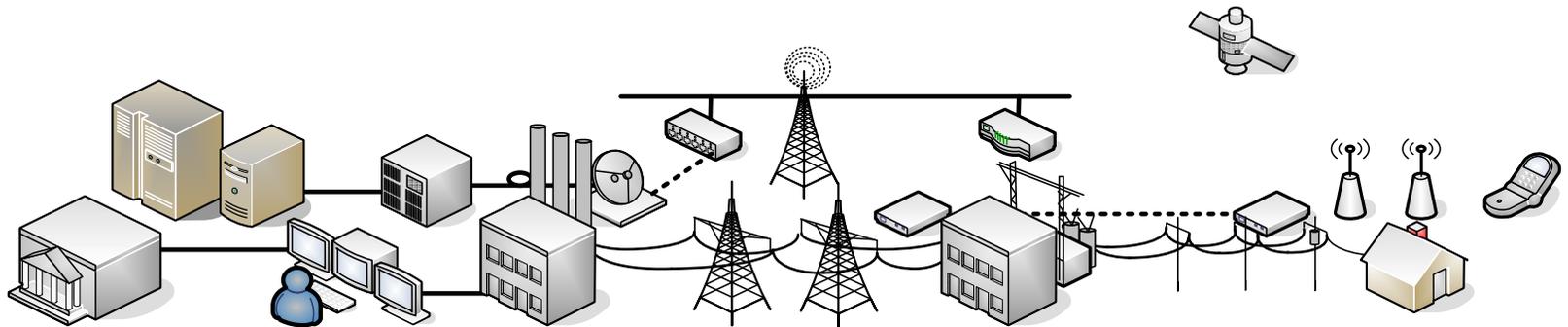


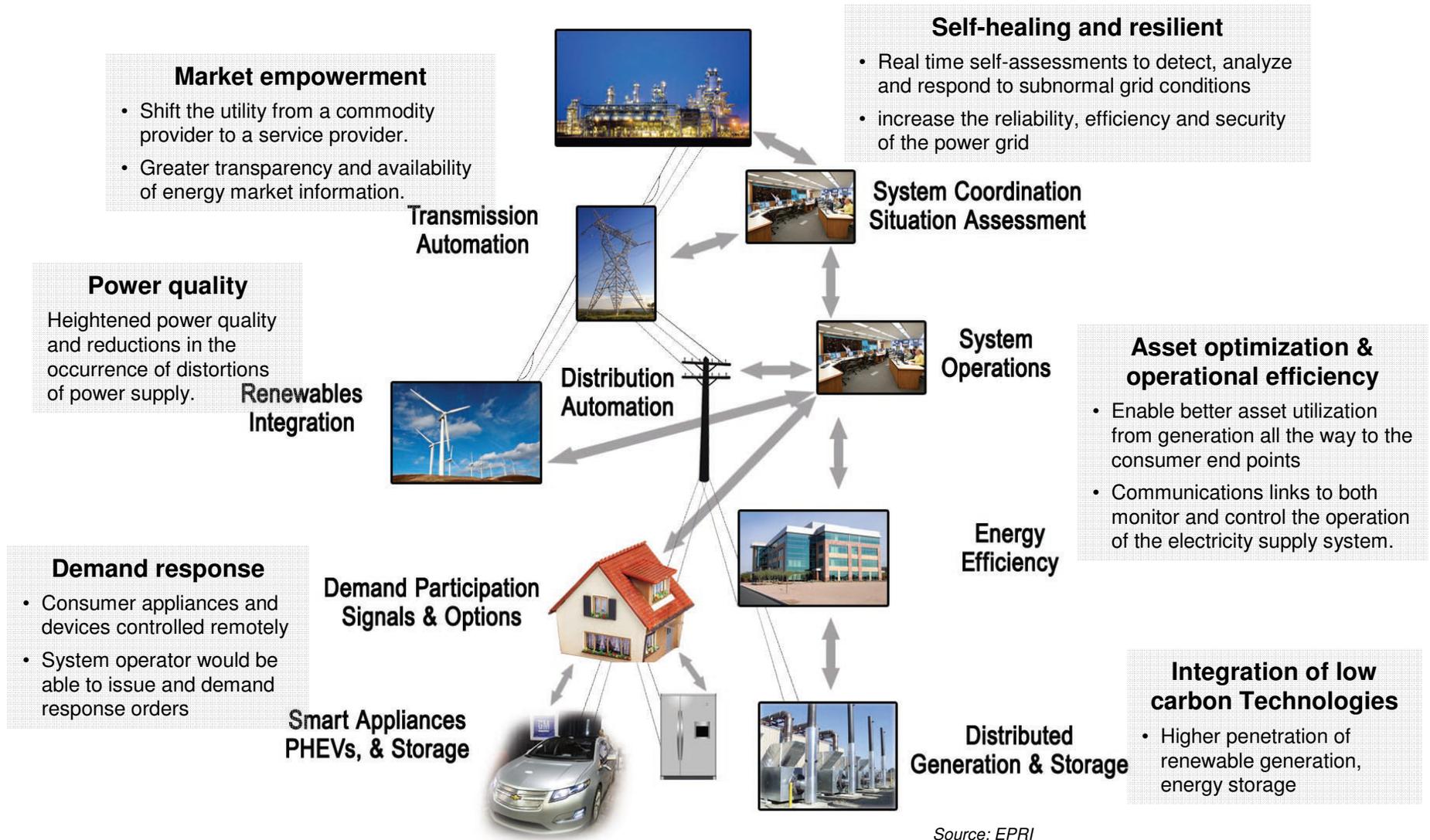
Smart Grid Program Execution

Delivering Value, Managing Risk

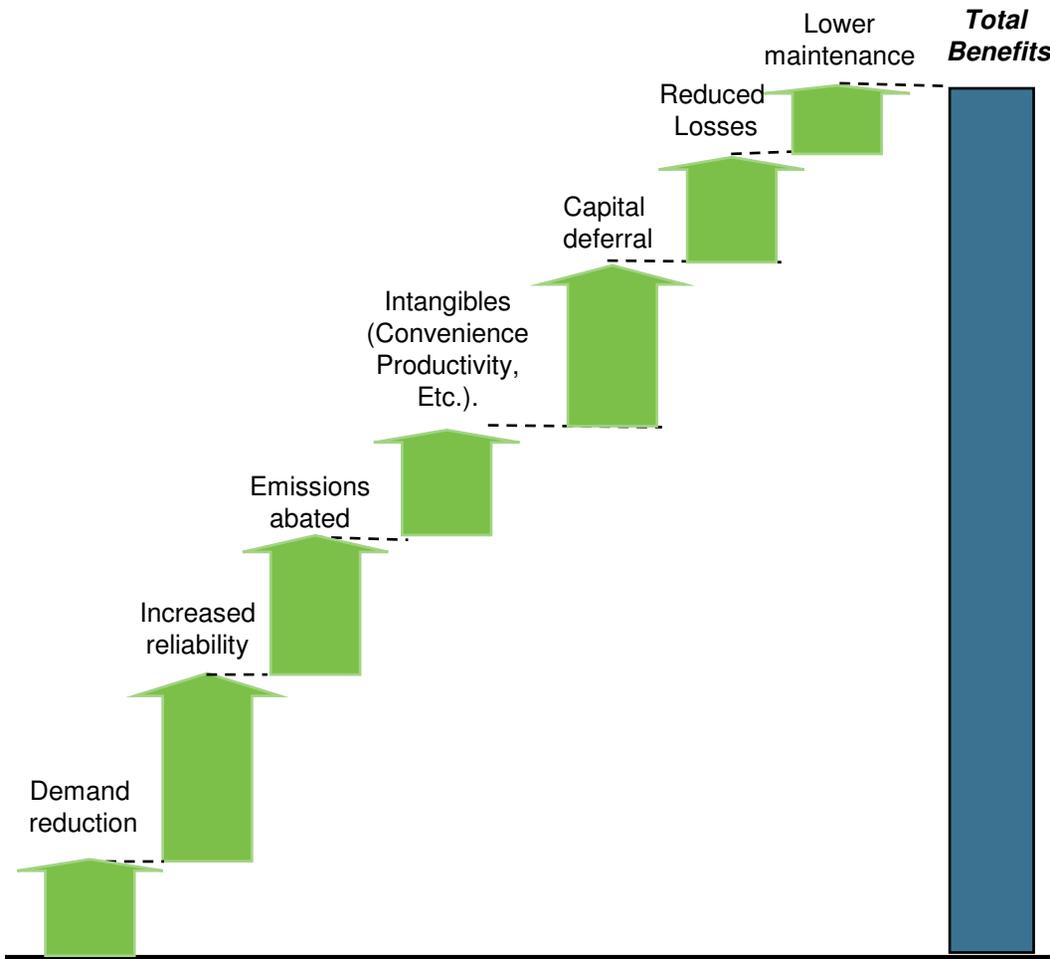
February 2010



Smart Grid initiatives promise fundamental changes in electricity production, delivery and use.



From the vantage point of consumers, society, and new market entrants, Smart Grid has large value creation potential...



- \$800B** Total benefit from Smart Grid over 20 yrs
Source: EPRI
- \$70B** Global market for Smart Grid Technologies
Source: SBI
- 20%** CAGR of Smart Grid Technologies
Source: SBI

New Markets Promoted by Smart Grid

Consumer Markets	Technology Industry	Power Industry
Smart Meters	Integrated Comms.	Energy Storage
PHEV	Broadband Over Powerline	Distributed Generation
Smart Equipment	Communication Software	Renewable Generation
Demand/Energy Mgmt.	Protocols (e.g. Zigbee)	Energy Efficiency

But a successfully executed Smart Grid program will require high quality planning, project management, and communication.

PLAN

- **Establish** clear priorities among investment options
- **Determine** the combination and sequence of investments that achieves the best balance among multiple values – e.g. risk vs. return. short-term vs. long-term values, shareholder value vs. societal value, etc.

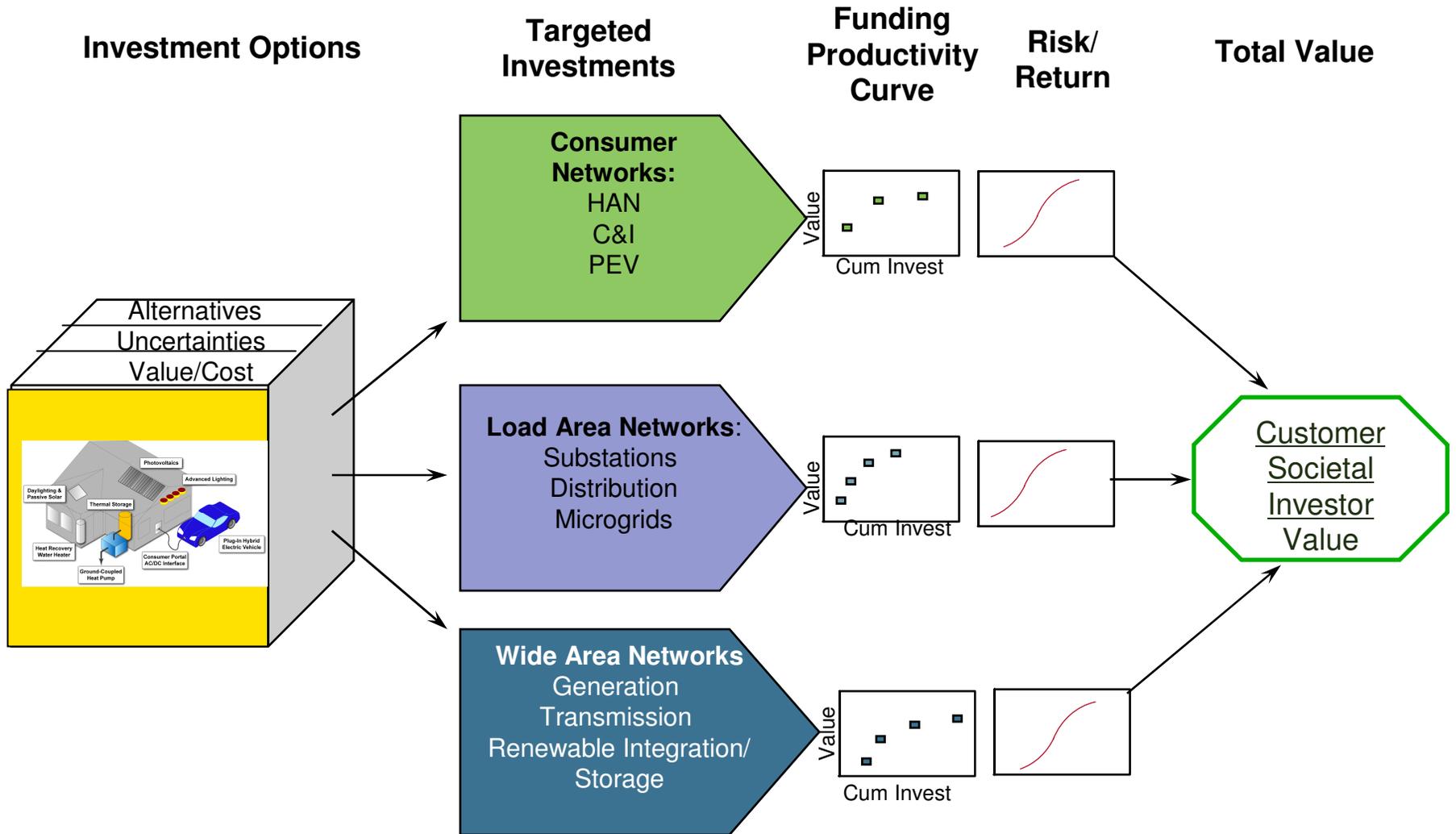
MANAGE

- **Quantify** execution risk of the Smart Grid program – project cost, schedule, etc.
- **Understand** the major risk drivers and signposts
- **Manage/mitigate** the risk through contingency planning, contract management, risk transfer/sharing, etc.

COMMUNICATE

- **Understand the** perspectives of major stakeholders and identify potential issues, conflicts, and value trade-offs
- **Clarify** the benefits and costs of Smart Grid program to all key stakeholders through rigorous analysis/comparison with broad set of alternatives.
- **Design** an effective process to involve key stakeholders to establish alignment and common understanding.

The optimum combination and sequence of investments should be identified based on comprehensive analysis.



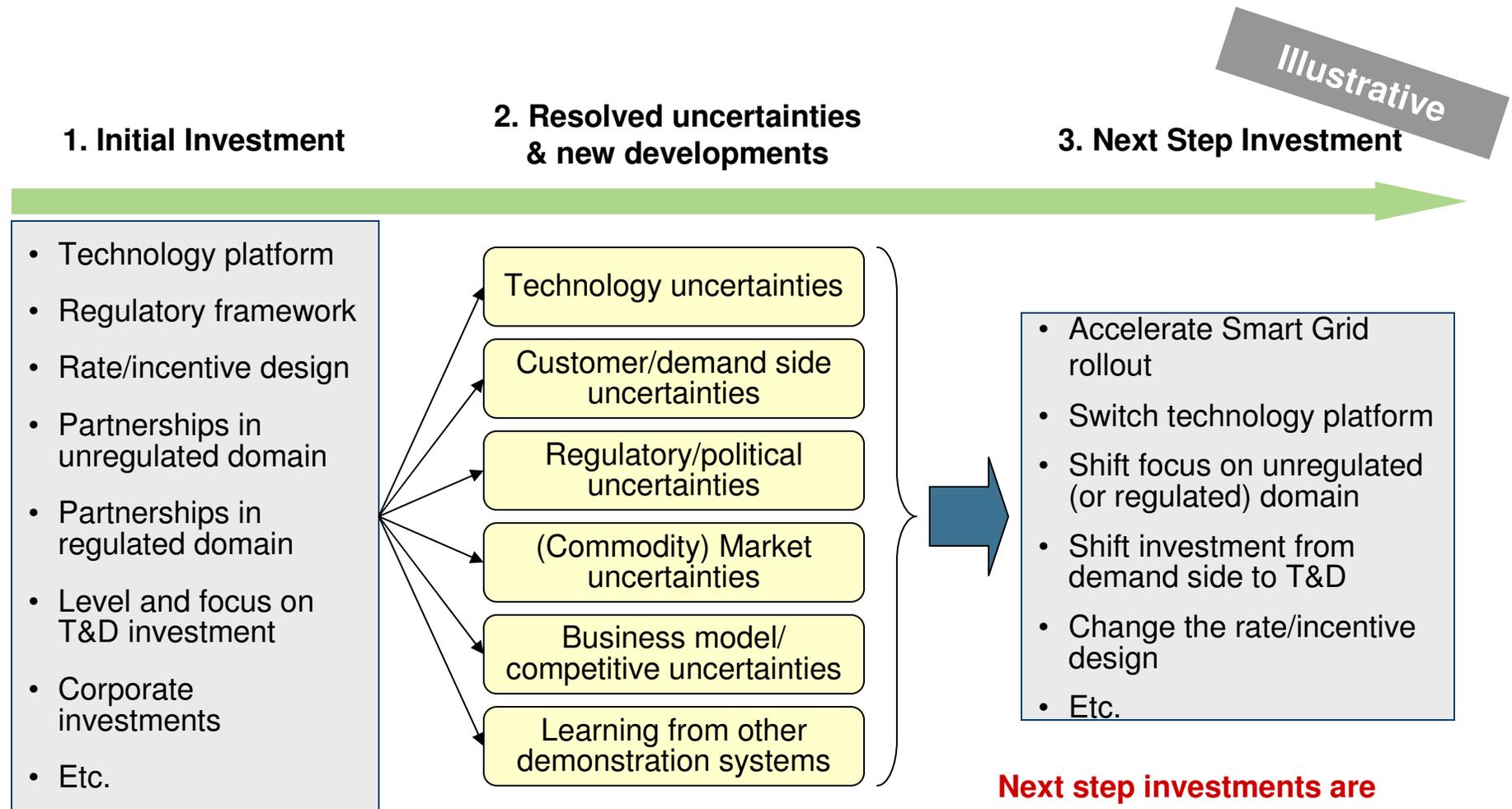
Careful examination of each SG program component will be necessary to ensure the maximum benefit/return with managed risk exposure.

Illustrative

Value Map:



The analysis should incorporate option value and flexibility in decision-making and implementation planning.



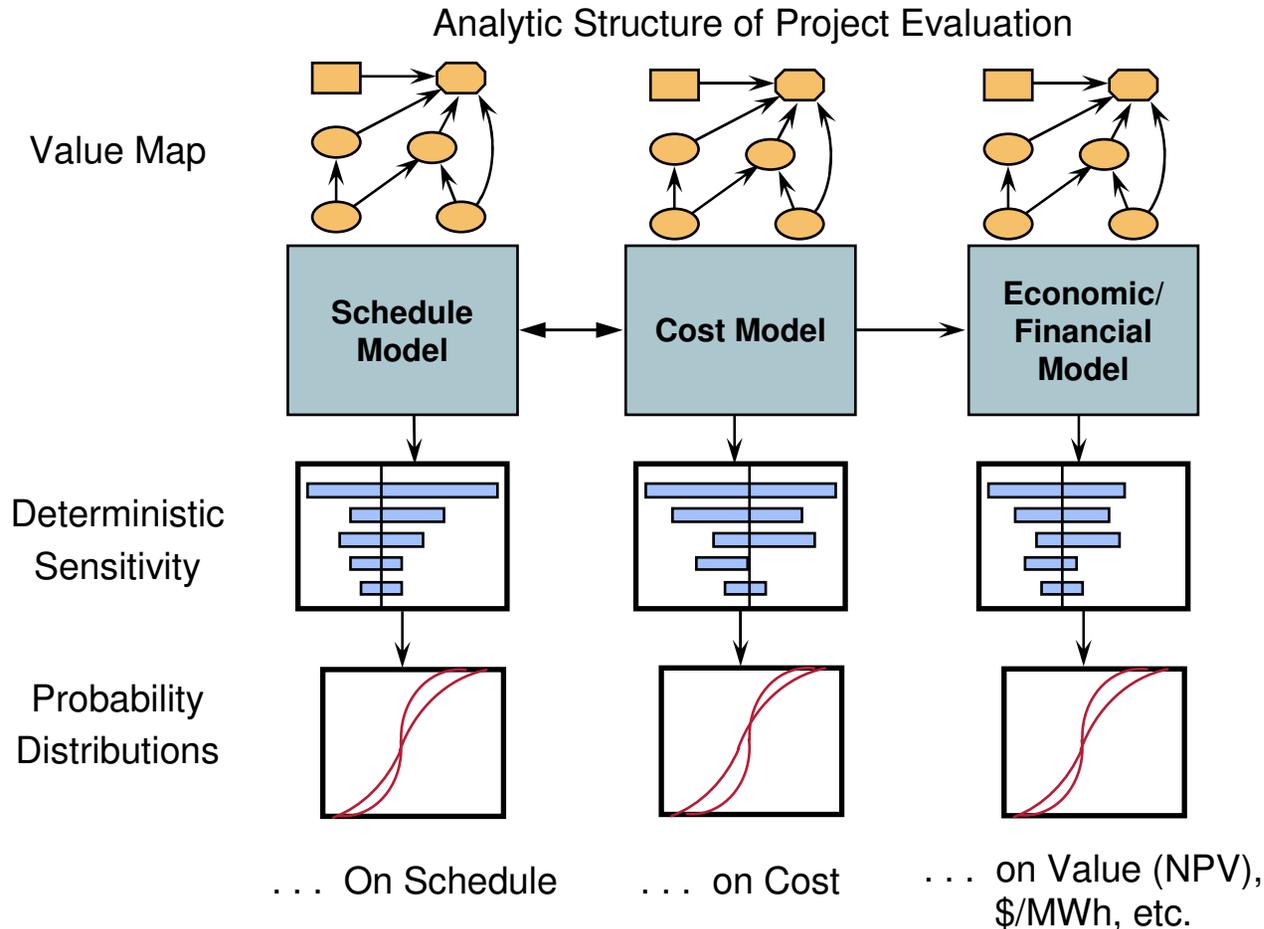
The initial choice should reflect the possibility of “learning” in the near to medium term.

Next step investments are taken following the resolution of critical uncertainties.

Due to its complexity and uncertainties, Smart Grid program execution will carry significant construction and operational risks for utilities.

- **System Complexity:** Smart Grid systems will depend on a number of inter-related components and subsystems including advanced meters, meter data management, distribution system automation and will likely necessitate significant changes in existing utility systems and processes.
- **Stakeholder Complexity:** There are a wide number of stakeholders affected in the deployment of a Smart Grid program. Each affected group possesses often fundamentally different expectations, demands, and beliefs. Smart Grid program execution will require a high degree of coordination, communication and interaction across all end-user types, interconnected third-party systems, in addition to multiple organizational units across the utility.
- **Fast Tracking:** Many Smart Grid programs, under public and political scrutiny, will be fast tracked. SDG's experience is that fast tracking increases project complexity and usually leads to significantly higher-than-anticipated cost and schedule over-runs.
- **First of a Kind:** Many aspects of a Smart Grid program will carry "First of a Kind" cost and schedule, as well as operational performance risks.

We build an integrated simulation of the cost, schedule and economics of a project to quantify risks and evaluate execution alternatives.

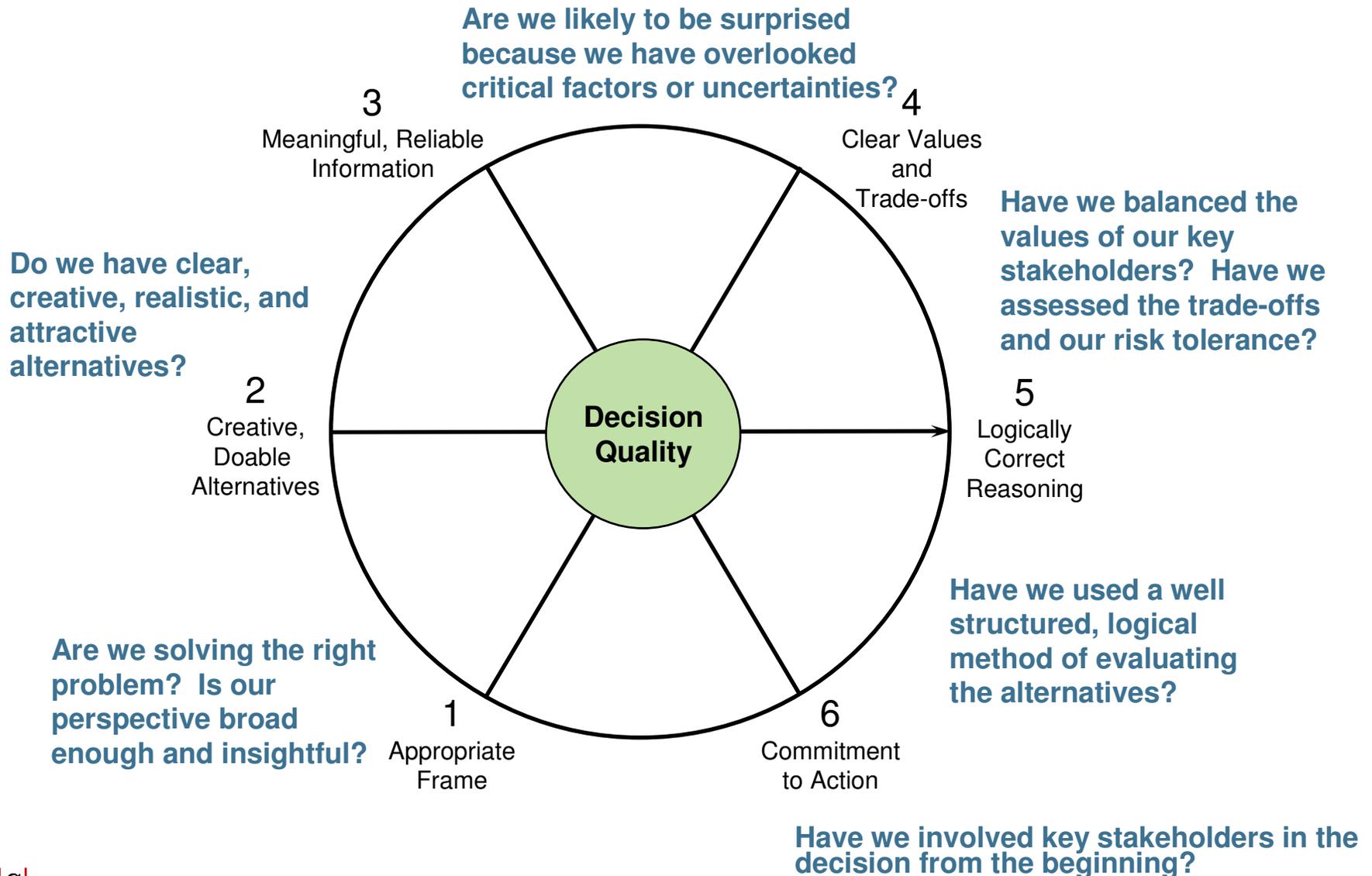


Cost, Schedule and Economics are **integrated** to incorporate inter-relationships and evaluate trade-offs based on relative economics (e.g. \$/MWh)

As demonstrated by some early experience, Smart Grid programs may face exceptional regulatory scrutiny.

- EPRI has estimated that Smart Grid will cost \$165B over the next 20 years
- Excel Energy's Smart Grid City, originally expected to cost \$11MM, is now estimated at \$42MM and the Colorado PUC is now requiring Excel to file for a Certificate of Public Convenience and Necessity
- Smart Grid Investments, while currently very popular politically, will have to stand the test of time:
 - The system will face the "Used and Useful" Screen - *Is this needed to provide adequate and reliable service?*
 - Construction and O&M costs will face the "Prudence" Screen - *Should it cost this much to provide adequate and reliable service?*

We work with clients to ensure decision quality in their major strategic decisions.



SDG's Energy & Environment practice has been at the leading edge of many of the critical strategic challenges facing the energy industry.

- **Generation Portfolio & Asset Strategy** – Support owners of the largest generation fleets to make decisions on asset investments, acquisitions, divestitures, retrofitting, and to address uncertainties arising from market volatility, fuel risks, environmental and other regulatory changes.
- **Enterprise Risk Management** – Support many leading companies in energy and other industries in assessing the value and risk inherent in their businesses and in devising strategies for increasing value and minimizing risk in their portfolios.
- **Nuclear Renaissance** – SDG has been at the forefront of the nuclear renaissance and is supporting several developers of new nuclear plants in developing strategy and risk management for these massive investments.
- **Smart Grid/Energy System of the Future** – Evaluate the potential market prospects and impact of emerging technologies and changing market needs on the energy system of the future.
- **Renewable Energy** – We work with manufacturers, developers and utilities in addressing strategic challenges in this highly uncertain market.

SDG's Energy and Environment practice's clients represent more than 75% of the total electricity generated in the US.

For more than 30 years, SDG has been supporting utility clients in developing innovative retail products and services.

- We are assisting utility clients in making the full range of marketing decisions: evaluating new products/services, channel selection, distribution, product portfolios, market testing, and market segmentation.
- We have recently worked in retail product and service evaluation for both regulated and non-regulated market participants in a variety of markets including California, PJM and ERCOT
- We have been actively engaged with a variety of clients in scenario development for the future of the utility industry and consumer centric technologies. We looked closely at the implications of future scenarios to the utility business model and product/service portfolio
- We have extensive knowledge of US and global energy markets and the commercial, political, and regulatory context of utility business risks.



SDG played a key role in The Galvin Electricity Initiative, privately funded by former Motorola chairman, Robert Galvin.



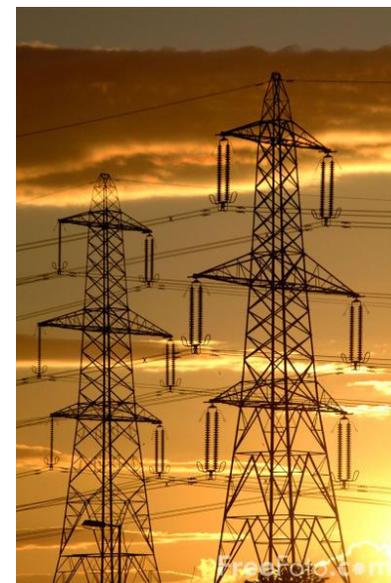
GALVIN
ELECTRICITY
INITIATIVE



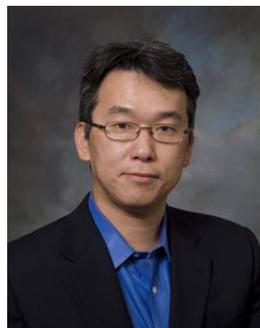
- SDG was selected to develop:
 - An analysis framework for evaluating stand-alone and grid-integrated alternative power system configurations and technology innovations, including energy efficient buildings and devices, micro-CHP, PV, fuel cells, energy storage technologies, and microgrids;
 - Consumer and society value models to evaluate a wide range of building-integrated and microgrid-level distributed power system configurations and technologies for commercial, residential, and mixed-use applications.
- SDG facilitated and co-facilitated five workshops with over 100 experts addressing future consumer needs and alternative power system configurations and technologies.
- SDG developed assessment tools and led interviews of leading technology experts and entrepreneurs to evaluate technology and market prospects, breakthrough-level investment requirements, legal and regulatory barriers, and timing.
- SDG's value-based models provide the capability for evaluating a wide range of current and future distributed technologies and energy system configurations as well as key market drivers, including:
 - Product design and manufacturing
 - Building design influence on reducing installed costs
 - Investment required to achieve breakthrough-level cost performance
 - Stimulating distributed power system market growth – role of subsidies
 - Product uncertainty influence on consumer buying decisions
 - Market uncertainty influence on manufacturing scale-up and technology investment

In PUC testimony, SDG evaluated a range of interveners – proposed distributed renewable alternatives to the 500kv Sunrise PowerLink.

- We evaluated the uncertainty surrounding the reliability, in-service date, greenhouse gas emissions, and feasibility of transmission and generation alternatives including in-area Renewables as an alternative with respect to meeting SDG&E's reliable service and renewable energy mandates.
- We assessed the feasibility and expected contribution of in-area PV, wind, biomass, and distributed generation in addition to SDG&E's DR and efficiency programs in meeting SDG&E's service obligation and renewable energy mandate.
- We developed risk profiles for each of the alternatives as well as sensitivity analyses (tornado charts) showing the relative importance of individual value and risk drivers.
- SDG also quantified customer and societal consequences of reliability shortfalls and imposed load dropping risk aversion actions associated with particular alternatives based on customer outage costs and value of electricity.



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About SDG

Strategic Decisions Group (SDG) is a management consulting firm renowned for its expertise in strategic decision-making, risk management, and shareholder-value creation. For nearly 30 years, SDG's Energy & Environment Practice has been a leader in helping energy market participants evaluate investment decisions, optimize the allocation of capital across their portfolios, and deal with market and regulatory uncertainty. Visit www.sdg.com.