



**Overview**

Brazilian Nickel PLC (BRN) owns 100% of the low cost Piauí Nickel Project (PNP) in north-eastern Brazil through its subsidiary, Piauí Níquel Metais S.A.. BRN acquired the project from Vale S.A. in January 2014. To date over US\$85 million has been spent developing the project.

The project resource contains 72 Mt at 1.00% nickel and 0.048% cobalt, with 73% of the resources in the JORC Measured category. An operating demonstration plant has leached 8,000 tonnes of ore in full-height heaps and has achieved first sales of nickel and cobalt products.

**Geology and Resources**

The Piauí deposit is a nickel laterite.  
The project has a JORC (2012) resource as follows:

JORC Category	Volume ('000m <sup>3</sup> )	Tonnes ('000t)	Ni (%)	Co (%)	Fe <sub>2</sub> O <sub>3</sub> (%)	MgO (%)	Al <sub>2</sub> O <sub>3</sub> (%)	MnO (%)	Cr (%)	SiO <sub>2</sub> (%)
Measured	31,040	52,887	1.03	0.048	17.84	9.95	4.85	0.29	0.69	51.90
Indicated	11,242	19,324	0.92	0.048	18.26	10.44	4.69	0.32	0.84	50.45
<b>Total</b>	<b>42,282</b>	<b>72,211</b>	<b>1.00</b>	<b>0.048</b>	<b>17.95</b>	<b>10.08</b>	<b>4.81</b>	<b>0.29</b>	<b>0.73</b>	<b>51.51</b>

Total Mineral Resources <sup>1</sup> of the Piauí Deposit at the 0.6% nickel cut-of-grade

**Mining**

The Piauí deposit occurs as an isolated hill and the near surface ore is mineable by conventional open pit mining. The mining licence is in place.



The Piauí Nickel Deposit

**Process**

The ore is amenable to sulphuric acid heap leaching which produces a Pregnant Leach Solution (PLS) containing nickel, cobalt and other metal species. The PLS is then treated in a simple precipitation circuit where limestone is added to remove iron and other impurities from the PLS. The remaining solution is then passed through an ion exchange process which separates and concentrates the nickel and cobalt solutions which are then precipitated and filtered as high purity nickel and cobalt hydroxide for packaging and sale. All residues are solid wastes with no need for any tailings dams necessary.

**Markets**

Nickel and cobalt production are targeted to be sold into new growth markets, such as lithium ion battery cathodes for use in electric vehicles, but can also serve conventional industrial needs (nickel to stainless steel, cobalt for refining to metal).

**Status**

BRN has successfully completed large scale demonstration of the heap leaching, purification and recovery of nickel and cobalt from the Piauí ore. Starting in May 2016, three commercial height heaps have been operated, with two heaps now completed with target nickel extractions of 80% achieved with low consumption of acid.



Demonstration Plant

The downstream impurity removal precipitation circuit was continuously operated from July 2016 to March 2017. The first nickel and cobalt hydroxide products were produced in August 2016, and the first trial products were exported and sold in December of that year. Early in 2017 the ion exchange unit was operated producing higher purity Nickel and cobalt products which have been shared with potential off-takers.

All preliminary environmental licences, Licença Prévia (LP) (awarded Jan 2020) and water extraction permits are in place. The project has good Piauí state government and local community support.

**Bankable Feasibility Study**

BRN is now ready to undertake a Bankable Feasibility Study (BFS) on the project. Current internal company estimates indicate that the project is expected to have an all-in financing requirement of US\$ 465 million for 25,000 tpa of contained nickel and 900 tpa of contained cobalt, with production targeted for end 2022. Operating costs after refining charges and cobalt credits are expected to be less than US\$ 2.8/lb of nickel. The project could start with a smaller financing requirement of US\$ 195 million to produce 10,000 tpa Ni and 450 tpa Co before ramping up to the higher production level.

**'PNP 1000' quick start plan**

BRN plans to capitalise on increasing nickel prices by expanding the existing demonstration plant by a factor of 10 (approx.). This will expand the production at the demo plant to 1,400 t of Ni a year (PNP1000), for a capital cost of just US\$ 16 million. PNP1000 is profitable at prices above US\$ 11,000/t. This expansion can be implemented in only 12 months, without the need for a BFS and using existing environmental permits, and would thus jump-start BRN's project to immediate producer status.

<sup>1</sup> All figures in the tables are rounded, and therefore the total sums might not be the direct sum of the input figures. The Mineral Resource estimate was completed by Rory Devlin under the direction of Mick Elias. Rory Devlin and Mick Elias are employees of CSA Global. Mick Elias FAUsIMM is a Competent Person as defined by the Australasian Code for the Reporting of Exploration Results, Mineral Resources or Ore Reserves (JORC Code 2012 Edition) and consents to the inclusion in the JORC report of the matters based on the information in the form and context in which it appears.