Investment Report

Ormat Technologies (NYSE:ORA)

LSIF November 2017 Call
Faculty Advisor: Dr. William McNally
Portfolio Manager: Seth Rubin
Analyst: Kelvin Wong

Recommendation: BUY
Target Price: $76.00
Margin of Safety: 22%

Table of Contents

1. Introduction

Ormat Technologies (NYSE:ORA) is a leading geothermal company with operations in the US and worldwide. The company operates two main businesses:

1) **Electricity Segment** – Through this business, Ormat owns and operates ~777MW in capacity of geothermal and recovered energy generation (REG) power plants.
2) **Product Segment** – Through this business, Ormat engages in the design and manufacturing of geothermal and REG equipment as well as the provision of related project development services.

Ormat reports results segmented along these two business lines. This report likewise forecasts revenues for the company's two businesses individually. Electricity revenues are projected based on per-annum growth in generating capacity (measured in megawatts). Product revenues are projected based on an annual growth rate in line with industry forecasts and the company's historical average.

I am initiating coverage of Ormat Technologies with a **BUY** recommendation at a target price of $76.00. With share prices hovering around $62.00, this opportunity implies an upside of approximately 22%.

1.1. Investment Thesis

Strong project pipeline underpins growth of recurring Electricity revenues

Ormat's current project pipeline will add 200MW in generating capacity by 2022 and enable a ~9% CAGR in Electricity revenues over the forecast period. Moreover, there are significant opportunities for upside as the company expands its development activities internationally.

Global transition towards renewables drive growth in Product business

Geothermal is a *base-load* energy source that enjoys significant differentiation and cost advantages over other renewables such as solar and wind. As the world accelerates its transition towards renewable energy, the geothermal industry–and Ormat in particular–is poised to experience significant growth.

Margin expansion in Electricity segment support overall profitability

Over the past five years, Ormat has expanded gross margins in its Electricity business from 24.60% in 2012 to 40.05% in 2016. I expect this trend to continue into 2022 as advances in geothermal technology enable greater efficiency in both existing and new plants.

1.2. Road Map

In this report, I establish my investment thesis on Ormat Technologies. In Section 2, I discuss each point in my investment thesis in detail. Section 3 will follow with an explanation of my base case forecasts of revenues, margins, and other model assumptions. Then, in Section 4, I present my base case valuation of Ormat found through the DCF method. Furthermore, this section will also look into three alternative scenarios: a no growth case, a bear case, and a bull case. In Section 5, I employ a comparable company analysis to corroborate my assertion that Ormat is currently undervalued. Finally, in Section 6, I summarize my key findings and reiterate my BUY recommendation for Ormat.

2. Thesis Arguments

In this section, I present arguments in support of my investment thesis. First, the company's strong project pipeline will underpin growth of recurring Electricity revenues over the forecast period. Second, a global transition towards renewables will drive growth in the Product segment. Lastly, a trend of margin expansion in the Electricity segment will sustain Ormat's overall profitability. After arguments are presented in support of these points, this section will conclude with a discussion of management compensation and shareholder alignment.

2.1. Strong project pipeline underpins growth of recurring Electricity revenues

Based on the company's known project pipeline, Ormat is expected to add at least 200MW in generating capacity over the next five years. This will enable a ~9% CAGR in recurring Electricity revenues into 2022, with potential for upside as the company's early prospects move forward. In this sub-section, I detail arguments in support for these claims. First, I present an overview of power purchase agreements (PPAs) and how they determine Electricity revenues. Then, I provide a breakdown of Ormat's existing power plants to establish a floor on Electricity revenues. Finally, I discuss the company's project pipeline to determine generating capacity growth in the next five years. Together, these discussions will inform my projections for Electricity revenues over the forecast period.

2.1.1. Power Purchase Agreements

Revenues in the Electricity segment originate from the sale of electricity to utilities pursuant to long-term power purchase agreements (PPAs). These PPAs govern the commercial relationship between Ormat and its customers, and largely determine the revenue generation capabilities of the company's power plants. For some (mostly recent) PPAs, management explicitly discloses pertinent terms of the agreement either via a press release or by attaching the contract as an exhibit to the relevant year's annual report. In this document, I refer to such PPAs as *explicitly broken out*. However, for other PPAs, no information is disclosed beyond the identity of the power purchaser and the length of the contract; such PPAs are *not broken out*. I model each of the two cases as follows.

Explicitly Broken Out PPAs

Under explicitly broken out PPAs, power purchasers are charged an energy payment determined by the contracted energy rate (measured in dollars per megawatt-hour) and the amount of electricity supplied (measured in megawatt-hours). Put succinctly, energy payments are calculated as follows.

$$\text{Energy Payment} = \text{Energy Rate} \times \text{Amount of Electricity Supplied}$$

For the most part, the energy rate is fixed and may be subject to an annual escalation rate to counter the erosive effects of inflation on pricing. This is the ideal scenario as my model can reliably project energy rates over the forecast period by simply taking the contracted price and growing it by an annual escalation rate (if any). However, under some older PPAs, the energy rate is variable. In this case, the price is determined annually based on the power purchaser's avoided energy costs and will therefore fluctuate with

energy commodity prices. These variable rate PPAs yield unpredictable revenue streams and cloud visibility into this segment's future revenue. Fortunately, variable rate PPAs make up only ~15% of Electricity revenues and management has committed to further reducing this figure. Furthermore, the company has entered several derivative contracts to hedge variable energy rates. Therefore, rather than attempting to forecast the movement of energy commodity prices, my model assumes a fixed energy rate based on the company's latest average price per megawatt-hour. For Q2 2017, the average price per megawatt-hour is $83.90.

Furthermore, although the amount of electricity supplied will vary from year to year, this figure can be reliably estimated by multiplying the power plant's generating capacity by the number of hours in a year and subsequently adjusting this figure for the power plant's average capacity factor (a ratio of average output over potential output). Ormat discloses average capacity factors for each region in which its power plants are located. My model will use exactly these figures (see Figures 1 and 2).

A minority of PPAs also provide for a capacity payment, which is based on the amount of generating capacity available to the power purchaser regardless of how much electricity is actually supplied. In general, capacity payments are calculated as follows.

$$\text{Capacity Payment} = \text{Capacity Rate} \times \text{Contracted Generating Capacity}$$

The capacity rate is typically specified as a fixed annual fee per megawatt and, again, may be subject to an annual escalation rate. Where information is available, my model includes a capacity payment. Otherwise, I assume none exists.

Not Broken Out PPAs

For not broken out PPAs, insufficient information is publically available. Consequently, I make the simplifying assumption that such contracts may be modeled as fixed rate PPAs as described earlier. As with variable rate PPAs, I assume an energy rate based on the company's latest average price per megawatt-hour ($83.90 for Q2 2017). Furthermore, I assume that the energy rate is not subject to an annual escalation rate and that no capacity payments are contracted. I believe this yields a conservative estimate of the value of not broken out PPAs since over- and under-estimates of their true energy rates should equalize in aggregate.

2.1.2. Existing Power Plants

Ormat is the second largest geothermal owner/operator in the US and the sixth largest worldwide. The company owns and operates ~777MW of generating capacity across 21 sites (see Figure 1). In the US, Ormat's customers are predominantly investment-grade companies who are unlikely to renege on their respective PPA obligations. These customers include: Sierra Pacific Power Company, Nevada Power, Southern California Public Power Authority, Southern California Edison, and Hawaii Electric Light Company. Internationally, Ormat's customers are state-owned utilities including Kenya Power and Lighting Company (Kenya), Instituto Nacional de Electrification (Guatemala), Electricite de France S.A.

(Guadeloupe), ELCOSA (Honduras), and PT Perusahaan Listrik Negara (Indonesia). Although political risk is higher at Ormat's international operations, again it is unlikely that any customer will renege on their respective PPA obligations.

Existing PPAs often extend out 20 years or more and, in aggregate, have a weighted average remaining length of 15 years (the earliest PPA expiry date occurs in 2026). This, together with the credit quality of Ormat's customers, suggests that it is unlikely any PPA will terminate in the next five years. Therefore, I model Electricity revenues based on the terms of existing PPAs (if it is broken out). This establishes an effective floor of ~$460,000,000 on Electricity revenues over the forecast period.

Figure 1. Existing Power Plants[1]

	Location	Plant	Ownership	Generating Capacity	Owned Capacity	Capacity Factor	Expected Completion
Existing Geothermal							
Domestic							
	California	Heber	100%	92	92	78%	N/A
	California	Ormesa	100%	40	40	78%	N/A
	California	Mammoth	100%	29	29	78%	N/A
	California	North Brawley	100%	18	18	78%	N/A
	Nevada	Brady	100%	18	18	87%	N/A
	Nevada	Steamboat	100%	73	73	87%	N/A
	Nevada	Don A. Campbell	63.3%	41	26	97%	N/A
	Nevada	McGinness	100%	86	86	97%	N/A
	Nevada	Tuscarora	100%	18	18	97%	N/A
	Nevada	Jersey Valley	100%	10	10	97%	N/A
	Hawaii	Puna	63.3%	38	24	78%	N/A
International							
	Kenya	Olkaria III	100%	193	193	96%	N/A
	Guatemala	Zunil	97%	23	22	96%	N/A
	Guatemala	Amatitlan	100%	20	20	96%	N/A
	Guadeloupe	Bouillante	60%	15	9	96%	N/A
	Honduras	Platanares	100%	35	35	96%	N/A
	Indonesia	Sarulla	12.75%	220	28	96%	N/A
Existing Recovered Energy							
Domestic							
	Various	OREG I	63.3%	22	14	83%	N/A
	Various	OREG II	63.3%	22	14	83%	N/A
	Various	OREG III	63.3%	6	4	83%	N/A
	Colorado	OREG IV	100%	4	4	83%	N/A
Total existing portfolio				**1,023**	**777**	**90%**	

[1] Adapted from Barclays Equity Research and Company filings

2.1.3. Project Pipeline

Based on the company's known project pipeline, Ormat is expected to add at least 200MW in generating capacity over the next five years (see Figure 2). This growth is fueled by a combination of new geothermal complexes and expansions on existing power plants both in the US and worldwide. These projects are currently under construction and, in most cases, are already contracted to deliver electricity immediately after expected completion (the expansion project at McGinness Complex is in advanced stages of securing a PPA). By 2022, Ormat is expected to own and operate ~977MW in generating capacity across 24 sites.

My model assumes that the entirety of these 200MW will come online by 2022. With projects for which PPAs are already signed (all but the McGinness Expansion project), management has disclosed sufficient information to reconstruct the pertinent terms for the agreements. Therefore, I forecast revenues under the broken out PPA case. However, since the McGinness Expansion project has yet to secure a PPA, I forecast revenues here under the not broken out PPA case. Together, these forecasts yield a ~9% CAGR in recurring Electricity revenues into 2022.

The 25MW Carson Lake, 20MW Mammoth Expansion, and 35MW Menengai projects represent a further upside of 63MW. Ormat also holds land rights to another 34 prospects. These projects are still under initial stages of exploration and development and so it is unclear when (and if) they will enter commercial operation. For conservatism, these projects are not included in the base case valuation.

Figure 2. Project Pipeline[2]

	Location	Plant	Ownership	Generating Capacity	Owned Capacity	Capacity Factor	Expected Completion
Under Construction/In Development							
Domestic							
	Nevada	Tungsten Mountain I	100%	24	24	97%	YE 2017
	Nevada	Dixie Meadows I	100%	21	21	97%	H2 2018
	California	McGinness Expansion	100%	48	48	97%	YE 2018
	Nevada	Tungsten Mountain II	100%	24	24	97%	YE 2020
	Nevada	Dixie Meadows II	100%	21	21	97%	YE 2020
	Nevada	Baltazor Hot Springs	100%	20	20	97%	YE 2020
	Nevada	Carson Lake	100%	25	25	97%	TBD
	California	Mammoth Expansion	100%	20	20	97%	TBD
International							
	Kenya	Olkaria III Repowering	100%	10	10	97%	YE 2018
	Indonesia	Sarulla Phase III	12.75%	110	14	97%	H2 2019
	Guadeloupe	Bouillante Expansion I	60%	10	6	97%	YE 2019
	Guadeloupe	Bouillante Expansion II	60%	20	12	97%	YE 2021
	Kenya	Menengai	51%	35	18	97%	TBD
Total construction/development pipeline				**388**	**263**	**97%**	

[2] Adapted from Barclays Equity Research and Company filings

2.2. Global transition towards renewables drive growth in Product business

Today, countries across the globe are transitioning their energy portfolios towards renewables, a trend that is accelerating. In this sub-section, I argue how this trend will drive growth in Ormat's Product segment. First, I explore industry fundamentals to determine a baseline for Ormat's long- and near-term growth potential. Then, I describe the geothermal market in greater depth to establish an estimate of geothermal growth rates going forward. Finally, I discuss Ormat's market leadership in binary geothermal technology and argue that it enables the company to grow in tandem with broader geothermal growth. Together, these discussions help pinpoint a 3.9% annual growth estimate for Ormat's Product segment.

2.2.1. Industry Fundamentals

Between 2017 and 2040, worldwide consumption of electricity is forecasted to surge 28%.[3] Spurred by pressures for decarbonisation and improvements in technology, renewable energy will account for much of this growth; renewables is forecasted to remain the fastest growing source of energy with an average growth rate of 2.3% annually in 2040.[6] Based on the competitiveness of geothermal power, I expect this positive trend in the broader renewables industry to buoy long-term growth in geothermal energy and, by extension, Ormat.

As a base-load energy, geothermal achieves the same environmental benefits as intermittent sources such as wind and solar without the negative consequences arising from intermittency. Unlike intermittent energy, base-load energy can continuously provide a minimum level of power over a period of time. As such, it often avoids much of the integration, curtailment, and backup costs necessary with intermittent energy (see Appendix 7.2). In fact, according to a study by the US Energy Information Administration, geothermal plants entering service in 2022 is expected to have the lowest average *levelized cost of electricity* of both base-load and intermittent energy sources.[4] The levelized cost of electricity represents the per-kilowatt-hour cost of building and operating a power plant over its useful life, and is often used as a proxy for the overall competitiveness of different energy sources. Thus the cost-competitiveness of geothermal power (on a levelized basis) will enable it to match, if not exceed the long-term growth trends present in the broader renewables industry. Taking these trends as a proxy for Ormat's own long-term growth, I assume a 2.3% terminal growth rate that is in-line with the long-term growth in renewables. The industry fundamentals discussed here also establish a base-line for near-term growth in Ormat's Product segment.

2.2.2. Geothermal Market Potential

Geothermal is an underexploited source of renewable energy. As such, the industry is one rife with growth opportunities both in the US and worldwide. According to a US Geological Survey from 2008, the US alone has approximately 9GW of identified geothermal power generation potential. Taking into account undiscovered geothermal resources, this figure jumps to about 30GW.[5] With installed capacity in the US

[3] Energy Information Administration, "International Energy Outlook 2017", 14 September 2017.
[4] Energy Information Administration, "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2017", April 2017.
[5] US Geological Survey, "The USGS National Geothermal Resource Assessment", 2008.

currently hovering around 3.7GW, this stark contrast between reality and potential is suggestive of an underutilization of geothermal resources.[6]

A similar story plays out on the international stage. In a study presented to the World Geothermal Congress in 2015, Ruggero Bertani shows that up to 140GW of geothermal energy can be installed by 2050, satiating up to 8.3% of global electricity demand.[7] In particular, Bertani identified 40 countries in Latin America, Africa, and the Pacific for which geothermal can supply 100% of their electricity needs.[7] Global installed capacity is currently around 13.3GW; this represents under 10% of potential capacity.[8] However, by 2021 global installed capacity of geothermal power is projected to reach 18.4GW.[8] Therefore, geothermal capacity growth is expected to accelerate to between 5% and 10% in the near future.[8] This forecast is further corroborated by IBISWorld which estimates 7.6% annual growth in the US into 2020.[9]

I expect this industry-level growth will bolster demand for geothermal equipment and related EPC services; this will ultimately drive growth in Ormat's Product segment. Although industry estimates peg geothermal growth upwards of 5%, for conservatism, I assume a 3.9% annual growth rate for the Product segment into 2022. This revision downwards is in-line with the segment's historic growth rate. Furthermore, it reflects increasing competitive pressures present in the industry and the company's shift in focus away from its Product business

2.2.3. Market Leadership

Ormat is a market leader in binary geothermal systems with 80% market share (measured by installed capacity).[10] Unlike its flash counterparts, binary technology has the advantage of creating a virtually closed-loop system and requires only geothermal resources under 300° Fahrenheit (see Appendix 7.1 for more details). Although binary technology currently accounts for only 16% of total installed geothermal capacity, it is the fastest growing niche within the broader geothermal industry–a trend that is likely to continue.[9] This growth may be ultimately attributed to the fact that low-temperature geothermal resources (under 300° Fahrenheit) is the most common type on Earth and many prospective sites are just beginning to be identified, explored, and developed.[8] Against this industry backdrop, I expect Ormat's market leadership in binary technology to drive the 3.9% annual growth assumed for the company's Product business.

As an illustration of Ormat's continued market leadership, the Geothermal Energy Association notes that the company has provided equipment to substantially more (albeit smaller) projects than any other company.[8] This is even as more and more binary suppliers enter the market, including large flash incumbents such as Fuji and Mitsubishi. In fact, of the 2.1GW of geothermal capacity installed in the past five years, binary accounted for 50% and Ormat accounted for 67% of that.[10] This is not surprising as a key consideration when choosing an equipment supplier or EPC contractor is a successful track record–

[6] JPMorgan, "Ormat Technologies: Value Unearthed", 15 June 2015.
[7] Ruggero Bertani, "Geothermal Power Generation in the World 2010-2014 Update Report", 19 April 2015.
[8] Geothermal Energy Association, "2016 Geothermal Power: International Market Update", October 2016.
[9] IBISWorld, "Geothermal Electricity Plant Operations in the US", July 2016.
[10] Company filings

something Ormat clearly exhibits as a market leader. Hence, I expect Ormat's market leadership to mitigate risks of market share erosion and enable the company to grow in tandem with the broader geothermal industry. This helps establish the conservatism of my 3.9% growth estimate.

2.3. Margin expansion in Electricity segment support overall profitability

Over the past five years, Ormat has widened gross margins from 25.71% in 2012 to 40.87% in 2017. In this sub-section, I discuss the drivers that enabled this expansion and examine how overall profitability will fare going forward. First, I analyse gross margin trends with respect to the Electricity segment. Then, I repeat a similar analysis for the Product segment. These two analyses explain the trends in overall gross margins for the company and inform my forecasts of profitability going forward. In particular, I expect that improvements in technology will enable efficiency gains in the Electricity segment. This will ultimately help maintain overall profitability even as Ormat's Product segment faces increasing competitive pressures.

2.3.1. Electricity Segment

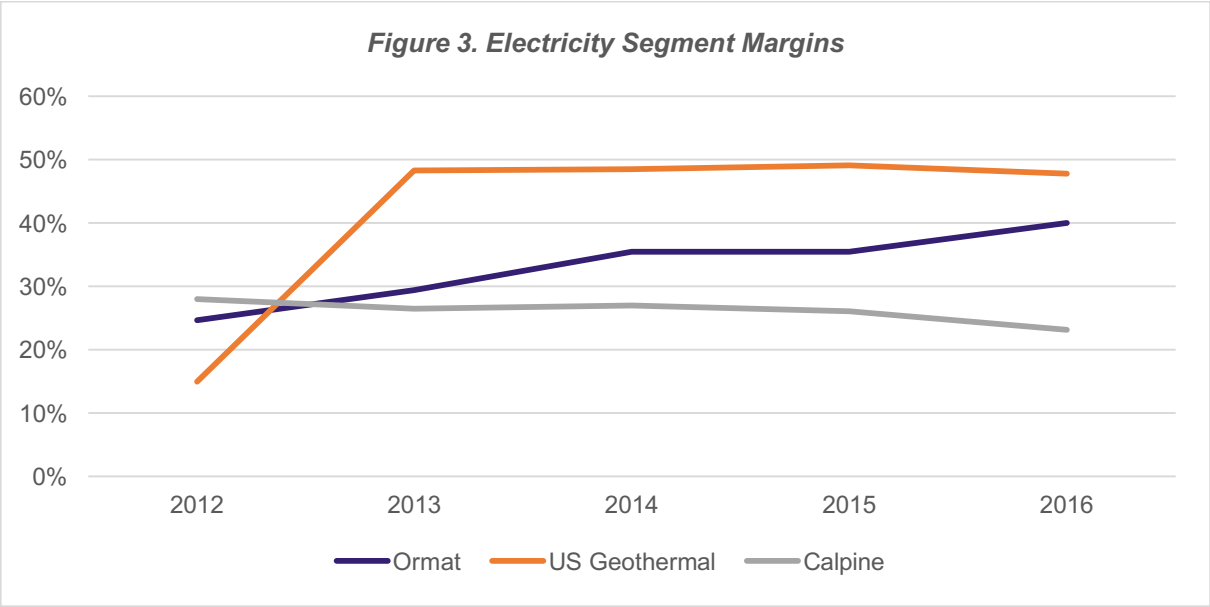
The principal expenses attributable to the Electricity segment consists of costs associated with operation and maintenance, lease obligations, royalties, property taxes, insurance, and depreciation and amortization. In the past five years, gross margins in the Electricity segment have steadily expanded from 24.60% in 2012 to 40.05% in 2016. Moreover, for the first and second quarters of 2017, gross margins further increased to 42.98% and 41.46% respectively. Going forward, management expects gross margins to continue to trend upward and reach 45% to 50% by 2022.

Three key drivers enabled this expansion in gross margins: (1) enhancements in existing power plants; (2) improved technologies at new power plants; and (3) lower operation and maintenance costs in international power plants. First, over the past five years, Ormat has made targeted investments to improve the efficiency of existing power plants. A prime example of such investments are the West Nevada and East Nevada control centers. These control centers centralized regional operations and enabled the company to reduce operation and maintenance costs.[11] Second, Ormat's latest generation of turbines and cooling systems helped boost generating capacity and capacity factors at new power plants while keeping operation and maintenance costs level. Third, the company notes that its international operations are generally more profitable due to prevailing market conditions and lower labour costs. Hence, as Ormat internationalized its Electricity business, gross margins benefited.

Figure 3 compares gross margins between Ormat, Calpine, and US Geothermal. Calpine is the largest geothermal owner/operator in the US with additional holdings in natural gasses. US Geothermal is a geothermal owner/operator with three power plants in the US and many other under construction worldwide. As another pure-play geothermal company, US Geothermal is the most appropriate benchmark to compare Ormat's gross margins in the Electricity segment. Given that US Geothermal has experienced gross

[11] Ormat Technologies. Analyst and Investor Day 2017.

margins around 50% in the past four years, it is certainly possible for Ormat expand gross margins to 45% by 2022, especially given the company's significantly larger operations.

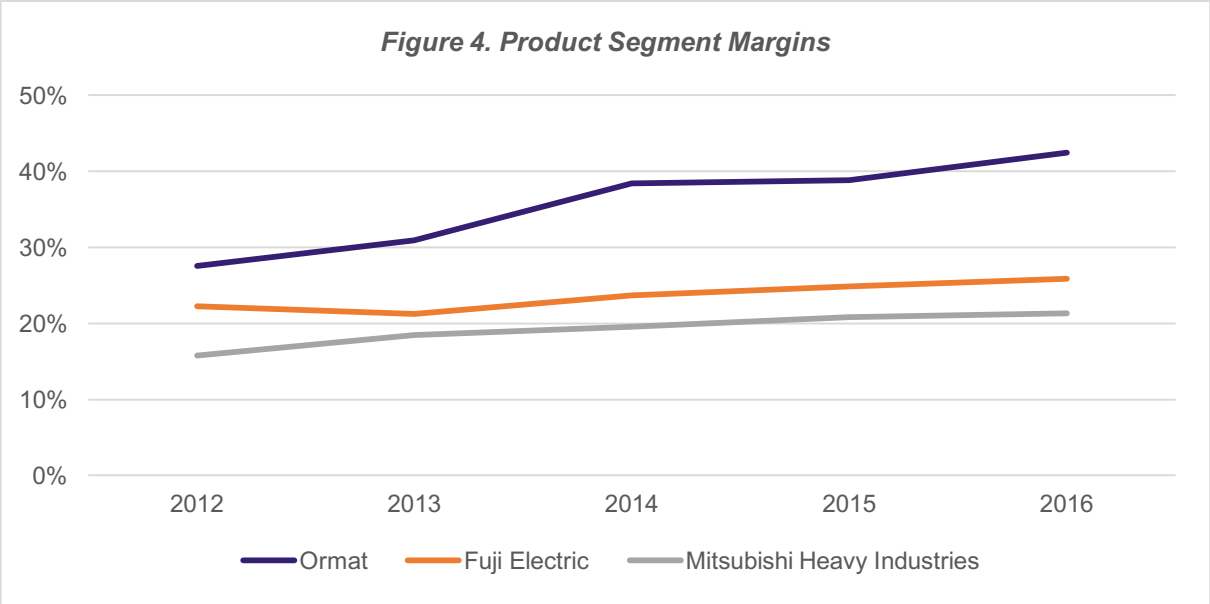


I expect the drivers discussed above to continue improving Ormat's gross margins into 2022. In particular, I expect the expansion projects in Ormat's pipeline to benefit from the same efficiency gains that past projects experienced. Furthermore, I expect the company's continued expansion worldwide to lift profitability for the segment overall. Therefore, my model assumes gross margins to widen to 45% by 2022—the lower end of management guidance.

2.3.2. Product Segment

The principal expenses attributable to the Product segment relate to materials, salaries, and transportation. In the past five years, gross margins in the Product segment have expanded from 27.58% in 2012 to 42.46% in 2016. However, the first and second quarters of 2017 have seen gross margins contract to 33.28% and 35.47% respectively. Going forward, management expects gross margins to contract to 30%.

Two key drivers cause this trend downwards: (1) increased competition in the binary geothermal space; and (2) the ramp-down of highly profitable supply contracts. As noted earlier, an increasing number of competitors have entered the binary geothermal space in recent years. Notably, these competitors include Mitsubishi Heavy Industries and Fuji Electric—the second and third largest suppliers of geothermal equipment overall. Their presence in this space erodes Ormat's pricing power and is likely to drag on this segment's profitability going forward, especially since they are accustomed to lower margins than Ormat (see Figure 4). However, it should be noted that margins here are not directly comparable since Fuji and Mitsubishi are diversified. In fact, these companies' geothermal businesses have generally outperformed their other segments and have likely experienced higher margins than depicted in Figure 4.



The other driver of gross margin contraction can be simply explained as a "return to normalcy". Gross margins expanded rapidly in 2014 when Ormat began constructing the 330MW Sarulla Complex in Indonesia; as this project ramps down over the next two years, gross margins trend downwards to "pre-Sarulla" levels. As a result of these downward pressures on gross margins, I forecast gross margins to contract to 30% over the next five years.

2.3.3. Overall Profitability

In the past five years, overall gross margins have expanded from 25.71% in 2012 to 40.87% in 2016. Over the same period, EBITDA margins largely mirrored that growth, expanding from 36.17% in 2012 to 49.28% in 2016. These trends were driven entirely by the upward trends in Electricity and Product profitability detailed earlier and, in fact, operating expenses have largely remained level over the past five years.

In the next five years, I expect gross margins and EBITDA margins to hover around 40% and 49% respectively. Gross margins will remain level as the increasing profitability of Ormat's Electricity business is offset by declining profitability in its Product business. However, in the long-term, I expect gross margins to trend upward as the more profitable Electricity segment continues to capture a greater share of total revenues. This stability in gross margins will help maintain EBITDA margins at ~49% as I do not see any material changes in operating expenses going forward.

2.4. Management Compensation and Shareholder Alignment

Ormat is led by a capable management team that has created significant shareholder value over recent years. Chief Executive Officer Isaac Angel joined Ormat back in April 1st, 2014 and oversaw the company's growth from a ~$1 billion to ~$3 billion company in market capitalization.

On May 4th, 2017, ORIX, one of Japan's leading financial services companies, announced its intent to acquire a 22.1% stake in Ormat at $57 per share. In connection with the closing of this transaction, company

insiders such as the founding family's investment fund Bronicki Investments, Israeli private equity fund FIMI, and members of senior management sold approximately 11 million shares. As such, management ownership in Ormat currently stands at zero, a possible point of concern.

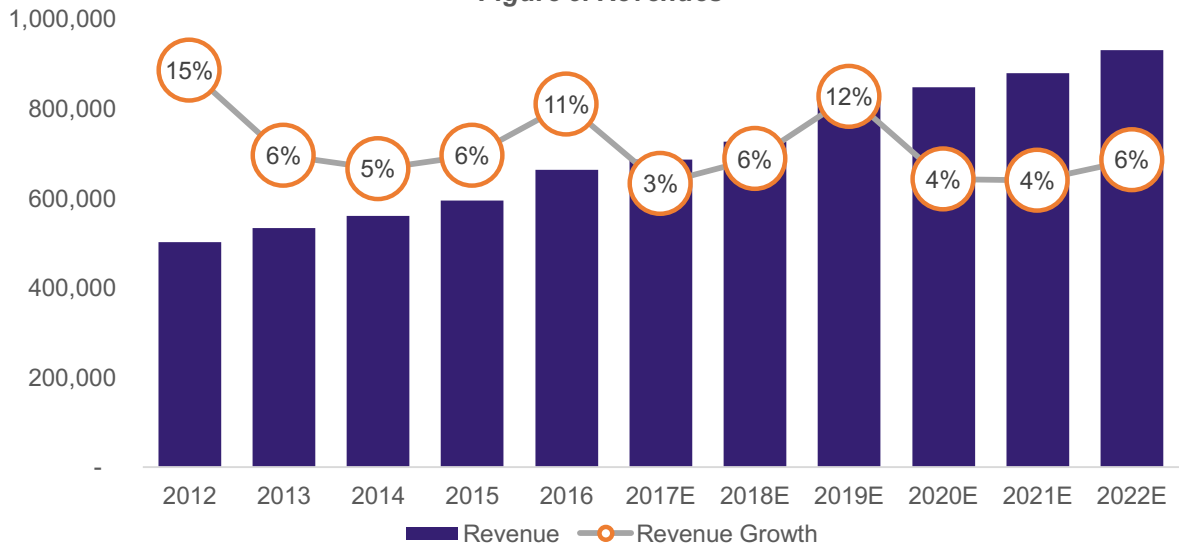
However, incentive structures are in place to mitigate concerns of misalignment of interests. In particular, Angel is eligible to earn an annual bonus of .75% of the company's annual profits up to $50 million and 1% for any amount above, with a bonus cap at $750,000. An Annual Management Incentives Plan also provides cash and equity incentives to other members of management based on the achievement of certain performance incentives. Together, these programs help promote management alignment with shareholders.

3. 3. Base Case Forecasts

3.1. Revenue Forecast

Over the next five years, I expect overall revenues to grow ~7% annually into 2022 to reach ~$929 million. This trend arises from my individual forecasts of Electricity and Product revenues. In this sub-section, I discuss these two forecasts in detail and show their contribution to the company's overall revenues.

Figure 5. Revenues



3.1.1. Electricity Segment

I expect Electricity revenues to grow ~9% annually into 2022 to reach ~$655 million. This implies that the Electricity segment will increase its share of total revenues from 65.85% in 2016 to 70.51% in 2022. My forecast is based on Ormat's existing portfolio of ~777MW in generating capacity as well as an addition of 200MW by 2022. In any given year, I assume all available generating capacity is contracted for sale via a PPA. This PPA may either be broken out (where the pertinent terms of the PPA is known) or not broken out (where assumptions need to be made). In either case, the PPA will provide the following terms:

- the contracted generating capacity of the relevant power plant;
- the average capacity factor of the relevant power plant;
- an energy rate specified in dollars per megawatt-hour;
- an annual escalation rate on the energy rate (if any); and
- a capacity rate specified in dollars per megawatt.

Based on these assumptions, I project annual revenues with the following algebraic model:

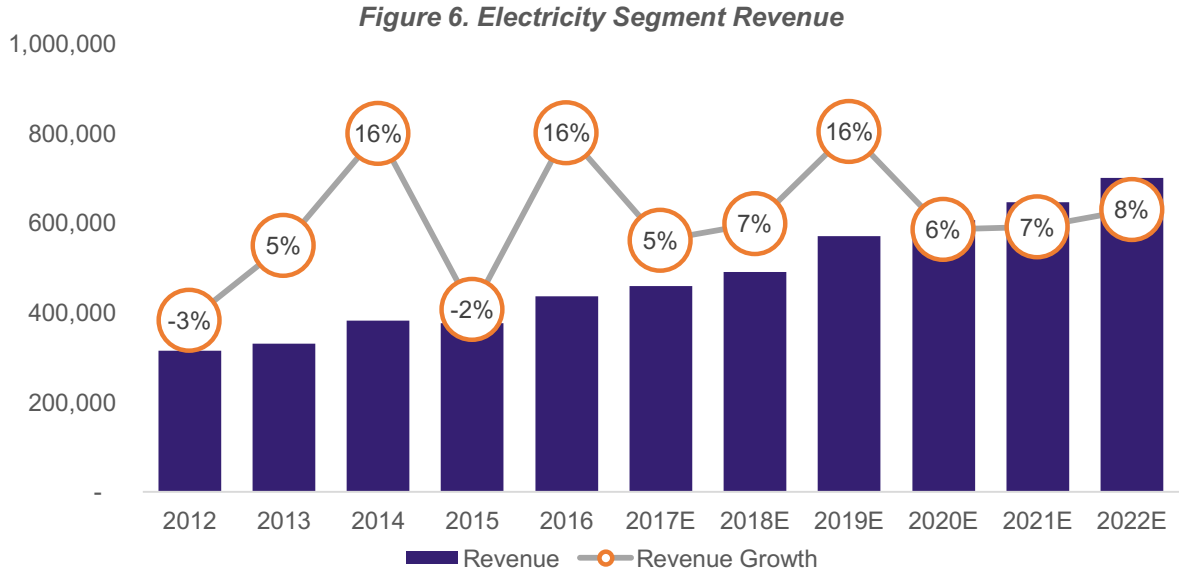
$$\text{Energy Payment} = \$/\text{MWh} \times (1 + \text{Escalation Rate})^t \times (\text{Generating Capacity} \times \text{Capacity Factor}) \times 8{,}760$$

$$\text{Capacity Revenue} = \$/\text{MW-Year} \times \text{Generating Capacity}$$

where t denotes the number of years since the start of the contract and 8,760 is the number of hours in a year.

Of course, payment structures will vary across individual PPAs. Where information is available, I will modify the model above to resemble the true structure of the PPA as closely as possible. However, most PPAs follow a common structure that is captured by the model above. As such, I believe this model accurately forecasts Electricity revenues based on publically known information.

Figure 6. Electricity Segment Revenue



3.1.2. Product Segment

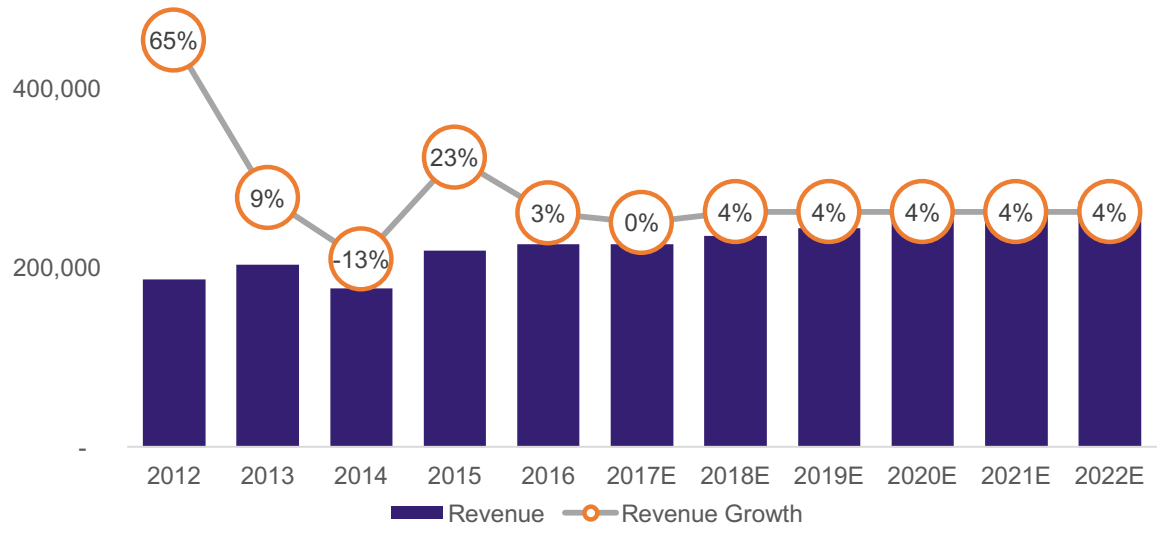
I expect Product revenues to grow 3.9% annually into 2022 to reach ~$274 million. This implies that the Product segment will decrease its share of total revenues from 34.15% in 2016 to 29.49% in 2022. My forecast is based on the projected near-term growth rate of 5% to 10% in the geothermal industry, adjusted for increasing competitive pressures and the company's shift in focus away from the Product segment. This yields my assumed growth rate of 3.9%.

Based on this assumption, I project annual revenues with the following algebraic model:

$$\text{Product Revenue} = \text{Prior Year Product Revenue} \times (1 + \text{Growth Rate})$$

As discussed in Section 2.3.2, I believe this to be a conservative forecast since it understates industry estimates while remaining in-line with Ormat's historical five-year average growth rate in the Product segment.

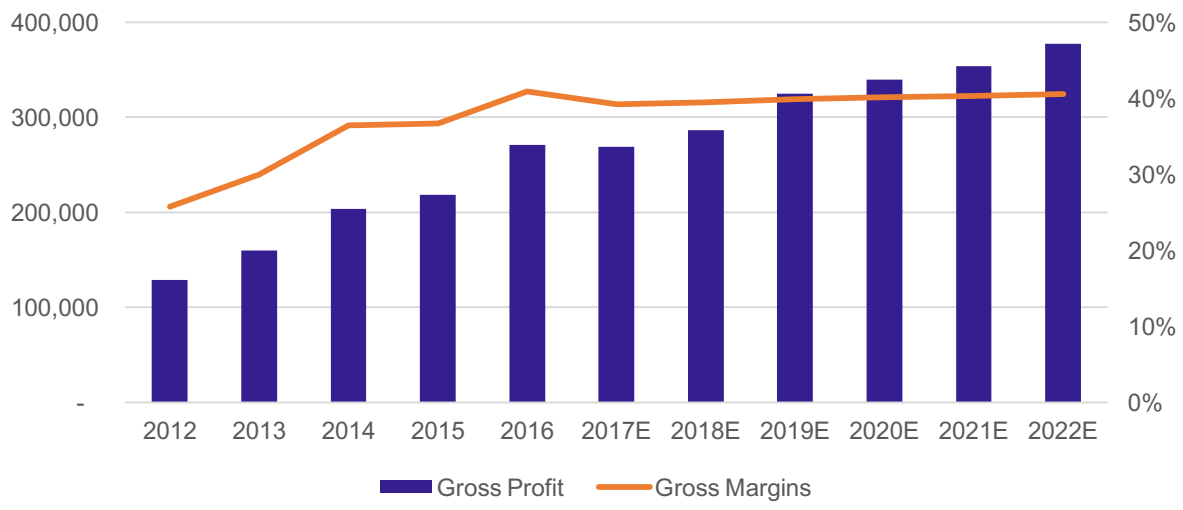
Figure 7. Product Segment Revenue



3.2. Margin Forecast

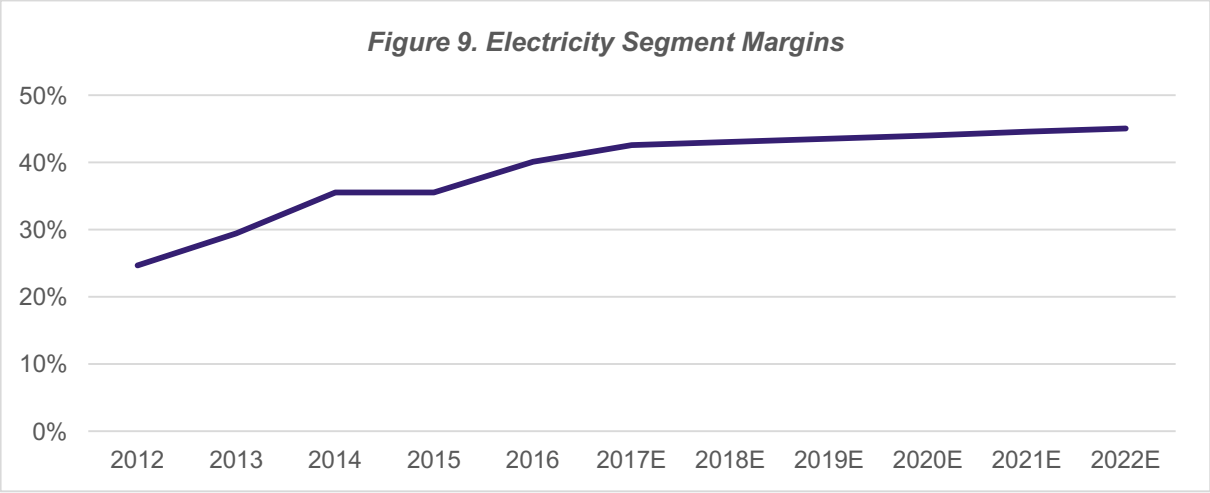
Over the next five years, I expect gross margins to stabilize around 40%, enabling gross profits to reach ~$377 million by 2022. This trend arises based on my forecasts of gross margins in the Electricity and Product segments. In this sub-section, I discuss these two forecasts in detail and show how they affect Ormat's gross profitability overall.

Figure 8. Gross Margins



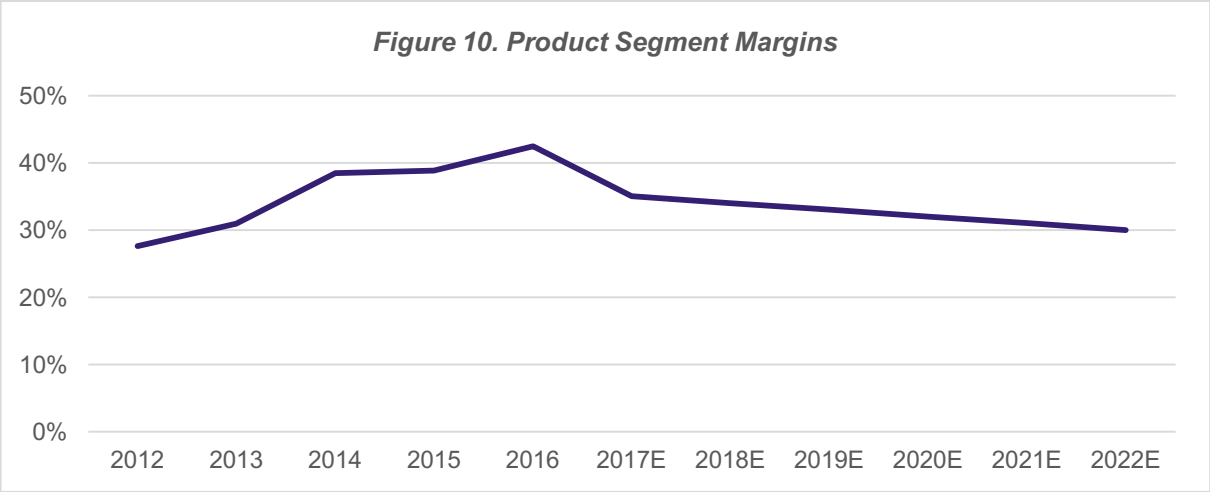
3.2.1. Electricity Segment

Drawing on Section 2.3.1, I assume gross margins in the Electricity segment to expand to 45% by 2022. In particular, I assume a gross margin of 42.50% in 2017 and grow that linearly to 45% by 2022. This trend will be driven by the company's efforts to improve efficiency in existing facilities, develop new power plants, and expand its international presence. Based on Ormat's known project pipeline, these efforts are well underway and are likely to be realized in the next five years.



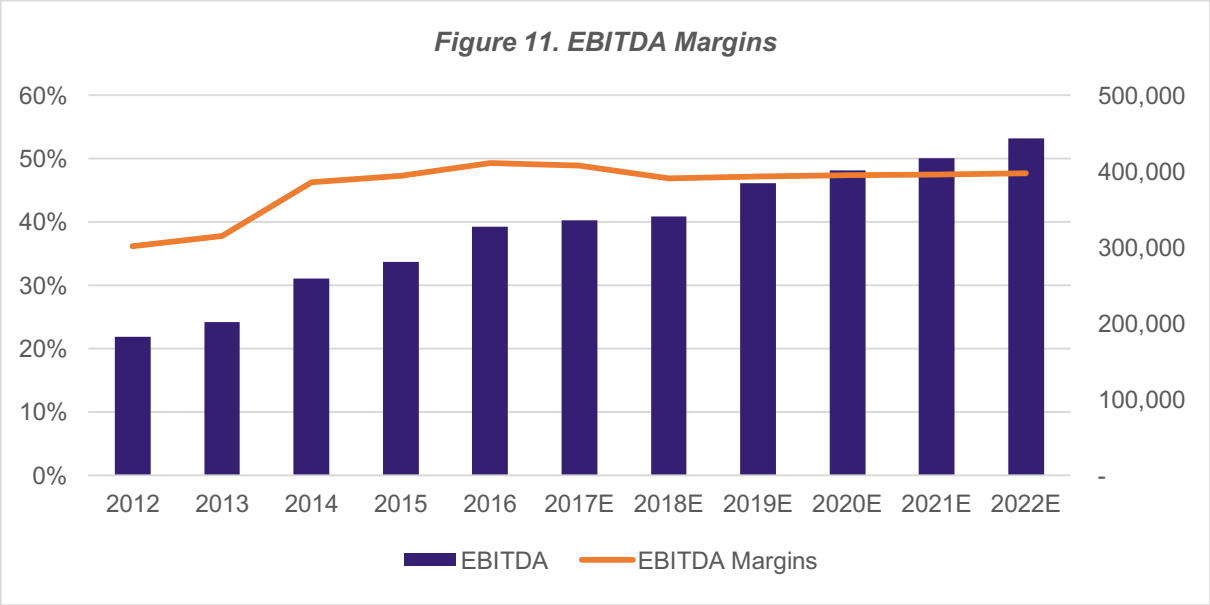
3.2.2. Product Segment

For the reasons outlined in Section 2.3.2, I assume gross margins in the Product segment to contract to 30% by 2022. In particular, I assume a gross margin of 32.50% in 2017 and decrease that linearly to 30% by 2022. This trend will be driven by increasing competitive pressures in the binary geothermal space as well as a "return to normalcy" as highly profitable contracts ramp-down. It is certainly possible that Ormat secure another high-margin contract during the forecast period. However, I choose to base my valuation on this more likely scenario for the sake of conservatism.



3.3. Operating Expenses Forecast

Over the next five years, I expect EBITDA margins to hover around 48%, enabling EBITDA to reach ~$443 million by 2022. This trend is driven by the stability of gross margins and operating expenses over the forecast period. In this sub-section, I discuss my forecasts of operating expenses. In particular, I detail my assumptions for my forecasts of research and development expenses, sales and market expenses, and general and administrative expenses.



3.3.1. Research and Development Expenses

Research and development expenses, as a percentage of total revenues, have fluctuated in the past five years between a low of 0.14% in 2014 and a high of 1.22% in 2012. Management has not indicated whether these fluctuations are the result of a deliberate shift in strategy, especially given the installation of a new CEO in 2014. As such, I use a five-year historical average of 0.60% in my forecast.

3.3.2. Sales and Marketing Expenses

Sales and marketing expenses arise from both Ormat's Electricity and Product segments. In particular, management notes that sales commissions from the Product segment is a key driver of S&M expenses. However, our analysis shows that sales and marketing expenses as percentage of total revenues exhibit relative stability over the past five years (with a slight trend downwards). Given that we do not have a breakdown of sales and marketing expenses for each of Ormat's two segments, I apply a five-year historical average of 3.14% over the forecast period.

3.3.3. General and Administrative Expenses

Adjusted general and administrative expenses, as a percentage of revenues, have hovered around an average of 5.36% over the past five years. General and administrative expenses have occasionally spiked as a result of one-time costs, an example being an $11 million litigation charge in 2016. After

adjusting for these one-time charges, I apply a five-year historical average of 5.36% over the forecast period.

3.4. Other Model Assumptions

In this sub-section, I discuss any other material assumptions in my model. First, I explain my projections of maintenance and growth capital expenditures. These expenses constitute one of the largest source of capital needs for Ormat and thus necessitate careful modeling. Then, I present my assumptions for calculating depreciation and amortization, income taxes, the terminal growth rate, and the weighted average cost of capital.

3.4.1. Capital Expenditures

Maintenance Capital Expenditures

Maintenance CAPEX is chiefly driven by the company's Electricity segment. Although explicit figures are difficult to locate, management provides estimates of maintenance CAPEX for the upcoming year in the company's annual reports. Over the past five years, these estimates, expressed as a percentage of Electricity revenues, have fluctuated between ~4% to ~8%. I apply a five-year historical average of 6.47% over the forecast period.

For the Product segment, estimates of maintenance CAPEX, expressed as a percentage of Product revenues, have fluctuated between ~1.5% to ~3.5% over the past five years. Since Product revenues account for only one-third of total revenues, the maintenance CAPEX attributable to the Product segment is small compared to that for the Electricity segment. I apply a five-year historical average of 2.41% over the forecast period.

Growth Capital Expenditures

Growth CAPEX constitutes one of the largest sources of capital needs for Ormat. These expenditures fund exploration activity, the development of new projects, as well as improvements on existing operations. Consequently, growth CAPEX is largely determined by the company's future expansion plans. My model forecasts growth CAPEX as a dollar figure per additional MW installed. In particular, I use management's estimate of $4,000,000 per MW installed to forecast growth CAPEX as a function of new projects under development. Hence, growth CAPEX will fluctuate based on my growth assumptions.

Based on estimates from the National Renewable Energy Laboratory, I allocate 13% of growth CAPEX per MW to exploration activities, 38% to production drilling, and 49% to construction.[12] Since Ormat typically requires two years to construct a power plant, my model allocates the costs associated with construction over a two-year period immediately before the expected commercial operation date of the power plant. Furthermore, my model assumes that production drilling costs are incurred one year before

[12] National Renewable Energy Laboratory, "Guidebook to Geothermal Power Finance", March 2011.

construction begins. As the projects I include in my base case forecast are known prospects for which exploration activities have already been occurred, I do not include exploration costs.

Management plans to increase installed capacity to 1150MW by 2022. As a result, the company estimates approximately $1.5 billion in capital needs over the next five years. My model assumes that only projects with PPAs signed or under negotiations are constructed during the forecast period. These assumptions see the company's total installed capacity grow to 977MW by 2022. Accordingly, forecasted capital needs lie well below management's guidance. I believe these assumptions yield a conservative valuation as more aggressive (but prudent) expansion activities will only increase shareholder value.

3.4.2. Depreciation and Amortization

Depreciation and amortization is modeled as a percentage of cost of revenues. I believe this is an appropriate assumption since Ormat reports depreciation and amortization as a key component of cost of revenues. Therefore, it is reasonable to assume that the two figures will remain closely linked going forward. In the past five years, these expenses, expressed as a percentage of cost of revenues, have hovered around 27%. As such, I apply a five-year historical average of 27.24% over the forecast period.

3.4.3. Income Taxes

Income taxes are modeled using the company's most recent effective tax rate of 22.5% for FY2016. This figure is substantially lower than the US tax rate of 35% in part due to where the company's income is realized. For example, the income tax rate in Kenya where the company's Olkaria III complex is located is 37.5%. By contrast, the income tax rate in Israel where Ormat has substantial manufacturing operations is 16%. Depending on the composition of income for any given year, Ormat's effective tax rate will fluctuate. Hence, for simplicity, I use the company's most recent effective tax rate going forward.

3.4.4. Terminal Growth Rate

My model assumes a terminal growth rate of 2.30%. This rate is based on the forecasted long-term growth rate in the broader renewable energy industry. It is used as a proxy for growth in both Ormat's Electricity and Product segments. I believe this is an appropriate estimate since it captures the global transition towards renewables in the long-term and the role geothermal will play in this development.

3.4.5. Weighted Average Cost of Capital

My model calculates Ormat's cost of equity based on CAPM using the following assumptions:

- a risk-free rate of 1.18% based on the interest rate on a three-month US treasury bill;[13]
- a LSIF standard equity risk premium of 7.00%; and
- a beta of 0.95 based on Bloomberg estimates.

My model calculates Ormat's after-tax cost of debt with the following assumptions in mind:

[13] US Department of the Treasury, "Daily Treasury Yield Curve Rates", 2 November 2017.

- a cost of debt of 7.02%; and
- an effective tax rate of 22.50%.

This yields a 7.83% cost of equity and 5.44% after-tax cost of debt. Since Ormat currently employs a capital structure of approximately 78% equity and 22% debt, I calculate a weighted average cost of capital of 7.30% over the forecast period. I also calculate a weighted average cost of capital of 8.72% during the terminal period based on the assumption that the risk-free rate is 3.00% – a LSIF standard. This adjustment accounts for abnormally low interest rates in today's markets and helps yield a more conservative valuation by more heavily discounting the company's terminal value.

4. DCF Valuation

4.1. Scenario 1 – Base Case

Scenario 1 represents our base case valuation of Ormat. It values the company based on the assumptions described in Section 3. In particular, these assumptions include:

- an additional 200MW of generating capacity added by 2022;
- Product segment revenues grow an average 3.90% annually;
- gross margins in the Electricity segment expand to 45%;
- gross margins in the Product segment contract to 30%; and
- a terminal growth rate of 2.30%.

Valuation – Scenario 1	
NPV of Free Cash Flow	4,588,913
Current Debt	872,578
Current Cash	119,771
Equity Value	3,836,106
Shares Outstanding	50,367
Implied Share Price	**76.16**
Current Share Price	62.21
Implied Premium	*22.43%*

4.2. Scenario 2 – No Growth

Scenario 2 assumes that Ormat does not sign new PPAs during the forecast period. This scenario helps establish a base-line understanding of the value of Ormat's current PPAs. Some major assumptions include:

- an additional 200MW of generating capacity added by 2022;
- no growth in the Product segment;
- gross margins in the Electricity segment are held stable at 42.50%;
- gross margins in the Product segment contract to 30%; and
- no terminal growth.

Valuation – Scenario 2	
NPV of Free Cash Flow	4,477,567
Current Debt	872,578
Current Cash	119,771
Equity Value	3,724,760
Shares Outstanding	50,367
Implied Share Price	**73.95**
Current Share Price	62.21
Implied Premium	*18.88%*

4.3. Scenario 3 – Bear Case

Scenario 3 models a scenario in which the company fails to fulfill maintain growth expectations. In particular, this scenario makes the following assumptions:

- an additional 152MW of generating capacity added by 2022;
- a negative growth rate in the Product segment of -1.00%;
- gross margins in the Electricity segment contract to 30.00%;
- gross margins in the Product segment contract faster than expected to 20.00%; and
- no terminal growth.

Valuation – Scenario 3	
NPV of Free Cash Flow	3,832,931
Current Debt	872,578
Current Cash	119,771
Equity Value	3,080,142
Shares Outstanding	50,367
Implied Share Price	**61.15**
Current Share Price	62.21
Implied Premium	*-1.70%*

4.4. Scenario 4 – Bull Case

Scenario 4 models a situation where the company fully achieves its growth goals by 2022. In particular, the bull case features the following assumptions:

- an additional 263MW of generating capacity added by 2022;
- Product segment revenues grow an average 5.00% annually;
- gross margins in the Electricity segment expand to 50% by 2022;
- gross margins in the Product segment contract to 32.50% by 2022;
- a terminal growth rate of 2.30%.

Valuation – Scenario 4	
NPV of Free Cash Flow	4,873,639
Current Debt	872,578
Current Cash	119,771
Equity Value	4,120,832
Shares Outstanding	50,367
Implied Share Price	**81.82**
Current Share Price	62.21
Implied Premium	*31.52%*

5. Alternative Valuation Model

Ormat is uniquely positioned as the sole vertically-integrated geothermal company. As such, no other company competes with Ormat across both its Electricity and Product segment. Furthermore, few pure-play geothermal companies are publically traded. This reduces the effectiveness of a comparable company analysis (though it is still worth considering). Consequently, I look to a group of North American owner/operators of renewable energy assets as a proxy for an appropriate peer group (see Figure 12).

Figure 12. North American Owner/Operators of Renewable Energy Assets

Name	Market Capitalization	Enterprise Value	EV/EBITDA 2017E	EV/EBITDA 2018E	EV/EBITDA 2019E	P/E 2017E	P/E 2018E	P/E 2019E
8Point3 Energy Partners LP	1,197	2,505	21.45	21.23	20.79	26.45	24.64	21.31
Alterra Power Corp	355	726	16.52	14.39	13.33		67.74	35.86
Brookfield Renewable Partners	10,542	27,143	15.88	13.86	13.16	202.32	73.73	83.31
Calpine Corp	5,405	16,708	9.08	8.40	8.55	79.31	18.53	20.07
NextEra Energy Partners LP	2,084	6,653	6.21	7.84	5.89	28.39	18.15	15.27
Pattern Energy Group Inc	2,063	5,372	13.10	15.06	12.61	83.60	51.11	40.24
TerraForm Global Inc	833	1,714	10.87	11.26	11.28			55.17
TerraForm Power Inc	1,920	6,681	15.12	14.51	14.10			
TransAlta Renewables Inc	3,322	4,489	10.19	10.47	10.30	15.47	13.61	12.71
US Geothermal Inc	76	194	11.42	9.97	8.18	64.06	52.96	
Median			12.26	12.56	11.95	64.06	37.88	28.59
Mean			12.98	12.70	11.82	71.37	40.06	35.49
Ormat Technologies	*3,224*	*4,137*	*12.34*	*12.16*	*10.76*	*30.15*	*26.72*	*22.34*

Ormat currently trades at a forward EV/EBITDA multiple of 12x on 2018E EBITDA. Based on the median multiple of 12.5x for its peer group, Ormat is trading at a slight discount. I consider the group of North American owner/operators of renewable energy assets as the most appropriate peer group, as these companies generally share a business model similar to Ormat's Electricity business. Given that the Electricity segment accounts for two-thirds of total revenues and will be the main driver of growth going forward, I believe this is an appropriate assumption.

Applying a forward EV/EBITDA multiple of 12.5x on 2018E EBITDA, I find an implied share price of $67.07. This valuation is based on my 2018E EBITDA estimate of ~$340 million and suggests that Ormat shares are trading at a ~5% discount relative to peers. Given that the peer group used here is not fully comparable to Ormat, I believe my DCF valuation yields a more accurate target price of $76.

Figure 13. EV/EBITDA Valuation

EBITDA (2018E)	EV/EBITDA (2018E) 11.5x	12.0x	12.5x	13.0x	13.5x
310,069	53.47	56.55	59.63	62.71	65.78
320,069	55.76	58.93	62.11	65.29	68.46
330,069	58.04	61.31	64.59	67.87	71.14
340,069	60.32	63.70	67.07	70.45	73.83
350,069	62.60	66.08	69.56	73.03	76.51
360,069	64.89	68.46	72.04	75.61	79.19
370,069	67.17	70.84	74.52	78.19	81.87

6. Conclusion

Ormat Technologies is a fundamentally-sound investment that is currently undervalued. The company and its management team have demonstrated competence in creating shareholder value and I believe this trend will continue into the near-future.

In summary, my investment thesis centers around the following points:

1. A strong project pipeline underpins growth of recurring Electricity revenues.
2. The global transition towards renewables will drive growth in Product business.
3. A trend of margin expansion in Electricity segment support overall profitability.

To conclude, I reiterate my **BUY** recommendation for Ormat at a target price of $76.00. With share prices currently hovering around $62.00, this opportunity implies an upside of approximately 22%.

7. Appendix

7.1. An Overview of Geothermal Power

Geothermal power is a renewable source of energy that harnesses heat from the Earth's core for conversion into electricity. To access this resource, geothermal developers typically drill wells at locations where faults in the Earth's crust enable heat emanating from its core to travel close to water reservoirs near the surface. Once this is done, steam and/or water can then be brought to the surface for conversion to electricity. Broadly speaking, geothermal systems achieve this conversion via three main ways:

- *Dry steam power plants* access steam from geothermal zones to drive the turbines that power its generators. These constitute the first generation of geothermal power plants.
- *Flash steam power plants* vaporizes super-heated fluids in low-pressure tanks and uses the resulting steam to drive turbines. Flash technology is the largest market segment today, and is dominated by players including Toshiba, Mitsubishi, and Fuji.
- *Binary power plants* transfer heat from moderately heated geothermal fluids to a secondary fluid with a lower boiling point. This act causes the secondary fluid to vaporize and the resulting steam is used to drive turbines. Although binary technology accounts for only 16% of the geothermal market, it has to advantage of creating a virtually closed-loop system and requires only fluids under 300° Fahrenheit—the most common geothermal resource on Earth. Ormat is the market leader in this niche with 80% market share.

Owing to the continuous availability of geothermal resources (assuming it is properly managed), geothermal power plants typically enjoy much higher availability factors than other forms of renewable energy such as solar and wind. This forms the core of geothermal power's competitive advantage.

7.2. The Curse of Intermittent Energy

Integration of intermittent energy into existing infrastructure require significant costs

Intermittent sources of energy generate costs that reach beyond individual power plants; they also incur significant costs at a system-level. These include the costs to provide back-up energy, for balancing energy supply and demand, to connect the transmissions grid to new generating capacities, and to improve the transmissions grid to handle higher variability in power generation. While these costs are also incurred by other energy sources, their magnitude is exacerbated by intermittent sources.

A report from the OECD Nuclear Energy Agency in 2012 highlights and quantifies the system-level costs associated with intermittent energy.[14] In particular, the agency found that introducing intermittent energy up to 10% of the total energy supply with increase the cost of electricity on a per-megawatt basis between 5% to 50%, depending on the energy source and country.[7] Moreover, introducing intermittent energy up to 30% of the total energy supply will increase the cost of electricity between 16% to 180%.[7]

[14] OECD Nuclear Energy Agency, "Nuclear Energy and Renewables", 2012.

At the moment, the system-level costs associated with intermittent energy are not fully considered by policymakers and power purchasers alike.[7] As such, despite the impression that wind and solar energy are cheaper than geothermal on a per-megawatt basis, they are in fact not. This is a view shared by Ormat and industry researchers alike.

Increasing penetration of intermittent energy creates periods of oversupply

Driven by regulatory incentives and ever-decreasing costs, wind and solar energy has grown tremendously in recent years. A report found that clean energy investment increased to $286 billion in 2015, with solar accounting for 56% of the total and wind for 38%.[15] However, this rapid growth of intermittent energy sources brings with it some complications. In particular, the variability of power generation from intermittent energy sources creates periods of oversupply that necessitate either shutting down power plants (curtailment) or paying others to use excess electricity (negative pricing).

Consider California's recent experiences with solar energy as an example. In 2010, California generated approximately 0.5% of its energy from solar; now, this figure has grown to 10%.[16] This created an unintended consequence of oversupply during midday periods when sunlight is most intense. In order to prevent instability in the transmissions grid, levels of curtailment have spiked from 15% of the time in a 24-hour period in 2015 to 31% in 2017.[9] But even as levels of curtailment grow, California is increasingly paying neighbouring states as much as $25 per megawatt-hour to take its excess electricity.[9] Consequently, electricity rates have increased faster in California than the rest of the US and Californians pay up to 50% more than the national average.[9]

Intermittent energy cannot supply consistent levels of energy

The nature of intermittent energy sources means that they cannot supply consistent levels of energy. The oversupply of energy has resulted in curtailment and negative pricing. However, the undersupply of energy can be equally destabilizing to the electricity grid. Moreover, to counter this, utilities are forced to keep fossil-fuel power plants running.

This problem is best highlighted by Germany's recent experiences when transitioning to renewable energy. For the first time in years, Germany saw an increase in carbon emissions in 2015.[17] Because Germany's portfolio of renewable energy consists predominantly of intermittent sources, the country is forced to keep fossil-fuel power plants running to make up for periods of undersupply.[10]

As nations continue to transition towards renewable sources of energy, they will likely encounter the same problems as Germany. On the one hand, renewable energy can supply most of the country's electricity needs. On the other hand, its variability of power generation necessitates the continued use of fossil-fuel

[15] REN21, "Renewables 2017: Global Status Report", 2017.
[16] Ivan Penn, "California invested heavily in solar power", 22 June 2017.
[17] Martin Richards, "Germany Runs Up Against the Limits of Renewables", 24 May 2016.

power plants. If left unresolved, this difficult dilemma will likely hold back the transition towards 100% renewable energy.

7.3. Institutional Ownership

Figure 14. Top 10 Institutional Ownership[18]

Company	Position	% Outstanding	Value ($)
ORIX Asset Management Corp.	10,988,577	21.72%	683,599,375
Migdal Insurance and Financial Holdings Ltd.	4,914,386	9.71%	305,723,953
Vanguard Group Inc.	3,366,355	6.65%	209,420,945
Phoenix Investments & Finance Ltd.	2,610,687	5.16%	162,410,838
BlackRock Inc.	2,472,138	4.89%	153,791,705
Clal Financial Management	1,548,783	3.06%	96,349,790
Dimensional Fund Advisors LP	1,526,801	3.02%	94,982,290
Renaissance Technologies LLC	1,085,257	2.14%	67,513,838
State Street Global	778,621	1.54%	48,438,012
Mivtachim The Workers Social Insurance Fund Ltd	679,326	1.34%	42,260,870

[18] Company Website