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James A. Yost
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Joan M. Dukes
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May 29, 2008

MEMORANDUM

TO: Power Committee

FROM: Tom Eckman and Charles Grist

SUBJECT: Introduction to Conservation Resource Potentials Assessment

One of the primary tasks that must be carried out in order to develop the Sixth Plan is a regional assessment of the remaining potential for conservation, a process including three key steps. First, there is the technical assessment of available energy efficiency technologies and practices. Inputs to this assessment include the estimated costs and savings for each technology or practice, the expected life of the savings, the load shape (i.e., time of day and season of the year) of the savings, the potential non-energy benefits or costs associated with a technology or practice, and interaction and/or overlap with other measures. The second step is to estimate how much of that technical conservation potential is realistically achievable over the entire twenty-year planning period. The third and final step in the process is to estimate the near-term pace of conservation acquisition that is realistically achievable. These assumptions constrain the amount of conservation that the portfolio analysis model is permitted to develop in any given period. In the Fifth Power Plan, these constraints on the maximum amount of acquisition were the factor that limited the Plan's five year conservation targets. As reported at the May Council meeting, the region far exceeded the Sixth Plan's assumed upper limit of achievable savings in 2007.

The first step in this process, the technical assessments, is carried out by staff. Staff submits its work to the Regional Technical Forum (RTF) and the Council's Conservation Resources Advisory Committee (CRAC) for review. While staff anticipates that most of the difficult technical judgment calls will be made during the RTF and CRAC review process, there may be elements of the technical assessments which prove to be controversial and which could benefit from review by Council members.

The second two steps in the process, establishing the portion of the technically available conservation that is realistically achievable over both the short and long term, has been a subject of considerable regional interest and debate over the past several years. Consequently, staff anticipates that the Council will likely choose to "weigh in" on this issue during the development of the Sixth Power Plan. In its first five plans, the Council assumed that 85 percent of the cost-effective conservation could be achieved over its twenty-year planning period. In 2007, staff compared the region's historical achievements against this "85%" planning assumption. The

results of this review support continued use of that estimate, or perhaps even the adoption a higher one.[1]

The Council's assumption regarding the maximum realistically achievable annual pace of conservation is a critical input into the process of setting the Sixth Plan's near-term conservation targets. This assumption, which is a subjective judgment, has also engendered considerable regional interest and debate over the past several years. In the Fifth Power Plan staff considered the historic conservation achievement rates and the nature of the conservation available to meet near-term targets prior to recommending the maximum pace of conservation to be used in the portfolio model. For non-lost opportunity conservation resources, the upper limit was set at 120 MWa/year based on the maximum achieved during the years when regional conservation achievements peaked. For lost-opportunity resources, a gradual increase in annual penetration rates was assumed, starting at 10 MWa per year and ramping to about 60 MWa per year over 12 years. In 2007 the region accomplished over 200 MWa of conservation, far surpassing the annual penetration limits assumed in the Fifth Power Plan.

The staff's presentation will provide an overview of how the assessment of the technical and economic potential of conservation resources is conducted. Staff will also discuss issues, such as those described above, regarding how much of the cost-effective conservation savings are achievable in both the near and long-term.

[1] The paper is on the Council website at http://www.nwcouncil.org/library/2007/2007-13.htm.

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Conservation Resource Assessment

How It's Done and Where We Need Your Input

June 11, 2008

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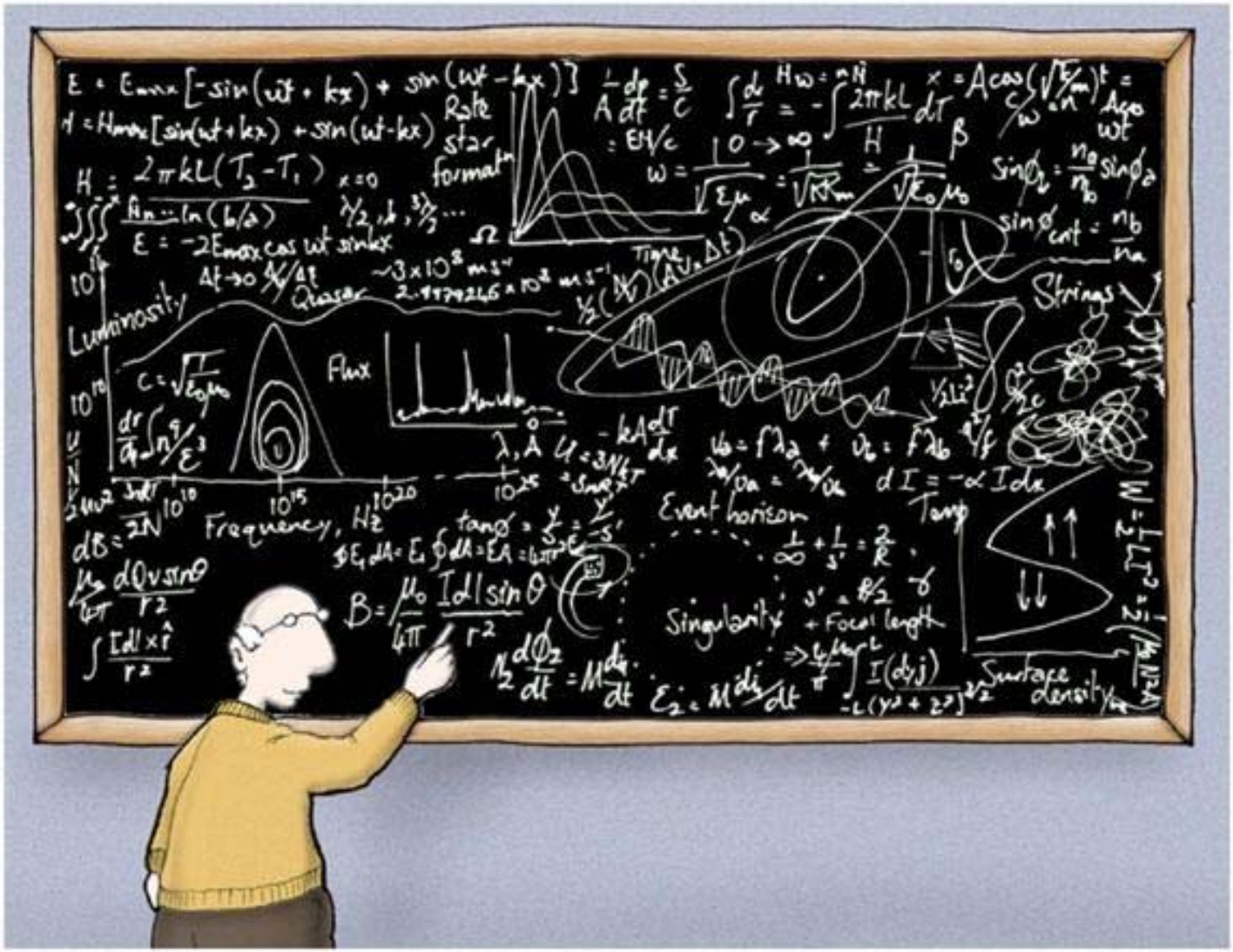
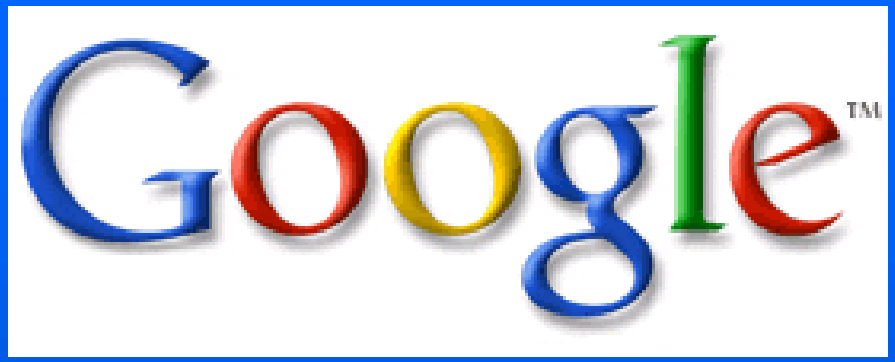


How Do We Know How Much is Left To Do?



PNW Efficiency Potential

- Advanced Search
- Preferences
- Language Tools

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It's *Only* a Six Step Process

- Step 1 - Estimate ***Technical Potential*** *on a* ***per application*** *basis*
- Step 2 – Estimate ***Economic Potential*** *on a* ***per application*** *basis*
- Step 3 - Estimate number of ***applicable units***
- Step 4 – Estimate ***Technical Potential*** *for* ***all*** *applicable units*
- Step 5 - Estimate ***Economic Potential*** *for* ***all*** *applicable units*
- Step 6 – *Estimate* ***Realizable Potential*** *for* ***all realistically achievable*** *units*

Before You Start – Decide On A Cost-Effectiveness Metric

- Participant Cost Test (PTC)
  - Costs and benefits to the program participant
- Total Resource Cost (TRC)
  - All Quantifiable costs & benefits regardless of who accrues them. Includes participant and others' costs
- Utility Cost Test (UTC)
  - Quantifiable costs & benefits that accrue only to the utility system. Specifically excludes participant costs
- Rate Impact Measure (RIM)
  - Net change in electricity utility revenue requirements.
    - » Attempts to measure rate impact on all utility customers especially those that do not directly participate in the conservation program
    - » Treats "lost revenues" (lower participant bills) as a cost

The Basic Formula

Achievable Potential **=** Number of Applicable Units X (Energy Use @ Frozen Efficiency - Energy Use @ Cost Effectiveness Limit) X Expected Market Penetration

Where :

Frozen Efficiency Use **=** Current efficiency adjusted for stock turnover and adopted changes in codes and standards.

Cost Effectiveness Limit **=** Cost of next similarly available and reliable resource (represented by future wholesale market prices) adjusted for T&D cost deferrals, environmental costs & risks (fuel price, carbon control, etc.) – *Estimated from Portfolio Model Results*

The Basic Formula

Achievable Potential **=**

Number Units * Cost-Effective kWh per Unit * Market Penetration

Number Homes
Floor Area of Retail
Number of TVs
Acres Irrigated
Pounds Steel

(kWh/Unit at Current Efficiency – kWh/Unit at Cost-Effectiveness Limit of Efficiency)

Current Efficiency is adjusted for adopted codes & standards and stock turnover (Frozen Efficiency)

Cost-Effective Limit of Efficiency is estimated from Portfolio Model Results. It is based on the cost of the next lowest cost resource available to meet load.

Fraction realistically achievable over time

Inputs to Resource Potentials Assessment Methodology

- Availability
  - Scope of measures
    - » Technologies
    - » Practices
  - Applicability territory
    - » Number of units
    - » Units savings
  - Achievable over time
    - » Retrofit
    - » Lost-Opportunity

- Costs
  - Materials & labor
  - Annual O&M
  - Periodic Replacement
  - Program Admin
  - Financing costs
  - Externalities
  - Other non-electric

Generic Methodology for Estimating Conservation Resource Potential & Targets

Measure Cost

- Program Data
- Contractor Bids
- Retail Price Surveys

Measure Savings and Load Shape

- End Use Load Research
- Engineering Models
- Billing History Analysis
- Independent Testing Labs

Measure Lifetime

- Evaluations
- Census Data
- Manufacturers Data
- Engineering Estimates

Supply Curves

- Number of eligible units* savings per unit = aMW
- Lost-opportunity resources
- Non-lost opportunity resources

PROCOST Model

Determines measure and program level "cost-effectiveness" using:

- Measure costs, savings & load shape
- *Aurora Market prices*
- T&D savings (losses & deferred $)
- 10% Act Credit
- Council Financial Assumptions (e.g. Discount Rate, Administrative costs, etc.)

Market Price Model

Provides Forecast of Hourly Avoided Capacity & Energy Costs Under Average Water Conditions

Portfolio Model

Determines NPV of Portfolios with Alternative Levels of Conservation vs Other Resources

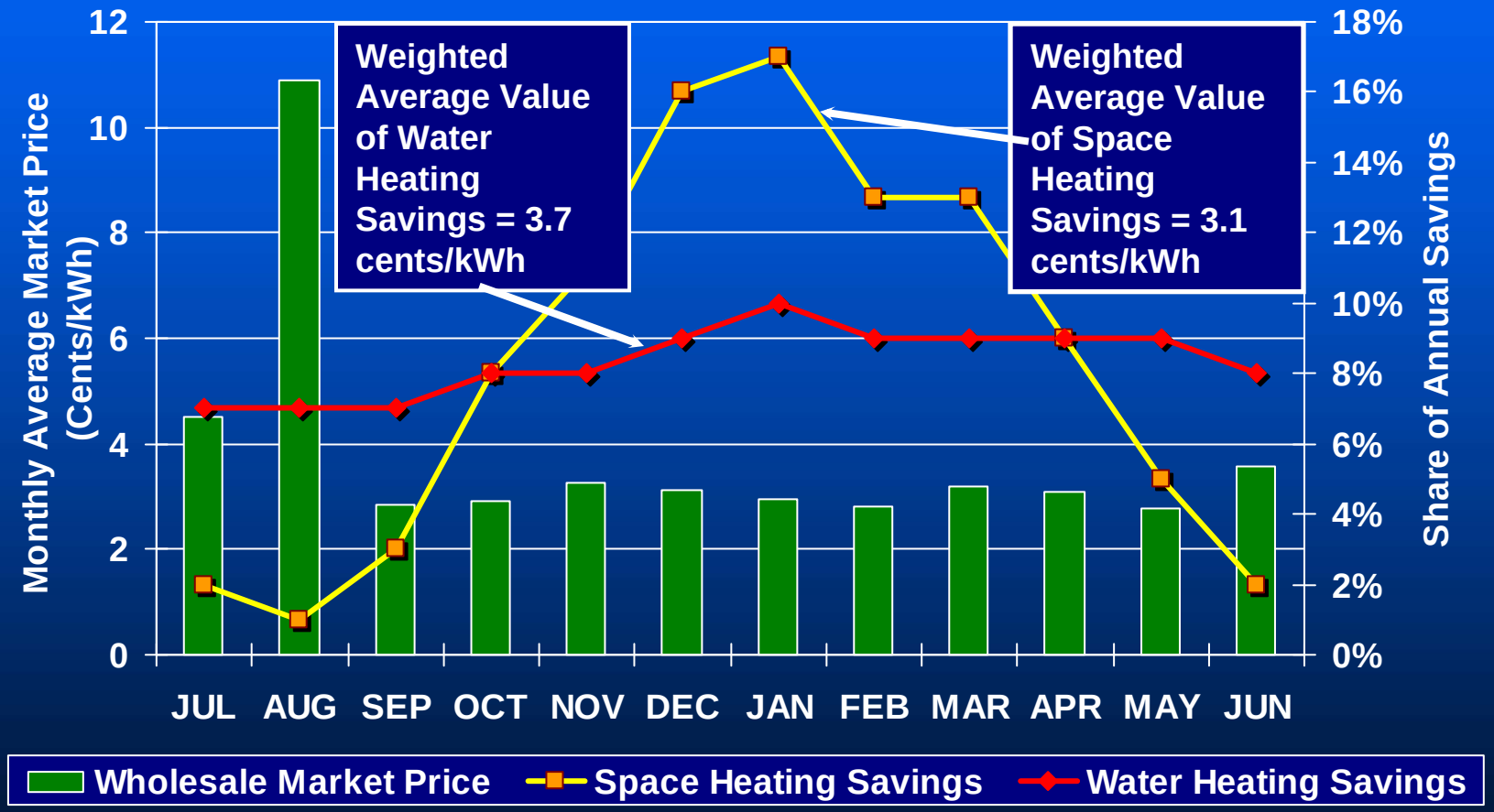
Plan's Targets

Northwest Power and Conservation Council

Results of Resource Potential Assessment Methodology

- Summarize availability & cost
  - Supply Curves
  - TRC levelized costs
    - » All Costs (net of benefits) per kWh
  - Lost-Opportunity Supply Curve
  - Retrofit Supply Curve (Non-Lost-Op)
  - Availability timeline
- Apples to apples comparison

Each End Use Has a Different "Cost-Effectiveness" Limit



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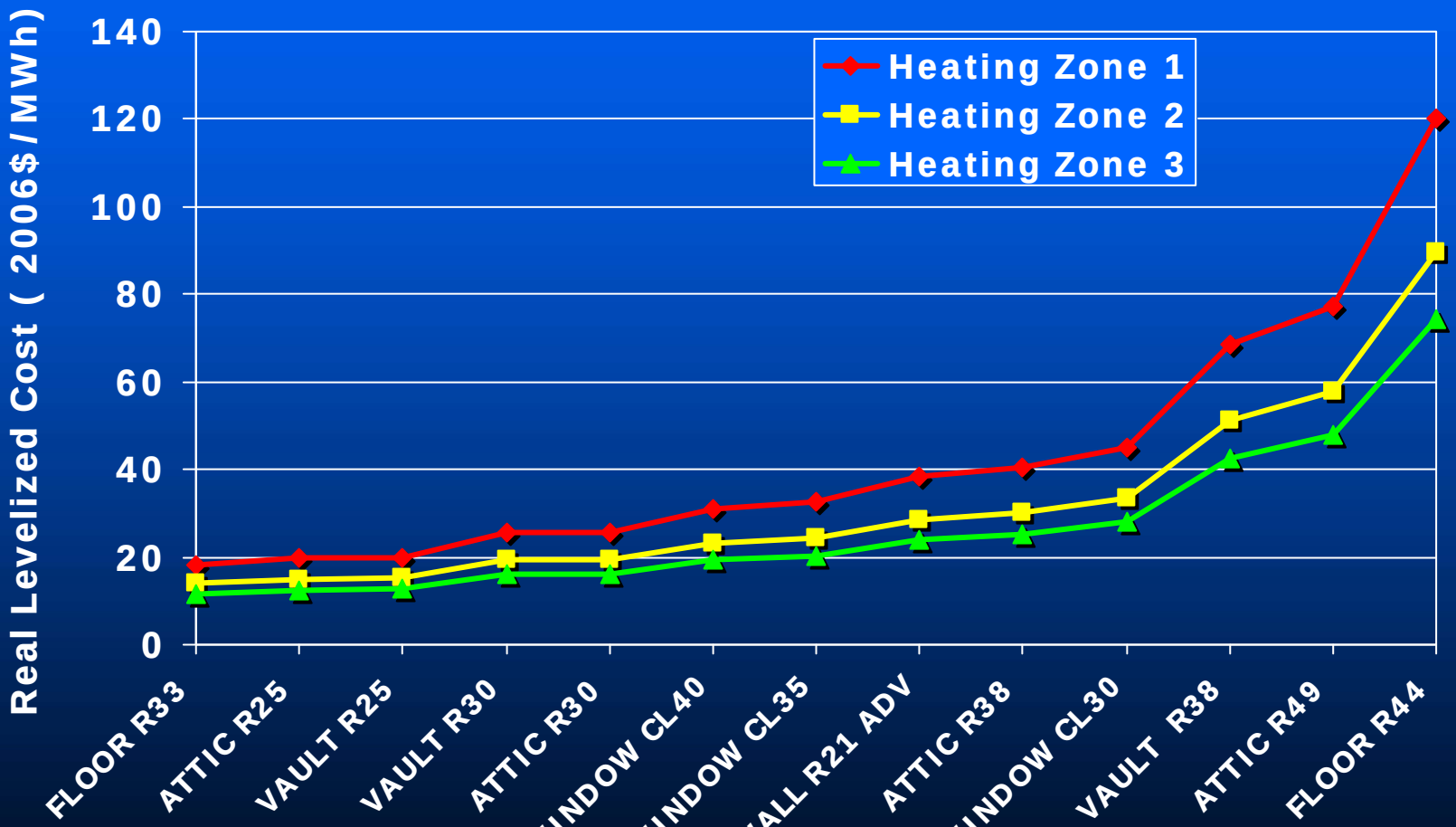
Steps 1 & 2
Assessment of "Unit Level" Technical and Economic Potential

Example: Residential Space Heating for New Manufactured Homes



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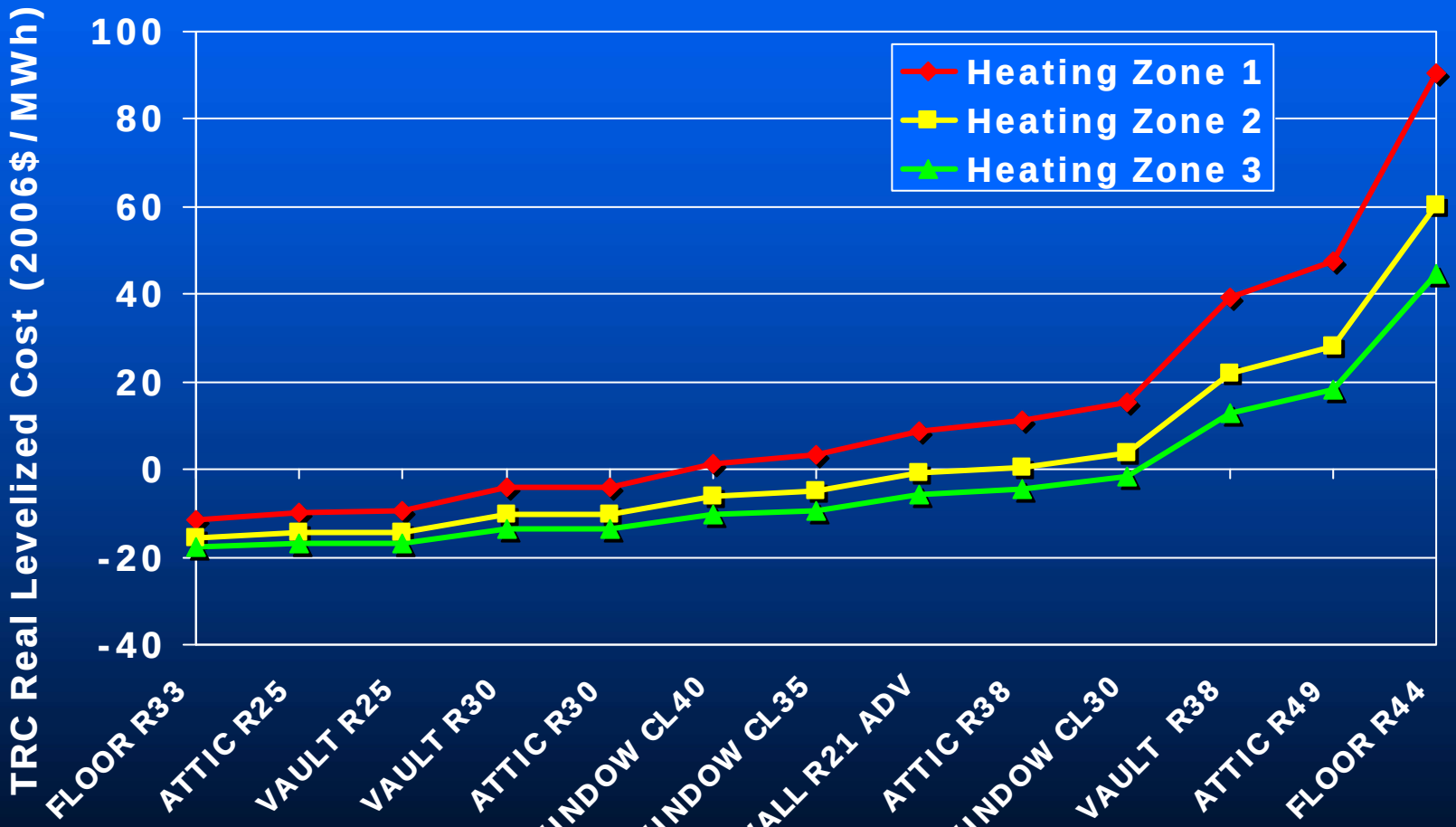

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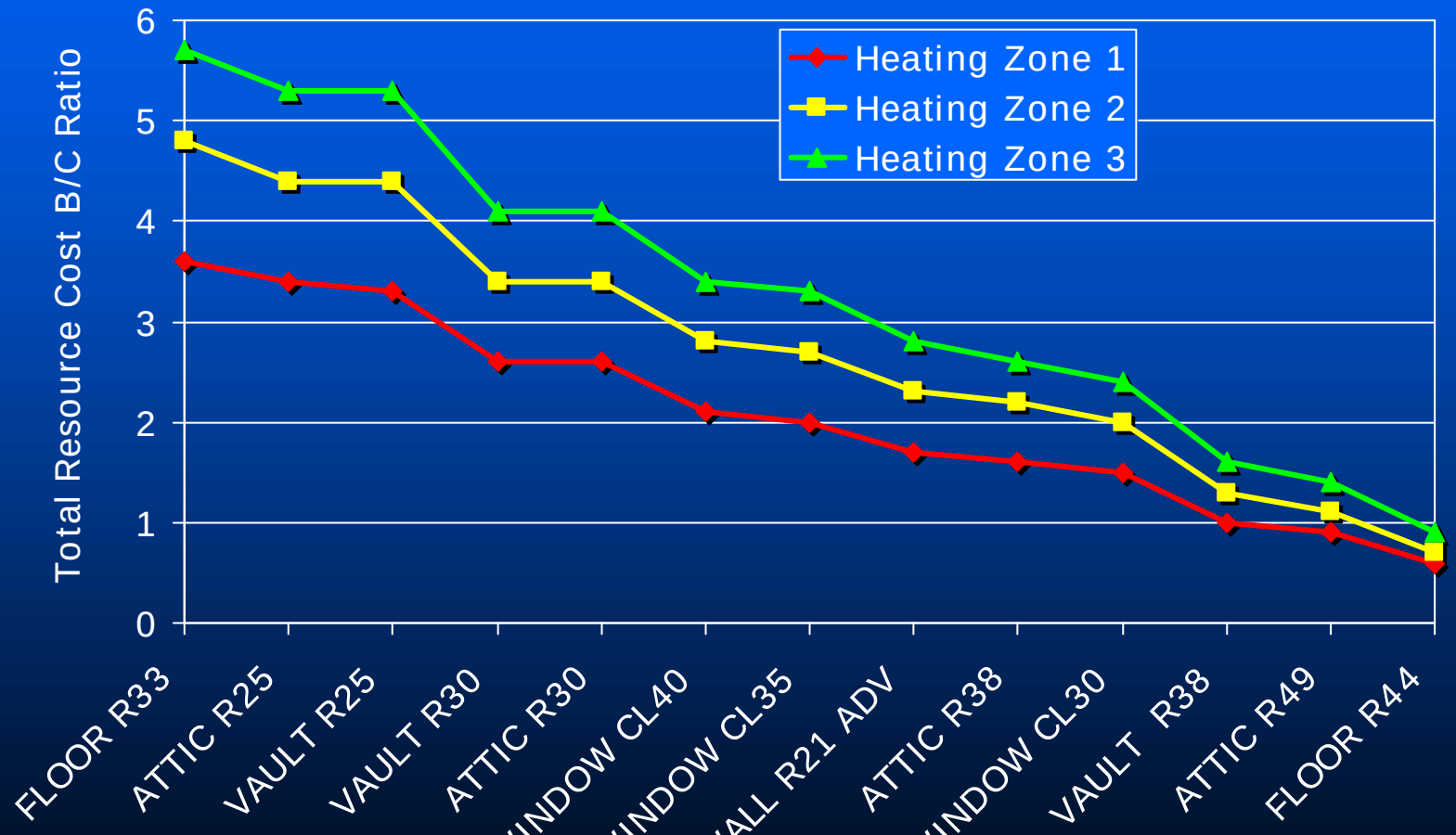


Steps 3 - Estimate of the Number of Applicable Units

Example: New Manufactured Housing

- ***Number of New Electrically Heated Units Sited in PNW by 2030*** = 100,000 (Forecast model estimate)
- ***Location*** (Based on 2005 sales data)
  - Heating Zone 1 = 64 %
  - Heating Zone 2 = 27 %
  - Heating Zone 3 = 9 %
- ***Frozen Efficiency Use*** @ 2005 "Current Practice" = 7600 kWh/year (Characteristics based on survey data from manufacturers & use based on simulation model calibrated to end use metering)
- ***Technical Potential*** unit savings = 3200 kWh/year
- ***Economic Potential (i.e.,Cost-Effective)*** *unit* savings = 3100 kWh/year

Steps 4-6
Derive the Technical, Economical and Achievable Potential

Technical Potential =

3200 kWh/year X 1.09 line loss adjustment

X 100,000 units => 40 MW

Economic Potential =

3100 kWh/yr X 1.09 line loss adjustment

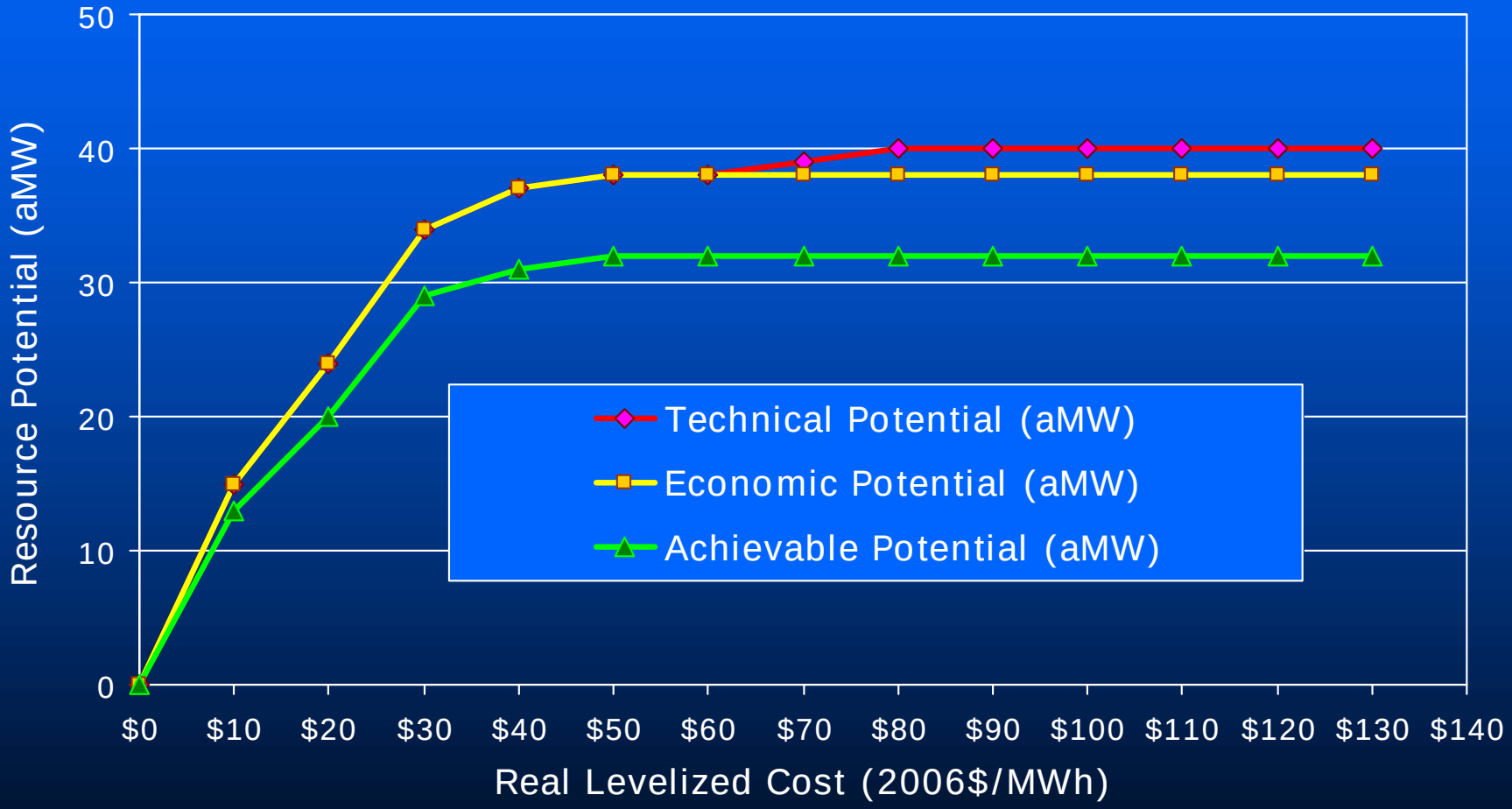
X 100,000 units => 38 MW

Achievable Potential =

38 MW X 85 % achievable => 32.5 MW

Who Made Up "That Number"?

Illustrative New Manufactured Housing Space Heating Resource Potential in 2030



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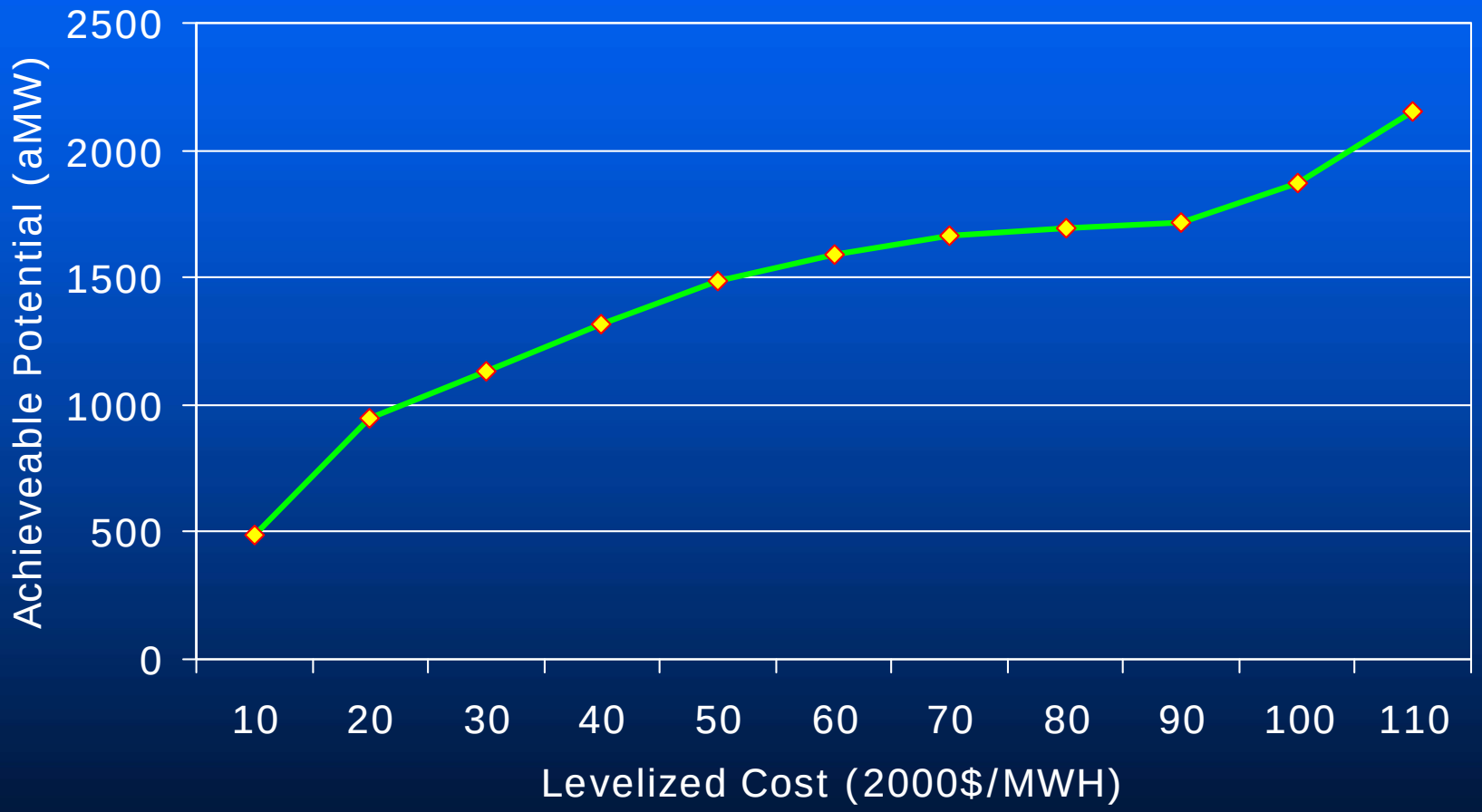
5th Plan's Non Lost-Opportunity Supply Curve



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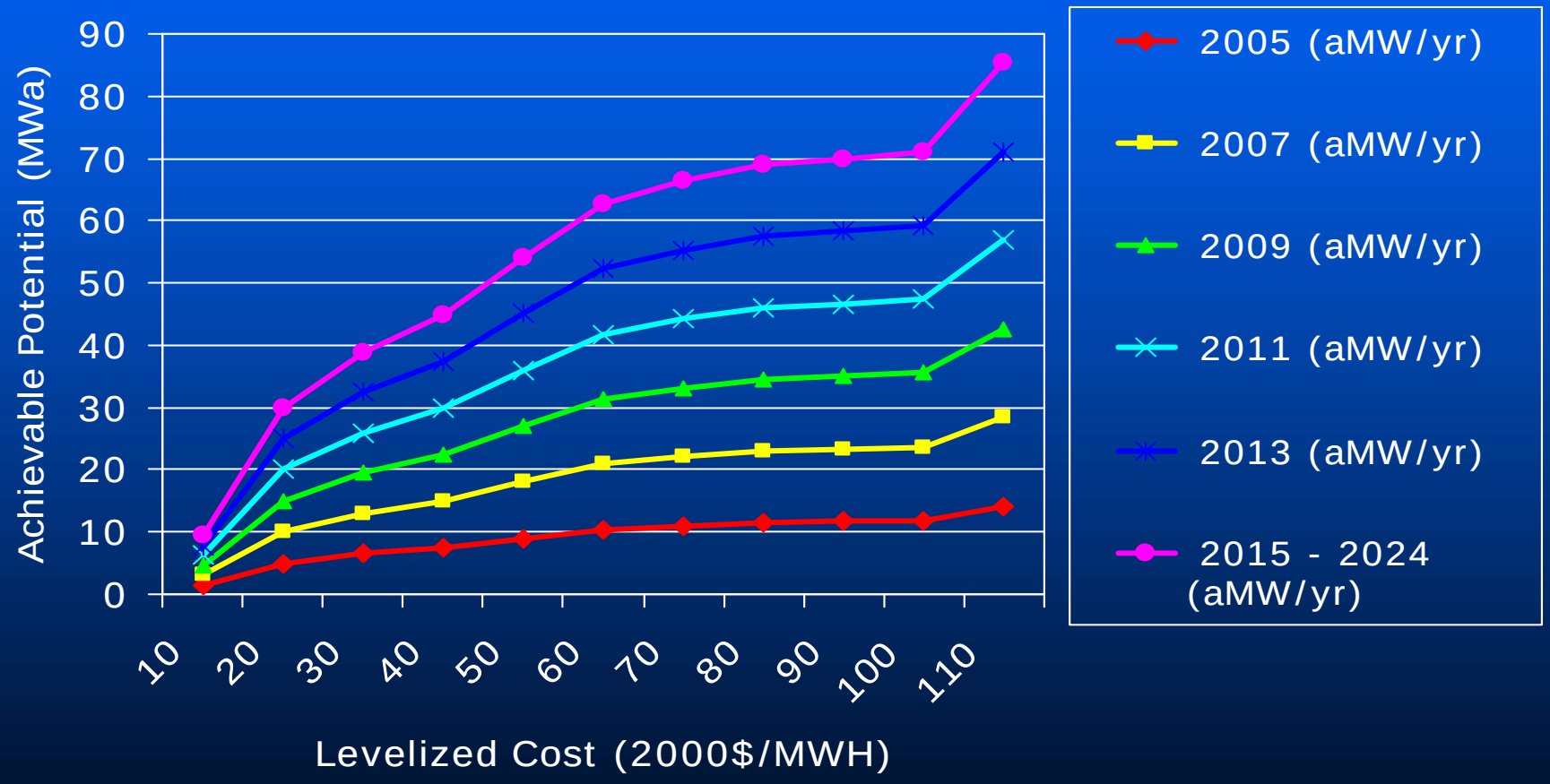
5th Plan's Lost-Opportunity Supply Curves



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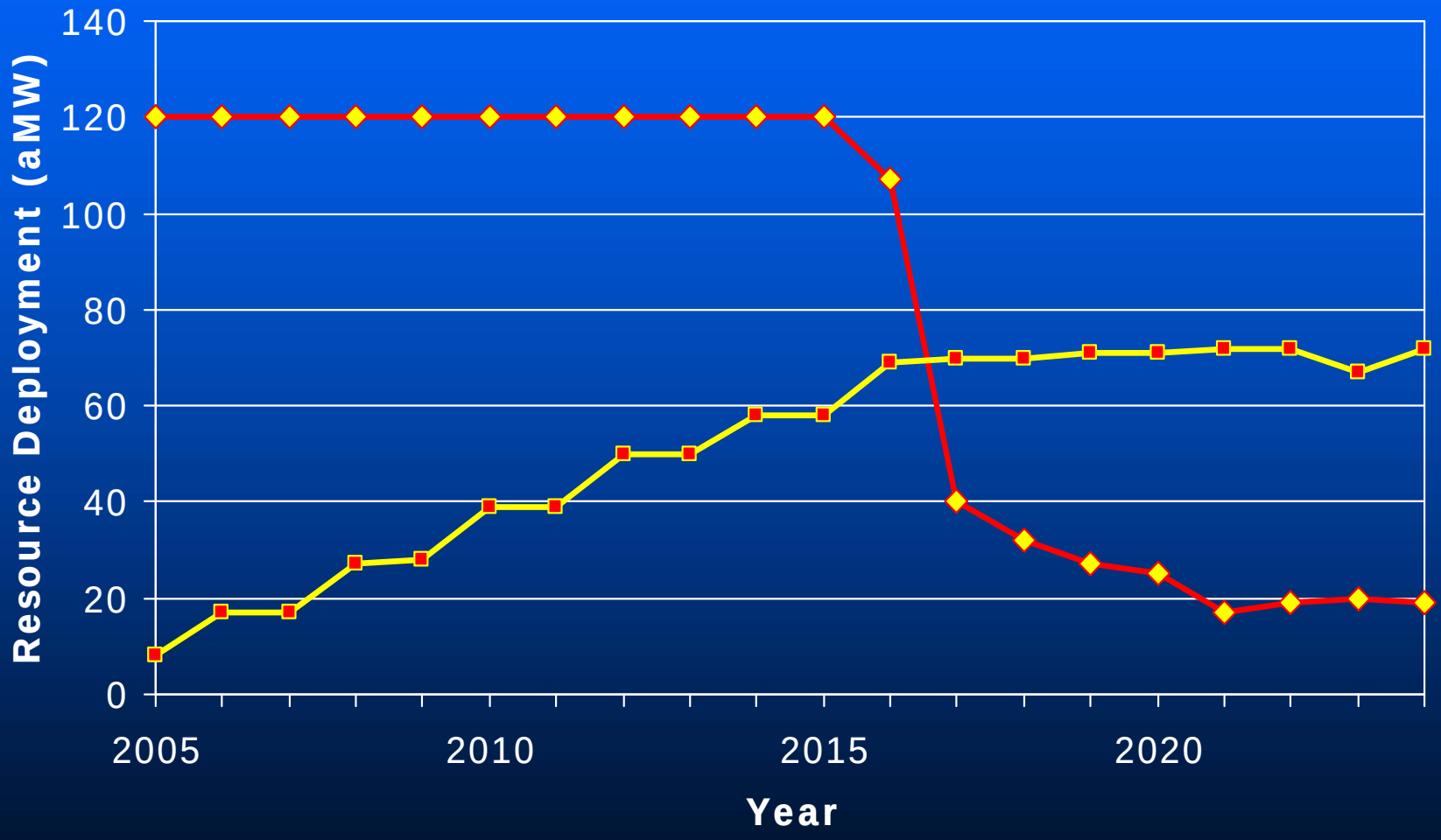
Retrofit Resources and Lost-Opportunity Resources Are Deployed Differently



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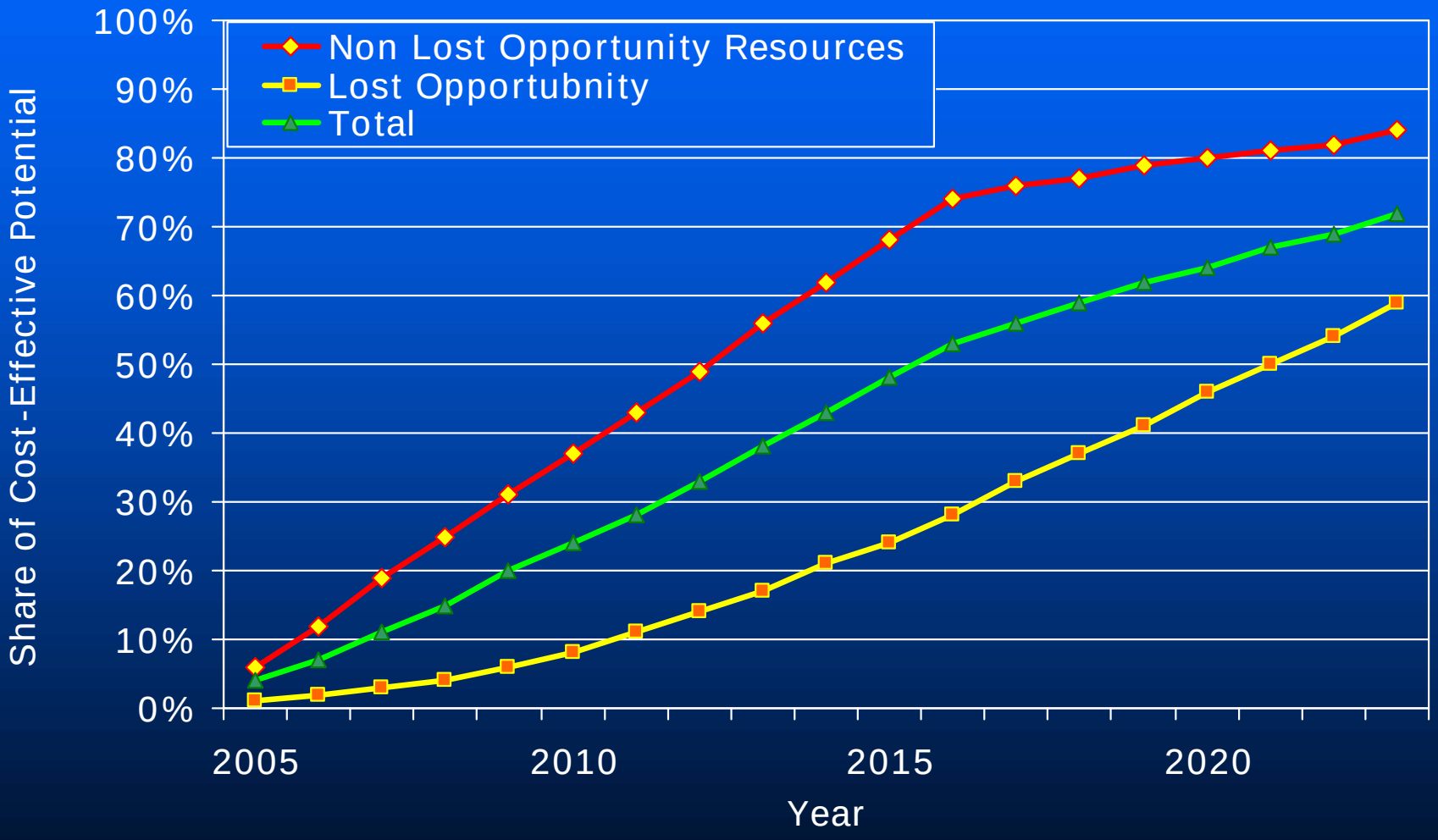
5th Plan's Achievable Potential



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Questions