Incorporating DSM Risks into Resource Planning Processes

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Opening remarks

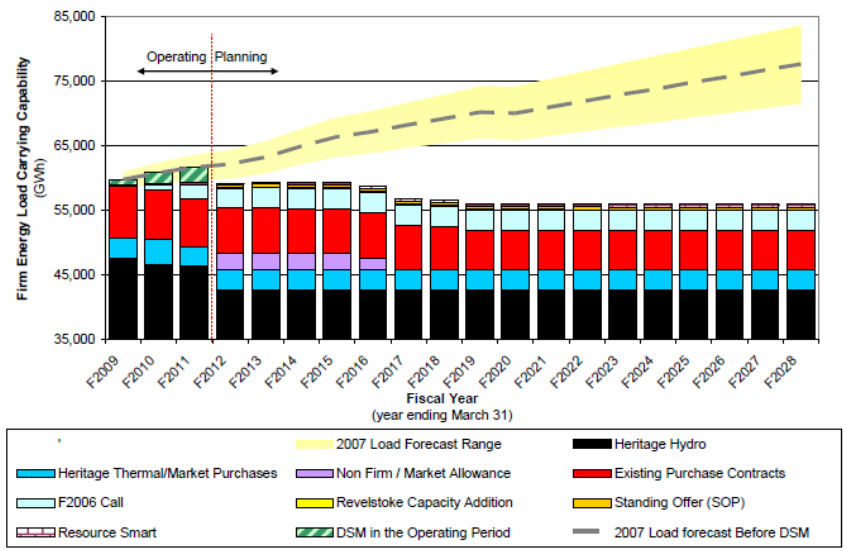
- Introductions
  - Myself
  - BC Hydro
- Main takeaways of talk
  - Tools – borrowed from Decision Analysis
  - Risk Framework – to integrate results
  - Key hurdles
    - Modeling uncertainty (not variability)
    - Modeling flexibility
    - Capturing interrelationships among key variables

Agenda

- Some background
  - Regulatory
  - Energy Planning task
- Assessing Uncertainty
- Results and tough tradeoffs
- Summary and conclusions

Background - Energy Planning in BC

- Resource Gap
- Long Term Acquisition Plan
  - To fill the resource gap
  - Drives short term (3-4 yrs) actions
- Regulatory Framework
  - Plan filed every 2-3 yrs



Background – Energy Planning in BC

- Provincial Government's energy policy
  - At least 50% of BC Hydro's incremental resources through conservation
- Update to legislation (Utilities Commission Act, 44.1)
  - Conservation first, then supply side resources
- A large change for BC Hydro's planners:
  - Increase over previous history
  - At the aggressive end in N.A.

How to capture uncertainty?

Rates	GWh FE (2020)
Residential	802
Commercial	404
Industrial	314
Codes and Standards	
Building Codes	475
Set top boxes	436
Fan blowers	100
Activities	
Appliances	174
Lighting	148
Windows	140
Total	**2993**

- Traditional approach
  - Sum up point estimates
  - Feed into resource stack
- But each line item is an uncertain project
- Limited data on delivery risk
  - But subject matter experts to have a “gut feel” for uncertainty

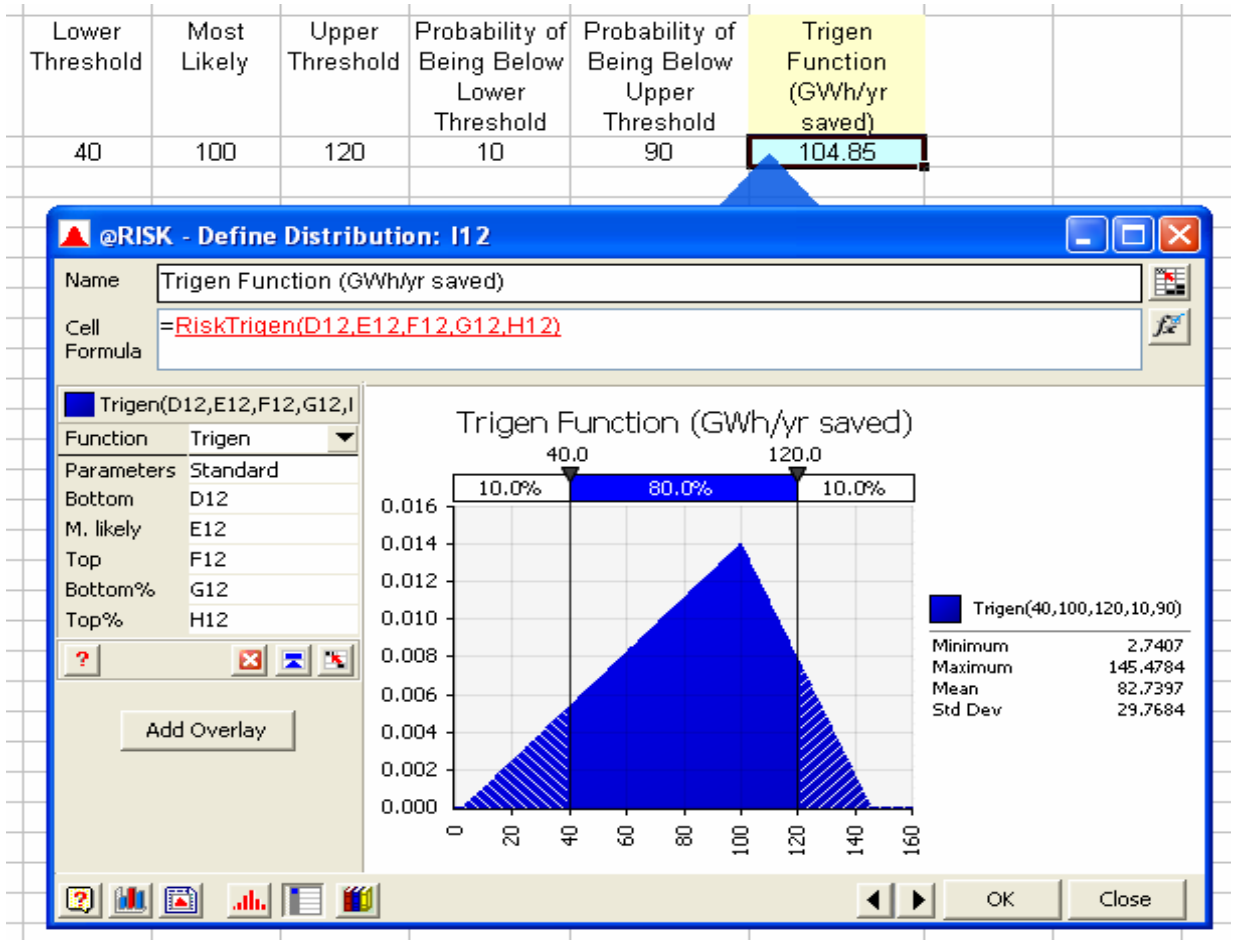
Step 1 – Focus on key drivers of uncertainty

- Savings (via appliance program) varies:
  - As a function of participation
  - And savings per participant

Within Project Relationships		
Name	**Sub-components**	**Est Savings**
Appliances	Participation	174
	Savings / Participant	
Lighting	Participation	148
	Savings / Participant	

Step 2 – Eliciting subjective probabilities from experts

- Interview protocols followed
- “Gut feelings” quantified



Step 3 – Assess relationships across variables

- As an example:
  - Variables within each activity are related
  - Variables across activities are related too
    - A culture of conservation

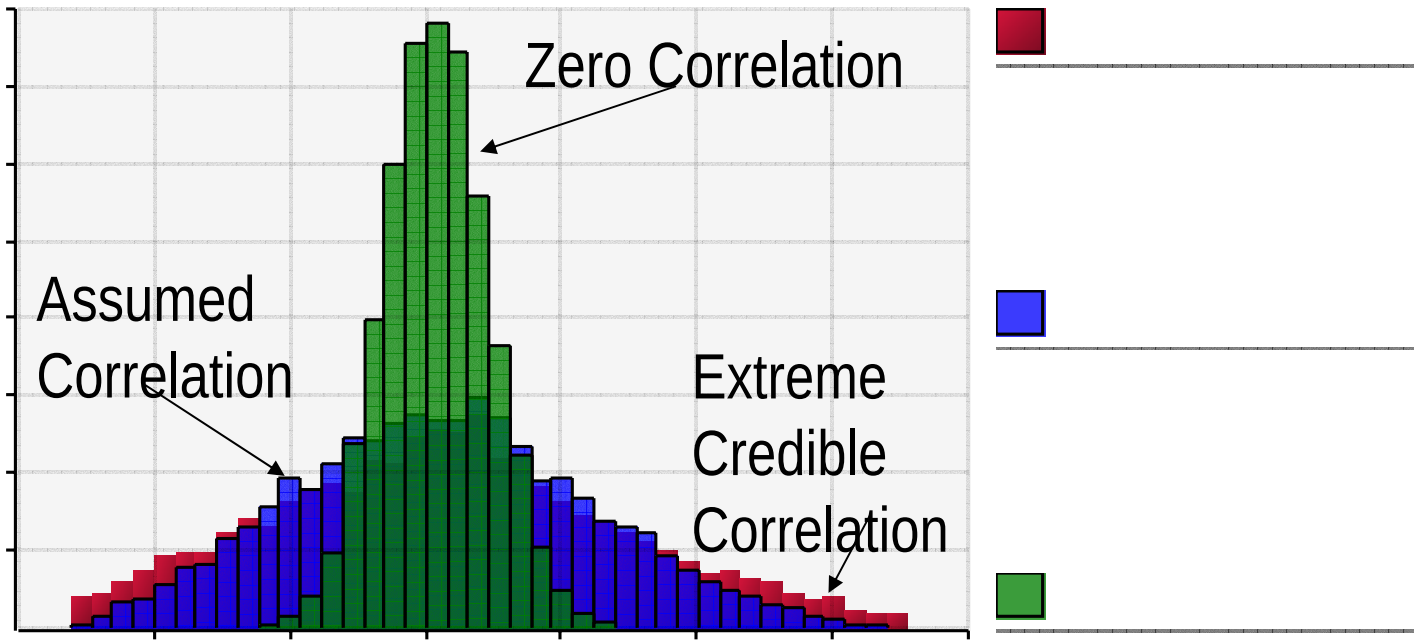
Within Project Relationships			Between Project Relationships		
Name	Sub-components	Est Savings	Name	Sub-components	Est Savings
Appliances	Participation	174	Appliances	Participation	174
	Savings / Participant			Savings / Participant	
Lighting	Participation	148	Lighting	Participation	148
	Savings / Participant			Savings / Participant	

How important are these interrelationships?

- These effects can be captured:
  - Through functional forms
  - Through correlational estimates
- Neither is easy to do
- As much “art” as “science” to this
- Some discomfort with level of subjectivity here
  - Lack of precision with estimates

How important are these interrelationships?

- Sensitivity Analysis
  - Zero correlation assumption has a strong influence
  - We know that this is the wrong assumption

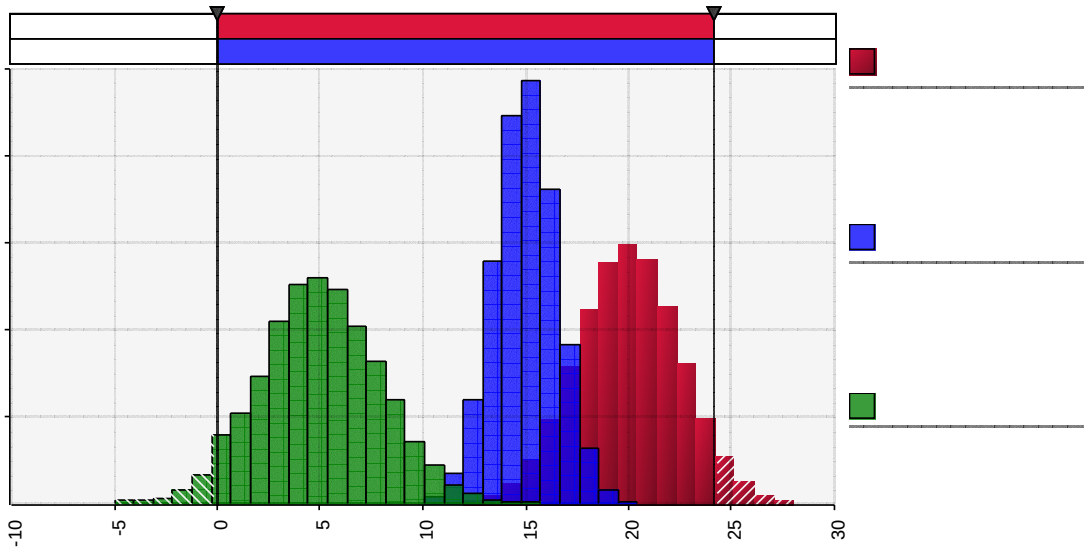


Risk Framework for Integrating Results

- Demand – Savings = Resource Gap
- But how do we show this?
  - As continuous variables?
  - Or as discrete outcomes?

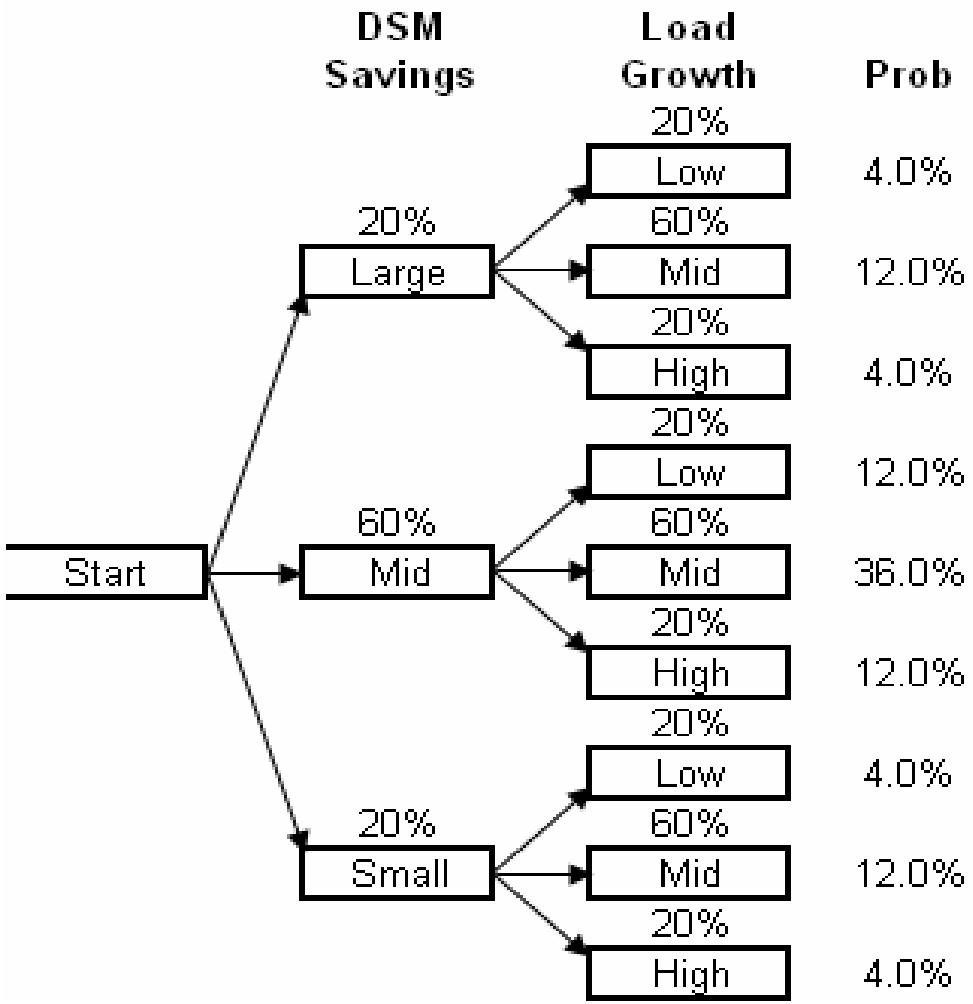
Integrating Continuous Results

- Gap = Load growth – DSM
  - Mock data shown below
- Advantages
  - Very easy to do
  - Analysis is very “clean”
- Downside
  - Don’t know how to interpret tail events
  - Hampers modeling costs, other impacts



Integrating Discrete Results

- Gap = Load growth – DSM
- Advantages
  - Easy to explain
  - Easy to interpret "tail" events
- Downside
  - Limits # variables
  - Subjective choices to manage tree size
  - Probabilities harder to interpret



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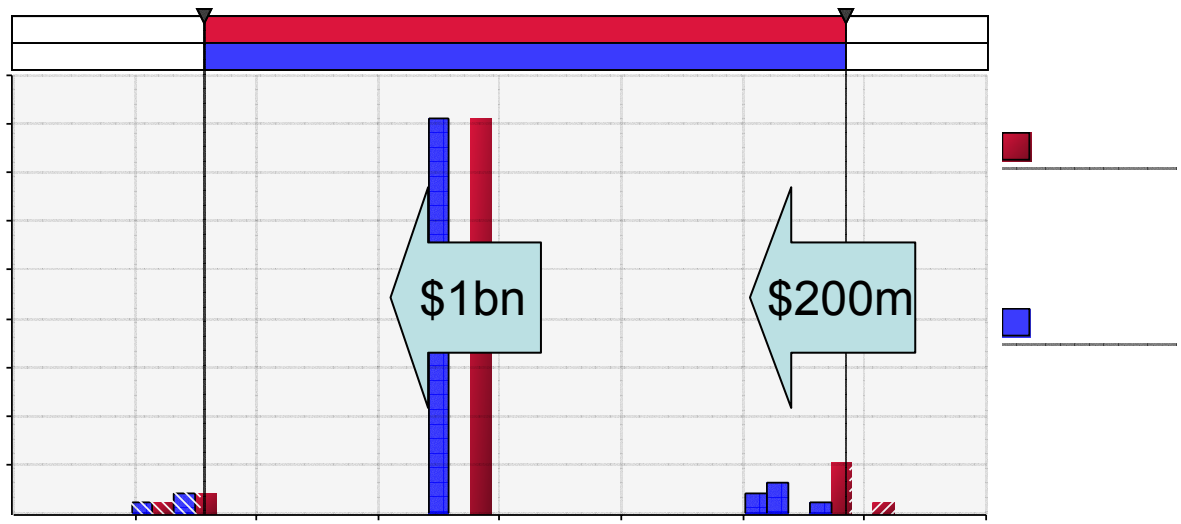
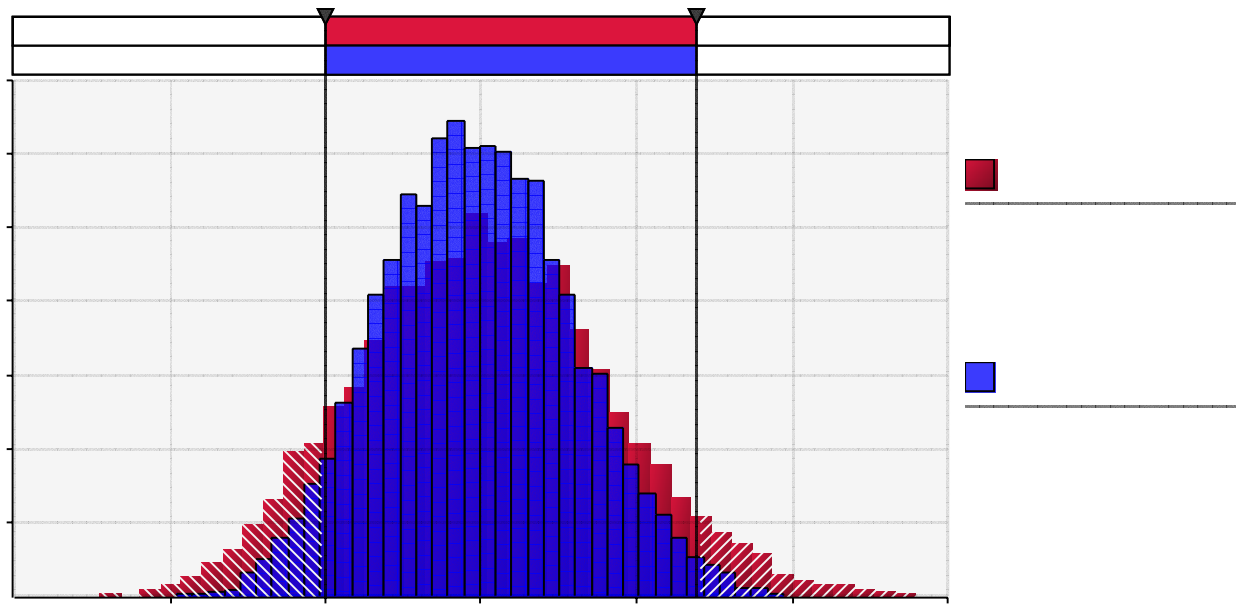
Results - Portfolio Cost and Cost Risk

- Analysis within a larger portfolio showed
  - Increasing DSM reliance reduced costs
  - Increasing DSM reliance reduced costs risks



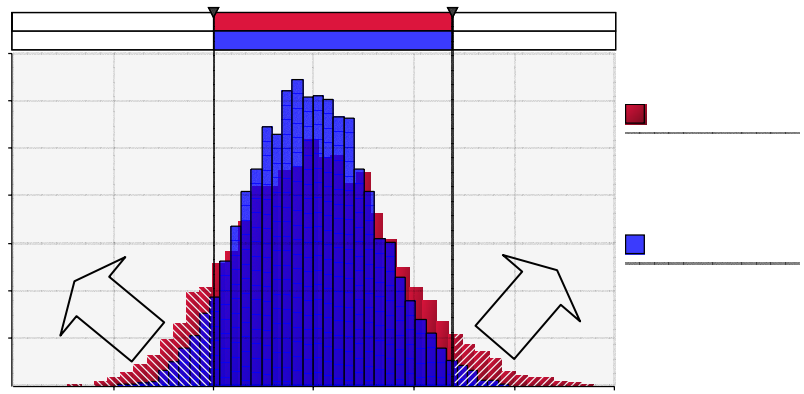
Results – Deliverability Risk

- Will these savings materialize
  - Key factor
  - Grows with increased reliance on DSM
  - Shows the probability of being short on energy



Results – Deliverability Risk

- Some caveats
  - Missing interrelationships:
    - DSM and load growth
    - DSM buckets of Rates, Codes and Standards, Programs
  - Feeling among planners that deliverability risk was understated



Cost Risk vs Deliverability Risk – A key tradeoff

- Previous slides suggest a tradeoff:
  - More DSM reduces cost, cost risk; but
  - Increase deliverability risk
- Tradeoff an artifact of modeling
  - Deliverability shortfalls should show as:
    - Decreased reliability
    - Increased costs
- Problem
  - Variability with perfect foresight ≠ uncertainty
  - Modeling doesn't capture "surprises"

DSM in BC Hydro's 2008 LTAP Submission

- BC Hydro's 2008 LTAP Submission
  - Targeted 10,000 GWh/yr DSM by 2020
    - Represented 78% of total load growth
  - An ambitious amount
    - But not the most ambitious option considered
  - DSM's delivery risk
    - Overshadowed calculated financial benefits of more extensive DSM
  - A key point of debate in regulatory review

Lessons Learned

- Risk Framework
  - Worked well to integrate uncertainty into resource planning
  - Drew little interest in regulatory review
- Key element that organized our
  - Thinking
  - Portfolio Modeling
  - Resource choices

Future Challenges

- Capturing Key Linkages:
  - Load growth and DSM savings
  - Relationships among
    - Rates
    - Codes and Standards
    - DSM programs
- Modeling uncertainty (not variability)
- Valuing flexibility

Conclusions

- DSM Uncertainty
  - Key question in our regulatory arena
- Requires a different set of tools
  - Borrowing from decision analysis field
- Framework to integrate results
- Important work needs to be done

Categorizing our DSM Resources

- Three “buckets” of conservation measures

- But, how to input these into resource planning?
  - Lots of potential combinations
  - These elements are interrelated

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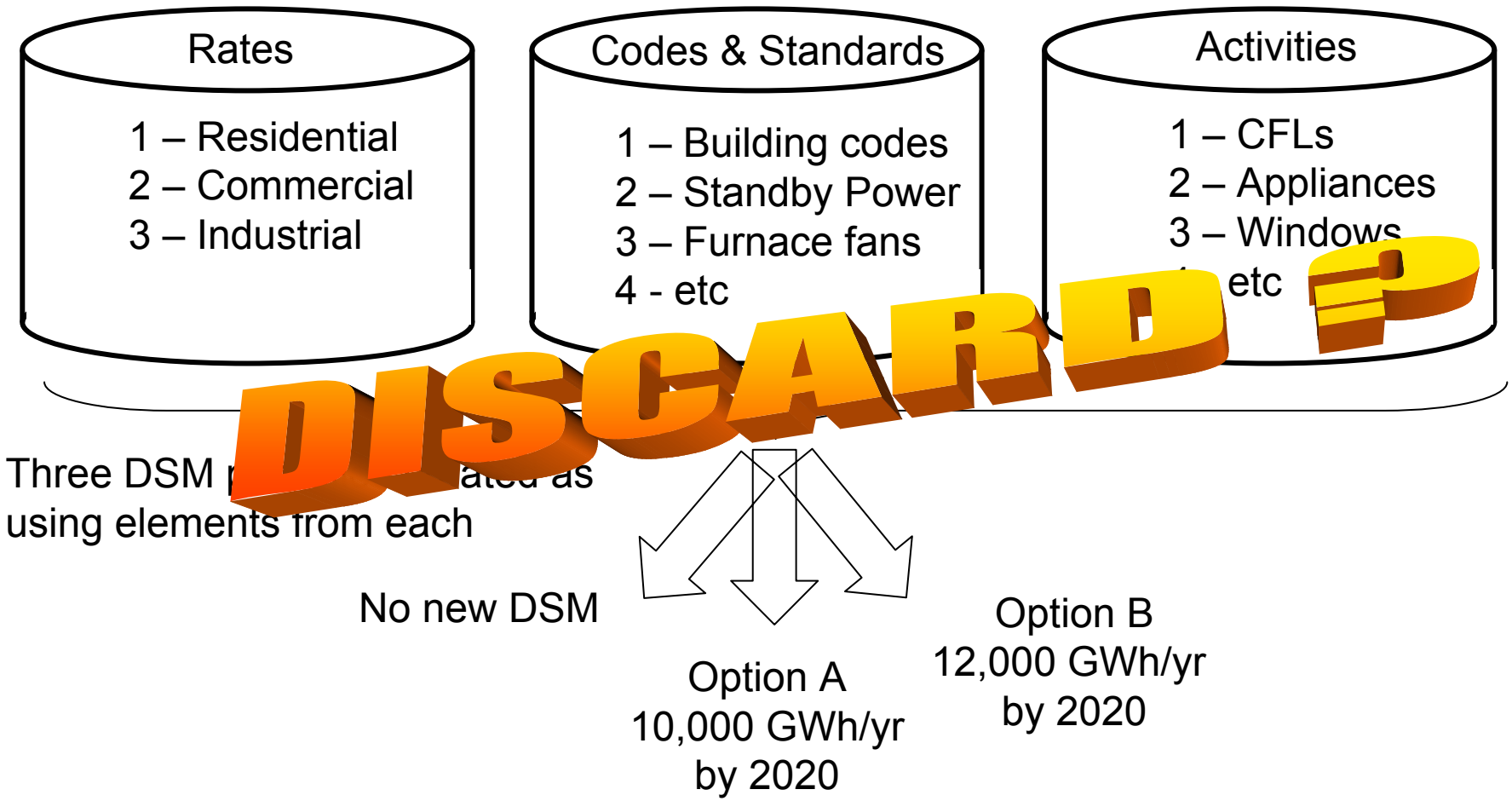
DSM portfolios as resource options



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