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PROJECT BLUE SKIES

A LEADERSHIP ROUNDTABLE ON LOW-CARBON
PROJECT DELIVERY—FROM IDEA TO OPERATIONS

A Booz & Company Practical Visionaries Event, 13 November 2008

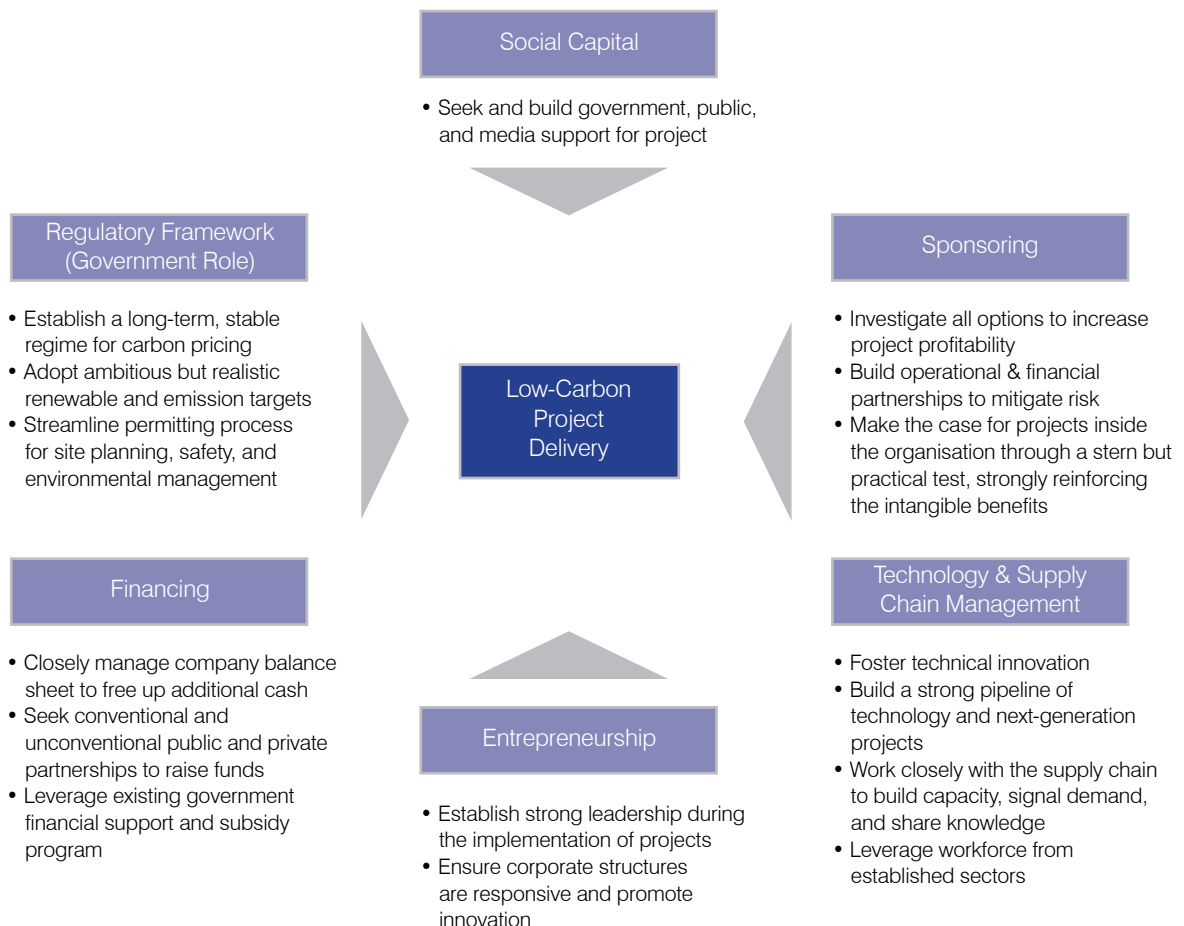
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It is now widely accepted that the forecasted increase in carbon dioxide (CO₂) emissions will lead to dramatic climate change and environmental damage. To limit the worst impacts of this trend, both developed and developing countries will need to significantly reduce their overall carbon emissions, which will require a major transformation in the way they generate and consume energy. The successful delivery of low-carbon energy projects will be an important step in this transformation.

However, the delivery of low-carbon energy projects is fraught with a myriad of market, regulatory, and technology challenges. The current market does not naturally drive low-carbon energy projects, nor displace traditional ones. This implies a huge commercial challenge. Regulatory frameworks and practices are currently not structured to support, govern, or permit many low-carbon initiatives, either in the U.K. or elsewhere. In addition, many low-carbon technologies are relatively immature: their supply chains are not yet established, and their performance, reliability, and lifetimes are unclear.

Whereas the first Booz & Company Practical Visionaries roundtable event promoted a better understanding of the low-carbon future, this second visionary event asked regulators, financiers, project sponsors, and suppliers to share their experiences on the delivery of low-carbon energy projects by using a “Blue Skies” project to help facilitate the discussion. Participants identified some of the major challenges, from the ideation through operations phases of projects to practical strategies for tackling them. Ideas generated at the roundtable are helping to build what might become a roadmap for the successful delivery of low-carbon energy projects (see Exhibit 1).

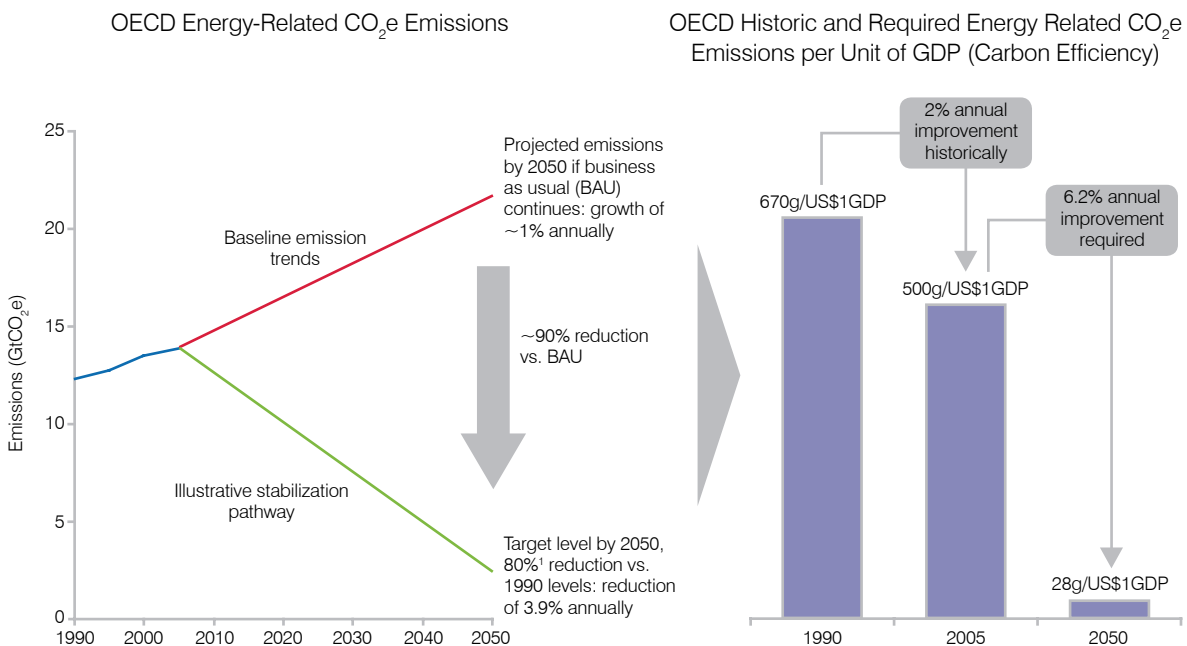
EXHIBIT 1: ROADMAP FOR LOW-CARBON PROJECT DELIVERY



It is now widely accepted that the global increase in energy-related CO₂ emissions—forecasted to grow 130 percent by 2050—will speed up climate change, leading to rapidly rising global temperatures. According to the Stern Review and the latest evidence from the Intergovernmental Panel on Climate Change (IPCC), the risk of severe environmental damage increases dramatically with each degree that global temperature rises potentially leading to falling crop yields, water shortages, and species extinction. In addition to causing damage to the ecosystem, climate change increases the risk of high-risk events that could have devastating economic and social consequences, from rising sea levels that threaten major cities to extreme storms, fires, droughts, and flooding.

To limit the worst impacts of climate change, both developed and developing countries will need to make dramatic reductions in emission levels. The challenge increases every year as the economy grows and more energy must be generated. The U.K. government already has started on the carbon-reduction journey by promising to cut greenhouse gas emissions by 80 percent of 1990 levels by 2050. In the U.S., President-elect Barack Obama is proposing similar targets. Booz & Company has estimated that if all countries that are members of the Organisation for Economic Co-operation and Development (OECD) were to follow the U.K.'s lead, overall OECD carbon efficiency (i.e., CO₂ emitted/\$GDP) would need to improve by more than 6 percent annually (see Exhibit 2).

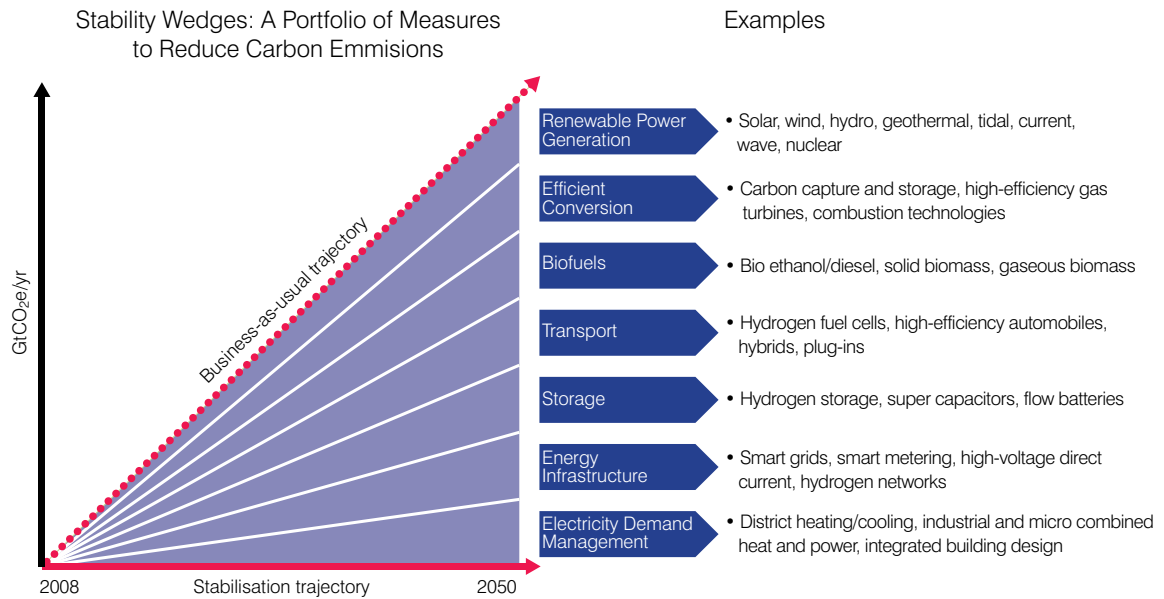
EXHIBIT 2: A MAJOR IMPROVEMENT IN CARBON EFFICIENCY IS REQUIRED TO REDUCE CARBON EMISSION BY 80% OF 1990 LEVELS



Sources: Intergovernmental Panel on Climate Change; International Energy Agency; Energy Information Administration; Booz & Company analysis 1. The U.K. Government has committed to cutting greenhouse gas emissions by 80% of 1990 levels

A wide portfolio of measures will be needed to deliver these reduced carbon-emission levels. Implementing these measures will require a transformation in the way countries both generate and consume energy. This may entail achieving zero-carbon electricity through nuclear power, wind, and hydropower; deploying new generation technologies such as solar; employing carbon capture and storage (CCS) to limit emissions from coal-based power plants; or pursuing new technologies and strategies that promote greater energy efficiency in homes, buildings, and vehicles (see Exhibit 3, page 4).

EXHIBIT 3: IMPROVEMENTS IN CARBON EFFICIENCY REQUIRE A PORTFOLIO OF MEASURES



Sources: Stern Review on Economics and Climate Change; Pacala, Socolow *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, Article published in *Science*, 13 August 2004

The successful delivery of low-carbon projects will be an important step in the transition to a low-carbon future. The execution of these projects today will provide an ideal opportunity to test, demonstrate, and validate the feasibility of new and existing low-carbon technologies, processes, and integrated systems, as well as to accelerate their consumer adoption and industrial commercialisation. However, low-carbon projects have not always been successful. For example, organisations are still struggling to justify the business case for CCS, despite many initiatives; first-generation biofuel projects are no longer seen as viable; wind and solar power still require significant government subsidies; and doubts remain regarding the introduction in the U.K. of smart grids and meters.

As a result of the difficult delivery issues, project stakeholders now are increasingly focused on understanding the key challenges involved in designing, deploying, and operating low-carbon energy projects, and on developing successful approaches and strategies to address these challenges.



PRACTICAL VISIONARIES ROUNDTABLE DISCUSSION

CASE STUDY: FLOATING WIND TURBINE

Booz & Company proposed a “Blue Skies” low-carbon energy project to facilitate discussion at the roundtable. The project involved a floating wind turbine in the North Sea with a design and deployment cost of £25 million–£50 million.

The hypothetical floating wind turbine exemplifies the challenges involved in delivering low-carbon energy projects. At the regulatory level, there are uncertain government subsidy regimes and low-carbon targets, as well as ill-defined standards and rules. Safety review processes are complex or unclear, as are environmental approval requirements.

Economic concerns related to the floating wind turbine, as compared to conventional technologies, include higher design, deployment, and operating costs, and difficulty of locating adequate financing. Underdeveloped supply chains offer limited economies of scale, and uncertainty over short- and long-term carbon and oil prices threaten the wind turbine’s competitiveness in relation to conventional energy projects.

Like many low-carbon initiatives, the immaturity of the technology poses a threat to its economic viability. The floating wind turbine’s performance, reliability, and lifespan are unclear, as are its continuing maintenance and support requirements and costs. In addition, swift technological advances in other areas could render the project obsolete.

ENSURING A STRONG REGULATORY FRAMEWORK

As a foundation, a stable, clear, and supportive regulatory framework is required to drive investment and ensure rapid delivery of low-carbon energy projects. This framework must help ensure: that these projects are competitive and profitable, through the implementation of measures such as long-term carbon pricing and renewable energy and emission reduction targets; and that the planning and approval processes are streamlined and efficient.

A long-term carbon-pricing regime is considered a critical factor. Today, many low-carbon energy projects are not approved because they are not cost-competitive with conventional energy projects, often due to issues such as technological immaturity, the lack of established supply chains, and limited economies of scale. Carbon pricing would help create a more level playing field by incorporating the real environmental costs of CO₂ emissions within the cost base of an energy project. As Martin Lawrence, chief operating officer of the Energy Branch of EDF Energy, said: “A robust carbon price is needed in the U.K. now. We should focus on this, as it will have an impact.”

Ambitious but realistic targets for renewable energy and emissions reductions can also help drive investments in low-carbon energy projects. These targets provide a clear signal to companies that they need to invest in new technologies, projects, and products both to meet regulatory requirements and to ensure long-term competitiveness. For example, California’s adoption of strict targets for vehicle emissions became a major catalyst for automotive investment in alternative power-train technologies.

A streamlined permitting process for site planning, safety, and environmental management also is required to rapidly implement low-carbon energy projects. In too many circumstances, low-carbon energy projects are delayed or derailed by lengthy approval processes.

6 Panellist Duarte Figueira, head of renewables deployment in the U.K.'s Department of Energy and Climate Change (DECC), highlighted the government's desire to create a stable and supportive regulatory framework for low-carbon energy projects. As a start, the U.K. government has adopted a target of 15 percent renewable energy use by 2020, and also the much more ambitious target of reducing CO2 emissions in 2050 by 80 percent of 1990 levels. The government also is planning and has already implemented a raft of regulatory improvements, including banding of the Renewables Obligation (RO) in the Energy Act, reform of the grid access regime in the Transmission Access Review (TAR), a new regulatory regime for offshore transmission, planning reform through the new Planning Act which will set up the Infrastructure Planning Commission (IPC), and a commitment to the removal of a number of regulatory barriers.

In addition to the regulatory initiatives, the U.K. government also is establishing the Office for Renewable Energy Deployment (ORED). John Hutton, former secretary of state for business, enterprise and regulatory reform, indicated that the ORED will address "barriers to renewables deployment, including helping to develop the U.K. supply chain."

TACKLING THE CHALLENGES OF LOW-CARBON PROJECT DELIVERY

FINANCING—RESHAPING THE MARKET

How to fund low-carbon energy projects is a perennial question, particularly in the current economic climate. Panellist Dai Clement, managing director of global investment banking at Royal Bank of Canada, provided a brief overview of low-carbon energy project financing while also highlighting the current financing challenges. Mr Clement discussed the fact that in 2003, renewables were not a core consideration for many—not even for the government. At that time, the challenge was convincing financiers of the reality of the low-carbon energy project's projections for lifetime revenue generation, particularly when the unclear long-term incentive regimes adopted by the government were taken into account. From 2005 to 2007, financing of major low-carbon energy projects became much easier as confidence grew regarding their profit potential and as governments provided increased financial and regulatory support. Mr Clement highlighted the support that financial investors had given to the large scale growth in renewable generation assets in Europe during this period.



DAI CLEMENT, ROYAL BANK OF CANADA



DUARTE FIGUEIRA, DEPARTMENT OF ENERGY AND CLIMATE CHANGE

However, in the current credit crunch, as Mr Clement noted, we face a new set of challenges, and the economic picture looks bleak for months - if not years - ahead. Large projects that require substantial capital, such as the Greater Gabbard Offshore Wind Farm, will have significant difficulty raising external project financing in the current markets. Smaller projects, developed by relatively small companies that have previously relied on project financing for a large part of their capital costs, are also likely to be impacted as banks become more selective over the companies to which they are prepared to extend credit.

Mr Clement noted that deals can still be completed. Bankers will need to develop more innovative strategies to raise money. In addition, companies will need to “use their balance sheets” to get the funds required to drive capital investment in large projects. However, in the absence of traditional funding options, there is a limit to how far they are able or prepared to stretch their resources. As a result, companies will also need to seek alternative government, industry and financial investor partnerships, which can provide major sources of financing and minimise the overall project execution risk.

Mr Figueira, from DECC, also highlighted several government programmes which had supported, or could support in future the financing of projects, including the Renewables Obligation (RO), the Renewables Transport Fuel Obligation (RTFO), the planned feed-in tariff (FIT) for small scale electricity generation, and capital grant programmes.

SPONSORING—MAKING THE CASE FOR PROJECTS

Project sponsors, those responsible for designing, deploying, and operating low-carbon energy projects, often face significant challenges in obtaining project approvals. This difficulty results from unclear financial returns, technology limitations, and resistance to change within a company. As a result, project sponsors must develop innovative approaches to increasing the project’s profit potential, mitigating overall financial risk, and clearly defining the intangible benefits.

Most importantly, sponsors need to investigate all potential opportunities to increase the project’s profitability. While there is no magic formula to increase profits, roundtable participants did highlight the importance of targeting a strong customer market with the potential to deliver sustained revenues over time.

In terms of mitigating financial risk, roundtable participants highlighted several approaches. Sponsors should try to build smaller, more discrete projects, which reduce financial obligations. In addition, sponsors should actively seek partnerships with governments and industry to help share the risk. As an example, United Parcel Service (UPS) formed a successful partnership with DaimlerChrysler and the U.S. Environmental Protection Agency (EPA) to develop zero-emission package delivery vehicles powered by hydrogen fuel cells. UPS has since gone on to form other successful cross-partner projects for hydraulic hybrid and other low-carbon vehicles.

Sponsors of low-carbon projects also must try to clearly illustrate intangible project benefits, such as improved brand reputation, the achievement of a technology leadership position, the development of a local industry and subsequent job creation, and improved employee morale.

WORKING WITH THE TECHNOLOGY AND SUPPLY CHAIN

The challenges related to many low-carbon technologies are numerous and well-known: poor performance and reliability, limited project lifetime, and high ongoing maintenance and support requirements. These challenges



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are further exacerbated by underdeveloped supply chains with limited economies of scale, as well as by a lack of skilled resources to implement projects based on new technologies.

The roundtable focused on strategies to address these challenges. Successful management of the technology pipeline is an essential component of any strategy. First, technologies incorporated into projects must be fully validated and tested to reduce the operational risks. During the operational phase of projects, all technology failures and issues must be investigated, and the lessons learned incorporated into improved operating procedures and, as required, upgraded designs. Companies also should have a strong pipeline of next-version technologies which can be incorporated into current and future projects.

Second, companies must closely manage the project's supply chain, particularly because these are often underdeveloped for low-carbon energy projects. In doing so, it is critical to clearly signal forecasted demands across the supply chain and support the build-up of capacity. Furthermore, companies should seek opportunities to share knowledge from specific projects and previous experience. In some cases, the difficulty in managing and controlling the supply chain forces companies to actively take control through vertical integration, which can help improve delivery quality and timeliness. Eddy Collier, managing director of Centrica's new heating business, strongly agreed with this approach when he stated that "flexibility increases when holding a larger part of the value chain, even if this means hiring the construction ship directly."

Finally, companies should actively seek, where possible, opportunities to transfer skills from their traditional activity base to the new low-carbon areas. This transfer will help avoid any bottlenecks and also will provide opportunities for employees in declining industries. As an example, maintenance technicians in offshore oil platforms easily could transfer to support the maintenance of offshore wind farms.

PROMOTING ENTREPRENEURSHIP

Delivering low-carbon projects demands entrepreneurship and therefore leadership in creating a vision. Creativity, flexibility, and drive also are needed to implement the project successfully. Centrica's Mr Collier described what

happened when Centrica's primary contractor dropped out of its offshore wind farm project: Centrica had to run everything itself. "We had to move our thinking from simply oil and gas," he revealed, "but it went well in the end; the company was able to bring diversity and new sorts of expertise to the project."

In addition, the opportunity to work on low-carbon energy projects is offering employees a new source of inspiration, allowing them to take pride in their work and the final results. As Mr Collier affirmed, "They do the work themselves and feel good to have done it."

Importantly, corporate structures have to remain responsive and promote innovation. Regimes need review and revision to cope with technological evolution and environmental change. As an example, some companies are concentrating their low-carbon activities in one unit, under direct report to the CEO. Although an organisational structure change can ignite the right signals, it remains imperative for success to ensure an entrepreneurial culture with less rigid processes.

BUILDING SOCIAL CAPITAL

The low-carbon future only can be achieved with public support. Low-carbon project delivery is as much about building public enthusiasm and commitment as it is about effecting technological change and industry development. When it comes to incentives, public understanding is crucial if people are to buy into the low-carbon agenda and its attendant costs and processes. As Caroline Fiennes from the Global Cool Foundation noted, "The final word comes from the public."

Public education will lead to community involvement, especially when the U.K. government has clearly established in the public eye that its four prime objectives are being met: acting on climate change; promoting U.K. business; ensuring security of supply; and providing affordable energy. As Lord Turnbull concluded, "With such advocacy in place, project sponsors, regulators, financiers, and suppliers will be well positioned to design, deploy, and operate highly successful low-carbon initiatives."

ROADMAP FOR DELIVERY

The delivery of low-carbon energy projects is facing significant market, regulatory, and technological challenges, which are further complicated by the current economic climate. At Booz & Company's Practical Visionaries Event, participants were able to share their experience and propose practical strategies to address these challenges. These contributions have formed the key elements of a roadmap for successfully delivering low-carbon energy projects.

However, the roadmap is not in itself sufficient. Strong visionary leadership from governments and industry at the local, national, and international levels is needed to overcome the traditional barriers to change. The general public also will need to demonstrate its commitment through financial support and changes to its energy consumption levels and patterns.

*"The great challenge...is stating the problem
in a way that will allow a solution."*

BERTRAND RUSSELL

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Blue Skies: A Lea
ble on Low Carbo
ea to Operations

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Supply constraints

Security of supply

Maintenance

Migration

on-site interdependency of the project

Distance of shore

BP (shore)

Biomass

EPRI

Arbitrage

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