ESCOs and Information Technology for New Markets

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For the foreseeable future demand growth for energy will be generally higher in developing countries than in the mature markets of developed nations. Demand growth coupled with inadequate capital resources in these markets has led to projections of shortfalls in electrical capacity. As subsidies are eliminated in liberalizing economies, energy prices will rise. These trends have already created a wave of international power projects involving independent power producers, global utilities, local affiliates, financial partners, and privatizing governments. Those seeking business growth must enter and develop new markets. (1)

The new global utilities will compete for market share on the basis of services as well as price. In deregulated environments direct marketing to major end-users and market segments will be part of the game. Energy efficiency (demand-side) resources, because they can be much less expensive than new supply-side resources, offer a cost enhancement to capacity but require varied and novel techniques for their decentralized delivery. Financing and technical services may provide non-price enhancements of critical value to specific customers. Energy procurement and load management play increasingly important roles after deregulation.

Energy Service Companies ("ESCOs") provide a means to identify customer needs, project opportunities, and enterprise energy solutions. They assemble services, suppliers, and funds into energy service "products." They serve as integrators in a relatively complex market and service delivery structure (see Figure 1). They are increasingly owned as utility marketing subsidiaries with a mission of getting closer to customers.

New markets across the world do not develop in lock-step. Consequently, a global ESCO will be confronted over time with an on-going series of market entries.

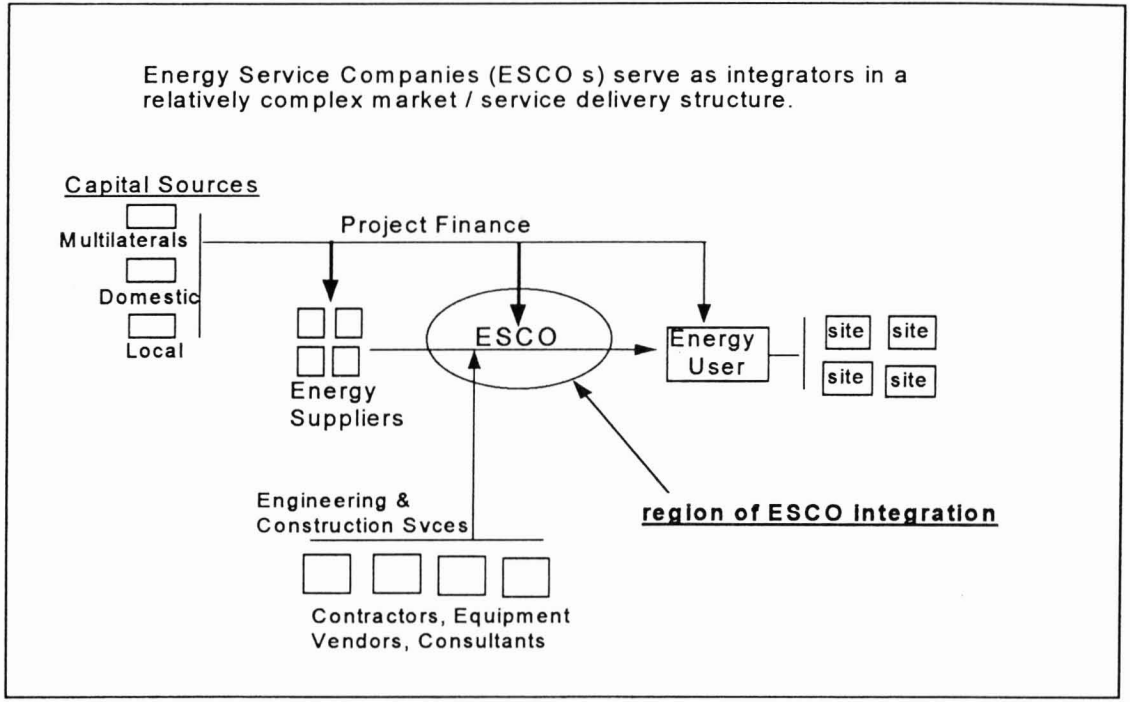
Energy Service Companies (ESCO s) serve as integrators in a relatively complex market / service delivery structure.
Capital Sources
Multilaterals
Domestic
Local
Project Finance
ESCO
Energy Suppliers
Energy User
site
site
site
site
Engineering & Construction Svces
region of ESCO Integration
Contractors, Equipment Vendors, Consultants

Figure 1.

As suggested graphically in Figure 2, Information Technology (IT) can help corporate "fit" to new environments by systematizing information, creating a consistent approach, projecting a consistent image and providing knowledge bases for comparative understanding of varying market circumstances.

At the strategy stage, accessible and comparable market information helps identify targets and plan the sequence of market entries. Such information includes the macroeconomic setting, political environment and policy reforms, energy costs and projections, sectorial data, and potential customers' perceptions gathered through surveying.

At the entry stage, corporate knowledge made tangible through Information Technology will help to negotiate and assemble the "pieces on the ground" in the form of relationships, alliances, and agreements. IT tools strengthen early performance in developing and implementing projects and new products. ESCO learning is improved by consistency in proceeding through repeated entries. "Learning the drill" improves speed and reliability. But individual markets will be idiosyncratic even amidst structural parallels. Knowledge repositories provide a place where "lessons learned" can be shared and studied.

IT FOR CREATING SUSTAINABLE MARKET POSITION

A key characteristic of energy services as an industry is relative ease of entry. Establishing a market presence can be accomplished quickly and with little investment. Joint ventures, marketing relationships, representation agreements can proliferate once a market becomes "hot." With many firms entering, competition becomes excessive. Where excessive competition prevails, profits will be slim. Frequent exit of energy service suppliers will undermine customer confidence. The challenge, therefore, is to create a sustainable position.

Sustainable competitive position (after Porter 1985) can be achieved by cost leadership or by differentiation. Since cost competition is the systemic problem stemming from ease-of-entry, differentiation is the strategic response. Differentiation implies qualities which add customer value in ways that competitors do not and which, moreover, can be communicated to the marketplace (Porter p119ff). Dimensions for differentiation, suggested in Table 1, are based on ESCO factors of production, success on how effectively the ESCO secures, coordinates, and markets them.

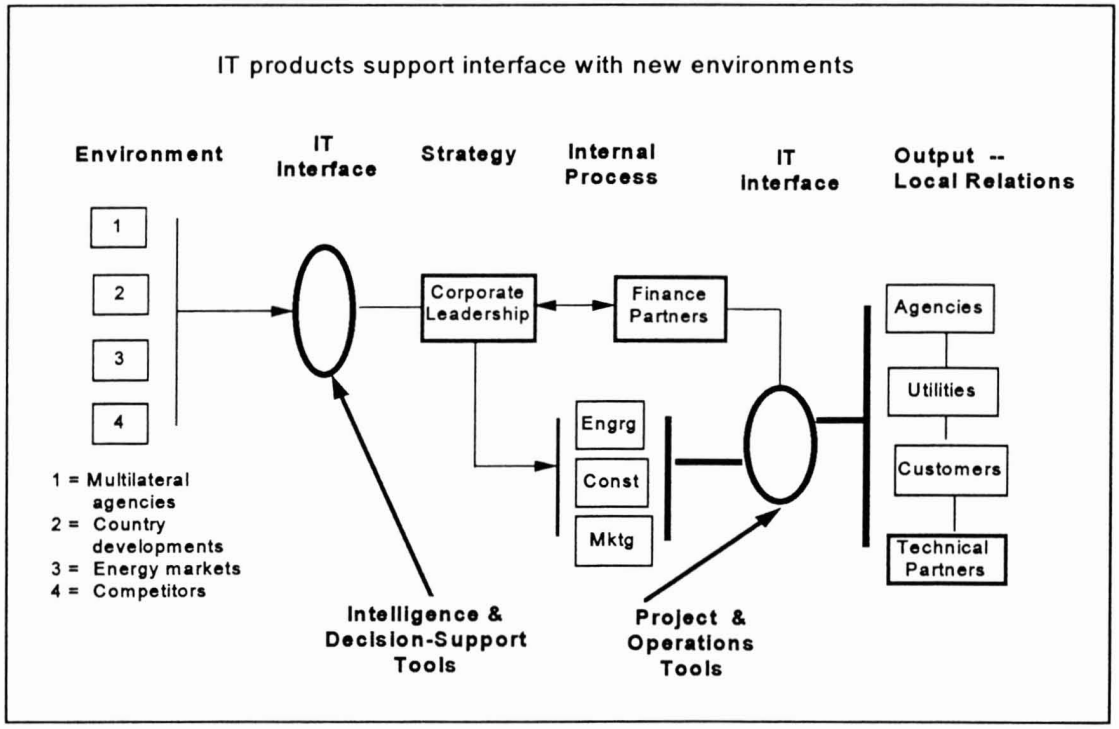
IT products support interface with new environments
Environment
IT Interface
Strategy
Internal Process
IT Interface
Output -- Local Relations
1
2
3
4
1 = Multilateral agencies
2 = Country developments
3 = Energy markets
4 = Competitors
Corporate Leadership
Finance Partners
Engrg
Const
Mktg
Agencies
Utilities
Customers
Technical Partners
Intelligence & Decision-Support Tools
Project & Operations Tools

Figure 2.

Table 1. Sources of ESCO Market Position

production factor	*reputational factor*	*market leadership and positional protection by*
• technical knowledge	• expert	• standards • resources & recognition
• customer knowledge	• understands customer needs	• on-going customer research • new product offerings
• project capital and incentives	• funding source	• multilateral arrangements • lock-up of local capital • expedited processing
• implementation & operation capabilities	• quality & reliability • long-term service provider	• TQM procedures • cash-flow momentum to build up local operations
• energy supplies	• procurement specialist • cost leader	• market knowledge • energy supply agreements

To be sustainable, differentiation must create barriers to entry (Porter 1985 p158). Information technology can be a central element in executing such a strategy. An ESCOs capabilities reside largely in its knowledge and experience. These intangibles can be embodied in a demonstrable and shareable form through IT. Via groupware applications and a telecommunications backbone, world-wide resources can be brought to the local market. Superior knowledge is identified and communicated as the underlying source of differentiation across all the production factors. Customers see their needs addressed through a depth of resources and expertise not otherwise available. The groundwork is established for long-term energy partnerships.

Any ESCO has technical and business systems for its work, which form the basis of information systems. The better these are, the more efficient and productive the ESCO's internal processes. IT development will probably begin with these, perhaps improving them through re-engineering.(2) But beyond this functional level, developing and strategically marketing "IT-embodied knowledge" conveys the message of

"world class practice offered locally." Using IT tools at each phase of the market cycle, as suggested in Table 2, can simultaneously enhance performance and send the desired, differentiating market signals.

Creating barriers to entry does not require trying to keep *all* other players out of the market. Rather the ESCO needs to consider its market position and define its protected space accordingly. For example, an ESCO with strong financial position or with special access to energy supplies may wish to encourage a "feeder network" of technical firms. In this instance, special purpose software releases can be made available with limited access to the entire system. The information system can thus be used as a filter for taking affiliates into the market at distinct levels and for specific purposes.

Success in making information technology and world-class knowledge prerequisite for doing business means that other market entrants must "ante up" to this level in order to play. Once the market expects certain demonstrable capabilities and services, both technology investment and knowledge organization are required of entrants. With an entry barrier raised competition is controlled. Because of the time, effort, and money invested, those who do enter have a common interest in market stability, in Michael Porter's terms in being "good competitors." Among many strategic uses (Porter 1985 p201ff), good competitors lend credibility to the market and satisfy customers that offers are real, reliable, and fairly priced.

CREATING AN IT INFRASTRUCTURE

A primer on IT infrastructure is well beyond the scope of this article. Moreover, the task of constructing the IT infrastructure is probably best done with outside resources and strategic partners. Database developers abound and telecommunication providers are eager to find "enterprise solutions for information systems."

There is a small new cohort of "knowledge management consultants." Instead of trying to master the full detail of IT infrastructure, ESCO management should keep its focus on the strategic objectives, critical content, and broadly what the system should look like and do. Moreover, just building the infrastructure will not ensure that it is used. The link between strategic value and technical means must be made by an organizational culture that allows and encourages interactivity and

Table 2. Sample IT Enhancements across the ESCO Market Cycle

Entry	*Project Development*	*Implementation*	*Operations*
• support strategy formulation by data access & indicators	• standardize and speed analytical procedures	• provide international design team capabilities	• automate monitoring, reporting, trouble flagging
• establish position with rule-makers	• demonstrate world-class practices to customers	• distribute on-line equipment reference	• tie-in to parent, customer, utility systems
• strengthen negotiation with potential partners, channels	• reduce review-and-revision for commitment of funds	• internationally coordinate sourcing and logistics	• expedite billing, provide client cost-accounting
• improve training and learning curve progress		• track projects centrally	• manage maintenance

knowledge sharing. Since such an organizational culture cannot be assumed to exist, especially integrating new international partners, it must be consciously and carefully cultivated (Davenport & Prusak 1998). With this caveat, a schematic overview of such an infrastructure is offered.

The IT infrastructure can be broken down into four general areas, discussed below.

1. data processing system
2. tools and software products
3. knowledge management
4. telecommunication backbone

DATA PROCESSING

At the heart of a multiple site energy operation is large amounts of site- and project-specific data. Collection and analysis starts with the first efforts to understand the customer and site situation, continues through project development and design, and, most importantly, is ongoing through operations. Analytical and data acquisition methods must produce outputs which feed into this data processing core. Forms and spreadsheets are developed to meet processing and review needs. Standard procedures routinize the function. These form an implicitly structured knowledge base of the organization's central work processes.

Project Records are structured into a database. The individual project record is the basis of review, negotiation and agreement during the development phase. Details are added during design and construction. Once implemented, the database project record becomes the repository of telecommunicated metering and monitoring data. Equipment requirements are exported to a maintenance management system and service records are returned. The database should have generative features which can automatically and on a customized basis evaluate performance, aggregate at various levels, sort along various dimensions, produce reports, portfolio analyses, and customer billings. A key capability is identifying and flagging under-performance so that troubleshooting and corrective action can be initiated.

Telecommunications for the data processing system is discussed below as Wide Area Network (WAN).

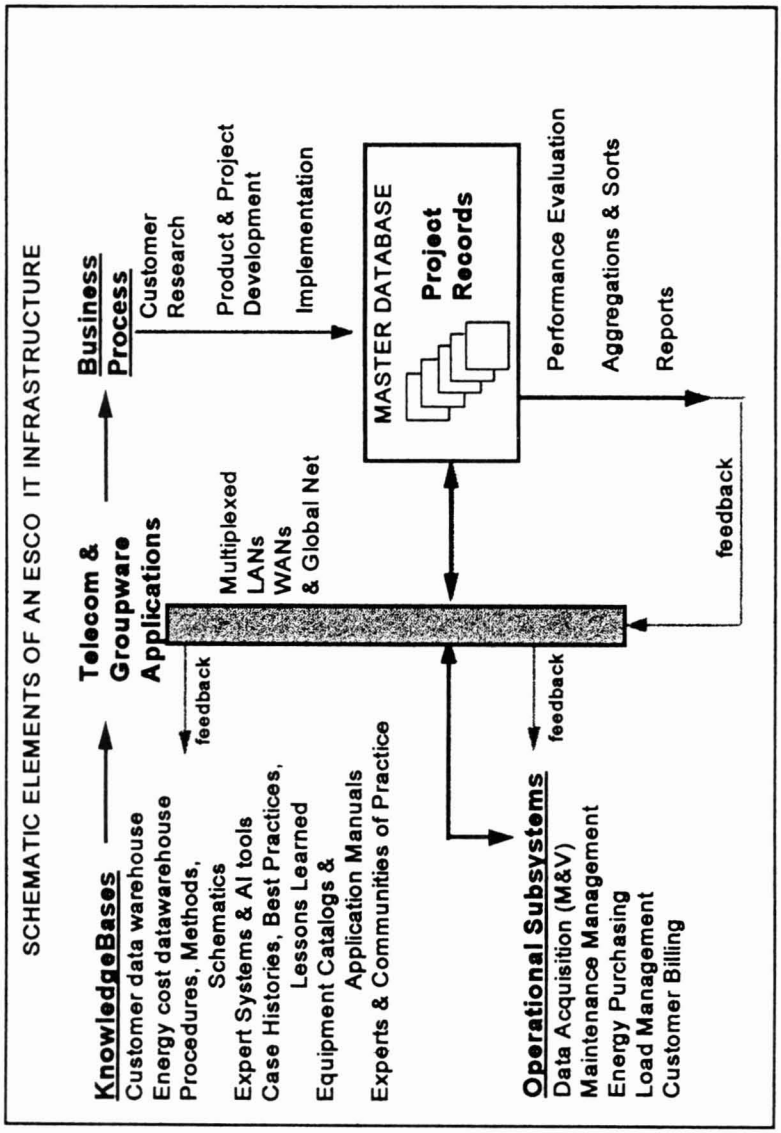
SCHEMATIC ELEMENTS OF AN ESCO IT INFRASTRUCTURE
KnowledgeBases
Customer data warehouse
Energy cost datawarehouse
Procedures, Methods, Schematics
Expert Systems & AI tools
Case Histories, Best Practices, Lessons Learned
Equipment Catalogs & Application Manuals
Experts & Communities of Practice
Telecom & Groupware Applications
Business Process
Customer Research
Product & Project Development
Implementation
feedback
Multiplexed LANs WANs & Global Net
MASTER DATABASE
Project Records
Performance Evaluation
Aggregations & Sorts
Reports
feedback
feedback
Operational Subsystems
Data Acquisition (M&V)
Maintenance Management
Energy Purchasing
Load Management
Customer Billing

Figure 3

TOOLS AND SOFTWARE PRODUCTS

An ESCO will have a variety of these already in its possession, reflecting its work processes and expertise. ESCOs often use software packages formally developed in-house or commercially for specific equipment applications, system modeling, energy audits, cost-benefit analysis, energy accounting and bill analysis. If an ESCO uses products under license, the negotiation of rights for broader distribution will become important. Engineering groups will have CAD-based libraries of schematics and details. Utilities and utility consultants will have customer data ("warehouses") and models such as for market projections, segmentation, DSM technology penetration. Operating divisions of utilities will have SCADA expertise, software, and systems adaptable to serving customer plants. Such systems, integrating data acquisition, market information, artificial intelligence modules, and equipment control can perform and optimize customer load management in complex deregulated settings with a mix of fixed-price contracts and spot market prices changing hourly (Centollela, 1998) (3).

The existing tools, capabilities, and products have been assembled and have grown incrementally to fit specific needs. Such development along multiple tracks no doubt will continue. The very process of inventorying itself for "system content" will be valuable to the ESCO: it will learn about its capabilities, see ways to systematize its knowledge base, see new opportunities and linkages. An overall vision is necessary but an integrated master design would probably be too confining (see note 2).

The ESCO may also find in this process opportunities to develop tools jointly with partners and allies. Equipment manufacturers may be eager to provide catalog material for on-line access. Bringing in financial partners and multilaterals at this level can contribute to relationship-building and understanding of the ESCO's plans and intentions while creating early acceptance of the methods embodied in tools and software. Process integrators and computerized control system vendors may seek joint ventures which would incorporate "gateways" to tools such as load management, energy accounting, and energy procurement.

In establishing local relations and distribution channels, the tools that matter most will be those relating to ESCO technical and business processes. These provide the means for the local partner to assimilate procedures and proficiencies in its new area of work. As development

moves from channels to customers, the IT tools emphasized will shift to products which accomplish a function for the customer. Capabilities with specialized software and advanced tools will encourage outsourcing of energy management functions to the ESCO. Finding ways to understand customer need and to produce tools and products responsive to them is an engine for increasing the customer value of services provided.(4)

KNOWLEDGE MANAGEMENT

In compiling its knowledge into system content, the ESCO begins to confront the challenge of organizing it. At the meta-level of knowledge management, categorizing and cross-referencing become paramount. Structure is necessary for finding and accessing information in "corporate knowledge repositories," as well as for facilitating the on-going addition of new information. What was once the function of the card catalog and stacks, has become the realm of the search engine and database. An on-line library offers a most valuable resource to the far-flung technical partner.

Beyond organizing the written-down and compiled, lies the task of making accessible corporate knowledge which resides in individuals. So another function is to provide means for individuals to connect around specific topics. Databasing individuals with their areas of expertise is a starting point. Searches can then be conducted and questions directed.

Another means is on-line broadcasting of queries and requests for help. This broader approach has the merit of allowing others to see who is looking for what. Various topics will warrant on-line discussion groups, committees, or what have been called "communities of practice." A project team may find and invite a distant expert to join its efforts. A clever salesperson will find videoconferencing opportunities to show customers worldwide benchmarks and resources. New forms of communication and participation through electronic media leverage core expertise beyond geographical boundaries.

As suggested in the previous section, knowledge of customers is another key area where active management can improve productivity in creating and deploying new services and products. Creating a systematic knowledge base should be an on-going market research function leading to product development (see note 4). One can imagine case-

based reasoning or statistical tools which look for customer characteristics and market situations to match with specific approaches and products. Actively managing such information across markets will encourage sharing ideas instead of wheel recreations.

TELECOMMUNICATION BACKBONE

With computers largely a commodity, critical decisions about infrastructure are made in how everything is tied together. Value is added at the level of the network. We can see distinct levels of network services required:

- Local Area Networks (LANs) at the regional/local partner office
- Wide Area Networks (WANs) between customers, sites, local headquarters and local service providers
- Global Network between international offices

The LAN at the regional office level might be generally typical of a networked US office. But as this is likely to be well above the standard in emerging markets, upgrading of a local partner's infrastructure (wiring, switching gear) can be anticipated. As the terminal points of the global network, the LANs must have the capacity to handle groupware applications, graphics, video, and greatly increased traffic. Without adequate infrastructure to handle the traffic, the attempt to use IT will frustrate users and global network tools will go unused. Hardware and software will have to be upgraded. How this investment is handled has strategic dimensions for establishing entry relationships.

At the next level, the local ESCO connects to its sites for monitoring and metered data. This function requires highly structured and automated protocol for connecting and downloading. Design requires coordination of capabilities and interfaces with on-site systems, which may include equipment controlled by other parties, such as building or process automation controls. A balance has to be struck between on-site memory and call frequency. Because data volume is high, this system may best be segregated from other functions as a "regional data center." Extracted and summarized data goes to Project Records and other op-

erational subsystems.

Periodically, data must be routinely transferred to archival memory. The structure and organization of such archives is also important — finding and recalling data in such "warehouses" can be vital to research and development.

The telecommunication infrastructure for the WAN will depend on the distribution of sites and local telecom systems, services, and rate structures. In some developing countries, cellular and satellite systems leapfrog beyond hard-wired infrastructure. WAN requirements and best forms of service will change over time as operations grow. The ESCO, probably through its telecom partner, must be capable of negotiating such varied and dynamic services in all kinds of markets.

As compared to the regional, site/data-oriented WAN, the global network requires more openness and flexibility. Communication shifts to office-to-office and people-to-people, conducted internationally. Although Lotus Notes attempted to establish a proprietary, licensed format for this kind of communication, the Internet (i.e., HTML format) provides what has probably become the standard. By erecting barriers at strategic points of the web site, areas can be left open to the public (i.e., potential customers) while restricted access to other areas creates a corporate intranet. In terms of hardware, telecommunication bandwidth and transmission speed must be adequate to support multi-media applications such as video conferencing and CAD (computer-assisted design).

CONCLUSION

Energy service companies should learn to use information technology for advantage in global competition. IT facilitates systematizing knowledge, producing new services, and enhancing performance through knowledge sharing. Creating the IT infrastructure requires specific attention and commitment to informatics and knowledge management. There is good reason and opportunity for teaming-up with a telecommunications provider and/or systems integrator. The effort is especially worthwhile for emerging markets, where introducing world class practice via IT can be used strategically to create sustainable market positions.

Notes

(1) The current deflation and recession in many emerging markets will cause a lull in energy demand growth. Such cyclical phenomena are distinct from trends measured in decades. The overall pattern remains clear, while the shorter term events are what make business planning an interesting, sometimes gut-wrenching, challenge.

(2) If, however, development remains limited to improvement of existing work processes, they may become "core rigidities" as described by Dorothy Leonard-Barton (1995) which block creativity, innovation, and response to new market conditions.

(3) Centolella (1998) provides a view from the utility-wide perspective of a systems integration consultant. The treatment considers IT applications for the various players in a deregulated market with real-time pricing and purchasing decisions.

(4) Because of his engineering/project management background, the author has struggled to break through his own "core rigidity" which sees energy projects rather than products. Control system products are readily accepted into this world view. But there is a much broader set to be patterned after "products" as used in financial services. Financial products typically refer to such things as futures, hedges, risk management, annuity payments and the like. These can be extended to energy procurement contracts and cost guarantees. Such products would blend a detailed knowledge of the customer's energy systems and needs with understanding and modeling of market mechanisms and macroeconomic and sectorial projections.

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