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SIR HUMPHRY DAVY

## “Energetics”

Financial models are as flawed as the assumptions that go into them, says Royal Gold's founder *Stanley Dempsey*, who proposes a new way to rank mines and industrial operations

What if mines are not about money? What if there was a new, truer, benchmark that industrial operations could all be ranked against? It's a radical premise, especially coming from Stanley Dempsey, a lawyer and merchant banker who founded Royal Gold, a \$5bn financing house listed on the New York Stock Exchange.

“I've always been attracted to the idea of looking at the energy input and output of a mine,” says Dempsey, 78, “to get a common understanding of what it really costs to build a mine.” Having spent decades in mining and finance, Dempsey has come to the conclusion that money-based metrics are flawed, he says from his office in Denver. Exchange rates swing around, taxes bob up and down and commodity prices are impossible to predict, so financial models are as faulty as the assumptions that go into them. But is there any better way to measure an operation's underlying economics?

Working as a young lawyer on an aluminium plant in the US, Dempsey started thinking about “input-output” analysis, he says. “It is interesting to think of all of the 'things' that come through the front gate of a plant, and what comes out the other end.” Alumina and electricity were pumped into the facility, whilst heat and aluminium were noisily pumped out. Fix an energy metric on each component and Dempsey's team of engineers could have modelled the plant's energy efficiency.

The idea is not totally new. In the 1970s, ecologist Charles Hall was looking at the

energy that animals burn during migration, before widening the idea to look at the net energy impact of oil wells in the US, including dry wells drilled. Society, Hall argued, was making huge investment decisions based on financial hunches about prices decades into the future, without any reference to where the highest underlying energy returns could actually be had.

As fuel prices fell in the 1980s and '90s, Hall's concept lost its urgent imperative, but Dempsey had been working alongside ecologists on the Henderson mine in Colorado, the first example of ecologists being brought inside a mine's decision-making process. “They showed us things we didn't know,” Dempsey remembers, “and vice-versa. The collaborative effort really worked. It got a lot of national attention.”

Energetics, or the idea of modelling energy flows, could also be lifted from ecology to be used in the mining industry, Dempsey argues. A mine's largest costs, from electricity to explosives, could all be converted into energy units, stripping out variable financial assumptions.

Mines with an energy return over their life-cycle of less than, say, 3-to-1 could simply be left on the drawing board. The metric could be used to tweak and inform everything from the mining rate (should we buy a new digger to speed-up production?) all the way up to international mineral policy (should we build a new railway to unlock a new basin?), giving everyone from investors to policymakers a new insight.

Dempsey's idea could lead to some

controversial conclusions. One study in 2010 found that coal mining boasts an energy return of around 80-to-1, easily outdoing wind farms or nuclear power. There are also huge complications, from working out the best methodology for measuring 'energy invested', to deciding how far up a supply chain 'sunk energy' should go. “I'd like to challenge all those new mining engineers out there to see if they can figure this out,” says Dempsey, chuckling, as a quacking duck ringtone pings on his smartphone. “I am sure there are plenty of problems with my approach, but I don't think that the laws of thermodynamics are one of them.”

And what advice would Dempsey offer youngsters running mining assets today? “I'd really drill down on each part of the technology, from what happens with people sitting in a tent in the Yukon drilling a hole when a helicopter can't come in with their food, all the way down to the mine, the mill, the ocean transport. Don't just go to the mine and look over the side of the pit and say, 'Boy, those trucks are big.' Really make this your heart and soul and know everything you could know about the industry.”

*Stanley Dempsey* was chairman of Royal Gold for over 20 years, growing it into one of the largest gold groups on the NYSE. He has degrees in law and geology and studied business at Harvard. His postgraduate work was in industrial engineering at a moly mine in Colorado

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