Great Lakes TAPPI – Energy Forum
Pulp Mill Energy Projects

February 25, 2009

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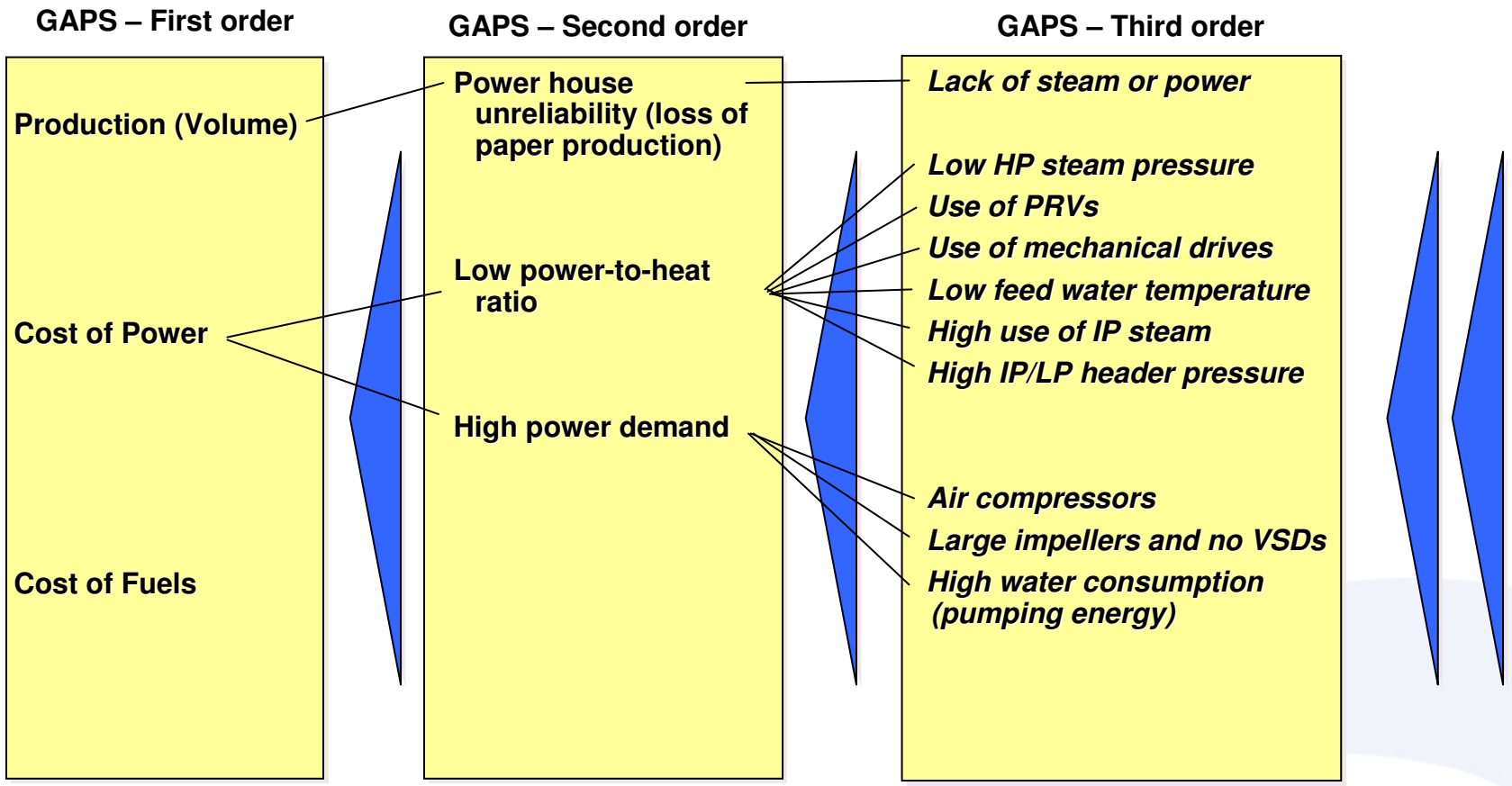
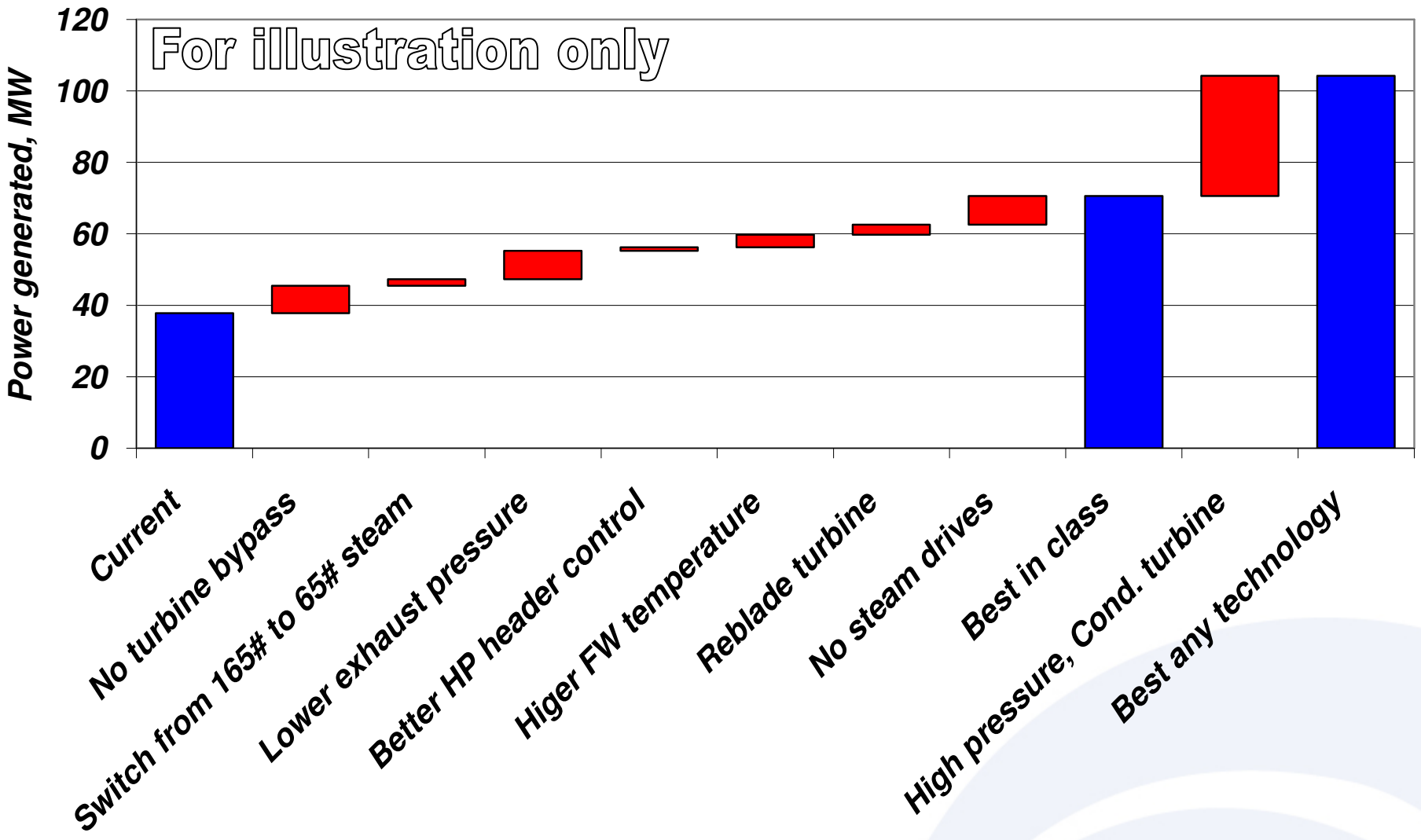
Contents

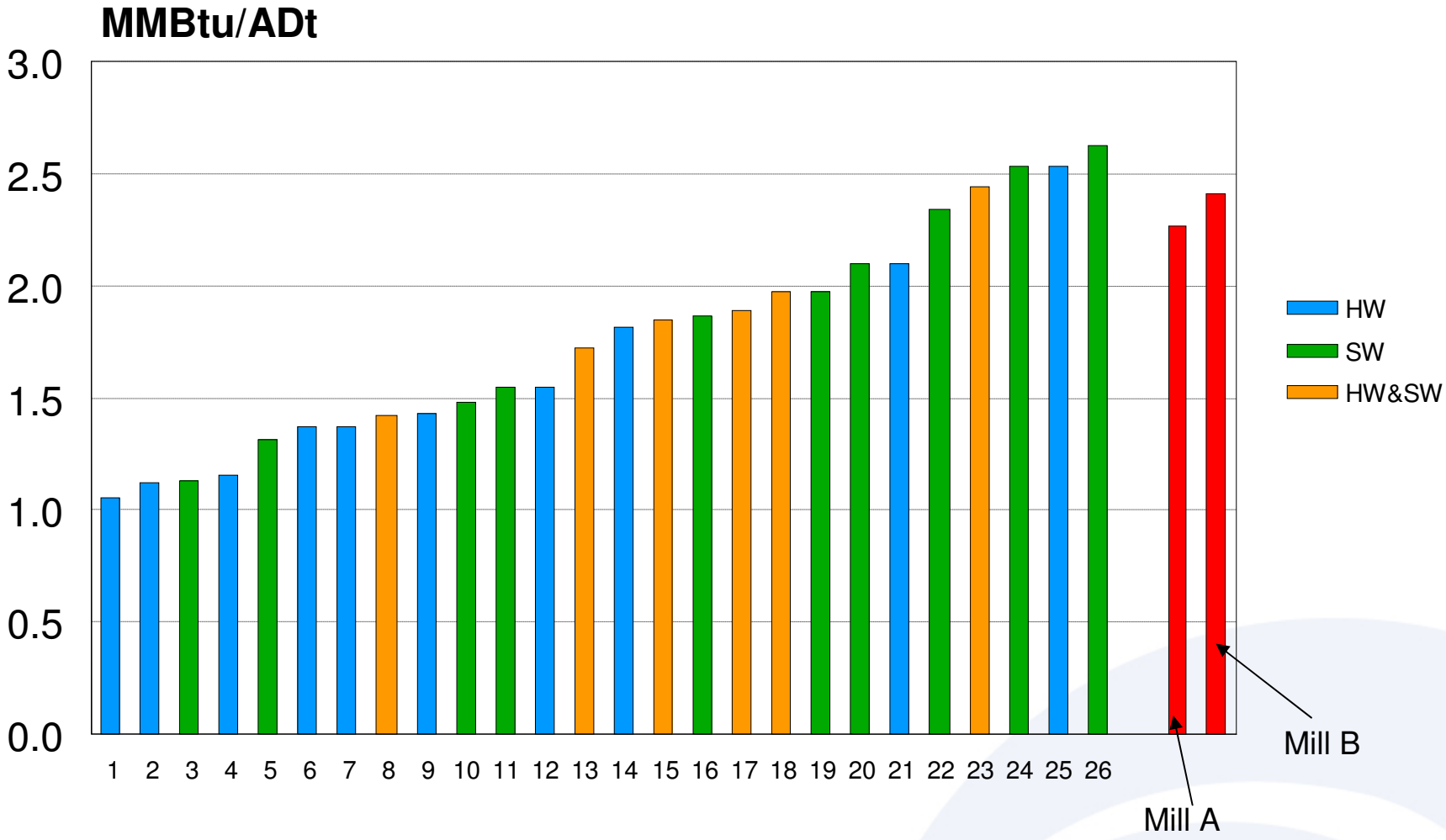
Identify Energy Gaps



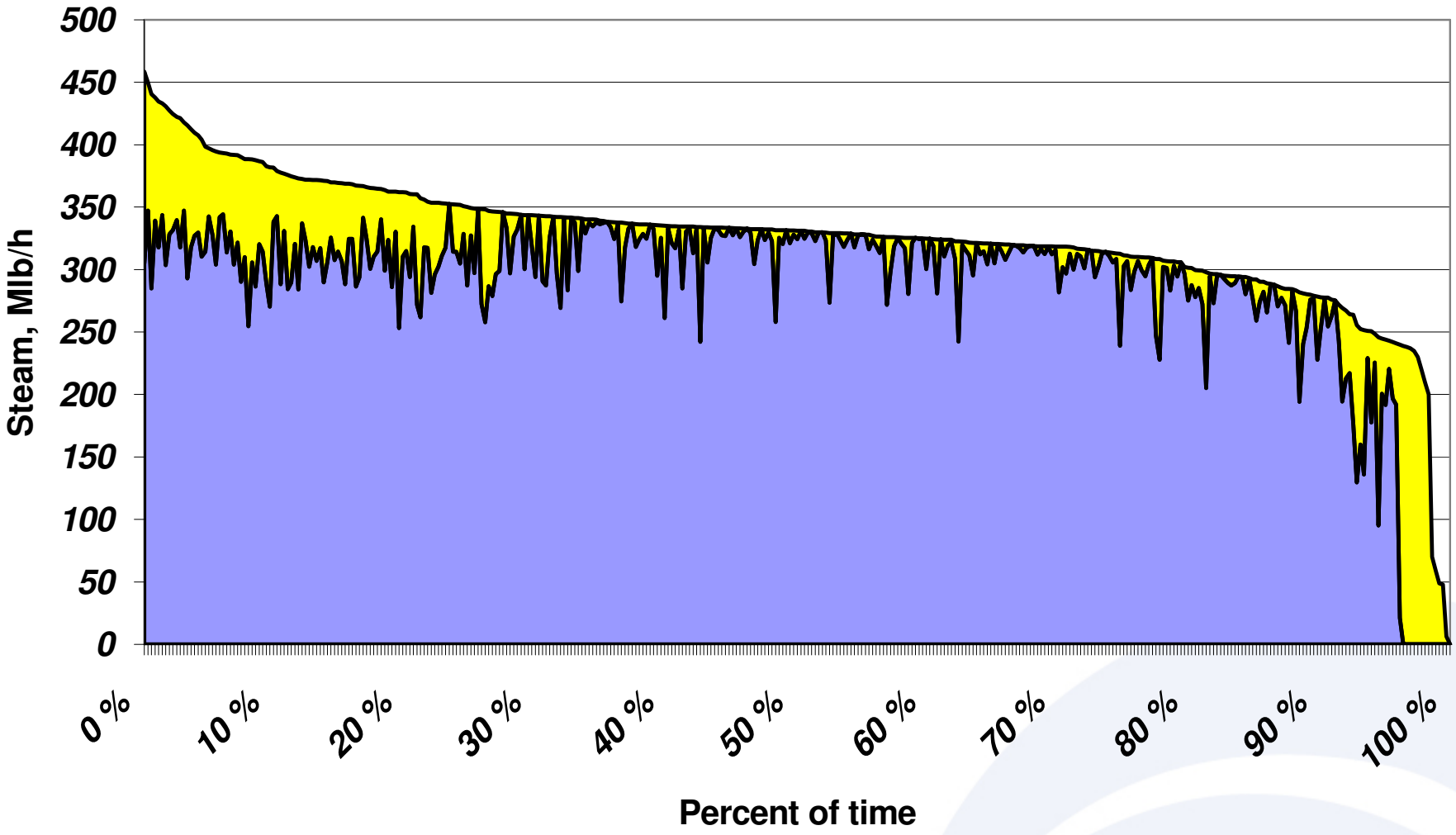
In-house Power Generation – Gap Analysis



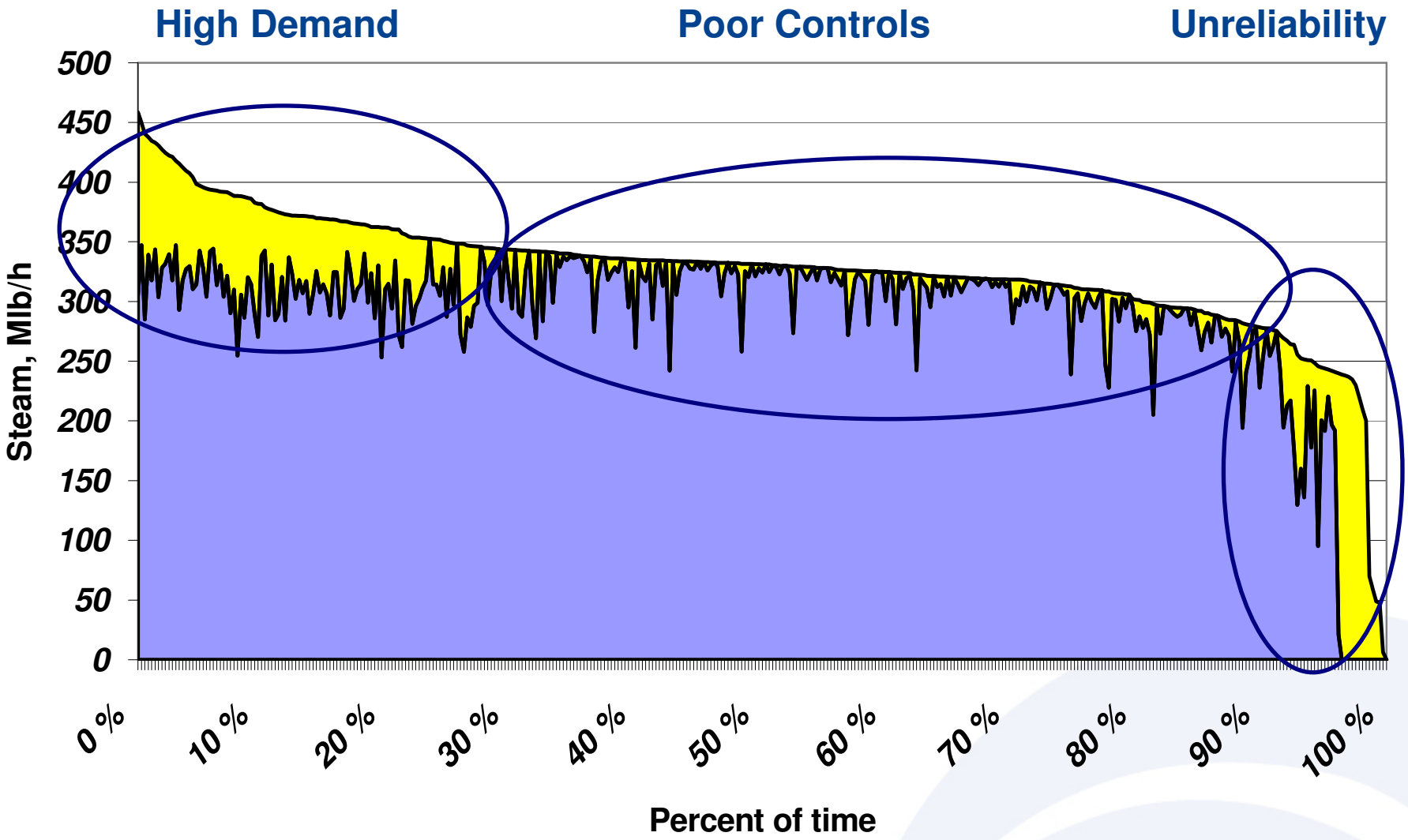
Lime Kiln - Energy Benchmarking



Example of Duration Curves – Boiler Fuels



Reasons for Boiler Gas Usage



Case Study – Northern Europe

Outline

- **Mill:** Modern Pulp Mill
- **Project:** Energy Efficiency Analysis.
- **Scope:** Wood handling, fiberline, pulp dryer, recovery boiler, NCG boiler, steam turbines, evaporation plant, recovery boilers, causticizing plant and lime kiln.
- **Findings:** Initially > 100 energy efficiency improvement ideas, 44 ideas selected for final saving calculations, 28 measuress recommended for implementation.

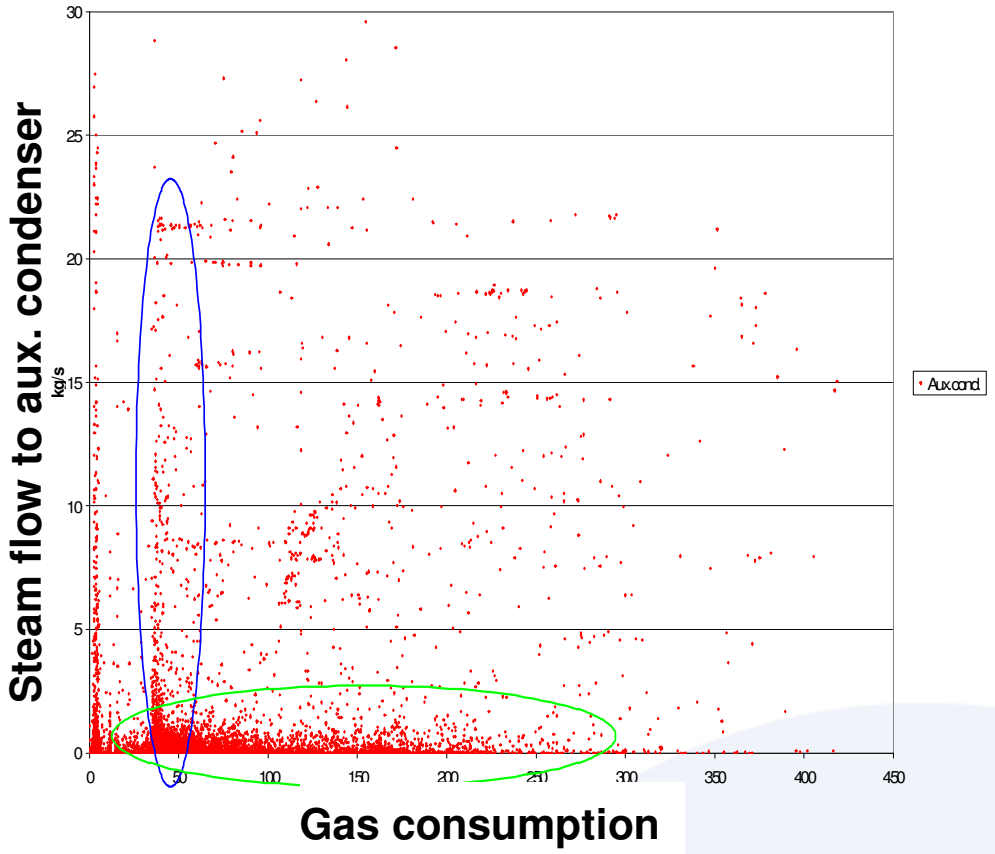
Case Study – Pulp Mill in Europe

Examples of cost effective measures:	**Investment**
Higher power-to-steam ratio	
• Preheating of RB primary air to 255 °F	
• Preheating of RB primary air to 290 °F	
• Preheating of RB secondary air to 265 °F	
• Sootblowing steam pressure to 400 psig	
• Sootblower optimization	
• Deaerator control adjustment	None
• RB steam temperature increase by 20 °F	
• RB steam pressure adjustment (by 30 psig)	None
• More accurate control of RB oxygen level (0,5%)	None
• Lower LP-steam header pressure (-3 psig)	None
• Lower MP-header steam pressure (-7 psig)	None

Case Study – Northern Europe

Example of Auxiliary Condenser Operations:

- **Finding:** Minimum load of auxiliary boiler has been 36 Mlb/hr steam with three burners in operation (30% of MCR). The boiler could be operated even at 18 Mlb/hr (and one burner)
- **Solution:** Decrease minimum load by means of operating on one burner only during low load conditions.
- **Saving potential:**
  10 MMBtu/hr gas firing can be replaced with biomass firing + aux. condenser steam reduced (at boiler minimum load reduced to 28 Mlb/hr steam



Case Study – Pulp Mill in Europe

Examples of cost effective measures:	**Investment**
Fiberline improvements	
• Better control of log thawing in the woodroom	None
• White liquor preheating with black liquor	
• Better control of hot water production in evaporation	None
• Larger evaporation contaminated condensate pump	
• Larger hot water tank	
Pulp Dryer	
• Better control of hot water addition	None
• Higher moisture content of exhaust air	None

Case Study – Pulp Mill in Europe

Examples of cost effective measures: **Investment**

Lime kiln

- Higher solids content from the pre-coat filter
  (better operating procedures – stable operation)
- Better control of flue gas oxygen content (supervisory control)

Pumping

- Decreasing of pressure drop over feed water control valves None
- Additional pump for pulp from the broke chest
- Frequency control for cooling water pulps

Case Study – Pulp Mill in Europe

Summary of the recommended measures:

• **Pay-back period**	**less than 6 months**
• **Increase in power generation**	**5.8 MW**
• **Reduction in power demand**	**0.5 MW**
• **Increase in sale of district heat**	**30 MMBtu/hr**
• **Savings in fossil fuels**	**12 t/d**
• **Water conservation**	**170 gpm**
• **Carbon dioxide (fossil) savings**	**900 t/yr**

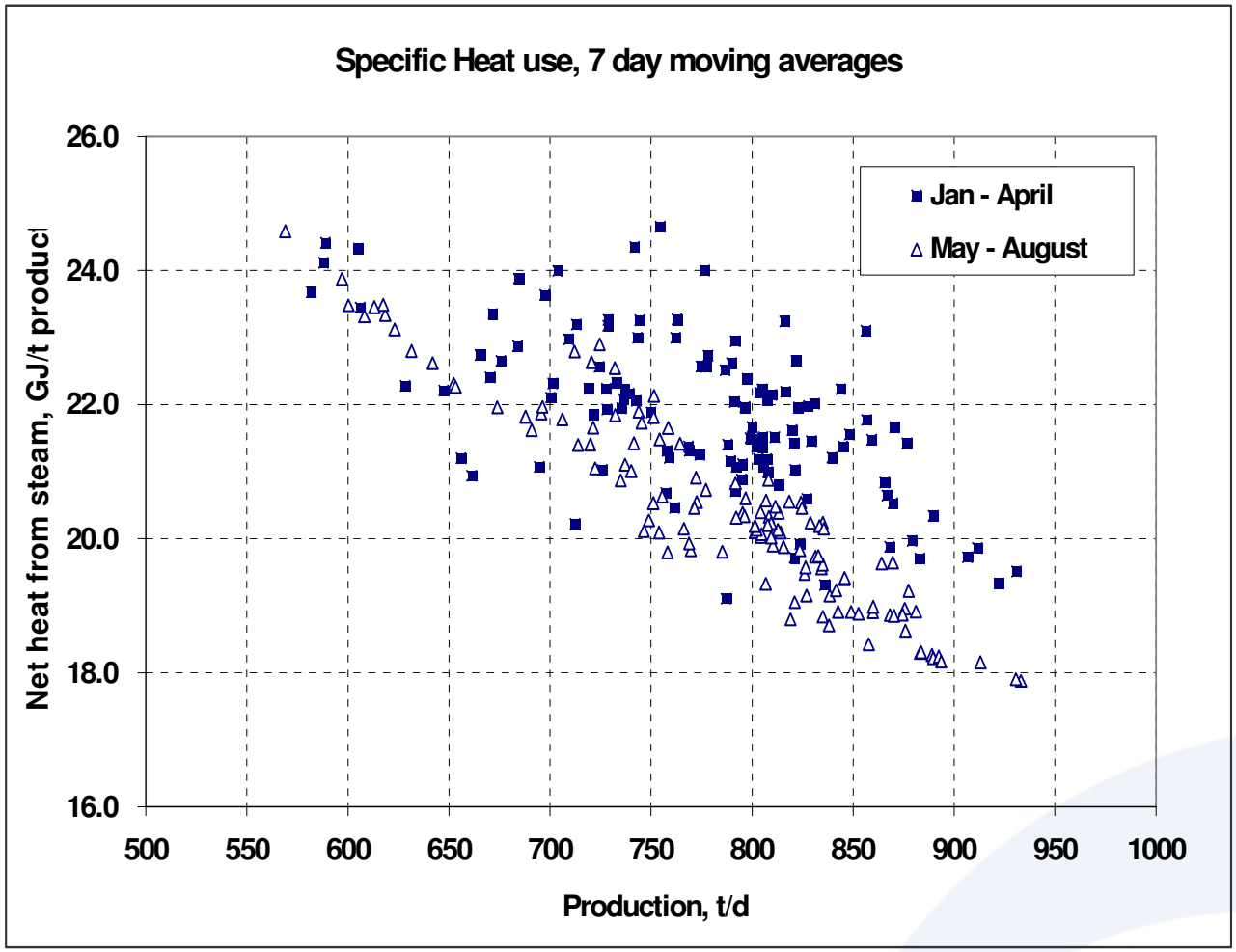
Typical Energy Conservation Projects

- **Steam/feedwater** system optimization to lower operating costs and to maximize power generation
- **Secondary heat** improvements to fully utilize vapor and hot water sources in wood handling, washing, bleaching, feedwater preheating, space heating etc.
- Reduction in **water usage** will generally lower energy consumption
- **Evaporator/washing optimization** to improve efficiency and reliability
- **Condensate system** improvements to increase condensate return and to optimize the use of the flash steam
- **Pulp dryer** improvements – dryer section, water systems
- Improvements in **control systems** to stabilize operations and to lower operating costs
- Understand the impact of **operating parameters** on energy consumption (kappa, WL strength, sulfidity, dead load)
- Is the **lime kiln fuel usage** normal (mud solids, mud fines content, flame characteristics)
- **Liquid methanol, turpentine or CTO** to replace fossil fuel consumption

Important Considerations

- Energy conservation must be part of the overall drive to improve mill efficiency and lower operating cots. Objectives must be **aligned with the business goals**.
- **Accountability** is important. Adequate reporting and management level cost tracking is important.
- Real time **cost tracking** will provide an excellent method to determine the savings potential and to understand the situations when energy costs are high.
- **Awareness** and training are needed for a “cultural” change
- **Stable and reliable operation** is essential for low energy usage and low operating costs.

Example of Mill Heat Consumption vs. Production Stability



Key Components of low Energy Costs