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Integrated Demand-Side-Management Cost Effectiveness -- Draft

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PRESENTATION

1. Overview
2. Summary of Findings
3. Major Issues
4. Capture of Customer-Specific Benefits
5. Initial Steps for IDSM Cost-Effectiveness
6. Vision for Cost-Effectiveness Valuation
7. Recommendations and Summary of Steps

Appendix

1. Overview -- What is IDSM?

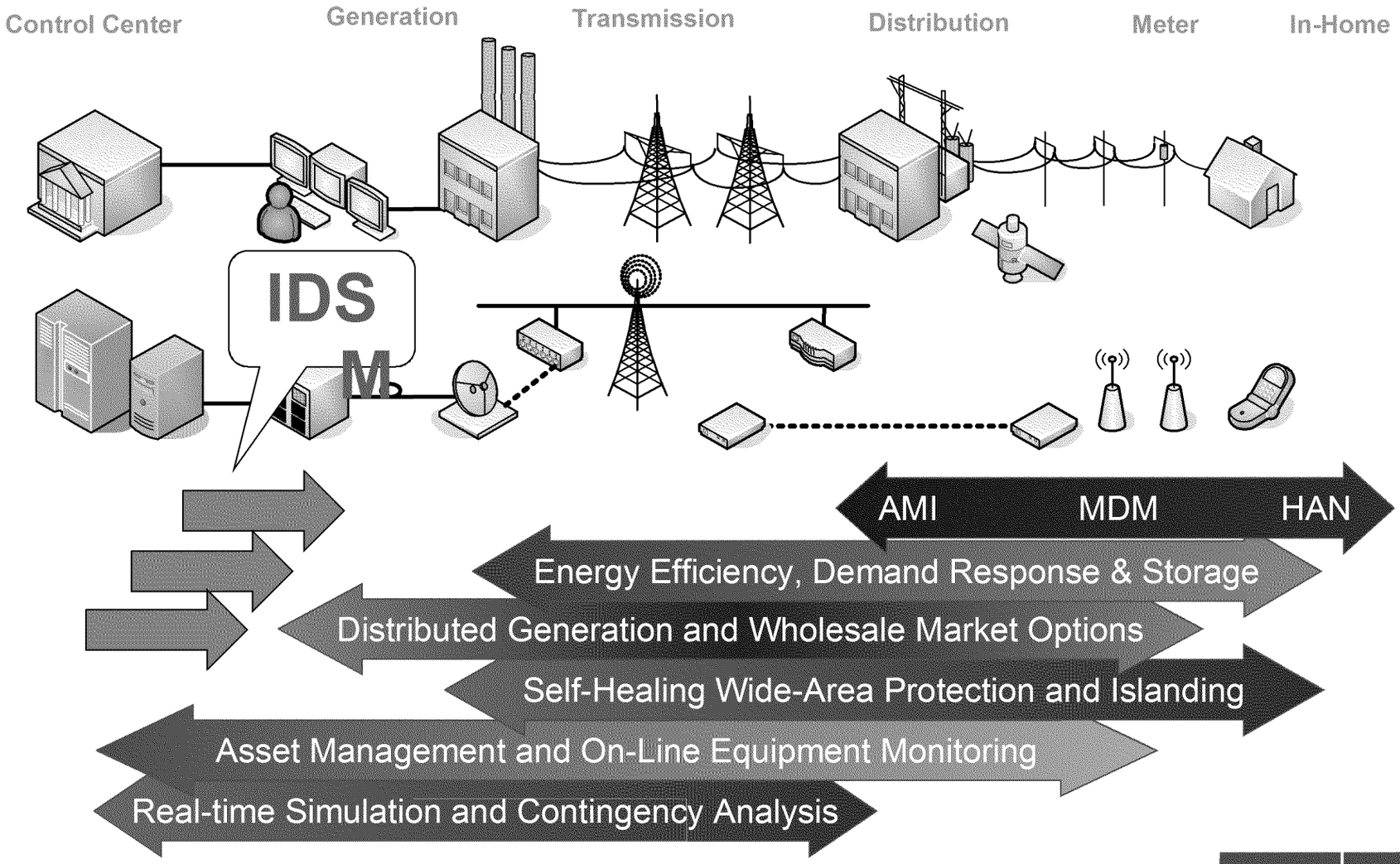
- Energy Efficiency (EE); lighting, insulation…
- Demand Response (DR); AC cycling, HAN, EMS
- Distributed Generation (DG); solar PV, micro-turbines
- Storage (ST); batteries, pumped hydro, flywheels
- From customer end-use to supply – the entire value chain => includes much of the smart grid
- Integrated Solution = EE+DR+DG+ST

IDSM Cost-Effectiveness

To effectively integrate DSM program design, a set of internally consistent … cost-effectiveness methodologies need to be developed for integrated projects, and for program efforts that seek to combine all … demand side resource options within an integrated portfolio.

(California Long-Term Energy Efficiency Strategic Plan, September 2008)

IDSM in the Smart Grid Context



Based on EPRI Intelligrid Materials

IDSM Strategy

- Shift: program-centric" to "customer-centric
- Under one umbrella -- "sell" all DSM options
- Statewide marketing – all on the same page
- Capture scope & scale benefits, exploit common costs
- Reorganize: remove silos that limit innovation

Part of California's Strategic Plan Vision

- Integrated customer offerings for energy efficiency, distributed generation, demand response, storage and advanced metering
- Meet zero-net-energy building energy and carbon reduction goals
- Quantify and attribute GHG, long-term economic and electric/gas hedging benefits, and water reductions benefits
- Provide a consistent cost effectiveness methodology – an IDSM calculator

Vision for IDSM

Energy efficiency, demand response, advanced metering, distributed generation, and storage technologies offered as elements of an integrated solution, which supports energy and carbon reduction goals now and water and other resource conservation goals in the future.

(California Long-Term Energy Efficiency Strategic Plan,

September 2008)

Steps to an IDSM Cost Effectiveness Framework

- Compare and contrast cost-effectiveness policies, methods, and assumptions
- Identify regulatory, methodology, and policy barriers
- Evaluate the feasibility an IDSM cost-effectiveness framework
- Define pros and cons of sequential versus simultaneous methods
- Compare and contrast cost-effectiveness calculation methods
- Formulate a cost-benefit framework to comparable treat all DSM
- Prepare and publish IDSM cost-effectiveness framework

2. Summary of Findings

- The IDSM customer focused approach … aims to make greater use of customer data and regional trends
- Methods to capture and use automated metering infrastructure and Smart Grid data provide better information (e.g., for customer load profiles)
- Use of customer-specific distribution and local market data increases accuracy & benefits
- Inaccuracies from averaged DSM data cause poor selection of IDSM resources
- Statistics and probability distributions better define critical inputs, including IDSM value and long-term economic and hedging benefits
- A three step IDSM cost-effectiveness framework can be used in the short term and be further developed to increase accuracy in the long term

3. Major Issues

- Literature and interviews suggest existing stand-alone calculation methods are inadequate
- Concurrent benefits are not captured, interactive effects are not defined, and critical estimates are often averaged
- Use of inaccurate average estimates for critical inputs reduce the cost-effectiveness of some resources and inaccurately attribute more value to others
- Avoided costs cannot always be defined to represent critical benefits -- the major deficiency with methods that rely principally on avoided cost
- More advanced valuation methods capture additional benefits to be included in a cost-effectiveness evaluation

4. Capture of Customer-Specific Benefits

- The aim is to harness data from customer billing, line extensions, distribution circuits, and the wholesale grid
- Customer value-of-service information about the value of reliability can be used to examine competing assets
- Based on this data IDSM cost-effectiveness can be more accurate and capture greater benefits

5. Initial Steps for IDSM Cost-Effectiveness

- Identify the full set of IDSM resources/measures and estimate the hourly deferred energy and capacity savings of each combination of resources/measures
- Map distribution circuit costs avoided (incurred), capital budgeting impacts, transmission needs, and ISO/RTO market opportunities
- Estimate cost-effectiveness with properly defined benefits and costs for Standard Practice Manual tests

6. Vision for Cost-Effectiveness Valuation: Use Standard Practice Manual & Other Methods

- An inclusive, cost-benefit framework that captures local and regional grid and market elements, and enables comparability treatment for all IDSM resources
- IDSM valuation approaches can help expand the reach and scope of traditional electric and gas DSM programs well beyond previous capabilities

  An key conclusion is that new processes and methods are needed to provide a better approach for IDSM cost-effectiveness

7. Summary of Recommendations

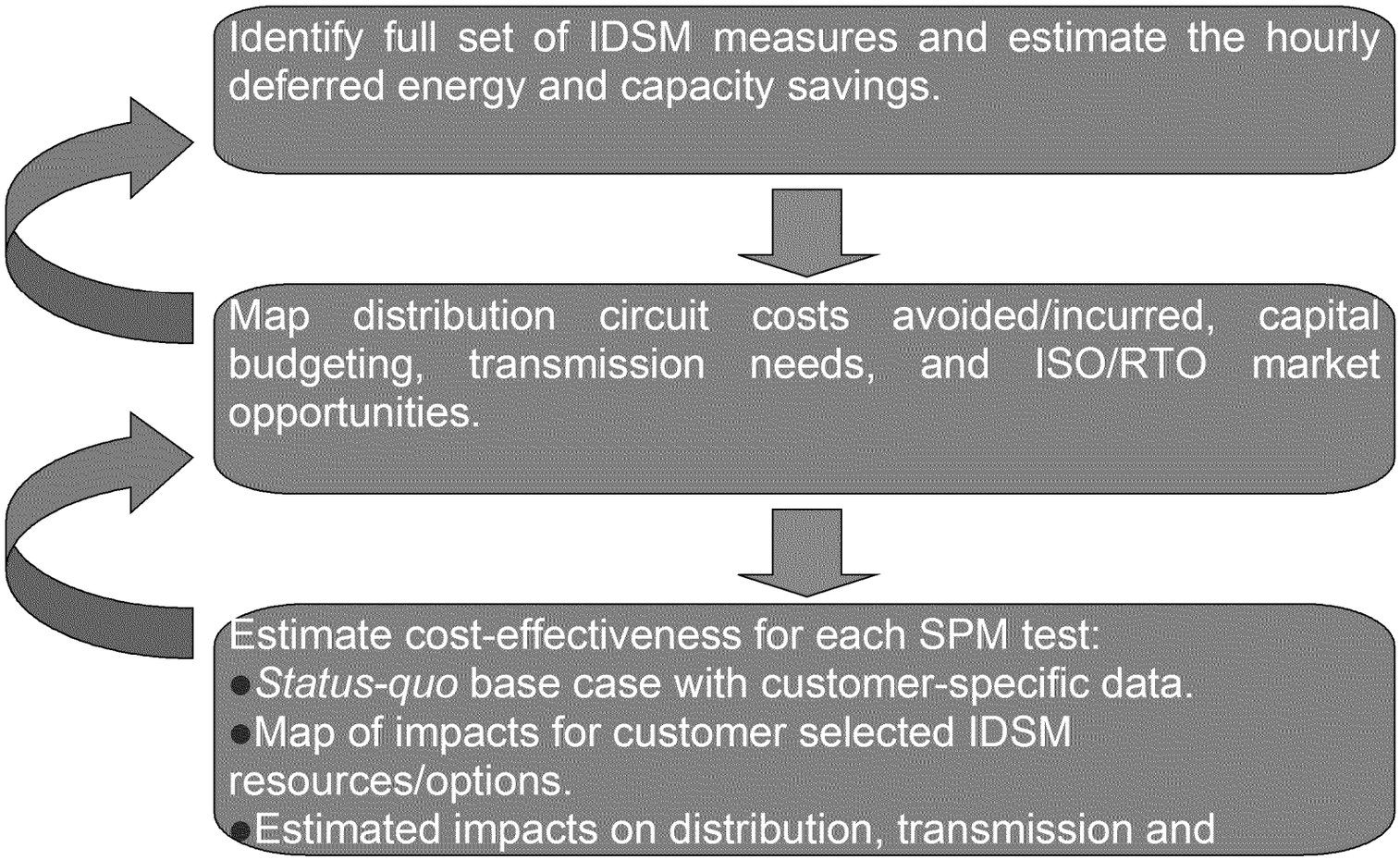
- Provide guidelines for a consistent IDSM cost-effectiveness framework to increase accuracy and consistency
- Focus on a common, comprehensive method based on the Standard Practice Manual (SPM), additional valuation methods and use local data
- Develop 1) better estimates of customer loads, 2) a system to define IDSM resource fit and full benefits, and 3) a cost-effectiveness calculator with advanced methods to harness and local, regional, and market data
- Use distribution circuit and transmission data to define deferrable costs

And…

Summary of Three-Step Methodology

1. Identify all IDSM measures and estimate the deferred savings of each combination of measures
2. Calculate the potential for reduced and additional energy costs, distribution circuit costs, capital budget costs, transmission needs, and the market opportunities that are available through California Independent System Operator
3. Estimate cost-effectiveness with properly defined benefits and costs for each SPM test, using a set of methods that extend beyond avoided cost calculations.

Three Steps for IDSM Cost-Effectiveness



Appendix: Additional Slides

Consistent or Inconsistent and Separate?

- **IDSM & Resource planning; two halves of same coin?**
- **Resource planning and procurement are typically supply-side; IDSM assessment is the demand side**
- **If IDSM resources are subtracted from the demand forecast used for supply-side resource planning & procurement?**
  - Interaction of supply and demand is not addressed
- **Simultaneous assessment of both IDSM and supply would capture interaction effects**
  - Process is more complicated and requires more complex analysis

Sequential and Simultaneous Calculations

- **Sequential IDSM cost-effectiveness must first assume some sequence is appropriate, but it is sub-optimal:**
  - California "loading order" first EE/DR, then DG/renewables …
- **But simultaneous cost-effectiveness will capture interaction effects & produce more optimal results**
- **All benefits in, cost-effectiveness results depend on how it is done -- it is not a zero-sum game – more benefits result with simultaneous calculation**

More Advanced Valuation Methods to Capture Long-Term Economic & Hedging Benefits

- Statistical methods to better capture IDSM value
- Option valuation and stochastic methods to ascribe benefits to dispatchable DG, DR, and ST
- Value of service assessment to define opportunities to increase power quality and reliability
- Estimation of consumer surplus to value changes in retail pricing, DR and DG

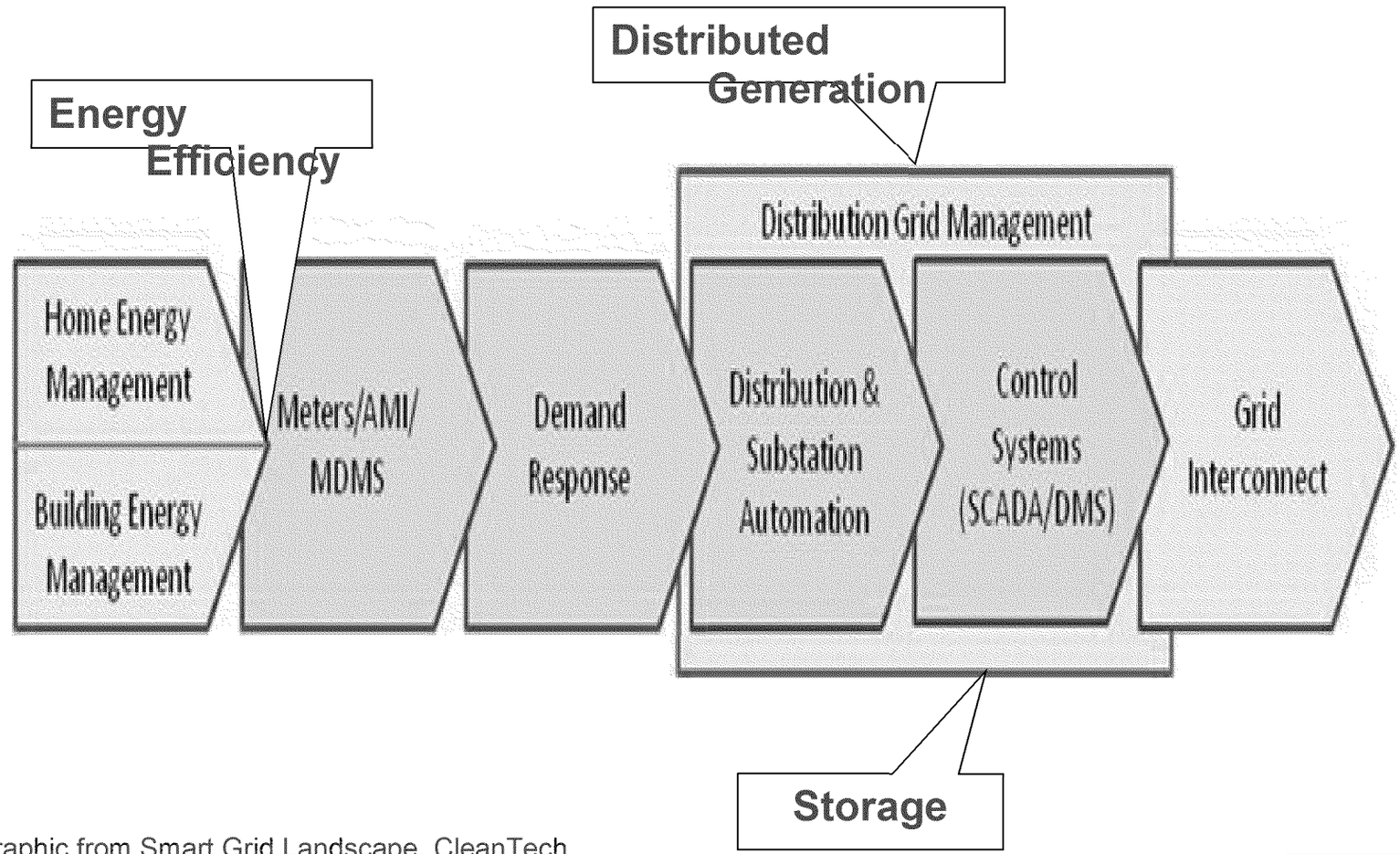
Positioning for Energy and Carbon Reduction Goals, and Water and Future Goals

- Methods to value long-term economic and hedging benefits -- including option value -- will increase IDSM cost-effectiveness
- Carbon value is likely to be included
- Embedded-energy-in-water is coming…
- Non-energy benefits for low income…

Other Benefit Calculation Methods

Methods	Energy Efficiency	Distributed Generation	Demand Response	Storage
Avoided Costing	●	●	●	●
Market Modeling	◒	●	●	●
Option Value	○	●	●	●
Distribution Circuit Planning	●	●	●	●
Transmission Planning	●	●	●	●
Environmental Benefits	●	●	●	●
Consumer Surplus	○	●	●	●
Value of Lost Load	◒	●	●	●
Business Case Benefits	●	●	●	●
Dynamic IRP Modeling				

Aspects to IDSM Valuation (in Smart Grid)



Graphic from Smart Grid Landscape, CleanTech Group, 2010

Questions and Comments

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