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Bureaucracies for the Better

To continue to lift its population out of poverty, India should give its energy ministries a new mandate—moving the country away from coal and toward a more sustainable economy.

2006: Missed opportunities at an ice cream factory

It was a hot and humid New Delhi afternoon, and I'd recently returned to the country of my birth for a summer internship at the Center for Science and Environment, a well-known environmental think tank. I was shadowing my boss on a surprise inspection of an ice cream producer suspected of discharging untreated waste into one of the city's many open-air drains.

A guard nervously ushered us into the factory, where the air was heavy, the lighting broken, and the floor muddy. Along the way, the guard offered us, and the inspector from India's Central Pollution Control Board (CPCB), ice cream from one of the freezers. While my boss and I declined, the CPCB official did not hesitate to accept. The inspector remarked on the improper lighting and ventilation and collected effluent samples. Then we departed for the next inspection, at a meat-processing facility.

That was my first experience with the remnants of India's legendary "inspector raj," an entrenched system of onerous government regulation and inspection that has roots in the bureaucracy installed by the British in the nineteenth century. The regime falls hard on small and medium enterprises, which receive countless citations, fines, and closures for—among other things—polluting. I don't know whether the samples collected that day ever made their way to a lab or if the company was ever cited. The CPCB has doggedly pursued its mandate of inspections and citations for generations, but industrial pollution continues to rise.

Recently, I have been thinking about that inspection and others like it. Could the CPCB offer solutions, rather than citations? Could the agency's vast knowledge and staff catalyze new ways for firms to work? Is it possible that the owners of a sketchy ice cream factory and a frazzled government inspector could combine forces to produce hygienic ice cream, good jobs, and clean effluent and thus help foster a vibrant, ecologically sustainable economy? In other words, could the creaky old inspector raj be repurposed for the future?

It is increasingly clear that the intergovernmental process to address climate change rests upon a presumption that countries must accept their "burdens to bear." This puts carbon management at the center of the problem, pitting entrenched institutions responsible (directly or indirectly) for management of the fossil fuel value chain against forces that rightly wish to turn the tide. This antagonistic conceptualization also ignores the flip side—that the energy transition offers opportunities to share in new technologies and ways to create value, a cleaner environment, and potentially a more equitable economy in which pollution doesn't fall hardest upon the poorest.

As a venture philanthropist based in the European Union, I believe tremendous opportunities could be unlocked if we could harness the power of entrenched bureaucracies for the better. India's dual challenge of reducing carbon emissions while raising the standard of living for its citizens is huge. The expertise of the country's enormous civil service, one of the oldest in the world, cannot be overestimated. Rather than relegating legacy energy management institutions to the past, India now has an opportunity to speed the pace of change by helping the people who work for them apply their knowledge and know-how to our future.

A laboratory for institutional innovation

Today, India's energy management institutions face an extraordinary confluence of challenges that, together, provide a once-in-a-generation opportunity for change. Not the least of these challenges is carbon. Under pressure to declare a carbon emissions reduction target, India announced a goal of net-zero emissions by 2070 during November 2021's COP26 in Scotland. This means the country has only 50 years to get off the coal value chain that is responsible for 70% of

its electricity, employs roughly 20 million people, and generates considerable revenues for the government.

A second and ongoing challenge is that India must constantly innovate to balance its growing intellectual capital—which is making it an influential player in information technology, space exploration, and biomedical sciences—with its pressing need to alleviate poverty and improve living conditions for hundreds of millions of citizens. Over the last decade, as part of this effort, India has provided electricity to nearly 50 million new users annually—equal to the entire population of Spain every year—culminating in electrification of virtually all households by 2019.

Almost simultaneously, in 2018, the use of coal for electricity generation peaked and began to decline as renewable energy became the cheaper option, putting terrific financial pressure on coal-dependent utilities.

The final straw was the arrival of the COVID-19 pandemic. India's energy management institutions, particularly cash-strapped, state-owned ones, are struggling to keep the electrons flowing while navigating this rapidly evolving energy landscape.

To recover from the pandemic and to meet its international climate commitments, India now needs to inject a significant amount of capital—much of which may come from outside the country—to fix the entrenched problems of its power sector and progressively transition away from coal. Managing this transition while keeping the lights on, maintaining economic growth, and reducing poverty cannot be done if fossil fuel ministries follow their old mandates. Moving forward will inevitably involve disruption: as new technologies and business models are created, these venerable ministries will need to learn to live with—and even embrace—obsolescence.

India's fossil fuel management ministries and government bodies, anchored so firmly to previous regimes and requirements, are still struggling to repair yesterday's problems. By changing their mandates and incentives away from specific fuels and toward the delivery of energy services and electrons, these bureaucracies could remake themselves to lead the country to a future economy that is environmentally, financially, and socially sustainable.

Institutional competence meets conflicting incentives

For decades, India has rightly argued that its people are energy-poor and require access to more affordable energy to improve their livelihoods. This argument makes a lot of sense in a country where the average per capita primary energy consumption is about 7,000 kWh (compared to nearly 80,000 kWh in the United States). However, it also encourages ministries to judge their progress by how much fossil fuel the country consumes. Despite the

STEVE MILLER, *Quantum System*, 2020, inkjet, pigment dispersion, silkscreen on canvas, 39 x 69 inches

transformation of energy markets and climate targets, India's ministries and corresponding state power departments, central- and state-owned utilities, and state-owned fossil fuel companies are incentivized to mine, deliver, and burn more fossil fuels. And they do their job very well. However, these conflicting incentives prevent the country from reaching larger goals, like achieving energy independence, reaching fiscal solvency, and meeting climate and pollution targets.

The problem of conflicting incentives at the institutional level is acutely obvious at India's Ministry of Coal, which has only one mandate: to ensure that enough of the black rock is mined domestically to continue feeding India's growing electricity demand. Meeting these targets provides essential income to central and state governments, while also carrying both revenue and purpose to other connected public entities, like Indian Railways, which transports the material, the National Thermal Power Corporation (NTPC), and Coal India Limited, the mining conglomerate that controls 90% of coal reserves in the country. Thus, the Ministry of Coal's mission extends through many sectors and organizations, employing between 13 and 20 million people.

But this business model is unsustainable. Despite having the world's fourth largest coal reserves, bottlenecks in the domestic supply chain have long forced India to turn to expensive imports. By 2018, it became clear that coal couldn't compete commercially with solar and wind. Even before COP26, the International Energy Agency (IEA) estimated that India's use of thermal coal could decline from 70% in 2020 to 30% of the electricity generation mix by 2040. In addition, by 2030, India aims to quadruple renewable energy production, reflecting stunning success in bringing the costs of solar energy down while building access to global capital.

So, in an unforeseen twist, coal's successes are accelerating the fuel's demise. The bureaucratic and physical infrastructure around coal has played a key role in transforming the country's economy and industry. But as the Ministry of Power brought electricity to 500 million new customers over the past decade, it also hastened the system's financial reckoning. With the newly expanded service area, India's already beleaguered state-owned electric utilities required these huge numbers of new, largely agrarian customers to pay the cost of electrical generation to help recoup costs for a sector already operating in the red.

There's a productive irony here. While other countries have been debating the strategy of electrifying everything as a route to net-zero carbon emissions, India found itself going through this energy transformation almost passively as soon as renewable electrons were in a position to outcompete oil and gas molecules. And even though the Ministry of Coal, the NTPC, Indian Railways, Power Finance Corporation, and Coal India Limited understood this shift better than anyone else, none of them were able to move at the pace required to steer the process or respond to its new demands. Having started a revolution that electrified India, they could only stand by and watch it crush their collective business model.

Still tied to delivering more coal, the relevant government power institutions are unable to responsibly invest public capital in building a climate-aligned energy system capable of incorporating cheaper, cleaner energy delivery systems as they emerge. Meanwhile, similar mandates drive the whole system, so that the IEA's recent India Energy Outlook forecasts that India's imports of petroleum and natural gas, already a significant financial burden, could triple by 2040.

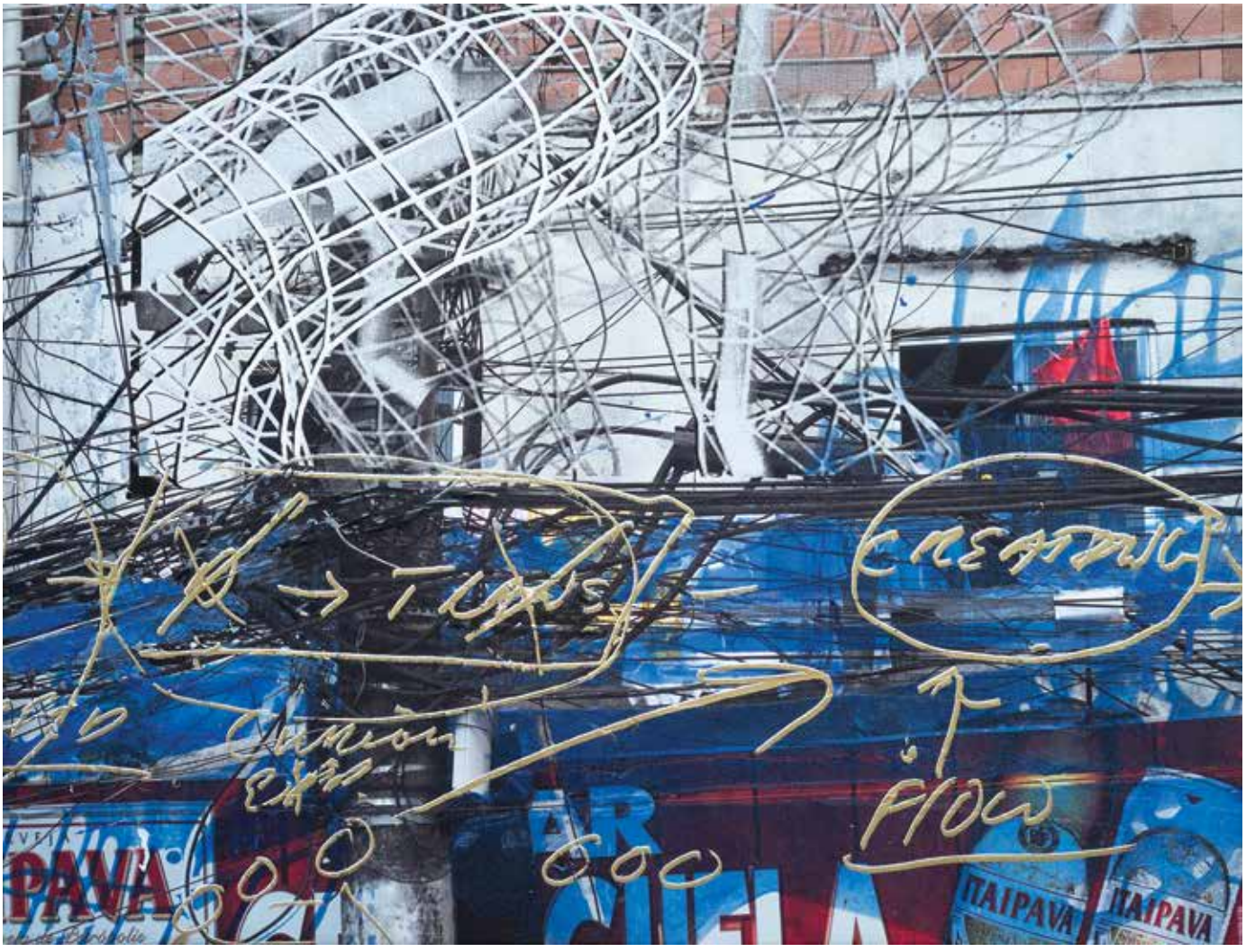
If the country's institutions were able to take advantage of this moment through new mandates, rather than remaining locked into energy targets from the past, they could very well power India's renewable energy ambitions, freeing up labor and resources all across the system. For example, if Indian Railways were freed from hauling coal, it could seize the opportunity to use its vast network and sophisticated logistics capacity to, among other things, dominate domestic freight transport, reducing the need to build more road infrastructure for trucking. Likewise, if the Ministry of Petroleum and Natural Gas were freed from increasing expensive liquified natural gas imports, it could shift to working with green hydrogen and renewable biogas in its pipelines. And, as these mandates move, the signals to allied industry would also move, so that, for example, Bharat Heavy Electricals Limited, the largest power generation equipment manufacturing firm, could pivot to making components for the renewable energy value chain that the country so desperately needs.

2009: The "gas" station of the future

One reason to think that repurposing India's old ministries toward new goals could be successful is that the country's private sector has been exceptionally flexible, investing in renewable energy technologies and disruptive business models and seeking to profit from changes that might seem heretical in other countries, where fuel modes are more entrenched.

In 2009, I returned to the country as part of the Indian Youth Climate Network to help plan an epic 40-day, 3,500-kilometer electric vehicle (EV) journey from the south Indian city of Chennai to the capital of New Delhi. Though the vehicles were made by an Indian manufacturer, vast tracts of the country still didn't have electricity access. This was a challenge, as we needed to stop every 120 kilometers to charge the lithium-ion batteries. A particularly dark stretch on the map between Bangalore and Hyderabad looked problematic—so I went off to scout for power.

At an Indian Oil gas station on National Highway 44, the owner listened intently as I asked whether he had the right voltage for us to charge our vehicles. He pointed to several outlets in the station. None had the voltage we needed. Then he took me to a shed in the back of the lot near



STEVE MILLER, *Crisis Led to Insight*, 2019, inkjet, pigment dispersion, silkscreen on canvas, 22 x 29 inches

the edge of a farmer's fields, where there was an electric sugar cane-processing machine—as well as a higher-voltage connection. It was exactly what we needed.

Several months later, when we stopped at the station in our EVs, the owner was ready. As our vehicles charged next to the processing machine, we answered his questions. He immediately understood the business potential in supplying electricity as a fuel—and voiced his own concerns about pollution caused by gasoline and diesel. In fact, as a franchisee fuel distributor, he suggested that the Ministry of Petroleum and Natural Gas and the Indian Oil Corporation needed to be sold on the vision of selling electricity as a fuel. But the entrepreneurial transformations he had witnessed in his lifetime made him confident that he could navigate an unknown future full of change and challenges.

In this way, emergent technologies, new business models, and electricity as a common-denominator power have been converging in India for some time. The Indian Oil Corporation recently followed the instincts of that gas station owner by installing solar panels on its stations, is considering adding EV charging at thousands of locations, and has started venturing into the hydrogen space. Entrepreneurs are also piling on. Private sector Reliance Industries, led by India's richest man, has pledged to help bring down the cost of producing green hydrogen from $3–7 per kilogram to below $1.

Scaling such entrepreneurial efforts will require strategic alignment of policies at the top of current energy management institutions, as well as attention to who profits and who suffers at the grassroots. The possible transformation in this move to electrons must benefit all of society to be politically, as well as ecologically, sustainable.

A ministry for electrons

While it's relatively easy to create a new ministry, it's nearly impossible to kill one that fails to fulfill its purpose anymore: employees of these behemoths all but ensure that no matter how ineffective they are, they will somehow manage to survive. Besides, ineffectiveness is often not the institution's fault. Many ministries arise out of a particular need—to solve a resource shortage, for example, or to manage a historic crisis—and find themselves hobbling onward years after their inception, long after circumstances have changed.

Rather than trying to eliminate the bureaucracy of such old carbon-heavy ministries, we should transform them. In the case of India's fossil fuel ministries, that could mean giving them new purposes: managing disruptions unleashed by an accelerated energy transition, repairing frayed ecosystems, and ensuring secure livelihoods for today's as well as coming generations.

In the pandemic's chaotic moment of reckoning, there is an opportunity to change these mandates and redesign India's energy bureaucracy. While the sector hobbles from bailout to bailout and COP26 necessitates redefining targets, Prime Minister Modi recently set an ambitious goal to quadruple the country's green power supply by 2030, and he is pushing to make India the center of global solar energy power deployment with the India-led International Solar Alliance and the One Sun, One World, One Grid project. Meanwhile, India's industrialization has reached a stage at which damages caused by pollution are continually nipping at the heels of efforts to raise the quality of life, particularly in booming urban areas, where poor air quality has reached a crisis point.

This, then, is the time to transform the ministries that make up India's energy sector, merging elements of the Ministries of Power, Coal, and New and Renewable Energy into a new Ministry of Power. This new entity should have a bold mandate: to set the agenda to coordinate India's energy transition. Part of the challenge is to shift the collective mindset away from a supply chain driven by carbon molecules to a value chain driven by the generation, storage, and distribution of electrons. The ministry could streamline planning of an increasingly renewable grid that uses coal-fired power strategically to build dependability and manage the full transition away from coal by creating jobs and other opportunities for those who depend upon it.

Similarly, India's Ministry of Petroleum and Natural Gas could become the Department of Liquid and Gaseous Fuels. The ministry's current mandate to bring fossil gas into every home for cooking could be changed to include giving households access to electric cooking and energy-efficient heating and cooling solutions. In the longer term, the new department could leverage and transition its oil and gas assets for the production and distribution of domestically sourced green hydrogen or renewable biogas that could also be used to generate electrons. And the new department could track the amount of money it is saving the country by avoiding imports of oil and gas with the aim of making India energy-secure.

With new mandates, these revitalized ministries can adopt new goals such as creating a sustainable future through job creation, pollution reduction, and ecosystem restoration. For example, the department charged with mining within the Ministry of Coal could merge with the Ministry of Mines to focus on critical mineral mining. Other parts of the Ministry of Coal could become a Department of Coal Transition, ensuring that people dependent on the coal value chain today continue to have jobs and purpose for the future. That new department could work with others to accomplish goals as varied as freight transport, infrastructure building, and environmental remediation.

This is also an opportunity to rethink, and redo, India's industrialization in a way that gives more people access to clean air, water, and land. As existing ministries and programs are enlisted in environmental remediation and restoration, the pollution watchdog CPCB could be reimagined to help industries clean up while stimulating a market for control equipment. There is already a working model in India's Energy Efficiency Services Limited, an energy services company that devised programs to procure and deploy hundreds of millions of LED bulbs and solar street lighting, which have saved state governments and municipalities hundreds of millions of dollars through efficiency gains. That same model is now being used to procure EVs and chargers for government fleets. With a new mandate, the CPCB and state pollution control agencies could assist in procuring air and water pollution control technologies for the industries they regulate, while aiding the growth of a world-class pollution control manufacturing industry.

Already, some parts of the new Ministry of Power are in place and are hard at the task of integrating emergent technologies and new business models. The state-based arms of India's Ministry of New and Renewable Energy (MNRE), for example, are adept at navigating a constantly

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changing technological and entrepreneurial landscape, while working toward successful adoption of low carbon strategies, creating jobs, and fostering innovation. MNRE, working with the Ministry of Science and Technology and India's Startup Mission, also manages the country's budget for energy and innovation. Similarly, at the state level, ministries have already had to adapt and find new purpose as large utility-scale renewable energy projects have become the domain of private developers and state electricity distribution companies.

2019: Embracing obsolescence

Assam, a state tucked away in India's northeastern corner on the other side of Bangladesh, is both beautiful and profoundly shaped by recent social change. After many years as a conflict zone, the region recently got full electrical access, which has been key to improving livelihoods and contributing to lasting peace. But it wasn't easy. Wires, poles, and transformers had to be carried by boat and on foot to ensure every hamlet was connected to the state's grid. Those living in remote or flood-prone areas were provided with off-grid solar systems by the Assam Energy Development Agency (AEDA), a state-based arm of India's national MNRE. Managing service for these multiple systems and millions of new customers, coupled with expanding demand to pay for the rollout, has been a challenge for the state's utilities.

MNRE shows how ministries can evolve to embrace new mandates. Created around the time of the 1970s oil crisis, MNRE had as one of its original mandates to help socialize renewable energy and promote its use through deployment of solar home systems, solar water heaters, and solar street lighting. As the technology developed in the mid-1990s, MNRE hauled its renewable energy technology education displays on the backs of large trucks to introduce new technologies to Indian society and ran a network of Aditya Solar Shops in nearly every district of the country to sell these products.

In 2019, on my way to a meeting at the AEDA office, I spotted one of those mobile renewable energy technology demonstration vehicles. Tires deflated, rusted, and dust-covered, it sat rooted to the spot opposite the model Aditya Solar Shop, also abandoned, with dusty shelves and cobwebs covering solar lanterns—vestiges of AEDA's old mandate, now obsolete.

I entered the AEDA building to find an organization that had reinvented itself. Full of enthusiasm about emergent energy technologies, the staff talked me through ambitious efforts to design and deploy floating solar farms (also known as "floatovoltaics") to make the most of the state's aquatic terrain. The director called in a young local entrepreneur to explain his network of EV chargers to support a growing market for electric three-wheeled vehicles that carry everything from passengers to consumer goods, obviating the need for expensive petrol imports. We discussed over a dozen possibilities for energy innovation and transformation for Assam.

The excitement I witnessed is a little-understood property of the "inspector raj." Through its long history, India's civil service has already been primed to accept new mandates and directions. The Indian Administrative Service trains bureaucrats to manage government service delivery programs no matter which government department—whether New Delhi or a state capital—they end up being assigned to. It provides a solid model for a culture of cautious "intrapreneurialism," in which leaders help their organizations transform to meet society's needs.

Similar intrapreneurial zeal can be found all across India, in departments with similar mandates. From Chhattisgarh and Madhya Pradesh in the center of the country, to Odisha on India's east coast, to the agency tasked with renewable energy deployment for the south Indian state of Kerala, officials are hard at work in similarly transformed institutions. Such renewed, revitalized mandates must spread beyond parts of MNRE to other state ministries and beyond if India hopes to successfully tackle the monumental challenges now at hand.

As I left the building, passing the rusted demo vehicle and the store with its cobwebbed solar lanterns, I took a moment to reflect on the arc that had brought us here—as the fuels and technologies and times changed, what remained consistent was the people at the agency. Embracing obsolescence, they applied their considerable know-how and their ability to reach complex goals to solve the next problem in front of them. Yes, bringing energy to Assam required money, equipment, and sophisticated technology, but ultimately it was people who figured out how the grids, the panels, the wires, and the electrons fit into society to create changes that were previously unimaginable.

As we look forward to achieving the goals of COP26—and all the COPs after that—we would do well to remember that there is a difference between making mandates, objectives, fuels, and technologies obsolescent and making the people and institutions associated with them obsolescent. There's a modern tendency to see bureaucracies as obstacles, as plodding second cousins to entrepreneurialism, but their very persistence speaks to the power of people organized around common goals—whether that's running pipelines, mining coal, or cleaning up pollution. And although much of the rhetoric around addressing climate emissions has focused on things we don't have—technology, money, time—the people who can make it happen are already here.

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