

# RECHARGE

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Why South African wind can continue steady growth

## Ideas

The great technology debate: PMGs or DFIGs

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David Mesonero on how Gamesa has changed

## The biggest wind farm in the West

Elusive billionaire Philip Anschutz bets \$8bn on 3GW project in cowboy country



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The edge of the 1,300sq km Overland Trail Ranch, the site of Philip Anschutz's 3GW wind project.

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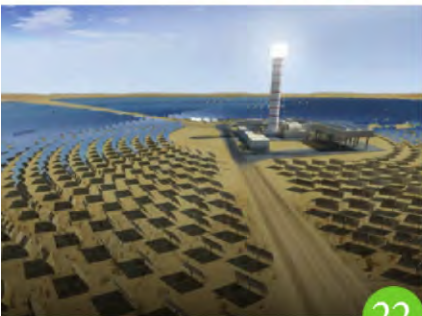
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Photograph | Matthew Lidler



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**Richard A Kessler**  
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It is the kind of wind that can blow your vehicle off the highway and then rip off your car door — even on a sunny day

# BIG

Through the ages, fierce wind has been the one constant presence in southern Wyoming. Indigenous peoples worshipped it.

Early American settlers heading west endured it. Today, residents in the thinly populated region have learned to tolerate it. It is the kind of wind that can blow your vehicle off the highway and then rip off your car door — even on a sunny day.

No-one has dared to harness its raw power on a grand scale — until now.

Publicity-shy billionaire Philip Anschutz is betting \$5bn that he can overcome a maze of regulatory, political and logistical challenges, and build the world's largest onshore wind farm at his enormous ranch outside the small city of Rawlins. With 1,000 turbines, the 3GW Chokecherry and Sierra Madre (CCSM) project would have more wind capacity than 43 states.

To get the power mainly to California, he is investing another \$3bn to string a 725-mile (1,166km), 600kV direct-current (DC)





Elusive billionaire Philip Anschutz is betting \$8bn on building the world's largest onshore wind farm on his Wyoming ranch — complete with a transmission line to California — with no guarantees that he will ever be able to sell its power, writes **Richard A Kessler** in Rawlins

# AMBITION

transmission line called TransWest Express across four Western states. It would have the capacity to transport the wind farm's entire output — enough electricity for one million homes.

The undertaking is as ambitious as it is fraught with potential pitfalls. Nothing on this magnitude has advanced as far towards construction, even though the project does not have buyers for the power or the necessary permits. It is a high-stakes gamble that would discourage even the biggest wind developers, including NextEra Energy and Iberdrola.

Few industry observers have thought he can make it work. Anschutz couldn't care less.

An admirer of Napoleon, he is said to love Bonaparte's reply to his generals when they informed him in 1806 that he should not fight the Battle of Jena because the chance of victory was slim: "What do I care about circumstances? I create circumstances."

For half a century, Anschutz has

won more than his share of skirmishes and beaten long odds on the way to amassing an \$11bn fortune across multiple businesses (*see panel, page 18*). Wind energy is his latest theatre of operations.

"Everything about the wind project has a ring of how he operates," says Marty Fridson, an Anschutz biographer. "He has been willing to take risks that are unconventional and untried. You don't become a billionaire without business risk."

"It takes some guts to go out there without customers already lined up and without the backstop of taxpayers," he adds, referring to Anschutz's decision to advance the project even if Congress does not renew the production tax credit, the industry's main federal incentive. "It's very much in line with how he has managed his whole career."

## Opportunity

Anschutz, an oilman, is an unlikely choice to provide US wind with its best opportunity to achieve a quantum

leap in economies of scale needed to become truly price competitive with coal.

This is his first and only foray into wind, and it isn't because he is going green. It is about taking advantage of an opportunity to make profits.

Anschutz certainly brings money — lots of it. The large holding company bearing his name expects to finance the CCSM project with 35% equity and 65% debt, possibly through a 23-year amortising bond with 6% interest. It coolly notes in its Wyoming state building permit application that it "possesses the appropriate reputation and relationships to attract such investments".

In 2005, after watching the emerging wind industry grow amid a push by states to adopt clean-energy mandates, he scrapped plans to sell the 500sq mile (1,300sq km) ranch. He formed Power Company of Wyoming (PCW) to evaluate and potentially harvest the winds at the site, a remote outpost far from major population centres.

Testing revealed that it is one of the

**GRAND SCALE:** Distances are hard to gauge on the 1,300sq km semi-arid ranch

Photograph | Matthew J. J. J.



## COVER STORY



**NO GAME:** Ryan Jacobson and Kara Choquette display the ranch's checkerboard ownership.



**HANGING ON:** A sign marks the edge of the enormous ranch. Inset: Kara Choquette leans into the wind.

### Class 7 wind's powerful embrace

Seven times the size of Washington DC, the Overland Trail Ranch stretches into the horizon in all directions. Distances are hard to gauge in the semi-arid landscape, broken at times by rolling hills and distant flat-topped mountains. This is unforgiving land, its rocky soil yielding barely enough nutrients for limited hay and alfalfa production.

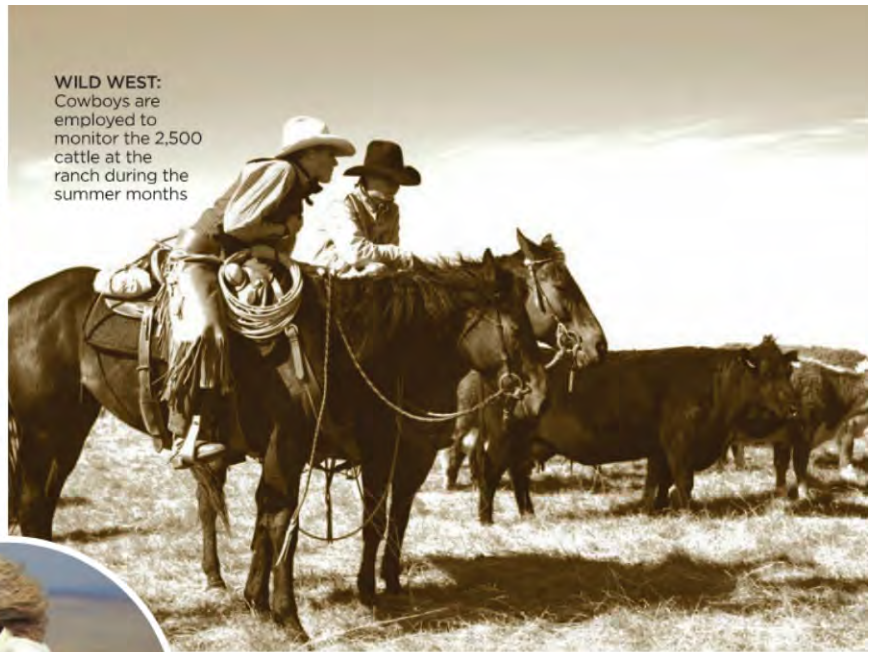
Then there is the relentless wind. There is no escaping it except in protected hollows against hillsides where clusters of aspen trees grow, their orange leaves providing a welcome dose of colour to the ubiquitous wild grass, which hangs onto the soil for dear life, blades bent at 45 degrees.

At an altitude of 7,300ft (2,225 metres), Class 7 wind greets a visitor with its powerful embrace. The onrush of air floods the lungs, making breathing harder. Eyes water and ears start to ache. Ordinary speech is difficult. "This is the hardest it has blown any time I've been here," shouts PCW spokeswoman Kara Choquette above the din of air cascading from higher elevations.

The wind produces pings, whistles and other strange sounds as it hits guy wires holding a nearby 200ft tall meteorological tower in place. A solar panel shakes from the onslaught even though bolted to the tower. "We've had some torn off," yells chief engineer Ryan Jacobson.

After 20 minutes or so, one starts to feel dehydrated, as the incessant discharge of air sucks the moisture from the mouth and skin as it whizzes past. The ambient temperature is 66°F (19°C), but it feels far cooler. Nature's awesome display signals the start of the peaks in wind strength that last from late autumn until early spring.

**WILD WEST:** Cowboys are employed to monitor the 2,500 cattle at the ranch during the summer months.



**TAKING FLIGHT:** A hawk sculpture in the nearby town of Rawlins.



few places in the country with the highest-quality Class 6 and Class 7 winds. They result from high-altitude air in the Rocky Mountains rushing down through a roughly 90-mile gap in the continental divide to Wyoming's rolling rangelands.

"You just don't see that in large volumes anywhere in the country. The wind resource here is among the very best," says Kara Choquette, spokeswoman for PCW.

Even better, the winds build from the early morning before hitting maximum strength in the early evening, matching peak load demand in the US Southwest. That contrasts with inland California wind, which tends to blow hardest at night. Indeed, a National Renewable Energy Laboratory analysis in March showed that California ratepayers would save up to \$1bn a year in generation costs if a new high-voltage DC transmission line connected its grid to Wyoming's

high-capacity wind energy.

And that is not all. The wind is strong year-round, dipping only slightly in the summer months, with very low shear, which places less wear and tear on turbines.

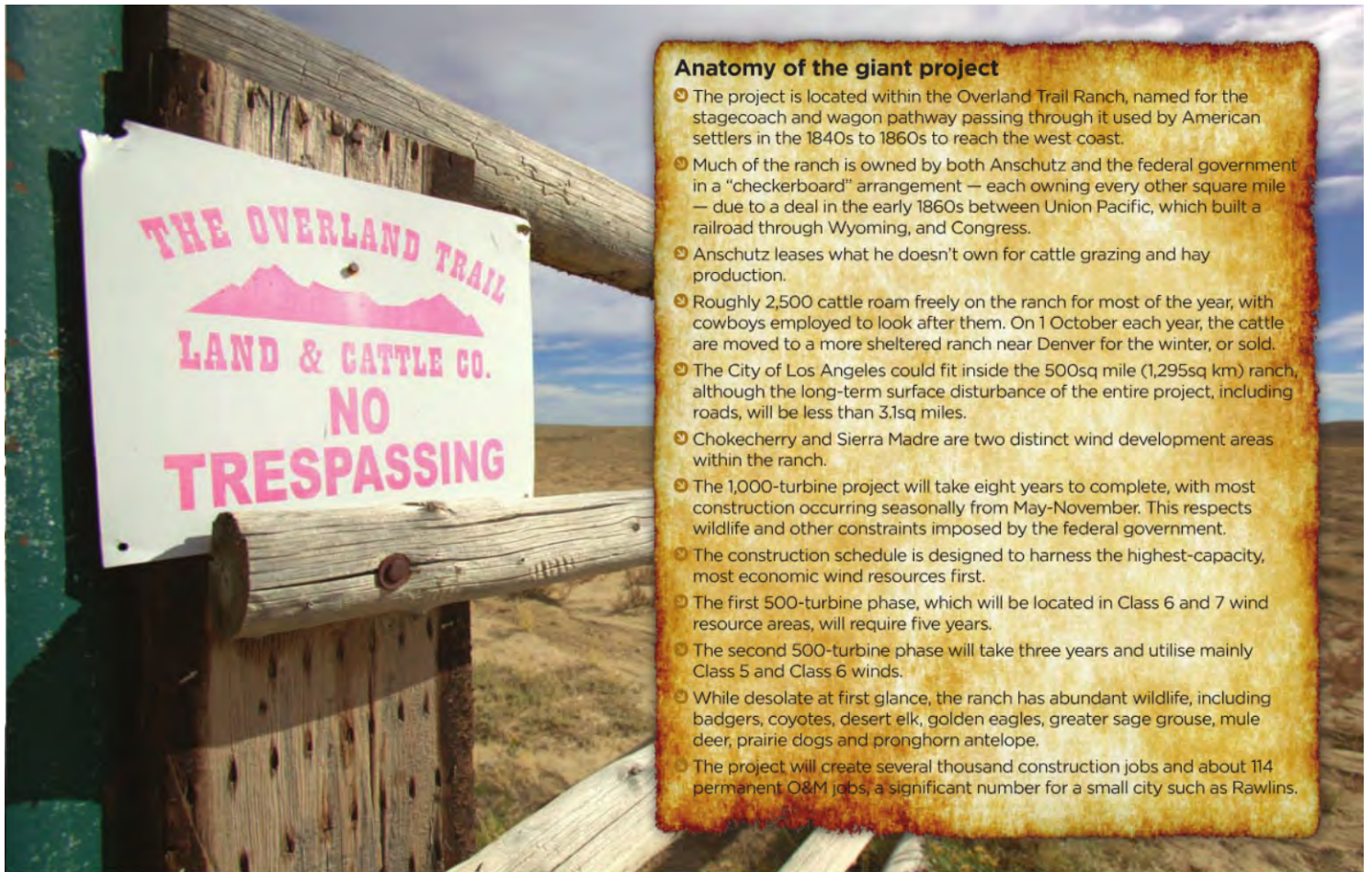
The company estimates that at a 40% capacity factor, the project will produce 10.5 terawatt hours annually. But this is a very conservative estimate. Wind farms in western Kansas and Oklahoma can operate at capacity factors of 50% or more, yet the winds are far stronger and more consistent at CCSM.

### Progress

It has not been easy, cheap or predictable to advance the project, as officials in Washington DC and Wyoming have never dealt with one like it. Wind farms in the state average about 75MW.

The biggest immediate hurdle has been the convoluted and lengthy





**Anatomy of the giant project**

- 1 The project is located within the Overland Trail Ranch, named for the stagecoach and wagon pathway passing through it used by American settlers in the 1840s to 1860s to reach the west coast.
- 2 Much of the ranch is owned by both Anschutz and the federal government in a "checkerboard" arrangement — each owning every other square mile — due to a deal in the early 1860s between Union Pacific, which built a railroad through Wyoming, and Congress.
- 3 Anschutz leases what he doesn't own for cattle grazing and hay production.
- 4 Roughly 2,500 cattle roam freely on the ranch for most of the year, with cowboys employed to look after them. On 1 October each year, the cattle are moved to a more sheltered ranch near Denver for the winter, or sold.
- 5 The City of Los Angeles could fit inside the 500sq mile (1,295sq km) ranch, although the long-term surface disturbance of the entire project, including roads, will be less than 3.1sq miles.
- 6 Chokecherry and Sierra Madre are two distinct wind development areas within the ranch.
- 7 The 1,000-turbine project will take eight years to complete, with most construction occurring seasonally from May-November. This respects wildlife and other constraints imposed by the federal government.
- 8 The construction schedule is designed to harness the highest-capacity, most economic wind resources first.
- 9 The first 500-turbine phase, which will be located in Class 6 and 7 wind resource areas, will require five years.
- 10 The second 500-turbine phase will take three years and utilise mainly Class 5 and Class 6 winds.
- 11 While desolate at first glance, the ranch has abundant wildlife, including badgers, coyotes, desert elk, golden eagles, greater sage grouse, mule deer, prairie dogs and pronghorn antelope.
- 12 The project will create several thousand construction jobs and about 114 permanent O&M jobs, a significant number for a small city such as Rawlins.

# Lifting Offshore Wind



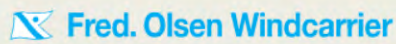
- .....
- Length 132m
- Breadth 39m
- Water depth up to 45m+
- Crane capacity 800t
- Payload capacity 6000t+
- Transit speed 12knots
- Positioning by DP2
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## COVER STORY



**HOLDING TIGHT:** One of the ranch's 20-met towers, which serve as masts, have their solar panels hoisted off by the wind, below Ryan Jacobson checks the measurements.



federal environmental review and permitting process — a labyrinth exacerbated by the fact that the ranch is half federal land, which Anschutz leases for cattle grazing (see panel, page 17). The Bureau of Land Management (BLM), the lead agency in the permitting effort, says it may be in a position to issue 30-year right-of-way grants for construction of the initial 500-turbine phase by June 2015.

That would be seven and a half years after PCW applied for them, despite President Barack Obama's 2012 pledge that his administration would expedite handling. That waiting period for approval — assuming no further delays — would have forced cancellation of most infrastructure projects at investor-owned companies.

Not with Anschutz. His control of a large holding company gives him final say on all major investment and strategic decisions.

A BLM green light for the first phase would enable him to justify the \$45m that PCW has spent thus far on development and permitting activities to comply with federal environmental reviews.

"We have studied everything from below the soil on this ranch to the sky above it," says Choquette. "We have gathered more data on the wildlife here than any other developer ever for any wind farm site."

The company has voluntarily reconfigured the project several times

to exclude some of the best wind resource locations to try to minimise bat and golden eagle deaths, but conservationists still fear the worst. It is also devising various wildlife conservation measures.

"We've invested the time and the resources to develop all aspects of this project properly, from engineering to gathering scientific data on wildlife to monitoring the wind for well over seven years," says Ryan Jacobson, director of wind engineering and construction at PCW. "All this pre-construction work ensures that we will get this project done right from the beginning."

The wait for approval is irritating local officials, who say tax revenue and jobs created by the project will be a boon for their communities. "That's our problem here. Too much federal government involvement," says Leo Chapman, chairman of the board of commissions for Carbon County, where the ranch is located.

The BLM also indicates that it will probably approve a right-of-way grant next year to allow TransWest Express to cross federal lands in Wyoming, Colorado, Utah and Nevada, where it would link up with the California grid.

"There were a lot of people who said, 'There is no way you're going to permit a 725-mile line over four states. Well, TransWest is proving they can do it,'" says Loyd Drain, executive director

### The elusive billionaire

Philip Frederick Anschutz, 74, inset, is a self-made businessman and modern-day empire builder.

Over half a century, the Denver-based tycoon has created (and occasionally lost) fortunes in an array of industries from oil and gas, railroads, ranching and real estate to live concert promotion, movie-making and telecommunications. *Forbes* estimates his net worth at \$11bn, making him the 38th-richest American.

After taking over his father's oil wildcatter business, he was almost broke by 1967 when he turned disaster into a fortune. When his only successful exploratory well, in Wyoming, caught fire, he persuaded Universal Studios to stump up \$100,000 to film oil well firefighter Red Adair putting it out, just as the studio was filming a John Wayne movie based on Adair's life.

He made his first million on the back of that well and others in the same oil field, and built on that fortune by investing in real estate, railroads and telecommunications.

One of his biggest businesses is now the Anschutz Entertainment Group (AEG), which controls more than 100 arenas and venues globally, including the Staples Center in Los Angeles and the O2 Centre in London. It is also the world's second-largest concert promoter, while its Walden Media arm produces family-friendly Hollywood movies, including the *Chronicles of Narnia* trilogy.

Anschutz, a conservative, evangelical Christian, also owns the LA Galaxy Major League Soccer (MLS) team and has stakes in the LA

Lakers basketball team and LA Kings ice-hockey team, both of which play at the Staples Center.

Anschutz's deal-making skills and uncanny ability to spot economic value and the next big opportunities before most people have paid off time and again. His instincts are usually on the mark and he won't admit defeat on investments regardless of prevailing opinion.

"He's been in this situation many times where the bankers have said, 'Give this up as a loss. Write it off.' He's just stubbornly held on and eventually it's worked out," says biographer Marty Fridson.

One example is his investment in MLS, which he co-founded, owning six franchises at a time when the league was struggling, incurring major financial losses.

Associates and employees say the notoriously press-shy Anschutz — he rarely gives interviews — is a genuinely humble and nice person with a good sense of humour, a family man who hasn't let wealth change who he is.

They say he values honor, integrity and loyalty. He doesn't raise his voice and has not been heard to swear. "He has no ego. He's the anti-Donald Trump," Tim Leiweke, former chief executive of AEG, told *Forbes*.



Photography: Matthew Idler | Getty





**MAKING TRACKS:**  
The Union Pacific Railroad, which will deliver turbine parts to the ranch

## Sale of the output is far from guaranteed. California is the target market, but politics and economics will dictate if supply deals materialise

of the Wyoming Infrastructure Authority. With permits in hand, Anschutz will have a much better case for trying to sell the wind energy, Drain says.

### Logistics

The project also presents some of the biggest logistical challenges ever for a wind project. For example, thousands of turbine components and tower sections must be transported from factories to the site by rail, unloaded and stored there. PCW has designed a facility on the ranch that it will build to handle delivery of 250 turbines per year and three trains simultaneously.

"There will be nothing like it in the world. The investment makes sense given the benefits," says Jacobson.

From the rail facility, trucks will transport components to turbine locations between two and 20 miles away on a network of roads that must either be built or upgraded. An existing quarry on the ranch will need to be developed to supply up to 70% of the rock for the roads and laydown yards.

Other critical infrastructure must be built, including a plethora of substations and intra-project transmission lines. Also to be built are a construction labour camp for hundreds of workers, utilities such as water supply and treatment, and site O&M facilities.

### Turbine supply

Jacobson says the project will use standard, off-the-shelf turbines

for high-wind, medium-altitude locations. PCW is in talks with multiple vendors but only those that can guarantee supply of large quantities of turbines. Door-to-door shipping cost will play a big role in what vendors are chosen.

The company is weighing whether to purchase both direct-drive and gearbox turbines to spread risk from a long-term O&M standpoint, he adds.

### Sales obstacles

Sale of the output from CCSM is far from guaranteed. California has always been the target market, but politics and economics will dictate if supply deals materialise, analysts say.

California's considerable efforts to combat global warming are in contrast to Wyoming, where scepticism prevails. Wyoming is also the nation's leading supplier of coal, while California uses little. This is unacceptable for some California politicians and regulators who see the two states working at cross-purposes.

Governor Jerry Brown favours mainly in-state renewables, as this would create green jobs and economic development benefits. After his expected re-election in November, he wants the state to do more to address climate change. This would include higher levels of renewables — beyond the 33% mandate by 2020.

The role the CCSM project could play may depend on how high this mandate is, says Arne Olsen, partner at consultancy Energy + Environmental

## Timeline for Chokecherry and Sierra Madre wind farm

- **1996** | Anschutz Company subsidiary Anschutz Corp acquires the 500sq mile Overland Trail Ranch in south-central Wyoming.
- **2005** | Anschutz forms Power Company of Wyoming (PCW) to evaluate and develop wind energy at the cattle ranch.
- **June 2007** | PCW installs initial ten of an eventual 32 meteorological masts in the Chokecherry and Sierra Madre (CCSM) areas of the ranch.
- **January 2008** | PCW applies for Right-of Way grants for the CCSM project with the federal Bureau of Land Management (BLM).
- **July** | The BLM begins its lengthy environmental review of project.
- **August** | Under federal pressure, Wyoming governor Dave Freudenthal signs a directive creating "core areas" totalling 15 million acres [six million hectares] to protect the greater sage grouse, a ground-dwelling bird that is "near threatened" with extinction. This sharply restricts energy development around its habitat. PCW reconfigures part of project, although outside core areas, to accommodate grouse on ranch.
- **2009** | Legislature allows a 6% tax exemption for renewable-energy projects to expire at the end of 2011. PCW estimates the move will add \$232.4m to the project's cost over eight-year construction phase.
- **March 2010** | Freudenthal signs first US state excise tax on wind-energy generation. The \$1 per MWh levy will add a \$10.5m annual tax bill to the project once it is on line.
- **October 2012** | The BLM finally completes its environmental review, agreeing that the area is suitable for wind development. Given the project's size, the BLM decides to carry out three site-specific environmental assessments: EA-1 to cover infrastructure components including proposed haul road and facilities, a road rock quarry and rail off-load facility; EA-2 for Phase 1 (first 500 turbines) and EA-3 for Phase 2 (remaining 500 turbines).
- **August 2014** | BLM releases EA-1 and a draft finding of "no significant impacts" on the human environment from the construction of project infrastructure minus the turbines.
- **September** | Wyoming Industrial Siting Council issues state permit to PCW to construct and operate the project. It is the last major non-federal approval the project requires.
- **H1 2015** | BLM will complete its environmental review and be close to permitting the first project phase. It will not issue final permits until the US Fish and Wildlife Service (FWS) approves a 30-year eagle "take" permit (allowing turbines to kill a certain number of eagles each year).
- **2016** | Possible construction start of five-year, 500-turbine, first phase.
- **2016** | PCW to finalise second phase layout, and submit its development plan for turbines and infrastructure to BLM. It will need to file another application with FWS for an eagle take permit for the second batch of 500 turbines.
- **2017** | BLM approval expected for second phase.
- **2023** | Project completion with all 1,000 turbines in commercial operation.



Economics in San Francisco. If it is increased to 40% by 2030, the CCSM output might not be wanted, as it would take up most of the increment and leave no room for other projects. For a 50% goal, there would be room, he says.

"If you can buy power [for] half or a third as cheap, you have to take [the project's output] into consideration. Or one would think you would," Drain says, referring to the state's utilities.

"California is famous for a lot of things, but world-class wind isn't one of them."

The real comparison is with solar, whose price has come down sharply in the past five years. Being California, policymakers want to use the sun as much as possible, but experts caution against this, as diversity of supply will facilitate integration and supply of renewables on the grid.

The state is also in the third year of an historic drought, which some scientists believe could last into the next decade. Lower water levels are affecting hydro output — so much so that the Hoover Dam was recently down-rated from 2.07GW to 1.59GW. CCSM could play a big role in making up some of this shortfall.

Photography | Matthew Idler



"If the state is going to maintain its commitment to ambitious renewable-energy procurement goals, it makes sense to cast a wide net to find the least-cost and most efficient sources of renewable energy," says James Bushnell, an associate economics professor at the University of California Davis.

Anschutz appears confident that will ultimately occur and his projects will win.

"[For him] it's the challenge and excitement of doing something and taking it to scale," says Fridson. At the age of 74, "Anschutz wants to continue to be in the action and make things happen". □

### Timeline for TransWest Express HVDC transmission project

- **2008** | Anschutz Corp buys the 725-mile (1,167km) 600kV direct-current transmission project from National Grid.
- **Jan 2010** | TransWest Express (TWE) files preliminary right-of-way request with federal Bureau of Land Management (BLM)
- **July 2010** | TWE files preliminary Plan of Development with BLM.
- **Sep 2011** | Anschutz and Western Area Power Administration (WAPA), a federal agency, agree to jointly fund the project's development phase; WAPA may also take a stake in the project.
- **July 2013** | The BLM and WAPA issue a draft Environmental Impact Statement for TWE.
- **Q3 2015** | The BLM target for issuing a right-of-way grant that would allow TWE to site the \$3bn project on federal lands from Wyoming to southern Nevada. TWE would still need to lease private land along the route.
- **2016-18** | Possible construction phase.

**NO WAY OUT:**  
The maximum-security prison in Rawlins

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