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Project Finance Modeling

Size, Sculpt and Stress a Renewable Energy Project

Course Book

Eight modules, one solar project, every figure computed.

Educational material. Not investment advice. Prepared with AI assistance.

MODULE 4

Sizing the debt: CFADS, target cover and sculpting

Objectives

- Compute CFADS and the debt service it can carry at a target DSCR.
- Size a sculpted loan as the present value of that debt service.
- Combine a P50 and a downside sizing case, and a gearing limit.
- Include the tax saved on interest without a circular reference.

Cash flow available for debt service (CFADS) is what the plant produces after operating costs, tax and maintenance, before any payment to lenders. The debt service cover ratio (DSCR) of a year is CFADS divided by that year's interest and principal. Lenders do not size on leverage multiples here: they size on DSCR, year by year.

Sculpting sets each year's debt service exactly at CFADS / target DSCR. If CFADS is $17.5m and the target is 1.35x, the plant can carry $13.0m of debt service that year. The loan is then the present value of all those debt services at the loan's interest rate. A level (annuity) loan, by contrast, pays the same amount every year, so it is limited by the weakest year.

Two cases and two targets

The case uses targets that depend on the period and on the energy case: 1.35x on P50 and 1.20x on one-year P90 while the PPA runs, 1.70x and 1.55x in the merchant years, which carry price risk as well as volume risk. Each year's debt service is the lower of the two: whichever case is tighter binds.

Years	Binding case	Why
1 to 15	P50	With a 75% EBITDA margin, P90 CFADS / 1.20x stays above P50 CFADS / 1.35x
16 to 18	P90	The two targets are closer (1.70x / 1.55x against 1.35x / 1.20x) and merchant margins are thinner

The tax shield, solved backwards

CFADS is after tax, tax depends on interest, interest depends on the balance, and the balance depends on the debt service. Most models loop. There is a closed form if you solve from the last year backwards: in each year, the opening balance B satisfies

B opening = (B closing + (X - tax rate x TB) / D) / (1 + r - tax rate x r / D)

where X is CFADS before tax, TB is taxable income before interest, r the interest rate and D the target. If that would make taxable income negative, there is no tax and B opening = (B closing + X / D) / (1 + r). The balance at the end of the tenor is zero; each year then gives the opening balance of the year from its closing balance, back to COD. The balance at COD is the debt the cover allows.

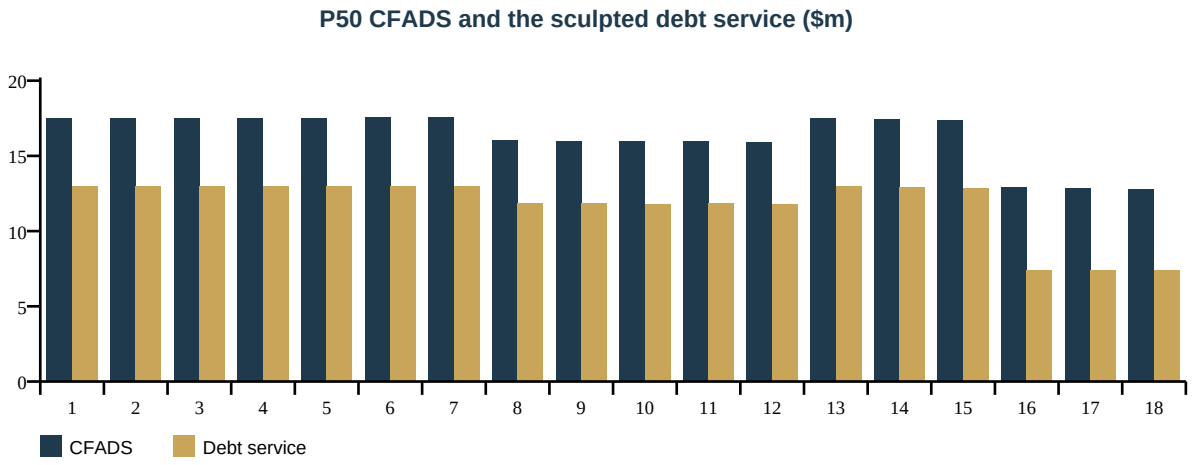
Gearing, the second constraint

The facility is the lower of the cover capacity ($132.0m) and the gearing limit (80% x $182.2m = $145.8m). Cover binds here. Had gearing bound, the whole sculpted schedule would have been scaled down in proportion, and every DSCR would sit above its target.

What moves the debt

Change	Debt ($m)	Gearing	P50 equity IRR
Running case	132.0	72.5%	9.12%
P50 target 1.30x instead of 1.35x	134.6	73.7%	9.19%
P50 sizing only (no downside case)	132.3	72.6%	9.14%
Base rate one point higher	124.3	68.4%	7.94%
PPA for the full 25 years	139.1	76.2%	11.10%

A level loan cannot pay more in any year than the smallest sculpted payment, $7.4m (in the merchant years); over 18 years that supports only about $80.5m. Sculpting is what lets a project with a merchant tail borrow $132.0m.



Worked example, step by step

1. Year 1 P50: CFADS before tax X = $18.046m; taxable income before interest TB = $9.665m; rate r = 5.75%; target 1.35x.
2. Balance at the end of year 1 (from the year 2 calculation): $126.645m.
3. P50 opening balance: (126.645 + (18.046 - 25% x 9.665) / 1.35) / (1 + 5.75% - 25% x 5.75% / 1.35) = $132.037m.
4. P90 opening balance with X = $16.043m, TB = $7.662m and target 1.20x: $132.392m. The lower one, $132.037m, is the debt at COD.
5. Year 1 debt service: interest 5.75% x $132.037m = $7.592m + principal $5.392m = $12.984m; CFADS $17.528m; DSCR 1.350x.

Pitfalls

- Sculpting on CFADS before tax and adding tax afterwards: every DSCR then falls below target.
- Sizing on P50 only for a plant with thin merchant margins: the downside case is what protects the lender in those years.
- Comparing a sculpted and a level loan at the same tenor: the level loan is limited by its weakest year.
- Forgetting that the gearing limit uses the total project cost, financing costs included.

Summary

- Sculpted debt service = CFADS / target DSCR each year; the loan is its present value.
- Two cases (P50 and one-year P90) and two periods (PPA and merchant) give four targets; the tighter binds each year.
- The tax shield is included with a backward closed form: no circularity.
- The running case borrows $132.0m on cover, 72.5% of cost, against an 80% limit.

In the Exercise Workbook: tab M4 Sizing: CFADS, sculpted debt service and the opening balance formula.

Practice questions

4.1 What is the debt the cover allows at COD?

A. $80.5m

B. $132.0m

C. $145.8m

D. $178.2m

4.2 How is the sculpted loan amount found?

A. As gearing times cost

B. As the sum of debt service

C. As the present value of the sculpted debt service at the loan's interest rate

D. As EBITDA times a multiple

4.3 When the gearing limit binds, what happens to the sculpted schedule?

A. The tenor is extended

B. It is scaled down in proportion, so every DSCR sits above target

C. Nothing

D. It is re-sculpted at a lower target