ECE 333 – Green Electric Energy

18. Demand – Side Issues in Energy

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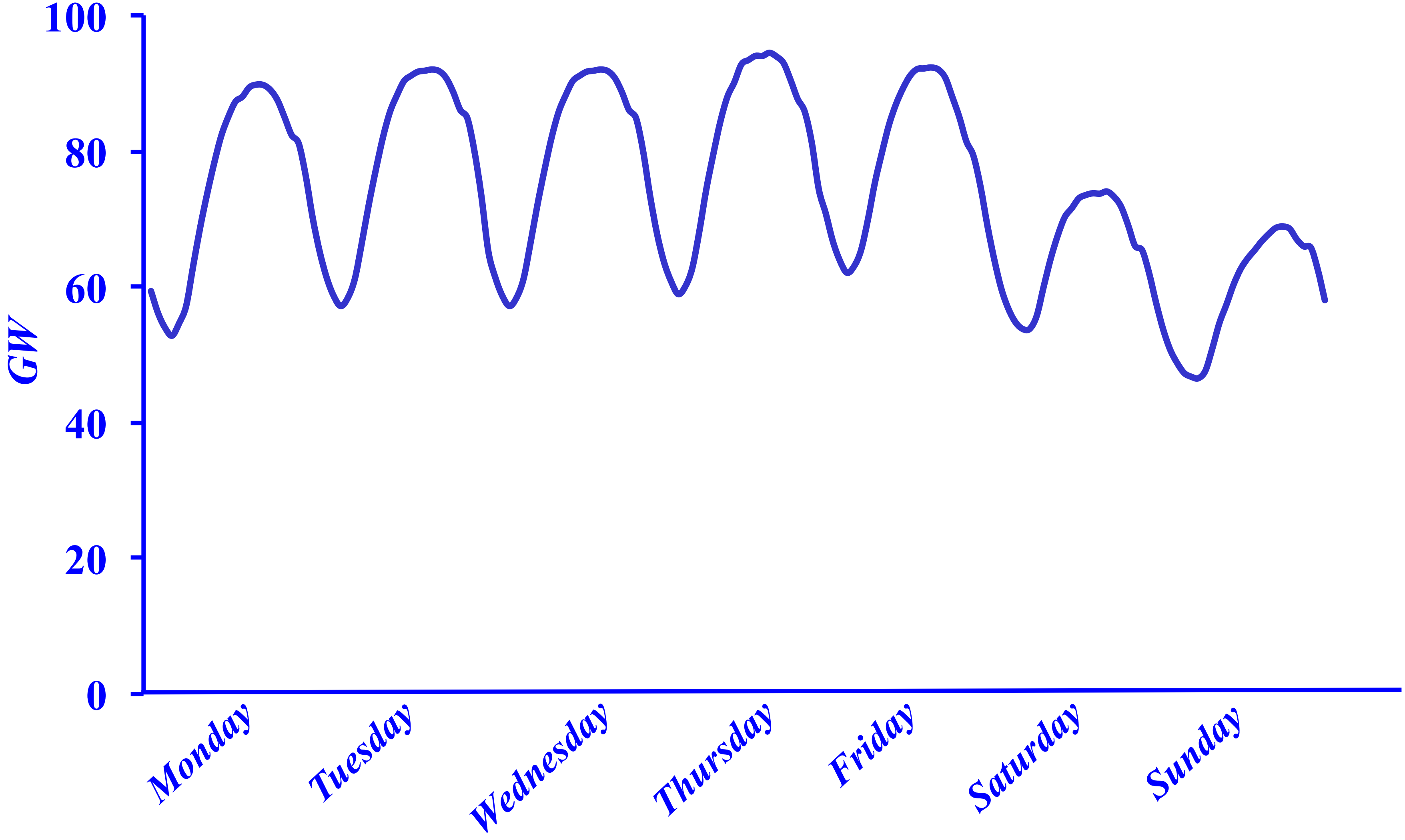
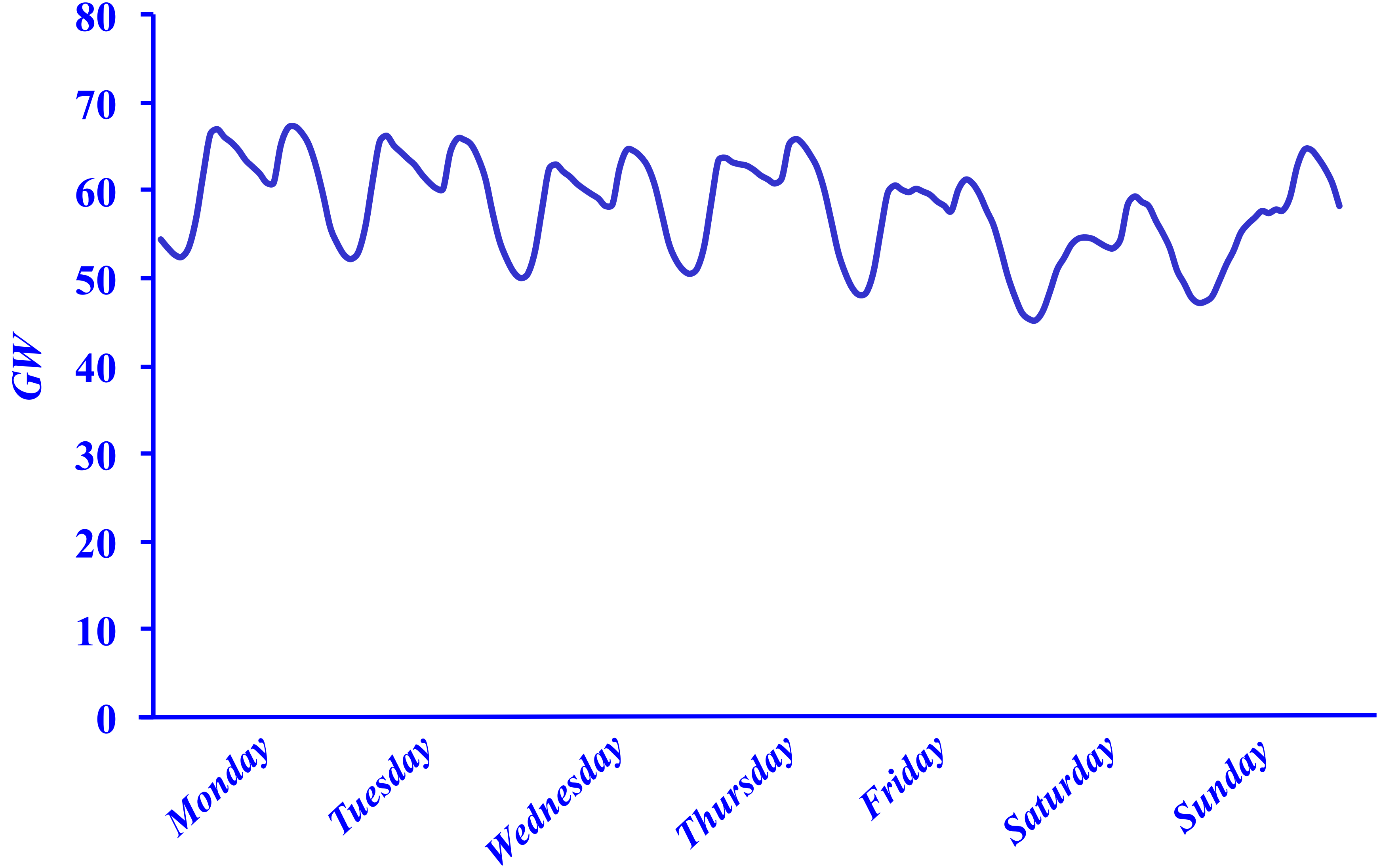
MISO CHRONOLOGICAL LOAD FOR THE JULY 15 – 21, 2013 WEEK



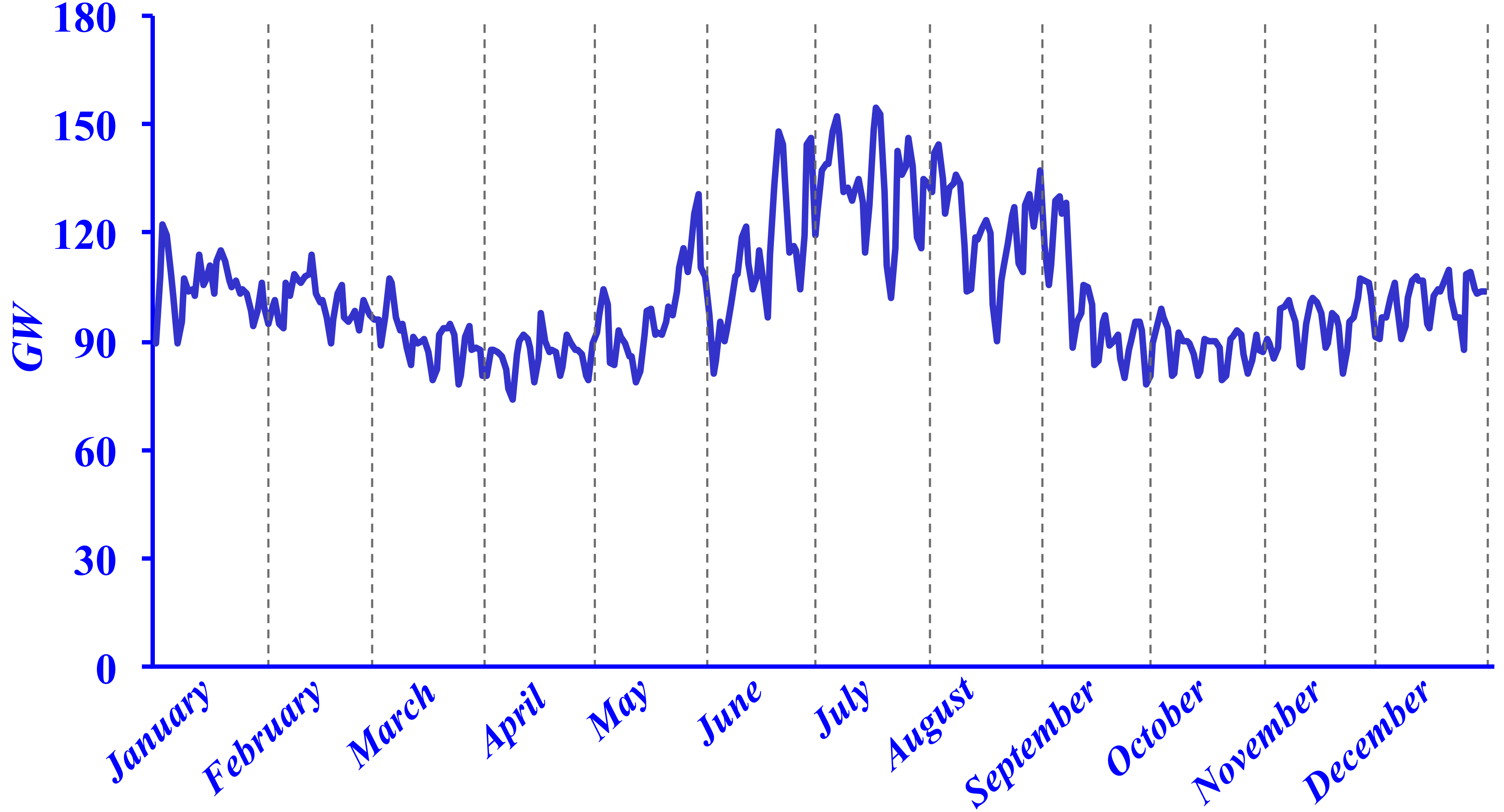
Source: https://www.misoenergy.org/Library/MarketReports/Pages/MarketReports.aspx

MISO CHRONOLOGICAL LOAD FOR THE JANUARY 7 – 13, 2013 WEEK



Source: https://www.misoenergy.org/Library/MarketReports/Pages/MarketReports.aspx

PJM 52 – WEEK DAILY PEAK LOAD PROFILE FOR 2012



Source: http://www.pjm.com/markets-and-operations/ops-analysis/historical-load-data.aspx

OUTLINE

- Supply – side resources
- Demand – side resources
- Impacts of demand – side management (*DSM*)
- Challenges in *DSM* implementation
- Example of savings in *DSM*
- Cost effectiveness of *DSM* programs
- *DSM*: the promise vs. reality

SUPPLY – SIDE RESOURCES

- The generation sources are considered to be supply–side resources; they provide the grid with
  - energy; and
  - capacity
- In addition, supply–side resources provide a variety of services ranging from reactive power support to system stability enhancement
- Unfortunately, some supply–side resources may

SUPPLY – SIDE RESOURCES

resource type	*examples*
base–loaded generation	*combined cycle, co–generation, coal, run–of–river hydro, geothermal*
mid–range generation	*combined cycle*
peaking generation	*gas turbine, peaking hydro*
purchases from other utilities	*firm capacity and energy contracts*

ADDITIONAL SUPPLY – SIDE RESOURCES

resource type	*examples*
non–utility source purchases	*co–generation; wind, small hydro, small coal, solar; larger thermal resources*
exchanges	*peaking capacity with off–peak energy return; seasonal capacity exchanges*
renewable	*solar, wind, hydro, photovoltaic, biomass*
energy storage	*pumped storage hydro, compressed air energy storage technology, batteries*

DEMAND – SIDE RESOURCES

- Programs designed to modify the demand by
  - efficiency improvement/energy conservation;
  - electricity consumption reduction; and,
  - shift of loads to periods with lower demand

  help to effectively meet customers' demand, but with a reduced negative environmental impact
- We refer to such programs as demand–side management (*DSM*) or demand–side resources

DEMAND – SIDE RESOURCES

- Conceptually, we may view *DSM* as a “source” of energy for meeting the system demand
- Conservation measures save energy by doing away with certain types of consumption; for example, insulation of a house reduces heating/ air conditioning needs over the life of the house
- Every conservation effort reduces overall demand for all future periods

DEMAND – SIDE RESOURCES

- Efficiency improvements serve to reduce demand without necessarily removing the load: for example, *Energy Star* appliances can be used to replace conventional appliances with the added benefits of reduced energy consumption and lowered energy expenditures and also emissions
- An efficiency measure serves to reduce the need for additional generation, but complications arise

ENERGY EFFICIENCY IMPLICATIONS

- The development of technology that improves the efficiency of a process implies that we can obtain the same output as with the earlier technology but the new process requires less energy input and possibly lower emissions
- However, the energy efficiency improvement in a specific application through the reduction in the required energy input for that application need not reduce significantly the overall energy consumption for that application

ENERGY EFFICIENCY HAS IMPLICATIONS

- As an example, we consider the case of doubled number of *km* per *l* of input fuel, say from 8 *km/l* to 16 *km/l*; typically, such an efficiency improvement leads people to use their cars to go twice as far as before and thus results in ***zero reduction*** in the total input fuel consumed

ENERGY EFFICIENCY IMPROVEMENT IN LIGHTING

- The history of *lighting* has gone through a series of accelerated improvements following the *Industrial Revolution*, including
  - "*town gas*" made from coal and deployed for street lighting
  - *whale oil*, the favorite indoor lighting fuel for the better–off *Americans* until its replacement by the more efficient kerosene

ENERGY EFFICIENCY IMPROVEMENT IN LIGHTING

- The *electric lightbulbs* came into use in the years of 1885–1900
- As each of these technologies matured, the demand rose and resulted in increased overall energy consumption
- As more technology breakthroughs were made, the demand for the newer lighting devices increased and led to lower prices: a study by *Roger Fouquet* of the *London School of Economics* and

ENERGY EFFICIENCY IMPROVEMENT IN LIGHTING

Peter Pearson of *Imperial College* provides evidence that the sequence of efficiency improvements has brought a 3,000–fold decrease in the real costs of illumination in the *UK* over the past 200 *years*

- Because cheap illumination fosters economic development, the cheap light technology has found many applications, beyond the illumination

ENERGY EFFICIENCY IMPROVEMENT IN LIGHTING

of streets, homes and workplaces, such as in *computers*, *TVs*, *minipads* and *cellphones*

- Studies by the *International Energy Agency* (*IEA*) and the *Intergovernmental Panel on Climate Change* (*IPCC*) show that the price reduction due to the lighting energy efficiency improvements results in usage *rebounds* – increases in energy consumption as high as 50 % in developed nations

ENERGY EFFICIENCY IMPROVEMENT IN LIGHTING

- Similar results are expected in developing nations as they make use of cheap lighting technology, as soon as widespread electrification is achieved
- The key implication is that overall electricity consumption is likely to increase as cheaper lighting is deployed on a geographically larger scale

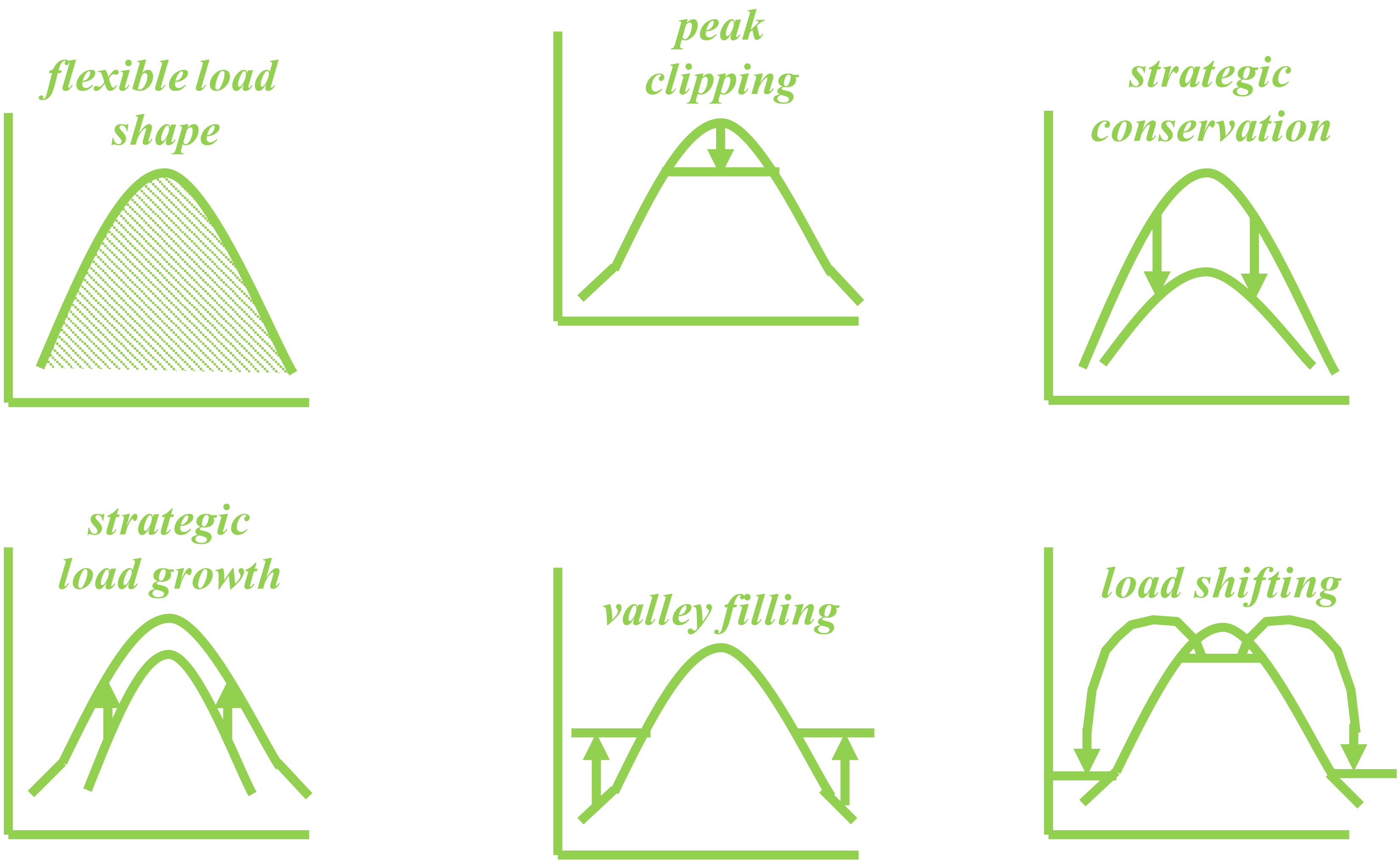
DEMAND – SIDE RESOURCES

- **Demand shifting programs aim to move energy consumption to periods of lower system loads, typically, from peak load times to off–peak hours; such load shifts serve to reduce or defer the need for additional supply resources**
- **Load management programs have the ability to switch loads *on and off* to effectuate *lower* demand in the system at various times, particularly at times of peak load**

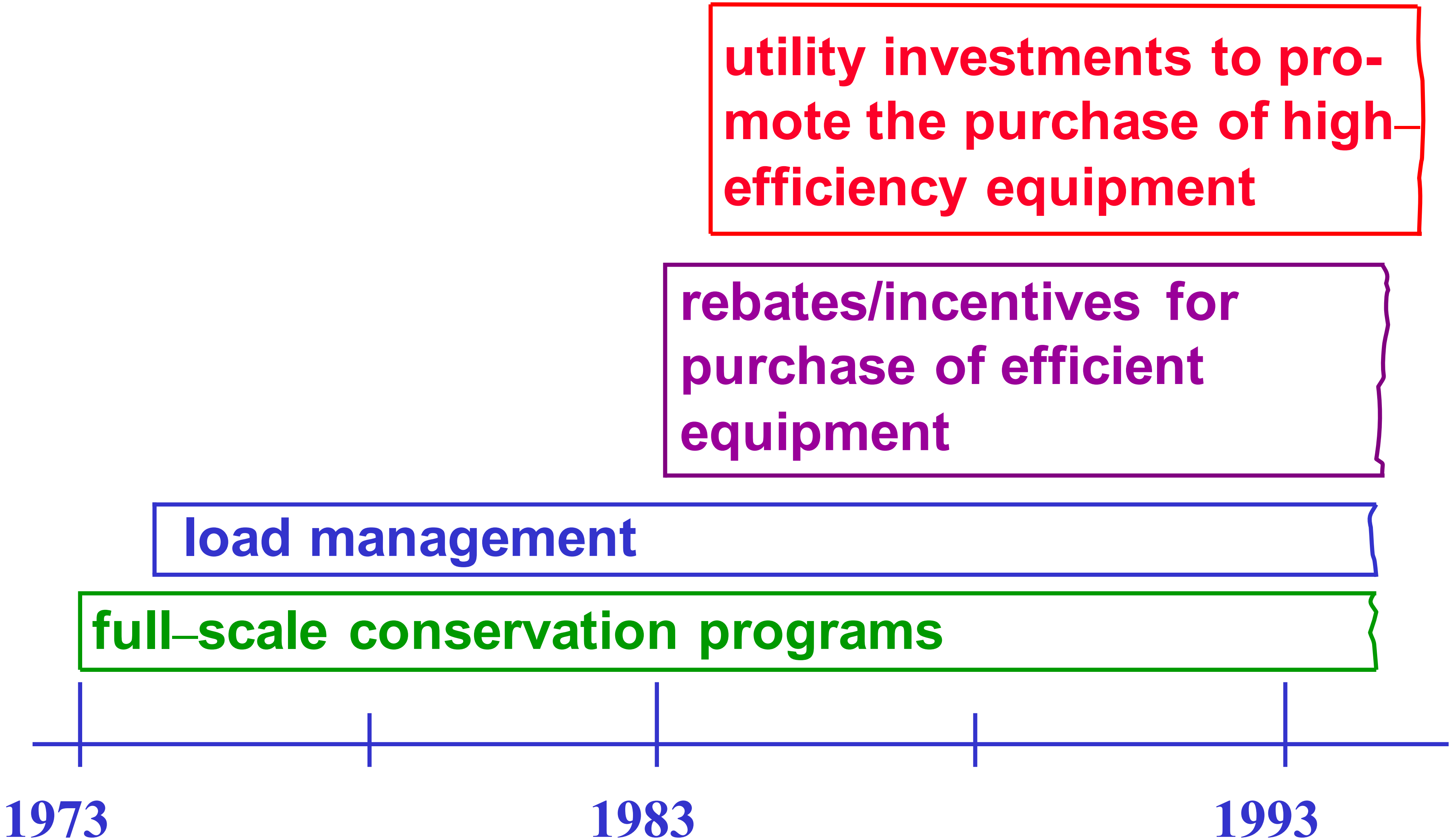
DEMAND-SIDE MANAGEMENT

- The term demand–side management (*DSM*) was used in the regulated environment to refer to the implementation of extensive programs that modify the demand of the system
- In practical terms, a *DSM* program is any measure that influences load on the *customer side* of the meter
- In analogy to supply–side resources, demand–side resources can be targeted for base, interme–diate and peaking applications

DSM PROGRAMS' LOAD SHAPE OBJECTIVES



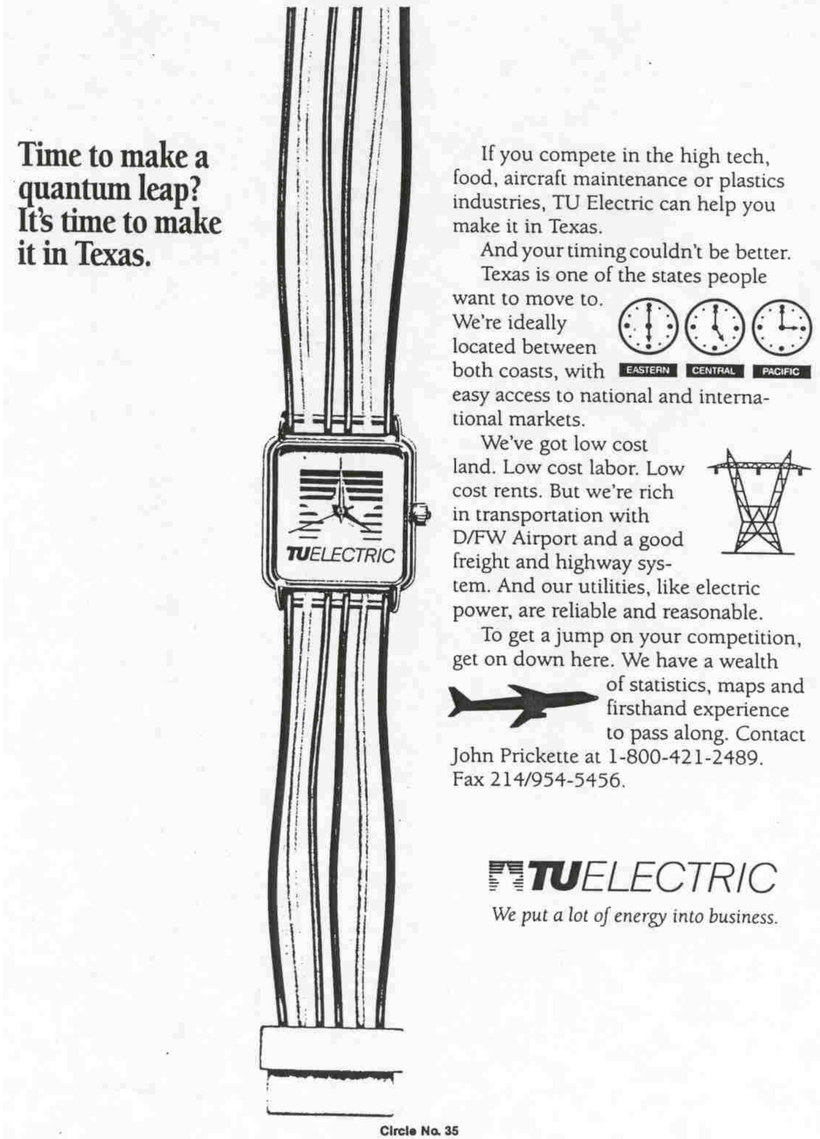
HISTORICAL STAGES OF *DSM*



TYPICAL EXAMPLES OF *DSM* PROGRAMS

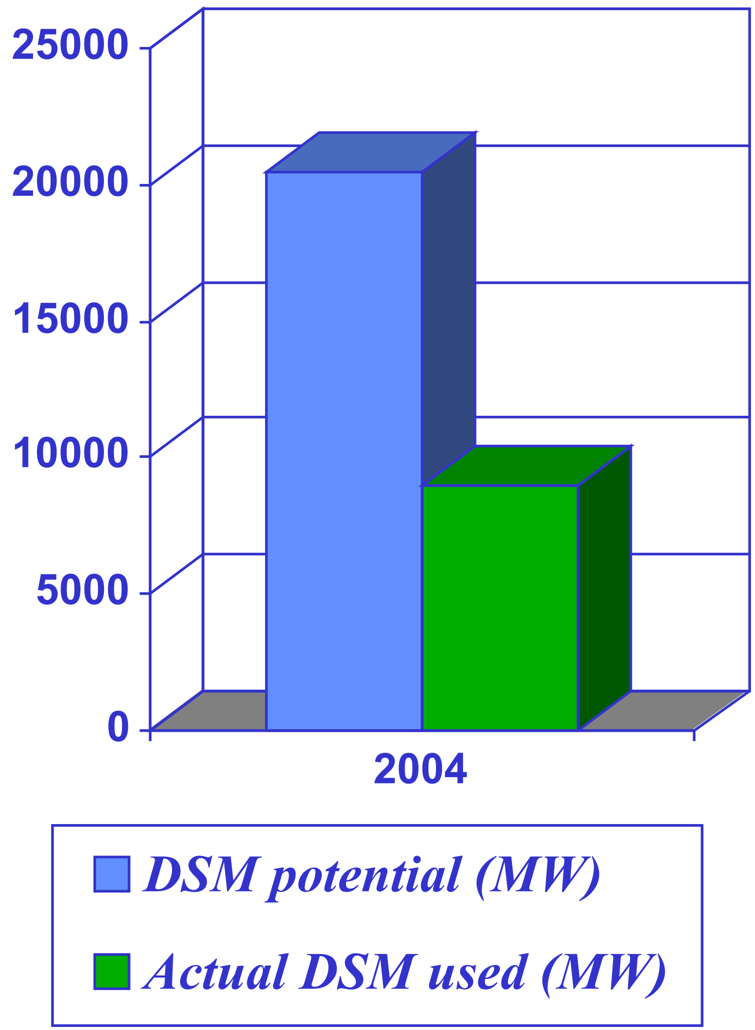
program type	*example*
load reduction	*conservation*
load buildup	*marketing*
load shifting	*load management*

ENERGY EFFICIENCY AND ECONOMIC DEVELOPMENT



US DSM CAPABILITY

- In 2004, it was observed that, since 1996, the potential for load management had decreased by 32 %
- Furthermore, the expenditures made by the utilities on *DSM* programs were reduced by 10 % since the 1990s



RENEWED INTEREST IN *DSM*

- With the assessment of services provided by demand–side resources, the Federal Energy Regulatory Commission (*FERC*) has repeatedly encouraged the incorporation and expansion of *DSM* within organized electricity markets
- Several grid operators (*NYISO*, *PJM*, *ISONE*, *ERCOT*) have encouraged consumer participation and have taken steps to integrate *DSM* into wholesale markets

RENEWED INTEREST IN *DSM*

- Some states (*MD*, *NJ*, *NY* and *PA*) have adopted real–time pricing as a default service for *large customers* or have implemented critical peak pricing programs (*CA*, *FL*)
- Several utilities (*Georgia Power*, *Duke Power*, *TVA*) have attracted significant customer participation in *real–time pricing programs* as an optional service for large customers

RENEWED INTEREST IN *DSM*

- A number of utilities have already deployed or are considering the deployment of advanced metering infrastructure (*AMI*) on a system–wide basis to enable price–sensitive demand response
- The number of *AMI* units deployed in the *US* exceeds 70 *million* and is growing year by year

APPROPRIATE *DSM* APPLICATIONS FOR DIFFERENT LOAD SEGMENTS

intended load segment	*base*	*intermediate*	*peaking*
typical programs	*motors* *water heater, refrigerator and freezer efficiency improvements* *lighting*	*building weatherization* *air-conditioner or heat pump efficiency improvements* *stricter appliance efficiency standards* *time-of-use rates*	*air-conditioner control* *thermal storage HVAC* *high peak rates*

FREE RIDERS IN A *DSM* PROGRAM

participant — actions undertaken without the *DSM* program

total free rider — same measures at the same time

partial free rider — less efficient measures later and in relatively small quantities

non-free rider — either no action (purchase) or continuation of past behavior (*industry standard* rather than *energy efficient equipment* purchase)

LOAD MANAGEMENT PROGRAMS

- **Key focus is to *strategically* reduce customer use at peak load times**
- **The deployment of these programs avoids the need to construct more peaking units**
- **Such programs have, typically, minor impacts on total energy consumption**

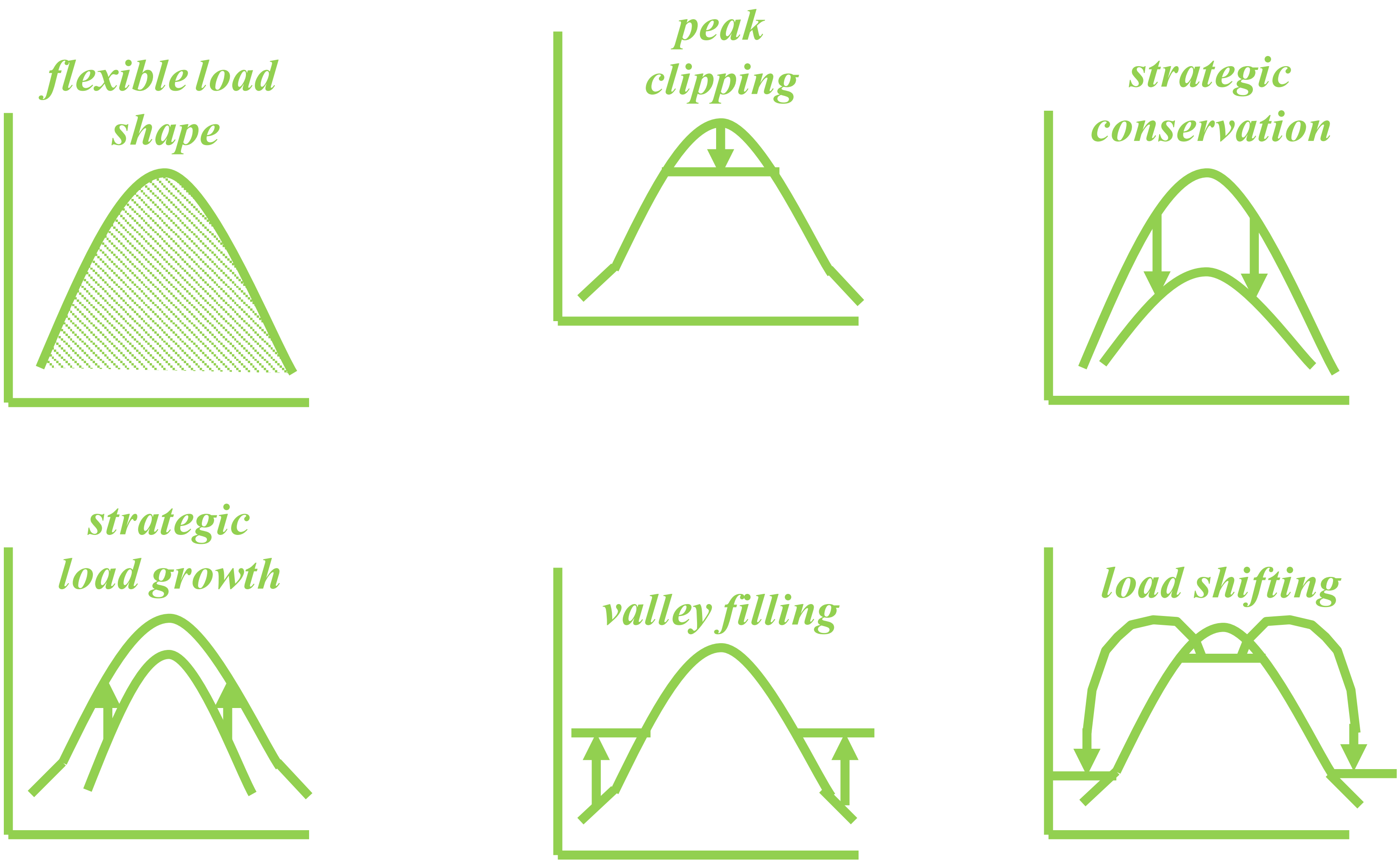
LOAD MANAGEMENT PROGRAMS

- These programs constitute the *mature parts of DSM*
- The two major classes of programs
  - *direct load control*; and
  - indirect control using *pricing–based options* (interruptible, curtailable, time–of–use rates) or the deployment of specially designed incentives for load management

BASIC ASPECTS OF *DSM*

- ***DSM*** **activities focus on the** ***customer–side of the meter*** **and aim to influence end use of electricity so as to bring about the desired changes in the utility's load shape**
- ***DSM*****, in practice, has become a collection of programs for increased efficiency, load manage–ment and conservation; programs aim to reduce the need for more electrical energy generation resources and additional installed capacity**

DSM PROGRAMS' LOAD SHAPE OBJECTIVES



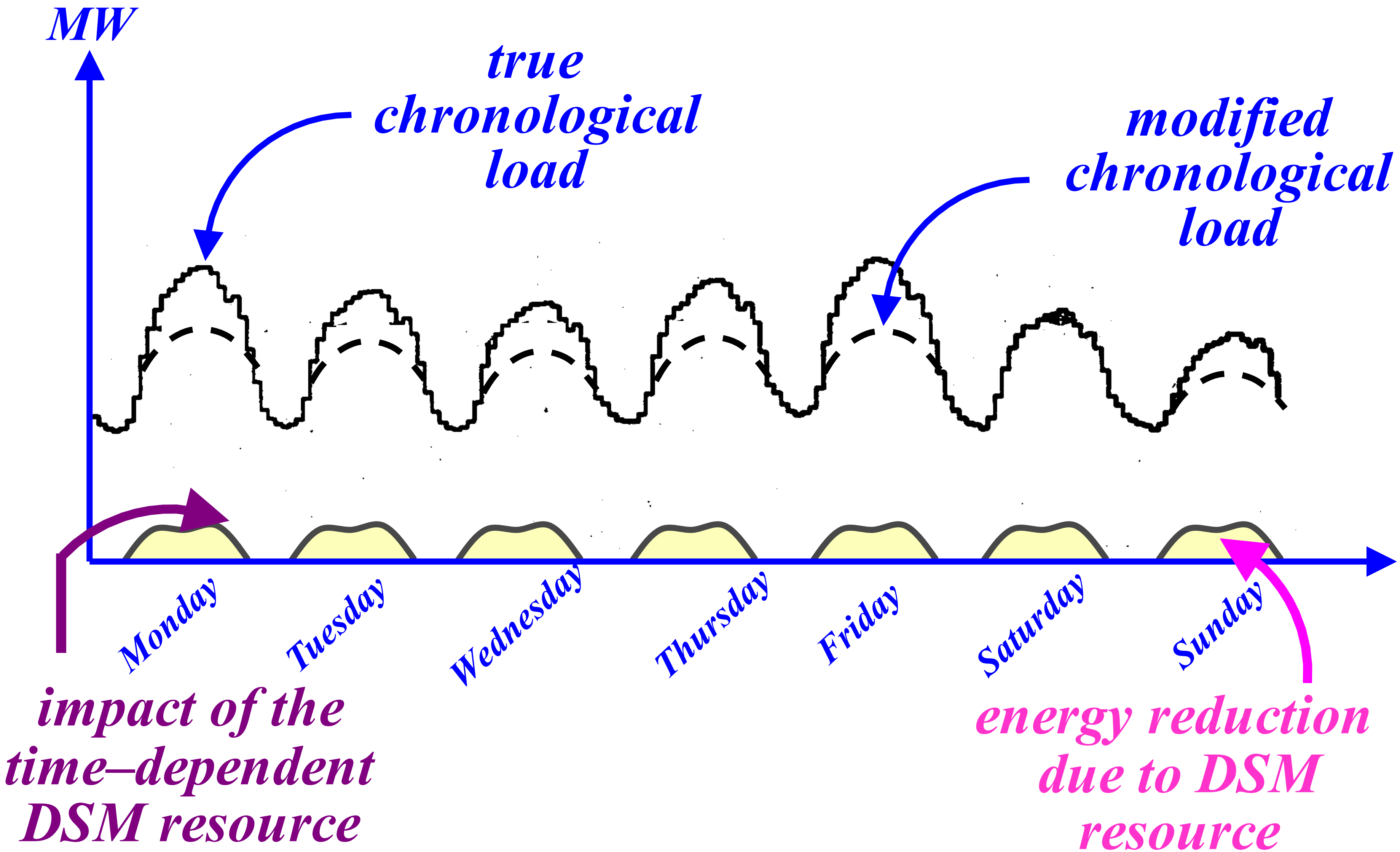
BASIC ASPECTS OF *DSM*

- **Load demand is not considered to be fixed: changes in demand are planned concurrently with supply–side operations, and the execution of *DSM* programs and energy dispatch is done in an *integrated* fashion**
- **The dispatch of implemented *DSM* programs becomes an inherent part of system operations**

DSM IMPACTS

- Modification of the chronological load shape
- Reduction of the peak load
- Delivery of the electricity at a lower consumption level
- Reduction in the overall emissions
- Deferral and possible avoidance of the need to construct new supply–side resources

DSM INTEGRATION



KEY CHALLENGES IN *DSM* IMPLEMENTATION

- Electricity service providers (*ESPs*) need to overcome the disincentives caused by *traditional* rate–making: the more electricity sold, the higher the contributions to profits
- The development of rate structures that not only permit the recovery of *DSM* program costs but also provide other incentives to encourage *DSM* implementation over investments in *grid–integrated* supply–side resources is a key issue

KEY CHALLENGES IN *DSM* IMPLEMENTATION

- The education/training of customers through the timely provision of information on topics, such as:
  - effective energy utilization;
  - the important role of demand in meeting supply–demand balance; and
  - cost–effective approaches to manage the customer energy needs

  is a primary requirement

KEY CHALLENGES IN *DSM* IMPLEMENTATION

- Design of appropriate tariffs and incentives for customers to
  - improve *efficiency* and adopt new *conservation measures*;
  - shift loads to periods with lower demand; and
  - obtain regulatory approval for their timely and effective implementation

EXAMPLE: SHARED SAVINGS PROGRAM

- An energy services company (*ESCO*) undertakes a lighting program to improve energy efficiency through the replacement of 75–*W* incandescent bulbs by 18–*W*, 10,000–*h* compact fluorescent lamps (*CFL*) that produce an equivalent amount of illumination
- To make the program attractive to customers, the *ESCO* offers a *$* 2 rebate on each installed *CFL*

EXAMPLE: SHARED SAVINGS PROGRAM

- We have the following data:

parameter	*units*	*value*
marginal costs	*¢/kWh*	3
average costs	*¢/kWh*	2
number of CFLs installed	–	10^6
administrative/overhead costs	*$/CFL*	1

EXAMPLE: SHARED SAVINGS PROGRAM

- We compute the energy savings to be

$$kWh\ saved = \underbrace{(75-18)}_{W}\underbrace{(10{,}000)}_{h}\underbrace{10^6}_{\substack{CFL\ units\\ installed}} = \underbrace{(570)}_{\substack{energy\ savings\\ per\ CFL\ unit}}10^6\,kWh$$

which correspond to

$$energy\ cost\ savings = (57)10^7(.03) = \$17.1\,M$$

- The program costs are

$$implementation\ costs = (2+1)\ 10^6 = \$\,3\,M$$

EXAMPLE: SHARED SAVINGS PROGRAM

- The net savings for *ESCO* are

$$net\ \ savings\ =\ 17.1 - 3 =\ \$\,14.1\,M$$

- The shared savings program is typically carried out with the allocation of the net savings to the customers and the *ESCO* along some specified basis: suppose the allocation is 15 % to the *ESCO* and 85 % to the customers:

$$ESCO\ net\ benefits\ \ =\ \ \$\,2.12\ M$$

$$customers\ net\ benefits\ =\ \$\,11.99\ M$$

EXAMPLE: SHARED SAVINGS PROGRAM

- The ability to directly capture a portion of the net savings provides incentives to the *ESCO* to undertake more wide–spread lighting programs

$$DSM\ \ costs \ = \ \frac{\$\,3}{570\,kWh} \ = \ \frac{¢\,300}{570\,kWh} \ = \ 0.52\ ¢\,/\,kWh$$

- The *CFL* program is judged to be *cost effective* as

$$\begin{matrix} average \\ costs \end{matrix} \ + \ \begin{matrix} DSM \\ costs \end{matrix} \ = \ 2 \ + 0.52 \ = \ 2.52\ ¢\,/\ kWh$$

$$< \ 3\ ¢\,/\ kWh \ = \ marginal\ \ costs$$

DSM PROGRAM COST EFFECTIVENESS

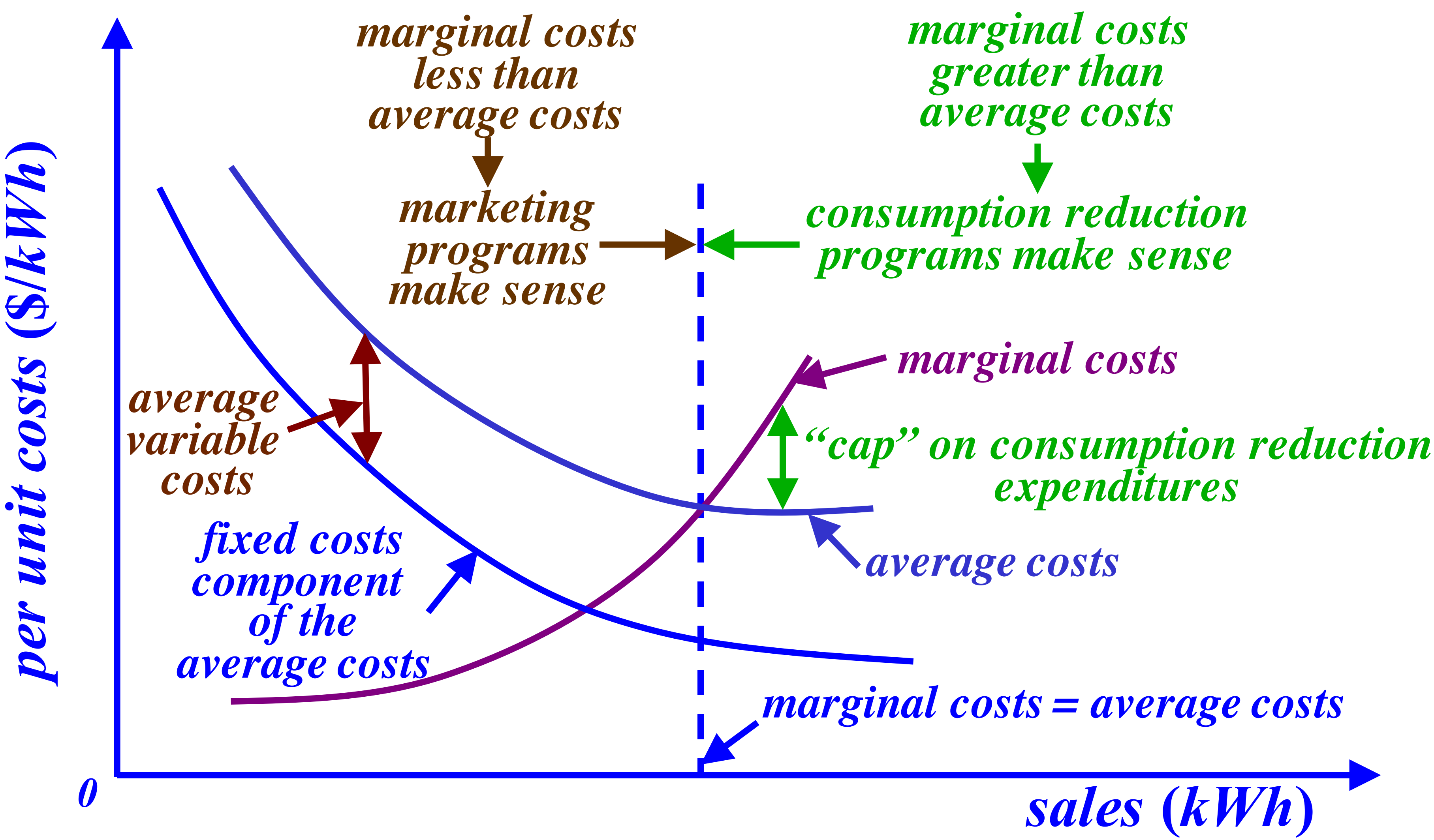
- The measurement of *DSM* cost effectiveness is difficult and is, to a large extent, highly policy dependent; typically, *DSM* programs need to pass certain tests to be authorized by regulatory agencies before utilities can implement them
- Cost effectiveness depends also from whose viewpoint the evaluation is made:

DSM PROGRAM COST EFFECTIVENESS

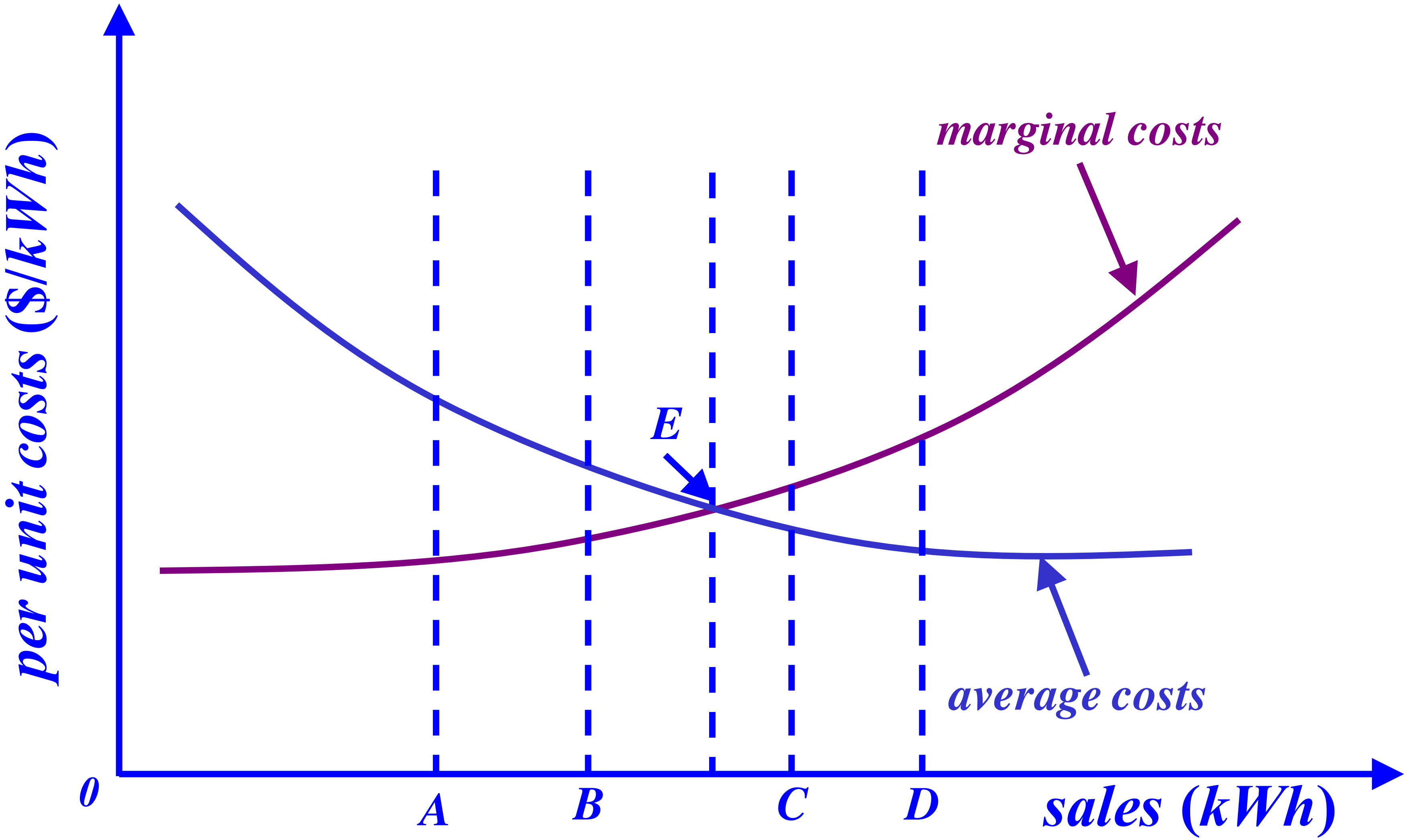
- participating customer
- non–participating customer
- utility stockholder

- There is controversy and uncertainty in the adoption of *DSM* programs in the areas of customer–behavior prediction and the various assumptions used for a particular program

A SIMPLE COST – EFFECTIVENESS TEST



A SIMPLE COST – EFFECTIVENESS TEST



COMPLICATIONS IN THE INTEGRATION OF *DSM* PROGRAMS

- Time–of–day effects: even if the marginal costs are below the average costs in some periods, in the peak periods the marginal costs exceed them; in such cases, the *ESP* needs to examine those conservation programs that are particularly effec–tive on–peak (e.g., more efficient air conditioners) or undertake specific load shifting programs

COMPLICATIONS IN INTEGRATING *DSM* PROGRAMS

- Evaluation of *life-cycle benefits*: parties differ over which discount rate is appropriate – the utility's or the ratepayer's

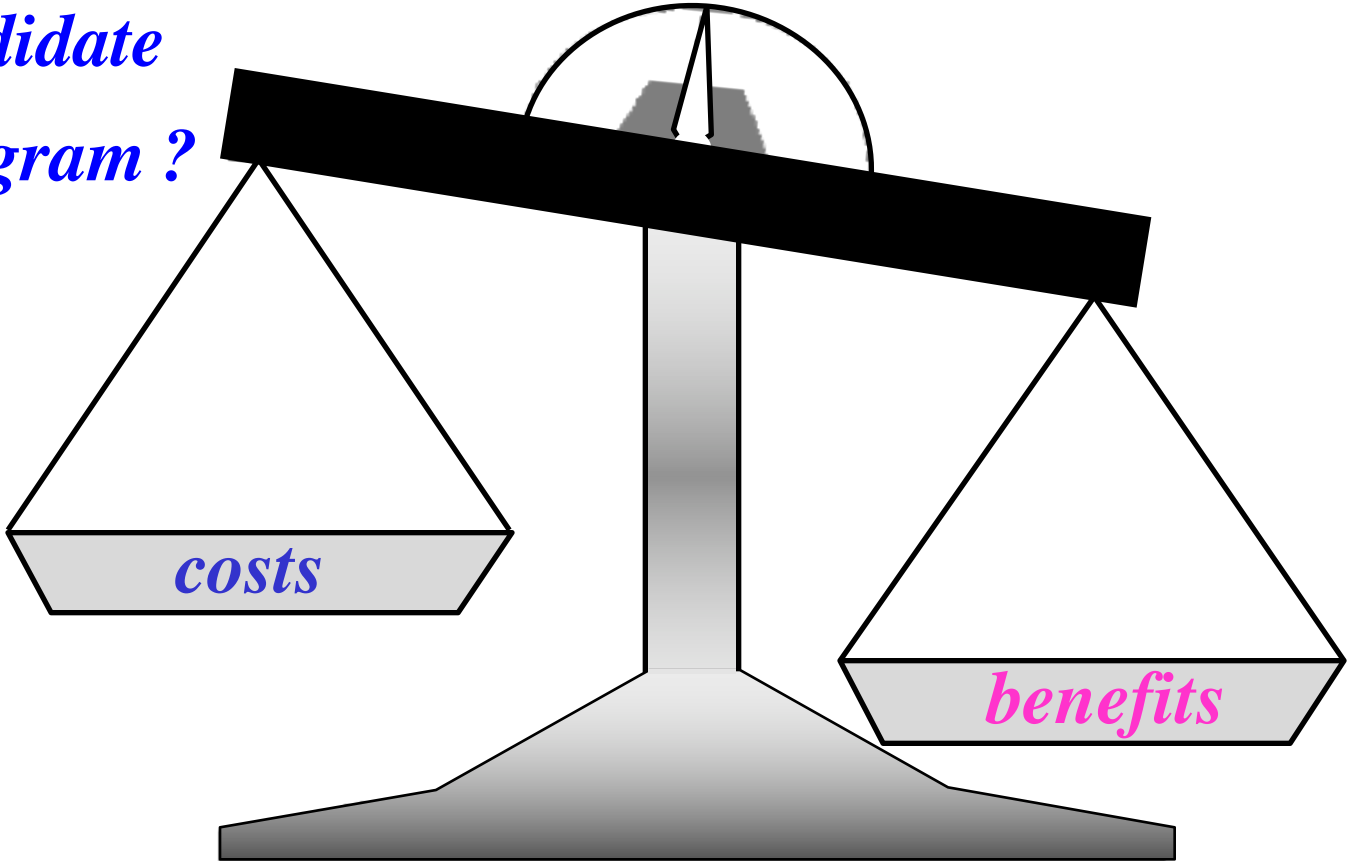
- The *economies of scale* in supply–side options fail to carry over to demand–side programs because of saturation effects

COMPLICATIONS IN INTEGRATING *DSM* PROGRAMS

- The savings due to a demand–side program are difficult to determine accurately; for example, an owner whose home has been insulated may set his thermostat to a higher temperature, which eliminates some of the benefits that are possible with the implemented insulation

PROGRAM BENEFIT/COST ANALYSIS

add candidate DSM program ?



a candidate may be implemented if

benefits > costs

DSM EVALUATION

- Principal difficulty: comparison of observed outcomes with a base case that is "estimated" to represent the outcomes without *DSM*
- Needed in measurement/evaluation of
  - program impacts
  - program effectiveness

DSM EVALUATION

- customer satisfaction with *DSM* programs/ technologies

- Key ingredients required to improve the ability to plan efficient investment strategies: the under-standing and the quantification of the customers' preferences and behavior in energy and capital equipment markets

DSM EVALUATION: KEY STRATEGIC QUESTIONS

- How large is the *DSM* resource?
- What are the end uses?
- What are the development costs?
- How long will the benefits last?
- Can we rely on it and when?

NEGAWATT COSTING EVALUATION

- Joskow and Marron studied energy conservation programs undertaken at a sample of *US* utilities and reported their results in the *Energy Journal* in 1992
- Objectives of the study
  - measure ***costs*** and *energy savings* that utility conservation programs are actually achieving
  - compare the results to the technical potential (*TP*) studies of *RMI* and *EPRI*

NEGAWATT COSTING EVALUATION

- verify that the utility measurement of the costs and the energy savings and the accounting practices are consistent with sound economic and regulatory accounting principles

- Approach: a group of 10 utilities was selected and information about conservation programs was collected (primarily covering specific programs that operated in 1990 and 1991)

JOSKOW AND MARRON STUDY FINDINGS

- Reported costs exceed *TP* analyses because
  - utilities report some administrative overhead costs that are either ignored (*RMI*) or under-stated (*EPRI*)
  - measured savings are lower than *TP ex ante* projections
  - estimated costs and performance are excessively optimistic (reliance on uncertain costs, uncertain technologies, limited market experience)

JOSKOW AND MARRON STUDY FINDINGS

- Costs reported by utilities failed to
  - track fully the administrative costs of their programs
  - costs incurred by program participants (portion of direct costs and real transaction costs)

JOSKOW AND MARRON STUDY FINDINGS

- Electricity savings are overstated because
  - estimates are often based on *ex ante* engineering projections and not *ex post* evaluations
  - estimates rely on *engineering* and not *economic* life times of the equipment
  - *free riders* are ignored

THE JOSKOW – MARRON STUDY RESULTS

- Utilities tend, on average, to report conservation costs that are *too low* and energy savings that are *too high*

- Reported costs per *kWh* saved are *systematically lower* than actual costs (the understatement may be, on average, by a factor of 2)

THE JOSKOW – MARRON STUDY RESULTS

- Experience of utilities with careful measurement programs indicates that the magnitude of energy savings achievable through utility programs is substantially smaller than indicated by the *TP* studies

EXAMPLE: THE *BPA* RESIDENTIAL WEATHERIZATION PROGRAM

- The weatherization program implemented by *BPA* was one of the longest – running *DSM* programs in the nation in a winter peaking jurisdiction
- Program provided financial incentives in the form of rebates to residential electric space heat customers to install various measures to increase energy efficiency
- Program accounted for *utility* costs *and customer* costs

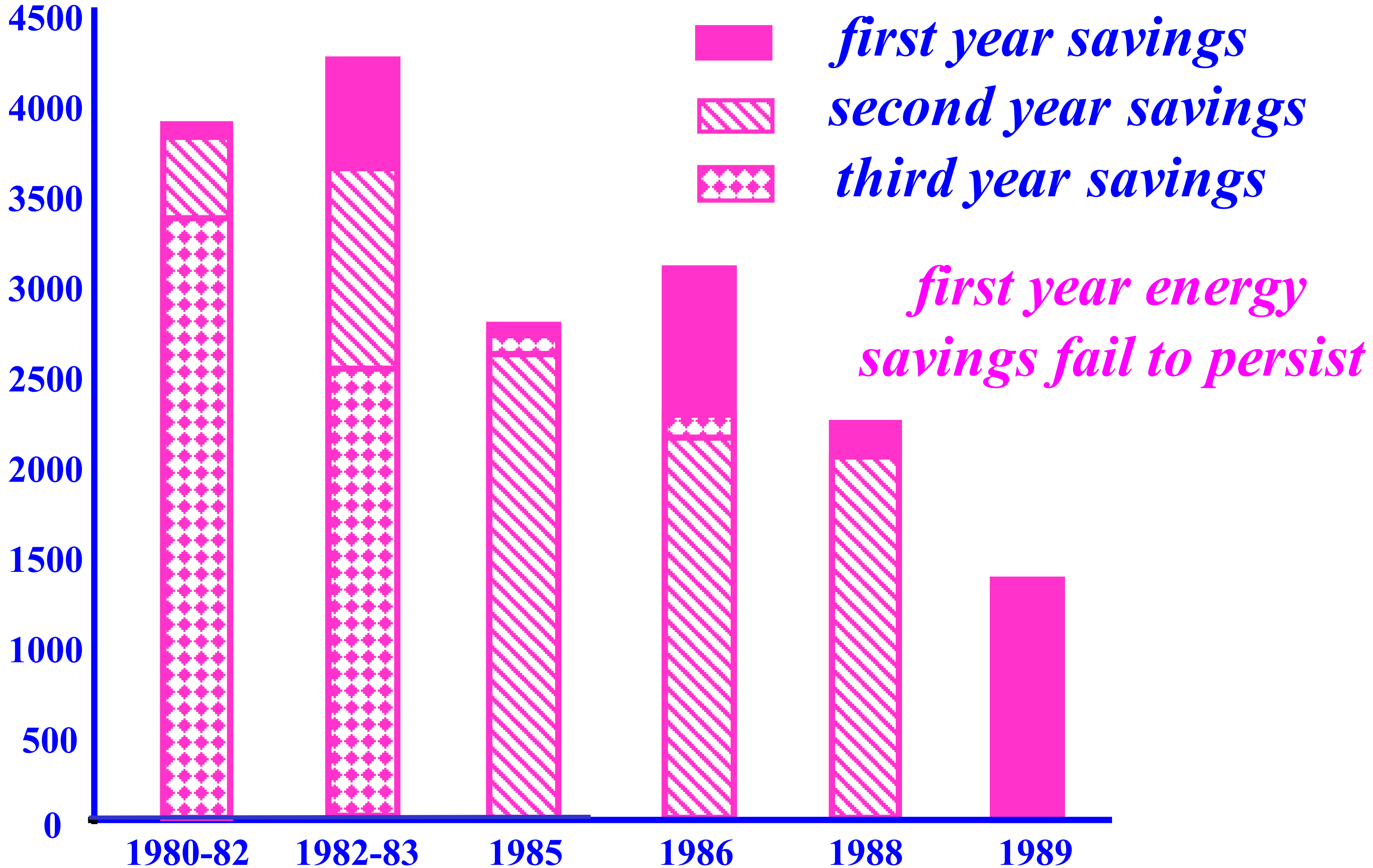
THE *BPA* RESIDENTIAL WEATHERIZATION PROGRAM

- Certain administrative costs were also included
- Measurement issues were a key focus
  - definition of cohorts and control groups
  - *ex ante* engineering estimates for planning
  - *ex post* measurements of actual performance evaluation

BPA RESIDENTIAL WEATHERIZATION PROGRAM RESULTS

program cohort	*measured costs per kWh saved* (1991 ¢)	*adjusted costs per kWh saved* (1991 ¢)	*avoided cost ceiling* (1991 ¢)	*ex post / ex ante savings ratio*
1988	**5.5**	**6.9**	**5.9**	**0.42**
1989	**9.1**	**11.4**	**5.9**	**0.31**

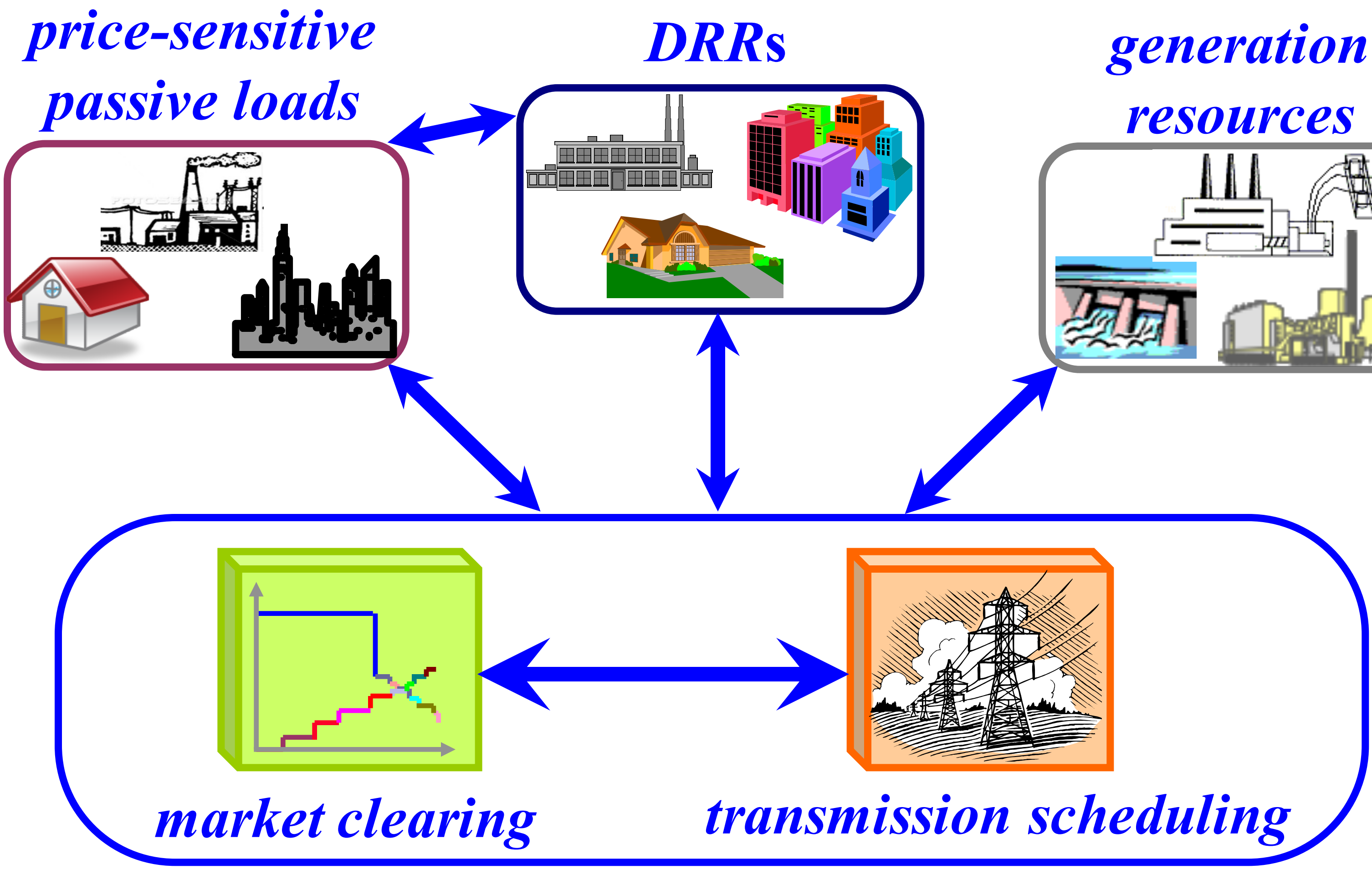
BPA: MEASURED ANNUAL *kWh* SAVINGS IN POST–RETROFIT YEARS



WHY *DSM* HAS NOT LIVED UP TO ITS PROMISE

- Basic reason: *DSM* has done a poor job of solving the customers' energy problems
- Key failures
  - *DSM* attempts to force a standardized "solution" for each customer's unique energy problem
  - *DSM* is based primarily on supply–side economics rather than the customer's end–use energy conservation economics

DEMAND RESPONSE RESOURCES (*DRR*s)



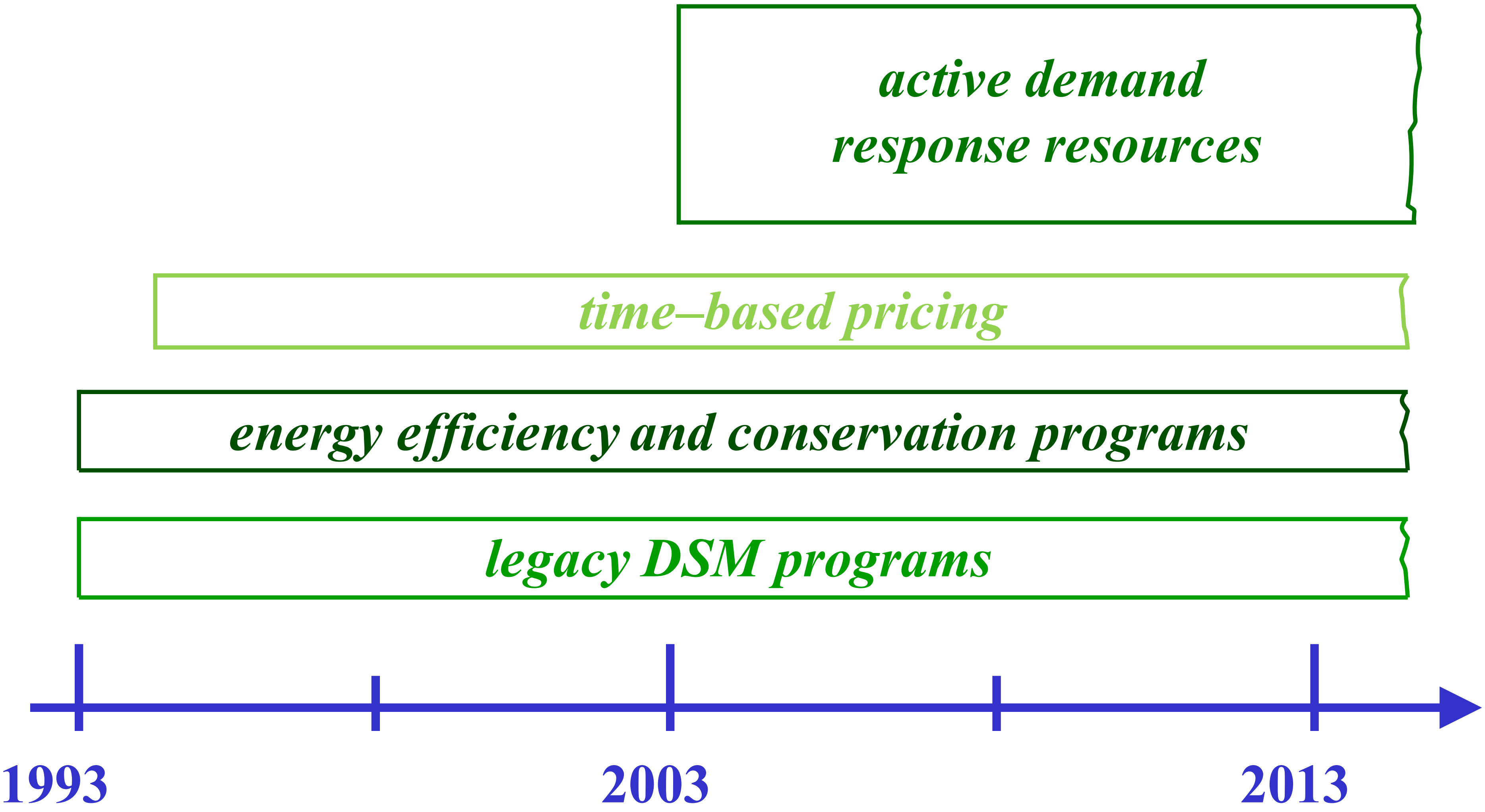
NATURE OF *DRR*

- The objective of *DRR*s is to make the load an **active participant** in the balance of electricity supply and demand around the clock via side–by–side competition with supply–side resources

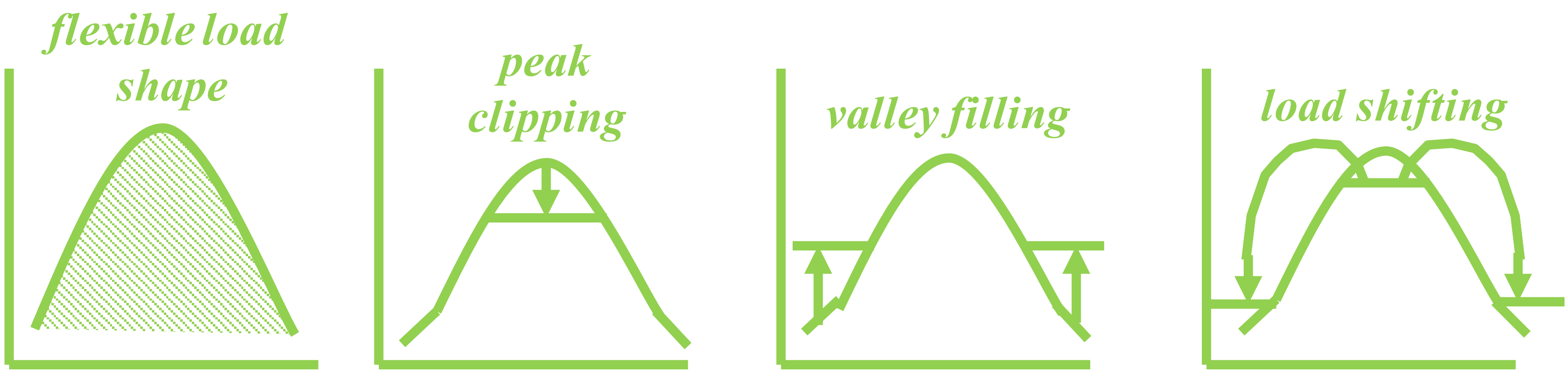
- *DRR*s curtail their loads in response to **incentive payments** to reduce electricity consumption at specified times

- *DRR*s are **attractive alternatives** to supply–side resources to meet the supply–demand balance

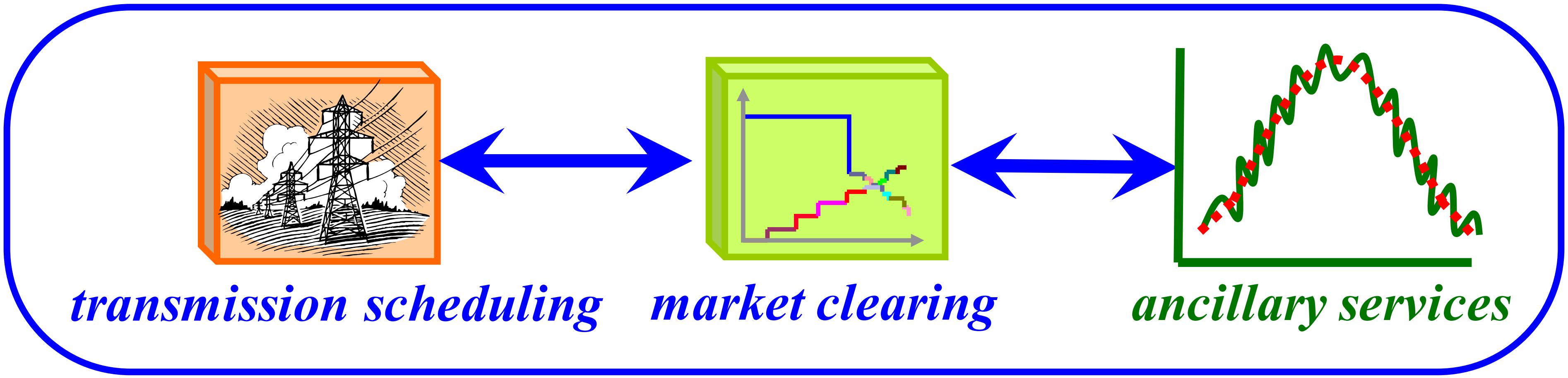
THE TRANSITION TO *DRR*s



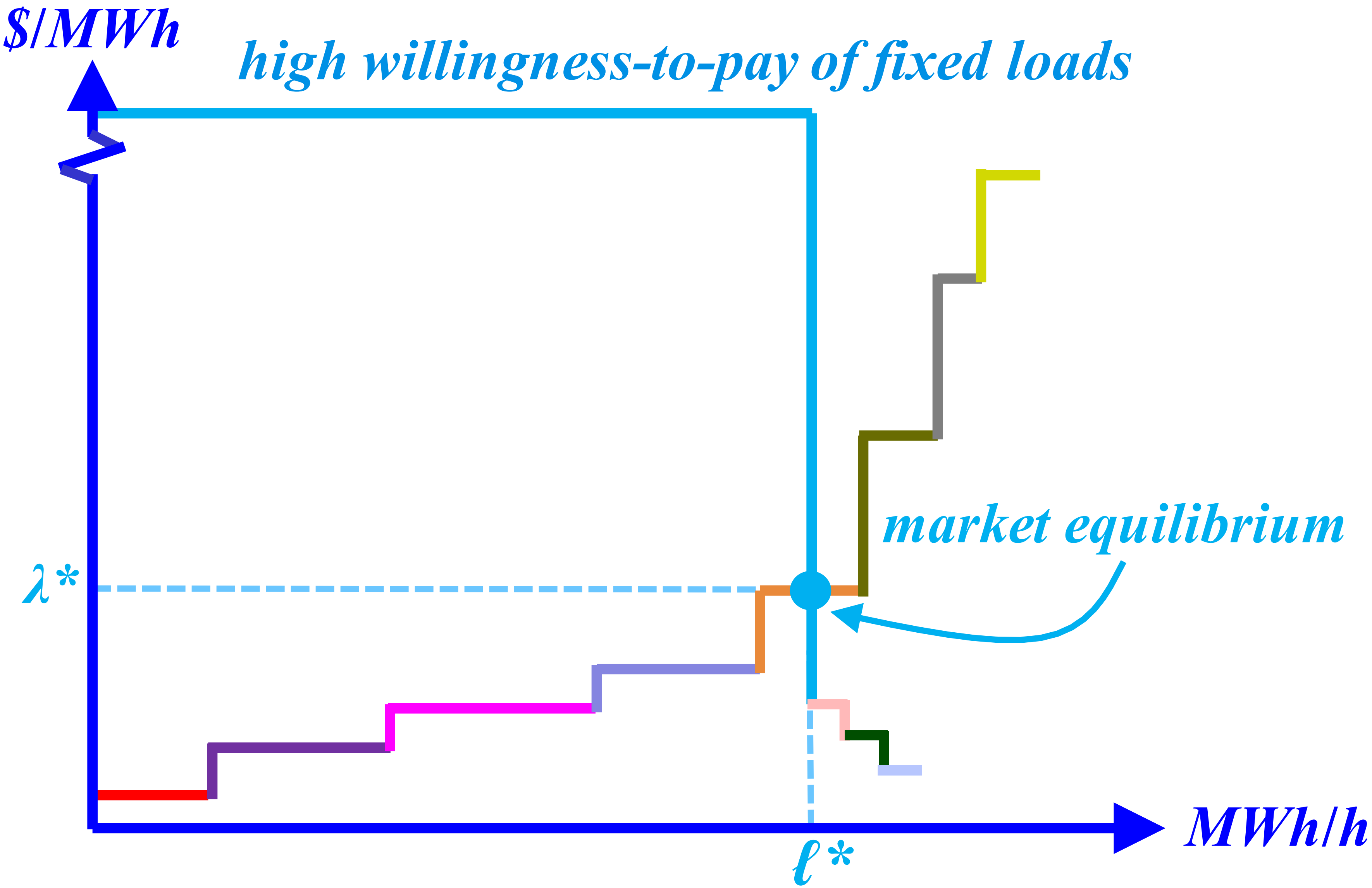
DRR ACTIVITIES



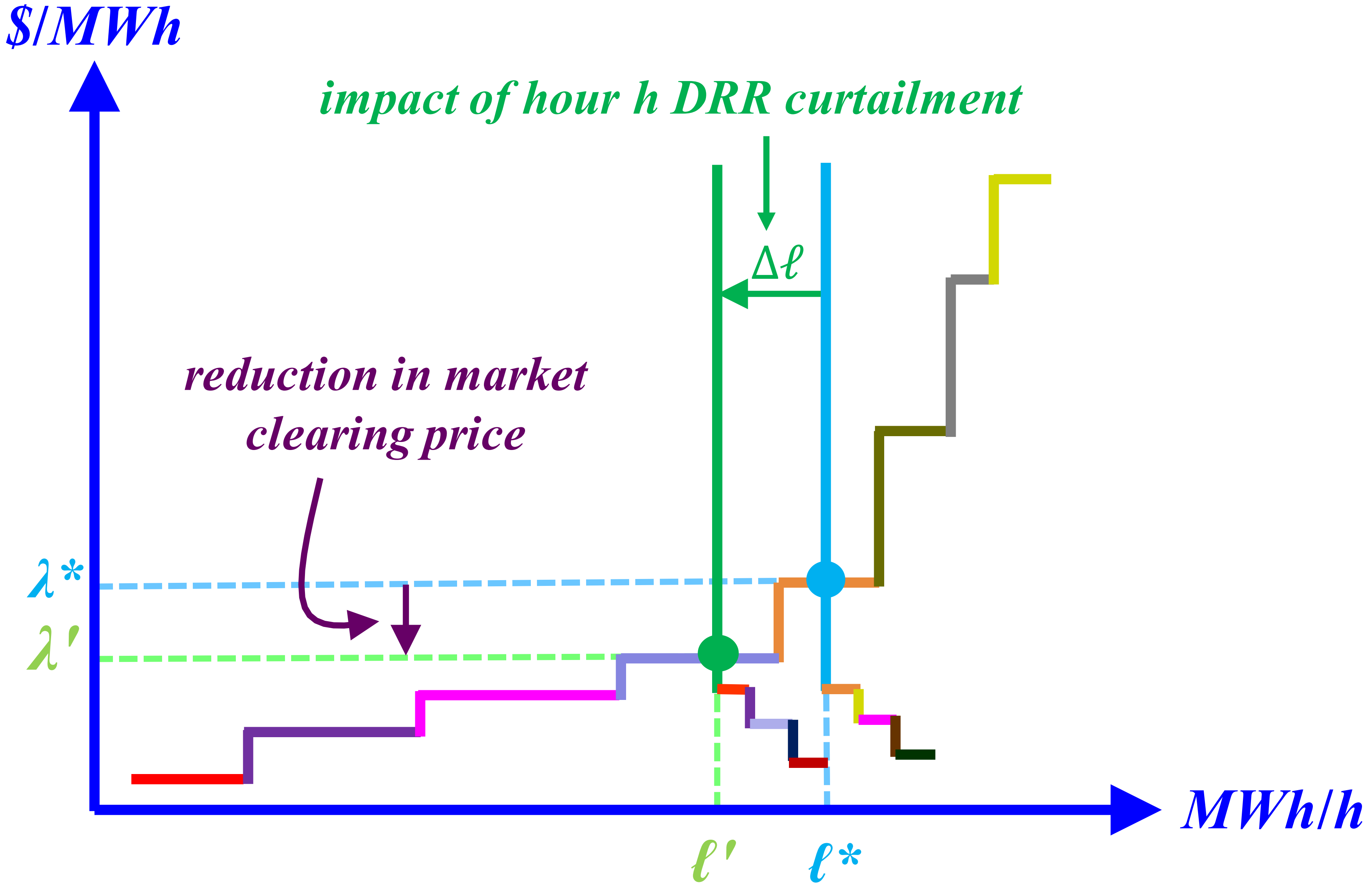
***DRR*s help to balance the supply and demand around the clock and in ancillary service provision**



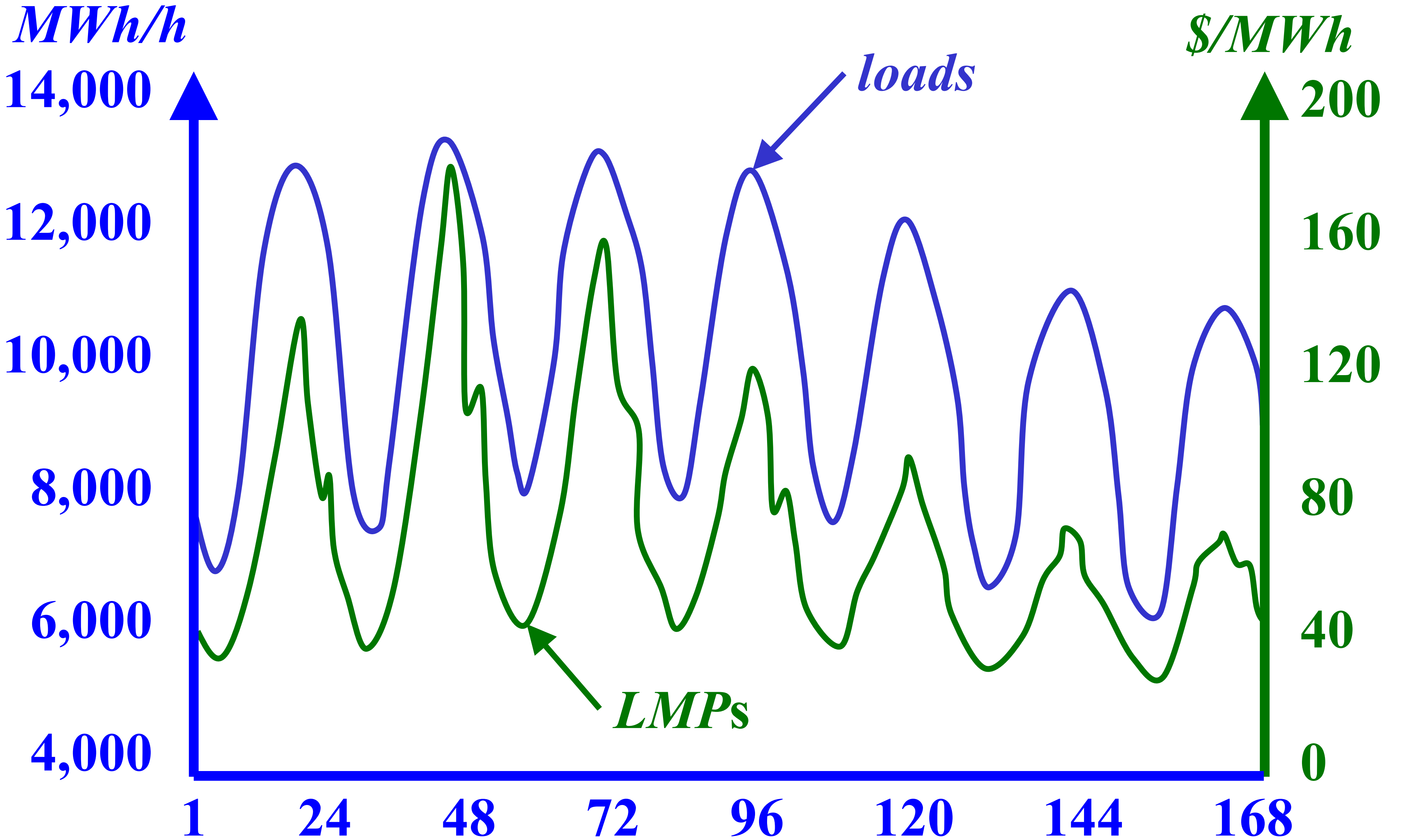
ELECTRICITY MARKET CLEARING



HOUR *h* *DRR* CURTAILMENT MARKET IMPACTS



PJM NODE LOADS AND *LMPs* IN THE WEEK OF AUGUST 9, 2010

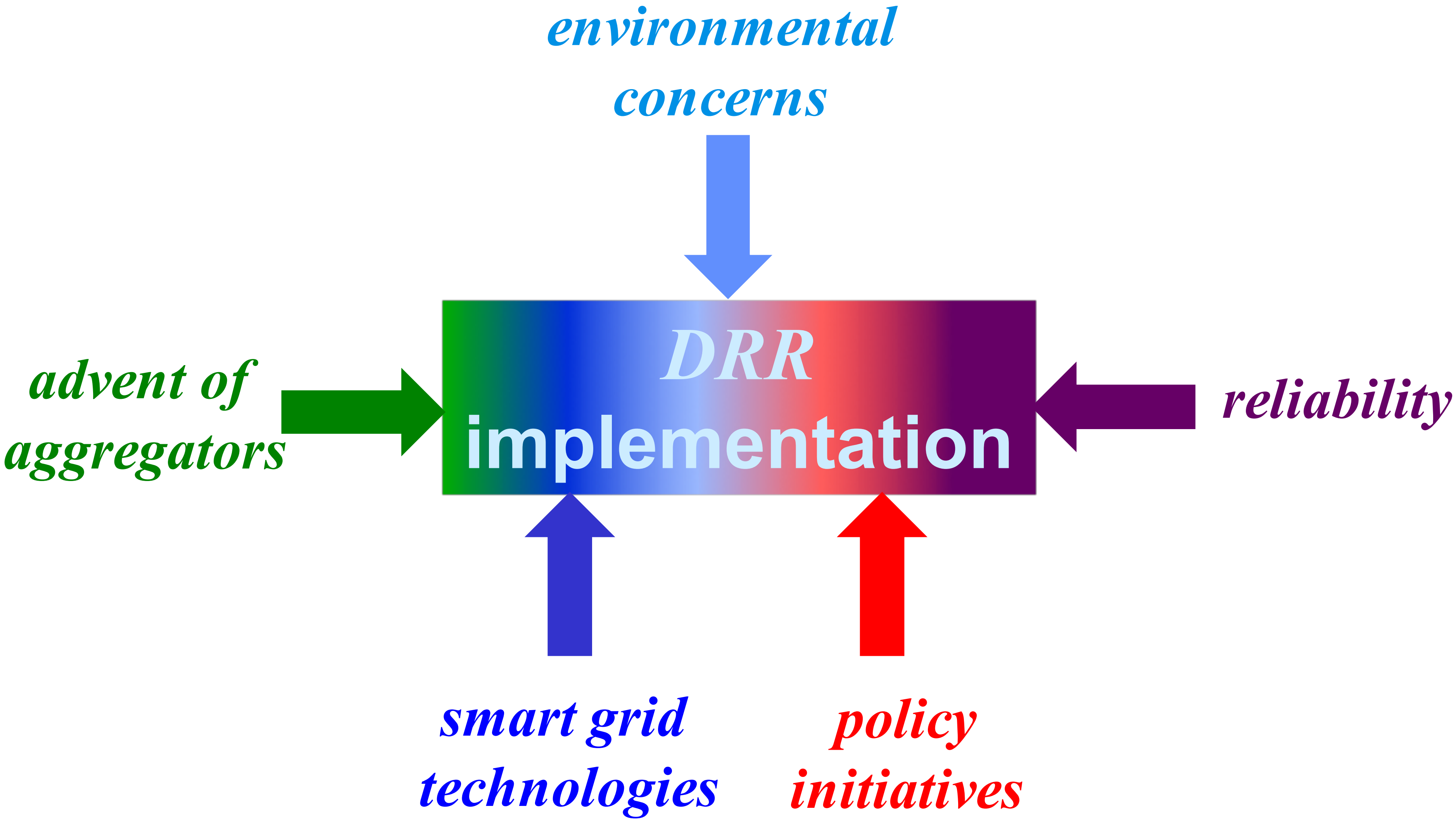


*DRR*s ARE ATTRACTIVE

- ***Jon Wellinghoff, past Chairman, FERC*: "There are tremendous benefits from demand response at very low costs, costs much lower than we can put any supply in place. This is the first fuel."**

- ***Jim Rogers, CEO, Duke Energy*: "The most environmentally responsible plant you build is the one that you don't build."**

DRR IMPLEMENTATION DRIVERS



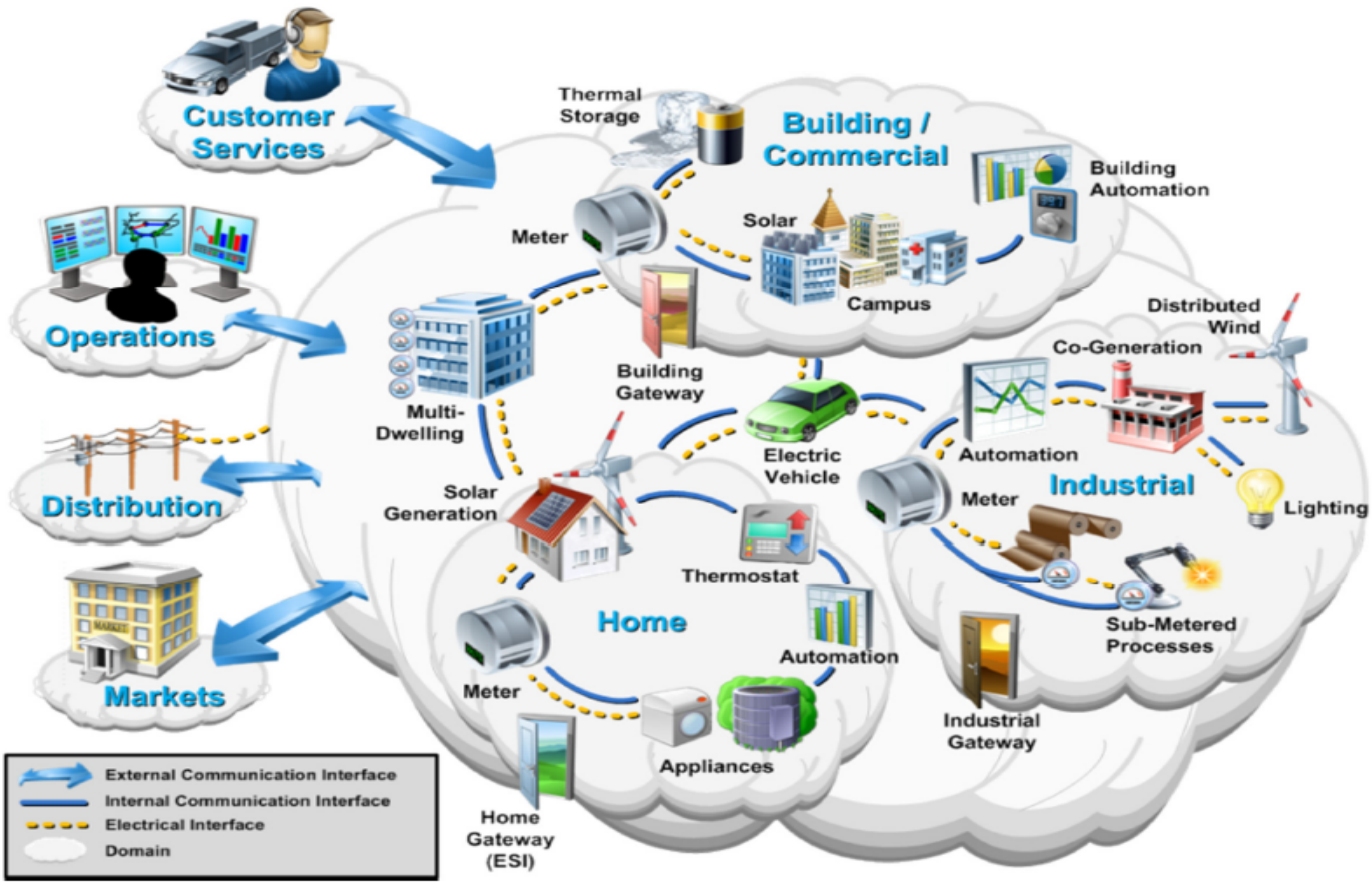
THE SMART GRID

The smart grid represents a modernized electricity delivery system that monitors, protects and automatically optimizes the operation of all its interconnected elements – from the central and distributed generator, through the high–voltage transmission grid and the distribution network to industrial users and building automation systems, to energy storage devices and to end–use consumers and their thermostats, electric vehicles, appliances and other devices

THREE SALIENT ASPECTS

- **Combined digital intelligence and real–time communications:** to improve the operations/control of the transmission and distribution grids
- **Advanced metering solutions:** to replace the legacy metering infrastructure
- **Deployment of appropriate technologies, devices, and services:** to access and leverage energy usage information in smart appliances and in the integration of renewable energy

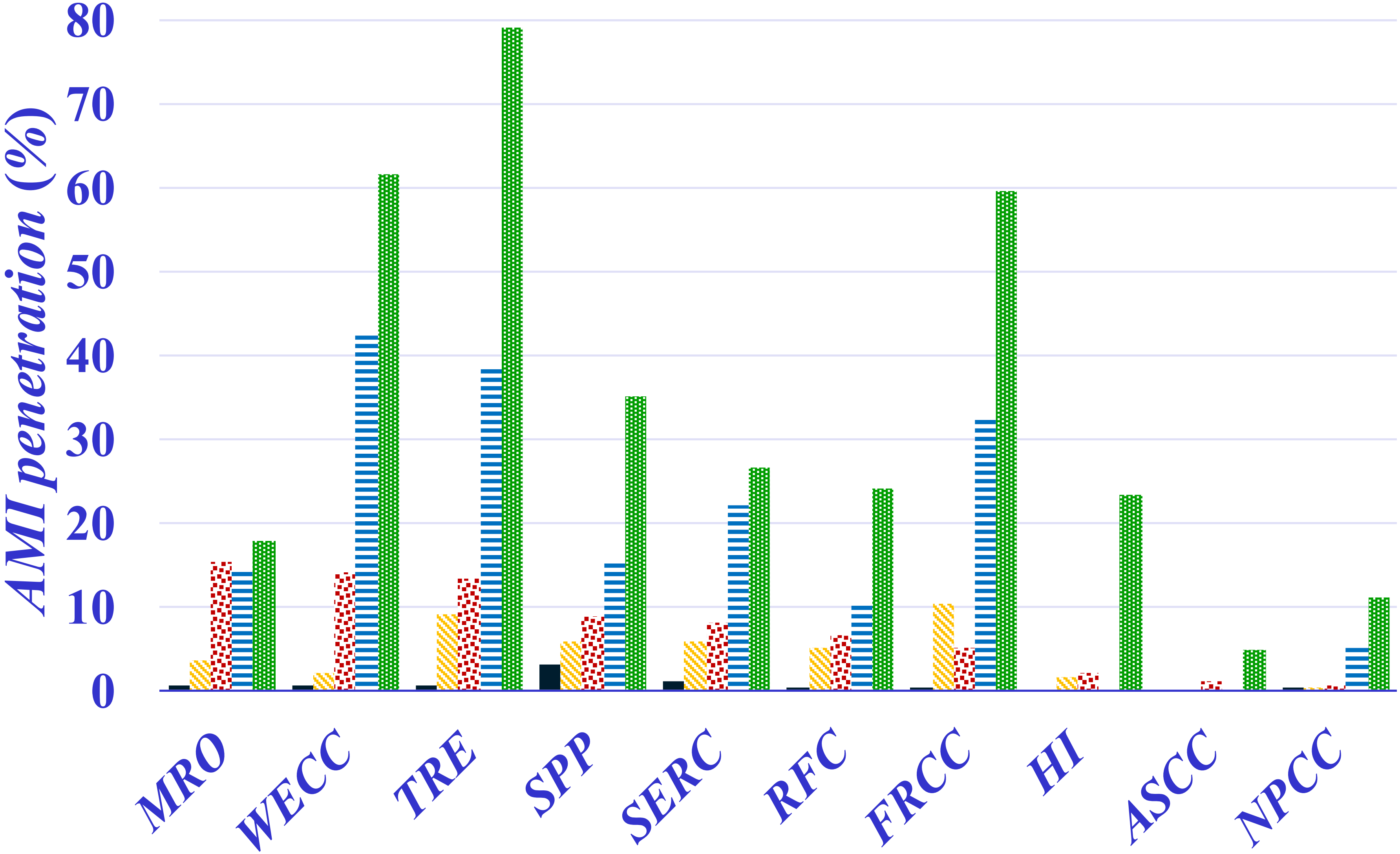
CUSTOMERS AND THE SMART GRID



Source: NIST Framework and Roadmap for Smart Grid Interoperability, http://www.sae.org/smartgrid/nist_smartgrid_interoperability.pdf

customers

ADVANCED METERING INFRASTRUCTURE (*AMI*) EVOLUTION

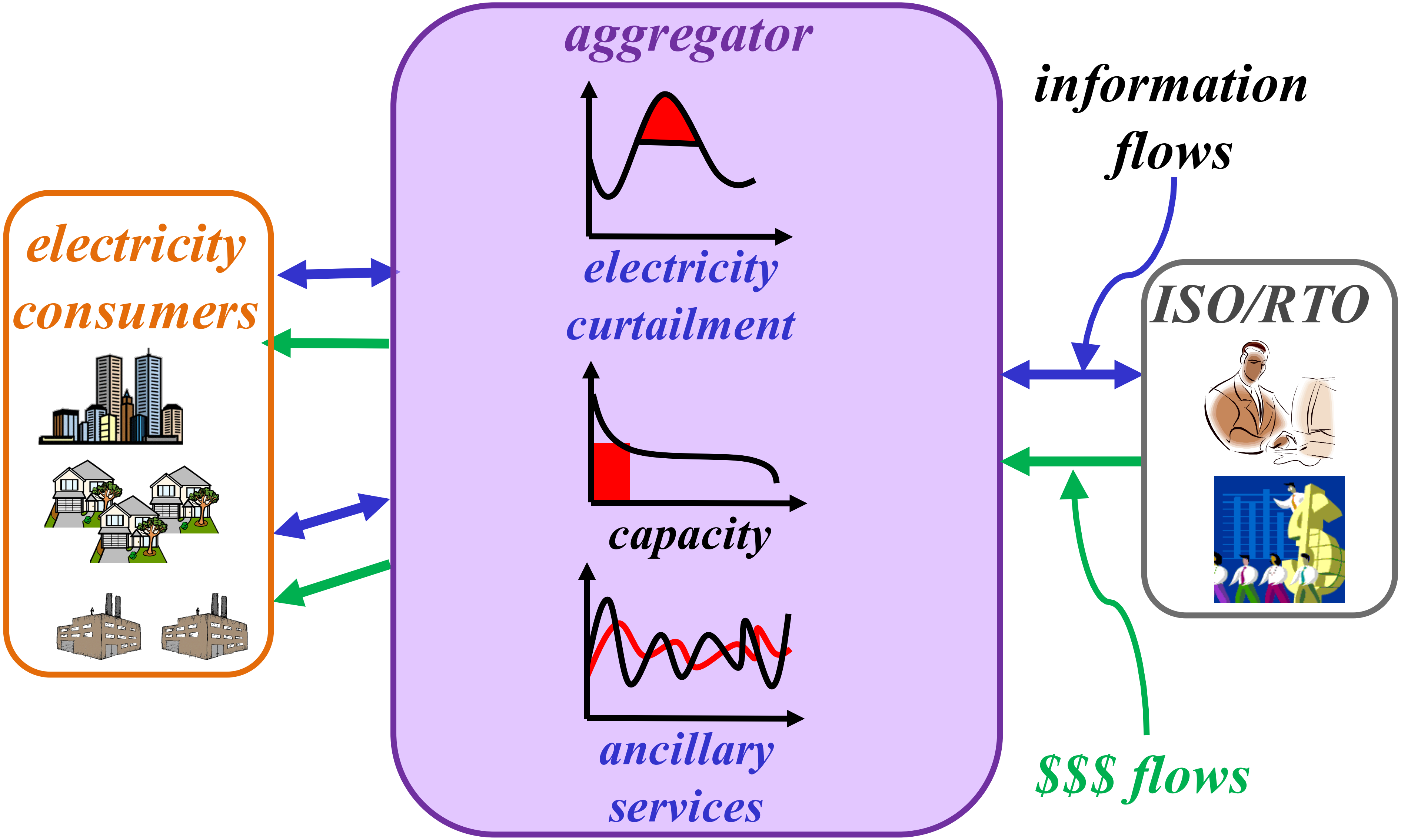


Source: Assessment of Demand Response and Advanced Metering, FERC 2015, https://www.ferc.gov/legal/staff-reports/2015/demand-response.pdf

ROLE OF AGGREGATION

- An aggregator is officially called a *curtailment service provider*
- Such an entity is authorized to act as an intermediary between the *ISO/RTO* and electricity consumers to deliver demand response capabilities to meet *ISO/RTO* needs in its markets

AGGREGATOR SERVICES

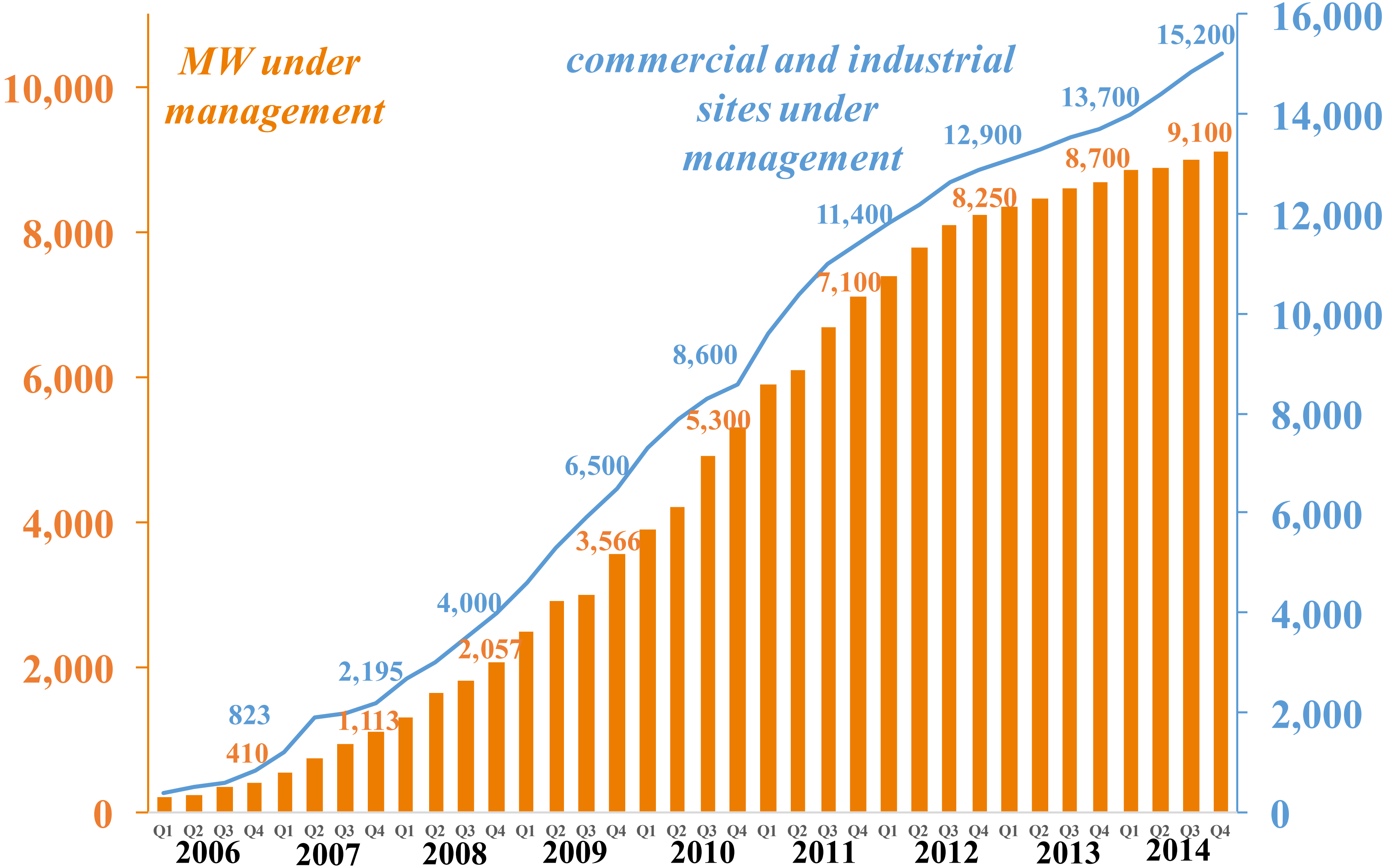


2015 STATS FOR THE TWO LARGEST AGGREGATORS

aggregator	*Comverge*	*EnerNOC*
demand portfolio size (MW)	**5,976**	**10,200**
annual portfolio growth (%)	**21.4**	**18.2**
revenues (million $)	**210**	**400**
annual revenue growth (%)	**11.7**	**3.8**

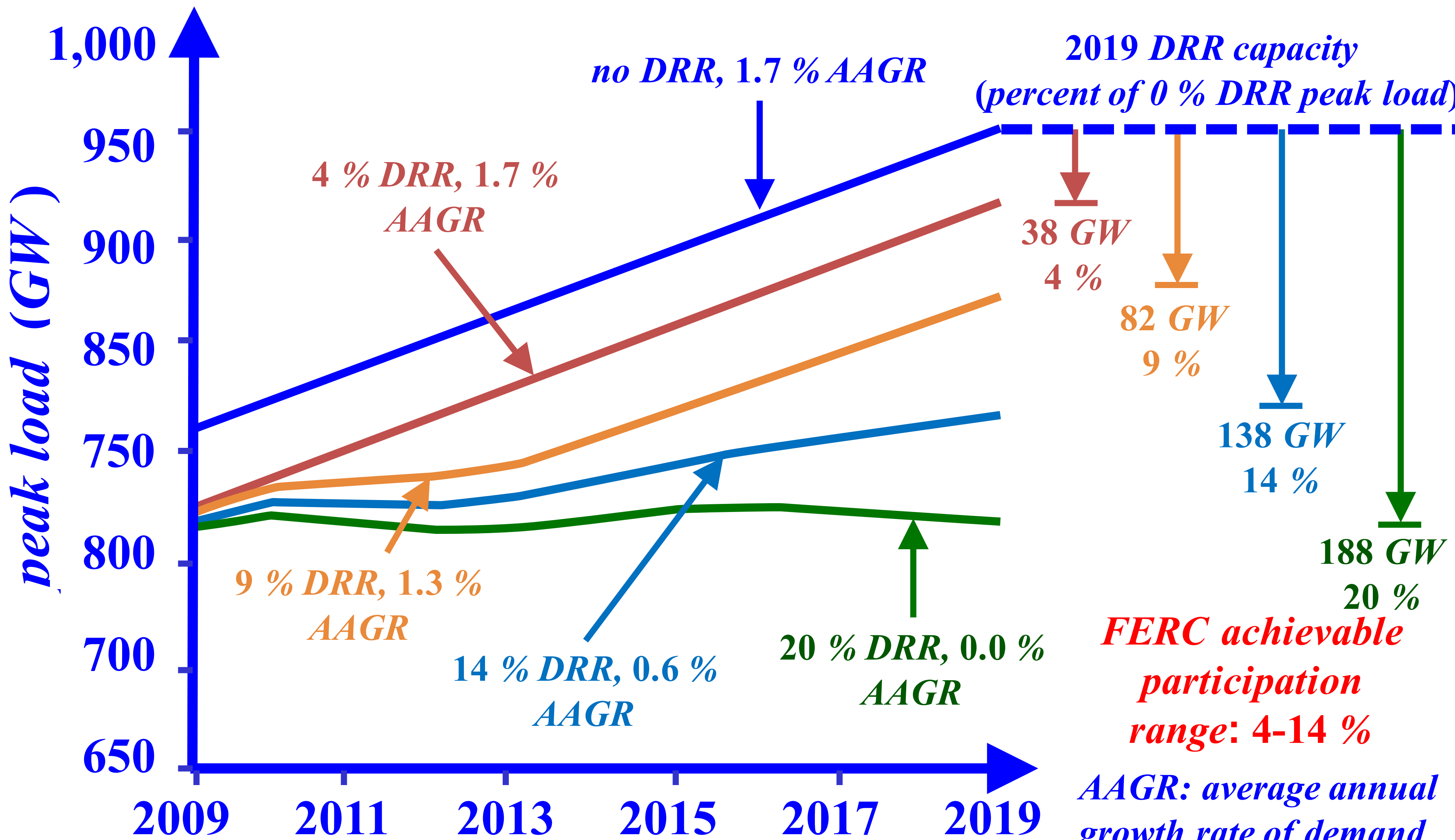
Source: http://investor.enernoc.com/releasedetail.cfm?ReleaseID=997290, source: http://www.prnewswire.com/news-releases/global-smart-demand-response-market-is-estimated-to-reach-usd-514789-million-in-2025-transparency-market-research-272713631.html

EnerNOC DEMAND PORTFOLIO GROWTH



Source: Annual Report 2014, EnerNOC, http://files.shareholder.com/downloads/ENOC/765684069x0x829286/8E5A82D-F01B-46B0-B1C9-DDA13F88D084/ENOC_2014_Annual_Report.pdf

FERC DRR CAPACITY FORECAST

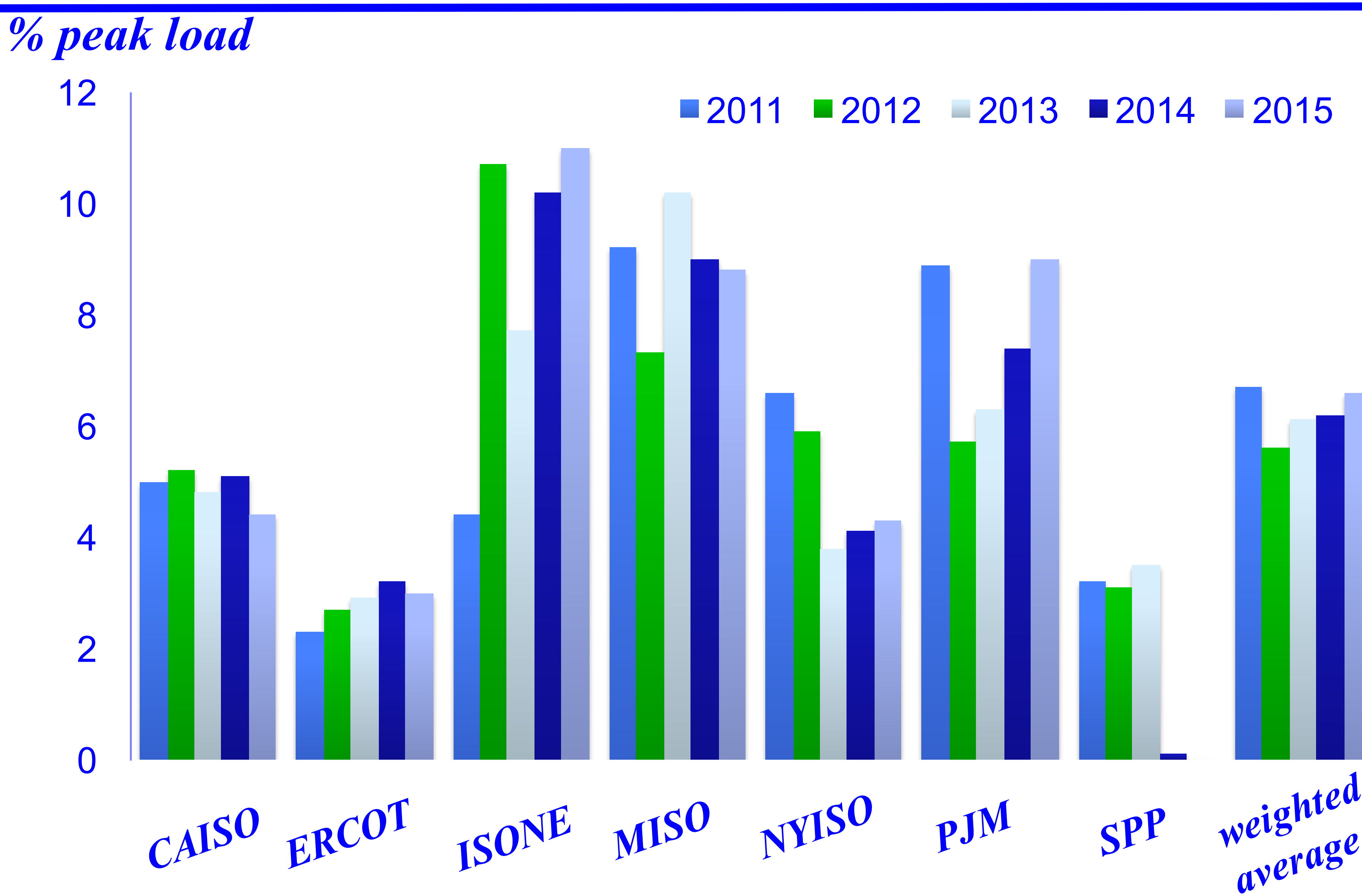


***FERC achievable participation range*: 4-14 %**

AAGR: average annual growth rate of demand

Source: A National Assessment of Demand Response Potential, FERC 2009,http://www.ferc.gov/legal/staff-reports/06-09-demand-response.pdf

EXISTING *DRR* CAPACITY



Source: Assessment of Demand Response and Advanced Metering, FERC 2015, https://www.ferc.gov/legal/staff-reports/2016/DR-AM-Report2016.pdf

DRR LIMITATIONS AND CHALLENGES

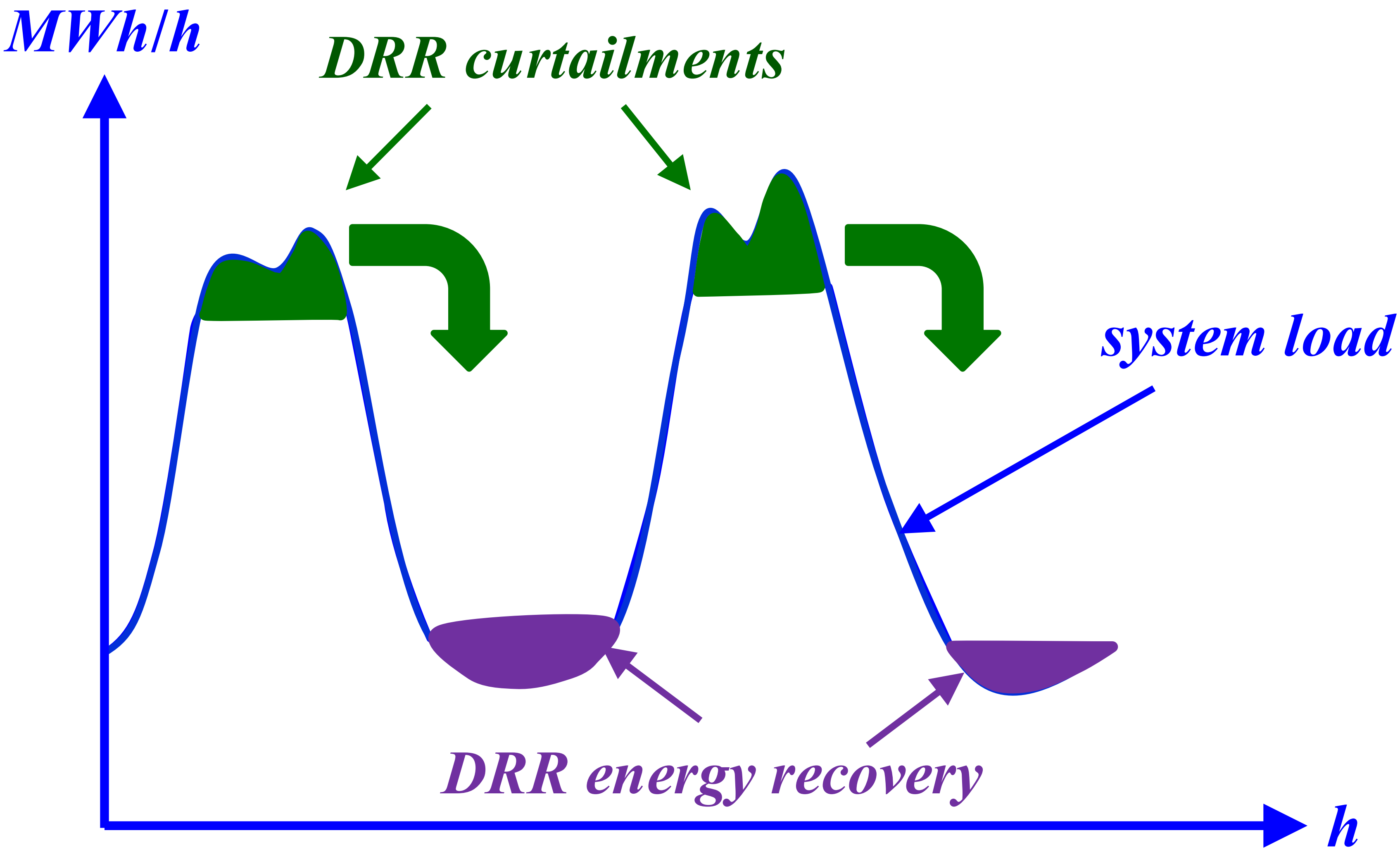
- The potential for *DRR* implementation is limited and challenges arise with deepening *DRR* penetration

- Policies to incentivize *DRR* participation must be formulated so as to effectively balance the benefits among all the market players

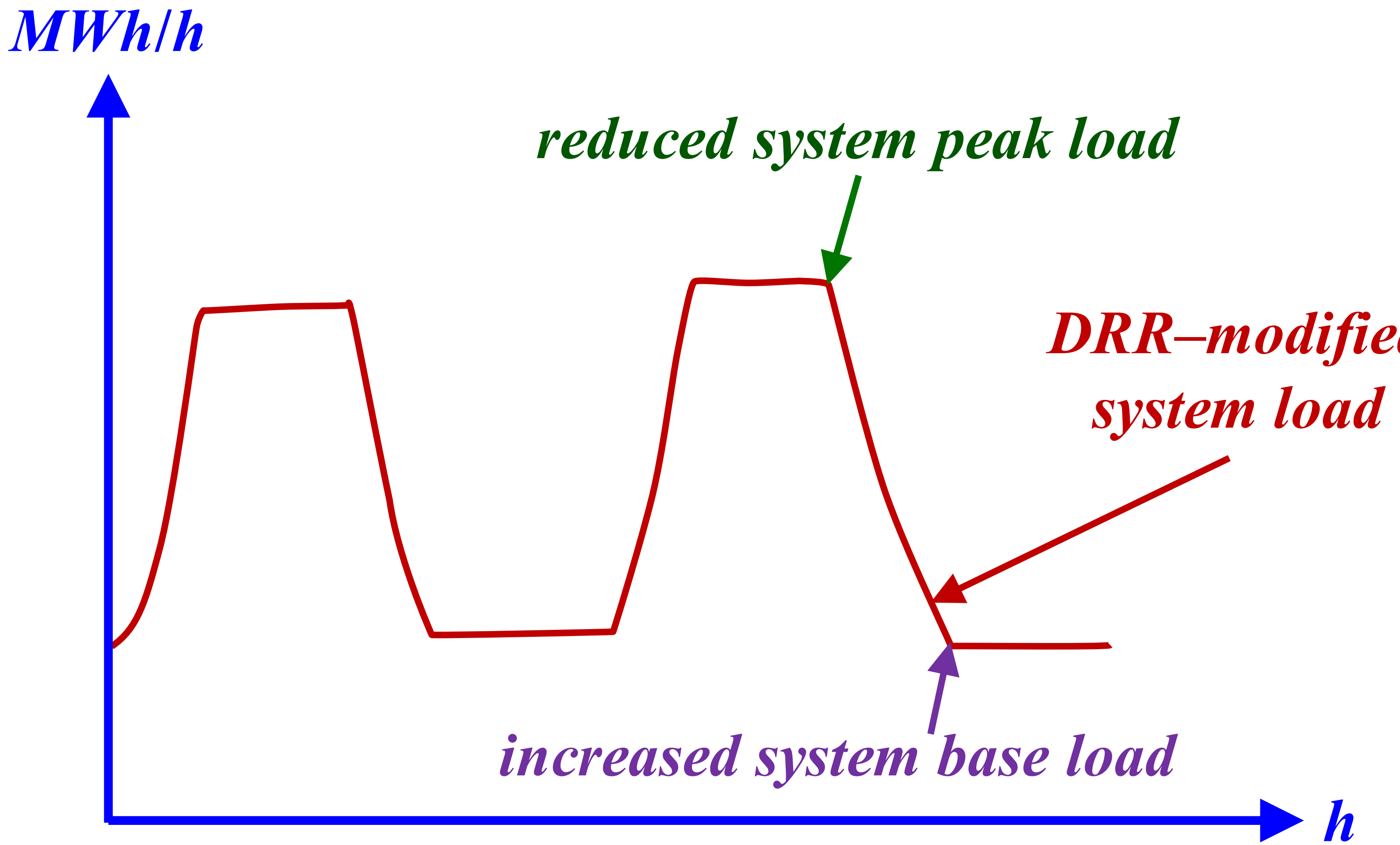
DRR LIMITATIONS AND CHALLENGES

- *DRR* curtailments in high–load hours are likely to be followed by energy recovery in lower–load hours, the so–called *payback effects*, with the associated price impacts
- *DRR*s cannot provide the system dynamic effects that generators do and so there are physical limits to the depths of effective *DRR* penetration

DRR WITH ENERGY RECOVERY



DRR WITH ENERGY RECOVERY ACTS



CONCLUDING REMARKS

- *DRR*s currently play a larger role than at any time in maintaining the supply–demand balance and in the provision of capacity–based *AS*
- Smart grid technology, aggregators and policies are key drivers in the deepening *DRR* penetration
- Huge potential exists for *DRR*s to provide grid services, such as regulation and load following, and to play a role in the reliable and effective integration of renewable resources

FERC ORDER NO. 745

- *FERC* Order No. 745 specifies the incentives to the *DRR*s for load curtailments in the *DAM*s
- The Order represents a significant increase in *DRR* incentives over past practices
- These incentives provide a major stimulus for *DRR* participation in electricity markets

RECENT JUDICIAL DEVELOPMENTS

- A number of generator and utility groups sued *FERC* to appeal Order No. 745
- The *US Court of Appeals* decided to vacate the controversial *FERC* Order No. 745 on demand response compensation
  - the court found Order No. 745 exceeded *FERC*'s jurisdiction
  - *FERC* obtained an extension to January 15, 2015 to file a petition at the Supreme Court

DECISION OF THE SUPREME COURT

- The Supreme Court made its decision to uphold Order No. 745 on January 25, 2016
- The Court recognized that *FERC* has the authority to regulate electricity rates in retail markets through the wholesale markets; hence it did not overstep its jurisdiction through Order No. 745
- The Court maintains that Order No. 745 was neither arbitrary nor capricious and suggests that the need for *LMP* compensation was justified