

STRUCTURED FINANCE & INDUSTRIAL COGENERATION

**FINANCING *ENERGY EFFICIENCY* (EE) &
DISTRIBUTED GENERATION (DG) PORTFOLIOS
with PROJECT FINANCE (PF) & ASSET-BACKED SECURITIES (ABS)**

wbs

Richard O'Rourke

Global Energy MBA 2014

Project & Dissertation

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FINANCING *ENERGY EFFICIENCY (EE)* & *DISTRIBUTED GENERATION (DG)* PORTFOLIOS

Research Question:

- What are the equity returns for an investment in the development of a portfolio (40) of cogeneration assets **Project Financed** by bank debt pre-construction and an **Asset-Backed Security (ABS)** post-construction?

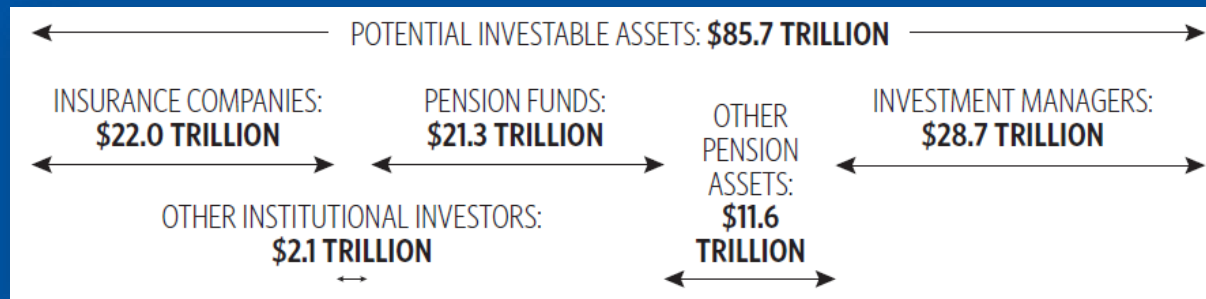
(cf Calpine strategy ~2000, SolarCity's recent ABS issues)

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Motivation:

- International Energy Agency (IEA): to keep average global temperatures below 2°C warming, the internationally agreed target, **infrastructure investment** needs to double from current levels to **\$500bn/yr by 2020** and double again to **\$1trn/yr after 2030**.



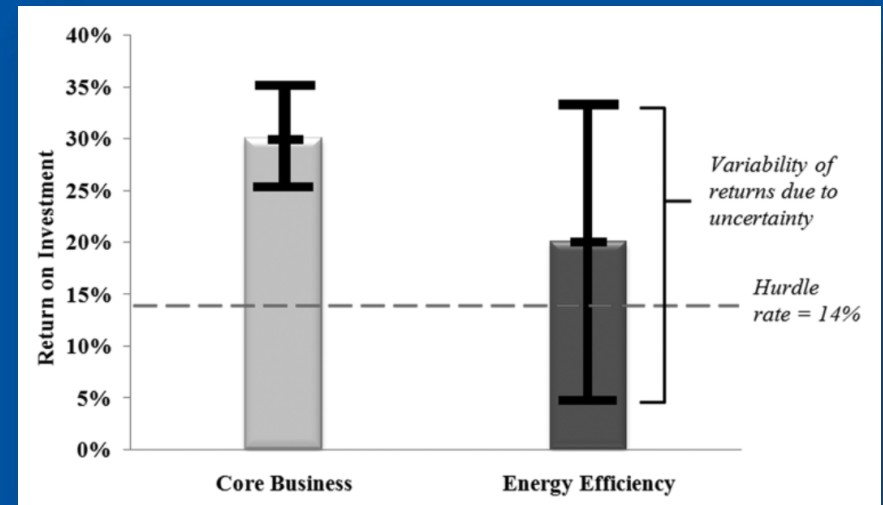
source: CPI

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Rationale:

- To scale the level of investment in EE and DG they require access to lower cost capital
- Aggregating EE/DG investments into portfolios provides the level of scale to attract institutional investors
- The portfolio effect mitigates counter-party credit risk



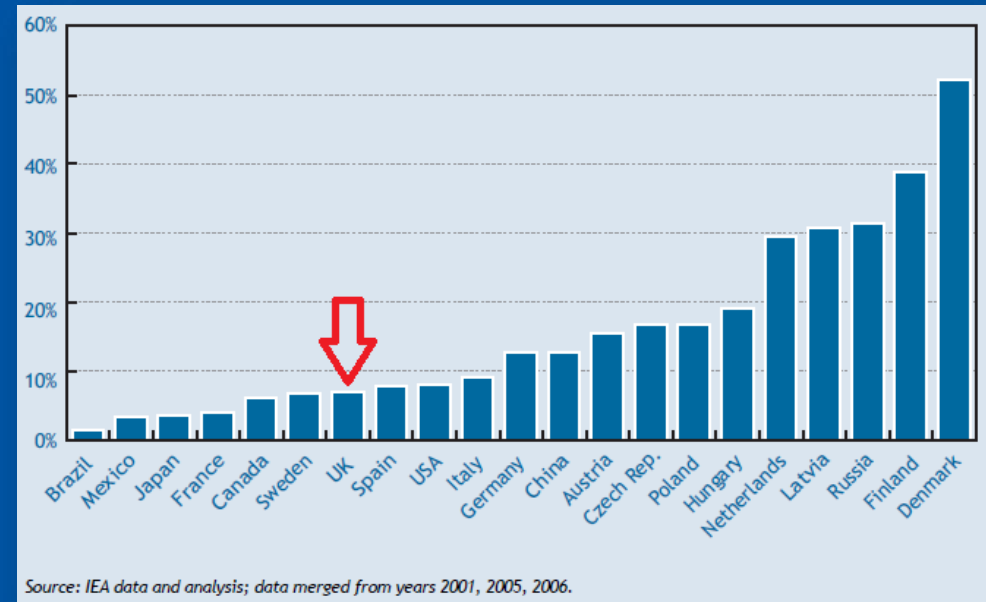
source: OECD

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Rationale:

- The UK remains behind its European counterparts in the deployment of cogeneration
- DECC forecasts an additional 2.8GWe will be installed by **2030** at an estimated cost of over **£1.5bn**

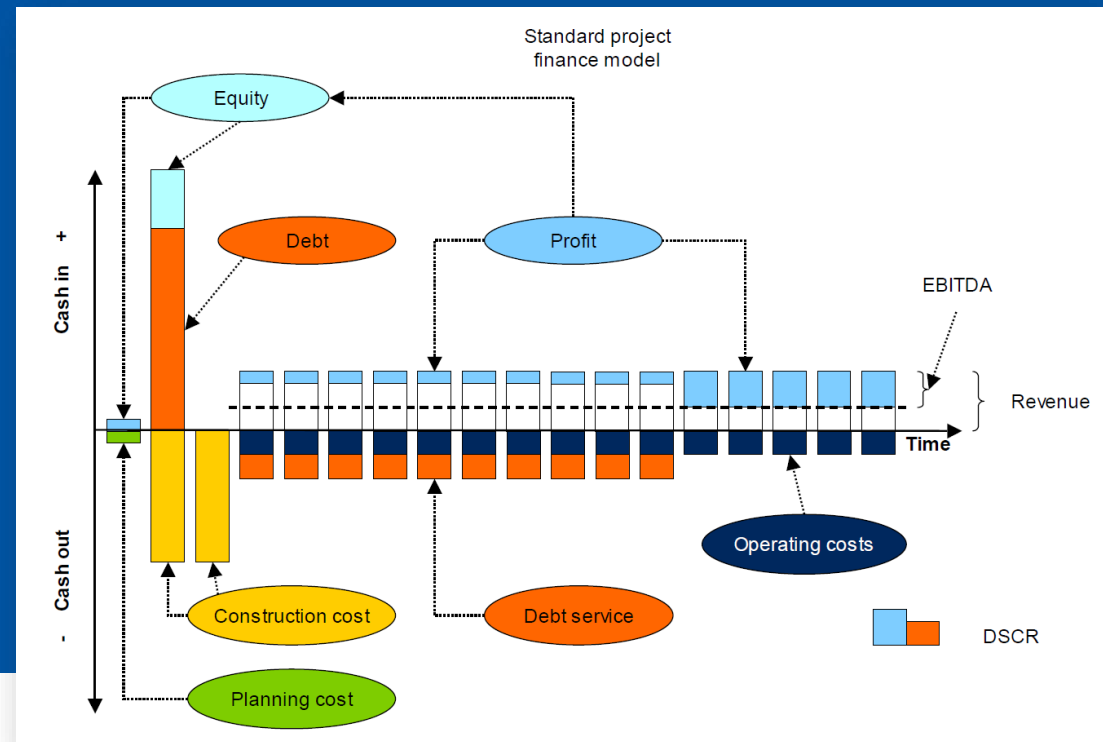


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Approach:

- Discounted Cash Flow (DCF) Model
- An arbitrarily set number of project finance (PF) deals were modelled (40) using a standard PF approach

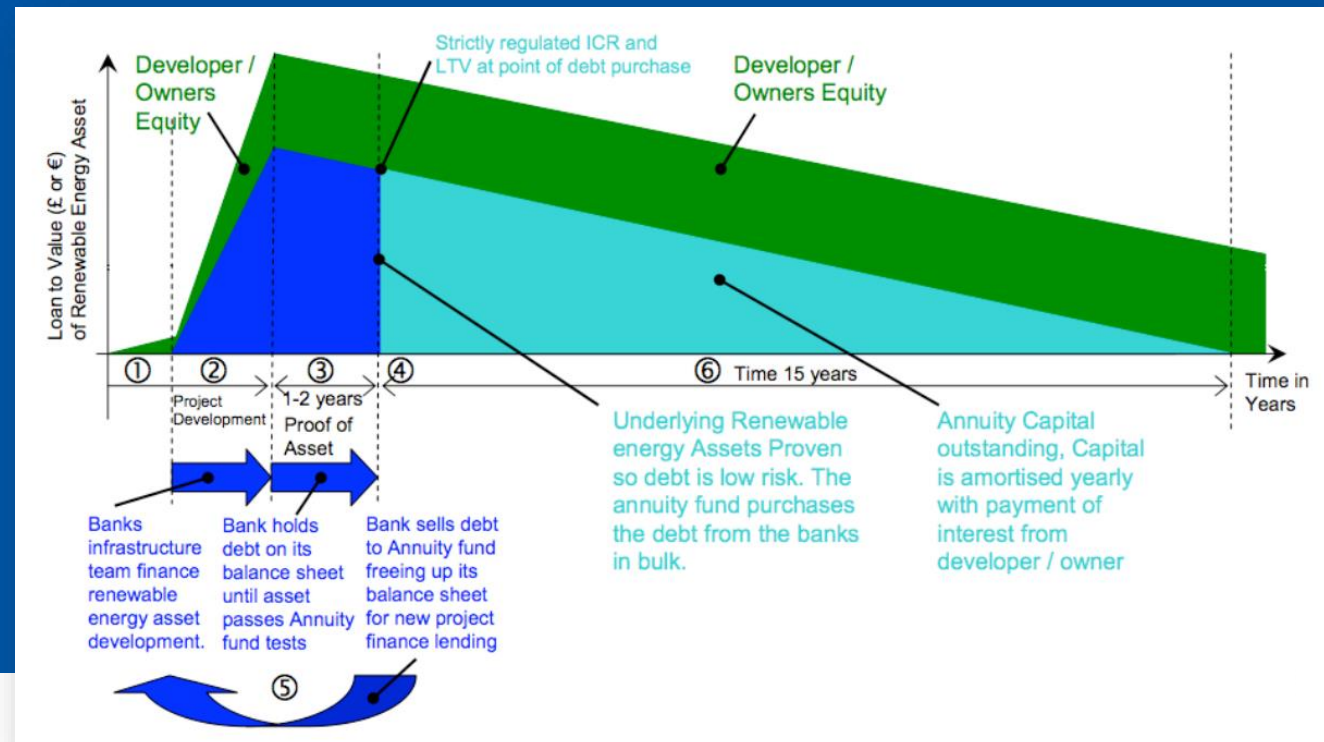


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Approach:

- Discounted Cash Flow (DCF) Model
- The model assumes the bank debt is refinanced by the issue of an Asset-Backed Security (ABS) once construction is complete for the entire portfolio



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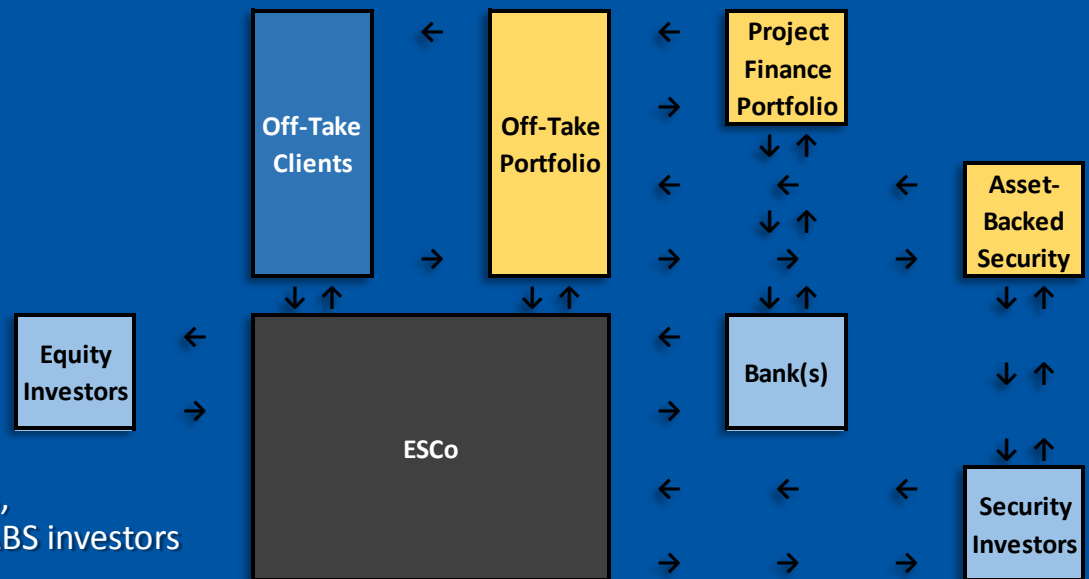
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Approach:

- Discounted Cash Flow (DCF) Model

- The core modules of the model are

- 'Off-Take Portfolio' – defines the client and engine parameters of the portfolio and associated cash flows
- 'Project Finance Portfolio' – defines the parameters of the bank debt and associated cash flows
- 'Asset-Backed Security' – defines the parameters of the ABS and associated cash flows
- Stakeholders includes the ESCo, its clients, the equity investors, the banks, and the ABS investors

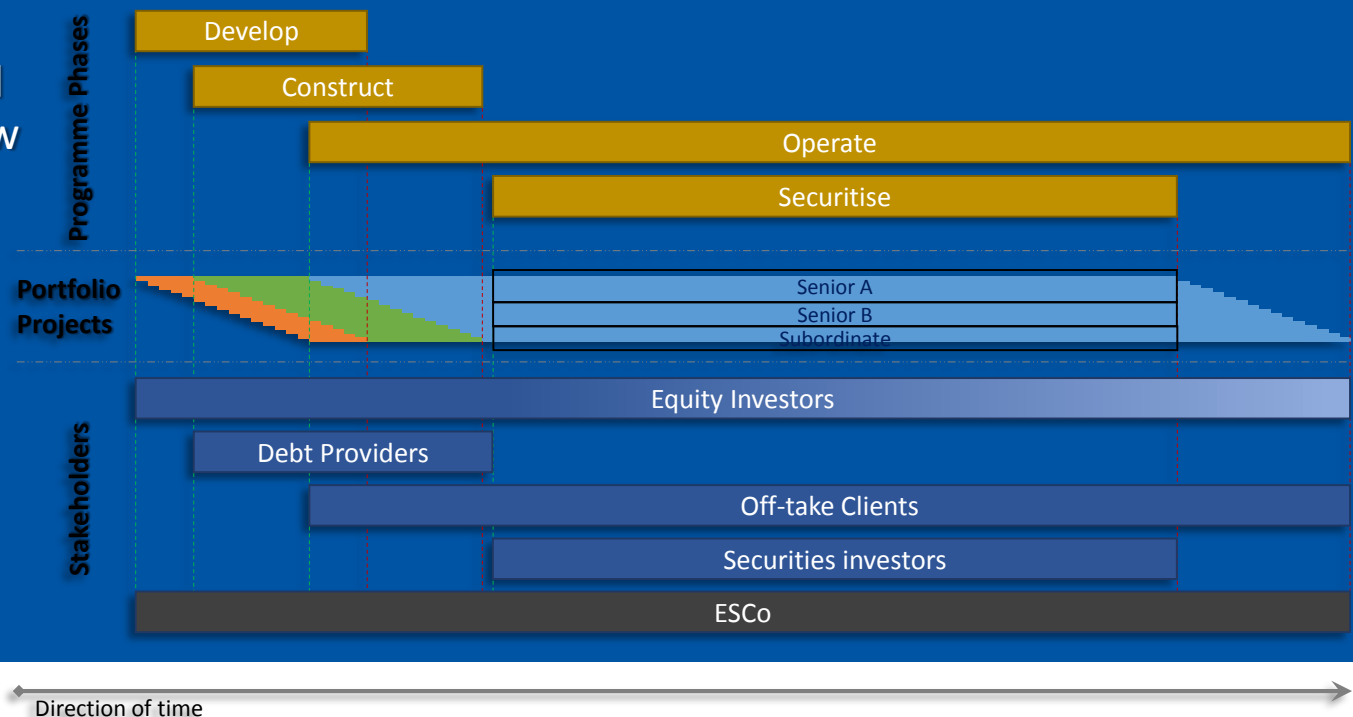


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Approach:

- Discounted Cash Flow (DCF) Model
- A temporal view of the programme phases and stakeholders shows how they overlap and/or change over time

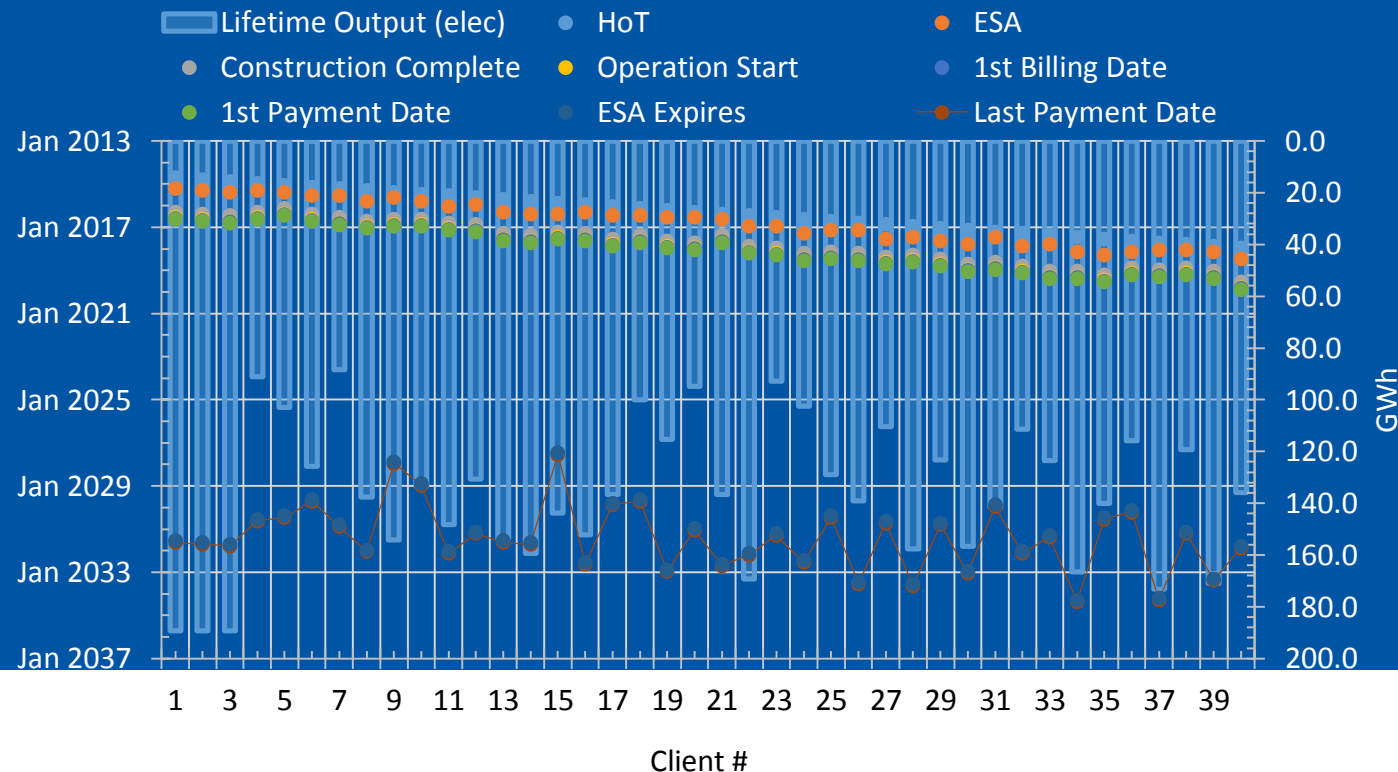


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Approach:

- Cogeneration Portfolio
- Many parameters of the portfolio were selected randomly to reflect 'real' business development activity



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Approach:

- Asset-Backed Security (ABS) Model
- A sophisticated ABS model was constructed to accurately reflect its typical operation

[illegible]

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Assumptions:

- A set of assumptions were selected to compare equity returns
- Cost of Capital (Low / High Scenarios)
 - Pre-construction Bank Debt (70%) : 7% / 9% + LIBOR (1%) [DSCR: 1.2/1.4]
 - Post-construction Bank Debt : 5% / 7% + LIBOR (1%)
ABS (Senior: 80%): 2% / 4% + IL GILTS (0%)
ABS (Sub: 20%) : 4% / 6% + IL GILTS (0%)
- Business Development (Low / High Scenarios)
 - 'Less' aggressive 40 engines/40 months
 - 'More' aggressive 40 engines/24 months

engine size ranged from 1.5 to 2.4 MWe

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Results:

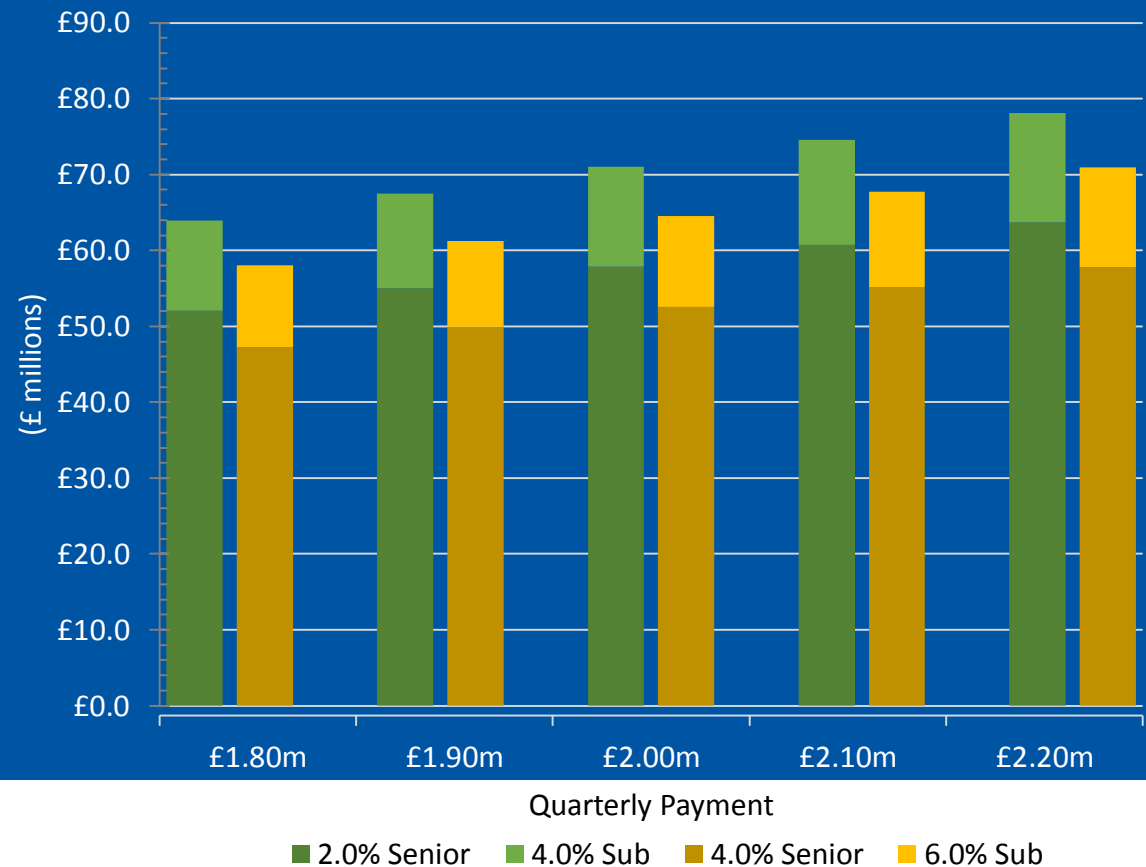
IRR (pre-tax)		Business Development	
		<i>Less Aggressive</i> 40 projects, 40 months	<i>More Aggressive</i> 40 projects < 24 months
Cost of Capital	Lower Cost Capital PF: Pre-C 8% Post 6% DSCR 1.2 ABS: Snr 2% Sub 4%	Scenario 1 IRR: 26.3% (Equity: £19.1m)	Scenario 2 IRR: 29.7% (Equity: £20.1m)
	Higher Cost Capital PF: Pre-C 10% Post 8% DSCR 1.4 ABS: Snr 4% Sub 6%	Scenario 3 IRR: 23.7% (Equity: £17.3)	Scenario 4 IRR: 25.1% (Equity: £19.2m)

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Results:

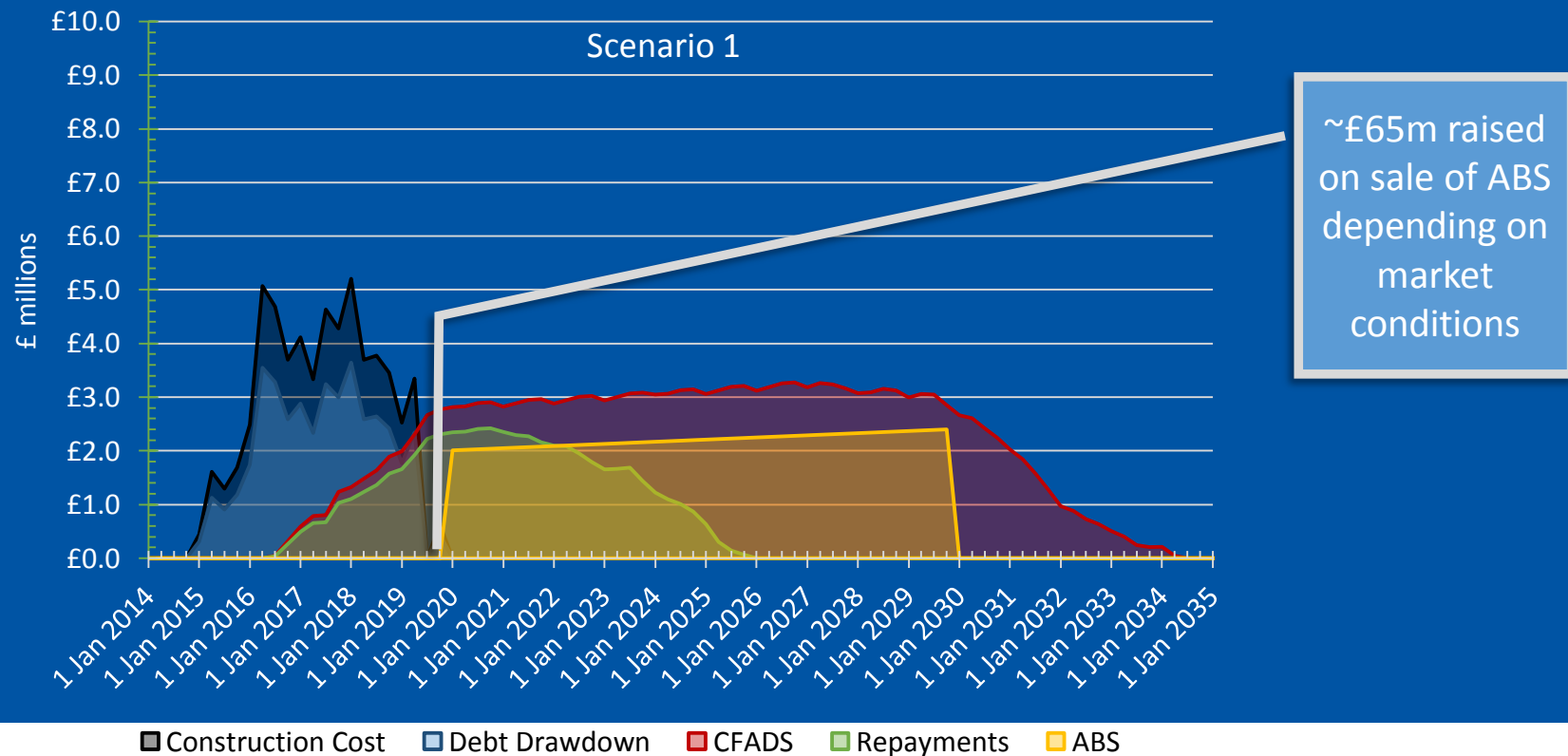
- Present Value (PV) of ABS Notes based on different levels of quarterly contribution (excluding inflation adjustment)
- Effectively it's the value of the mortgage that can be borrowed for the interest rate on the note based on different levels of fixed quarterly payments
- The model uses £2.0m for the scenarios explored



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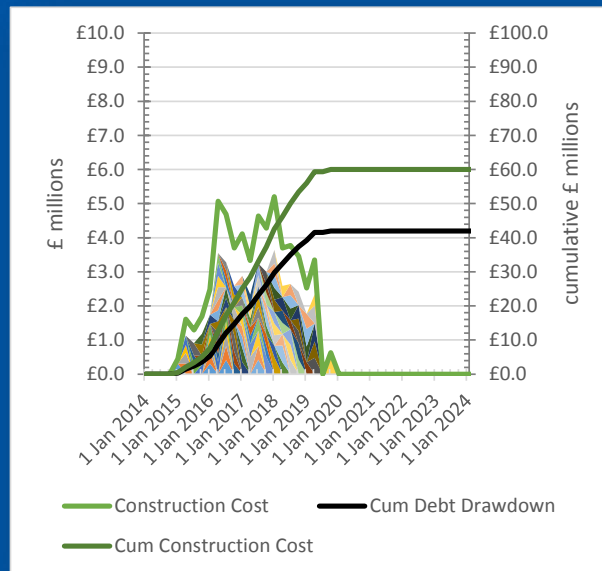


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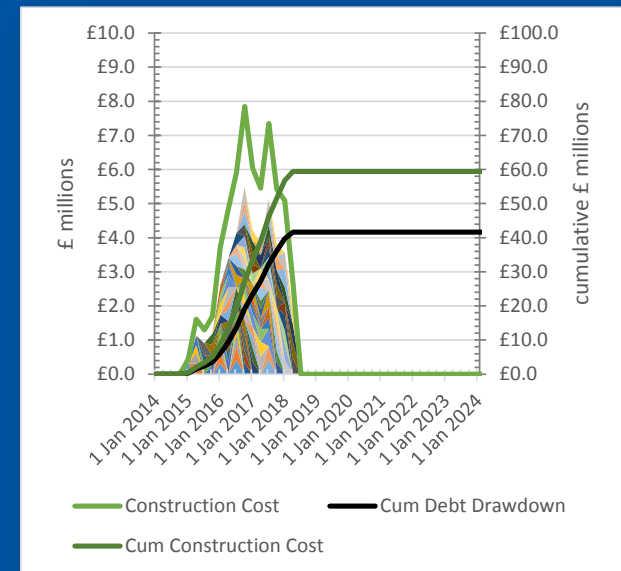
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Results:

- Business Development Risk
 - 'Less' Aggressive Scenario



'More' Aggressive Scenario

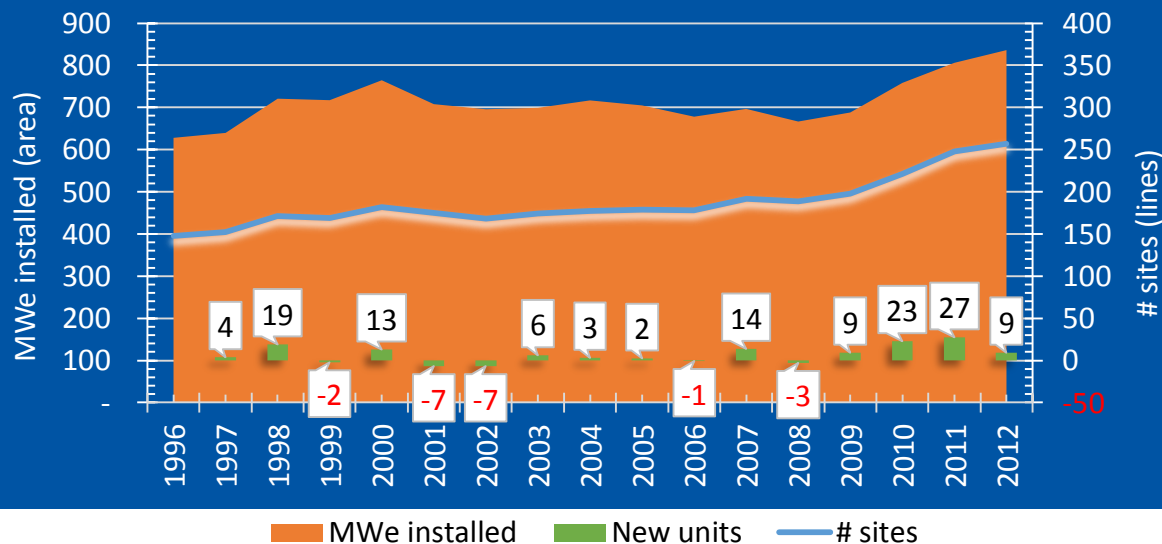


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Results:

- Business Development Risk
 - Both scenarios very aggressive in light of market data
 - Although, projects below funded at much higher cost of capital



UK CHP installations in the 1 to 9.9 MWe range, source: DUKES 7.1

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Results:

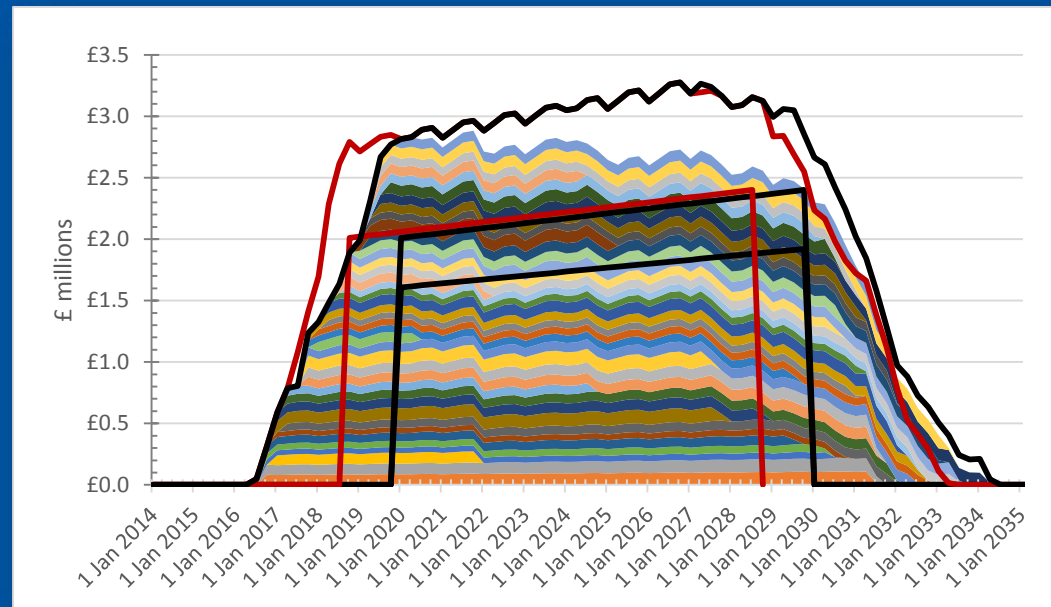
- Default Risk
 - Returns above assume perfect portfolio performance
 - How badly are equity returns affected by client defaults?
 - Further work required to develop appropriate default models
 - Simple model defaults 15% of clients randomly mid-way through contract
 - Equity returns **reduce by <10%** (IRR remains >15%)

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Results:

- Default Risk



CFADS under a 15% default scenario

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Results:

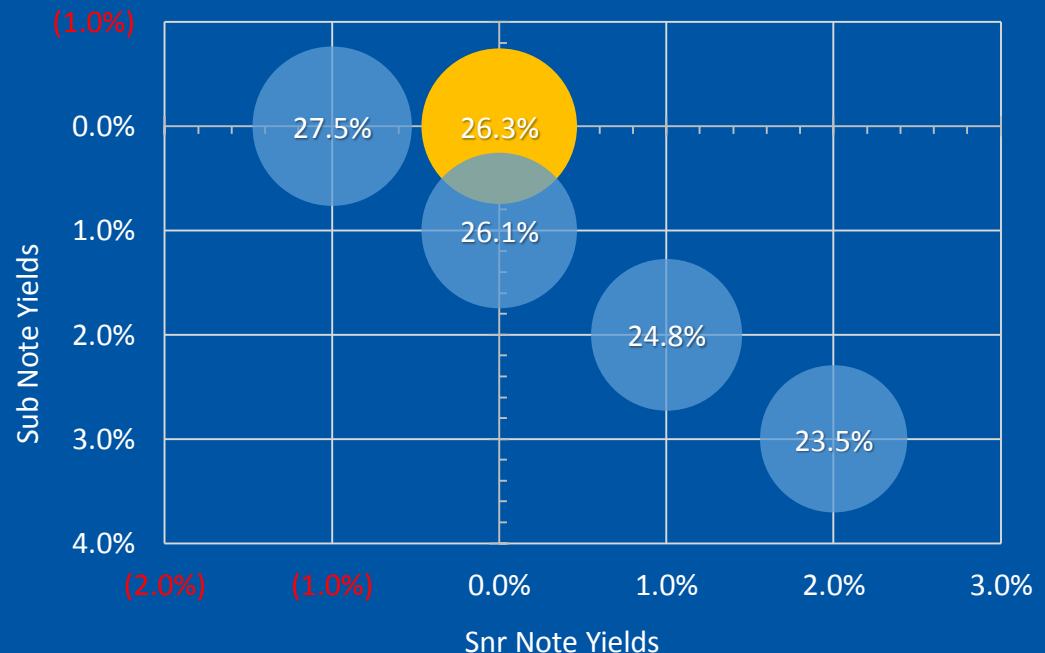
- Refinancing Risk
 - In order to manage **construction risk**, the ABS is not issued until all the assets in the portfolio are operational
 - However, this creates a refinancing risk for the pre-construction funders
 - This risk will be born primarily by the equity investors
 - How sensitive are equity returns to the ABS issue price?
 - UK Govt Index-Linked Gilts currently trade at negative yields

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Results:

- Refinancing Risk
- The greater the yield demanded by the ABS investors, the lower the equity returns



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Conclusion:

- Equity Returns are attractive for scenarios modelled
 - >15% IRR
- The scale of investment is likely attractive to institutional investors
 - >£30m (\$50m)
- However:
 - Business Development risk is very high in current market
 - Appropriate Default Model needs to be developed
 - a simple default model of 15% of clients **reduces** equity returns by <10%
 - Refinancing Risk appears modest
 - given favourable current market pricing for Index-Linked Bonds
 - however, the default model will have a large bearing on pricing

Richard O'Rourke

Technology & Start-ups (Energy / IT)

- *BSc Industrial Chemistry (1996)*
- General Semiconductor R&D
 - Taipei: Power electronics
- EPFL: Swiss Polytechnic University
 - Lausanne: Fuel cells (batteries)
- KineMatik
 - Ireland/US: R&D management software
- ExerGen Biosciences
 - New York: Next-gen search software
- REDT
 - Dublin/London: Battery technology

Energy & Green Infrastructure Finance

- *UCC: MEngSc Sustainable Energy (2007)*
- *LSE: MSc Environmental Policy (2008)*
- EnerNOC
 - London: Smart Grid
- MITIE Asset Management
 - London: Energy Project Development (ESCo)
- *Warwick Global Energy MBA (2014)*
- Kinetik NRG
 - Dublin/London/NY: Strategy & Fundraising, Product Management & Business Development

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