

LEARNING THE ROPES
Secretary of Energy
Steven Chu at his office in
Washington, D.C. A Silicon
Valley physicist, Chu is a
newcomer to the capital.

THE SECRETARY OF SAVING THE PLANET

Steven Chu has a Nobel Prize in physics and a mandate to stop global warming. But can Obama's energy visionary win the battle against Big Coal?

By Jeff Goodell

WHEN STEVEN CHU, PRESIDENT OBAMA'S PICK FOR SECRETARY OF ENERGY, WAS CONFIRMED IN JANUARY, THE RAP ON HIM WAS THAT HE'S A BRILLIANT SCIENTIST WHO DOESN'T KNOW POLITICS. "WASHINGTON IS GOING TO EAT HIM ALIVE," ONE CONGRESSIONAL STAFFER TOLD ME. CHU IS THE FIRST MEMBER OF ANY PRESIDENTIAL CABINET TO HAVE WON A NOBEL PRIZE. BUT AT THIS MOMENT IN HISTORY, SHOULD HE PROVE LESS ADEPT AT THE PHYSICS OF CONGRESSIONAL APPROPRIATIONS THAN HE IS AT QUANTUM MECHANICS, THE ENTIRE PLANET COULD BE IN BIG TROUBLE. CHU IS NOT ONLY ONE OF THE PRESIDENT'S MOST TRUSTED ADVISERS ON GLOBAL WARMING - BY FAR THE MOST PRESSING ISSUE FACING HUMAN CIVILIZATION - HE IS ALSO RESPONSIBLE FOR DOING OUT \$38 BILLION FROM OBAMA'S STIMULUS BILL AND CREATING A NEW ECONOMY FOUNDED ON GREEN ENERGY. ✪ In the early days after his confirmation,

Photograph by Charles Ommanney

Chu made some classic neophyte gaffes. He seemed to brush off concerns about dwindling oil supplies, saying it was not his job to lobby OPEC, and he provoked China's ire by suggesting we might raise tariffs on their goods if they don't support an international plan to cut climate-warming pollution. "Steve is a scientist, so he's good at facts and numbers," says Rep. Bill Foster, a Democrat from Illinois. "But he is still learning the emotional logic of Washington."

In the parlance of Washington, of course, "emotional logic" is a synonym for "spin" or "compromise." But is it possible that Chu has simply decided to play politics by a different set of rules? Could it be that, because the guy has a Nobel, he cares more about the truth than about catering to the self-serving demands of Congress? Shortly after he was confirmed, Chu offered some straight talk about the looming impact of climate change. "I don't think the American public has gripped in its gut what could happen," he said. "We're looking at a scenario where there's no more agriculture in California. I don't actually see how they can keep their cities going." In April, at the Summit of the Americas, he spoke frankly about the threat that Caribbean nations face, including fiercer hurricanes and a "very, very scary" rise in sea level.

CHU IS "VERY IMPATIENT," says Obama's chief science adviser. "The Department of Energy is ponderous. Steve is going to have his frustrations."

In fact, Chu represents something entirely new in the world of Washington politics: the scientist as entrepreneur. As a product of Silicon Valley, where he has spent the bulk of his career, he professes a near-absolute faith in the ability of science and business to join forces and fix global warming. Chu envisions a world powered almost entirely by the sun, with photovoltaic cells painted on the surface of buildings, deserts covered with solar panels, and superconducting transmission lines crisscrossing the country. Cars would be powered by smart batteries and genetically engineered biofuels. You might see a few next-generation nukes, as well as fields of wind turbines, but the one thing you won't see in Chu's perfect world is much oil, gas or coal. Chu is an unabashed crusader for the renewable future, a man whose most basic assumption about energy is that the age of fossil fuels is coming to a close.

In May, on a trip to the Massachusetts Institute of Technology, Chu is greeted like

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a rock star – students line up for hours to get a seat, and professors elbow their way to the front to meet him. It's not that Chu himself is a commanding presence – at 61, dressed in a serious Washington-insider-style suit and tie, he projects the air of a slightly awkward boy genius. But to the MIT crowd, Chu represents the hope that the Bush-era disdain for science has finally come to an end: *Reason is back! The geeks will reign again!*

Chu does not disappoint. In the packed auditorium – every chair filled, the crowd overflowing into an adjacent room equipped with video monitors – he talks frankly about the immediate peril posed by global warming and the future of renewable energy. At a reception after the talk, Chu is asked for his views on geoengineering, especially the controversial idea of spraying particles into the stratosphere to deflect sunlight and cool the planet. "Is this something we should be thinking about as a backup plan," a man in the crowd wonders, "in case the planet starts warming faster than we think?"

If Chu were a conventional politician, he would dismiss geoengineering as a sci-fi fantasy and move on. Not only is the whole idea anathema to environmentalists, it suggests that we are not going to cut pollution fast enough to stave off disaster. This

is a particularly delicate topic right now, as Congress wrangles over climate legislation that sets specific targets for carbon emissions. Today, the amount of CO₂ in the atmosphere is roughly 385 parts per million. Most climate scientists agree that the threshold for irreversible climate change is 450 parts per million. If we go much above that, we risk melting the polar ice sheets, turning the oceans into acid baths and causing extreme droughts.

Chu is certainly aware of all this. But instead of evading the question, he takes it a step further. "The fact is, we're not going to level out at 450 ppm," he says. "We're going to go over 450 ppm. So what will we do? I'm not in favor of deploying geoengineering. But thinking about it is OK."

For a moment, the room goes quiet. In effect, the United States secretary of energy has just told an elite group of scientists and politicians that, no matter what happens with climate legislation this summer in Congress, no matter what China does or does not do, no matter what targets are set at climate negotiations in Copenhagen later this year, our future as a species is likely a grim one. Chu has uttered the political-

ly unthinkable: that his own administration's efforts to halt global warming might not be enough to avert a catastrophe. John Holdren, President Obama's chief science adviser, would never be so frank. ("I'm not going to talk about targets," he tells me, before noting that he has said on previous occasions that he "hopes and expects" we can hold the line at 450 ppm.) Nor would President Obama himself.

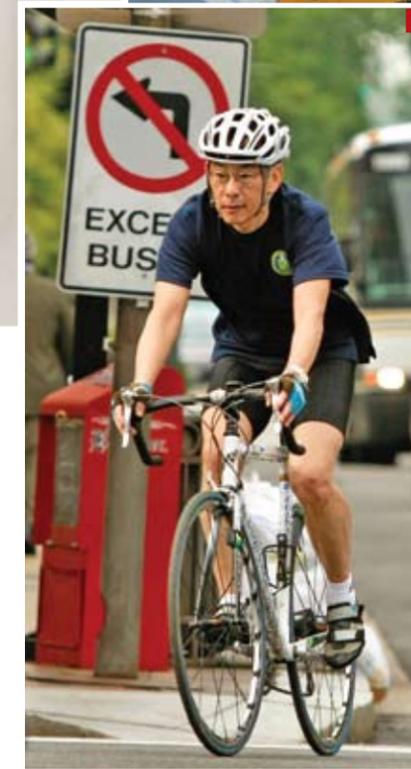
Later, as Chu is en route to the Boston airport, I ask him again: Does he really believe we are beyond the tipping point? He doesn't flinch. In fact, he suggests, it is even worse than that. "I hope we hit 550 ppm," he says. "Who knows?"

Now I ask you: Is this a man who doesn't understand the "emotional logic" of politics? Or is this a bold scientist who isn't afraid of the truth?

THE HEADQUARTERS OF the U.S. Department of Energy is located on the edge of the National Mall in a giant concrete bunker. The lobby is a shrine to the nuclear era, with creepy, spectacular images of mushroom clouds and the proud men who built the bombs. Police decked out in blue coveralls prowl the halls, some of them leading fierce-looking German shepherds. Each time the

steel elevator doors open, you expect Dr. Strangelove to roll out. The whole place, says Carol Browner, Obama's climate and energy czar, is "a little retro."

Secretive, bureaucratic and unmanageable would be a better way to put it. The department grew out of the Old Atomic Energy Commission, founded in 1946 largely to manage the nuclear weapons stored at Los Alamos, New Mexico. Today, the DOE is a Kafkaesque empire with 17 national labs, 14,000 federal employees and 93,000 contract workers scattered across the country. Its primary job is not energy research, as its name would suggest, but maintaining America's nuclear stockpile and cleaning up the toxic mess left behind by the manufacture of nuclear weapons. Of the DOE's \$26 billion budget, some two-thirds goes to the care and cleanup of nukes. Even worse, the department remains steeped in a Cold War mind-set. The national labs, where most of the DOE's work is carried out, operate as overstuffed fiefdoms with antiquated research priorities. Given the clout of their defenders in Congress, overhauling the mission of the labs will likely be a long, slow process at best.



Dr. Chu Goes to Washington

Chu, a product of Silicon Valley, hates wearing suits, doesn't own a car and understands venture capital better than government. "He's not a political strategist," says one insider. (1) With Obama at the DOE in February. (2) Examining magnets used to image nanoparticles at the Brookhaven Lab in March. (3) His "only extravagance": a \$5,000 carbon-frame bike.

Chu is also, says science adviser John Holdren, "a very impatient man." Like many Silicon Valley types, his informal manner disguises a big ego. "He believes he knows everything about everything," says one scientist who worked closely with him at the Berkeley lab. "And he expects everything to happen at his pace." Matt Rogers, a recently hired senior adviser at DOE, recalls an early meeting in which department bureaucrats tried to explain to Chu why it was taking years to process guarantees for renewable-energy loans. The secretary's reaction? "After the meeting, a few tiles had to be replaced on the ceiling in the room," Rogers says, only half-joking.

But the biggest thing that separates Chu from past energy secretaries is money. In February, when Congress approved \$787 billion in stimulus spending, it set aside \$38 billion for the DOE, most of it to be spent on creating jobs through energy projects. In addition, the department is authorized to guarantee \$140 billion worth of loans to help clean-energy companies build factories and launch major projects. With the credit markets virtually frozen due to the banking crisis, the DOE is practically the only stable source of money for clean energy, giving it enormous power in deciding who succeeds and fails in the clean-tech market.

There is no question, given the threat of global warming, that Chu feels a sense of urgency about his energy mission. "We must begin making changes now," he says. "We don't know how much time we have." But the dilemma he faces is obvious: How

Chu's office is on the top floor, its large windows offering a panoramic view of the U.S. Capitol. But despite the proximity to power, the job of energy secretary is not historically an influential position in Washington. "The secretary of energy is not like the secretary of treasury," says Joe Romm, a former assistant energy secretary. "The DOE has no authority over huge parts of America's energy domain – such as transportation, which accounts for 30 percent of our energy consumption." Nor is it a job that requires much expertise. "In the past," says a former top congressional science staffer, "the only qualification necessary to becoming secretary of energy was that you know nothing about energy." George W. Bush's first pick for the job, Spencer Abraham, was a party hack who got the post as a consolation after losing his Senate seat in Michigan. His successor, Samuel Bodman, at least had an engineering degree from MIT, but he made his name as CEO of Fidelity Investments.

Whatever else Chu may be, he is not a party hack. Before coming to the DOE, Chu was director of Lawrence Berkeley National Laboratory, one of the department's most distinguished labs. At Berkeley, he gave the operation a sharper focus on energy – everything from advanced photovoltaics to next-generation biofuels. As a result, Chu arrived in Washington with a deep knowledge not only of how the DOE works but of the strengths and weaknesses of a whole range of emerging ener-

gy technologies. The secretary, in fact, is almost entirely a creature of Silicon Valley. He has spent the bulk of his adult life in the Bay Area, at UC Berkeley and Stanford, and has absorbed the cultural nuances of the place. The first time I met him, at a clean-tech conference in 2007, he was perfectly at ease among the venture capitalists, chatting about commercial applications for several technologies being developed in the Berkeley lab. He hates wearing a suit, doesn't own a car, rides his bike as often as he can, and loves to talk about where ideas come from and what drives innovation. He carries a BlackBerry in one pocket (for DOE business) and an iPhone in another (for personal stuff). His bike – "my only extravagance," he has called it – is a \$5,000 Colnago with a carbon-fiber frame.

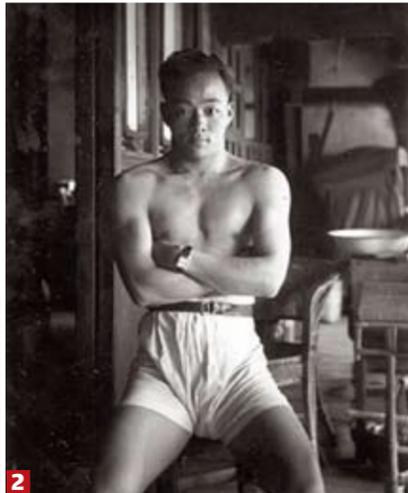
do you launch an energy revolution from inside an aging, corrupt Cold War bureaucracy like the DOE? "Steve's biggest challenge is going to be to figure out a way to be as forward-leaning and fast-moving as he would like to be," says Holdren. "The DOE is a huge and ponderous agency. Steve is going to have his frustrations."

CHU GREW UP IN GARDEN City, a Long Island suburb. His parents were both from highly educated families in China, and both attended Tsinghua University in Beijing, the MIT of China. After the Japanese invaded in the late 1930s, his parents fled. Chu's father escaped easily, arriving in Massachusetts in 1943. His mother, unable to leave until a year later, took a dangerous, circuitous route through India to avoid submarines and warships. Both went on to study at MIT - he in chemical engineering, she in economics.

The family moved to Garden City when Chu was three, partly because it offered an easy commute to the Polytechnic Institute

First-Generation American

Chu grew up in the Long Island town of Garden City, where he tinkered with rockets as a kid. But in the Chu home, school always came first. (1) Steve (left) with his brothers in 1951. (2) Chu's father, who fled China during World War II, studied engineering at MIT. (3) Chu, at two, with his mother.



League schools and instead enrolled at the University of Rochester. He studied math and physics, intending to become a physicist, but his father urged him to do something more practical. "My father wanted me to be an architect," Chu says. "He knew I could draw pretty well, and he thought it was less competitive." Chu stuck with physics and was accepted into the graduate program at UC Berkeley.

He arrived in 1970, as Berkeley was erupting in protests against the Vietnam War. Chu sympathized, but focused on science, not politics. Eugene Commins, a physics professor, was struck immediately by Chu's talent. "He was very active, energet-

there. "Projects were funded not by writing up 1,000-page proposals," recalls Chu, "but based on how well you could make a five-minute argument for it." Chu distinguished himself not only with his brains but with his work ethic. "Steve worked at all hours," recalls Jeffrey Bokor, a physicist whose lab was next to Chu's. "He was there nights, weekends. He was impossible to keep up with." In 1985, Chu developed a technique called "optical molasses," which uses lasers to slow down atoms to a near-standstill, similar to the way a marble slows down when it rolls into molasses. It was a breakthrough in quantum physics, laying the groundwork for the discovery of an entirely new state of matter, known as Bose-Einstein condensate. On the basis of this work, Chu shared the Nobel Prize with two other physicists in 1997.

Some scientists consider the Nobel a silly award. Not Chu. He'd been dreaming about it since the 1970s. "Steve became very serious and determined in the five years before he got the Nobel," recalls Bokor. By that time, Chu had moved back to the Bay Area, taking a professorship at Stanford. He also

of Brooklyn, where his father found a teaching job. The Chus were one of three Chinese families in town. Steve - the middle of three boys - tinkered with Erector sets, model airplanes and chemical rockets. He also liked sports, especially stickball and tennis. But school always came first. "Education was of utmost importance in the family," recalls Chu's younger brother, Morgan, now a trial attorney in Los Angeles. Chu's older brother, Gilbert, was the star pupil, scoring off the charts on every test and making Steve, a solid but unspectacular A student, feel like "the academic black sheep."

Unlike Gilbert, who went straight to Princeton, Chu was turned down by Ivy

ic, full of imagination," recalls Commins, who guided Chu's switch from theoretical to experimental physics. Chu started playing around with lasers, then a hot new field. He also met a grad student named Lisa Thielbar. "He'd show up at my apartment at 2 a.m. with an open jug of wine," she recalls. "He'd say, 'I just finished a physics run - wanna talk?'" Chu and Thielbar married a few years later and had two sons.

After finishing his Ph.D., Chu was lured to Bell Labs in New Jersey. Even though they were run by the old Bell telephone monopoly, the labs were real hotbeds of innovation - the transistor, lasers and the UNIX operating system were all born

left his wife. "I would go in to see him, and he was working so hard I couldn't even talk to the guy," Bokor says. It wasn't until Chu finally won the Nobel that "the darkness lifted, and the old Steve was back again."

A few years later, Chu joined the board of the Hewlett Foundation, which hosted talks about the dangers of climate change. Chu paid close attention. "There wasn't a eureka moment for me," he says now. "I had been drifting into polymer physics and biology, following my scientific nose. I began reading about discoveries that convinced me that significant climate change was caused by humans, and that there could be some real consequences of that."

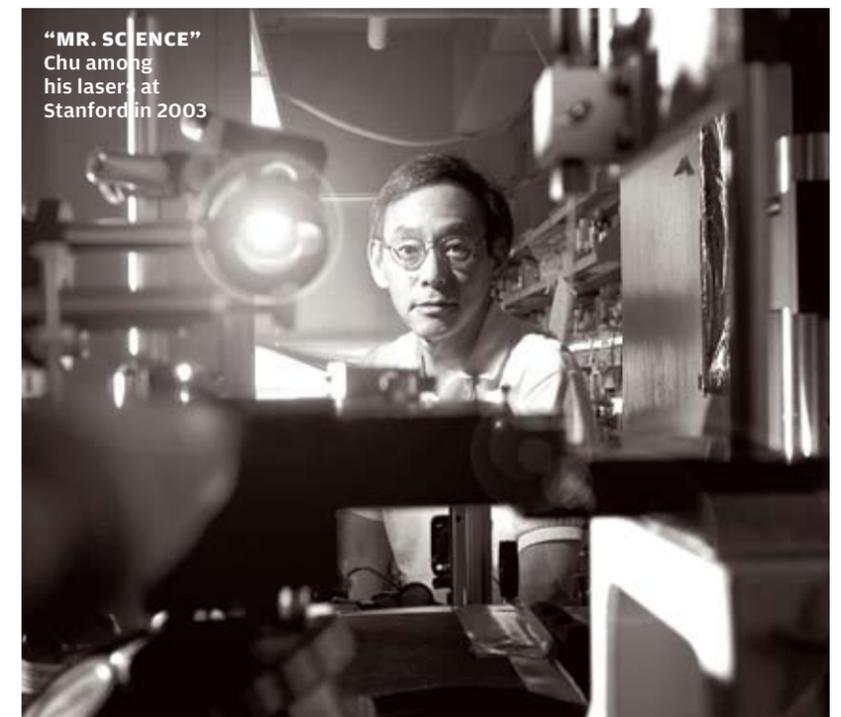
In 2004, Chu was recruited to run Lawrence Berkeley. Although the lab already had a strong tradition of energy research, especially in ways to boost energy efficiency, Chu put the scientists on an alternative-energy crusade. "He was our energy messiah," says Robert Birgeneau, the university's chancellor. Chu also orchestrated a controversial deal in which BP, the British petroleum giant, agreed to invest \$500 million in a partnership to set up the Energy Biosciences Institute, a renewable-energy center on the Berkeley campus that would focus on biological innovations such as genetically engineering crops to create advanced biofuels.

The deal underscored the Silicon Valley approach that Chu takes to innovation: Bypass the government bureaucracy and form partnerships directly with industry. To Chu, it was a win-win - the lab and the university got much-needed cash, and BP got a crash course in renewable energy that it could put into effect in the real world. "BP was essentially looking to outsource its research lab," says Steve Koonin, the chief scientist at BP at the time, and now the head of the DOE's Office of Science. "We didn't know a thing about biology, and decided this was the best way to learn."

To others, however, the partnership was a deal with the devil. Berkeley professor Robert Reich, who served as labor secretary under Bill Clinton, questioned "whether this proposal will be a huge feather in Berkeley's cap, or a huge noose around Berkeley's neck." BP's money, he warned, might enable it to dictate research priorities at the university and stifle debate about energy alternatives. The headline for an op-ed in *The Los Angeles Times* was even more blunt: BIG OIL BUYS BERKELEY.

WHEN IT CAME TIME for Obama to choose a new head of the DOE, Chu was the obvious pick. Last November, shortly after the election, Chu flew to Chicago to meet the president-elect. "We talked about the importance of energy in America's future," Chu recalls. "I became convinced it is very high on his agenda." Still, he wasn't entirely sure the job was a good fit, even after he had accepted the position. A few weeks later, at a Christmas party at Berkeley, Eugene Commins ran into his old student. "He realized that a lot of the job was about administering nuclear weapons, which he didn't know much about," Commins recalls. "But his primary concern was creating a new energy agenda for the nation. Steve realized it was not just about science and technology, which he understood, but politics, too. Now that he had decided to take the job, he was overwhelmed by it."

Chu now says that the experience of coming to Washington was "like being thrown in the deep end of a pool." He paid courte-



CHU'S ENERGY VISION

Here are five ways that the energy secretary - a Nobel Prize winner - plans to get us off fossil fuels and build a cleaner, greener world

1 Smarter Buildings

Chu believes it's possible to cut energy consumption in buildings - which currently suck up 40 percent of all energy - by 80 percent. Some steps are simple, like better insulation. Others are futuristic: computer systems embedded during construction will use CO₂ sensors to track a building's occupants at all times, precisely targeting heating and cooling.

MAJOR OBSTACLE Retrofitting existing buildings is hugely expensive.

2 Better Biofuels

Chu believes we'll soon be filling up our tanks with fuel made from perennial grasses like miscanthus, which packs double the energy content of corn, grows in lousy soil (making it less likely to displace food crops) and requires little water. Once highly efficient microbes, like those found in the guts of termites, are genetically engineered to turn plants into fuel, every bioresearch lab will become a wellhead.

MAJOR OBSTACLE Engineering microbes is so complex that any major advance may be decades away.

3 Thinner Solar

Breakthroughs in nanotechnology will allow solar cells to be manufactured in flexible sheets that can be integrated into the design of buildings or spread out in the desert. Chu points

out that covering less than one percent of the Earth's deserts with solar panels would supply the world's entire demand for electricity - without producing a single ton of CO₂.

MAJOR OBSTACLE Will take at least 20 years to build new transmission lines and mass-produce solar cells.

4 Living Batteries

Batteries for plug-in hybrids and electric cars are getting better fast. In the next five years it's all about using nanotechnology to create lithium-ion batteries that are more stable and efficient. In the long run, batteries may be constructed by viruses or microbes.

MAJOR OBSTACLE Keeping China from owning the industry.

5 Captured Carbon

Capturing CO₂ from coal plants is expensive - but Chu believes the solution might be as simple as breathing. Our bodies, after all, use enzymes to capture CO₂ in our blood and release it through our lungs - with almost no energy loss. Now, using genetically engineered bacteria, scientists are trying to create similar enzymes that can capture CO₂ from coal plants - or even directly from the air. The gas can then be recycled into other substances or buried.

MAJOR OBSTACLE Cost and volume. How many enzymes does it take to eat 2 billion tons of CO₂?

COURTESY OF STEVEN CHU, 3

BART NAGEL



A CAPITOL VIEW
Chu in his office at the DOE on June 1st

sy visits to key players in Congress. “Steve came to see me in my office one day,” says Sen. Dick Durbin, the Senate’s second-ranking member. “I asked him, ‘Are you ready for this job?’ He said, ‘Except for the political part and the bureaucracy, I’m ready.’” Chu spent a day at a Democratic congressional retreat, getting to know members, and later invited several to his office for lunch. “The best thing about Steve,” says Browner, the climate czar, “is that he knows what he doesn’t know” – which, in Chu’s case, is Washington itself.

Conservatives have taunted Chu in the press as “Mr. Science,” but his knowledge as a scientist is exactly what makes him invaluable to the White House. In Cabinet meetings and other high-level discussions, Browner says, Chu excels at “explaining to everyone what the realities

are, in terms of science.” Recently, Browner and Chu got so wrapped up discussing the technical details of capturing and storing carbon dioxide from coal plants that Chu wound up missing a meeting on Capitol Hill. “He’s not a political strategist,” says a top congressional staffer involved in energy and climate legislation. “He doesn’t have the political skill set that Carol Browner has – but we already have a Browner. He is a scientist, and that is a valuable role in itself.”

Chu has played a similar role in shaping climate legislation, providing scientific heft rather than political arm-twisting. In his testimony during congressional hearings in April on the administration’s top energy and climate initiative – a bill to cap CO₂ pollution and enable industry to trade pollution credits – he was forceful and di-

rect. “For decades, our energy strategy has been little or no strategy at all,” Chu observed. According to a congressional staffer, Chu also participated in a key meeting with House members and chief White House economic adviser Larry Summers over how pollution permits should be distributed in the cap-and-trade scheme. President Obama had proposed that the permits be auctioned off, raising \$650 billion for clean-energy research and tax breaks to ease the pain of higher energy bills; the House bill would give more than half the permits to industry for free. In the meeting, Summers pressed congressmen about the economic impact of the change, while Chu wanted to be sure that a portion of the revenues would be channeled into energy R&D. Over the past month, as the bill has moved through committee,

GETTY IMAGES

the DOE did when it released its 2010 budget, was a no-brainer; the program was nothing more than a stalling tactic by the Bush administration. But Chu’s decision to slash funding for the Yucca Mountain nuclear-waste facility in Nevada prompted John McCain, a strong proponent of nuclear power, to challenge the secretary at a hearing: “What’s wrong with Yucca Mountain, Dr. Chu?” Some observers, however, say that Chu had little to do with the move. “The decision to shut down Yucca Mountain was made above Steve’s pay grade,” says William Reilly, a former EPA administrator. “It was done as a favor to Harry Reid” – the Senate majority leader who has long opposed the waste-storage facility in his home state.

Chu’s biggest troubles have involved coal. During his confirmation hearing in Janu-

job. And since coal is by far the most carbon-intensive fossil fuel, responsible for a third of all CO₂ emissions in the United States, it’s not a fight he can afford to wimp out on.

CHU’S VISION OF A FUTURE powered by renewable energy depends largely on revamping the DOE’s bloated network of research labs. To do that, he plans to make an end run around the existing bureaucracy. The secretary laid out his strategy in March, during a talk at the Brookhaven National Laboratory on Long Island, not far from where he grew up. He started by recalling his days at Bell Labs, saying he plans to spend \$280 million to build eight energy-innovation hubs, or “Bell Lab-lets,” each of which would focus on a

CHU TOLD DURBIN he was ready for the job of energy secretary – “except for the political part and the bureaucracy.”

ary, senators prodded Chu about a talk he gave in 2007, when he called coal “my worst nightmare.” Chu suggested that the remark had been taken out of context and implied that he was mostly referring to coal use in China. He then offered a brighter outlook for coal, insisting that “I am optimistic we can figure out how to use those resources in a clean way” and calling America’s coal reserves a “great natural resource.”

The truth is, Chu’s remark about coal was not taken out of context. I know, because I happened to attend the talk in 2007 when he said it. That night, Chu fretted openly about the buildup of coal plants in the U.S. and China. “We’ll be adding three times the carbon dioxide in the previous century of all humanity if we continue our present course,” he said. He also noted that coal, which contains trace amounts of uranium, releases 100 times more radiation when burned than nuclear plants. “The waste from coal burning is worse, in my mind,” he said. “It may not seem scary, because we’re used to burning coal more, but in terms of killing people and things like that, coal is far deadlier.” And he voiced skepticism about a technological fix for CO₂ pollution from coal: “It is not guaranteed that we have a solution with coal.”

Chu has kept close tabs on the legislation, meeting with its co-sponsor, Rep. Edward Markey, during the markup phase to discuss the latest changes.

Chu knows that the final legislation that emerges from Congress may not cut CO₂ levels fast enough, or may create too many loopholes like carbon “offsets” for industry. But like the president himself, Chu seems less concerned with the details than with getting a cap-in-trade system in place as quickly as possible. “We’re certainly going to get less than a perfect bill,” he tells me. “But how imperfect are you willing to tolerate before you say no? This is a perennial debate. But I want to get something going. Boy, do I want to get something going.”

Chu’s initial moves as secretary have raised a few hackles on Capitol Hill. Pulling the plug on hydrogen-car research, as

particular energy problem: solar, building design, energy storage. But the idea closest to Chu’s heart, and the one that he believes has a chance to save the world, is called ARPA-E, short for Advanced Research Projects Agency – Energy.

As Chu envisions it, ARPA-E will be part of the DOE, but it will operate more freely than the rest of the department. It will be exempt from many of the DOE’s cumbersome rules for funding and personnel, and report straight to Chu himself. The agency is modeled on DARPA, the advanced research group within the Defense Department that gave birth to a huge number of technological advances, including the Internet itself and the Predator drones commonly used in the Iraq War. The idea of DARPA, like Bell Labs, was to create a well-funded brain trust of the country’s hottest tech wizards, lock them in a basement for a few years and hope they come up with a world-changing idea. At ARPA-E, the goal is to create what one DOE document calls “transformational technologies . . . that disrupt the status quo.”

“ARPA-E could be the most exciting place to work in government,” says Rafe Pomerance, a longtime climate activist who helped shepherd authorization for ARPA-E through Congress in 2005. Obama’s stimulus bill included \$400 million in funding for the agency, ensuring that it gets off the ground later this year.

ARPA-E has attracted an enormous amount of attention in the energy and clean-tech world, in part because it is such a deeply American idea – it’s [Cont. on 85]

STEVEN CHU

[Cont. from 65] the institutional equivalent of Steve Jobs' garage. It will also enable Chu to recruit young researchers to the DOE by repositioning the department as something more than a moribund bureaucracy whose job is to baby-sit nukes. President Obama even mentioned ARPA-E in a speech to the National Academy of Sciences in April, a sure sign that the project is high on the administration's radar. The following month, when the DOE asked researchers to submit funding proposals for ARPA-E projects, it expected to receive 1,000 requests. Instead, it got more than 5,000.

Given the paucity of money and attention devoted to basic research in recent decades, ARPA-E is a step in the right direction. But \$400 million for new research

consulting firm McKinsey & Company. Rogers brought in a team of eight advisers, most of whom have experience in Silicon Valley, and set up what amounts to a venture-capital operation within the DOE. The outfit has already helped dole out more than \$4 billion in stimulus money, and the first loan guarantee – \$535 million to build a new photovoltaic factory in California – was given conditional approval in March. Nevertheless, Rogers estimates that it will take 200 reviewers working full-time throughout the summer simply to wade through the current backlog of applications for federal funding.

In handing out the stimulus money, which is vetted less closely than the loan guarantees, the DOE also runs the risk of creating new and costly energy boondoggles. Big Coal, seeing profit in the clean-

Chu is spending \$400 million to create a brain trust of clean-tech wizards – the DOE equivalent of Steve Jobs' garage.

is unlikely to change the world; to have a real shot at that, energy experts say, will require at least \$2 billion, sustained over a decade or so. "Developing new energy systems is a heavy lift," says one university scientist. "You might get some interesting breakthroughs on photovoltaics or wind, but to really change things, you need something more like a military operation."

ARPA-E MAY BE CHU'S PET PROJECT, but the biggest challenge he faces right now is simply shoveling money out the door at the DOE. The \$38 billion that the department received in the stimulus bill needs to be contracted out by September 2010; Chu is also trying to get the DOE's long-comatose loan-guarantee program up and running. Unless that money is spent quickly and wisely, the administration doesn't have a hope of fulfilling the president's promise to create 5 million new green jobs, and to double the country's supply of clean energy over the next three years. "If the loans go to companies that fail, or that don't do well, it could set back the entire clean-tech revolution a decade," says one venture capitalist.

When he first arrived in Washington, Chu was clearly aghast at the DOE's loan guarantee program. The program had been authorized by Congress in 2005, but by early 2009 not a single loan had been approved. And no wonder: Loan applications were 1,000 pages long. The whole application and approval process was so complex, Chu found, that consultants were charging companies \$225,000 to shepherd loans through the DOE.

To help get the loans out the door, Chu hired Matt Rogers, a senior partner at the

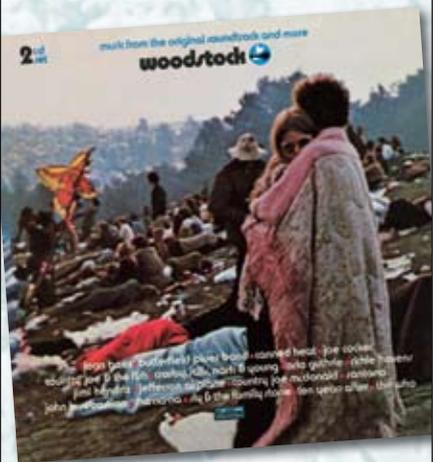
energy rush, is pushing to use the stimulus money to resurrect a "near-zero emissions" coal plant known as FutureGen. Launched by the Bush administration in 2003, the \$1.8 billion project was to be funded by a coal-industry partnership, including Peabody Energy, the world's largest coal company, which has a long track record of undermining climate science and progressive energy legislation. Even within the power industry, FutureGen – or "NeverGen," as it came to be known – was widely viewed as a joke. Its real role was as a PR tool: It gave the industry something cool to talk about while it went on building another generation of dirty coal plants. In 2008, Energy Secretary Samuel Bodman finally pulled the plug on the project.

But under Obama's stimulus plan, FutureGen appears to be back. Earlier this year, \$1 billion of the DOE's share of the stimulus bill was designated for an unnamed project that looks a lot like the Bush boondoggle. But for Chu, who must sign off on the deal, FutureGen brings up a raft of complex questions. A private company, Summit Power, is already set to build an advanced coal plant in Texas that does virtually everything FutureGen does – and the company isn't asking for a billion-dollar subsidy. If private investors are willing to take the risk, why should the DOE spend \$1 billion to underwrite FutureGen – especially since it would benefit companies that have spent years fighting any law that might require them to install cleaner technology?

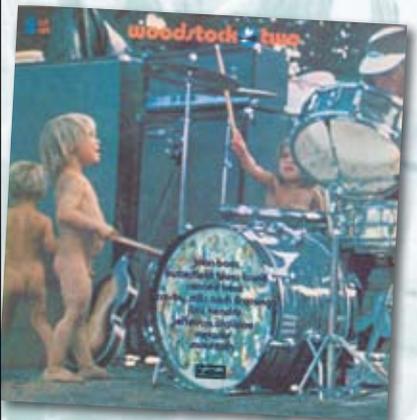
When I ask Chu about it, he is clearly uncomfortable. "We're looking very, very closely at FutureGen," he says. "We have a lot of coal. Ideally, you want to make it clean." The project has a powerful backer in Sen.

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Durbin of Illinois, where FutureGen would be based. Durbin insists there is no political pressure on Chu from the White House – even though President Obama and his chief of staff, Rahm Emanuel, hail from Illinois. “I’ve talked to Rahm,” Durbin says. “I told him, ‘I don’t want the White House to make the call on this. I want to win it on merits.’”

IF THERE IS A SHADOW OVER CHU’S vision of America’s energy future, it’s his excessive faith in technology as the solution to all our woes. It’s not that he runs around mindlessly touting the miracles of biofuels made from genetically engineered termite guts. Unlike many techno-fantasists, Chu is an ardent believer in the importance of “soft” solutions like energy efficiency. He understands that alternative energy will stand no chance against fossil fuels that are heavily subsidi-

“Steve likes sexy, high-tech solutions,” says a former colleague. “If it doesn’t have the word ‘nano’ in it, he’s not interested.”

dized by the government unless we place meaningful limits on CO₂ emissions and fund massive research into renewable alternatives. But Chu’s vision of the world includes few references to the market distortions and regulatory bullshit that slows the commercialization of renewable technology we already have. He rarely mentions the inconvenient ways that we will have to change our lives to curb the threat of global warming: driving less, growing food closer to home, lowering our expectations about how many goods it is our God-given right to consume. “Steve never talks about any of this,” says Tad Patzek, a professor of engineering at the University of Texas who left Berkeley, in part, because he disagreed with Chu’s enthusiasm for biofuels. “Steve likes sexy, high-tech solutions. If it doesn’t have the word ‘nano’ in it, he’s not interested.”

Chu also runs the risk of playing into America’s desire for a quick fix to every complex problem. Programs like ARPA-E, which aim for gee-whiz breakthroughs, are all well and good, but energy experts say it will take a much larger commitment from the government to overhaul America’s energy infrastructure. “The best thing Steve could do would be to look back to Silicon Valley and see how it handled this,” says Dan Arvizu, director of the DOE’s National Renewable Energy Laboratory in Colorado. He points to Sematech, an alliance of high-tech manufacturers that the government jump-started in the 1980s to promote collaboration on research and set standards for new technology. “There is no simple solution to all this,” says Arvizu. “Moving to renewable energy is going to take decades

of effort and require the investment of trillions of dollars.”

It won’t be easy for Chu to launch an energy revolution while fulfilling the DOE’s primary job: keeping a close eye on America’s nuclear stockpile. One dumb-fuck security guard at Los Alamos who wants to make a buck selling secrets to Pakistan could end up distracting Chu from his mission for months. But even if he can keep the nukes locked down, Chu’s biggest challenge may be the tyranny of high expectations. After all, he understands climate science as well as anyone. He knows the ins and outs of energy technology. He has a direct line to the president. (In theory, anyway. During the height of the banking crisis in March, a scientist at one of the national labs asked Chu, “Do you have the ear of the president?” Chu replied, with startling frankness, “Not as much as I would like, because he’s distract-

ed.”) He has nearly \$40 billion at his disposal to help push things along. And most of all, he has that Nobel, which gives him enormous credibility. If he can’t solve our problems – or at least make a dent in them – then who can?

This summer, as the fight over climate legislation heats up, Chu’s political leadership, as well as his commitment to slowing global warming, will be put to the test. But if it’s true that you can tell a lot about a person by how he treats strangers, then a chance encounter that Chu recently had at Reagan National Airport is telling. He was walking through the terminal, accompanied as usual by an entourage of young staffers, when Wendy Abrams, the founder of Cool Globes, a traveling art exhibit designed to call attention to global warming, walked up to him out of the blue. She was well-dressed, carrying a big purse silkscreened with images of children’s faces.

She smiled and introduced herself, then thanked him for his work. “I’m an environmental activist,” she said.

Chu hesitated for a moment – he clearly didn’t know her – but he smiled back and shook her hand. “So am I,” he said. **PS**

ROLLING STONE (ISSN 0035-791X) is published biweekly except for the first issue in July and at year’s end, when two issues are combined and published as double issues, by Wenner Media LLC, 1290 Avenue of the Americas, New York, NY 10104-0298. The entire contents of ROLLING STONE are copyright © 2009 by Rolling Stone LLC, and may not be reproduced in any manner, either in whole or in part, without written permission. All rights are reserved. Canadian Goods and Service Tax Registration No. R125041855. International Publications Mail Sales Product Agreement No. 450553. The subscription price is \$25.94 for one year. The Canadian subscription price is \$38.00 for one year, including GST, payable in advance. Canadian Postmaster: Send address changes and returns to P.O. Box 63, Malton CFC, Mississauga, Ontario L4T 3B5. The foreign subscription price is \$65.00 for one year, payable in advance. Periodicals postage paid at New York, NY, and additional mailing offices. Canada Post publication agreement #40683192. Postmaster: Send address changes to ROLLING STONE Customer Service, P.O. Box 8243, Red Oak, IA 51591-1243.

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