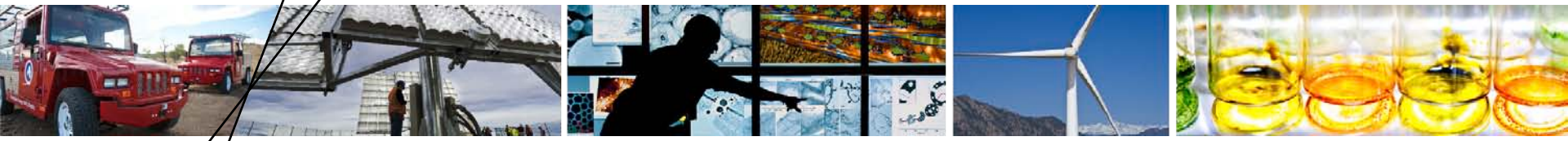
Impact of Financial Structure on the Cost of Solar Energy



SAM Virtual Conference

Michael Mendelsohn

June 20, 2012

Summary of recent NREL report…

The Impact of Financial Structure on the Cost of Solar Energy

Michael Mendelsohn, Claire Kreycik, Lori Bird, Paul Schwabe, and Karlynn Cory

NREL/TP-6A20 53086
March 2012

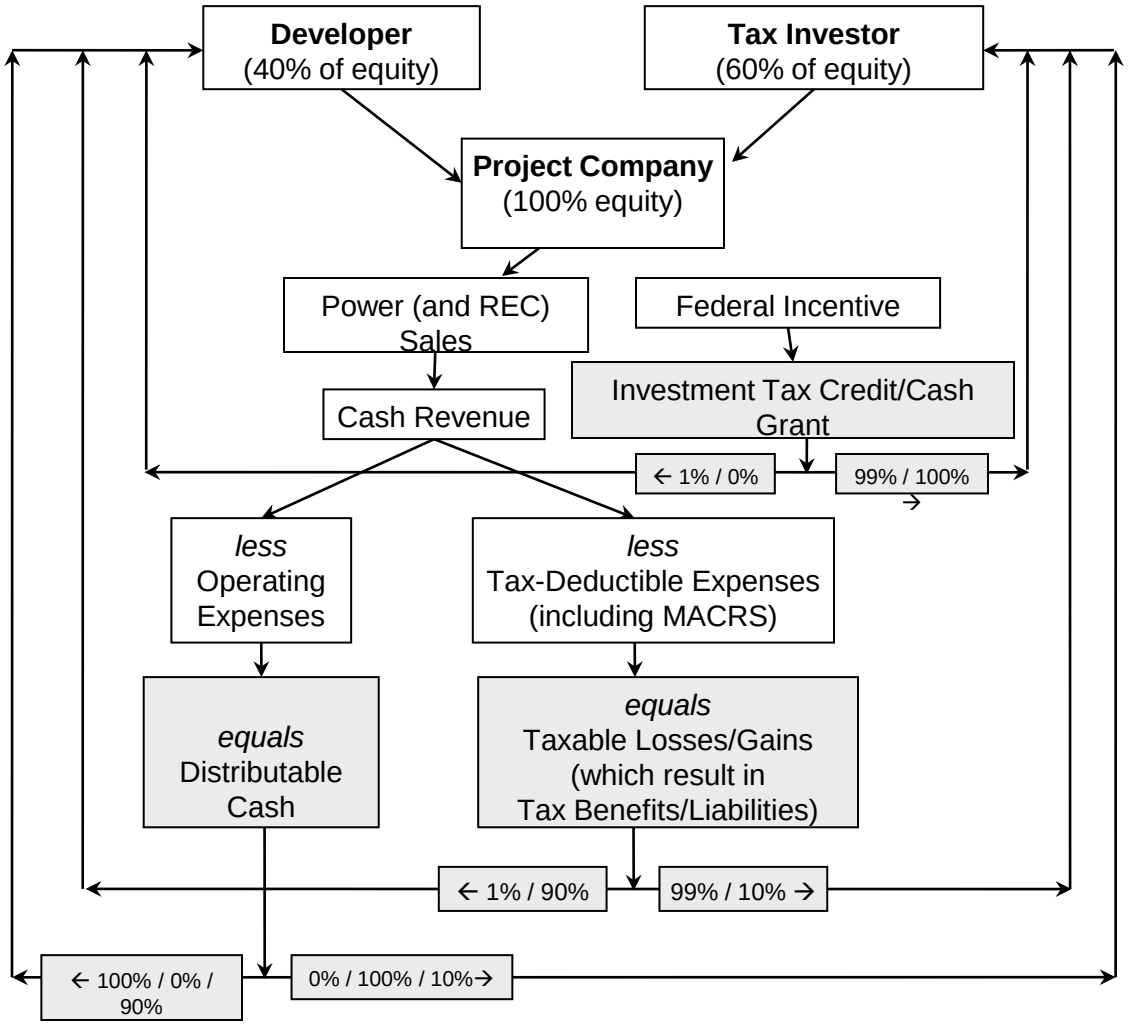
U.S. Analysis - Tax Incentives

- Two Primary Federal Incentives Available:
  1. Investment Tax Credit (ITC) / Production Tax Credit (PTC)
  2. Accelerated Depreciation
- Together, ITC/PTC and accelerated depreciation can count for approximately 50-55% of a project's capital investment (depending on discount rate applied)
- *But*, renewable energy projects (or developers) often don't have sufficient taxable income (aka "tax appetite") to utilize fully
- So, a separate "tax equity" investor is required to utilize tax benefits

Commonly Used Financial Structures

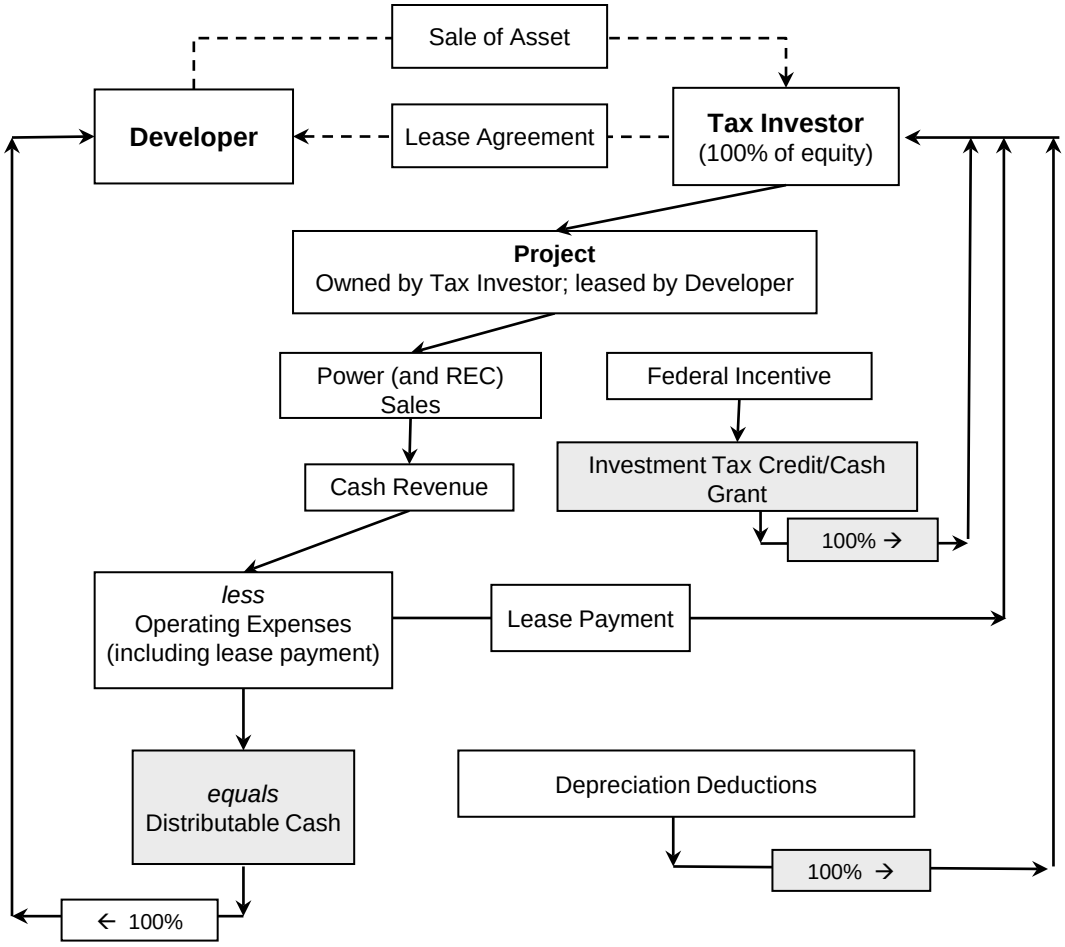
1. Partnership Flip (PF) structures
   - All Equity PF
     - Cash and tax benefits allocated to tax investor (primarily) until tax equity investor receives pre-defined IRR (flip point). After, allocations flip from investor to developer
   - Leveraged PF
     - Similar to AEPF but debt at project level increases required yield by tax investor by approx. 2%, often alters allocation schedule
2. Lease structures
   - Sale Leaseback
     - Developer sells project to an entity (lessor) who then leases it back to the developer to operate and garner revenue
   - **Inverted lease (a.k.a. lease pass-through)**
     - **ITCs passed via Master Lease; Tenant operates equipment and makes lease payments to Owner (not simulated in SAM)**
3. Single-owner (balance sheet)

All Equity Partnership Flip



- Tax investor provides a majority (e.g., 60%) of equity. Specific allocations set for each project.
- Pre-Flip Point, there are bi-furcated allocations:
  - Cash: initially 100% to developer (for either fixed duration or until return of investment); then 100% to TI until flip target reached
  - Tax Benefits: 99% to TI from COD until flip target reached
- After Flip Point is reached, virtually all allocations go to developer.

Sale Leaseback



- Developer constructs project and sells 100% to Tax Investor.
- Developer (Lessee) leases the project back from Tax Investor (Lessor).
- Lessee operates the project and pays Lessor an annual lease payment. Lease payment sized to provide Lessor with target return.
- Lessee retains free cash flow after lease payments and operating costs.
- Lessor receives annual lease payment from Lessee, and tax incentives and depreciation from ownership of project assets.
- Each party to the transaction has a separate taxable income (project taxable income is not shared as in the Partnership Flip Structures).

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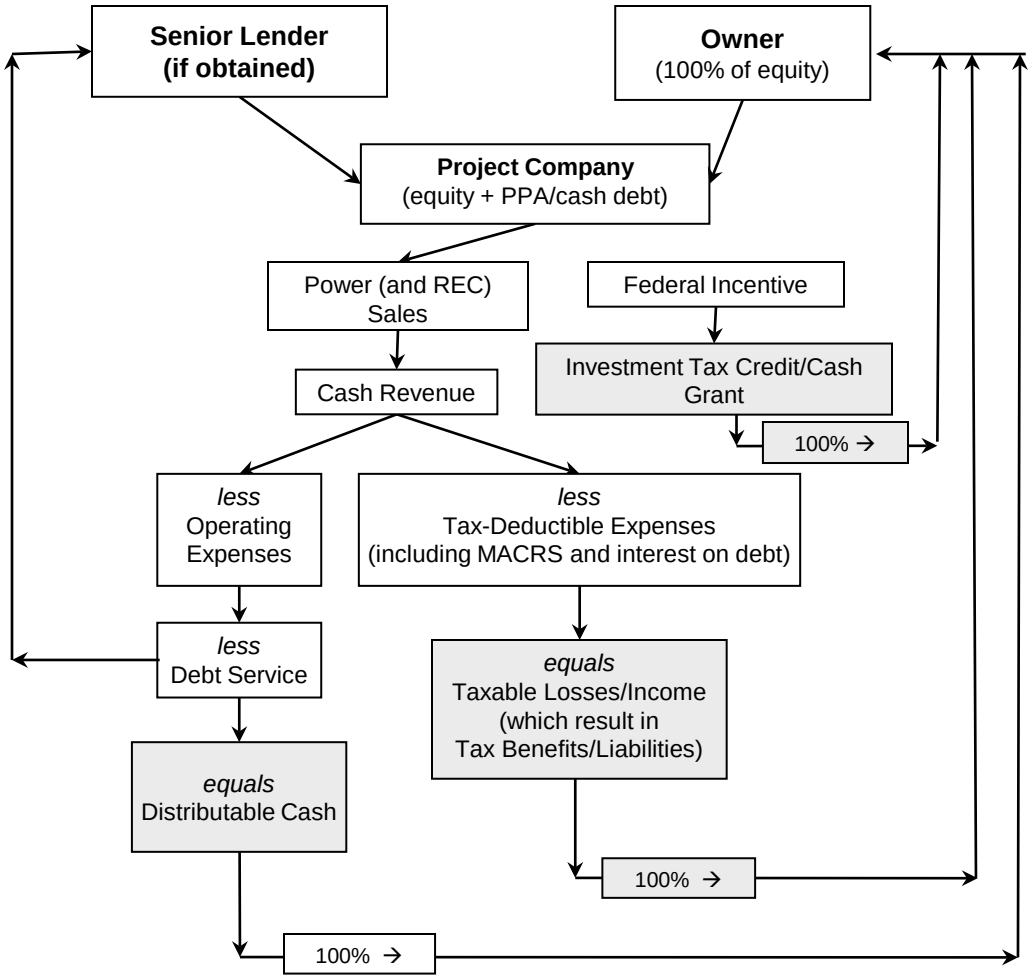
Single Owner



- One equity owner; project level debt (if obtained by owner).
- Owner funds 100% of the equity costs of the project as equity in the project company. The equity amount will vary if project level debt is obtained.
- 100% of each benefit stream flows to Owner:
  - Distributable cash
  - Tax Benefits: (a) taxable losses and gains, and (b) ITC/Cash Grant
- With just one Owner, there is no “flip” in the allocation of cash and Tax Benefits.

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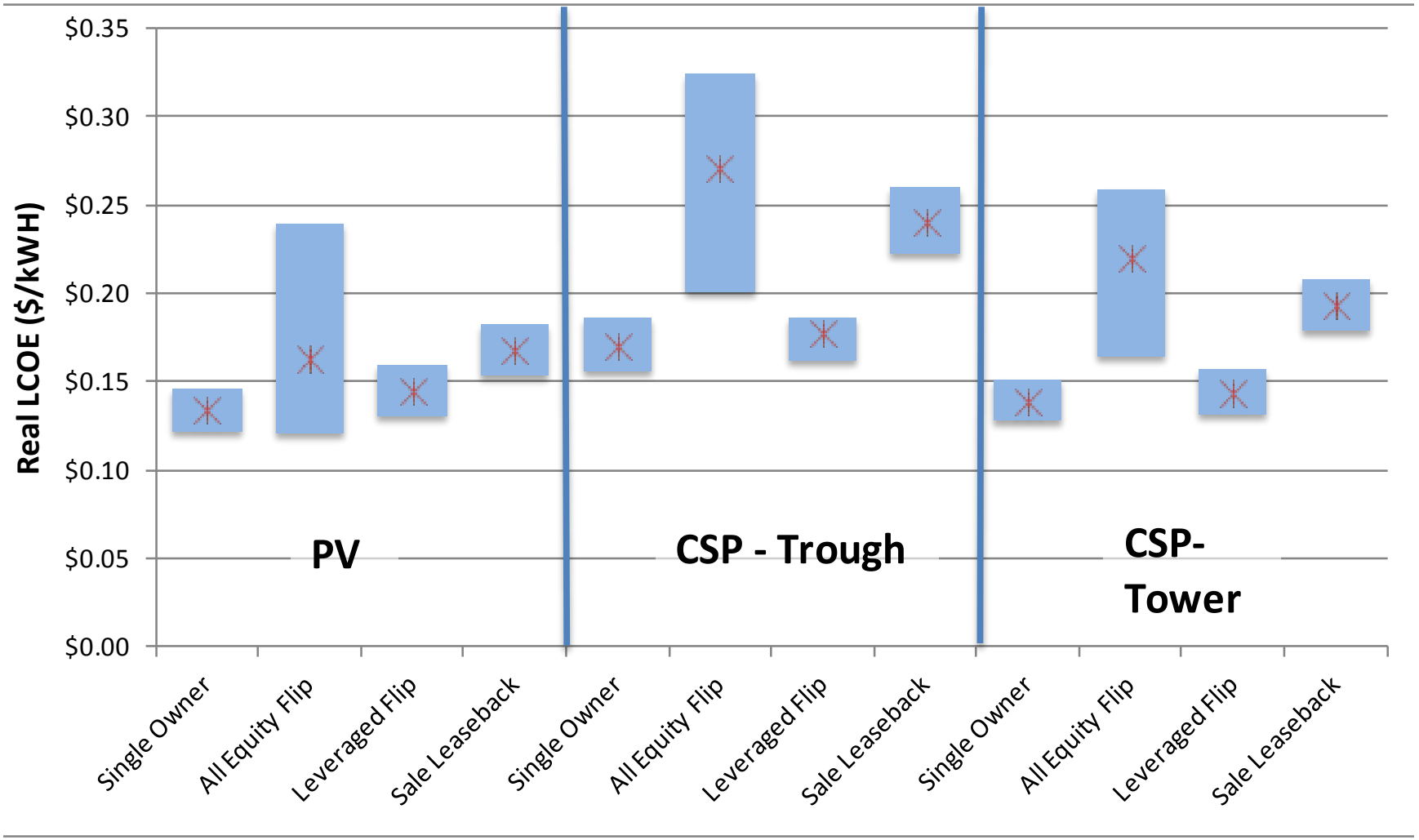
Analysis Non-Financial Inputs

	CSP Trough	CSP Tower	PV
Project Size (MW)	100	100	20
Installed Cost ($/watt)*	$7.50	$6.05	$4.30
Capacity Factor	41%	42%	26%
Generation – annual (GWh)	359	368	46
Fixed O&M	$70/kW-yr	$70/kW-yr	$10/kW-yr
Variable O&M	$3/kWh	$3/kWh	-

Analysis Financial Inputs – PV

Financing Variable	All-Equity Partnership Flip	Leveraged Partnership Flip	Sale Leaseback	Single Owner
(Tax equity) IRR target year	9	9	20	20
(Tax equity) IRR target	9.0%	11.0%	9.0%	11.0%
Equity closing costs	$300,000	$300,000	$300,000	
Development fee	3%	3%	3%	
Tax investor contribution to equity	60%	98%		
Developer contribution to equity	40%	2%		
Developer operating margin			$20/kW	
Lease payment reserve			6 months	
Debt interest rate (PV)		7.0%		7.0%
Debt term		18 years		18 years
DSCR		1.3		1.3
Debt closing costs		$450,000		$450,000
Debt closing fee		2.75%		2.75%
Insurance (% of installed cost)	0.50%	0.50%	0.50%	0.50%
Analysis period	25 years	25 years	25 years	25 years

Results



Leveraged structures (SO, LPF) benefit from low-cost debt in deal. All equity structures particularly expensive for capital intensive CSP.

DOE Loan Guarantee Scenario

	Single Owner ($/kWh real)	DOE Loan Guarantee ($/kWh real)	Difference ($/kWh real)	% Difference
PV	$0.134	$0.114	-$0.020	-15%
CSP Trough	$0.171	$0.138	-$0.033	-19%
CSP Tower	$0.139	$0.114	-$0.025	-18%

Access to very low cost debt per LG or similar program can reduce cost of energy significantly, ranging from $20 - $33/MWh per analysis inputs. In contrast, cost of loan guarantee program is roughly $8 per MWh (See "Looking Under the Hood: Some Perspective on the Loan Guarantee Program", Mendelsohn (2012)