



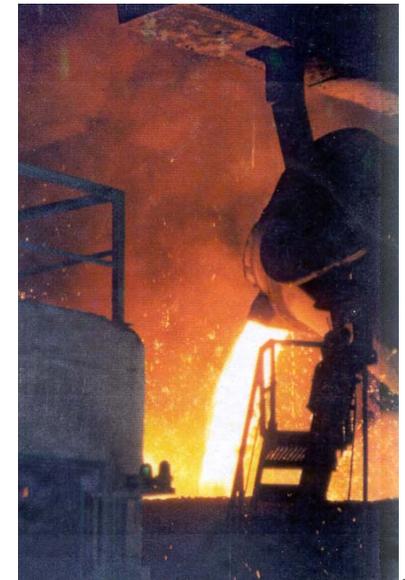
U.S. Department of Energy
Energy Efficiency and Renewable Energy

Decision-Making Through Studies & Analysis

Industrial Technologies Program

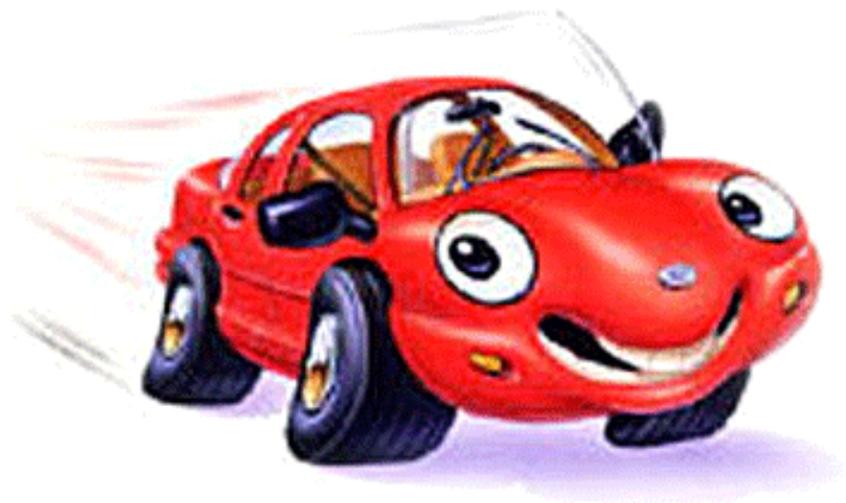
Corporate Peer Review

Scott Richlen, Supervisor
Industrial Technologies Program, EERE
U.S. Department of Energy
September 7, 2006





We don't want to be a car that outruns its headlights.
Not that we move that fast,
just that the range of our "headlights" is not that far.





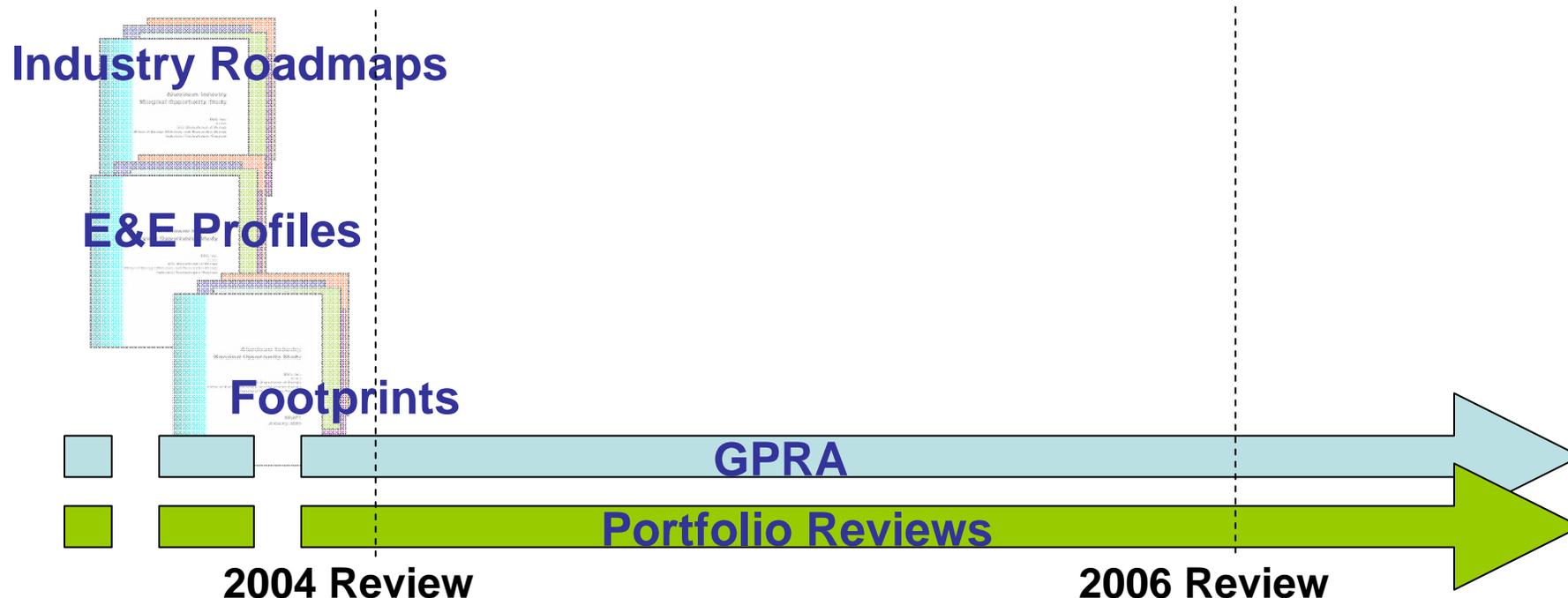
Studies and Analyses

- Quantitative base and rationale for program management
- Answer three key questions:
 1. What are the best R&D opportunities for ITP to meet its mission?
 2. Which R&D opportunities can be significantly impacted by ITP resources?
 3. Are the current R&D investments meeting our mission goals?



Early Studies and Analyses answered:

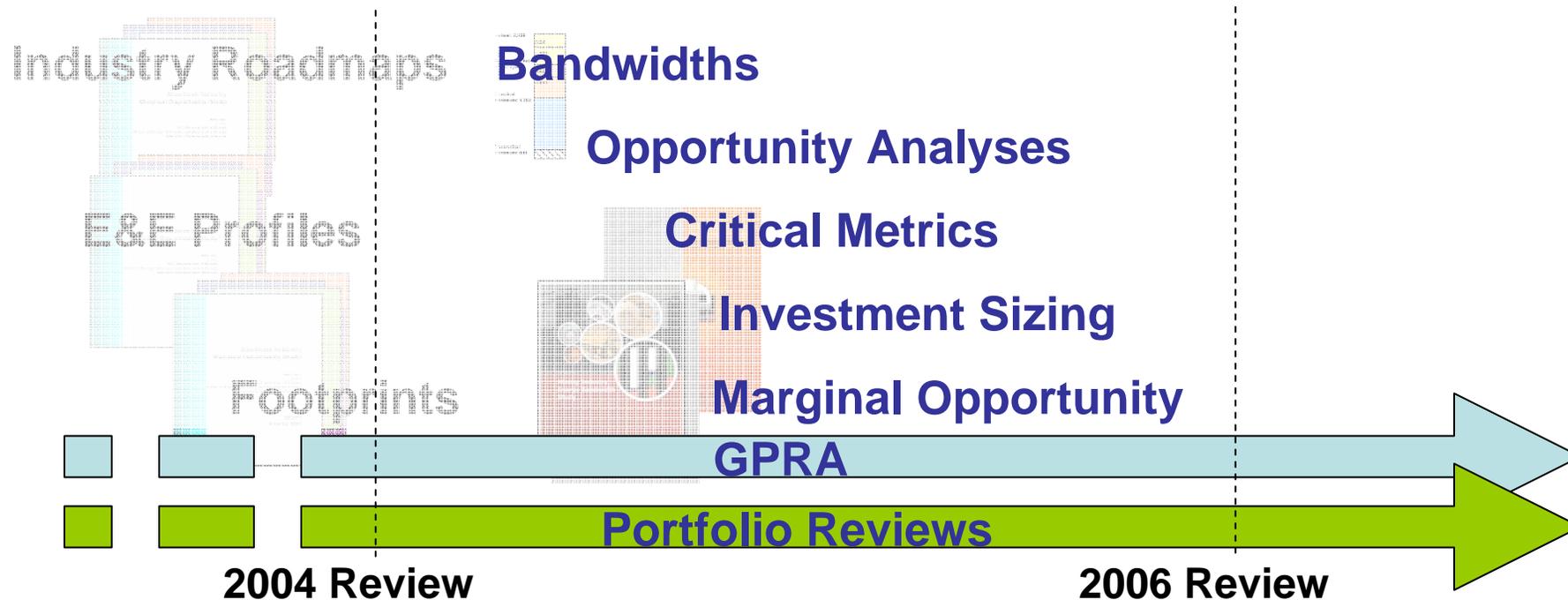
- What are industries' priorities (*Roadmaps*)?
- How much energy is being used (*E&E Profiles*)?
- Where is this energy being used? (*Footprints*)?





More Recent Studies and Analyses are answering:

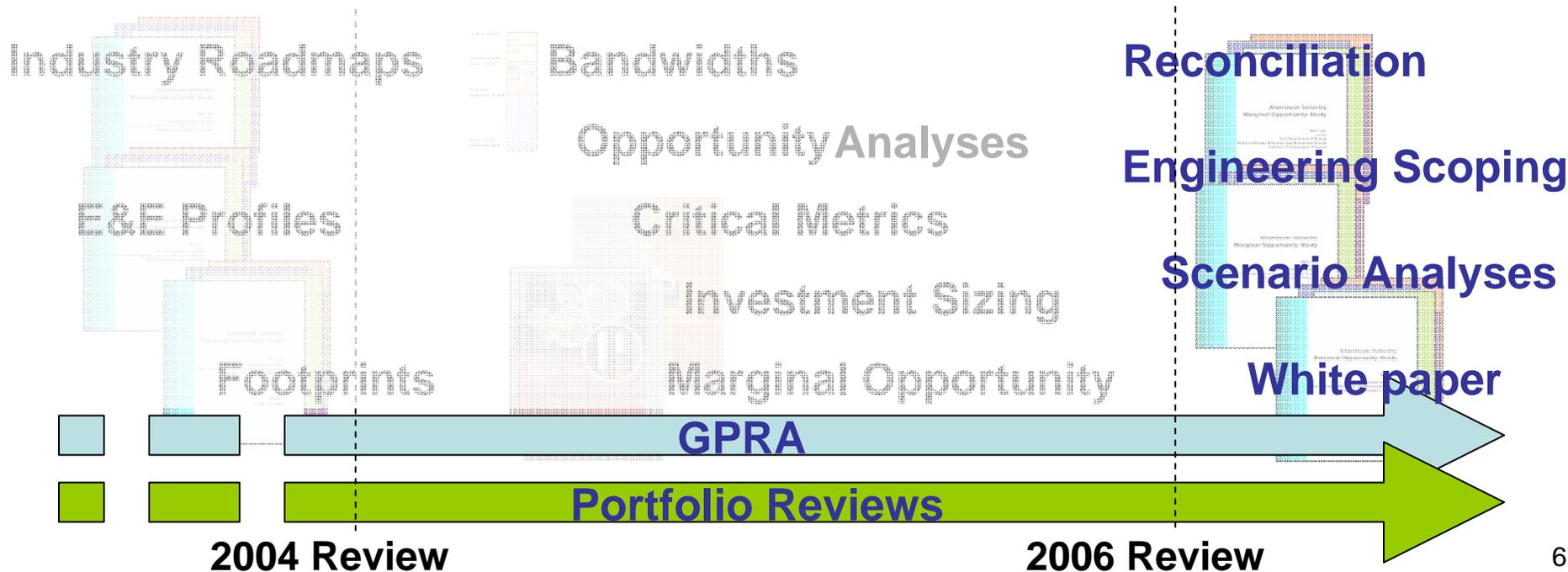
- How much can energy consumption be reduced with R&D (*Bandwidths*)?
- What are the energy savings from crosscutting technologies (*Opportunity Analyses*)?
- How do we gauge our success (*Critical Metrics*)?
- Do we have the resources to pursue the Opportunity (*Investment Sizing*)?
- How do the opportunity and current investments compare (*Marginal Opportunity*)?





Current and Future Studies and Analyses will answer:

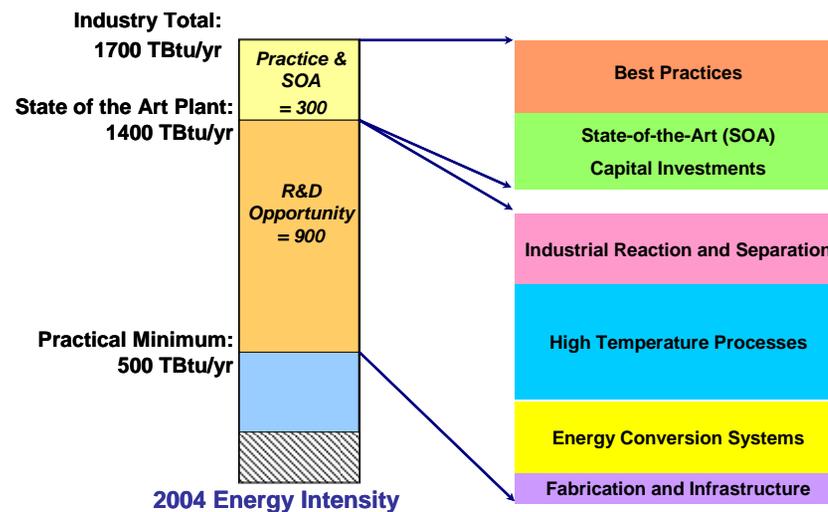
- Do the pursued R&D opportunities meet our 2020 goals (*Reconciliation*)?
- What are the engineering/technical issues with applying the R&D (*Scoping*)?
- Where is industry and energy consumption 20 years out (*Scenario Analysis*)?
- How to move transformational technologies into industrial practice (*White Papers*)?





Bandwidth Analysis

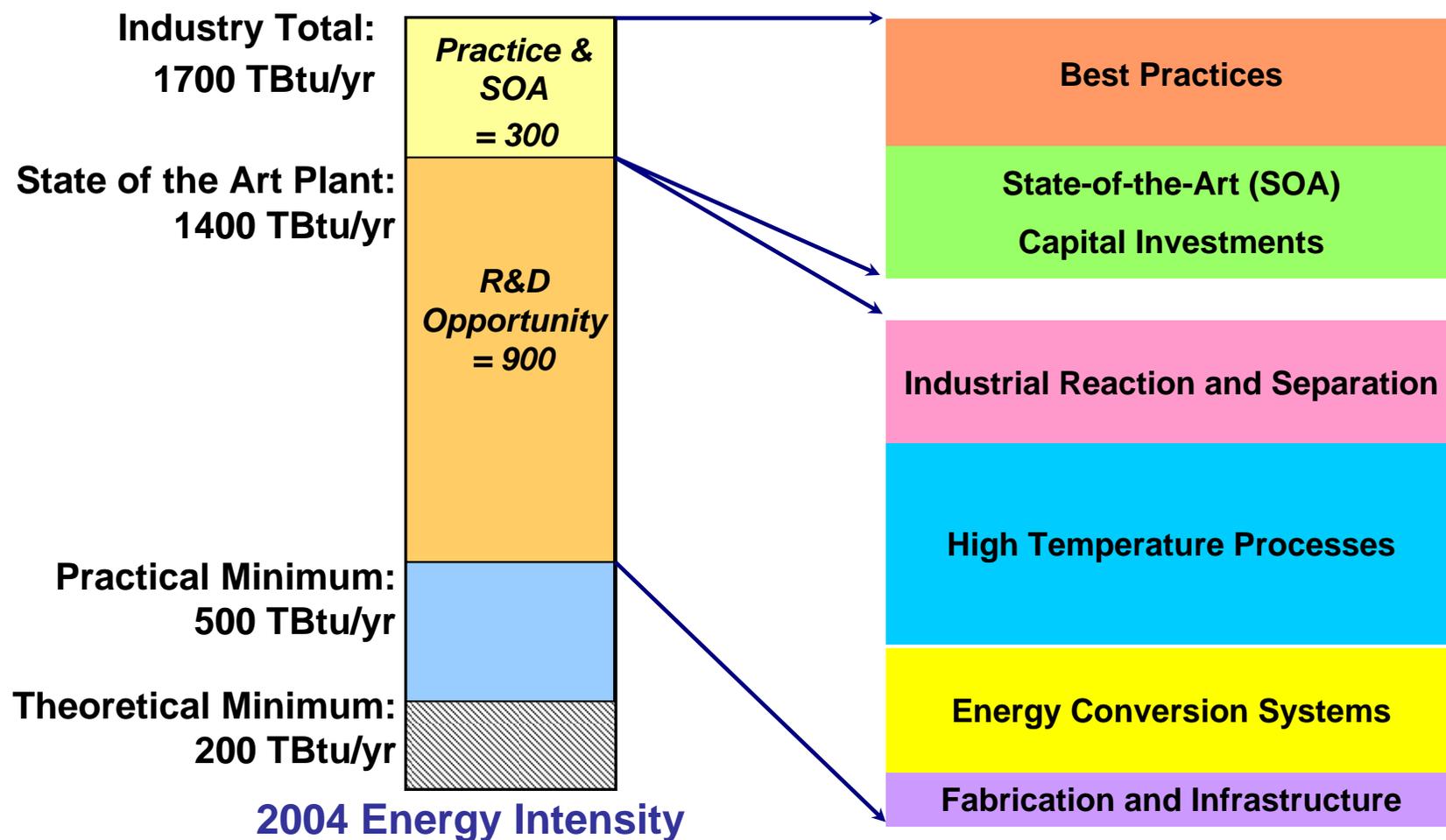
- Prioritizes the energy opportunities
- Categorizes the opportunities as to best practices or various R&D categories
- Determines theoretical and practical minimum energy requirements of major processes
- Identifies current State of the Art (SOA)





Bandwidth Analysis

Mapping R&D and State of the Art Investment Opportunities Identified in the Bandwidth Analysis

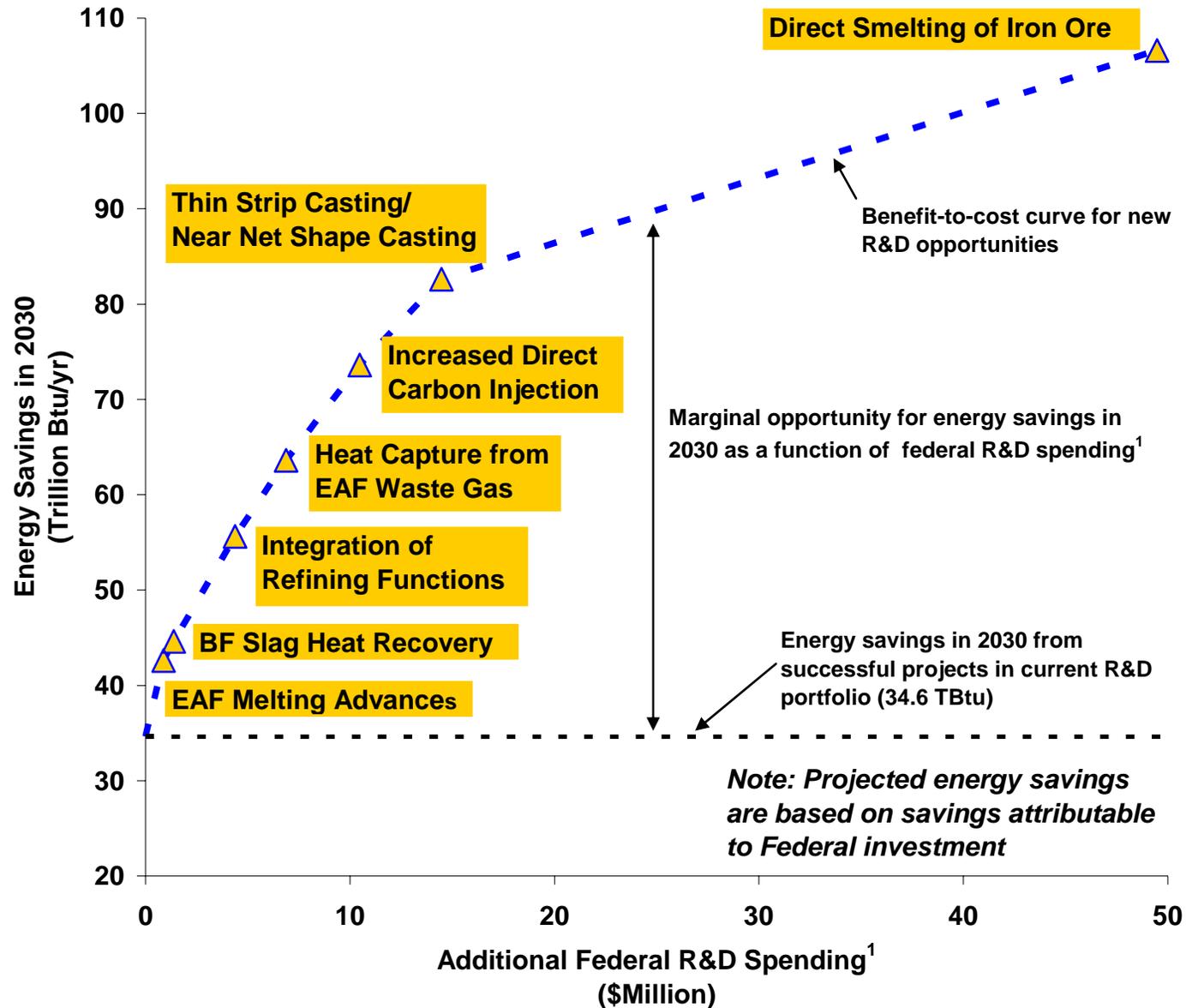




- ITP has limited resources; potentially limiting ITP's impact
- ITP must focus its resources on R&D with the best impact
- Vehicles to help identify the best impact are:
 - Marginal Opportunity Analyses
 - Critical Metrics
 - Metrics Reconciliation

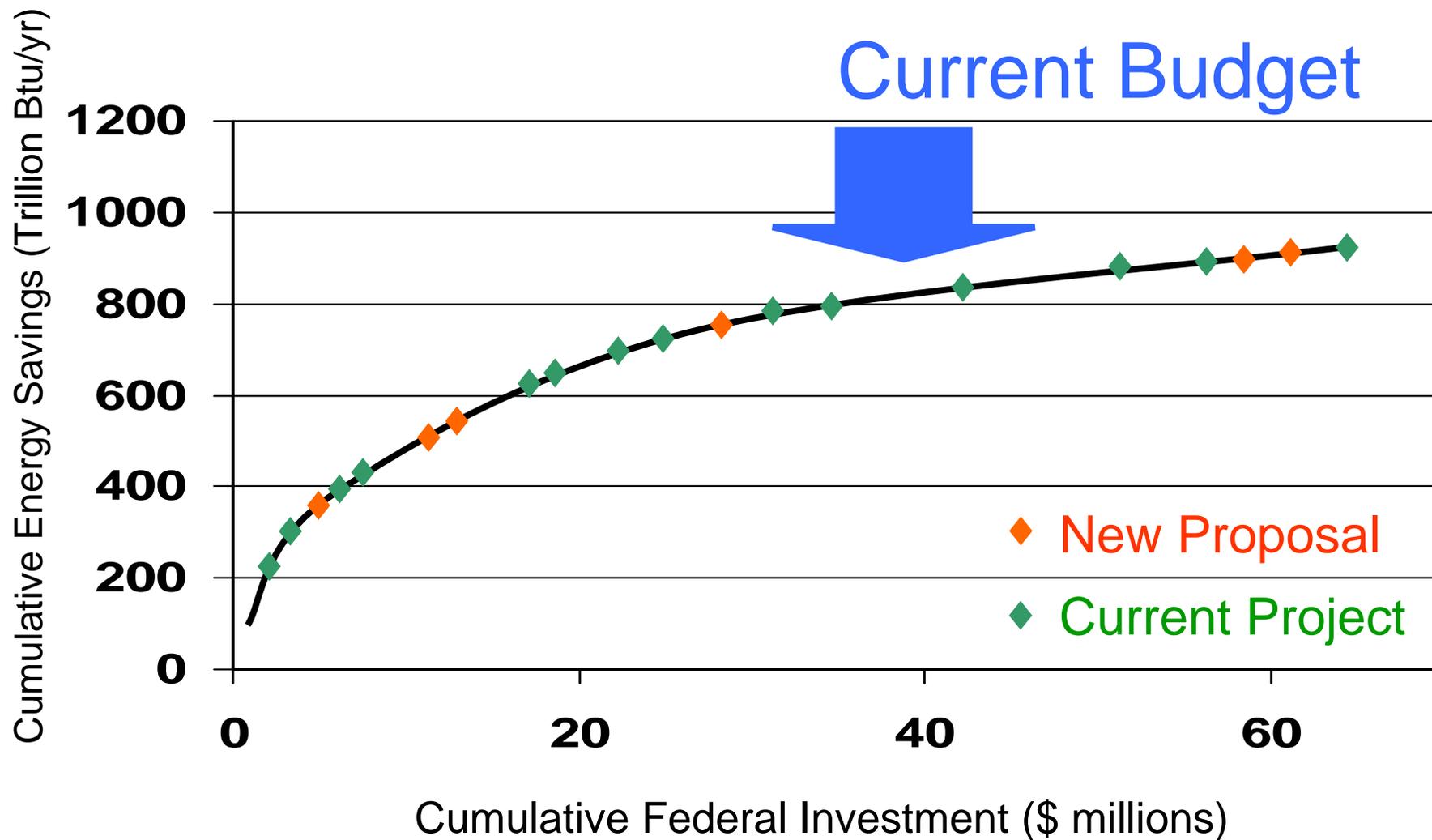


Steel Marginal Opportunity





Marginal Opportunity Curve





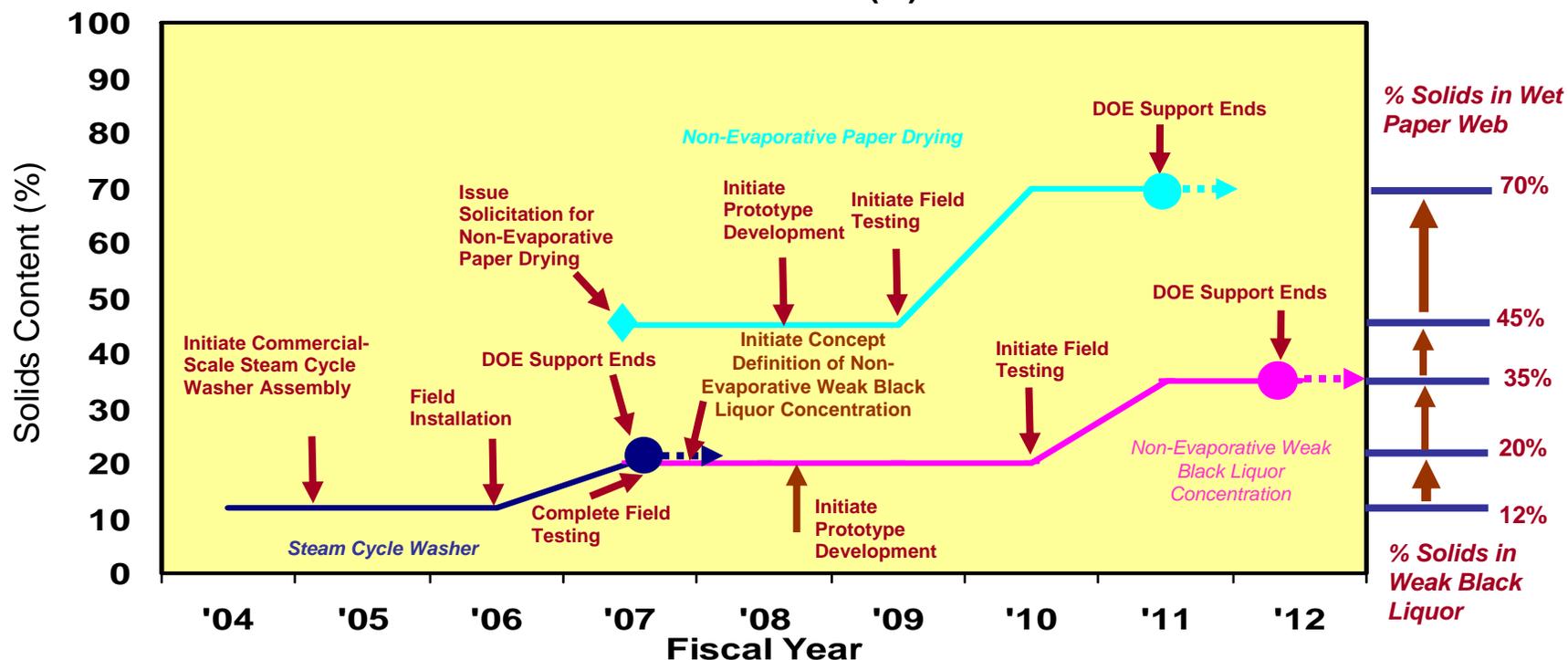
Critical Metrics

- Establish key technical metrics and associated pathways for each technology against which progress can be measured
- Quantify baseline value of the metric and establish goal



Forest Products: Advanced Water Removal

Advanced Water Removal Critical Metric:
Solids Content (%)





Critical Metrics

Industry	Focus Area	Critical Metric	Goal Value
Aluminum	Alternative Reduction Systems	Footprint	35,000 tonne/yr
	Advanced Hall-Heroult Cells	Anode-Cathode-Distance	2.0 cm
	Melting/Thermal Technologies	Thermal Efficiency Melt Loss	50% <1%
	Forming Technologies	Product Yield	90%
Chemicals	Reactions	Product yield	95-100%
		Conversion per pass	40-90+%
	Separations: distillation	Column efficiency	50%
		Reduction of baseline reboiler load	25%
	Separations: membrane	Reduced membrane and module cost)	\$30-750/m2 depending on application
		Membrane lifetime	10 years
	Enabling technologies	Onstream time	95%
		Ratio of process energy to theoretical minimum process energy	Less than 2
Forest Products	Advanced Water Removal	Solids Content: weak black liquor	% TBD
		Solids Content: wet end paper web	70%
	High Efficiency Pulping	Energy Intensity	% TBD
	Improved Fiber Recycling	Recycled Fiber Yield	% TBD
	Innovative Wood Drying & Curing	TBD	TBD



Critical Metrics

Industry	Focus Area	Critical Metric	Goal Value
Glass	Next Generation Melting Systems	Melting System Energy Efficiency (MMBtu/ton glass)	Container 3.4 Flat 5.0 Fiber 3.0
	Energy Efficiency Performance Improvements	Glassmaking Energy Efficiency (MMBtu/ton glass)	Container 5.5 Flat 7.7 Fiber 12.0
	Advanced Processing and Environmental R&D	Process Yield	Flat 80% Container 96% Textile Fiber 94% Insulation Fiber 90% Glass Melting 98%
Metal Casting	Advanced Melting	True Yield	56%
	Innovative Casting	True Yield	71%
Mining	Extraction	Average Product Recovery Ratio	74%
	Beneficiation & Processing	Average Product Recovery Ratio	74%
	Materials Handling	Diesel Consumption Ratio	5.2 bbl/1,000 tons mined
Steel	Cokeless Ironmaking	Nugget Purity	≥95% Metallic Iron Content
	Next Generation Steelmaking	Energy Efficiency (MMBtu/ton of steel)	Integrated (BF/BOF) Route 14.3 Scrap-based (EAF) Route 6.0
	Yield Improvement	Process Yield	Ironmaking 98% BOF Steelmaking 95% EAF Steelmaking 95% Finishing Operations >99% Applications 90%



Metrics Reconciliation

Reconciling several programmatic metrics will provide important benefits

Reducing IOF energy intensity by 20% from 2002 to 2020

2002 energy consumption from the AEO Industry Footprint

Current and theoretical min energy consumption from bandwidth

2006 - 2025 energy savings in the GPRA06 estimates

Common set of assumptions

- **Validate current R&D strategy**
 - Can the current portfolio meet goals?
 - On what basis should we allocate R&D funding to opportunities?
- **Identify opportunities for additional savings**
- **Estimate saving per dollar of Federal investment**



Metrics Reconciliation

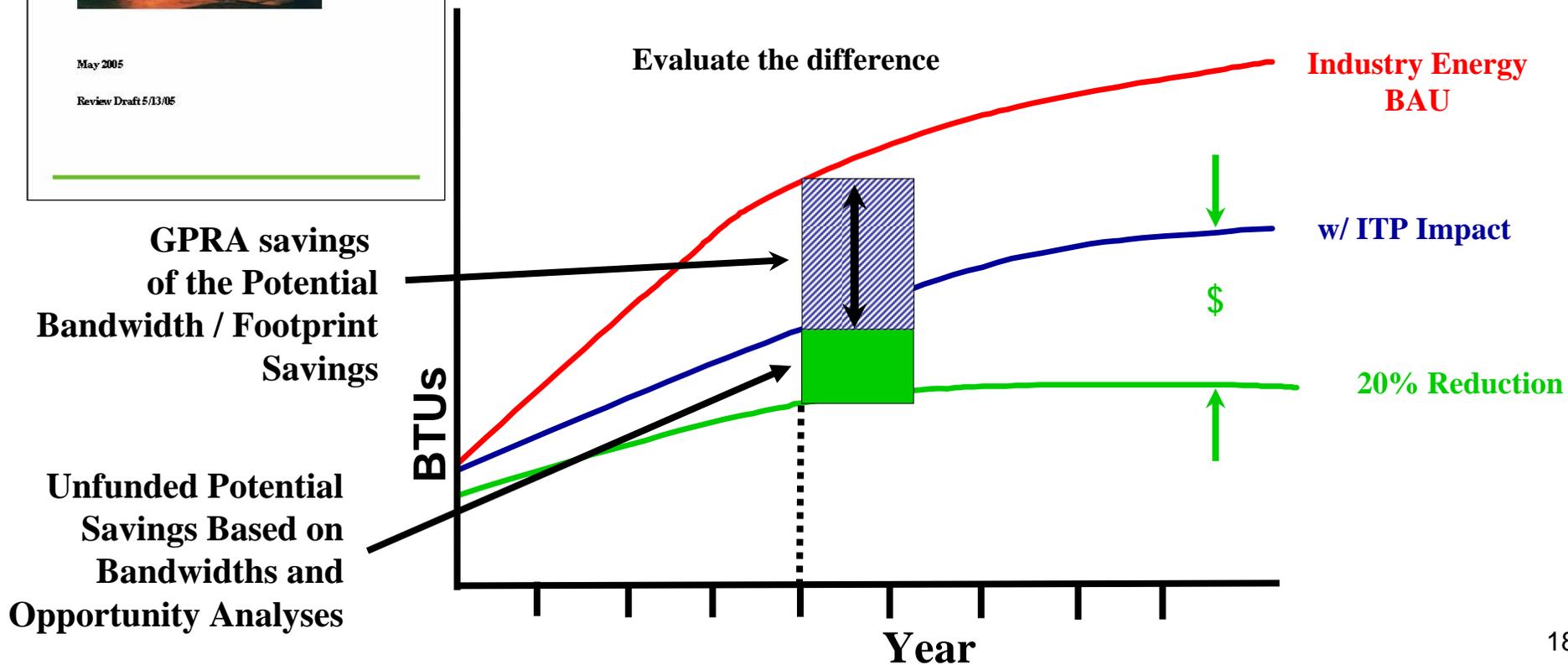
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Website: www.eere.energy.gov
Energy Efficiency and Renewable Energy

Industrial Technologies Program
Aluminum IOF Metrics Reconciliation



May 2005
Review Draft 5/13/05

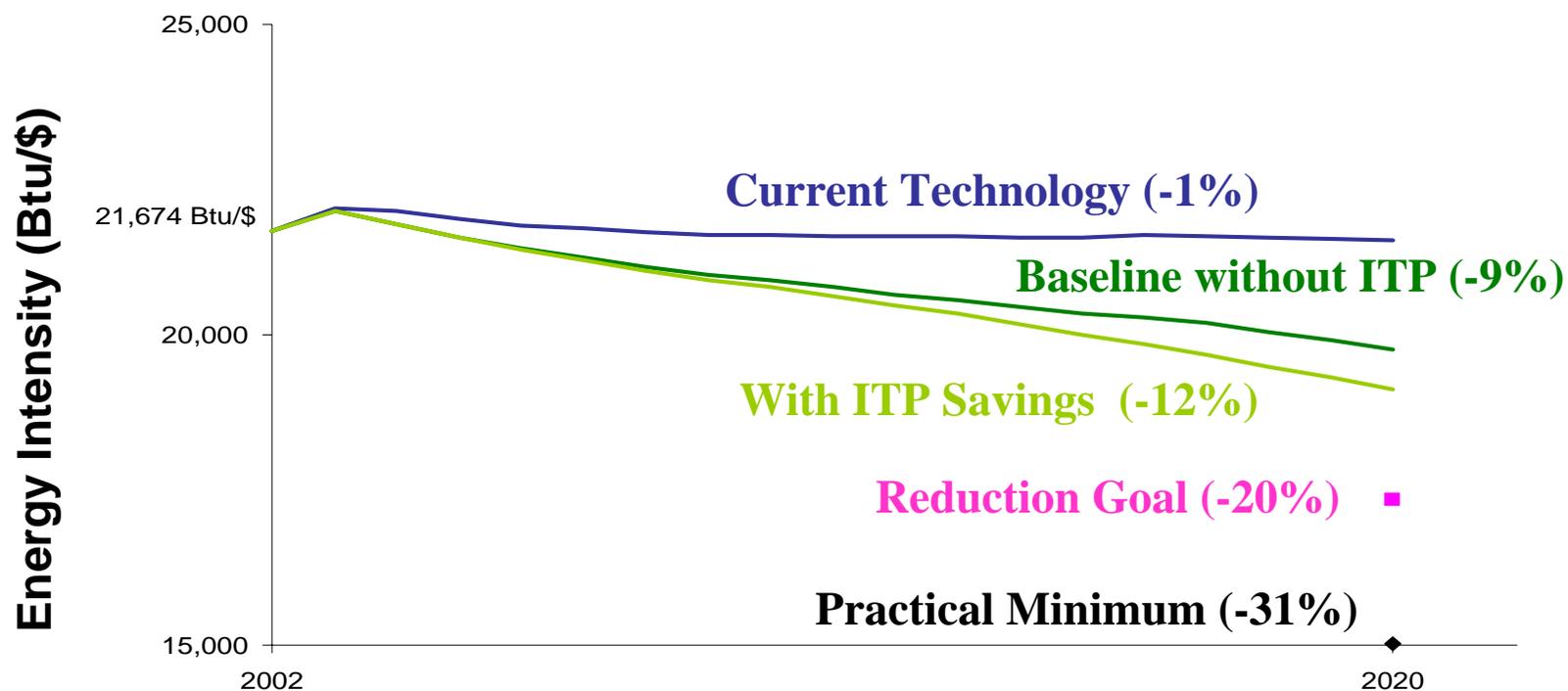
Compare Roll-up of Bandwidth to Projected 20% Industry Savings





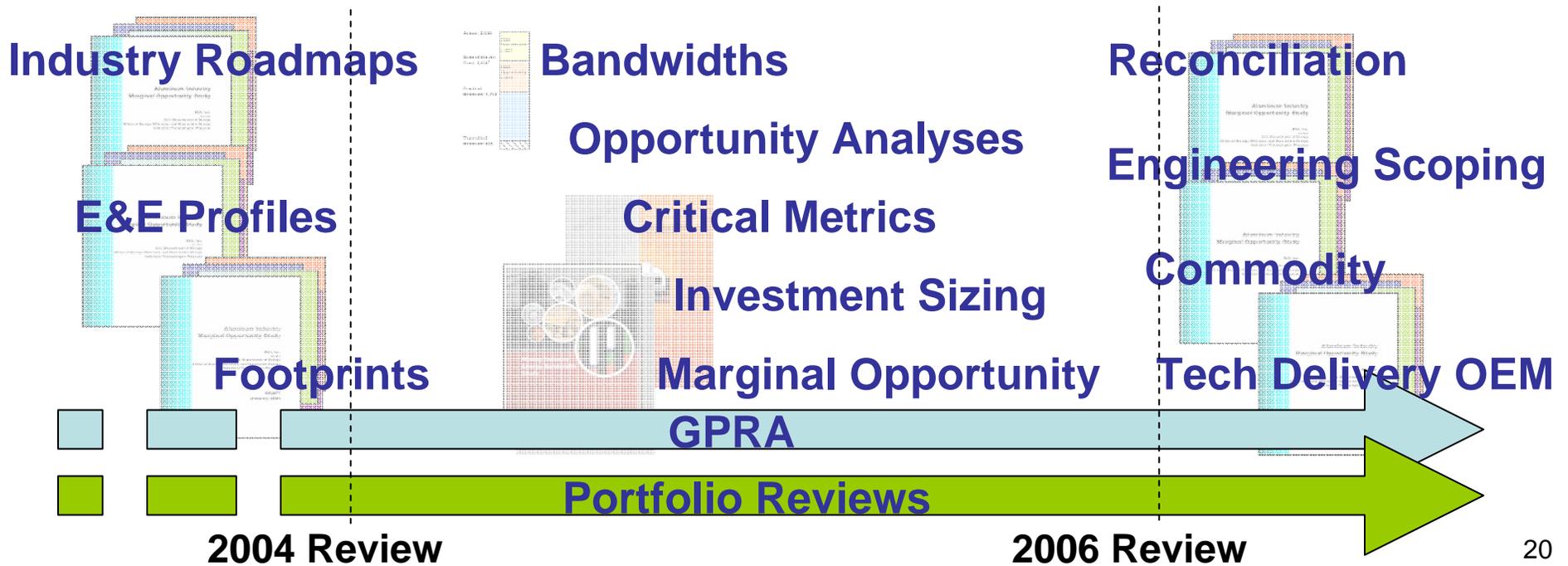
Preliminary Results

- Based on 6 IOFs
- Does not include:
 - Best Practices / Save Energy Now
 - Crosscutting
 - Other industries





Studies and Analyses give ITP the Focus and Measure to Meet its Mission





Often, bureaucracies get awfully caught up in intangible policies and strategies. At the end of the day, it is clear, understandable metrics that will tell you if your strategies are working or not...