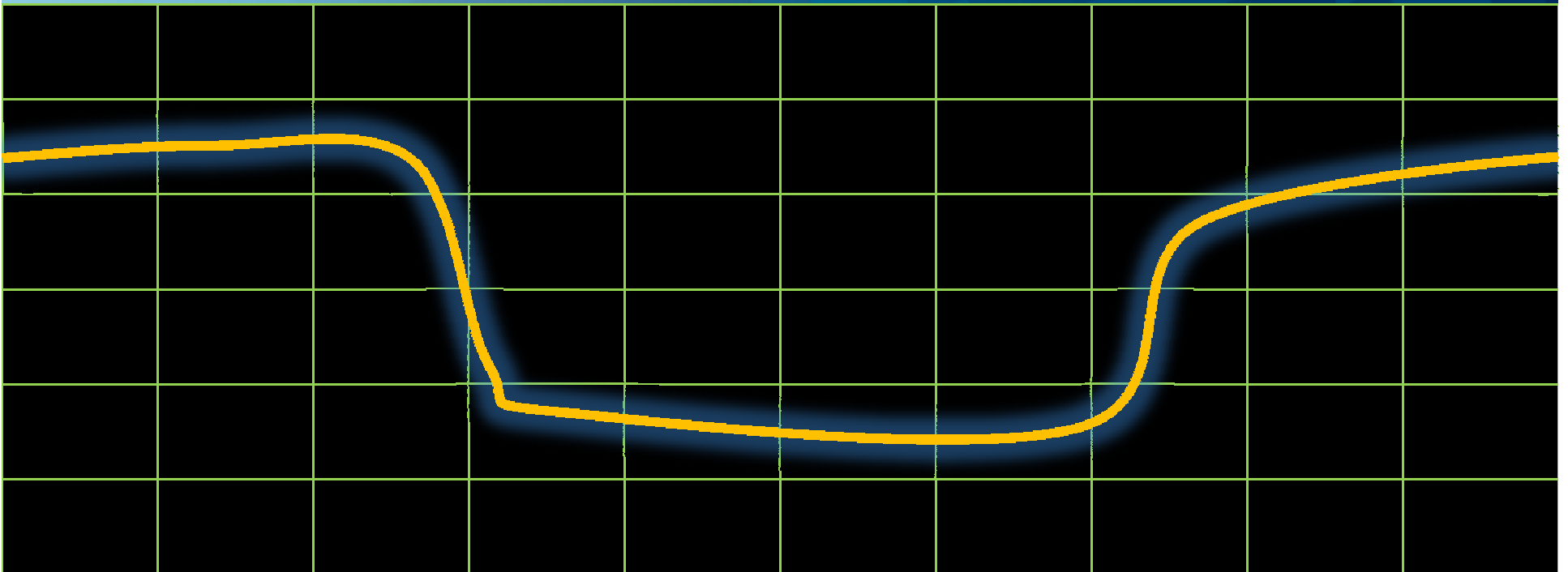


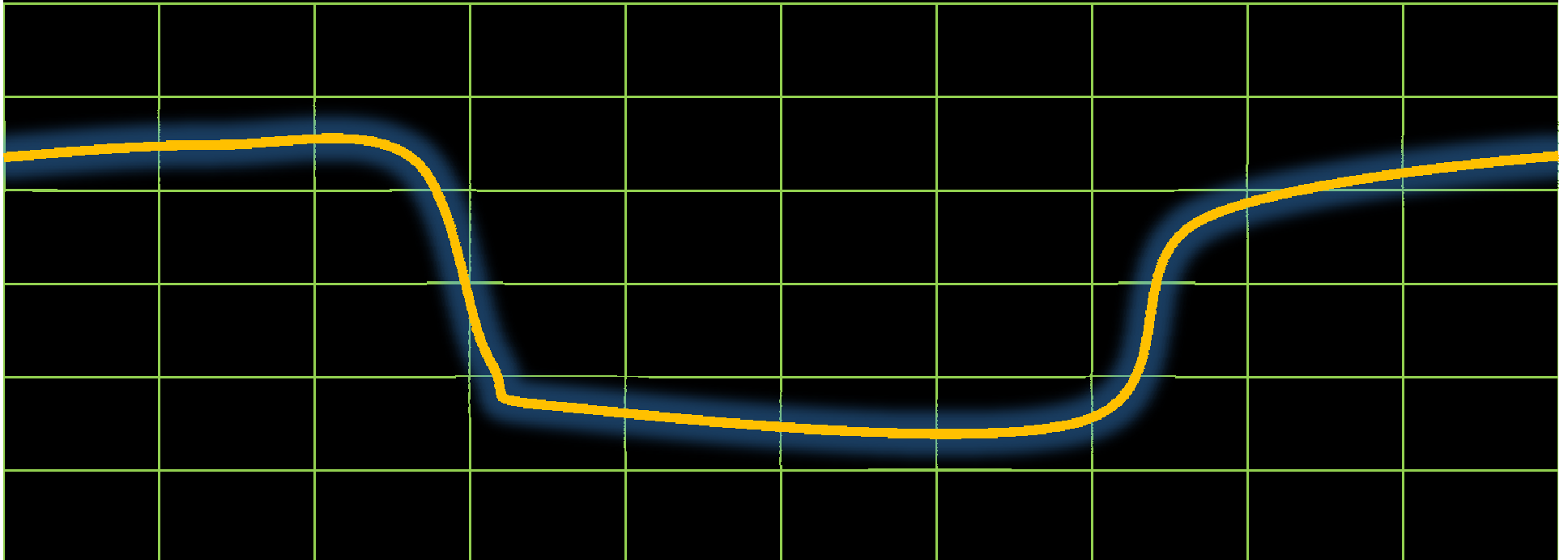
# SGF Agenda Item # 5: "Demand Response" Theme Discussion

Ontario Smart Grid Forum  
Tuesday, June 8, 2010

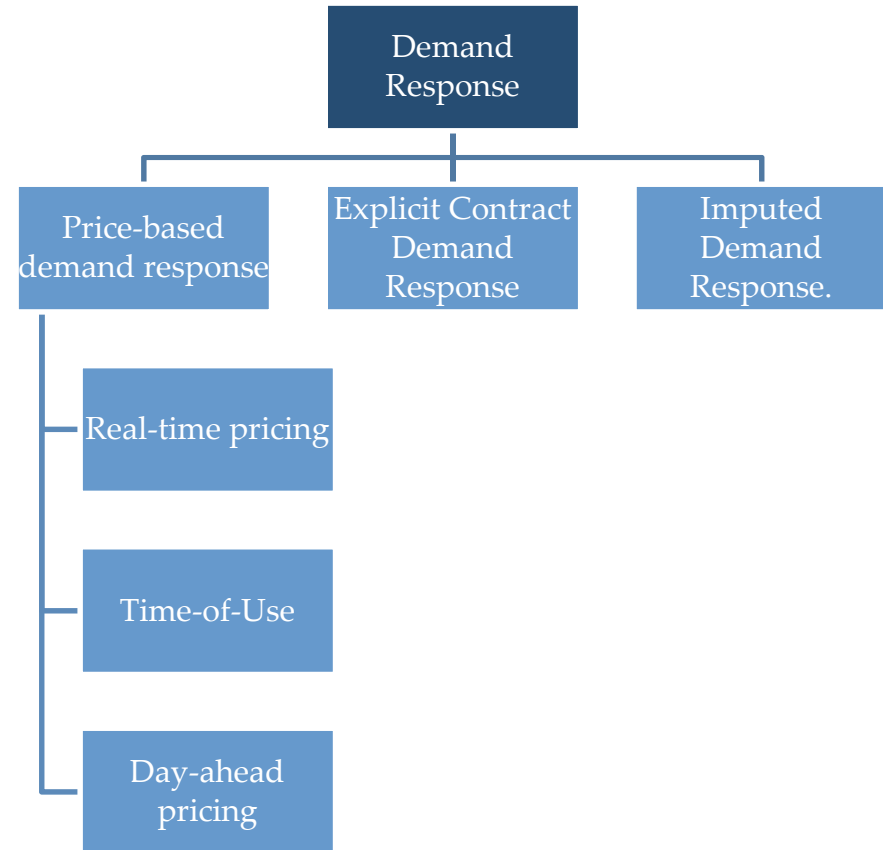


## Today’s Theme Discussion:

- Review Related Smart Grid Principles
- Current demand response topics and developments
- Questions for the Forum



- The basic premise behind today’s theme discussion, is that Smart Grid technologies can provide the **technical** capability for consumers to participate in virtually every type of Demand Response.
- But how does this array of technical choices intersect with Ontario’s policy objectives, goals, planning targets and industry structure?



## Back to first principles...

- The topic of “Demand Response” has a number of touch points with the high-level smart grid principles discussed by the Forum.
- Some of those principles also have relevance to the “behind the meter” topic discussed at the May 17<sup>th</sup> meeting...

“**CUSTOMER VALUE:** the smart grid must provide benefits to electricity customers.”

“**EFFICIENCY:** Improve efficiency of grid operation, taking into account the cost-effectiveness of the electricity system.”

“**RELIABILITY:** Maintain reliability of the electricity grid and improve it wherever practical, including reducing the impact, frequency and duration of outages.”

## Related Smart Grid Principles (from the “Customer Control” category)

**“VISIBILITY:** Improve visibility of information, to and by customers, that can benefit the customer and the electricity system, such as electricity consumption, generation characteristics, and commodity price.”

**“CUSTOMER CHOICE:** enable improved channels through which customers can interact with electricity service providers, and enable more customer choice.”

**“EDUCATION:** Actively educate consumers about opportunities for their involvement in generation and conservation associated with a smarter grid, and present customers with easily understood material that explains how to increase their participation in the smart grid and the benefits thereof.”

*“The interface between the Smart Grid and the Customer domain is of special importance. It will be the most visible part of the Smart Grid to the Consumer”*

NIST Framework and Roadmap for Smart Grid Interoperability Standards,, Release 1.0, page 41.

# Related Smart Grid Principles (from the “Customer Control” category)

“**CONTROL:** Enable consumers to better control their consumption of electricity in order to facilitate active, simple, and consumer-friendly participation in conservation and load management.”



“**ACCESS:** Enable access to data by authorized parties who can provide customer value and enhance a customer’s ability to manage consumption and home energy systems.”



## Current, and planned demand response targets in Ontario include a combination of:

Various Ministerial directions given to the Ontario Power Authority



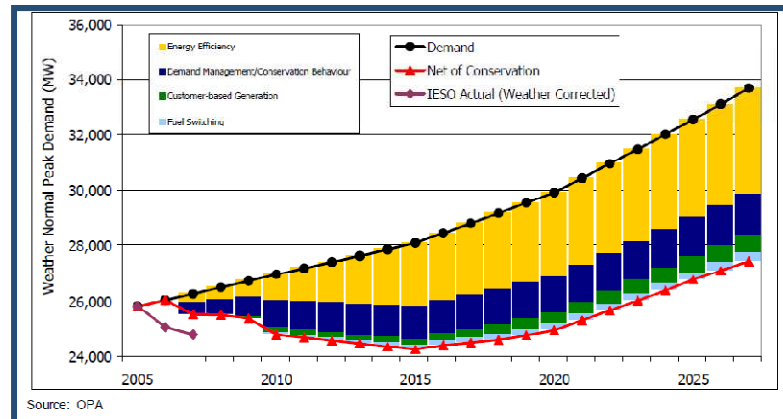
CDM components of the OPA's Integrated Power System Plan (IPSP)




The recent direction given to the OEB under Order-in-Council 437/2010

Targets	Focus	Date Direction was Received
250 MW	Demand side management and demand response programs across Ontario	June 15, 2005
100 MW	Residential – low income/social housing demand side management programs	October 8, 2005
100 MW	Appliance exchange and efficient lighting demand side management programs	October 20, 2005
300 MW	Toronto demand side management programs	February 10, 2006
250 MW	Demand side management and demand response programs across Ontario	February 2006. Amendment to increase the June 15, 2005 directive to 500 MW
150 MW	Commercial buildings and municipalities, universities, schools and hospitals (MUSH) demand side management programs	March 10, 2006
150 MW	Electrically heated houses and other residential upgrades demand side management programs	March 10, 2006
Not Specified	Develop CDM programs to be delivered through LDC's, and provide funding mechanisms for up to \$400 M over three years	July 13, 2006

Source: OPA, 2006 Annual Report of the Chief Energy Conservation Officer, Page 13





**Order in Council  
Décret**

On the recommendation of the undersigned, the Lieutenant Governor, by and with the advice and concurrence of the Executive Council, orders that:

Sur la recommandation du soussigné, le lieutenant-gouverneur, sur l'avis et avec le consentement du Conseil des ministres, décrète ce qui suit:

**WHEREAS** it is desirable to achieve reductions in electricity consumption and reductions in peak provincial electricity demand.

Overall, the aggregate provincial target must be met by a combination of specific programs – not simply the theoretical, “technical” potential offered by smart grid technology.

“Technical” Potential

“Economic” and “Achievable” Potentials

Program Potential

D.R. Program  
1 Potential

D.R. Program  
2 Potential

{...}

D.R. Program  
'N' Potential

**Question for Forum:** Does the province have an adequate portfolio view of the potential yields of smart grid-based demand response programs? If not, how and where should these be developed?

“Technical” Potential

“Economic” and “Achievable” Potentials

Program Potential

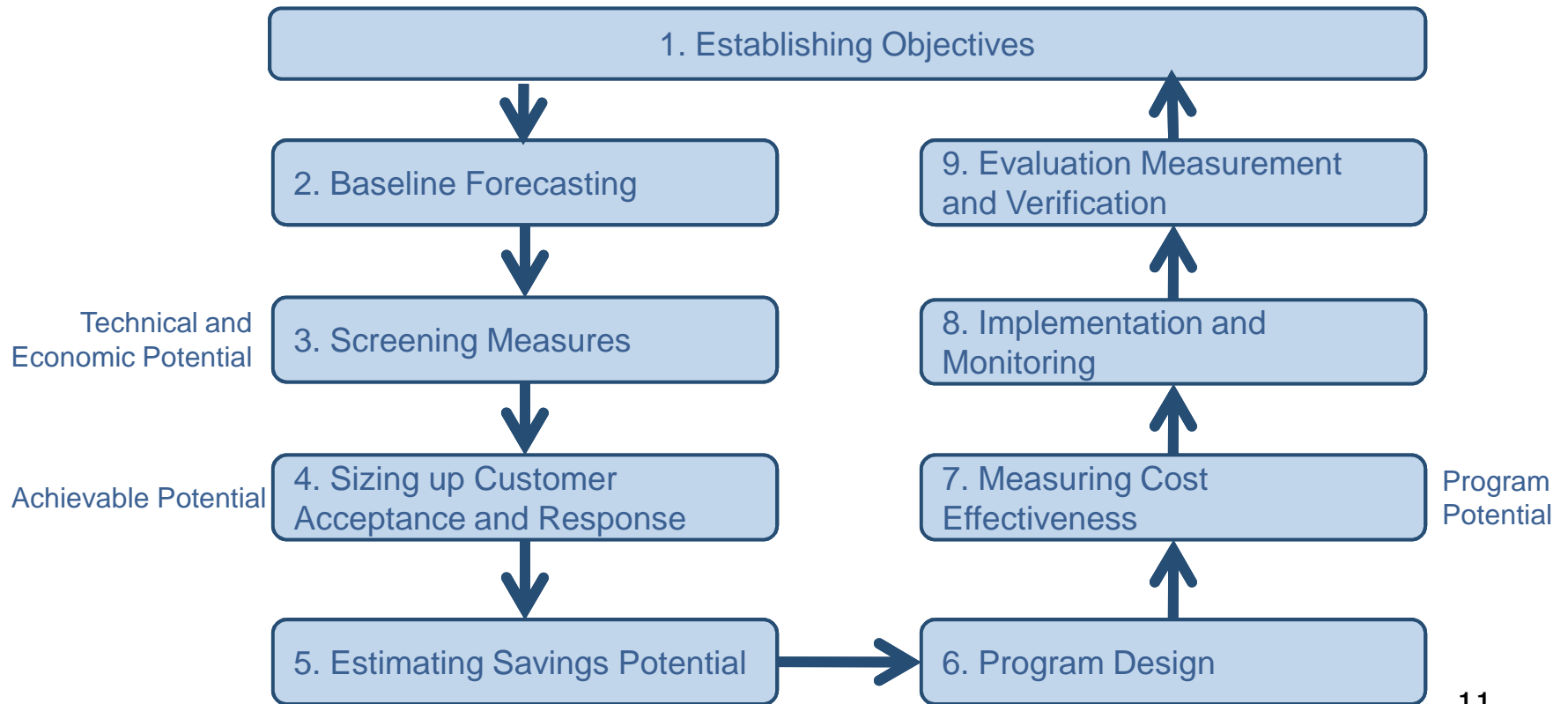
D.R. Program  
1 Potential

D.R. Program  
2 Potential

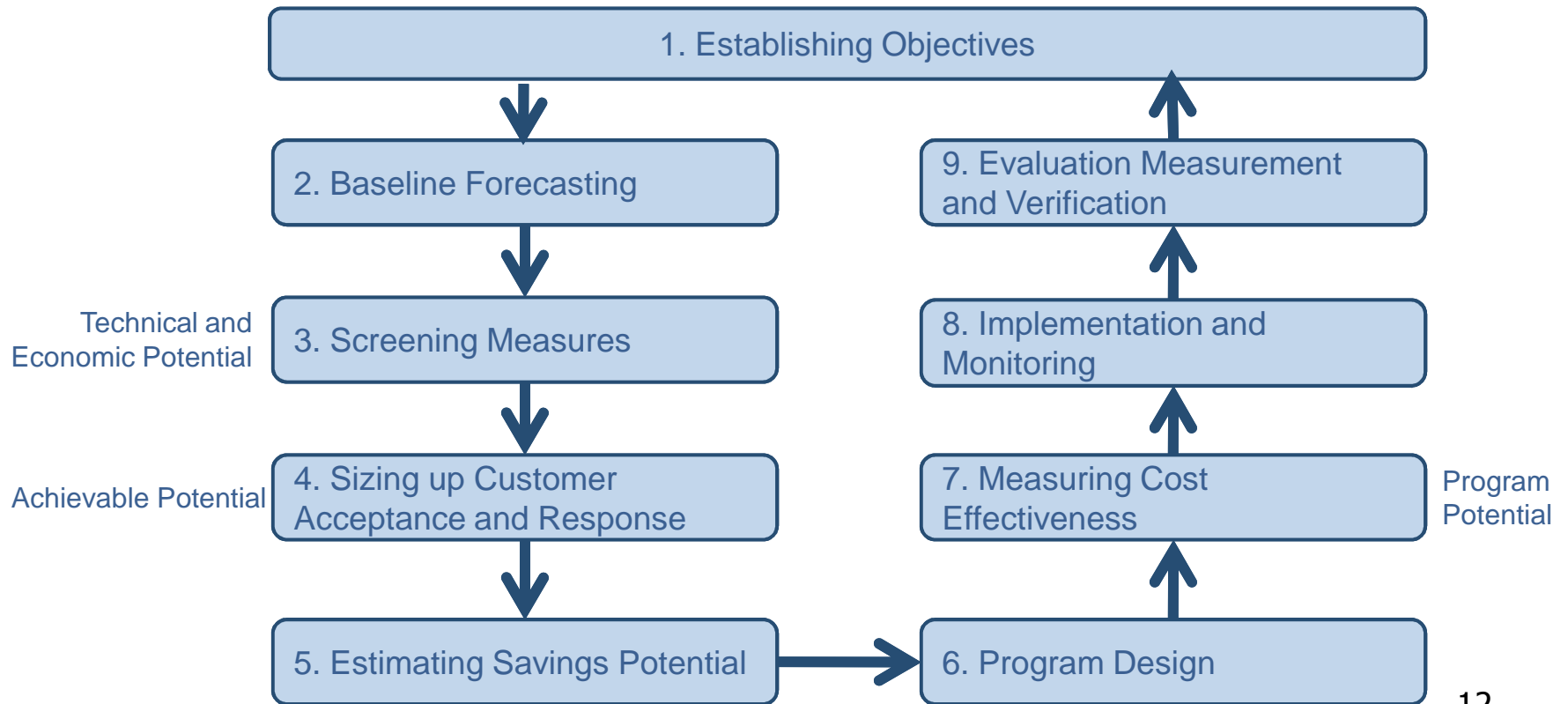
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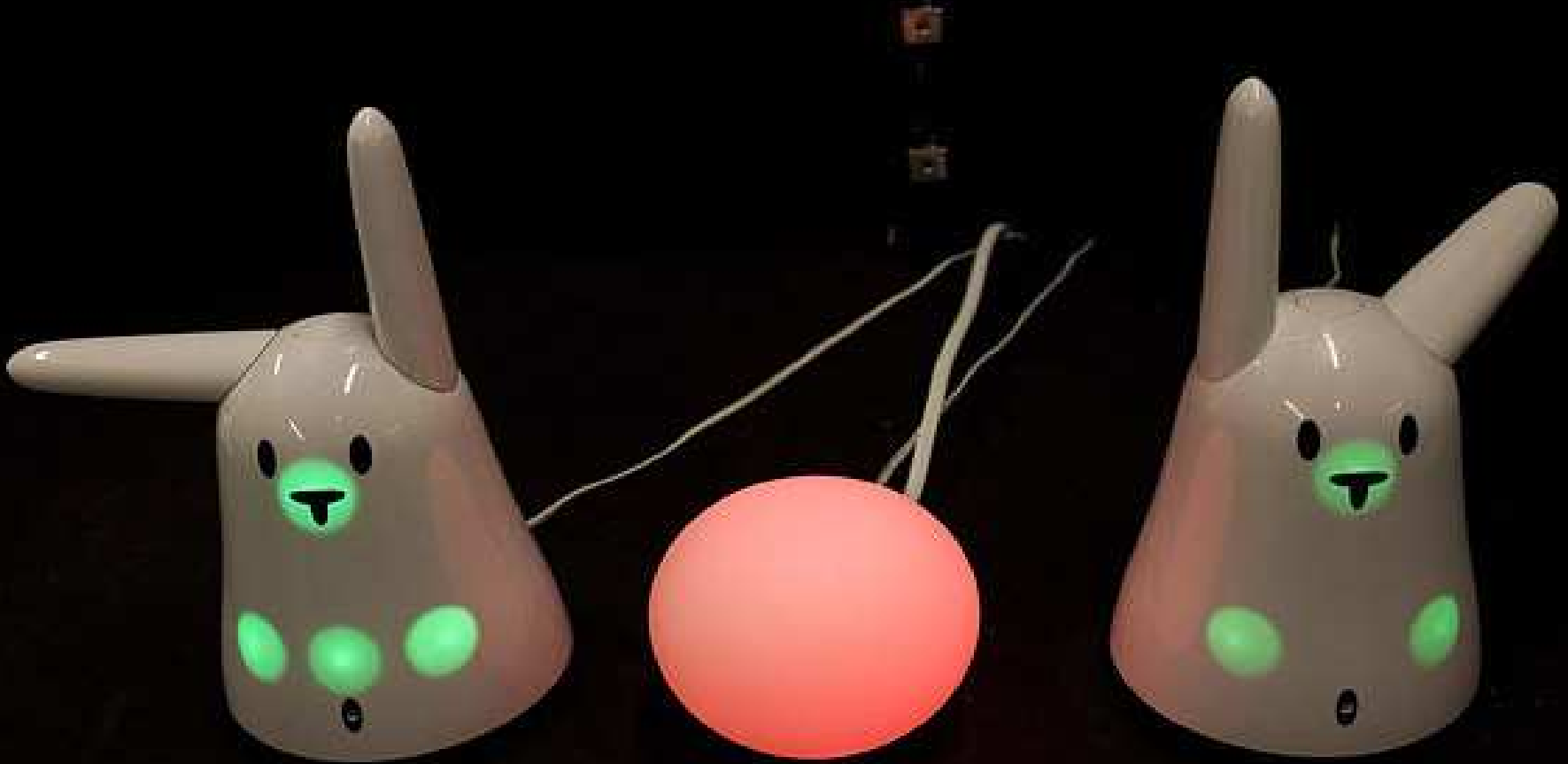
D.R. Program  
'N' Potential

The Smart Grid could impact virtually every aspect of the Demand Response Planning Framework...



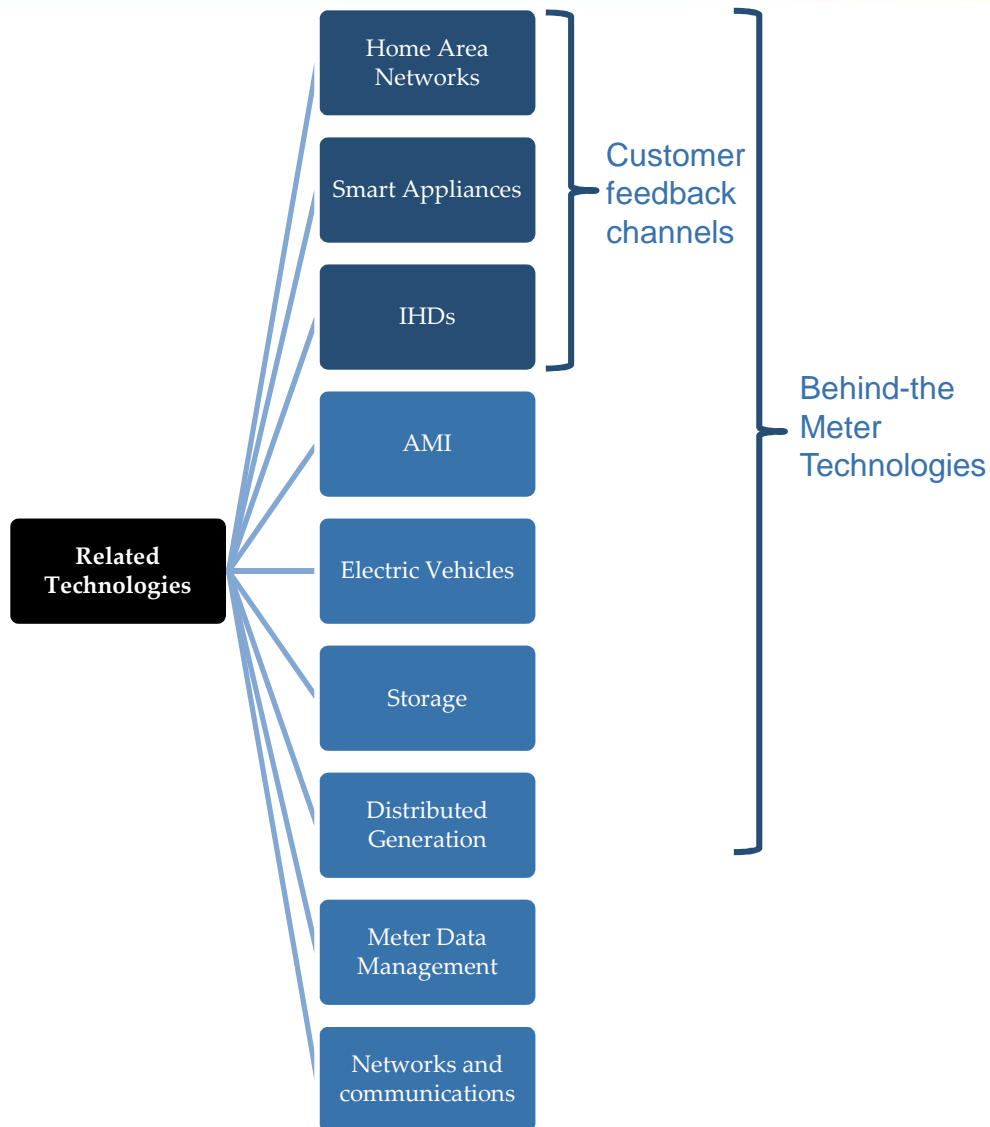
**Question for Forum:** Are the fundamental components of Demand Response planning in a Smart Grid context being adequately covered in Ontario? If so, are there areas of duplication and overlap? If not, where are the gaps?





(Design concepts for Time-of-Use in-home display devices)

Image Source: EPRI/Time Magazine



- There is extensive overlap between “behind-the-meter” technologies and the demand response topic.
- Some of these technologies provide the feedback loop to the customer, while others are integral to signalling and response functions.
- In addition, demand response brings requirements for meter data management and networks.



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# Technological Considerations: Customer Information Intensity vs. Cost

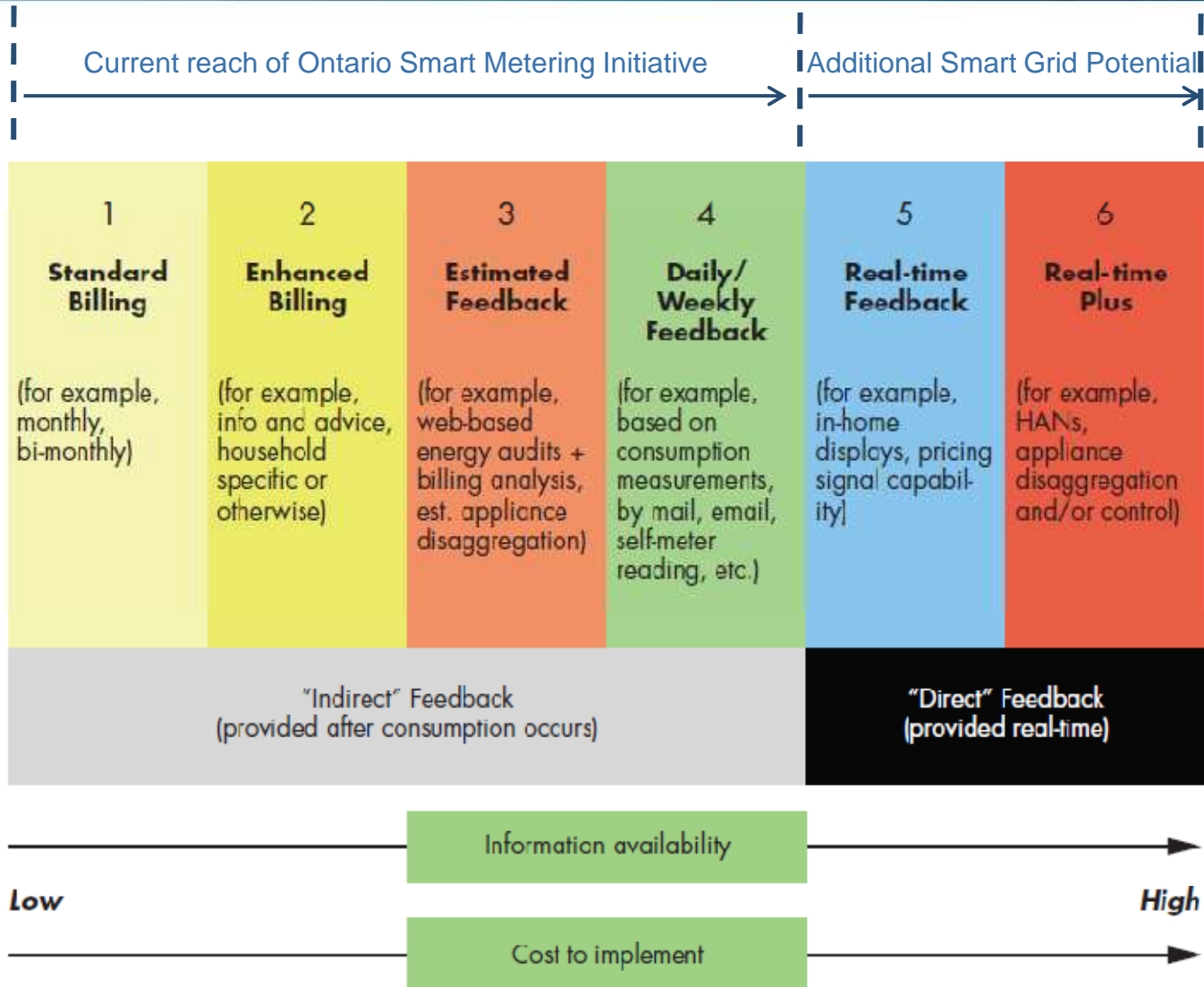
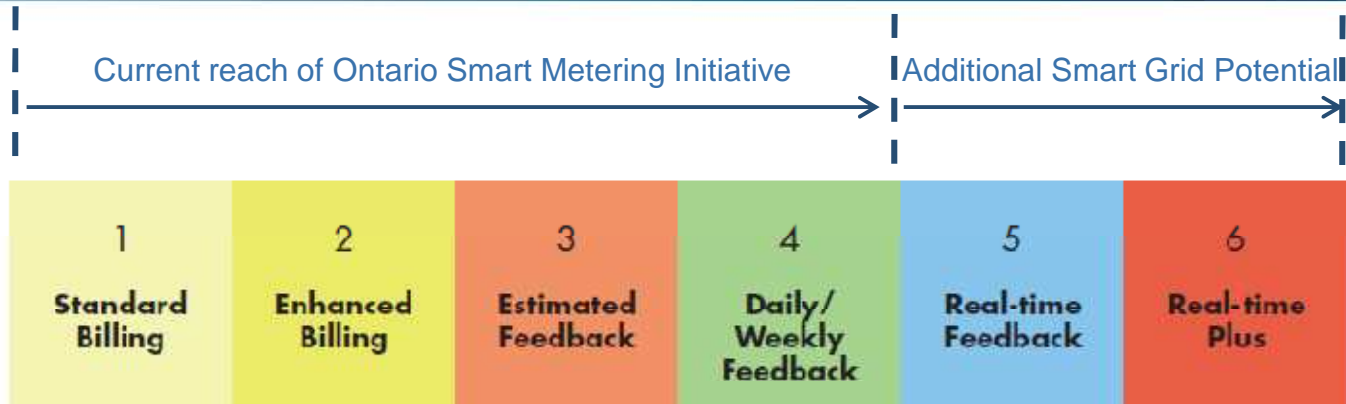


Diagram Source: EPRI

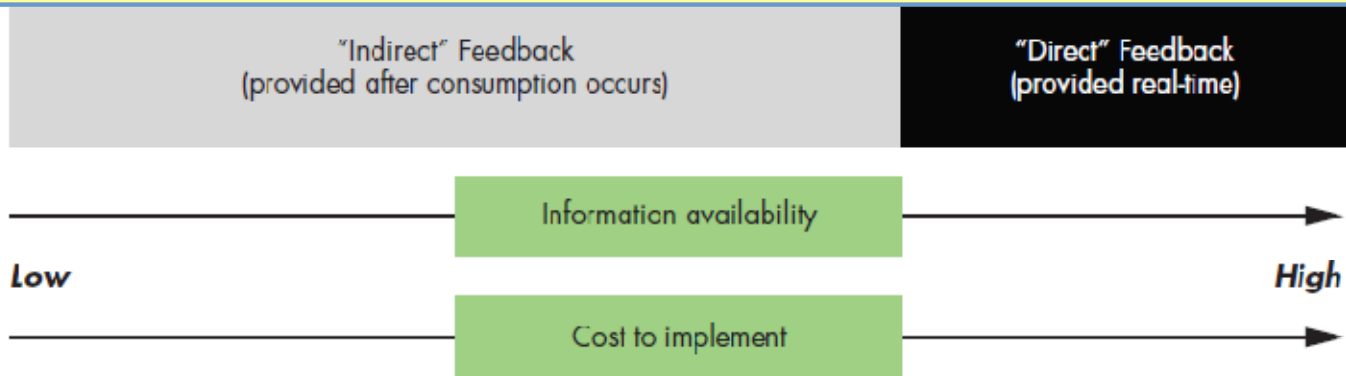


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# Technological Considerations: Customer Information Intensity vs. Cost



**Questions for the Forum:** How does Ontario strike an appropriate balance between cost and providing customers with more visibility, access and control over their consumption? How much of this problem is a regulatory concern?



## Background – recent developments:

- As with other behind-the-Meter technologies, interoperability is a major consideration with respect to Demand Response and activities are underway in a number of different areas.:
  - NAESB contributions to four NIST Priority Action Plans (PAPs):
    - PAP 03 - Common Price Communication Model
    - PAP 04 - Common Scheduling Mechanism
    - PAP 09 - Standard Demand Response (DR) Signals
    - PAP 10 - Standard Energy Usage Information
  - Other NIST PAP's of relevance to the Demand Response topic:
    - PAP 00 - Meter Upgradeability Standard
    - PAP 01- Role of IP in the Smart Grid
    - PAP 07 - Electric Storage Interconnection Guidelines
    - PAP 11 - Common Object Models for Electric Transportation

## **Technical Topics from the Minister's Directive for consideration:**

- Tie-ins to other “relevant entities” (Minister's Directive, section 6(b))
- Evaluation, Measurement and Verification ” (“EM&V” - Minister's Directive, section 6)
- OPA third party vendor of record list (Minister's Directive, section 6(g))
- Technological selection process and smart grid integration issues for geothermal heating and cooling, solar heating and fuel switching (Minister's Directive, section 6(h))



## Demand Response Trunk Problem Statement developed by the Working Group:

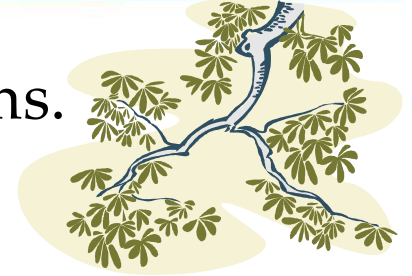
*“Capture the benefits of the smart grid by facilitating demand response.”*

**Question for the Forum:** Does this problem statement developed by the Working Group adequately reflect the “demand response problem” insofar as smart grids are concerned?

- The Working Group identified 10 **root** problems. Some examples include:
  - Smart grid unlocking new potential sources of demand response – but which ones should be targeted and by whom?
  - Need to demonstrate value of the smart grid to the customer – but how?
  - Portfolio selection: new programs or enhance/expand existing ones?
  - Emerging technologies enabling new sources of DR
  - Growing need for regional targeting of demand response programs, but who should be responsible for this?
- The Working Group recognized that not all root problems can be easily addressed, as they are inherently reflective of the current environment that yields the smart grid demand response problem.



The Working Group identified 34 **branch** Problems.  
Some examples include:



## D.R. Program Design Category:

- Example: Need to avoid poorly designed programs that lead to inefficiencies – but how?
- Example: Role of third parties and where should competition be allowed to take place?

## Technology Category:

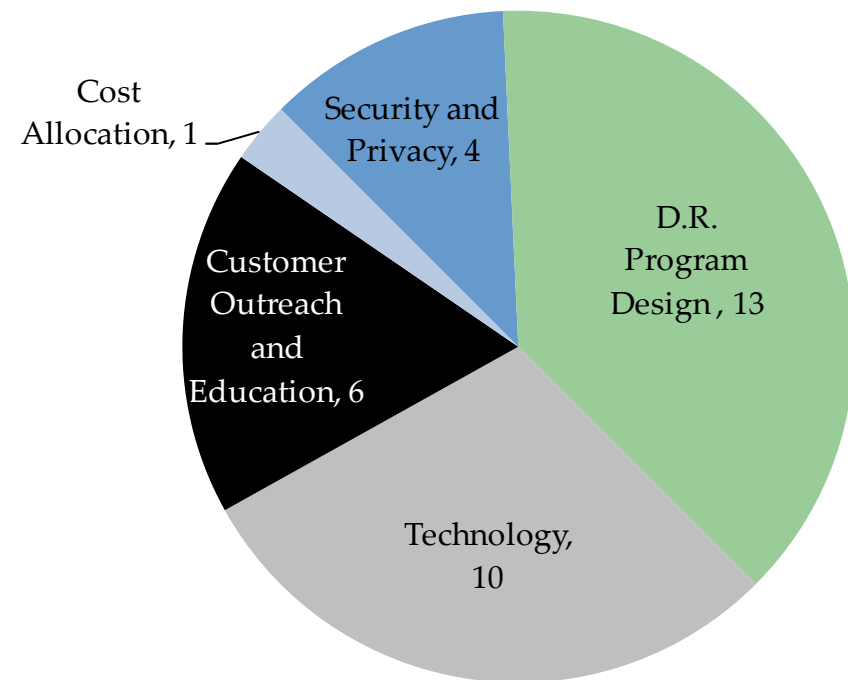
- Example: Avoid adverse or under-utilized technological selection
- Example: Integrate Electric Vehicles, storage and smart appliances DR capability
- Example: Should AMI infrastructure be the only Home Automation Gateway?

## Customer Outreach and Education Category:

- Example: Ensure DR programs are effectively marketed

- The current demand response tree (see also, distribution item) includes various symptomatic “branch” problems in five main categories:
  1. Security and Privacy
  2. D.R. Program Design
  3. Technology
  4. Customer Outreach and Education
  5. Cost Allocation

No. Of Demand Response Branch Problems by category





# Assignment of Demand Response Topics

- At least 15 problems/issues were deemed to have a close relationship to the “behind-the-meter” topic area
- The Working Group also made some recommendations for various problems to be assigned between the Forum, the Working Group and the Partners Committee (see problem tree for details):

Forum	Working Group	Partners Committee
•14 branch problems •2 root problems	•6 branch problems •1 root problem	•7 branch problems



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Thank you.