

# Building a Sustainable Hydropower Partnership

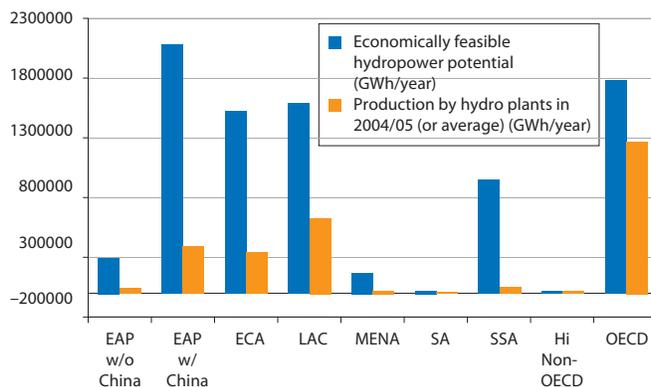
Hydropower is the largest global source of affordable renewable energy, yet in the developing world less than a quarter of the potential of this abundant resource has been tapped. When developed appropriately, with attention to social and environmental risks, hydropower projects can provide multiple economic and environmental benefits to the world's poor. For these reasons, after a decade of declining lending, the WBG is re-engaging in hydropower as a way to contribute to its mission: to eradicate poverty and help build sustainable development. However, the financing requirements of many large projects exceed the funds available from public sources, like the WBG, and thus the private sector plays a critical role in hydropower development. To ensure the financial, environmental and social success of these projects, the World Bank is working in partnership with national governments, civil society organizations, and the private sector to support and plan quality hydropower projects in developing countries.



## An Abundant Resource

Hydropower potential of varying sizes and configurations (pico, micro, mini, run-of-river, through to dams and storage reservoirs) amounts to roughly 7 billion GWh per year in developing countries<sup>9</sup>. Yet, only 23 percent of the energy potential has been developed, compared with 72 percent in OECD countries (see Figure 4). And, in terms of water management, per capita water storage in Africa amounts to less than one fiftieth of that in North America or Australia.

**Figure 4: Hydropower Potential and Production by Region**



Source: *World Atlas and Industry Guide (2006 edition)*, a publication of *The International Journal on Hydropower and Dams*. Aqua-Media International, Sutton, Surrey, U.K.

## The Multiple Benefits of Hydropower

Appropriate multipurpose hydropower development, as part of a menu of options, can bring significant benefits in terms of access to electricity, diversified energy options, managing water scarcity (and over-abundance), and support-

<sup>9</sup> The international community considers hydropower of all sizes and configurations to be renewable, as acknowledged at the World Summit on Sustainable Development in Johannesburg, South Africa, and the International Renewable Energies Conference in Bonn, Germany.

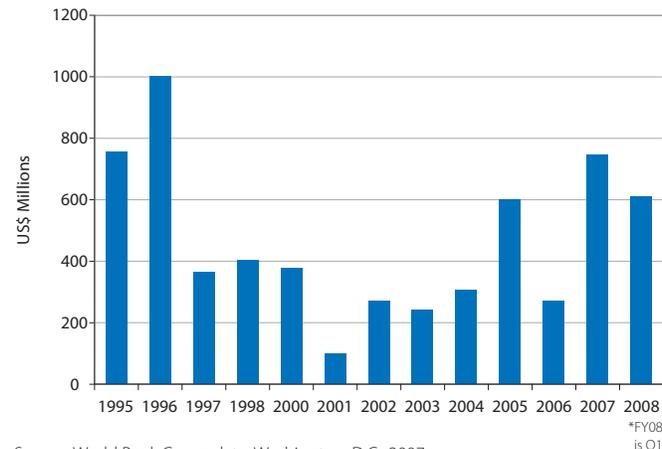
ing water-dependent activities. Hydropower contributes to the energy security agenda as a low-carbon source of electricity drawn from an indigenous natural resource that reduces susceptibility to the oil price shocks that developing countries have experienced in the last five years. It also provides unique, complementary services to an energy system that mixes thermal and renewable sources, adding reserve capacity to back up intermittent sources, such as wind and solar. Beyond energy, hydropower storage projects – when designed and operated sustainably – can help manage the drought and flood stresses of naturally volatile hydrology and the allocation of this increasingly scarce resource across multiple users, thereby contributing to water security. Finally, hydropower also offers the opportunity to build transboundary cooperation through regional initiatives in both water management and the development of power pools, with benefits beyond the river.<sup>10</sup>

Financial benefits of low carbon generation are being exploited in hydropower projects. Between 2005 and 2007, carbon credit was extended to 15 WBG projects valuing US\$110 million. Increasingly, the carbon market is accessed by larger projects in both the private and public sectors. For example, the 59 MW Felou project in Senegal recently accessed US\$3.1 million through the signature of an Emissions Reduction Purchase Agreement with the World Bank Spanish Carbon Fund, and the larger 412 MW plant in India is exploring carbon financing of US\$15 million.

### The World Bank Group's Hydropower Investments

The WBG is re-engaging in hydropower for both energy and water security. After a decade of declining lending, the Bank now supports a range of projects, from small run-of-river and rehabilitation to large multiyear storage and multipurpose investments. Thirty-five hydropower projects

**Figure 5: World Bank Group Annual Hydropower Financial Commitments**



Source: World Bank Group data, Washington, D.C., 2007.

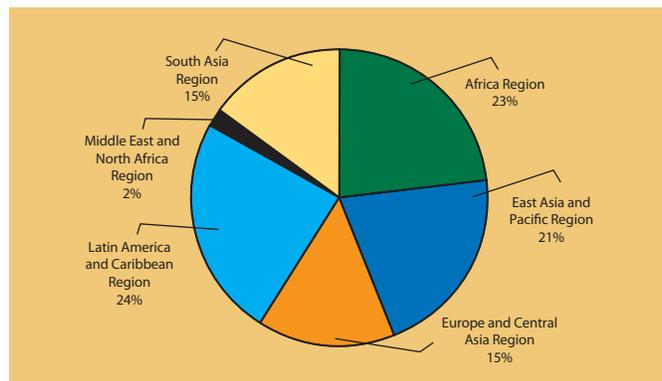
have been approved in the last three years, amounting to US\$1.6 billion in commitments (to support a total of US\$4.9 billion in project investments and 6,224 MW; see Figure 5). Major projects have recently been approved in Africa (Democratic Republic of Congo, Senegal, Sierra Leone, and Uganda) and Asia (India and People's Democratic Republic of Laos), with several rehabilitation projects in Eastern Europe (Georgia, Macedonia, and Ukraine). New projects are under discussion in Brazil, Ethiopia, Georgia, Guinea, India, Rwanda/Nile Equatorial Lakes, Tajikistan, and Vietnam, along with carbon finance projects in Madagascar and Sri Lanka (Figure 6).

Regionally, the hydropower story varies considerably:

- *In India*, the focus is on addressing an **electricity gap** that is compromising growth and on realigning the balance among renewable and nonrenewable energy resources. The Rampur project benefiting from a combination of IBRD financing and carbon finance

<sup>10</sup> C. Sadoff and D. Grey (2003), "Beyond the River: The Benefits of Cooperation on International Rivers," in *Water Science & Technology*, Vol. 47, No. 6, pp. 91-96, IWA Publishing.

**Figure 6: Regional Distribution of World Bank Group Hydropower Projects**



Source: World Bank Group data, Washington, D.C., 2007.

Note: The number of projects counts separate WBG engagements, which in some cases support a single hydropower.

will add 412 MW into the Northern India Electricity Grid.

- *In Africa*, hydropower needs to be addressed from a **water management** perspective, given the challenges of multiple demands for water and the predominance of international rivers. On the Niger River, for example, the Bank is aiding nine countries in developing a river basin organization that will enhance regional coordination, development, and sustainability of water resources along the third longest river in Africa. The **regional context** is also an important driver from the energy side as well. A recently approved project in the Democratic Republic of Congo will rehabilitate two Inga plants for a total increase of 600 MW in supply to the Southern Africa Power Pool. Coupled with investments in transmission and distribution, this additional energy will increase the reliability of electricity supply in the region.
- *In Eastern Europe*, the WBG is assisting countries in **rehabilitating** and upgrading facilities to feed into an emerging regional power pool.
- *In East Asia*, challenges and opportunities are arising in the effort to ensure that projects **alleviate poverty** in host countries while feed-

ing demand for energy in multiple countries, such as the Nam Theun 2 project in Laos that serves Laos, Thailand, and Vietnam.

### Managing the Risks of Hydropower Projects

Along with the potential development benefits of hydropower, the WBG also recognizes that hydropower, like many natural resource projects, poses risks, particularly when it involves regulation of rivers or resettlement of local communities. Hence, hydropower must be developed cautiously in the context of broader development goals, including (a) responsible environmental management, (b) poverty alleviation and social development, (c) integrated water and energy management, and (d) institutional development.

There has been exceptional development in the past decade in understanding how to address what used to be overwhelming environmental and social risks. The contraction of Bank lending in the 1990s was in part a response to concerns about the environmental and social impacts of dams, and the balance between benefits and costs of development. The World Commission on Dams, in which the World Bank participated, produced a useful reference document that identifies important issues and outlined important strategic priorities for dams. The WBG also actively participated in the United Nations' follow-up to the Commission: the Dams and Development Program.<sup>11</sup> Its final report, "Dams and Development: Relevant Practices for Improved Decision-Making," provides a positive and constructive compendium for addressing environmental and social concerns. These endeavors complement the industry's own efforts to raise awareness and improve practices through the International Hydropower Association's Sustainability Protocol.<sup>12</sup>

<sup>11</sup> <http://www.unep.org/dams>.

<sup>12</sup> <http://www.hydropower.org>.



WBG projects are themselves subject to the “most sophisticated set of policies, operational procedures, and guidelines among the international donor community,”<sup>13</sup> which has prompted innovative approaches to sustainability. The Nam Theun 2 project, for example, includes a conservation offset to protect a regionally significant biodiversity area. Nearly 10 times the inundation area in the Nakai Nam Theun watershed, the offset is supported by long-term financing (US\$1 million per year for 30 years) and an innovative institutional and capacity building arrangement. In the Nile Basin, the proposed Rosumo Falls multipurpose project undertook a comprehensive strategic environmental assessment to compare various options from a “triple bottom line” perspective.<sup>14</sup> With this ongoing experience, the Bank continues to synthesize lessons learned and refine “best practices” to improve the outcomes of hydropower projects.

### Engaging the Private Sector

The private sector plays a critical role in hydropower. The financing requirements of many

large projects exceed funds available from governments and public sources. Private participation can also bring additional skills in financial management, procurement, and project management. However, the financial crises of the second half of the 1990s, coupled with reduced lending from multilateral development banks for hydropower, greatly cooled the prospects for private sector participation. Today, the lack of strong regulatory and enabling environments set against intense scrutiny of larger projects raises considerable risk for private capital. The inherent complexities of large hydropower (such as large upfront costs, long project development time, and environmental and social impacts) further compromise investment.

The WBG is addressing the challenge and opportunity for private sector participation by (a) taking a programmatic approach to institutional

---

<sup>13</sup> World Commission on Dams, *Dams and Development: A New Framework for Decision-Making*. Earthscan, 2000.

<sup>14</sup> *Triple bottom line* refers to the three values in sustainable development: economic, environmental, and social.

and regulatory development (as in the recently approved Development Program Loan to the state of Himachal Pradesh in India) and (b) acting as financial intermediary, providing targeted financial support, convening multiple parties, and accessing a range of financial instruments and models.

Given the hiatus in new project development for hydropower, knowledge and experience in attracting private participation in these projects is lacking. A recent study of financing water infrastructure explored project financing models, instruments, and project structures (for example, BOOT and government).<sup>15</sup> The extent of private sector involvement and appropriate structure for public-private partnership will depend on site- and country-specific circumstances. It will also depend on the type of project. Many small and medium run-of-river projects that have limited financial risk, low environmental consequences, and no resettlement complications are bankable

by the private sector. The WBG has been successful in supporting the entry of the private sector for small and medium hydropower projects as exemplified by projects in several countries:

- The World Bank Carbon Finance Unit began purchasing carbon offsets from La Esperanza, a run-of-river private hydropower project located in the waters of Intibucá River, Honduras, in 2007. The project developer is also developing forestry and land protection programs around the river basin, cleaning the garbage from the lake area, and generating local direct and indirect jobs. Further, La Esperanza electrifies the local village. More recently, La Esperanza has funded a tree planting program in the surrounding community with more than 30,000 trees that were donated by La Esperanza.

<sup>15</sup> C. Head, *The Financing of Water Infrastructure: A Review of Case Studies*. World Bank, Washington, D.C., 2006.



- In India, the World Bank supported two financial intermediation projects over the last 15 years that has resulted in 79 small hydropower projects with 276 MW in total capacity. The projects helped launch several small hydropower project developers, some of whom are also investing in other countries. The success of the schemes funded by the World Bank and IREDA has also raised interest from commercial banks, leading to the gradual emergence of a competitive commercial market for funding such schemes. Consequently, total small hydropower capacity in the country stands at more than 2,000 MW as of 2007.
- The IFC is financing Hidromaule S.A. in Chile, a hydropower generation company owned by an Italian-Chilean consortium. The company's initial project, Lircay, is a 20 MW run-of-river hydropower project located along the Lircay River in the VII Region of Chile, approximately 30 km to the northeast of the city of Talca. The Lircay hydropower project takes advantage of water rights owned by the Canal Maule Association, a long-established irrigation group formed mainly by small and medium agriculturists and with approximately 2,200 shareholders.
- In Sri Lanka, an indigenous renewable energy industry was born in 1997 that today has invested more than US\$130 million in more than 100 MW of small hydropower plants (Case Four). This industry emerged thanks to policy, legal, regulatory, and financial support from the World Bank to establish a small power purchase framework and to invest in renewable energy. This achievement also led the IFC to set up a facility in Sri Lanka to create more standardized financial terms for distributed generation to expand and extend this small power model.

At the other end of the spectrum, large storage projects with multipurpose operations demand

a more complex mix of public and private structures in order to balance public and private benefits and a range of risks. The Nam Theun 2 project's complex private-public partnership involved more than 30 parties, with explicit allocation of risks across Nam Theun Power Company equity holders, project sponsors, and private participants, as well as the Government of Laos and the WBG (see Table 4).

Generally, risks are allocated to the party best able to manage it at the least cost to the overall project. Risk instruments, such as guarantees, have had a significant role in recent Bank projects. Three projects—Bujagali (see Case Five), Bambuna in Sierra Leone, and Nam Theun 2—took advantage of risk guarantees from IDA or MIGA, or both, as in the case of Nam Theun 2. MIGA guarantees against political risks, such as war, civil disturbance, expropriation, and foreign exchange inconvertibility, and the insurance requires no host country backing. IDA partial risk guarantees cover commercial bank debt. During the past three years, the value of risk guarantees for WBG hydropower was valued at US\$518 million.

### **The World Bank Group's Hydropower Strategy**

Looking forward, the WBG will continue to build a pipeline of sustainable projects that add value to water management and mixed energy portfolios. The portfolio, a combination of lending, technical assistance, and analytical advisory services will continue to be characterized by diversity, with projects ranging from small local plants and rehabilitation of existing facilities to pumped storage and multipurpose transnational projects. The contribution of hydropower to the renewable energy portfolio will build on the following:

- Region-specific lending strategies, taking into consideration country programs and

**Table 4: Nam Theun 2 Project Risk Allocation**

<i>Phase</i>	<i>Risks/Obligation</i>	<i>NTPC Equity Holders, Project Sponsors and Private participants<sup>(a)</sup></i>	<i>Lao PDR<sup>(b)</sup></i>	<i>IDA PRG</i>
Pre-Construction	Project design	•		
	Pre-construction works	•		
	Financing	•		
Construction	Cost overruns	•		
	Construction delays	•		
Operation	Operations and maintenance	•		
	Tariffs	•		
	Transmission	•		
	Hydrological	•		
	"B-period" tariffs	•		
Concession Team	Thai Baht devaluation	•		
	Lao political force majeure	•	•	•
	Changes in Lao PDR law		•	•
	Natural force majeure <sup>(c)</sup>	•	•	•
	Lao—expropriation		•	•
	Thailand political force majeure	•		
	Thailand —expropriation	•		

(a) Including EGAT as an off-taker; Engineering, Procurement and Construction (EPC) contractors; project lenders and GOL, as shareholder in NTPC.

(b) Excludes risks taken by GOL as an NTPC shareholder.

(c) Natural force majeure: acts of God, earthquakes, fires, typhons, etc.

Source: World Bank, "IDA Guarantee Paves Renewed Interest in Private Hydropower—the Nam Theun 2 Project," Project Finance and Guarantees Group, Washington, D.C., June 2005, p. 5.

- capacities, sector needs, and constraints, and Bank value added.
- Attention to environmental and social management and cross-cutting issues, such as revenue management and benefit sharing across all stakeholders, retaining water flows to sustain the environment, and climate change.
- Alignment of financial instruments to hydropower needs, addressing public-private partnerships, funding for regional projects, and transaction costs of Bank lending.
- Continued emphasis on capacity building to enhance regulatory environments and embed sustainability principles in executing agencies.

## CASE FOUR

# SRI LANKA—PRIVATE SECTOR LEADERSHIP IN SMALL HYDROPOWER

Sri Lanka's small hydropower (SHP) industry has received international acclaim in recent years. Ten years since the first grid-connected, privately owned small hydropower project was commissioned by Premasiri Sumanasekera in Dick Oya, the industry has grown into a 109 MW success story (Figure 7). Domestic private sector investment in the industry of about US\$130 million has contributed 4 percent of the nation's gross generation. Between 2005 and 2006 the only new generation that was added was from these private small hydro-power generators. In a world pressured by escalating oil prices, the Government of Sri Lanka is now committed to build on the SHP industry's achievement and reduce the burden on the consumer by prioritizing the development of indigenous, economical sources of energy. The National Energy Policy and Strategy has set a target of meeting 10 percent of the total demand from new renewable energy sources by 2015.

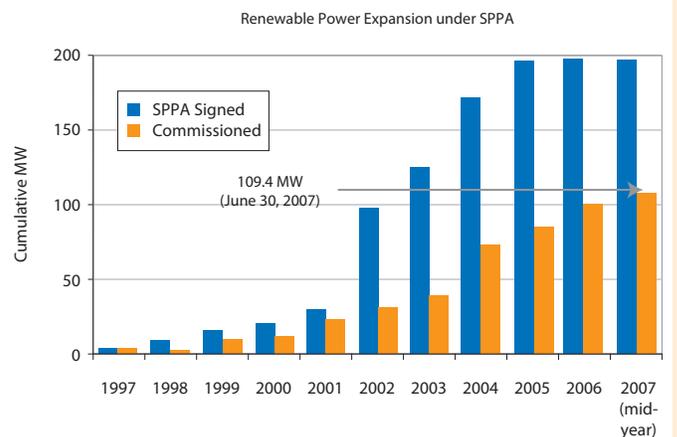
An effective framework has evolved over a decade to attract private sector investment for the development of small-scale, run-of-river hydropower projects in Sri Lanka. This framework rests on six important cornerstones, which together provide a powerful incentive and support structure that tilts the scale toward continued investor confidence, which in turn overcomes numerous obstacles in the process (see Box 7).

The SHP industry is now endowed with a skilled pool of local engineers and engineering firms. Local engineers have ingeniously adapted imported technology and know-how to suit indigenous conditions. As a result of their efforts, the cost of development in Sri Lanka is 20–30 percent less than internationally accepted benchmarks. Their techni-

cal prowess has evolved over the years and enabled them to resourcefully counter ever-increasing input costs. Consequently, local expertise is now sought after internationally, and three Sri Lankan engineer-



**Figure 7: Sri Lanka Small Hydropower Growth**



ing firms are already designing, constructing, and investing in small hydropower projects in Africa.

Indigenous, new renewable energy generation is having a significant positive impact on the economy, society, and environment of Sri Lanka. The country's energy security is improved because of the diversification of the energy mix, local private sector investment is mobilized to develop

the nation's infrastructure, and policy makers are encouraged to steer the country toward sustainable development by balancing economic progress with the conservation of the environment and empowerment of rural communities. The quality of life of villagers in the vicinity of SHP plants has improved in large part because of better road access, bigger bridges and, in some areas, access to grid electricity. The provision of basic infrastructure facilities undoubtedly translates into enhanced income-generation opportunities for these communities. The country as a whole also benefits from a significant foreign exchange savings of about US\$30 million generated by the 346 GWh that these SHPs supplied to the national grid in 2006 (assuming 60 percent of generation displaced oil-based power at US\$80/barrel of oil). Sustainable development has thus become a reality as tangible economic gains are derived, while the environment profits from the reduction of polluting emissions equivalent to 221,000 metric tons of carbon every year.

### **Box 7: Cornerstones of Progress**

1. A straightforward application process to reserve a site for development based on a Letter of Intent issued on a first-come, first-served basis.
2. A 15-year standardized, non-negotiable power purchase agreement with the utility ensures that this Must Run facility is operated and maintained in a manner consistent with Prudent Utility Practices.
3. A power purchase tariff with a guaranteed floor price based on the avoided cost of marginal generation of utility-owned thermal power plants.
4. Tax and import duty concessions that are available to other energy and nonenergy investments meeting Board of Investments criteria.
5. Medium- to long-term project financing through the World Bank-funded Energy Services Delivery Project and thereafter the Renewable Energy for Rural Economic Development Project (additional financing of US\$40 million was injected into the RERED project in FY07 by the World Bank).
6. Strong domestic entrepreneurial capacity and local technical expertise.



## CASE FIVE

# BUJAGALI HYDROPOWER: FINANCING AND RISK MITIGATION

An ongoing electricity crisis is a major impediment to foreign investment in Uganda. It has placed a significant strain on economic growth and has contributed to a decline in GDP growth down to 5 percent in 2006 from 6 percent in previous years.

The 250 MW run-of-river Bujagali Hydropower Project is a major component of the Ugandan government's least-cost energy sector expansion strategy that will supply enough power to meet the country's needs once it is commissioned in 2011. The associated transmission line is being financed by the African Development Bank.

The estimated US\$870 million project is structured on an IPP basis. The project company, Bujagali Energy Ltd. (BEL), will sell power to Uganda Electricity Transmission Company Ltd. (UETCL, Uganda's national transmission company) under a 30-year Power Purchase Agreement. The WBG's support of this project has been pivotal in mobilizing the financing package needed for what is the largest single private investment in Uganda—and among the largest in East Africa.

### Major Challenges and Lessons Learned

The Bujagali project faced the normal challenges of engineering, environmental, and social issues, as well as financing, involved in any large hydropower project. However, the project's large size with respect to the economy and the sector, as well as the country environment, called for both innovation and dedication to see the transaction through.

The Ugandan government's commitment to developing Bujagali has played a defining role in meeting these challenges. The government undertook a

transparent selection process for the project sponsor and required the sponsor to follow a transparent process for selection of the engineering, procurement, and construction contractor. The government has also engendered public support through a well-orchestrated communications campaign. In addition, the government retained highly qualified legal services for support throughout the transaction, which provided confidence to all participants that Uganda's interests were adequately represented.

To lay the groundwork for such substantial investments in the sector, the government had previously undertaken a comprehensive power sector reform program, including unbundling of the power utility, promotion of private sector participation, and creation of a sound legal and regulatory framework. The robust sector framework created by the government has allowed electricity prices to remain at or near cost-reflective levels. The bankability of





projects such as Bujagali depend heavily on the general confidence that a committed government can establish through reform actions, as well as sustained support of the donor community.

The challenges faced by the project required focused and carefully crafted strategies for WBG engagement. The main features of this experience can be summarized as follows:

- **Leveraging effect:** An innovative combination of a US\$115 million IDA partial risk guarantee, US\$130 million in IFC loans, and US\$115 million of MIGA guarantee for equity investment resulted in the mobilization of nearly US\$870 million of project financing for this project.
- **Rigorous analysis and effective external communication:** The WBG team pursued rigorous analysis and external communication with the wider public, business, and investment community to ensure compliance with policies.
- **Efficient collaboration within the WBG team:** The success of this project hinged on co-

operation within the IDA/IFC/MIGA WBG team in close collaboration with key project stakeholders in the government, the project sponsor, and other members of the lending consortium.

- **Strong package of accompanying support to the energy sector:** In parallel to the Bujagali preparation, IDA supported the power sector reform process with technical assistance and with financial support to the privatization of the distribution company (which also received MIGA support). IDA also provided a power sector development loan supporting the sector's finances and 50 MW of additional temporary thermal generation capacity to help mitigate the short-term power shortage.
- **Signaling effect:** The substantial participation of the WBG in the Bujagali Project has signaled to its clients, financing partners, and to the private sector its willingness and capacity to re-engage in the development of a public-private partnership in support of "transformative" energy and infrastructure projects in Africa, especially the largely untapped hydroelectric potential.