Demand Resources: A Consumer-Oriented Strategy for Minimizing Long Term Costs

National Energy Policy Institute
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The Regulatory Assistance Project

Vermont ♦ Maine ♦ New Mexico ♦ California ♦ Illinois

Website: *http://www.raponline.org*

About the Regulatory Assistance Project

- RAP is a non-profit organization providing technical and educational assistance to government officials on energy and environmental issues. RAP Principals all have extensive utility regulatory experience.
  - Richard Sedano was commissioner of the Vermont Department of Public Service from 1991-2001 and is an engineer.
- Funded by foundations and the US Department Of Energy. We have worked in nearly every state and many nations.
- Also provides educational assistance to stakeholders, utilities, advocates.

Can Using Less Energy Really Cost Less?

- How much of America's increasing demand for energy can be met with conservation efficiency and demand side management?
- A lot!
- All of it!
- Even more than that!
- At costs much less than new capital

Distributed Resource Attributes - EE

- **Energy Efficiency** is consistently delivered at 3 cents per lifetime kWh – a "busbar" equivalent cost that no new supply can match
  - High volume states show that this figure holds up due to economies of scope and scale enabled with bigger budgets and more comprehensive programs
  - People are increasingly used to energy efficiency and expect help through a "utility"

Limitations on Energy Efficiency

- How do utilities make money?
  - And how do they make it on EE?
- Committing to cost today to avoid large expensive assets in the future (politics)
- Measuring the absence of sales – some are skeptical, despite years of practice
- Supply-oriented conversation
  - And workforce, and codes and standards, and…

Comfort in Efficiency

- Resources from the National Action Plan for Energy Efficiency
- The way some RTOs are using energy efficiency for reliable capacity
- The local development, national security, and global environmental attributes

Distributed Resource Attributes - DR

- **Demand Response** addresses the most expensive hours, those when reliability is most threatened, or whenever curtailment is better than more usage
- Customers learn to appreciate the value of their consumption (behavioral economics?)
  - They can become operational resources, just like a peaker or load following generator
- Cost-effective now, and smart grid will make the interface better

Some DR Varieties

- Interruptible load – a reliability resource
  - No discretion, reliability resource
- Automated DR
  - Mandatory: reliability resource
  - Voluntary: price mitigation resource
- Biddable load – a price-driven resource
- Customer acts for itself or through an agent
- Policy affects ease of participation

Distributed Resource Attributes - DG

- **Distributed Generation** for customers is a huge and diverse category of different systems in different kinds of buildings
  - Policy is key to make economical DG easy
    - Net metering, interconnection, stand by rates, feed in tariff
  - Further nudging from government can build a marketplace
    - Demo project funding, tax policy, recognition

DG Varieties as Diverse as Buildings

- Combined Heat and Power
  - For industry process heat and cooling
  - For supermarkets for heating and cooling
  - For district energy systems
  - Homes?
  - Using biomass fuel
    - Growth in pellet manufacturing
    - Sustainable practices

DG Varieties as Diverse as Buildings

- Agricultural methane conversion
- Wind (up 000s of kW)
- Rooftop Solar Photovoltaic

Barriers to CHP – 1 (6th Plan Draft)

- The required return on investment of the host facility is often higher than that of a utility
- Limited capital and competing investment opportunities often constrain the host facility's ability to develop cogeneration.
- Energy savings benefits to the host facility may not be worth the hassle of installing and operating a cogeneration plant.
- Unless participating as an equity partner, the utility sees no return plus possible loss of load.

Barriers to CHP – 2 (6th Plan Draft)

- Difficulty in establishing a guaranteed fuel supply for wood residue plants.
- Uncertainties regarding the long-term economic viability of the host facility.
- The locational value of cogeneration is often not reflected in electricity buy-back prices.
- Relative complexity of permitting and environmental compliance for small plants.

Promoting CHP

- Routine surveys of potential sites
- Fully reflect costs and benefits including energy, capacity and ancillary services values, avoided T&D costs, losses and environmental effects
- Elimination of disincentives to utility acquisition of power from customer-side projects such as inability of investor-owned utilities to receive a return on investment in generation owned or operated by others, or to recover fixed costs over fewer sales
- Uniform interconnection agreements and tech stds
- Equitable standby tariffs
- Provision for the sale of excess customer-generated power through the utility's T&D system

Innovations

- Smart grid can optimize on-site generation
- Storage, perhaps located at the substation
- Solar Thermal, to fuel switch from fossil for space and water heating
- Flatbed-based turbines as temporary solutions
- Need to avoid creating air quality problems
  - Engage air regulators, establish appropriate stds

Paradigm Shift

- Electrified Transportation!!!
  - Feeding back to the grid?
  - When will it make a difference?
  - Will regulation and policy be ready for the technology?

What if there were no throughput incentive?

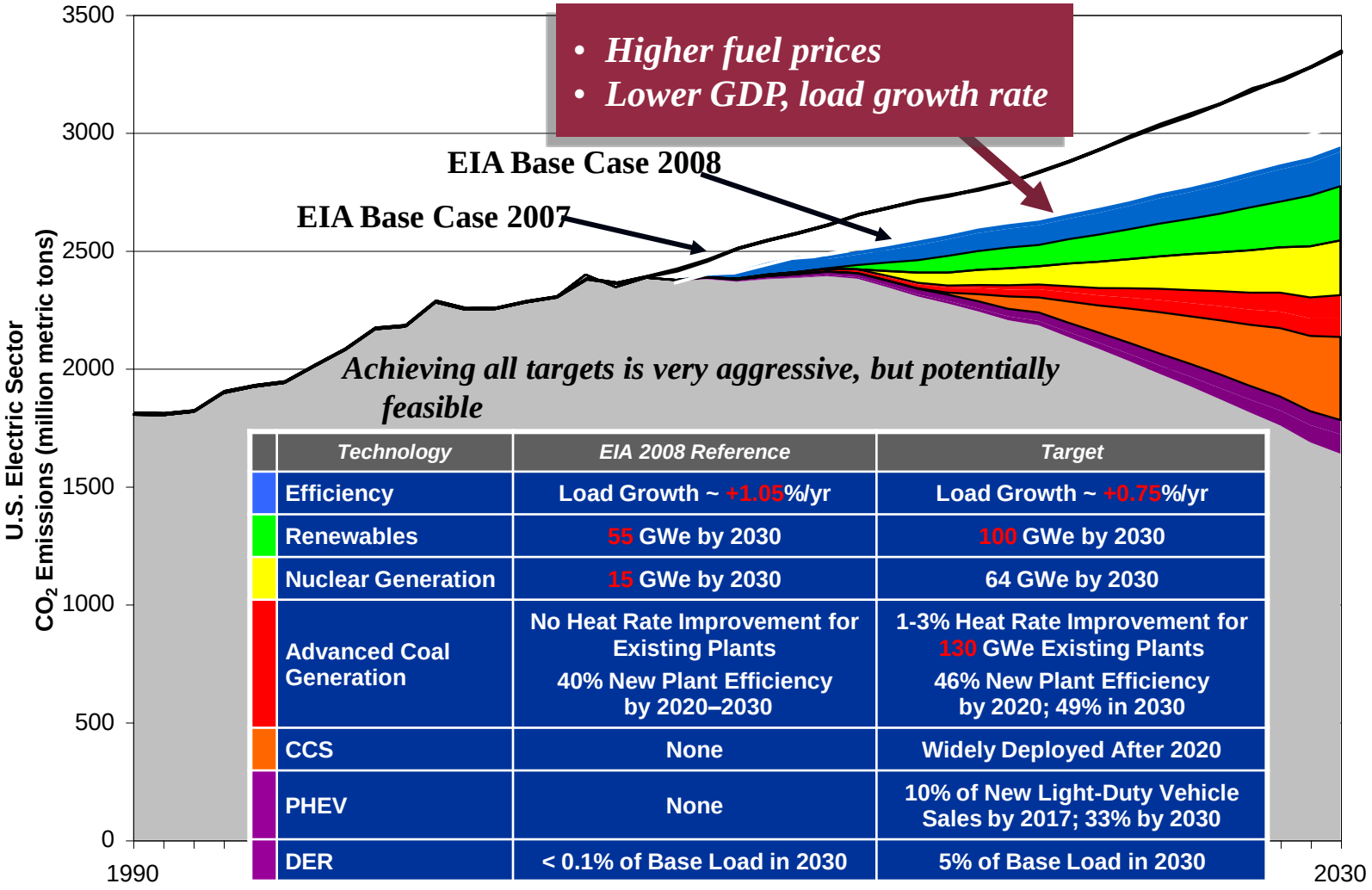
- Utilities can help customers by suggesting or encouraging integration of distributed resources in new efficient construction and remodeling
- Policy can promote building systems that go beyond regulated fuels
  - solar hot water

- All forecasts show distributed resources making a difference

Question: How Much of a Difference?

- Report from the industry:
  - EPRI PRISM
    - A recent study of how to meet future utility system resource needs
      - Thanks to EEI for the following slide

CO_2 Reductions – What's Technically Feasible?



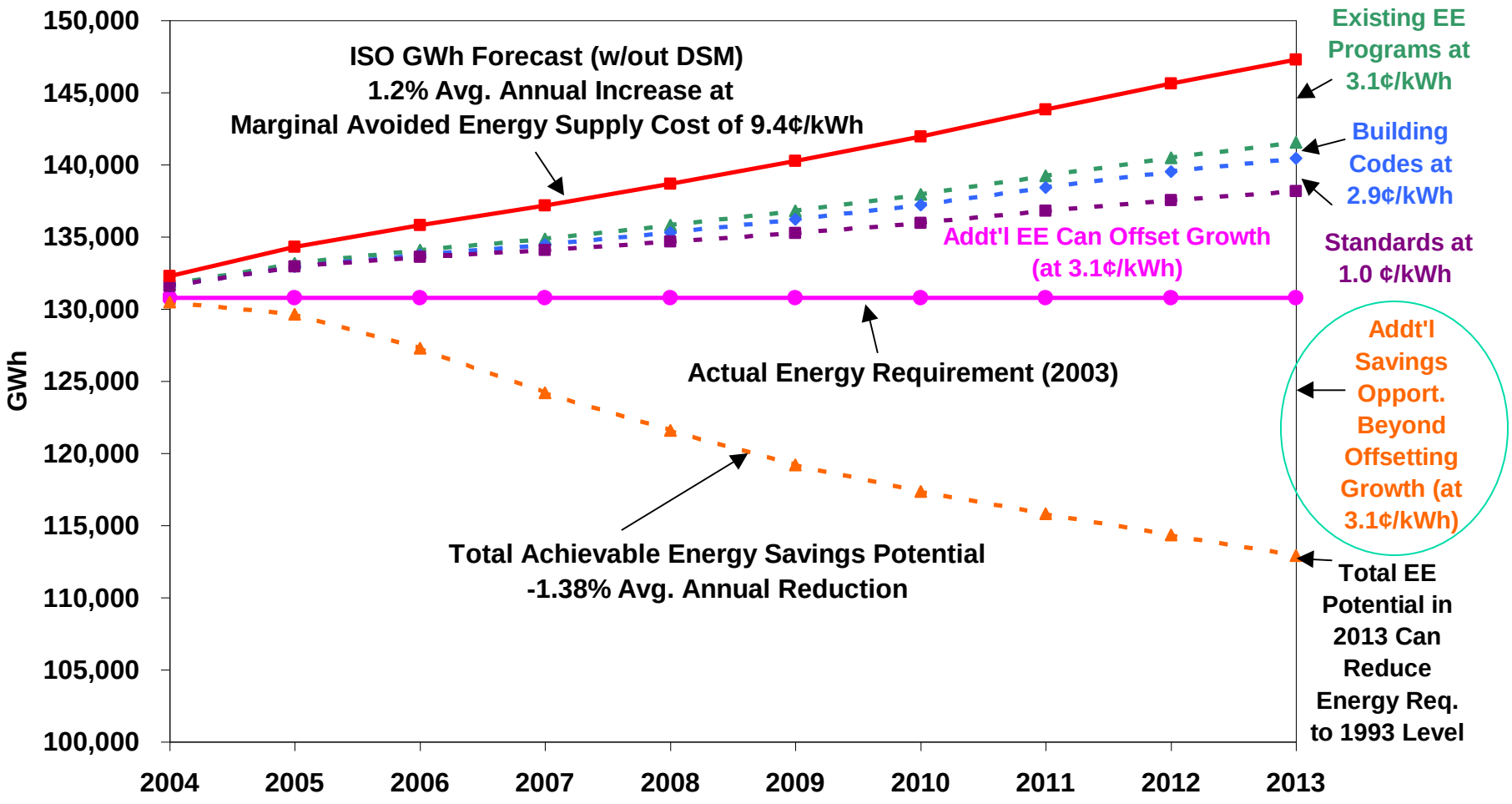
Technology	EIA 2008 Reference	Target
Efficiency	Load Growth ~ +1.05%/yr	Load Growth ~ +0.75%/yr
Renewables	55 GWe by 2030	100 GWe by 2030
Nuclear Generation	15 GWe by 2030	64 GWe by 2030
Advanced Coal Generation	No Heat Rate Improvement for Existing Plants 40% New Plant Efficiency by 2020–2030	1-3% Heat Rate Improvement for 130 GWe Existing Plants 46% New Plant Efficiency by 2020; 49% in 2030
CCS	None	Widely Deployed After 2020
PHEV	None	10% of New Light-Duty Vehicle Sales by 2017; 33% by 2030
DER	< 0.1% of Base Load in 2030	5% of Base Load in 2030

(EPRI Prism – With EIA Update)

Is that all?

- Others think the reservoir of energy efficiency savings is deeper
  - Pacific Northwest: 6th Plan says 90% of growth met by Energy Efficiency
    - Avg MW is energy, 1 MW over 8760 hours
  - Northeast Energy Efficiency Partnerships: Energy Efficiency can turn load trend negative

Existing and New EE Strategies Can Offset ISO Forecasted Energy Requirements (GWH) and Beyond



New England Achievable EE Potential

Big wins in 6th Plan

- Water heating
- Building shell
- HVAC (Res, Comm)
- Commercial lighting
- Process Energy
- Electronics
- Irrigation
- Food industries
- Pace of retrofits are big uncertainty, with big potential

Figure 4-2: Residential-Sector Achievable Conservation by Sector and Levelized Cost

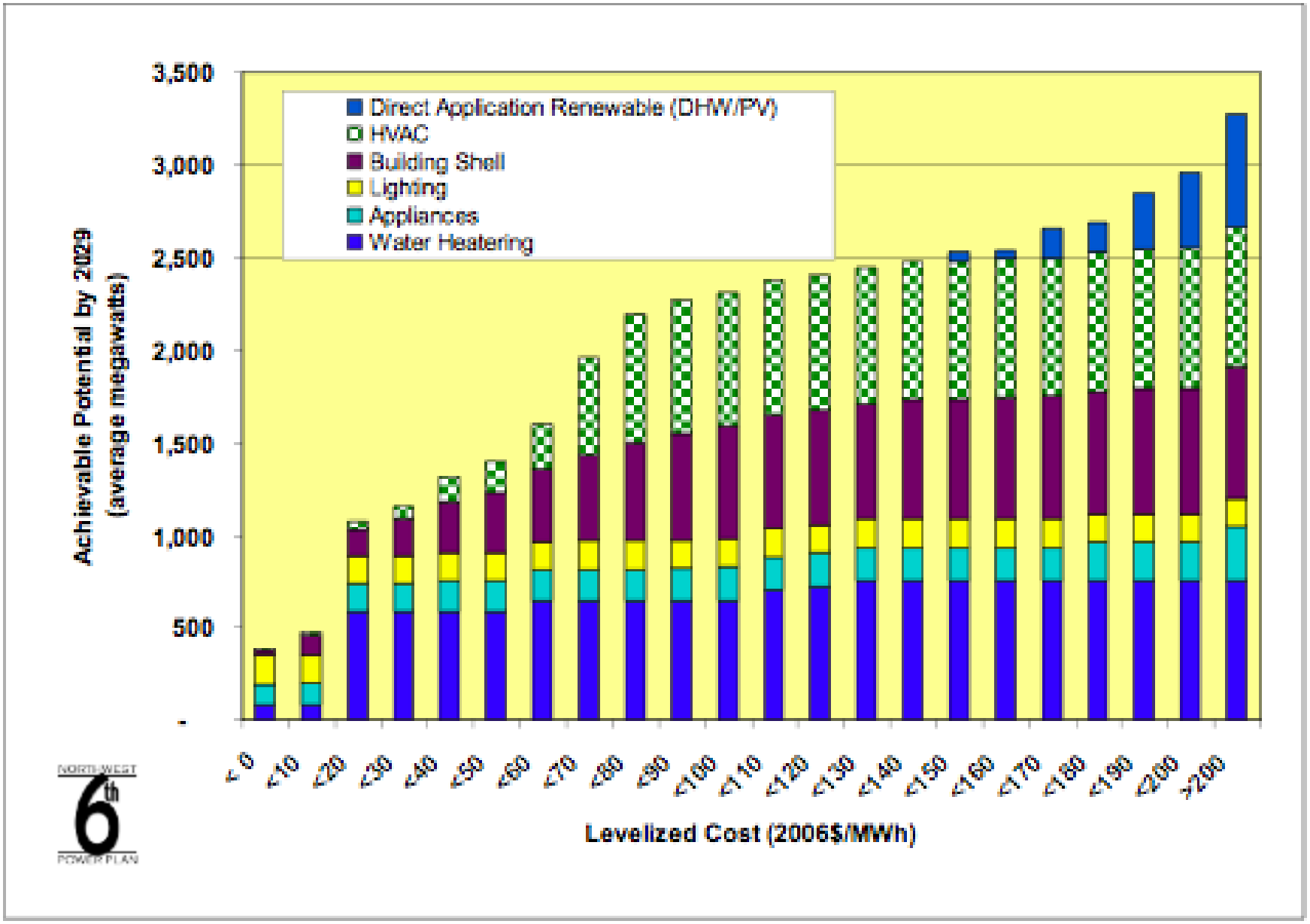


Figure 4-3: Agriculture Sector Achievable Conservation by 2030 (MWa) by Sector and Levelized Cost

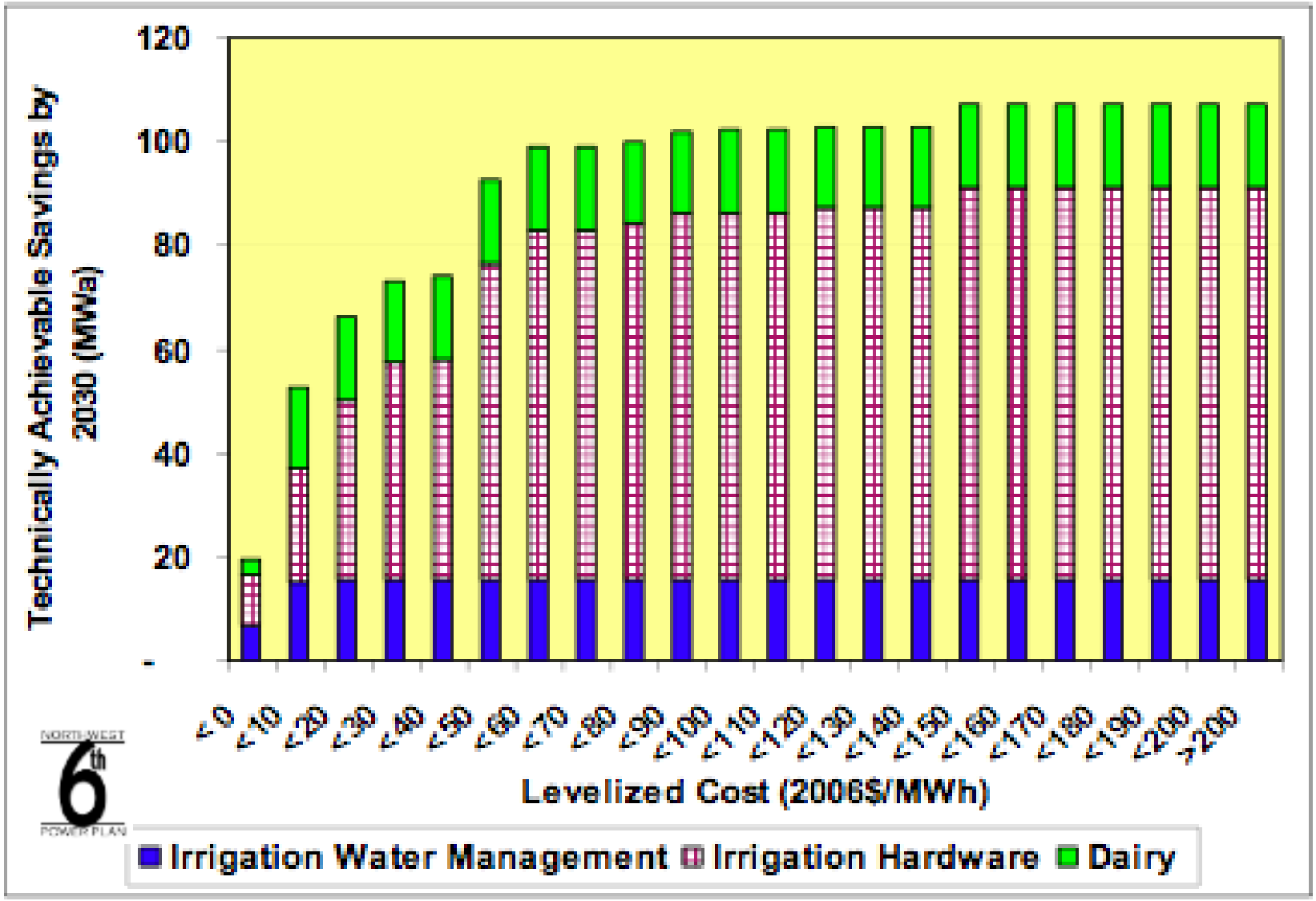


Figure 4-4: Achievable Commercial Sector Savings Potential by 2029 (MWa) by End Use and Levelized Cost

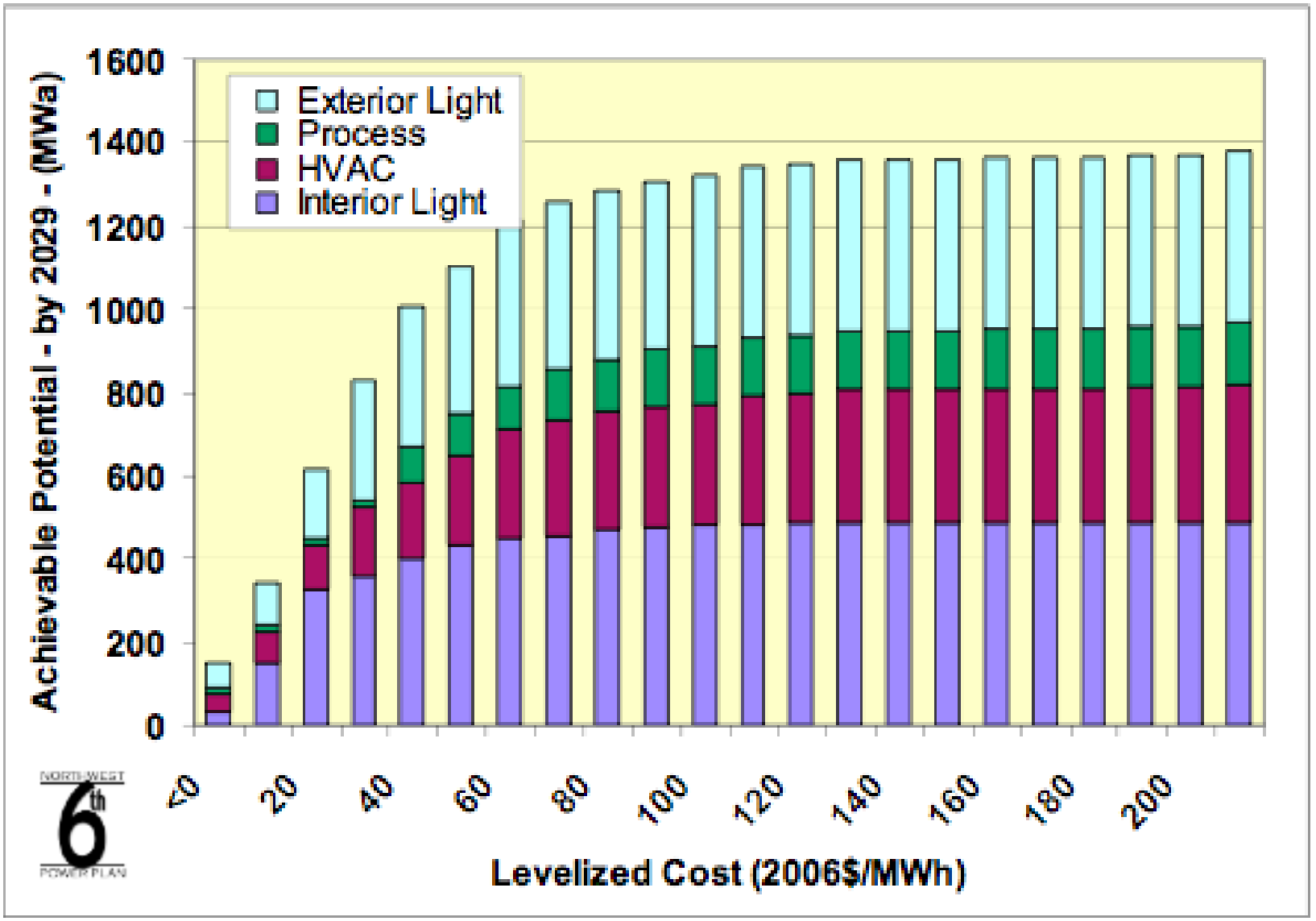


Figure 4-5: Achievable Industrial Sector Savings Potential by 2029 (MWa) by Levelized Cost

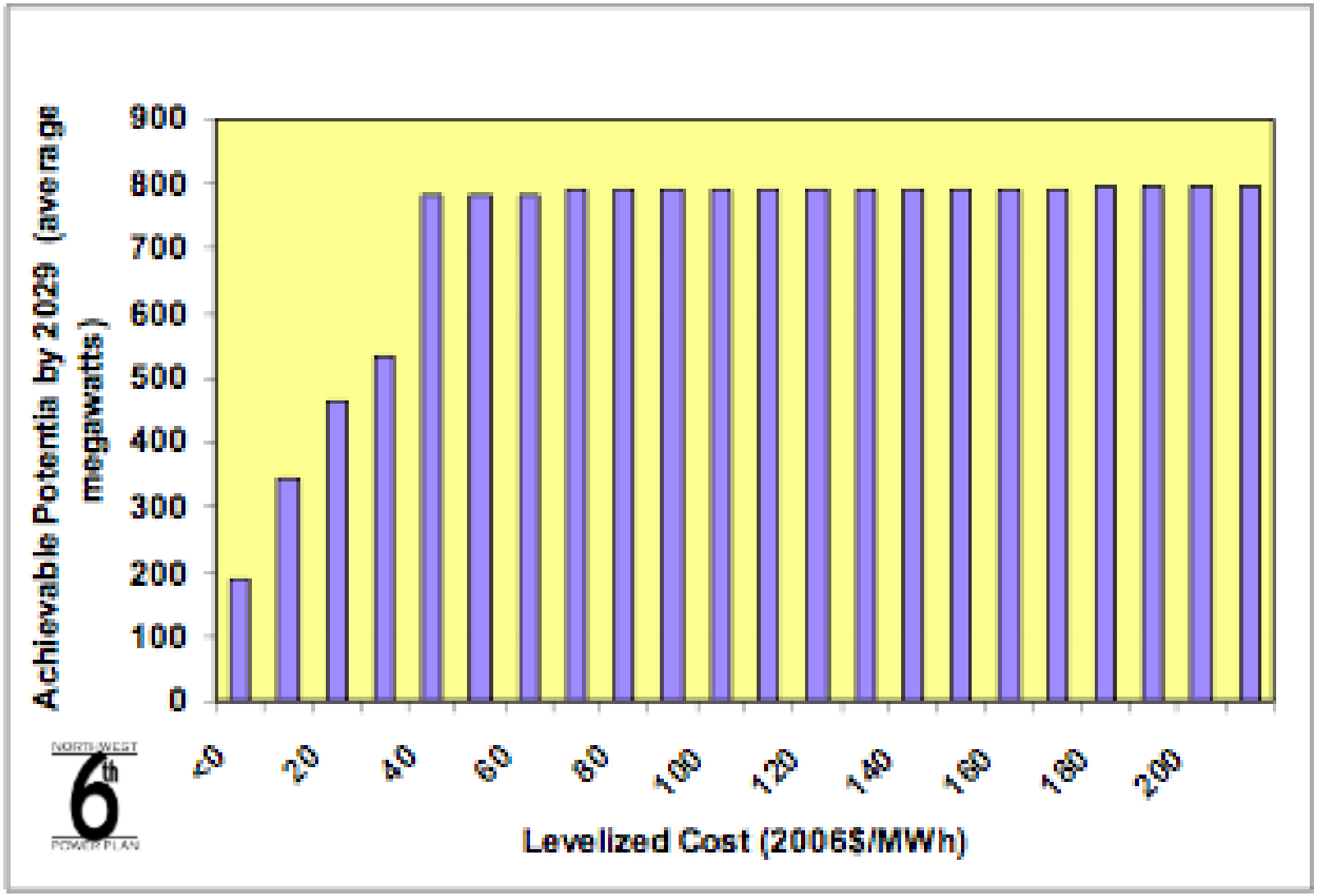


Figure 4-6: Achievable Industrial Sector Savings Potential by Industry Subsector

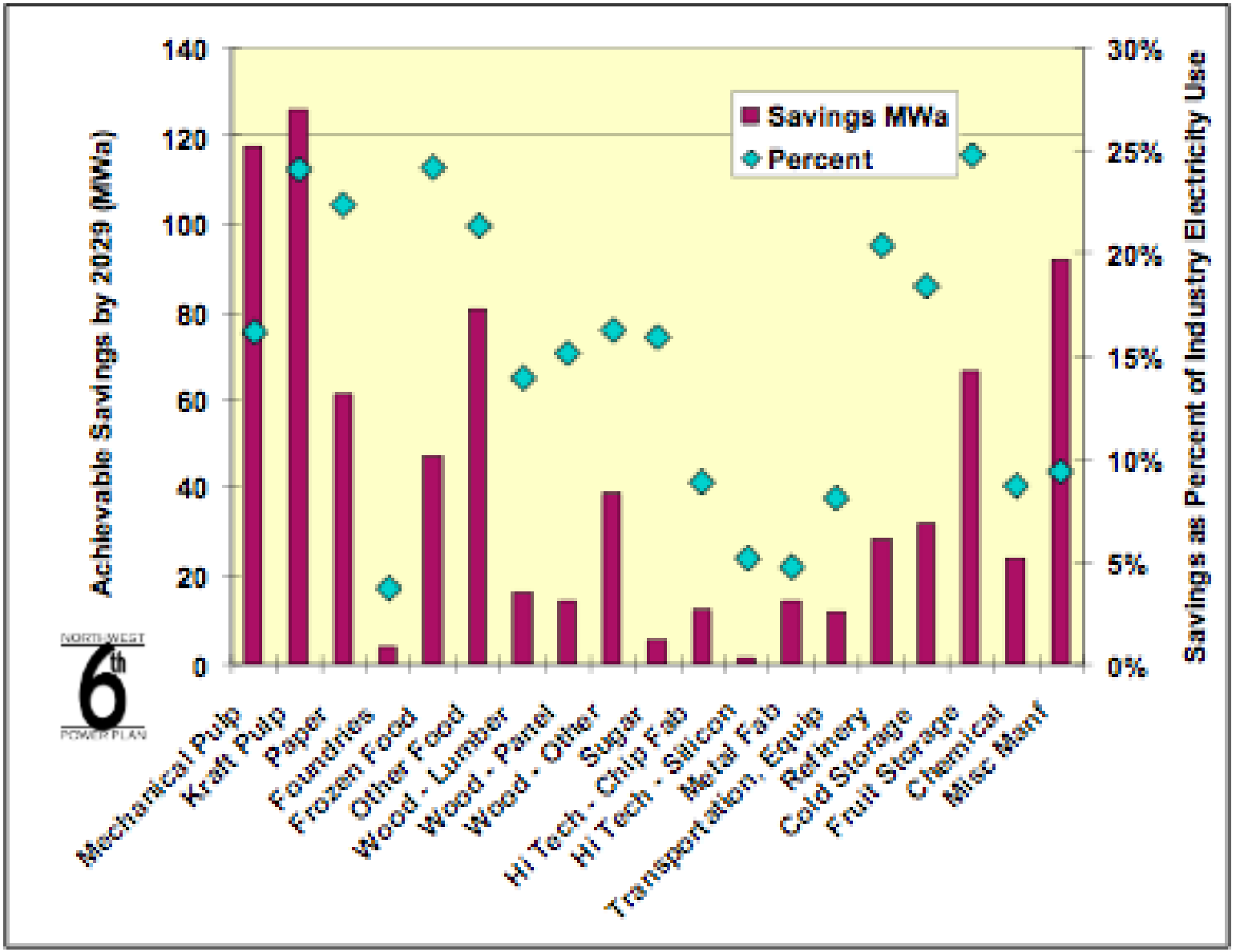


Figure 4-8: Consumer Electronics Savings Potential by Levelized Cost

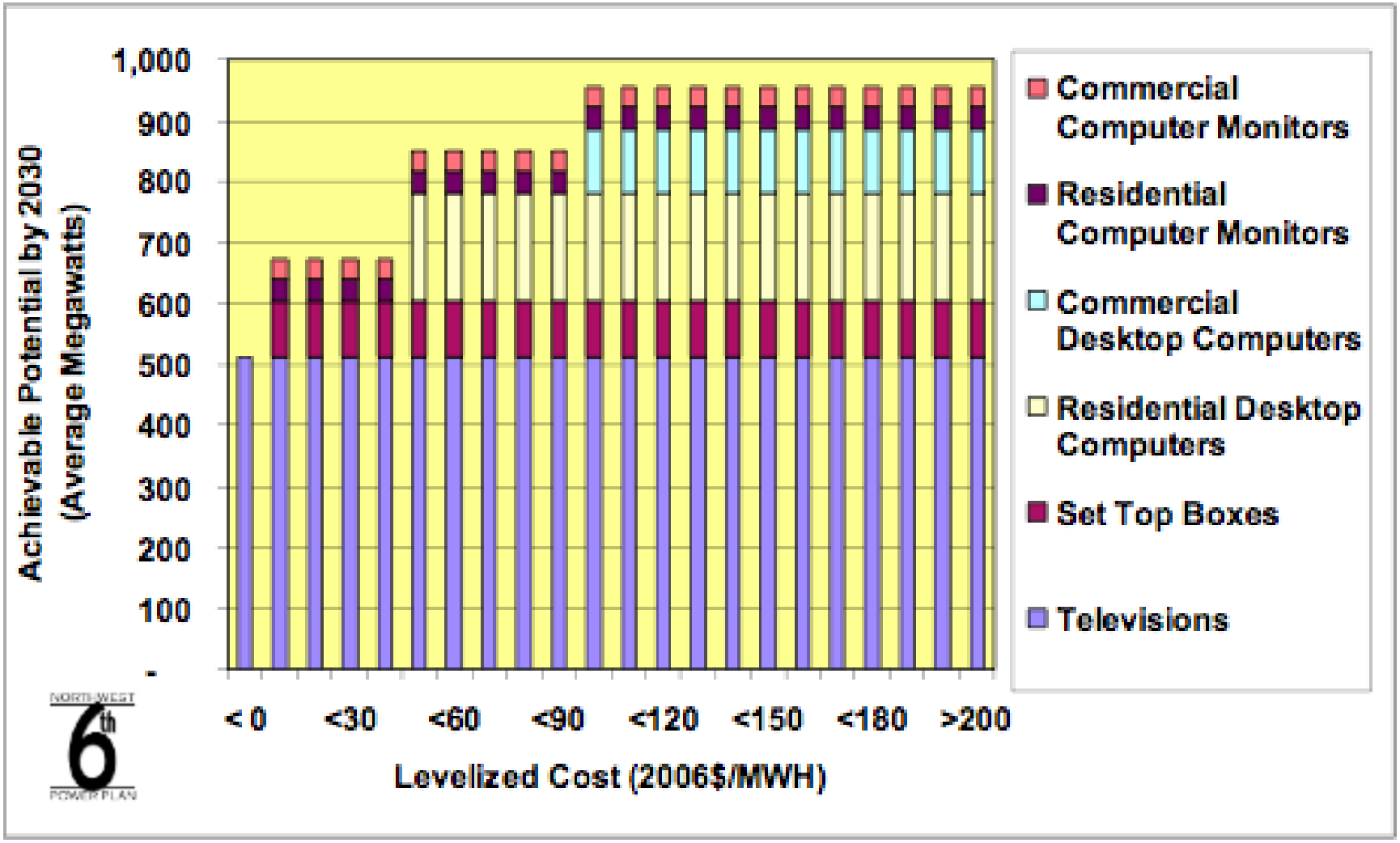
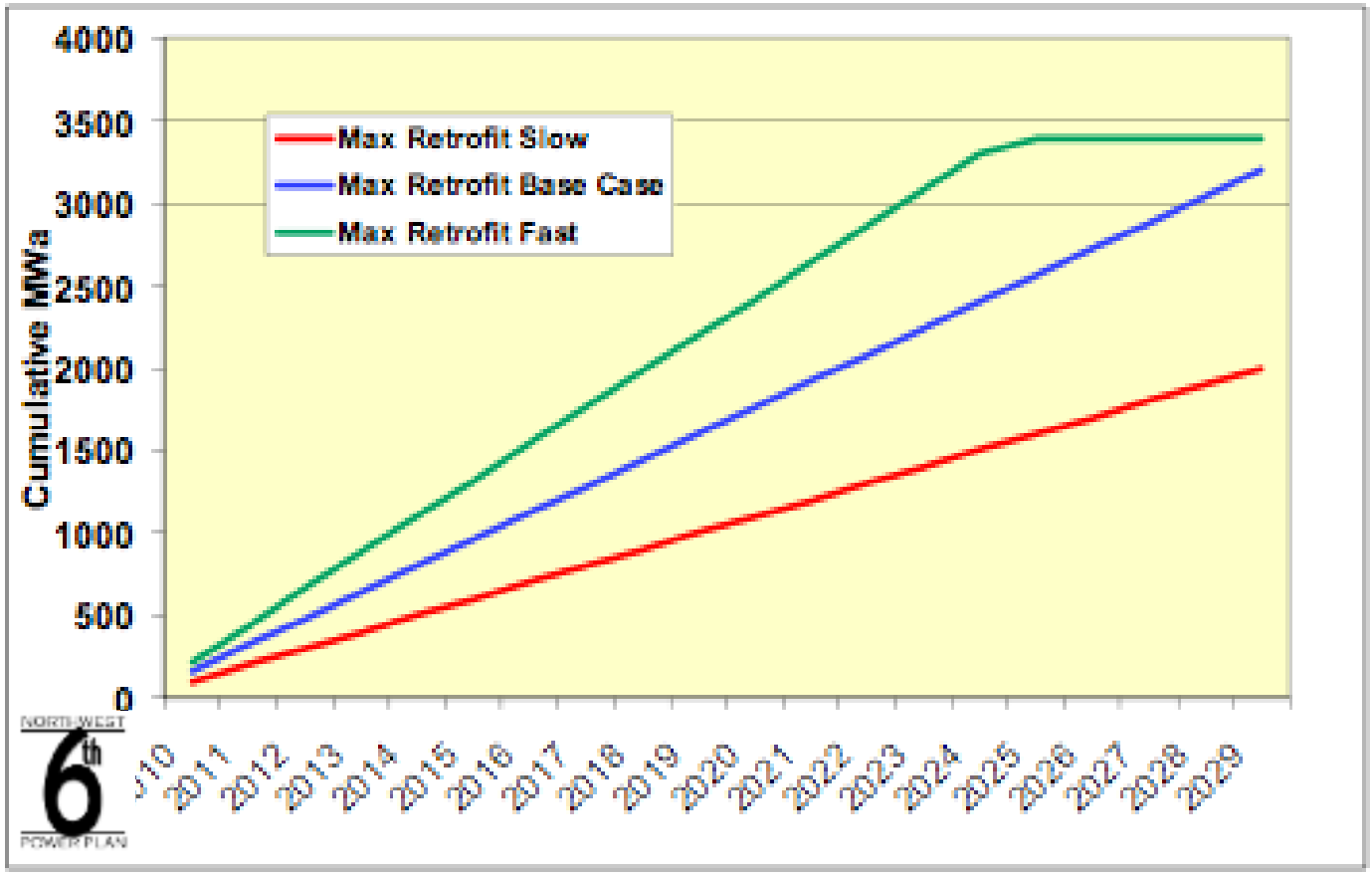


Figure 4-11: Maximum Conservation Acquisition Rates Tested for Non-Lost-Opportunity Conservation



Summary

- Demand Resources are quite valuable
- Demand Resources are quite plentiful
- Demand Resources are reliable and technology will help
- Demand Resources are economical
- Yet the power sector has a long way to go to make effective use of this potential

Thanks for your attention

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- RAP Mission: ***RAP is committed to fostering regulatory policies for the electric industry that encourage economic efficiency, protect environmental quality, assure system reliability, and allocate system benefits fairly to all customers.***