RAP | Energy solutions for a changing world

Integrated Resource Planning Issues and Methods

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Topics For Discussion

- What is an Integrated Resource Plan?
- Load and Fuel Cost Forecasts
- Cost-Effectiveness
- Existing Resources
- New Generating Resources
- New Energy Efficiency Resources
- Demand Response
- Customer Generation
- Integrating Supply and Demand
- Public Involvement
- Short-term (2-5 year) Action Plan

What is an Integrated Resource Plan

- A consolidated plan, using consistent economic assumptions, that evaluates both supply and demand-side options to meet the utility's needs at the best combination of **cost**, **quality**, and **reliability**.
- It may not be the least **cost** plan.
- It may not be the lowest **environmental impact**.
- It probably should not compromise **reliability**.
- It might come out different from what you expect; embrace that thought.

Where Did the Idea of IRP Come From?

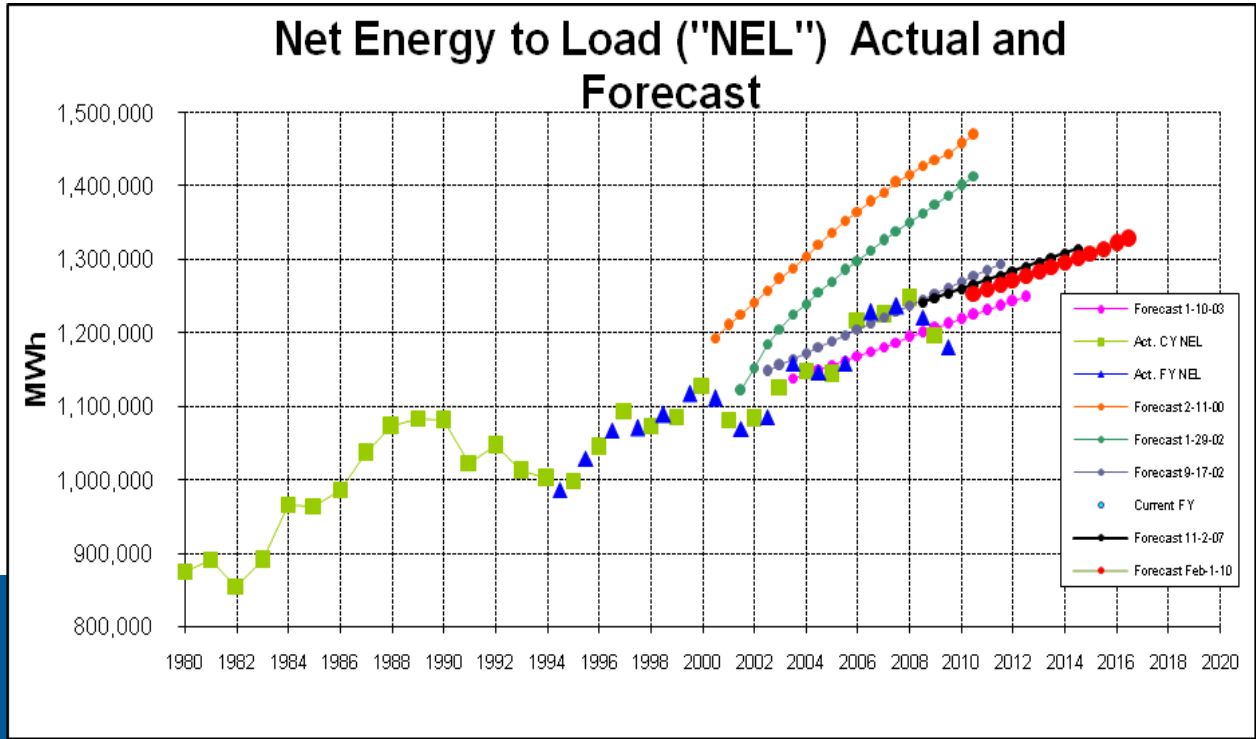
- Late 1970's
  - Huge cost overruns on coal and nuclear units
  - Delays in in-service dates created shortages
  - Price increases made energy efficiency an attractive option
- 1978 "Alternative Scenario"
- 1979 Three Mile Island accident
  - 60 nuclear units canceled

Examples of Major Decisions Guided by IRPs (of various types)

- Portland General Electric: Boardman
- Southern California Edison: Mohave
- Hawaiian Electric: Customer solar
- Northwest Power and Conservation Council: WPPSS Nuclear Units 1/3.
- California Air Resources Board: AB32 Implementation Plan

Load Forecast

- To consider a route, it's useful to have some idea where you're going.
- Forecast should explicitly consider level of energy efficiency embedded – so that incremental amounts can be determined.
- Econometric
- End-Use
- Trend



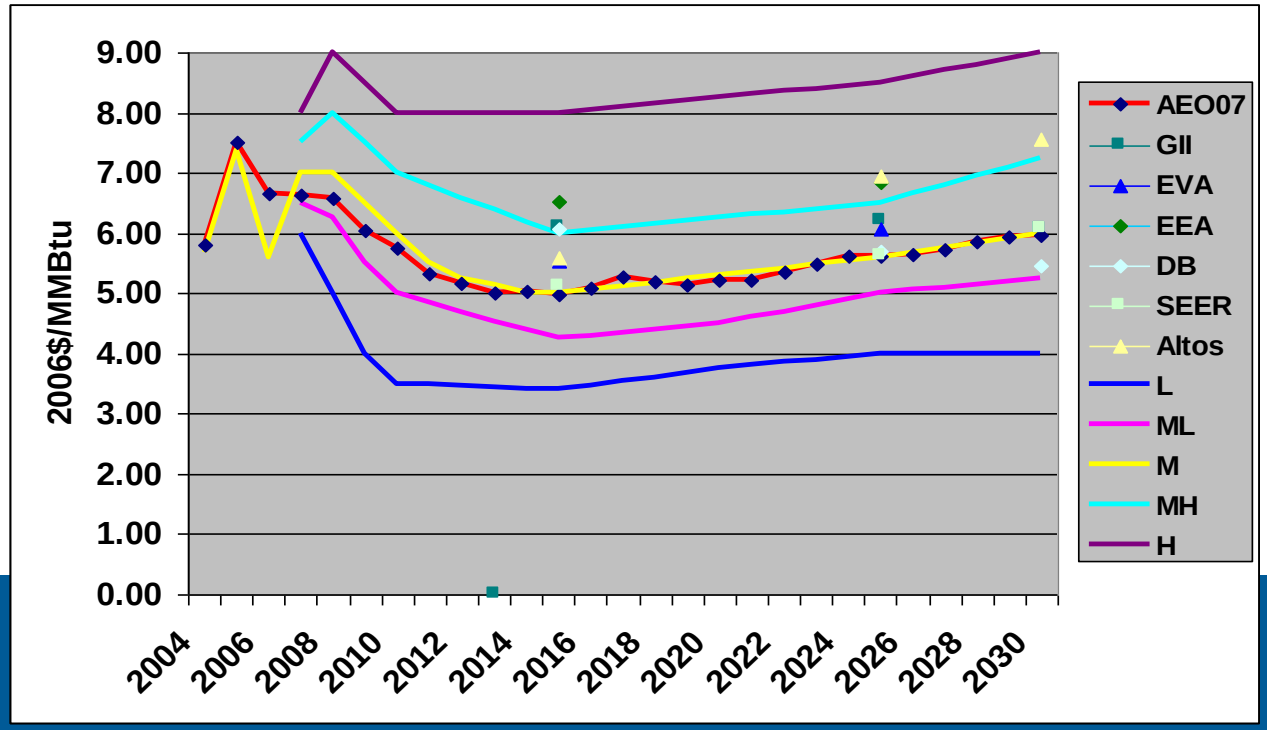
Fuel Cost Forecast

- Drives expected cost of fossil-generated energy, against which other options are compared.
- Up to 10-year futures available for gas
- Forecasts have high degree of uncertainty; so sensitivity analysis is essential.

Hedging Strategies

•Long-term contracts for coal

–Some utilities buying wells in the ground



Cost-Effectiveness Analysis

- Different resources have different cost shape over time:
  - Nuclear, Renewables, and Efficiency are capital-intensive, with low or no fuel cost
  - Natural gas is fuel-intensive, with more uncertainty as to cost.
  - Potential for future carbon regulation creates uncertainty for all fossil resources.
- Most analysts use levelized cost as the base.

Elements of Cost-Effectiveness

- Measure capital cost and financing costs
- Operation and Maintenance expense
- Fuel expense
- Emissions and potential future regulations
- Integration, Transmission, and Distribution costs
- Operating lifetime
- Load shape
  - Coal and nuclear are baseload
  - Efficiency is shaped like the load
  - Wind and solar have unique load shapes
  - Demand response may have high value

Existing Resources

- Portfolio of existing resources
  - Current capital and operating costs
  - Remaining operating lifetime
  - Potential major retrofit costs
  - Flexibility to meet changing loads, with renewable (wind) additions
  - Ultimately: measure life, retrofit costs, and levelized power cost will guide analysis of economic viability.
- Are any at severe risk?

New Generating Resources

- Develop a portfolio of potential new generating resource options
- New fossil generation
- Nuclear??
- Central station renewables
- Distributed renewables
- Combined heat and power
- Include costs of construction, operation, emissions, interconnection and integration, transmission, distribution, and uncertainties

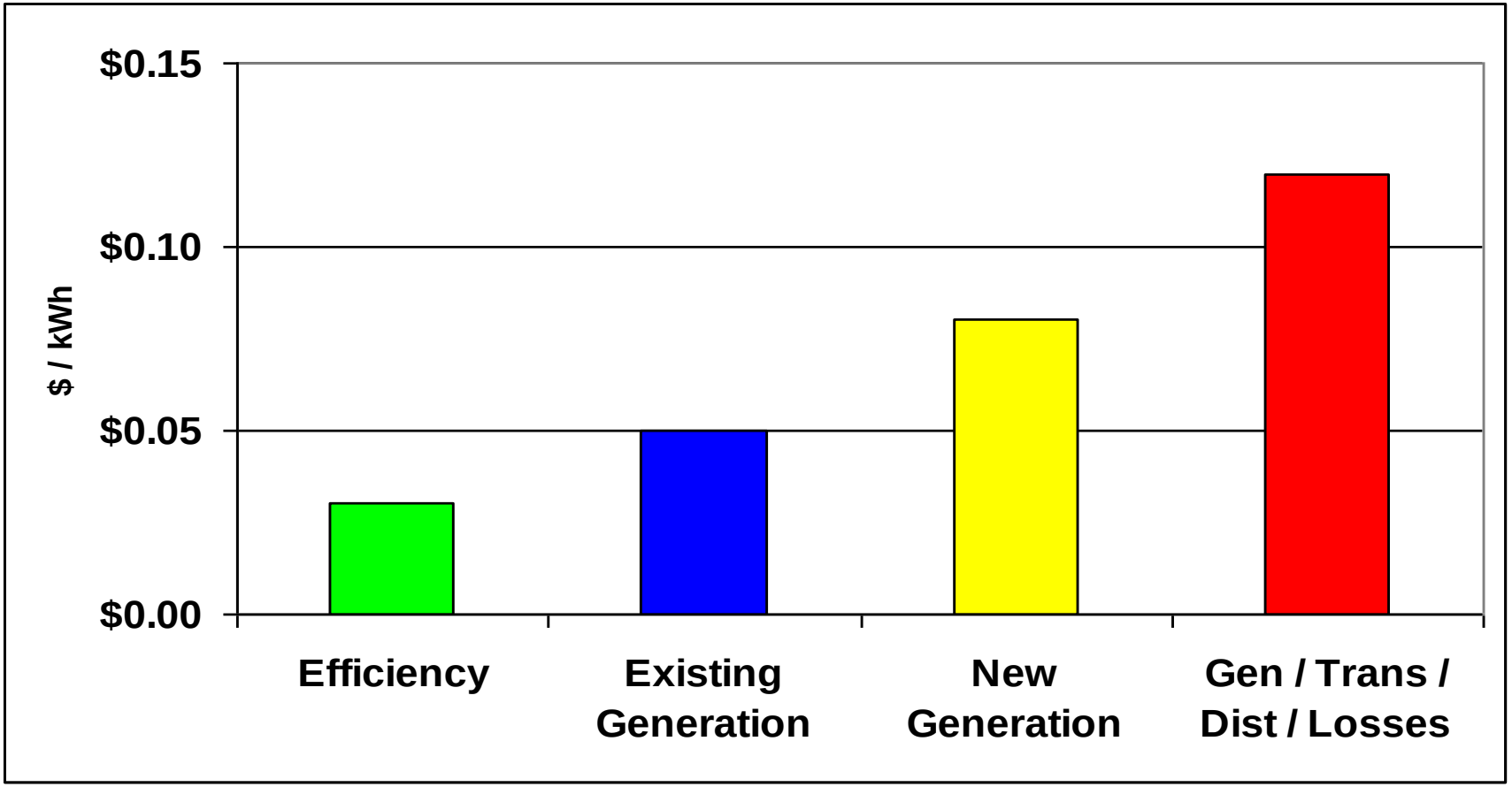
New Generating Resources: Be Pragmatic

- Given LCRA contract, PEC has limited reason to develop large central generation.
- Small units, providing network support, may be a viable consideration.
- Most likely PEC-built generation will be renewables, probably in cooperation with other utilities.

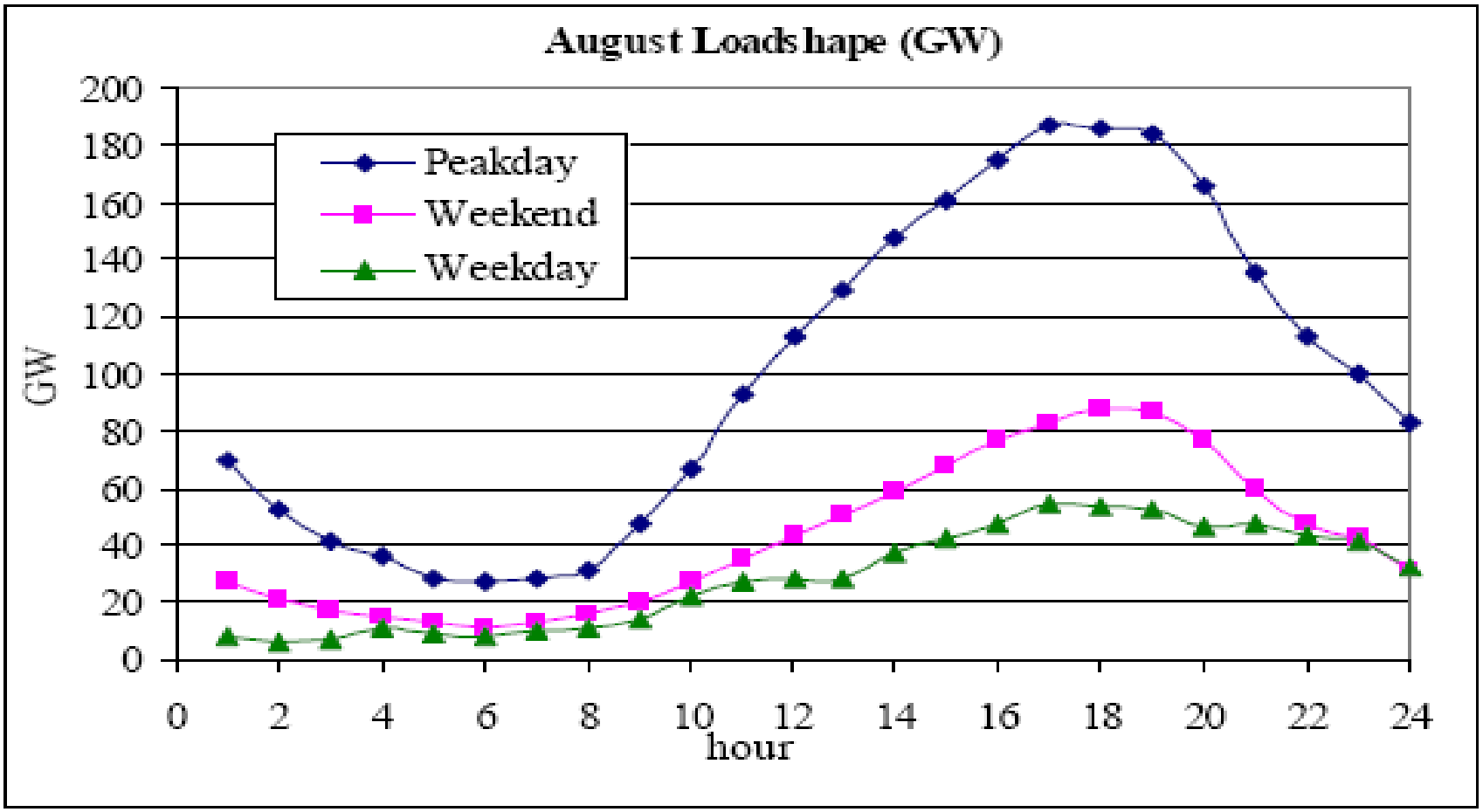
New Energy Efficiency Resources

- Frontier study is forthcoming.
- Most flexibility with the LCRA contract to use Energy Efficiency (EE) to support growth and/or displace fossil energy.
- Load shape of EE is very important in valuing EE in the IRP:
  - On average, shaped like system load
  - Many resources with favorable load shape
  - Some, like security lighting, are off-peak

EE Is the Low-Cost Resource
Mature Programs Costing $.03/kWh

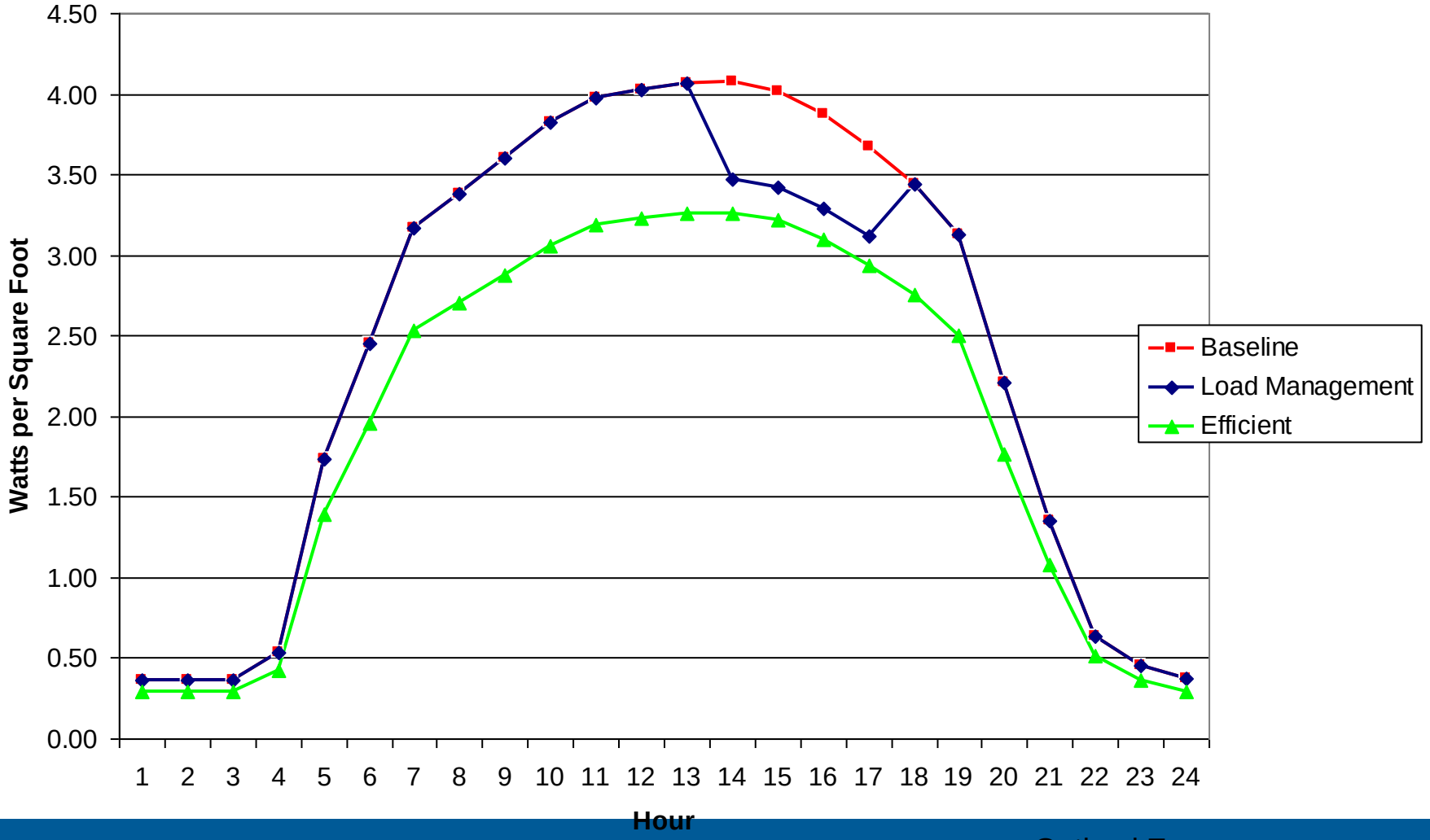


Air Conditioning: The Most Extreme Load Shape



Source: LBNL Report 52235

Combined Commercial Cooling and Lighting Loadshape
Baseline, Load Management (STDR), and Energy Efficiency



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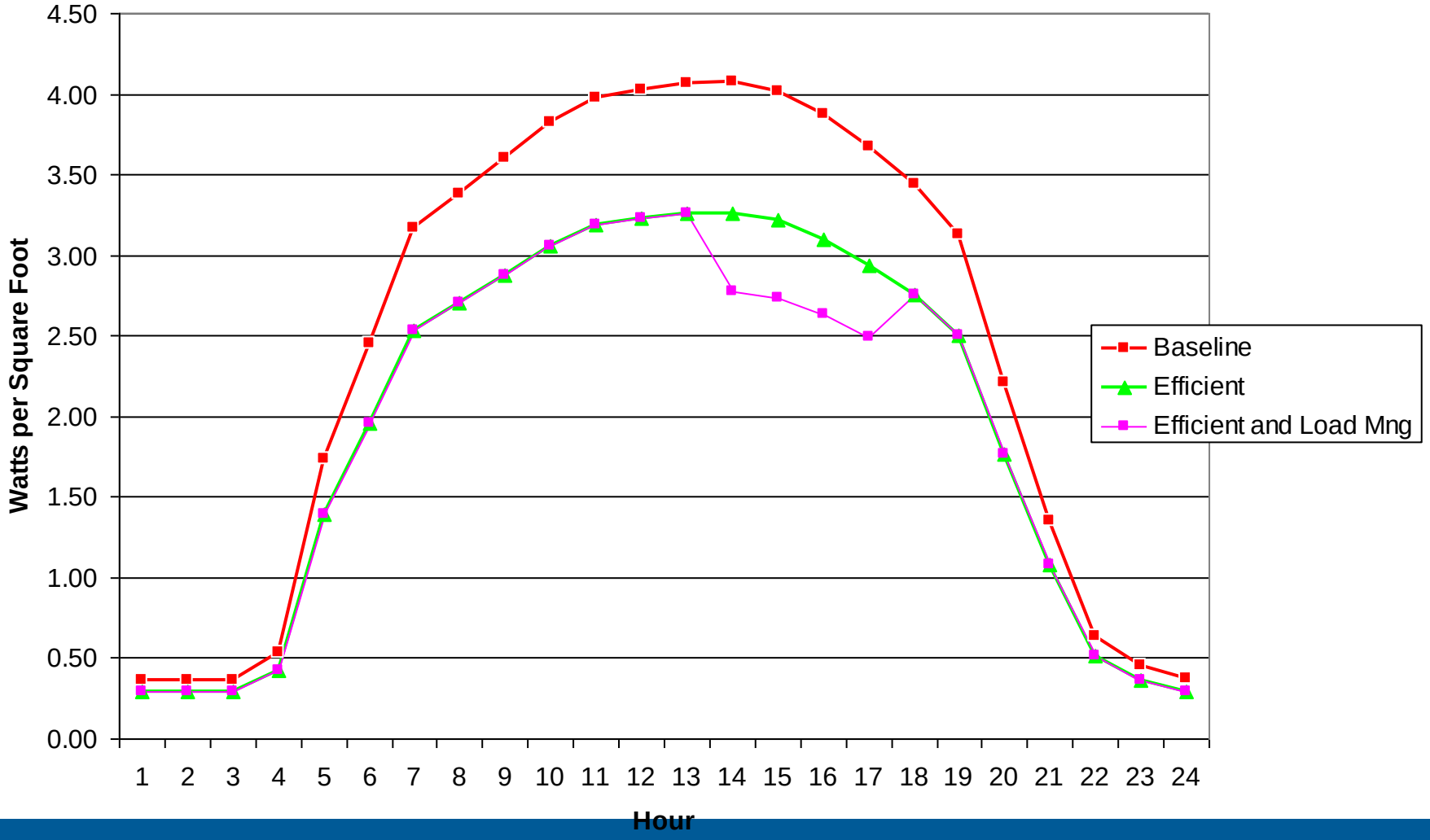
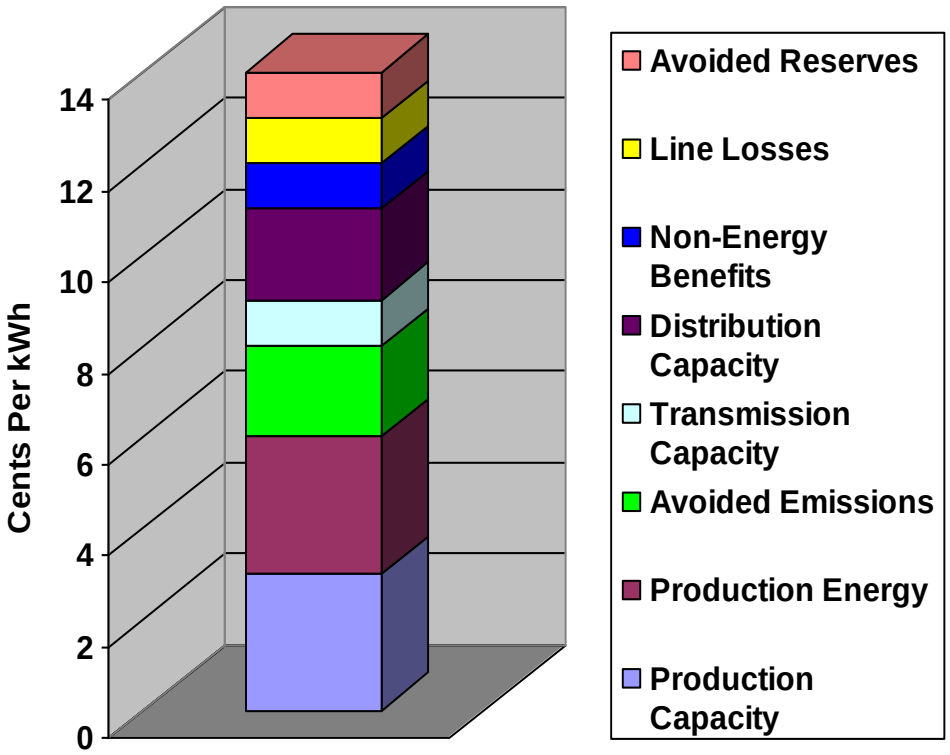


Energy Efficiency Has Many Benefits

- Production Capacity
- Production Energy
- Avoided Emissions
- Transmission Capacity
- Distribution Capacity
- Non-Energy Benefits
- Line Loss Reduction
- Avoided Reserves



Demand Response (DR)

- Demand Response provides short-term load relief at time of system strain.
- Can help avoid expensive, seldom-used peaking units.
- The lower the system load factor – or the circuit load factor – the more that Demand Response may help.
- Marginal line losses at time of system peak can reach 20% or more.
- Can be targeted to the specific circuits where load relief is essential.
- Air conditioner cycling is probably the primary alternative
  - How much can you get?
  - How much will it cost?

Customer Generation

- Mostly wind,, PV and possibly some CHP.
- Cost-effectiveness is questionable
- Customer enthusiasm may be high
- Load shape is crucial
- Potential supply large
- Clear policy issue.
- Decide.
- Then make it easy.

RPS and EERS: Alternatives to Planning?

- Many states have adopted renewable portfolio standards (RPS) and Energy Efficiency Resource Standards (EERS)
- Examples: California, Wisconsin, Minnesota, Washington
- Do these supplant, or support IRP?
  - Where IRP not practical, good second-best
  - Where IRP is appropriate, supplement.

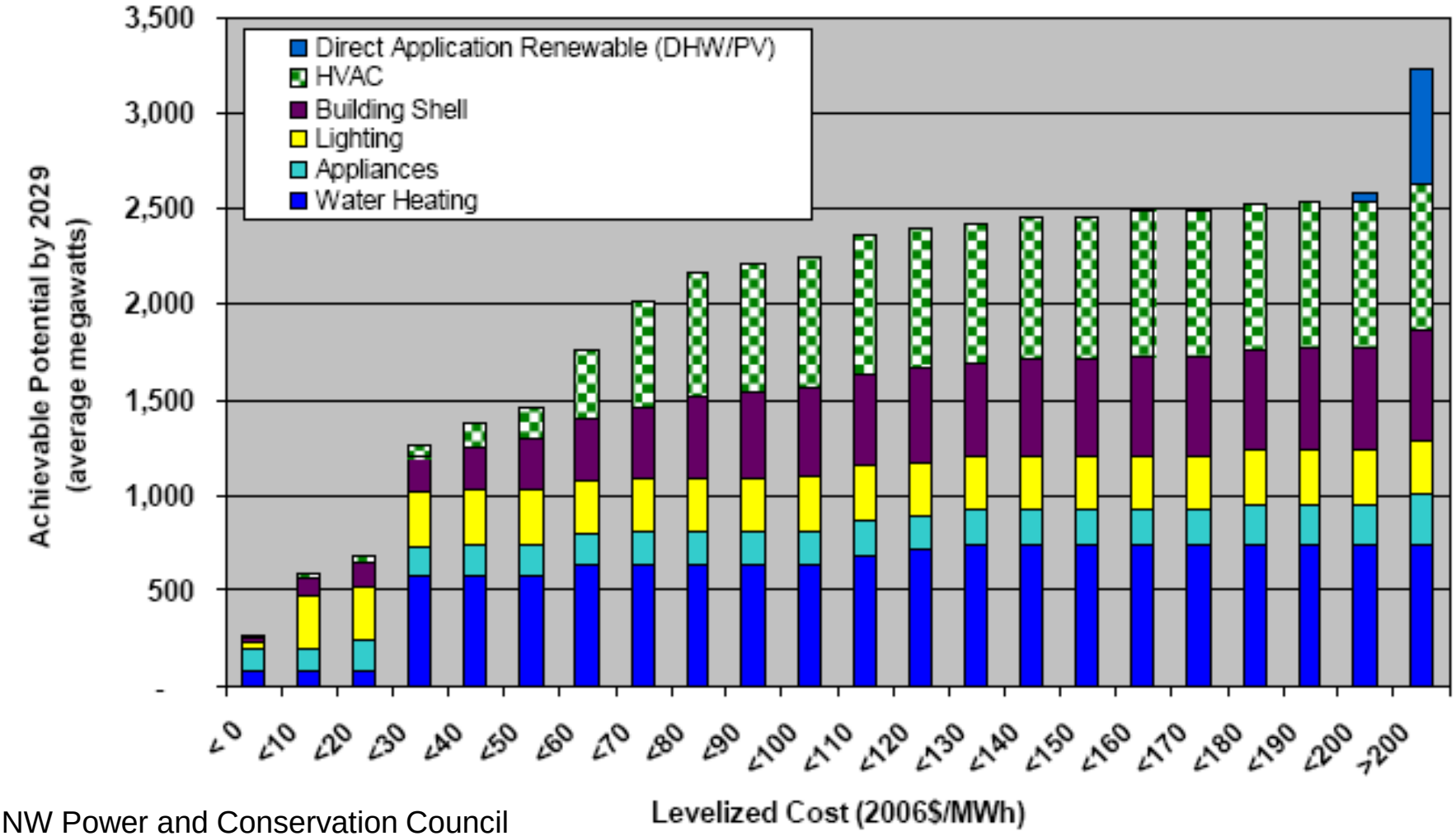
Integrating Supply and Demand

- Large utility IRPs include significant computer modeling for “portfolio optimization.”
- Risk models account for unknowables, such as economic conditions, fuel costs, and weather.
- Hundreds of resources may be examined for cost and load shape.
- Not practical for a small utility like PEC

Integrating Supply and Demand For a Small Utility

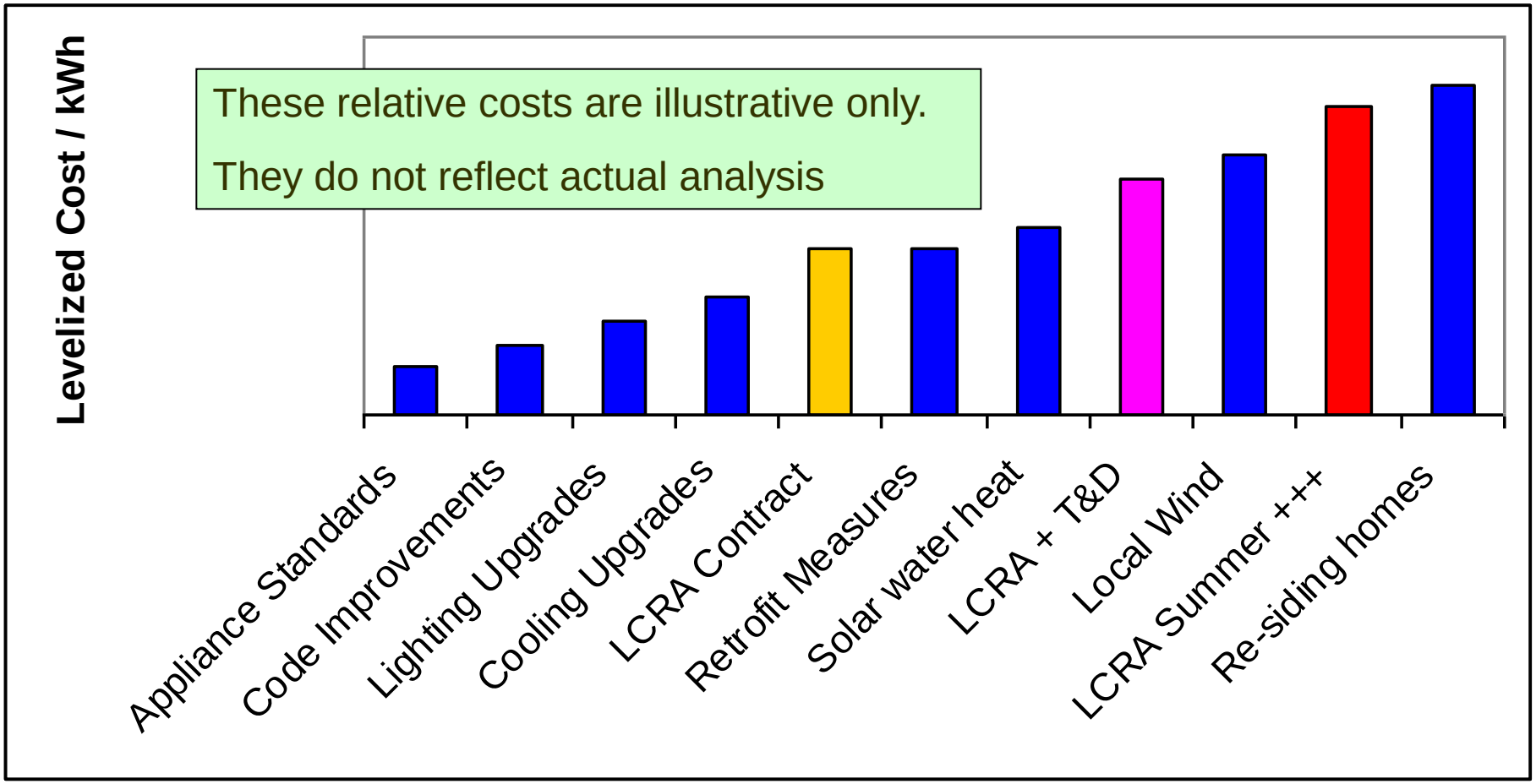
- Evaluate existing resources on a life-cycle basis, as emission retrofit and rebuild costs are inevitable.
- Evaluate potential EE and distributed resources on the same basis, including **all elements** of avoidable cost. P, T, D, Emissions, Losses
- Develop a spreadsheet model that can compare any potential resources to existing system.
- Estimate potential within the service territory
- Make some reasoned decisions.

A "Real" Residential EE / RE Conservation Supply Curve



NW Power and Conservation Council

Illustrative Resource Supply Portfolio for PEC



Public Involvement

- Your customers know things that you do not. And that your consultants do not.
- Public involvement early in the development of an IRP yields many benefits:
  - New ideas
  - Sense of what the members want
  - Sense of their willingness to sacrifice
  - Rankings of priorities: cost, environment, equity, reliability, local self-reliance

Public Involvement Program

- Public review of RFP responses before selection
- Kick-off meeting
  - Immediately followed by stakeholder meetings
- Written input early enough to influence WHAT is examined, and HOW it is examined.
- Member / stakeholder advisory group?
- Ability to review drafts before they solidify
- Public meetings prior to adoption of a plan, strategy, or policies.

Short-Term Action Plan
2 – 5 Years

- Probably the most important element of an IRP.
  - What existing resources will we retire?
  - What new resources will we build?
  - What EE and DR programs will we launch?
  - What will we ask members to do differently?
  - What options will we study for the next cycle?
  - How will we measure our success?

IRP
Policy Issues for the Board

- Financial parameters for the study
- Fuel hedging alternatives to consider
- Risk of uncontrolled shutdown of existing resources (Fayette)
- How sophisticated a risk analysis?
- PEC support for customer renewables
- IRP, or EERS/RPS?
- Public Involvement Program

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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