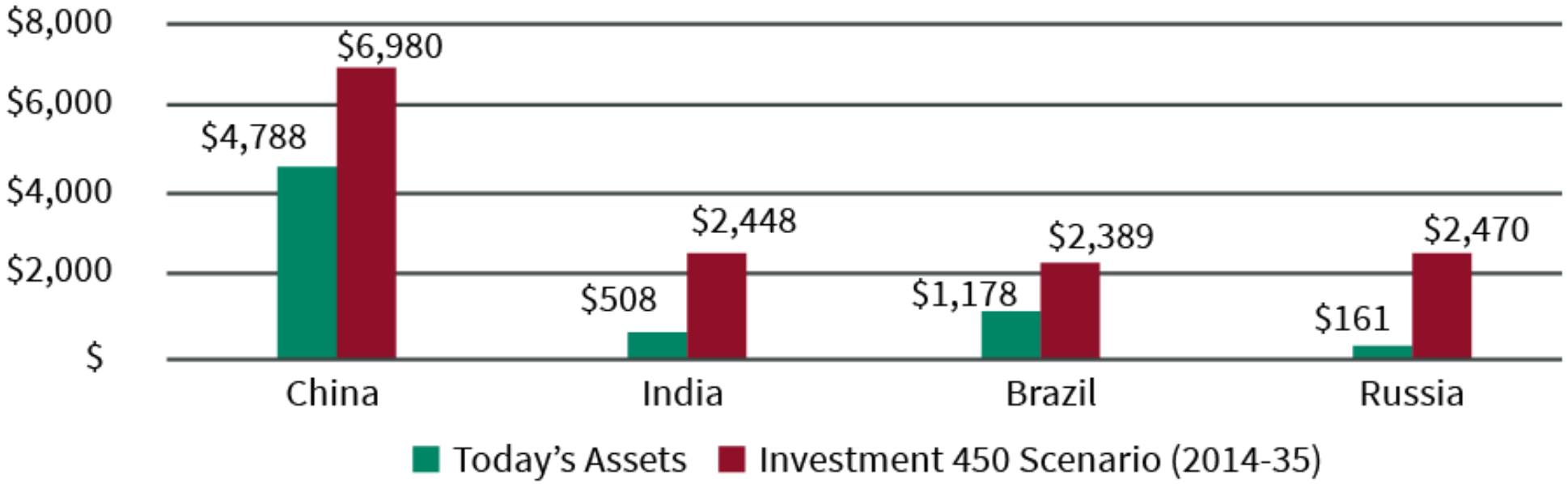


Quality Problem – Pension Funds
Most Clean Energy Investment in a 9% Allocation ($T)

9% x $24T
= ~$2T



Location Problem – Capital in Wealthy Countries, Spending in Poor Countries ($Bn)



“Making Green Energy Investments Blue Chip”

Risk Category	Specific Investment Risks
Markets	Electricity Market Design
	Fossil Fuel Prices
Policy	Mandates & Carbon Pricing
	Government Subsidies
Project Development	Innovative Technologies
	Government Approvals & Permitting
Investment Framework	Rule of Law
	Tax Issues
	Debt Regulation, Equity Disclosure & Currencies

The "Big Four" Investment Risks: Some Examples

#1 Policy

- Unstable/un-bankable emissions rules, carbon pricing, EE stds
- Trade policy (e.g. solar tariffs)
- Feed-in-Tariff contract risks
- Net Energy Metering problems
- Fuel economy stds in flux → EVs?

#2 Market

- Low/volatile nat. gas and oil prices
- Low/unstable electricity prices
- Over-generation/curtailment risks
- Dispatch rules in "competitive markets" vs ZECs, etc.
- Lack of "capacity" markets → PPA issues
- Storage—resource or load?

#3 Project Development

- Permitting reqs and timelines
- Technology issues → EPC Issues
- Transmission /Interconnect
- Land availability
- PPAs/Regulatory approvals
- Problematic gov't support
- Access to dev capital and debt mkts

#4 Investment Regime

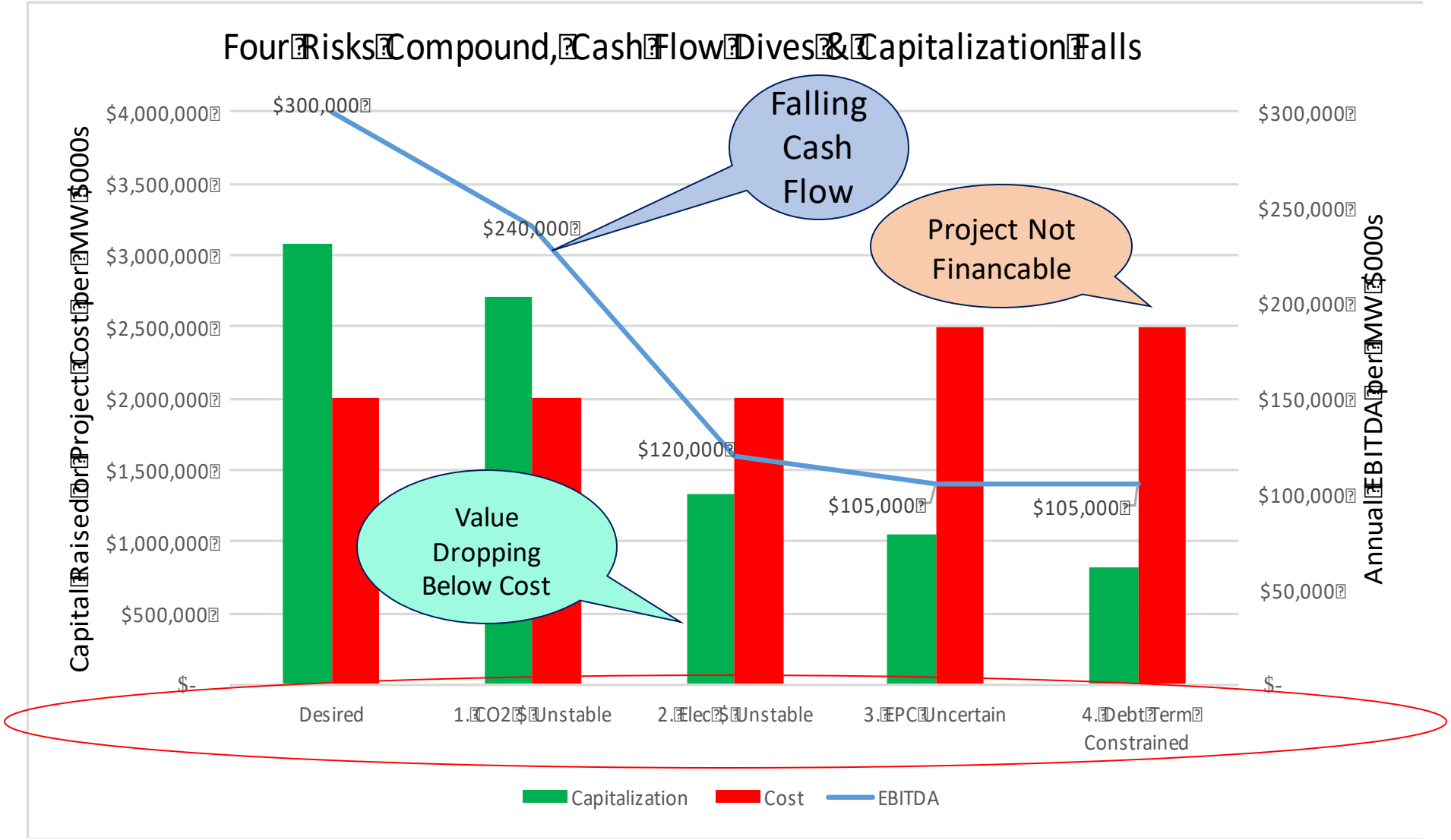
- U.S. tax incentives; alternative minimum tax; passive loss rules
- Unstable currencies in dev. world
- Weak contract, bankruptcy laws
- Basel III bank capital rules
- Export Credit Agency maturity limits
- Sovereign Wealth Fund tax treatment

Example of an Investment Risk

Local Currency Needed to Buy $1USD in BRIC Countries 2007-2017

	2007	2017	Low Value vs. USD	Decade Change[169]
Brazil Reals	1.8	3.1	4.17	(72%)
Russian Rubles	25	57	82	(128%)
Indian Rupees	40	64	68	(60%)
Chinese Yuan	7.5	6.5	7.5	+13%

A Hypothetical Project



A Closing Thought

" 'Investment grade' energy policy is a critical factor for unlocking significantly scaled-up capital flows into renewable energy and energy efficiency. To be 'investment grade', policy needs to tackle all the relevant factors that financiers assess when looking at a deal. It must be embedded in wider energy policy, and be stable across the lifetime of projects. Investors need to be confident, in a policy-driven market, that governments are serious." **Kirsty Hamilton, Chatham House, 2009**

Thank You

Disparate Treatment of Low-Carbon Resources in CA Electricity Market

- Higher reliability *RPS resources*, e.g. CSP, geothermal, and biomass lose out in spot power market auctions to less reliable but lower cost solar and wind.
- Low carbon *non-RPS* resources, e.g. large hydro, CCS, nuclear lose out to less reliable/lower capacity/lower-cost solar and wind.
- Low-carbon/higher reliability sources, e.g. CSP, geothermal, biomass and hydro lose out to higher-carbon/lower-cost natural gas generation in fixed-price *capacity-focused procurement.*
- Energy efficiency project investments lose out to solar and wind wrt state (and federal) incentives.
- Lower-cost/higher-capacity/longer duration non-battery storage, e.g. pumped storage, loses out to mandated procurement of higher-priced battery storage.

A Tax Policy Issue in Energy Project Investment

- Tax credits have driven much U.S. clean energy project investment but they are a problematic tool
- Limited universe of taxpayers with “tax appetite” who can ”monetize” tax credits
  - Many non-taxpayer investors = corps with large losses; REITs, partnerships/LLCs/MLPs; pension funds/charitable trusts/endowments; IRAs/401(k)s; state “permanent funds”
- Taxpayer universe further reduced by passive activity rules, corporate AMT, SWFs
- The limited group of “tax equity” investors can charge higher rates meaning more in their pockets, less in projects
- And, perversely, weak points in the economy, when investment most needed, are also when the least tax equity available
- Several solutions: “cash grant” alternative, open up MLPs and REITs, FITs, PABs etc.

Temporal Phases of Project Financing

Phase	Assessment	Development	Financial Closing	Construction	Term Financing	Operations
Time Scale	1 year →	1-3 years →	1 year →	1-4 years →	½ year →	20 years
What Happens	Figure out if project makes sense.	Get all permits. Get all contracts. Mitigate risks enough to satisfy lenders and equity.	Lock down all debt & equity – usually close simultaneously. Provide all funds needed to pay for construction and early operation – plus fund to cover delays or cost overruns.	Draw down committed funding to build the project. Supervise contractors so they don't blow it.	Get project working well enough so that long-term, permanent financing can be put in place.	Run the project: enforcing all input& output contracts; avoiding defaults on loans, and; paying dividends to equity.