Natural Resources and Commodities

Interview preparation summary · RE track

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INT.RN.1.a · Oil and Gas, Mining and Royalties

Assess a producing oil and gas asset from its reserve categories, decline curve, netback and hedges, and explain how PV10 and the price deck decide what a buyer can pay.

Upstream value comes from barrels that will be produced and sold, so start with how certain those barrels are. Proved developed producing reserves, or PDP, come from wells already flowing and need little new capital. Proved undeveloped reserves, or PUD, are still proved, but they need new wells and spending before they produce, so their value depends on capital, drilling results and a price high enough to justify the wells. A well declines steeply at first and then flattens, so the buyer must model volumes year by year and not assume a flat rate. The netback is what is left per barrel of oil equivalent after royalties, operating costs and transport; it is the unit margin, and because most costs are fixed per barrel or per well it moves faster than the price does. PV10 discounts the forecast net cash flows at 10% and is the standard yardstick for comparing reserves, and the price deck behind it decides the answer. Hedges such as swaps fix a price on part of the volume for a period; they protect debt service and the near-term cash flow but give up upside and do not change the economics of the later years. The usual mistake is to pay for PUD value as if it were already producing, or to quote a PV10 without saying which deck produced it.

WORKED EXAMPLE: PV10 OF THE RIDGEBACK BASIN WELLS

An interviewer shows you the Ridgeback Basin wells, an invented set of producing wells. Net production is 100,000 barrels of oil equivalent (boe) in year 1 and declines 25% a year. The realised price is 60 per boe, the landowner royalty is 20% of revenue, operating costs are 15 per boe and transport is 3 per boe. Value the next three years at a 10% discount rate, then say what a 20% fall in the price does. Convention: cash arrives at the end of each year, ignore capex, tax and anything after year 3.

Answer: Netback is 30 per boe and the three-year PV10 is about 5.85m; a 20% price fall cuts netback by 32% and PV10 to about 3.98m.

> **Interview tip:** Say: the netback is 30 a barrel after royalty, operating cost and transport, so three years are worth about 5.85m at 10%. Costs do not move with price, so a 20% price fall takes about 32% off the value.

INT.RN.1.b · Oil and Gas, Mining and Royalties

Assess a mining asset on reserves against resources, grade, strip ratio and its place on the cost curve, and compare offtake, streaming and royalty or mineral interests as ways to own the same ore body.

A mineral resource is mineralisation with reasonable prospects of eventual extraction; a reserve is the part of the measured and indicated resource that a study shows can be mined at a profit once mining, processing, cost, price, legal and permitting factors are applied. Only reserves should support a valuation, and inferred resources are upside, not value. Grade is the amount of metal in each tonne of ore and recovery is the share that the plant captures, so metal produced is ore tonnes x grade x recovery. A small fall in grade raises the cost per unit of metal by more than it looks, because the same tonnes are moved and processed for less metal. In an open pit the strip ratio is the tonnes of waste moved for each tonne of ore, and it usually rises as the pit deepens, which pushes up the cost of each tonne of ore. The cost curve ranks mines by cost per unit of output: a mine in the low-cost quartile earns a margin when higher-cost mines lose money and cut output, so it survives a downturn. An offtake agreement commits the output to a buyer, sometimes with a price floor. A stream buys a share of future metal at a fixed low price for an upfront payment, and a royalty pays a percentage of revenue, in an NSR, or of profit, in a net profits interest. Streams and royalties carry little operating cost exposure, which is why they are less volatile than the mine's equity, but they are exposed to price and to production.

WORKED EXAMPLE: STONEFALL COPPER: GRADE, STRIP AND ROYALTY

An interviewer shows you Stonefall, an invented open-pit copper mine. It mines 1.0m tonnes of ore a year at 0.5% copper with 85% recovery. The strip ratio is 3 tonnes of waste per tonne of ore. Moving a tonne costs 4, processing costs 12 per tonne of ore and overheads are 2.0m a year. Copper sells for 9,000 a tonne. Work out the cost per tonne of copper, then what happens if the grade falls to 0.4%, and what a 2% NSR royalty holder receives in that case.

Answer: Cost is about 7,059 per tonne of copper; at 0.4% grade it is about 8,824, up 25%, and the 2% NSR still pays 0.612m while the operator breaks even.

Interview tip: Say: at 0.5% grade the cash cost is about 7,059 a tonne. Cutting grade by a fifth raises it by a quarter to 8,824, which wipes out the margin, but a 2% NSR royalty is paid on revenue and still receives 0.612m.

INT.RN.1.c · Oil and Gas, Mining and Royalties

Underwrite a commodity asset with a price deck, breakeven, capital intensity and depletion, test it against the price cycle and hedging, and judge how far energy-transition demand should lift the deck.

Commodity assets are underwritten on a price deck, a set of price assumptions by year, because the sponsor does not control the price. A deck close to the forward curve is easier to defend than one set at the recent peak. The first output is NAV10 or PV10, the present value of net cash flows at 10%, which should be shown at the base deck and at lower decks. The second is breakeven: the price at which the asset covers its operating costs, and the price at which the PV10 equals what the fund paid. Capital intensity, the capital spent for each unit of annual output, shows how much money is at risk before a unit is sold, and a high figure means a longer payback and more exposure to a downturn. Depletion is the accounting charge that spreads the cost of reserves over the units produced; it is not a cash cost but it reduces taxable and reported profit, and the fund must remember that the asset is a wasting one whose reserves need replacing. Commodity prices move in cycles because high prices attract new supply that arrives years later, while low prices cut investment and set up the next shortage. Hedges can protect a fixed period. Energy-transition metals such as lithium, copper and nickel have strong demand stories, but new supply responds too, so an investor should test a conservative deck and the asset's position on the cost curve before paying for the demand story. A common mistake is to underwrite at the spot price.

WORKED EXAMPLE: BREAKEVEN DECK FOR THE HARROW GAS ASSETS

An interviewer shows you the Harrow Gas assets, an invented producing package. The seller asks 40.0m. At the base price deck of 65 per boe the PV10 is 52.0m, and at a deck 20% lower (52 per boe) it is 34.0m. The reserves are 10m boe and the assets will produce 1.0m boe in the first year. The fund plans 20.0m of debt. Work out the margin of safety, the deck at which the PV10 equals the price, the depletion charge and the debt against PV10. Convention: PV10 moves in a straight line with the deck, ignore tax.

Answer: Margin of safety is 30%, the PV10 equals the price at a deck about 13.3% lower (56.3 per boe), depletion is 4.00 per boe, and debt rises from 38.5% to 58.8% of PV10 in the stress.

Interview tip: Say: the PV10 is 52 against a price of 40, but the deck only has to fall 13% before I have paid full value, and the debt goes from 38% to 59% of PV10 in that stress, so I would price off the lower deck.

INT.RN.2.a · Land, Timber, Water and Risk

Assess farmland on yield, soil, water and rent, choose between leasing and operating, and explain how land values follow income, interest rates and the cap rate.

Farmland is a real asset whose income comes from crops, either as rent from a farmer or as the operating margin if the owner farms. Productivity depends on soil quality, climate and above all water, so irrigated or reliably watered land commands a premium to dryland and a secure water source is part of the asset. A lease passes crop price and yield risk to the farmer and gives the owner a steady rent, usually after the owner pays property tax and some upkeep. Operating the land lets the owner keep the margin from good years but exposes it to yields, prices, input costs and the need for farm management skill. The owner should compare the extra expected margin from operating with the extra volatility, and many institutions lease or share the crop result. Land values are the net rent divided by the cap rate, so they rise when rents or crop prices rise and when interest rates fall, and fall when rates rise. A rise in crop prices tends to lift land values before it lifts rents, because buyers capitalise expected income and rents reset slowly. The usual mistake is to quote the gross rent as the yield, to ignore owner costs, or to forget that a half point on the cap rate is a large move in value when the yield is only a few percent.

WORKED EXAMPLE: NET RENT AND CAP RATE FOR TALLIS FARMS

An interviewer shows you Tallis Farms, an invented 1,000-acre farm priced at 10,000 per acre. The cash rent is 350 per acre and the owner pays 40 per acre of tax and upkeep. A tenant could instead be replaced by the owner farming: yield 180 bushels an acre at 5.00 a bushel, non-land costs 520 an acre, with the same 40 of owner costs. Work out the net rent yield, the operating margin against the rent, what a 15% yield fall does, and the value if the cap rate moves from 3.1% to 3.6% with the rent unchanged.

Answer: Net rent yield is 3.1%; operating earns 340 against 310 for the lease, but falls to 205 after a 15% yield fall; a cap rate of 3.6% takes the value to about 8,611 an acre, down 13.9%.

> **Interview tip:** Say: net of the owner's costs the rent yields 3.1%. Operating earns about 30 an acre more in a normal year but 105 less after a 15% yield fall, and a half point on the cap rate takes 14% off the value, so I would lease.

INT.RN.2.b · Land, Timber, Water and Risk

Assess timberland and water assets on the harvest cycle, growth, income and appreciation returns, carbon credits and the legal right to the water, and explain how each is valued and what can go wrong.

Timberland earns income from harvests and appreciation from tree growth, land value and price changes; the NCREIF timberland index reports an income return and an appreciation return, with the harvest counted as income and values based on appraisals, so they are smoothed. The trees keep growing, about a few per cent a year in volume, so an owner can defer harvest when stumpage prices are weak and be paid for waiting; this flexibility is the main difference from most other assets. The rotation, the years from planting to harvest, differs by species and region. Carbon projects, such as deferred harvest or improved forest management, earn credits for storing more carbon than a baseline, but they usually commit the land for decades, cut harvest income and carry risks of fire, pests and reversal. Water assets are usually rights to a volume of water, or the infrastructure that moves it. Their value depends on the legal priority of the right, whether it can be moved or leased to another user, regulator approval for any change, and the reliability of the supply in a drought. Income is often per unit delivered, so it falls when allocations are cut. A common mistake is to price a water right as if it were a commodity without testing its legal standing.

WORKED EXAMPLE: FERNBROOK FOREST: RETURNS, WEAK PRICES AND CARBON

An interviewer shows you Fernbrook Forest, an invented 10,000-acre timberland valued at 20.0m. Harvest revenue is 1.05m a year (30,000 tonnes at 35) and costs and taxes are 0.15m. Standing volume grows 4% a year. The value at the end of the year is 20.7m with no capital spent. Work out the income, appreciation and total return, the effect of a 20% fall in the stumpage price, the gain from deferring the harvest one year, and the carbon income from 12,000 net credits at 15 with 0.04m of verification cost.

Answer: Income return is 4.5%, appreciation 3.5% and total return 8.0%; a 20% stumpage fall cuts net income to 0.69m, deferring a year adds about 4% volume, and carbon adds about 0.14m (0.7%).

> **Interview tip:** Say: income is 4.5% and appreciation 3.5%, so 8.0% in total. If stumpage falls 20% I can defer, because the trees add about 4% in volume a year, and carbon adds under one point but would tie up the land.

INT.RN.2.c · Land, Timber, Water and Risk

Weigh the permitting, environmental and jurisdictional risks of a natural resources asset, price them into the underwriting, and plan the exit routes and buyers.

Natural resources assets are tied to a place and to a licence, so the legal and political setting can change value as much as the price does. Permits decide whether an asset can be built and operated at all, so the timetable and the conditions must be underwritten: a delay pushes every cash flow later and adds carrying cost, and conditions add capital. Environmental liabilities such as site reclamation, tailings, water use and emissions must be modelled as cash costs at the right date, with any bonding or guarantee the regulator requires. Social licence matters too, because community opposition or a lack of consultation can stop a project even when it has a permit. Jurisdictional risk includes changes to royalties and taxes, export restrictions, currency controls, contract renegotiation and, in the extreme, expropriation. The investor should describe each as a scenario with a size and a probability, add structure such as stabilisation clauses, political risk insurance, local partners, offshore holding and hard currency sales, and ask whether the extra return pays for the expected loss. Exit is the last test: buyers for a producing asset are strategic operators, other funds, infrastructure and pension investors, royalty and streaming companies or a public listing. Buyers price the remaining permit life, the reserve life and the carbon and ESG record, so exit should be planned at entry.

WORKED EXAMPLE: VELDT RIDGE: PERMIT DELAY AND A ROYALTY RISE

An interviewer shows you Veldt Ridge, an invented mine in a developing country. It is expected to generate 12.0m a year of cash flow for eight years, after a royalty of 3% on revenue of 50.0m. You are asked what you can pay. Discount at 10%. Then the government proposes to raise the royalty to 5% of revenue and the permit is delayed 18 months, so all the cash flows move back 18 months. Work out the value now, the value after the royalty rise, after the delay, and after both, against a 60.0m price.

Answer: Value is about 64.0m; 58.7m after the royalty rise, 55.5m after the delay and 50.9m after both, which is about 9.1m under a 60.0m price.

> **Interview tip:** Say: base value is about 64m against 60m, but a royalty rise takes 8% off, an 18-month delay takes 13%, and both take 20%, so at 60m I need a stabilisation clause or a lower price.

Summary of the Charta interview-preparation topic. Companies and figures in the examples are invented. Draft content, not yet expert reviewed.