CHAPTER 5

Challenges and barriers to smart grid implementation and establishing milestones for the Israeli market

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Introduction

In the first section of this chapter, we will survey the existing barriers and obstacles to smart grid implementation abroad. In the second section, we will investigate the development of the smart grid in Israel and construct milestones based on international experience and its adaptation to the Israeli market.

1. **Survey of international experience – milestones and primary obstacles**
    1. General

       In developing any large-scale, infrastructure-intensive field, it is necessary to set clear, measurable milestones. Prior experience in adopting smart grid policies (e.g., smart grid-compatible rate design and cost recognition, pilot project design, and large-scale interval smart-meter installations) point to significant failures in the absence of such milestones. Decisions on milestones need not be a comprehensive, integrative solution, but goal clarity and measurability must be primary characteristics of such decisions.

       In addition to these requirements for clear, measurable milestones, there are several barriers to smart-grid development that must be overcome, including:

       - Conflicting information on the influence of smart grid on public health and privacy;
       - Conservatism of electric utilities and regulators regarding introduction of the product and the need for pilots
       - Lack of coordination in the definition of terms, causing confusion among stakeholders involved in the process (regulators, equipment manufacturers, electric utilities, suppliers, and consumers);
       - Use of technologies that have yet to prove their commercial viability.

- Lack of recognition that the smart grid is only a means toward achieving policy objectives, rather than an objective. The smart grid may be considered a catalyst toward achieving energy efficiency, the environment, system reliability and security objectives, as well as other policy goals, but it is not a goal itself.

When performing international comparisons regarding smart grid implementation, it is important to be aware that there is considerable inter-country variation that significantly influences implementation policy. The variation is due to several reasons such as

- Consumption habits influencing load factor
- Percentage of renewables penetration
- Tariff policy of the utility regulator
- The characteristics of the generation sector, primarily regarding the composition of generating fuels
- The goals of decision makers regarding the smart grid.

Investigating smart grid implementation in the US and Europe indicates the main differences among the approaches and the barriers in the US relative to Europe.

In the US, most investments have emphasized encouraging start-up companies that are considered to be innovation sources. Only recently have we seen greater involvement by larger companies, mainly because of the failure of startups to make the transition independently from the development stage to the stage of integration into the electric utilities. The reason for this is that the time horizons required to make decisions in the electric utilities are too long for the average start-up company, but are a reasonable timetable for the larger communications, engineering, and VC intermediaries in the US.[1] Since 2010, the total annual investment in smart grid in the US has declined from $7 billion in 2010 to $5.1 billion in 2011 and $4.3 billion in 2012[32]. An investigation of the data indicates that approximately $4 billion originates from grants from the American Recovery and Reinvestment Act[4] (henceforth, "ARRA"). The main reason for this significant share of total investments by federal grants is due in part to the lack of policy coordination and consistency between the state and federal regulator. The lack of coordination and uniformity is largely in the area of rate recognition of the investment costs associated with smart grid by state-level regulators. This variation in state regulatory policy is creating uncertainty that is deterring regulated electric utilities from investing in smart grid, unless they receive preferential financing conditions from "non-rate" sources such as grants[5]. The frictions between the federal and the state regulators have also been reflected in the stagnation regarding critical transmission investments (most of whose benefits flow to consumers beyond state borders). Smart grid development has therefore become overly dependent on the "selfish" interests of state regulators and their respective constituencies regarding renewable energy and the state's benefits from trade with neighboring states, rather than on broader national policy interests.

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[1] http://gigaom.com/2013/01/29/how-to-keep-innovation-alive-in-the-smart-grid/

[2] http://www.gereports.com/top-10-countries-for-smart-grid-investment/

[3] http://www.rtcc.org/2013/03/01/smart-grid-investment-leaps-7-in-2012/

[4] Smart Grid R&D: 2010-2014 MYPP 2012Update located at http://energy.gov/sites/prod/files/SG_MYPP_2012%20Update.pdf

[5] In the US, the state regulators approve tariffs and mart rules unless the electricity transaction crosses state borders. Therefore, there is a situation by which the FERC and the Department of Energy set targets for smart grid, but the state regulator determines that the benefits from these investments in smart grid do not flow to the customers in its jurisdiction, causing the state regulator to refuse recognition of these investments in rates. In this case, the regulated electric utility must turn to FERC in order to recover recognition of these investments in tariffs that cover inter-state transactions over which FERC has jurisdiction. This phenomenon of state-federal conflict has already become a barrier to transmission construction that is essential to interstate electricity delivery.

In Europe, the level of smart meter penetration is nearly at the level reached in the US, and is likely to pass the US level by 2016.[6] The reason for this, beyond the fact that Europe has developed its smart-grid initiatives based on a transmission grid that already included some of the main components of smart grid (e.g., digital signaling systems to identify network faults)[987] , is the development of advanced rate structures accompanied by greater awareness by both consumers and suppliers. In France, England, and Norway, dynamic tariffs, varying according to the status of the market in real time, or within a few hours of real time, have been an increasingly relevant feature of retail electricity pricing. It is possible that an additional reason for the more rapid development of the smart grid in Europe stems from the protracted regulatory processes in the US that include lengthy hearings and expert witness testimony prior to regulatory decisions being issued, a phenomenon that does not exist to the same extent in most of Europe, and which has caused delays in progress toward a smart grid.

2. <u>California , Texas, and England</u>

The survey below shows the barriers and challenges to smart grid implementation in 2 US states (California and Texas) and 1 country (England). Smart grid integration into the transmission network has occurred either in whole or in part in these jurisdictions during the past several years. The table below shows the main points of their implementation plans.

State/country	**California**	**Texas**	**England**
Description	Full deployment of	Gradual – smart	Smart grid

[6] http://www.fastcoexist.com/1679148/europe-set-to-rule-the-smart-meter-world
[7] http://www.smartgrids.eu/documents/vision.pdf
[8] http://www.docstoc.com/docs/100311921/Enels-vision-on-Smart-Grids
[9] Powergrid International, June 2013, pp. 12-13

of the smart grid plan	smart grid (metering, communications systems, sensors, and signals) within the jurisdiction of the California Public Utilities Commission ("CPUC") in accordance with Senate Bill SB17.	meters and then additional smart grid infrastructure (metering, communications systems, sensors, and signals), in response to the growth of intermittent renewables (wind, solar)	deployment in accordance with targets of the DECC regarding reduction of coal usage. The first stage was completed in 2011, but most of the deployment will occur through 2020. [10]
Obligations of the electric utility and the consumer in the plans	Annual submission of a development and compliance plan by the electric utilities for regulatory approval.	Monthly submission of a development and compliance plan by the transmission and distribution utility (plan includes meter switchouts and transmission and distribution network equipment according to a compliance	Provision of services and infrastructure according to the requirements of the RIIO mechanism (revenue, incentives, innovation, outputs)[11]. The requirements include engineering and equipment standards and system integration, as well as standards for commercial

[10] https://www.ofgem.gov.uk/electricity/retail-market/metering/transition-smart-meters

[11] http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_INTERNATIONAL/EU-US%20Roundtable/10supthsup%20EU-US%20Roundtable/10th%20EU-US_Session%20IV_Nixon%20-%20RIIO.pdf

		timetable.	agreements and consumer protection rights.
Cost recognition in tariffs	System of cost recognition for all regulated utilities in tariffs and system of accepted cost-effectiveness tests	System of cost recognition in the tariff base according to regulator discretion and the RIIO.	System of recognition in the current base tariffs.
Statutory/regulatory timeframe	20 years (with 10-year planning horizons)	None. The integration timeframe is according to the electric utilities with the regulatory approval of the plans and progress reports	20 years
Primary focus	Achieving targets for renewables and energy efficiency	Encouraging efficient consumption and operation of electrical equipment	Achieving reductions in coal usage

3. Barriers and implementation problems in smart grid implementation in the selected states and countries

California

- **Public opposition due to concerns regarding privacy.** There is significant public concern that the communications and storage systems are not sufficiently secure to guard against transmission of data to unknown parties. These concerns have been raised during public hearings and at technical regulatory proceedings, mainly as a result of insufficient initial attention paid to issues such as: (1) ownership of energy consumption data; (2) ownership of rights to privacy protection regarding this data; (3) consumer control over transferal of data to third parties; and (4) desired procedures for protecting consumption data.[12]
- **Consumer opposition due to concerns regarding public health resulting from electromagnetic radiation.** The main concern is that continued exposure to the level of exposure from metering and communications of the smart grid will cause chronic illness, depression, dizziness, and even some forms of cancer, despite the scientific evidence of low exposure relative to cellular phone devices and prevailing environmental radiation. Nevertheless, the fact that this evidence has not yet proved to be conclusive has increased the level of opposition to smart grid development and created additional uncertainty impeding the future progress of smart grid. **Lack of coordination between the CPUC and the California Independent System Operator (CAISO).** Although the regulatory and the ISO have supported smart grid integration, their priorities for implementation differ. While the CAISO has been emphasizing the operational benefits of smart grid for dispatch, the CPUC has been emphasizing the development of

[12] http://energy.gov/sites/prod/files/gcprod/documents/Broadband_Report_Data_Privacy_10_5.pdf

smart grid for consumer benefits and enabling California to meet its energy efficiency and renewables targets. While these goals are not necessarily mutually exclusive, the difference in priorities between the CPUC and the CAISO creates unnecessary delays in smart grid development.

- **Lack of readiness and openness of the electric utilities to integrating third parties in smart grid.** The process of integrating additional supply companies in the electricity market has been time-consuming and complex. Third party integration requires coordination in two-way communications and storage systems within the systems of the dominant electric utility. In practice, however, the electric utilities have not adapted their communications systems to accommodate additional companies and have left competitive companies in a position of being secondary contractors, at best. The CPUC has also been unsuccessful in making clear decisions regarding the limits of the electric utilities in elements of the smart grid market that are not natural monopolies.

Lack of uniformity in system standards for participants in the smart grid and in methods of evaluating economic viability of smart grid investments. In the absence of common standards and uniform evaluation methods, it is difficult to make useful comparisons among electric utilities, in order to determine the most successful smart grid models and how to achieve that success.

- **Uncertainty regarding cyber security.** The implementation process has been accompanied by concerns and uncertainties regarding the level of security of computing systems and their ability to withstand challenges to that security, such as the ability to withstand attempts at security breaches and improper access/use of private consumption information.

Texas

- Texas has experienced identical problems to those described above in California regarding health impacts and concerns regarding consumer privacy. The main problem in smart grid implementation in Texas has been with regard to consumer privacy and this subject has been an ongoing subject for the regulator ("Public Utilities Commission of Texas" or "PUCT"). It is important to note that one of the reasons for this concern stems from the fact that there is retail competition for almost all customers, while in California there are only a few significant retail suppliers serving large commercial and industrial customers. Therefore, the concern regarding unmonitored data going to suppliers is significant. In order to provide a solution, large electricity suppliers are investing resources in quality security systems and educating consumers with regard to the personal benefits from smart grid, in their efforts to reduce remaining smart-grid opposition. Moreover, the PUCT is working primarily with the large distribution companies with the goal of creating clear, implementable standards for ensuring privacy.
- **Concern regarding public health.** This has been a concern in Texas as well, although the PUCT has given it lower priority. Although the PUCT has decided to address this topic in cooperation with the Federal Communications Commission to establish acceptable exposure standards,
- **Lack of clarity and rate recognition.** The PUCT has not adopted a rigorous set of principles for evaluating smart-grid investments for purposes of rate recognition similar to those of the California PUC. Rather, the PUCT has relied on existing policy and precedent in determining rate recognition for these investments. Consequently,

determining the probability of cost recovery is more difficult than in California, although the PUCT's relatively simpler set of policy rules mitigates some of that lack of clarity.[13].

England

- **Problems of adapting technology and standardization of commercial agreements.** Although England has also experienced opposition based on concerns of health and privacy, the main problems in smart grid implementation has been the adaptation of smart grid technologies to the existing systems of various market participants and in drafting the relevant commercial agreements. This problem is especially important because of the variation existing among the 14 distribution companies with respect to commercial procedures, service territory characteristics, competitive electricity and metering suppliers, and the like.

2. **Difficulties in implementing the rate recognition mechanism.** Difficulties have arisen with regard to implementing the rate recognition of smart grid investment within the RIIO (revenue, incentives, innovation, outputs) framework by regulated distribution companies (known in the UK as distribution network operators or DNOs), necessitating wise risk management and rapid innovation[14]. Until implementation of the smart grid, the DNOs concentrated all smart grid activity and investment in their companies and received rate recognition per the RIIO mechanism. However, in the area of smart grid implementation, the DNOs must be the coordinator between technology developers, transactions between suppliers and consumers, and incentivizing investors, while also advancing goals set by the regulator per RIIO. This change has required the DNOs to create a network of management and coordination while taking responsibility for the commercial and technical risks associated with this coordination. To date, the DNOs have not yet developed the capabilities necessary to create such a

[13] http://www.puc.texas.gov/industry/electric/reports/smartmeter/SmartMeter_RF_EMF_Health_12-14-2012.pdf
[14] https://www.ofgem.gov.uk/ofgem-publications/75546/sgf-second-annual-report.pdf

network independently, contributing to implementation delays[15]. **Smart grid in Israel – current status**

1. Introduction

   The Ministry of Energy and Water Resources has established that smart grid is one of four key areas in the energy field and has classified it as a top national priority[16]. At the same time, the Israel Public Utilities Authority – Electricity ("PUA") has taken a number of steps in its activities with the Israel Electric Corporation ("IEC") to improve network components, including: (a) establishing advanced data systems for automation and protection on the network; (b) installing continuous metering systems in the transmission sectors for purposes of control and information acquisition on the network; and (c) supporting the smart grid pilot project by recognizing the initiative's costs in IEC's rates. The PUA has noted that IEC estimates that it will require an investment of approximately NIS 2.9 billion just for the implementation of the initial pilot projects.[17]

2. Energy policymaking and regulation – Ministry of Energy and Water Resources ("Energy Ministry") and the PUA

   In its efforts to reach its energy efficiency objectives, , the Energy Ministry has been active in promoting advanced metering and control systems[18] and integrating them into Israel's electricity system. One example of this activity has been to mandate installation of smart meters for all customers as part of the Ministry's development plan for the electricity distribution sector.

   However, in order to achieve this objective, the PUA, as the independent regulator of the electricity sector, must develop the

[15] https://www.ofgem.gov.uk/ofgem-publications/47067/riioed1decoverview.pdf
[16] http://www.iec.co.il/ElectricityProfessionals/DocLib4/reshet%20new.pdf
[17] http://www.pua.gov.il/560-2823-he/Electricity.aspx?pos=80
[18] http://energy.gov.il/English/PublicationsLibraryE/projects2012corrected.pdf

appropriate incentives, including clear principles for rate recovery of the associated costs. Although the PUA has yet to issue a comprehensive decision regarding IEC's smart grid plan (which is expected to be issued by October 2013)[19] , the PUA has claimed that the IEC plan involves high costs that have yet to be reviewed, does not provide sufficient detail regarding economic and operational parameters, and does not explain how open access principles will be preserved. The PUA proposes to establish, based on international experience, an economic viability analysis and a pilot limited to approximately 1% of consumers and establishing rules and protocols for information management. The PUA estimates that the break-even point for economic viability is achieving a 4% improvement in energy efficiency and a 10% reduction in peak loads, percentages that are difficult to achieve when, in the PUA's opinion, smart meter investment is not cost-justified for about one-third of all customers. Because of these assessments, the PUA believes that it is necessary to implement the smart grid gradually, rather than in a single step. In addition, the PUA points out the need for criteria for evaluation of smart grid projects, both at the tender issuance and program analysis stages, based on accepted cost-benefit analysis principles. [20]

The PUA has set a number of objectives for smart grid implementation:

- Encouraging IEC to establish information systems for network automation and protection;
- Obtaining and validating t information on transporting energy among the network sectors through the installation of metering systems at various locations on the transmission system;

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[19] צוות רשות החשמל מעריך שהרשות תפרסם החלטה עד אוקטובר 2013.

[20] http://www.pua.gov.il/560-2823-he/Electricity.aspx?pos=80

- Improvement of reliability in electricity supply and quality on the network;
- Achieving the PUA's efficiency targets (from international experience, the PUA estimates that it is possible to reduce electricity consumption by 9% and peak demand by 15%).

3. IEC

IEC defines the smart grid as "the future network based on a combination of the current electricity network with systems for communications, control, and advanced information."[21] In order to maximize smart grid benefits, IEC has established a smart grid steering committee led by IEC's Vice-President for Customer Relations. The committee brings together various activity areas in order to implement smart grid at IEC. The committee functions through an executive group responsible for preparing a road map and methodology for implementing smart grid in the company. The first stage of the committee's work was to define the goals for smart grid implementation in Israel as a whole, and particularly within IEC, including:

- Active customer involvement in the electricity market by means of demand-side management and facilitating choice for new commercial services;
- Integration of renewables, electric vehicles, and future technology networks to reduce greenhouse gases;
- Development of new products, services, and markets;
- Improvement of operating and energy efficiency in the electricity market, through optimal use of infrastructure and advanced technology systems.

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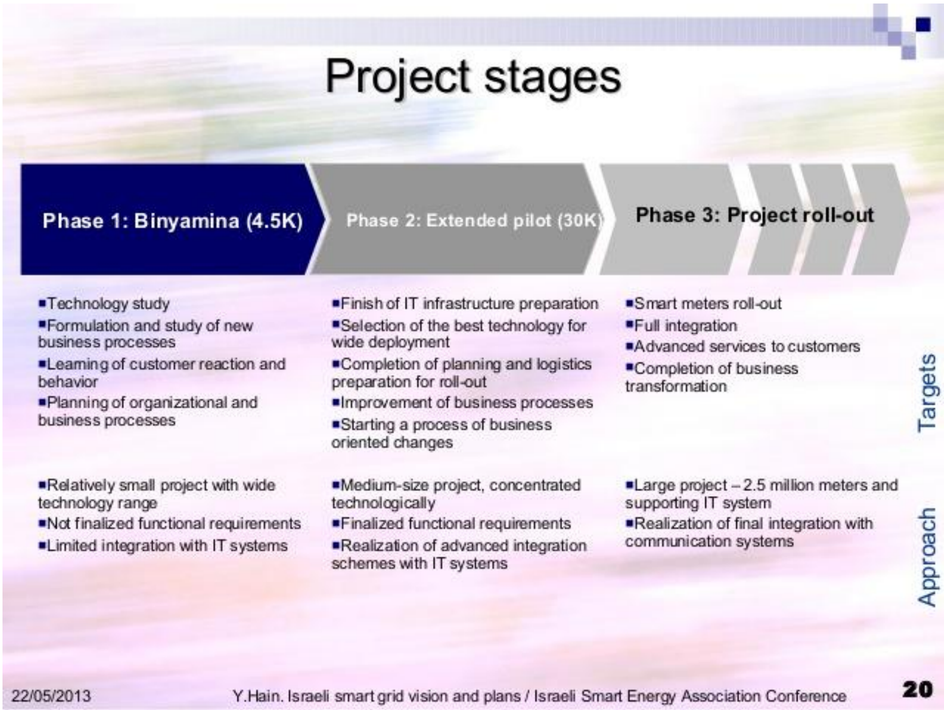
[21] http://www.iec.co.il/ElectricityProfessionals/DocLib4/reshet%20new.pdf

The exhibit below illustrates IEC's proposed staged plan for smart grid implementation:



Source: http://www.slideshare.net/IsraelExport/iec-israeli-smart-grid-vision-plans

This plan includes: (1) continuation of the current pilot taking place in Binyamina through continued use of the existing metering data system; (2) determining the approach toward cost-benefit analysis to be used both for the pilot and for wide-scale integration; (3) a tender for wide-scale integration based on lessons learned from the pilot; and (4) preparations for full-are scale integration in the system. From the plan, it is apparent that IEC is focusing its investment targets mainly in the areas of engineering, communications, improving business processes, and implementing the local-area pilot.[22]

4. Private parties

[22] http://www.slideshare.net/IsraelExport/iec-israeli-smart-grid-vision-plans

In addition to the activities of the regulator and IEC (as the main Essential Services Provider (ESP)), private companies have been active in developing initiatives focusing primarily on metering systems management, audit and control, and energy efficiency. For example, companies in the communications area are participating in tenders for communications infrastructure and support for IEC's pilot project, and are planning to expand their activities in upgrading communications between the transmission and distribution sectors through smart grid technology applications. While some of these companies are participating in IEC's "sub-pilots" and are receiving financing from IEC and Government entities, other companies have already received venture capital funding and have begun commercial operations both in Israel and abroad.

Within the framework of encouraging the private sector in developing the smart grid in Israel, the Israeli Smart Energy Association ("ISEA") was established. The goals of the ISEA include, among others, increasing awareness of the potential of smart grid, discussions with decision makers on regulatory and incentive issues, exposure of leading customers to appropriate solutions for their applications, and cooperation with similar organizations abroad.

3. Smart grid implementation – challenges and milestones

3.1 Challenges to smart grid implementation

a. **Setting agreed-upon policy among regulators regarding goals and activity means.** Promoting the smart grid in a systematic way, like other major developments in the electricity sector, involves coordination among direct regulators of the electricity market. As we have seen in the controversy regarding promoting mandatory smart metering, coordination of uniform policy and definition of clear goals is a necessary basis for correct, rapid advancement of the process. Moreover, the coordination must extend to secondary –level regulators of the electricity sector, such as the Ministries of Environmental Protection, Communications, Economics, and Justice, and the standards-setting bodies such as the Standards Institution of Israel. As indicated above, experience abroad indicates that environment and data security issues were the main barriers to smart grid advancement. The complexity of these subjects and the fact that they cross multiple areas of regulatory jurisdiction further clarifies the need to set agreed-upon targets and policies at the systemwide level. To achieve this, designating a lead party and clearly delineating jurisdictions and areas of responsibilities is essential.

b. **Conduct and cooperation of IEC:** Currently, the Israeli electricity network is conducted mainly by IEC. The success of smart grid implementation depends on easy access to smart grid data and the audit and control system, as well as on IEC's cooperation. However, IEC's goals for smart grid development are not necessarily identical to those of the regulator, private companies, and consumers. The subject of cooperation with IEC has become even more sensitive in light of the lack of clarity regarding the direction of electricity sector reforms. There is a concern that smart grid development will be influenced by criteria related to negotiations conducted in the context of these reforms, rather than by a strict application of a cost-benefit analysis of smart grid implementation in light of various electricity sector reform scenarios. <u>This concern must be addressed on a professional, systemwide basis by the decision maker, while minimizing partisan interests</u>

Integrating interests while setting priorities in promoting smart grid: Continuing from the previous paragraph, promoting the smart grid embodies a much wider range of interests than the range of objectives achievable from its implementation. For IEC, the ability to manage the system while controlling activity on the electricity network is important. Private entrepreneurs, in turn, want assurances that they will be able to be integrable into the smart grid and will have access to needed information and infrastructure. The private consumer wants assurances of its ability to use the network for to improve its decisions regarding energy efficiency while ensuring that its data privacy concerns are addressed. One of the main challenges to regulators is to adopt an approach that involves the various stakeholders as much as possible, while developing a clear order of priorities in line with their policy objectives.

c. **Determining rules for ensuring data confidentiality/security:** One of the barriers abroad to smart grid rollout is the concern regarding data system security. A prominent feature of smart grid is the free flow of information regarding consumption habits circulating among a number of parties, creating concerns that use of this information may be for purposes not related to reliability, efficiency, and quality of supplying and transmitting electricity. Without a clear framework of market rules ensuring fair access and legitimate use of this information at the initial stages of smart grid design, regulators are likely to encounter strong opposition by consumers and judicial bodies that will delay smart grid rollout.

d. Increasing consumer awareness: The level of consumer awareness in Israel is still relatively low. Israel lacks the history/tradition of wide-scale activity in areas typical of an advanced market such as plans for intelligent electricity use, smart meter rollout, and demand-side activity. Although we have recently seen increased activity in this area, it is primarily targeted toward a limited number of customers. The result is that the lack of awareness is likely to cause a prolonged integration process that will not facilitate the creation of a consumer base sufficient to display the advantages of smart grid at a scale necessary to reduce the costs to the customer in smart grid application.

e. **Creation of coordination among technology systems:** Smart grid implementation represents a system comprised of various technologies by various generators, IEC's legacy systems, and a number of parties from various areas with various access and usage characteristics. One of the main challenges to smart grid implementation is setting market rules and standards for coordinated operations and communications, otherwise known as interoperability.

f. **Setting an updated tariff policy:** In order to fully take advantage of the benefits of smart grid integration, one essential condition is the provision to consumers and generators of the system information necessary for making economic decisions. This information must include tariffs that include a "menu" of tariff alternatives such as real-time pricing, dynamic pricing, and critical-peak pricing, among others. The current time-of-day rates and smart-consumption arrangements are insufficient for realizing the full potential of smart grid in the new era.

3.2 Milestones in Smart Grid Implementation

As a direct result of the challenges involved in implementing smart grid in Israel – some of which are unique to Israel but most of which are well-known from international experience – every smart grid implementation plan should be based on a number of basic principles beyond tests of economic viability:

A. **Defining the implementing party:** It is recommended that the committee for regulating the energy sector should address this issue, and should make a decision within the general context of the recommendations for electricity market reforms. During an interim period potentially extending over more than 6 months, smart grid implementation should be delegated to an inter-ministerial committee consisting of the Energy Ministry and the Ministry of Finance. To the extent that this committee's lead time is too long, the Ministries of Environmental Protection, Communications and the Interior should join this committee. The PUA should resolve any obstacles that might delay the implementation process.

B. **Defining priorities:** There is a wide variety of goals involved in smart grid coordination, including system reliability; intelligent demand (including tailoring rates for efficient consumption); compliance with international environmental standards; distribution of the manufacturing and storage. Given the time and budget constraints, it is impossible to achieve all the goals of smart grid implementation. Defining the main goals at the outset provides guidelines regarding areas on which to focus. It is also possible to establish a multi-year, multi-level plan in order to achieve all policy targets, but only after determining the most important goals in advance.

B1: The definition of the level of coordination among the regulator, the private sector and regulated electric companies: Such definition and coordination must be based the defined goals that have been established. In this context, the question of the extent to which a smart grid will be set up and funded by (a) the regulated electric companies according to regulator directives; (b) the government itself; or (c) private companies is extremely important. The definition of the best combination of market participants can change over time: for example, metering and information can move from the vertically-integrated electric companies to private companies with expertise in developing the relevant technology and products.

C. **Government obligation for smart grid integration in the Energy Master Plan:**

Current energy planning in Israel, in which the demand side is relatively passive and therefore not taken into account, have limited value for the future market which will include smart grid, which necessarily allows for active demand-side participation. Smart grid integration into the plan is important from the perspective of resource allocation, optimal planning, and cost-benefit analysis in providing solutions. Addressing smart grid in a manner separate from the Energy Master Plan will result in sub-optimal planning of the electricity market.

D. **Creation of a series of mechanisms to increase awareness and build consumer trust:** This issue has two dimensions: (1), consistent with global experience, assuaging concerns on the issue of data security and non-ionized radiation; and (2) educating consumers to transform themselves from being passive to assuming an active role in actively managing supply-side resources. Without such an informed base of customers, such levels of intelligent usage will not be achieved, let alone optimal levels of resource usage that should be achievable through smart grid integration.

Creation of a clear methodology for recognizing the costs involved in smart grid in electric rates: Such a methodology will ensure that smart grid initiatives are evaluated on a uniform cost-benefit basis for rate recovery purposes, and that these costs are allocated fairly among market participants.

2. Additional recommendations for promoting the smart grid

A. **Follow-up analysis:** A follow-up analysis should include data security, improved system diagnostics associated with the smart grid, businessmodel analyses for the purpose of making necessary changes, and a results analysis regarding compliance with national goals (e.g., operating penetration of renewable energy). The analysis should support the determination of progress toward measurable goals over time, because of the large and generally irreversible costs in setting up the smart grid. Such goals may include, for example, "to reduce peak demand by X percent from a specific baseline, within five years", while the extent of compliance with that goal would determine the percentage of the relevant costs in rates. Other goals may include decreases in greenhouse gases, employment gains, system performance enhancements, and increased customer participation as an active resource for meeting system reliability and system security goals.

B. **Identifying and enhancing areas of expertise currently found in Israel and leveraging that expertise**

C. **Establishment of dedicated funds.** Dedicated funds through electricity rates and/or Government budgets should be directed toward incentivizing promising smart grid development initiatives, including incubators to initiate new projects and technologies, and toward increased awareness of the integrated advantages of the smart grid, efficient devices and intelligent use of energy. Such funding mechanisms should be coordinated with funding sources and with the Finance and Economics Ministries, to ensure their implementation.

D. **Use of proven models from other countries in implementing cost-benefit analyses.** Utilization of the accumulated experience from abroad facilitates the identification of promising technologies and activities within a reasonable time frame. The use of such models can be part of a transparent regulatory initiative that would shorten the wait time for innovative technologies and filter out other initiatives whose benefits will not be demonstrable in a reasonable time frame.