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Stock Data

Share Price: 0.42p
Market Cap.: £25.3m
Shares in issue: 6,030.7m

Company Profile

Sector: Mining
Ticker: WRES.L
Exchange: AIM

Activities

Tungsten exploration and production in Spain and Portugal as well as gold exploration in Portugal.

Share price performance



Source: LSE. Note that past performance is not a reliable indicator of future performance.

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TPI acts as broker to W Resources plc

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W Resources plc

Ramp-up production imminent

W Resources (WRES) is currently focused on near-term production from its wholly owned La Parrilla tungsten and tin mine located in southwest Spain. The Company is in the final construction stage of the new large-scale concentrator plant and has already commissioned the new crusher and jig plants. The newly commissioned crusher and jig plants are now operating at near design capacity. As such, we expect the Company will be able to ramp-up production during Q3 2019.

Fully funded, low capital intensity with a long mine life

La Parrilla is a fully-funded, large low-cost tungsten and tin open pit operation. The Company expects to initially process 2Mtpa producing some 2,700t of tungsten concentrate and 200t of tin during the T2 Phase. An expansion phase (T3.5) is expected to process 3.5Mtpa in year 3, producing some 4,000t of tungsten concentrate. Total JORC-compliant reserves are estimated at 29.7Mt grading 931ppm (0.1%) WO₃ and 116ppm (0.01%) Sn.

Tungsten outlook: increased demand to drive APT prices

Whilst European APT prices are likely to remain soft relative to 2018 over the near-term, we see prices recovering due to supply constraints coupled with increased demand. In the longer-term, as global consumption continues to grow, albeit at a slower pace, and production continues to lag, we expect European APT prices to recover to incentivise producers to bring new capacity on line to meet increased demand.

Promising pipeline of projects in Portugal

Elsewhere in WRES' portfolio, development work continues at the Régua tungsten project in Portugal. Infill drilling of the mine entry portals has been completed and the database is currently being updated as well as a revised resource estimate. Drill results returned thick, high-grade intercepts including 29m grading 0.75% WO₃ (drill hole RGR015) and 6m grading 0.43% WO₃ (drill hole RGR020). A haulage and crushing contract has been recently signed with a local contractor.

Located 20km from Régua is the Tarouca tungsten and tin project where high-grade zones have been intercepted including 1m grading 2.9% WO₃ and 3m grading 1.2% WO₃.

WRES' São Martinho gold project has a JORC-compliant resource 3Mt grading 1.04g/t Au. The best intercept was 56.4m grading 2.34g/t Au from surface. Management has a near-term target of some 250koz. Consultants are working towards an updated JORC-compliant resource.

Valuation: SOTP at 1.07p per share (un-risked)

We value WRES on a SOTP basis based on a DCF model for La Parrilla (given its imminent production) and provide a relative valuation based on our selected tungsten explorers and developers peer group for the Régua project. Assuming a discount rate of 10%, a flat long-term tungsten price of US\$300/mtu, a 10-year life of mine and inputs from the Final Investment Decision Report (August 2017), we calculate an NPV of £85.1m for La Parrilla. To this we then add an implied EV of £3.9m, based on our average EV/resource multiple of 3.2x for the Régua project. Taken together, our SOTP un-risked valuation implies a £89m, which translates into an equity value of £64.8m or 1.07p per share, representing a 155% upside to the current share price of 0.42p.

Investment Summary

Company description

WRES is a production, exploration and development company with several tungsten projects including the past producing La Parrilla tungsten mine in south-western Spain and the Régua tungsten exploration project in Portugal. The Company also has a tin (and tungsten) exploration project at Tarouca as well as a gold exploration prospect at Portalegre, both located in Portugal. WRES is also developing the São Martinho gold project in Portugal with a current JORC-compliant resource of 3Mt grading 1.04g/t Au and is currently working on an updated resource update. WRES is currently focused on ramping up production of the La Parrilla project during its initial T2 development (up to 2Mtpa) in Q3 2019, followed by an increase to 3.5Mtpa during the T3.5 development phase in 2021.

Valuation: 1.07p per share based on the SOTP

For the basis of WRES' valuation, we have taken the established compliant resource at Régua and applied a US\$3.2 per mtu (metric ton unit = 10kg of WO₃) EV/resource multiple derived from our group of tungsten explorers. In addition, we calculate a DCF-derived valuation for the La Parrilla project using an 10% discount rate and a long-term price of US\$300/mtu for a 10-year life of mine as well as parameters set out in the 2017 Final Investment Decision Report. Our SOTP equity valuation is £64.8.5m or 1.07p per share, which implies a 155% premium to WRES current share price. We see additional upside should WRES other exploration projects be converted to resources.

Financials

On 16 February 2018, WRES secured a US\$35m loan to fund the development of the La Parrilla mine from BlackRock Financial Management Inc. The loan has a five-year term with an average rate of 12.6% interest. Repayment will be made by free cash-flow and WRES has the right to repay the loan after two years subject to a 5% premium, 3% after 3 years and no premium after four years. As at 31 December 2018, WRES had a cash balance of £4.3m. On 28 March 2018, WRES' wholly owned subsidiary received confirmation that it will receive a €5.3m grant from the Junta de Extremadura Government. The grant is expected to be paid in Q4 2019. As such, WRES has secured a €3m loan facility with Caja Rural de Extremadura that provides an advance on this funding with an interest rate of 1.7% per annum for a term of 15 months.

Tungsten market

China is the largest producer of tungsten, at c82% of global production. We expect pricing to be well supported over the medium to long term as global supply remains tight on the back of China reducing its presence in the international end-product market and its local concentrate shortage. Assuming this trend continues and China's tungsten consumption keeps growing at a modest 5-10%pa against the backdrop of its slowing economy, we think the prevailing market tightness is unlikely to be significantly affected any increase in supply. Given the current uncertainty in capital markets, we see significant risk for project and execution delays for projects that require financing.

Risks and sensitivities

Ammonium paratungstate (APT) and tin prices are the greatest sensitivity within our valuation. We note that a 10% reduction in our long-term European APT price of US\$300/mtu coupled with a 10% reduction to our long-term Sn price of US\$19,000/t results in a 23% decrease in our NPV.

Given that La Parrilla is fully funded and ramp up production is expected during Q4 2019 we believe there is limited risk in terms of additional funding and execution. That said, we note that the tungsten and tin price may fall affecting the project economics and WRES' ability to service its loan to Blackrock Financial Management.

Overview: Company description and history

W Resources (WRES) is a tungsten production, development and exploration company focused on development of the La Parrilla project. The La Parrilla mine is located in the Extremadura region of south-west Spain, within the provinces of Caceres and Badajoz and approximately 310km south-west of Madrid. The site is accessed directly from the highway along a 3km asphalt road and is serviced by electricity and water.

The La Parrilla mine lies within the western part of the Iberian Peninsula, referred to as the Centro Iberian Zone, which represents the central part of the Hercynian orogeny. This area is dominated by intense metamorphism and multiple granitic intrusions. Mineralisation comprises coarse-grained scheelite bearing veins hosted within greywacke and shale. The mineralised veins range in thickness from 1cm to 3.95m and dip shallowly towards the south-east at 30 degrees. Veins form a series of 10m to 45m wide zones that display good continuity over 300m down-dip and several 100s of meters along strike. Greissendised granite fingers have also been intersected providing the highest-grade intersections to date (55m grading 0.73% WO₃). During the period from 1968-1986 7Mt of ore was processed.

WRES' other tungsten projects include the Régua and Tarouca as well as its CAA/Portalegre gold/copper project and the São Martinho gold project in Portugal.

Figure 1. WResources project locations



Source: W Resources

La Parrilla – large-scale, low-cost and long-life tungsten and tin project

La Parrilla is a large-scale, low-cost, long-life tungsten and tin project, located approximately 310km southwest of Madrid. The project is fully funded and T2 development work is expected to be completed in Q3 2019 with ramp up to large scale production comprising 2Mtpa of ore, producing c2,700t of tungsten concentrate and c400t of tin concentrate per annum. La Parrilla has a JORC-compliant resource of 49Mt grading 998ppm (0.01% WO₃) and compliant reserves including dilution of 29.8Mt grading 931ppm (0.01% WO₃) supporting an estimated 11-year mine life.

Table 1. La Parrilla JORC-compliant mineral resource estimate (May 2017)

Classification	Tonnage (Mt)	WO ₃ (ppm)	Sn (ppm)	Metal content (WO ₃ t)	Metal content (Sn)	Contained WO ₃ (mmtu)
Measured	1	1,115	278	1,115	278	0.11
Indicated	35	1,004	110	35,140	3,850	3.51
Inferred	13	974	97	12,662	1,261	1.27
Total	49	998	110	48,917	5,389	4.89

Source: Golder Associates

Table 2. La Parrilla JORC-compliant diluted mineral reserves estimate (June 2017)

Classification	Mt	WO ₃ (ppm)	Sn (ppm)	Metal content WO ₃ (t)	Contained WO ₃ (mmtu)	Metal content Sn (t)
Proven	1	995	251	1,171	0.12	295
Probable	29	928	111	26,511	2.65	3,156
Total	30	931	117	27,682	2.77	3,451

Source: AYMA Mining Solutions

Development

With funding finalised in early 2018, WRES has turned its attention to mine construction and development. The crusher plant concrete and civil works were completed during the summer of 2018. The Metso crusher plant equipment was fabricated in their plant in Mâcon, France and was delivered to site as steelwork which was erected on a just in time basis. The fully automated crusher plant is complete and fully commissioned to design capacity of 350t/hour.

The earthwork and foundations for the jig and mill plant were completed in Q3 2018 with mechanical completion occurring in April 2019. Commissioning of the jig & mill plant is in the final stages leading up to acceptance and hand-over to operations. Construction of the large-scale concentrator plant is being built under a fixed price schedule contract with allmineral Aufbereitungstechnik GmbH & Co. KG and is scheduled for completion and commencement of commissioning following ramp-up in Q3 2019.

Figure 2. La Parrilla construction nears completion



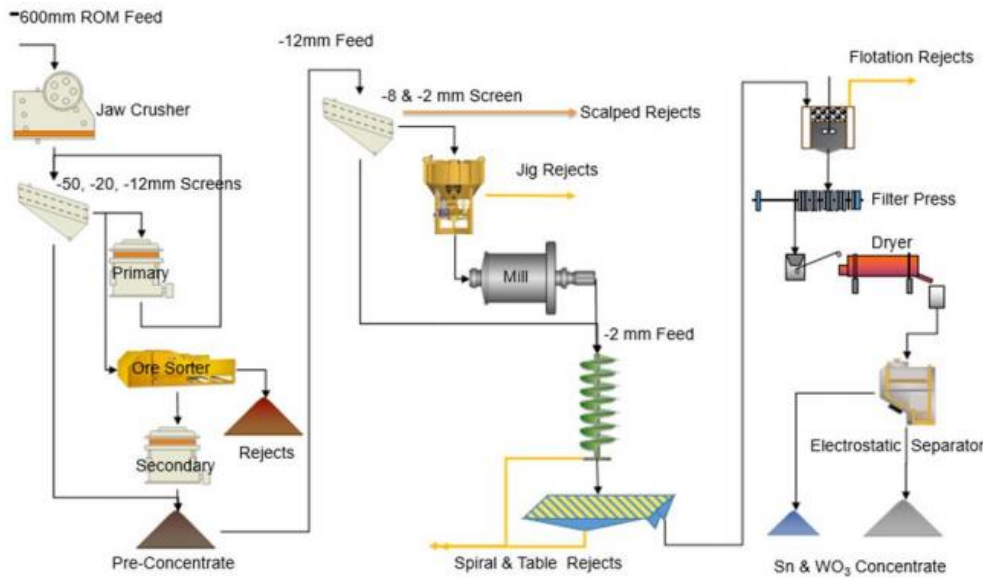
Source: W Resources

Processing and Production

Initial concentrate production at La Parrilla began in October 2018, with first shipments occurring in late November 2018. Initial production was from tailings material that fed to the existing concentrator plant, since then a series of production runs on mined ore have been successfully completed. On 30 April 2019, the first blast occurred for the T2 Phase to prepare access to the 10m benches closer to the ROM pad and crushing plant. Mined ore is to be initially dry processed at the mine site through a conventional dry crushing and screening plant, including coarse x-ray ore sorting during the T3.5 phase. Advanced jig technology produces a quality preconcentrate which is ultimately concentrated by conventional gravity techniques. A tin concentrate will be produced via electrostatic and magnetic separations and arsenic levels reduced to below product specifications via standard sulphide flotation techniques.

Following the completion and commissioning of the jig and mill plant, WRES has started production tests using the new large-scale crusher plant and the existing concentrator plant. Production will then move to a larger-scale operation with the start-up of the new concentrator plant. WRES plans to produce tungsten and tin concentrates via conventional gravity separation techniques. Management has undertaken detailed metallurgical testwork in order to refine the process flow sheet.

Figure 3. La Parrilla flow sheet

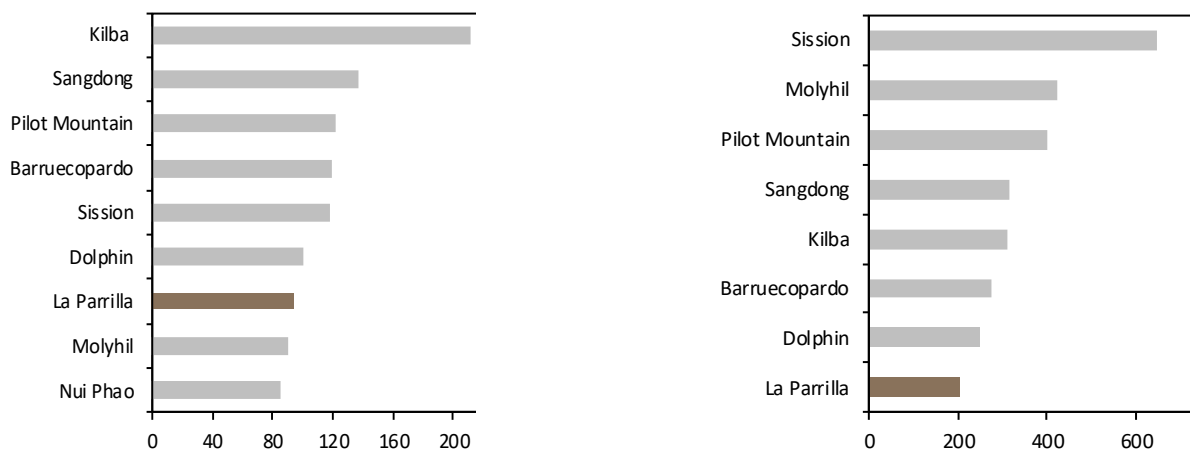


Source: W Resources

Capital and operating costs

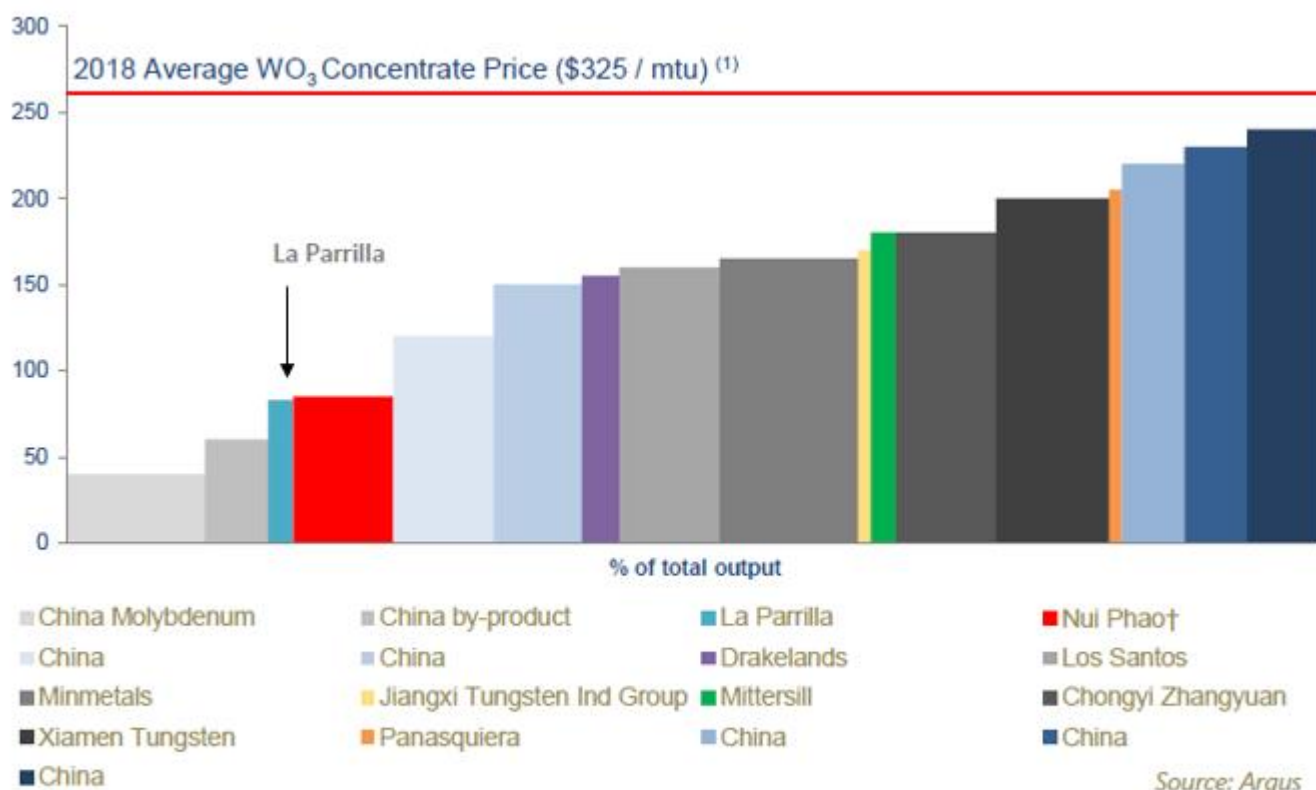
The La Parrilla mine project’s total estimated capital cost is US\$48 (£37m) spilt into US\$27.8 (£21.4m) for the T2 Phase and US\$20m (£15.4m) for the T3.5 Phase. The average unit cash operating cost is US\$94/mtu during the first six years of production as indicated by the Final Investment Decision Report (August 2017). This represents one of the lowest cost producers. Likewise, La Parrilla has a low capital intensity of US\$200/mtu that compares favourably with similar-scale open-pit projects.

Figure 4. Capital intensity (RHS) and opex (LHS) in US\$/mtu for selected tungsten projects



Source: W Resources and Turner Pope Investments

Figure 5. At full production La Parrilla would sit in the lowest quartile of the global cost curve.



(1) Assuming a 20% discount to the 2018 average European APT tungsten price of US\$325 / mtu (Source: Metal Bulletin)

Source: Argus Metals Week, presentation, February 2019

Offtake agreements

In February 2018 WRES signed two major off-take agreements: the first with Wolfram Bergbau und Hütten AG, (WBH), the largest tungsten processing company in Europe and the second is directly with a leading supplier to the USA tungsten markets.

Going forward, WRES will supply both off-take partners with approximately 66% tungsten concentrate on competitive pricing terms. These agreements cover the initial T2 development of the La Parrilla Mine and will account for approximately 80% of the planned production during this phase. There is significant demand for the balance of production which WRES plans to secure offtake following initial production start-up.

Régua and nearby Tarouca – ready for development

The Régua tungsten project, located in the Viseu region of North East Portugal, is a high-grade deposit wholly owned by WRES. The proposed project will be an underground operation scalable at low cost and requiring limited capital. In October 2015, Golder Associates confirmed a compliant mineral resource estimate of 5.46Mt grading 0.28% WO₃, based on a cut-off grade of 0.1% WO₃. The deposit remains open in all directions and at depth.

Table 3. Régua JORC-compliant mineral resource estimate (October 2015)

Classification	Tonnage (Mt)	WO ₃ (ppm)	Metal content (WO ₃ t)	Contained WO ₃ (mmtu)
Indicated	3.76	3,040	11,430	1.14
Inferred	1.7	2,270	3,859	0.39
Total	5.5	2,800	15,289	1.53

Source: Golder Associates. 1000ppm (.1% WO₃) cut-off grade.

WRES has now secured all approvals, and in February 2018 cleared the last hurdle for development with the purchase of 20.3ha of land covering the main area of the Régua mine, for a total consideration of €300,000. The acquired land covers the outcropping resource of the deposit along with the trial mine facilities including the portals and the underground projected stopes. The project already has a trial mining licence in place and in July 2018, the Portuguese Secretary of State for Energy under the Ministry for the Economy granted a further one-year extension valid until the 19 June 2020. Régua's high ROM grade (at greater than 0.3% WO₃) and proximity to a crushing facility are likely to prove beneficial to the project economics.

WRES has recently signed a crushing and haulage with a local company, Francisco Pereira Marinho Imaos SA (FPMI). Once mining has commenced, ore will be hauled to an existing FPMI crushing plant located 27km and crushed to 8mm. The estimated crushing and haulage cost is approximately US\$40-50/mtu and WRES will pay €50,000 to expand access roads for haulage. Processing of the crushed ore will be done through the existing La Parrilla concentrator plant which will be moved to Régua and upgraded.

Tarouca – could provide additional ore

In 2015, trench sampling at the Tarouca project showed high-grade tungsten results with 15 out of 126 samples >0.5% WO₃, including 0.8m grading 11.4% WO₃ (drill hole TTR063). Taken together with the 15 holes drilled in 2014, this confirms a highly prospective exploration target in the north-eastern area of the licence. In April 2018, WRES' exploration team carried out a RC drilling programme including 29 holes totalling 1,515m of total drilling. Assay results, as announced on 7 June 2018, returned high-grade tungsten intersections, including 1m grading 2.9% WO₃ (drill hole TARC011) and 3m grading 1.2% WO₃ (drill hole TARCO14). Moreover, 11 assays reported grades over 1% WO₃. A further 2,725m, comprising 916m of diamond core drilling and 1,809m of RC drilling was completed in Q1 2019. Results confirmed continuity of mineralisation with excellent grades and significantly thicker zones of higher-grade ore including 29m grading 0.75% WO₃ near two proposed mine portals. The next step will be resource modelling with a view to prepare a trial mine application in 2019.

Initial results have reported some very high-grade tungsten zones have been intersected which provides greater reassurance that this project can provide additional high-grade feed to the Régua mine development, just 20km to the north. The above drill results also provide greater clarity on the geological structure and the potential for continuity of mineralisation.

Other projects

São Martinho – Gold

The São Martinho gold project currently has a JORC compliant resource estimate of 111,987oz. Results from the drilling campaign in 2017 provided very promising results with a thick intersection of 56.4m grading at 2.34g/t Au from surface.

These results provide a base to drive extension drilling with the potential for a materially larger resource. In May 2018, the Portuguese technical team commenced a 15-hole, 2,000 metre RC drilling programme with a view to materially increase the JORC resource. Initial results were received in July 2018, which highlighted continued strong gold intersections, enabling the team to further delineate the deposit. The evaluation work on this programme remains ongoing. The overall results of the RC drilling campaign will form part of the update for the upgrade to the JORC compliant mineral resource estimate. In November, the Company appointed SRK Consulting (UK) Ltd to complete the upgraded São Martinho gold deposit resource estimate which is now scheduled for completion in Q2 2019.

Table 4. São Martinho maiden JORC-compliant mineral resource estimate (June 2016)

Classification	Mt	grade (g/t Au)	contained gold (oz)	Cut-off (g/t Au)
Indicated	0.48	1.03	17,363	0.5
Inferred	2.56	1.05	94,624	0.5
Total	3.04	1.04	111,987	0.5

Source: *Goldier Associates.*

Valuation

We value WRES on a SOTP basis with the La Parrilla open pit being the main driver of the company's valuation. We calculate a DCF-derived valuation of £85.1m based on an 10% discount rate and 10-year life of mine. Our model is based on the parameters set out in Final Investment Decision Report (August 2017) and forms the basis of the mine development plan. The 2017 FID outlines a two-stage development strategy, commencing with T2 processing 2Mtpa for years 1 – 2 and then expanding to T3.5 processing 3.5Mtpa. Total capex is estimated at US\$48m consisting of US\$27.8m for T2 development and US\$20m for T3.5 (as outlined in the FID report). The average operating costs is US\$94/mtu during the first six years of production. We have not attributed any value to WRES' other projects given the early stage of development but will revisit as the projects move through advance stages of development.

Table 5. La Parrilla 10-year life of mine NPV valuation

	unit	2018	2019	2020	2021	2022	2023	2024	2025	2023	2024	2025
LTAPT price	US\$/mtu		300	300	300	300	300	300	300	300	300	300
LT concentrate price	US\$/mtu		240	240	240	240	240	240	240	240	240	240
ROM production	000t		0	2,000	3,200	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Feed grade	%		0.14%	0.13%	0.10%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%
Recovery	%		72%	72%	72%	72%	72%	72%	72%	72%	72%	72%
Saleable concentrate	000mtu		0	181	236	281	281	281	281	281	281	281
Sn grade	%		0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Sn recovery	%		68%	68%	68%	68%	68%	68%	68%	68%	68%	68%
Saleable Sn conc	t		0	150	239	262	262	262	262	262	262	262
Revenue	US\$'000		0	43,476	56,678	67,496	67,496	67,496	67,496	67,496	67,496	67,496
Total cash cost	US\$'000		0	17,265	21,666	26,243	26,243	26,243	26,243	26,243	26,243	26,243
EBITDA	US\$'000		0	26,211	35,012	41,253	41,253	41,253	41,253	41,253	41,253	41,253
Operating profit	US\$'000		0	22,975	25,372	30,709	30,709	30,709	38,259	38,259	38,259	38,259
PBT	US\$'000		0	22,975	25,372	30,709	30,709	30,709	38,259	38,259	38,259	38,259
Tax payable	US\$'000		0	(6,893)	(7,612)	(9,213)	(9,213)	(9,213)	(9,947)	(9,946)	(9,945)	(9,944)
Profit after tax	US\$'000		0	16,083	17,760	21,496	21,496	21,496	28,312	28,313	28,314	28,315
FCF	US\$'000	(25,400)	0	19,318	5,501	32,041	32,041	32,041	31,306	31,306	31,306	31,306
Discount rate	%		10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Discount factor	#		1.00	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47	0.39
Discounted FCF	US\$'000	(25,400)	0	15,966	4,133	21,884	19,895	18,086	16,065	14,604	13,277	12,070
Sum of discounted FCF	US\$'000		110,579									
Enterprise value	US\$'000		110,579									
Enterprise value	£'000		85,061									

Source: *Turner Pope estimates*

We value the La Parrilla project on a DCF basis given its near-term production and provide a relative valuation based on our selected tungsten explorers for the Régua project. Assuming a discount rate of 10%, a flat long-term tungsten price of US\$300/mtu and inputs from the FID, we calculate an NPV of £85.1m or 1.41p per share. To this we then add an implied EV of £3.9m or 0.07p per share, based on our average EV/resource multiple of US\$3.2/mtu to the Régua project. Taken together, we calculate an indicative enterprise value of £89.0 which translates into an equity value of £64.8m or 1.07p per share, representing a 155% upside to WRES' current share price.

Table 6. SOTP summary valuation

	ownership	value method	£m
La Parrilla mine	100%	NPV	85.1
Régua deposit	100%	EV/Res	3.9
Enterprise value			89.0
Net debt			24.2
Equity value			64.8
Number of shares (m)			6,031
Equity value per share (p)			1.07
current share price (p)			0.42
upside (%)			155

Source: Turner Pope estimates, as at 15/08/2019.

Sensitivities

Our NPV valuation is most sensitive to the European APT and tin prices, where a 10% reduction in our long-term European APT price of US\$300/mtu and a 10% reduction in Sn price results in a 23% decrease in our NPV. Other sensitivities are shown in the table below.

Table 7. La Parrilla NPV sensitivity

	-30%	-20%	-10%	Base case	10%	20%	30%
APT price, \$/mtu	210	240	270	300	330	360	390
Sn price US\$/t	13,300	15,200	17,100	19,000	20,900	22,800	24,700
La Parrilla NPV, £m	27.4	46.6	65.9	85.1	104.3	132.5	142.7
WRES equity value, £	0.12	0.44	0.76	1.07	1.39	1.71	2.03
Discount rate		5%	8%	10%	12%	15%	
La Parrilla NPV, £m		119.3	97.2	85.1	74.5	61.2	
WRES equity value, £		1.64	1.28	1.07	0.90	0.68	
Unit cash cost, US\$/mtu	66	75	85	94	103	113	122
La Parrilla NPV, £m	106.0	99.0	92.0	85.1	78.1	71.1	64.2
WRES equity value, £	1.42	1.31	1.19	1.07	0.96	0.84	0.73

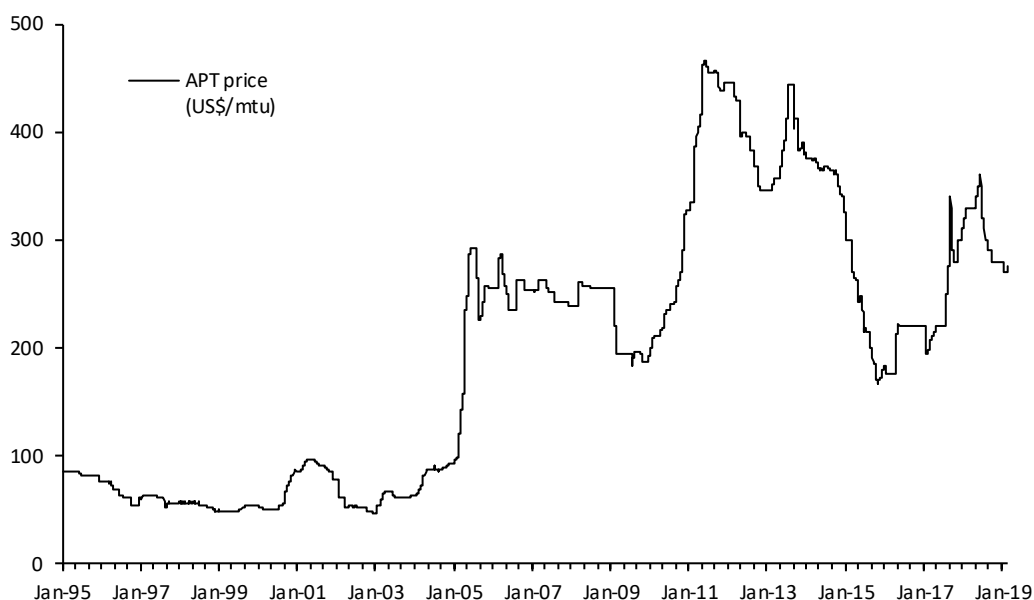
Source: Turner Pope estimates.

Tungsten prices: All eyes remain on China

Tungsten is commonly traded as ammonium paratungstate (APT) and most producers sell tungsten-bearing concentrates based on the APT price, discounted for processing costs at approximately 20%. The cost of building a chemical processing plant to produce APT is generally prohibitive for most small-scale producers.

The European APT price remains soft, with the current value of cUS\$230/mtu, more than 50% off its highs of US\$462/mtu in May 2011. However, this is significantly higher than prices seen between 1995 and 2010, exceeding the average price by more than 200%. This structural price increase has been driven by the tightness of the global supply-demand balance for tungsten, which is now considered a strategic mineral due to its unique chemical characteristics and high relative supply-risk. The unique physical properties of tungsten, including melting point, hardness and tensile strength, coupled with the lack of substitutes, make it a critical element which is widely used in industrial, oil & gas, mining and agricultural applications.

Figure 6. European APT spot price, US\$/mtu



Source: Bloomberg.

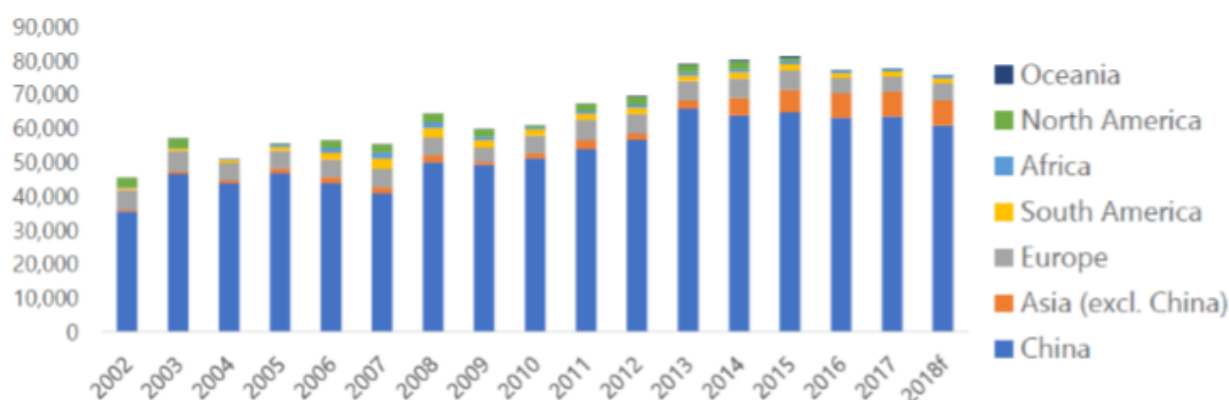
China, which accounts for c82% of the global supply and c60% of demand, has regulated its tungsten industry by limiting the number of mining and export licences, imposing quotas on concentrate production and placing constraints on mining and processing. Overall, it is estimated that China's tungsten demand grew by as much as 9% per annum over the last decade, compared with just 2% in the developed countries (Argus). As such, world consumption grew by 3% per annum over the past decade and reaching just over 100,000t in 2016. Global demand is forecast to grow by 2.5% pa till 2026. Automotive, mining, construction and the oil & gas sectors remain the largest end users and consumption is expected to grow with increasing applications.

While China's economic growth is slowing, we expect its tungsten demand is likely to keep growing at a rate of 5-10% per year, as both industrialisation and urbanisation continues. In line with its increased demand, China has also grown its tungsten supply although very little mine supply is being exported and domestic mine supply is supplemented with imports. China is more focused on increasing exports of value-added tungsten products to the world market. This has contributed to a tightening supply of tungsten concentrates to non-Chinese consumers. As such, a reduction in the availability of tungsten concentrate outside of China has incentivized end-users to secure dependable sources outside of

China. China's market share of global production continues to be the dominant force with 82% of production in 2017. Along with new non-China mine supply, China's market share is expected to be reduced by growing scrap recycling. This trend is especially visible in developed countries, as approximately 45% of tungsten demand in the US and Europe was met from secondary sources. According to Roskill, some 26% of global supply will be sourced from recycling.

According to Roskill, the global tungsten market was in excess supply from 2014 to H2 2016, resulting in reduced output in 2016. We expect supply to again be reduced this year as mine closures in China and the UK make an impact. Supply curtailments have had a positive effect on prices with levels remaining steady above US\$200/mtu since the beginning of 2017. We believe that tungsten pricing should be well supported in the medium to long term, as supply will remain constrained and is unlikely to be significantly challenged by increase in any new mine supply coming in 2019-20. Notwithstanding the potential supply shortages, as is always the case in mining, there is a high execution risk as some of the announced projects have not yet been through the feasibility study stage and/or secured financing.

Figure 7. Historical tungsten mine supply 2002-2018



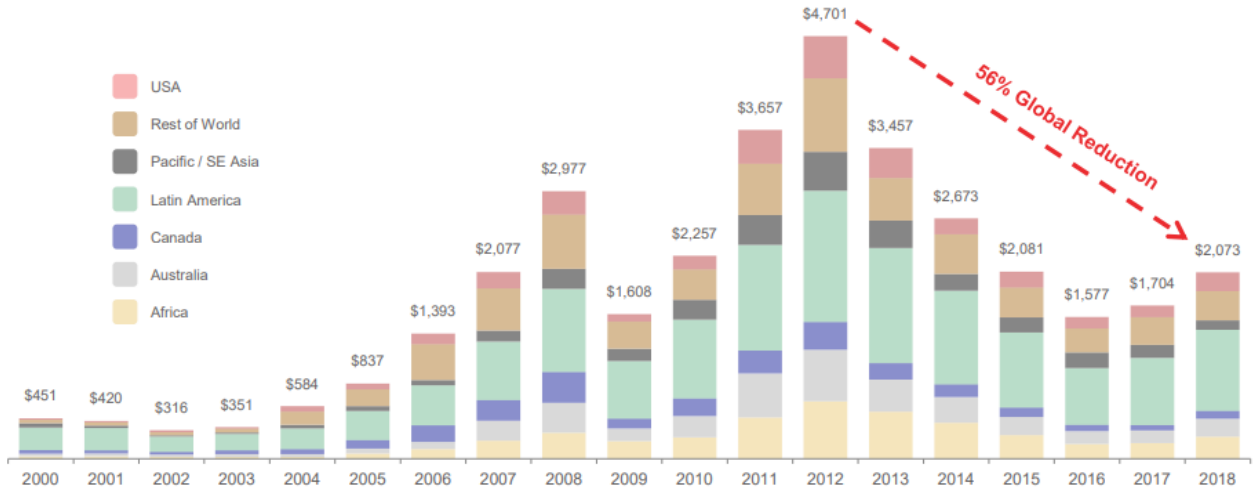
Source: Roskill

Pricing for APT, the benchmark used to derive concentrate pricing, was based on the Argus Tungsten Annual 2018 report and published in October 2018. Argus forecasts APT prices based on Base, High and Low scenarios, commencing January 2021 through to 2028, as follows:

Base case	Range US\$/mtu commencing Jan 2021 thru to 2028	
High	345	360
Base	295	310
Low	245	260

We believe declining exploration expenditures will continue to drive demand for robust projects in all commodities. We note that exploration expenditure, according to S&P Global Market Intelligence, has declined 56% since its peak in 2012.

Figure 8. Global exploration spends in US\$



Source: S&P Global Market Intelligence.

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