Supporting Manufacturing Leadership Through Sustainability

E3: Economy, Energy, and Environment

E3

- Introductions
- The E3 program nationwide and in Virginia
- E3 Technical Assessment examples
  - Energy
  - Environment
  - Economy
- E3 experience of one E3 participant
  - Randy Beauchamp – CCP, Inc.
- How do I participate?
- Q&A

E3 Panel Participants

- CCP
  - Randy Beauchamp
- Manufacturing Technology Center (Wytheville)
  - Keith Litz
  - Nelson Teed
- GENEDGE Alliance (Martinsville, Richmond)
  - Tom Zbell
  - Frank Watson
- EPA
  - Mindee Osnoo

E3: What are the 3 Es?

- Environment
- Energy
- Economy

What is E3?

A model for collaboration among manufacturers, utilities, local government, and federal resources intended to:

- Invest in local communities
- Address energy and sustainability challenges
- Provide valuable technical training and assessments
- Enable economic growth

What is E3?

- Supported by six Federal agencies
  - Environmental Protection Agency
  - Department of Energy
  - Department of Labor
  - Department of Agriculture
  - Department of Commerce
  - Small Business Administration

E3: Economy, Energy, and Environment

E3: What is the program?

1. Technical Assessment
2. Implementation Support
   - Loan guarantees
   - Leveraged funding
   - Technical assistance
3. Training and Continuous Improvement

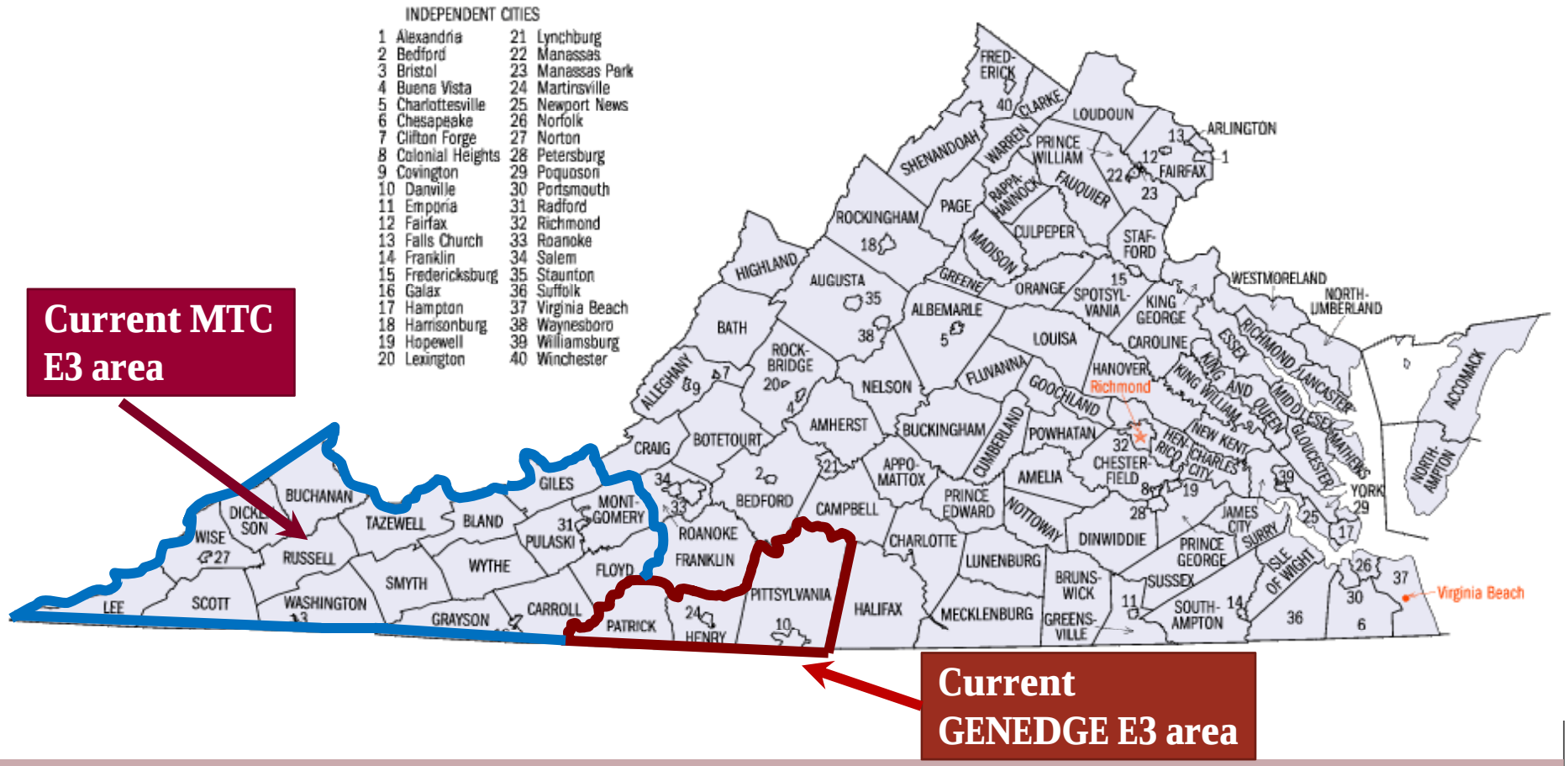
What does E3 mean in Virginia?

- Technical assessments
  - On site assessments with a follow-up report identifying improvement opportunities.
  - Full funded through grants
  - No cost to assessment recipients
- Peer-to-peer “events” to develop a base that can share ideas going forward.
- Implementation assistance

E3 Technical Assessment

Component	Description
Economy	A **Lean Review** that leads to increased productivity and reduced costs
Energy	An **Energy Assessment** that provides tools and insight to reduce energy demand and costs
Environment	An **Environmental Assessment** that results in opportunities for water and energy conservation, reduced emissions, and additional cost savings
Optional	A **Greenhouse Gas (GHG) Evaluation** that teaches manufacturers how to calculate GHG emissions and evaluate reduction strategies

E3: Economy, Energy, and Environment



E3 in Virginia as of 2013

E3 in Virginia: Funding

- Funding sources
  - Southwest Virginia
    - EPA
  - Danville / Pittsylvania County
    - Danville Regional Foundation
    - Virginia Tobacco Indemnification & Community Revitalization Commission
  - Martinsville / Patrick County / Henry County
    - Virginia's Appalachian Regional Commission
    - Virginia Tobacco Indemnification & Community Revitalization Commission

- Partners
  - Danville Utilities
  - Appalachian Electric Power

E3 in Virginia: Partners

- Danville / Pittsylvania County
  - Danville Utilities
  - AEP
- Southwest Virginia
  - AEP
  - Powell Valley, part of TVA.
  - Bristol Virginia Utilities, part of TVA.
  - Atmos Energy

E3: What kinds of organizations?

E3 itself doesn't limit the organizations that can participate.

Virginia E3 focuses on industrial firms.

The "sweet spot" seems to be 50-200 employees:

- Smaller than that, we see fewer high return opportunities.
- Larger than that, the organization usually has already dedicated resources to environmental and energy opportunities.

E3: What kinds of organizations?

- Chemicals (x3)
- Custom electronics
- Apparel / Shoes (x2)
- Packaging materials (x3)
- Building product (x3)
- Cable
- Transformers
- Furniture
- Automotive components (x3)
- Mining equipment (x2)
- Mattresses
- Heat treat job shop
- Food processing
- Ladder components
- Rigid film

Technical Assessment

Energy

E3 Technical Assessment:

Energy

- Energy management
- General building areas
  - Lighting
  - Building envelope
  - HVAC
- Manufacturing specific areas
  - Compressed air
  - Steam systems
  - Process heating
  - Motors
  - Pumps and fans

E3 Technical Assessment:

Energy

- Lighting
  - Everyone in the country must soon replace their T12 fluorescent lighting.
  - It makes economic sense to replace metal halide lighting.
  - It makes economic sense to replace incandescent EXIT signs.
  - Motion sensors are cost effective and can work with fluorescent lighting where they couldn't with metal halides.
  - Outside security lighting is often on in the daytime.
  - Facilities that have installed some motion detectors haven't put them in small areas that are usually unoccupied.

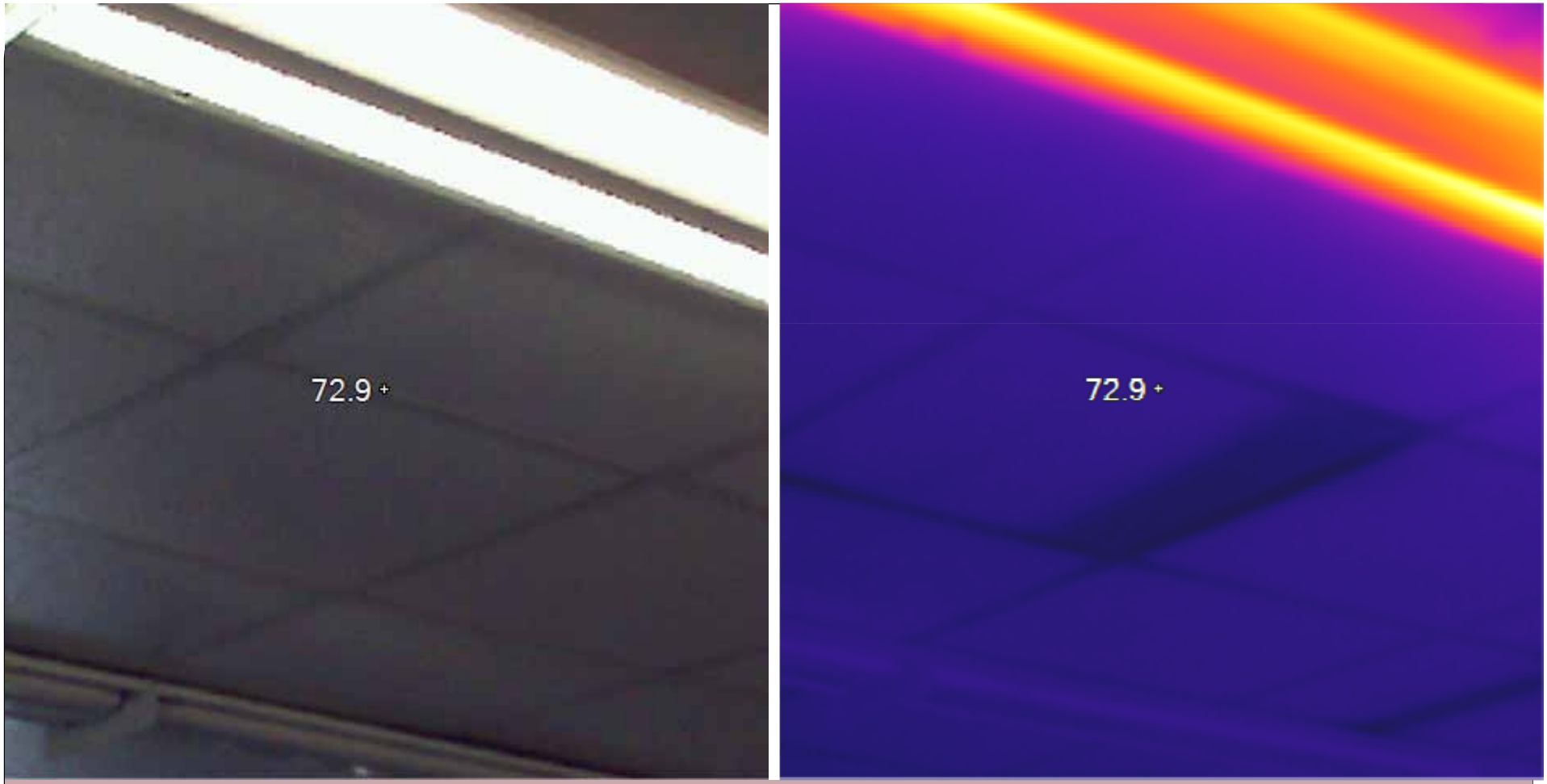
E3 Technical Assessment:

Energy

- Thermal imaging
- Flue gas analyzer
- Data logging
- Ultrasonic leak detection

- A thermal imager provides a real-time infrared image that shows temperatures of a target.
  - Hot spots
  - Cold spots
  - Guys hiding under boat tarps

Thermal Imaging

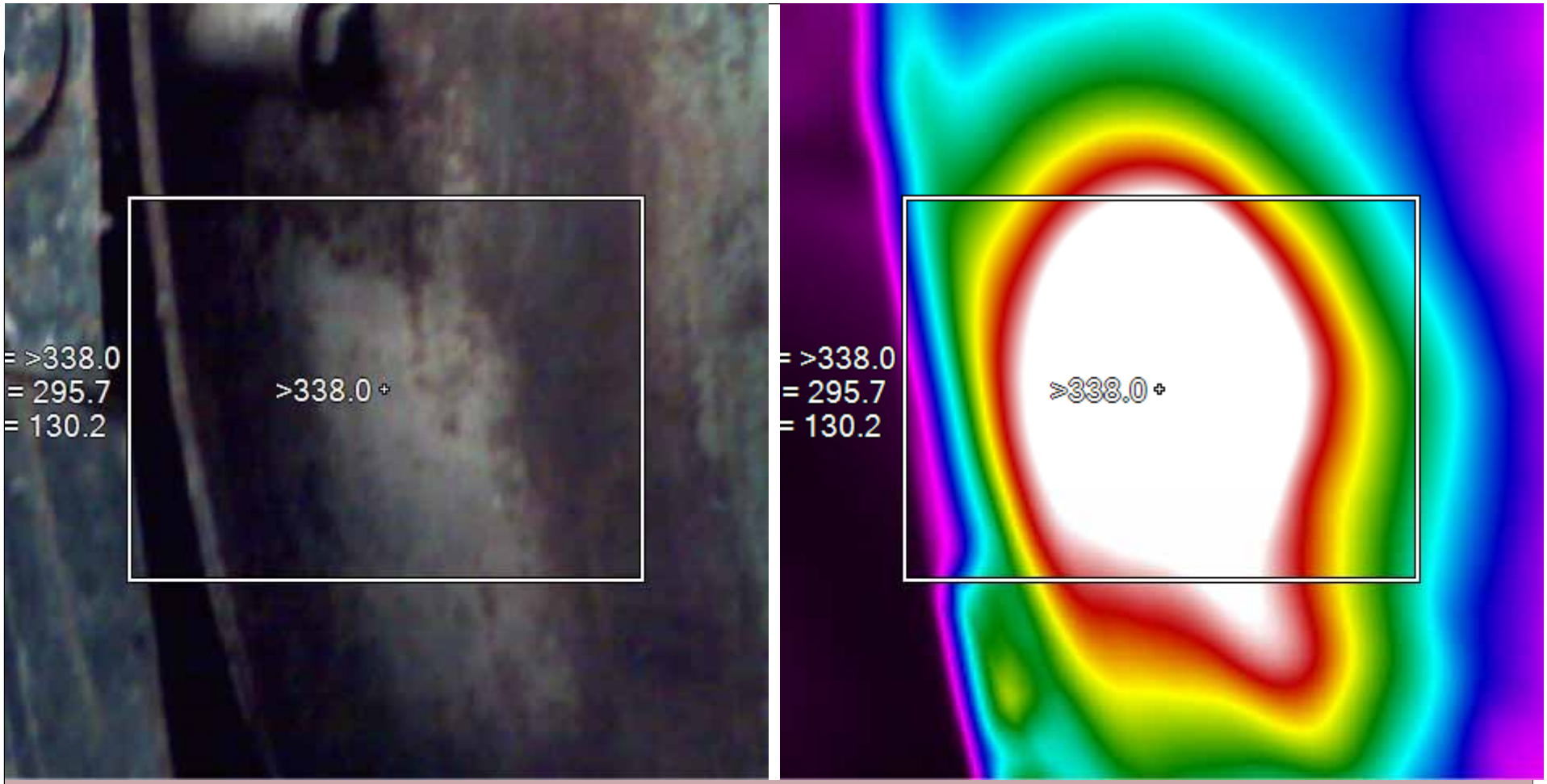


Thermal Imaging

Missing insulation over a ceiling tile.

Thermal imaging

Poor seal around a boiler end.



Thermal imaging

Hot spot in the side of a boiler that needs repair.

Setting:	High Fire	Low Fire
Temperature	386 º F	295 º F
O_2	3.5	12
Excess Air	17.3	112
Efficiency	85%	81%
CO_2	9.75	5.3
CO	94-100	16

Flue gas / stack analyzer

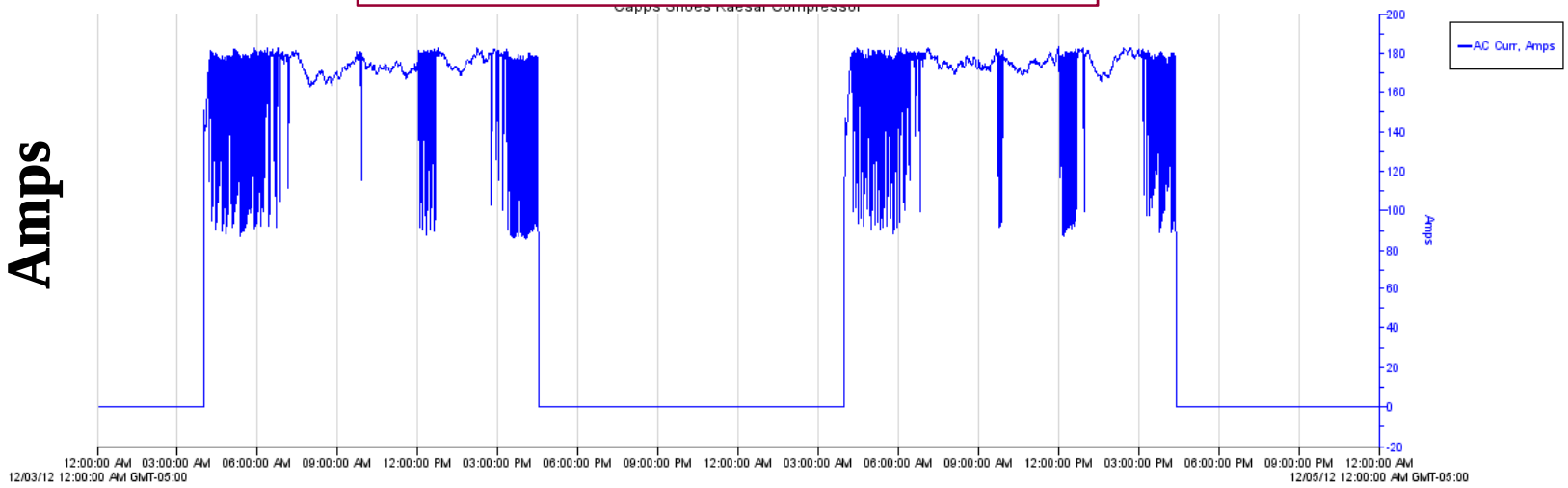
A stack analyzer shows what is in a boiler's exhaust gas and by extension shows if the burners need tuning.

Data logging

Data loggers attached to sensors can save data to flash memory for up to 4 weeks. This is most useful for investigating how multiple air compressors are actually working (or not).

Data logging: Air compressor

Air compressor current draw over two days



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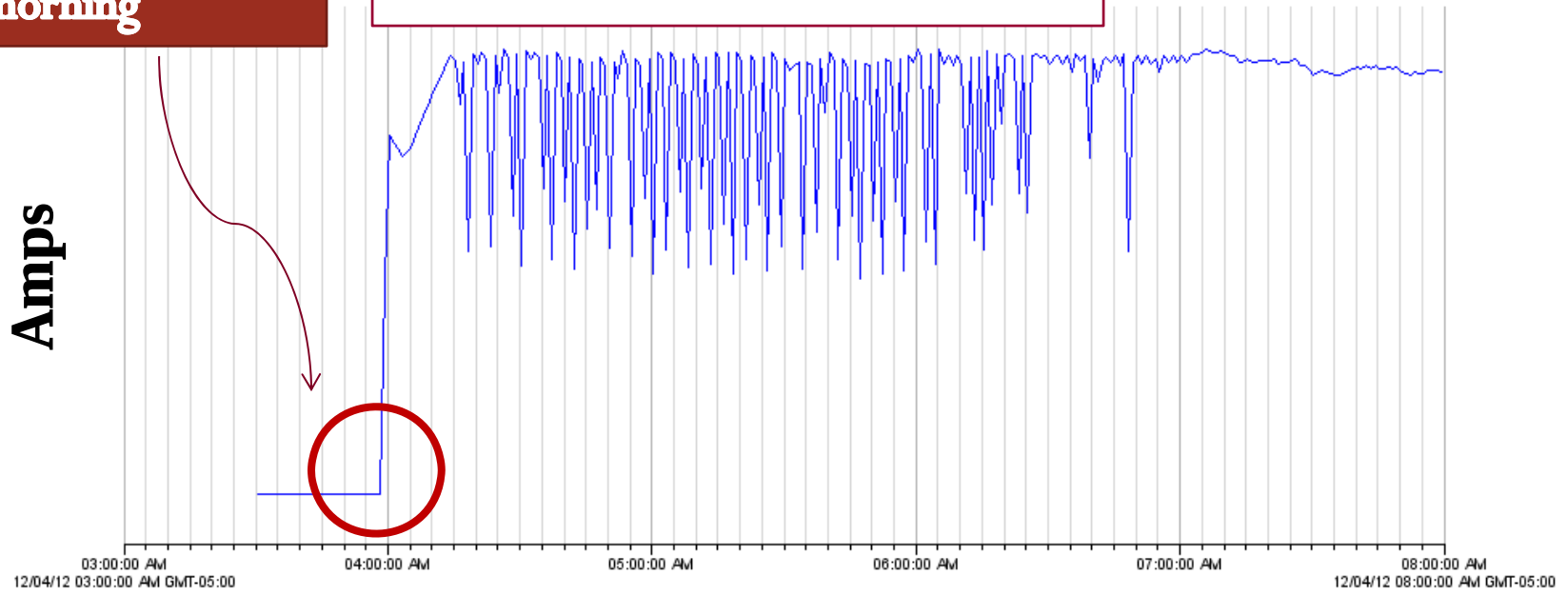
Data logging: Air compressor

Maintenance turns on compressor at 4:00 am each morning

Air compressor current draw from 3 am to 8 am



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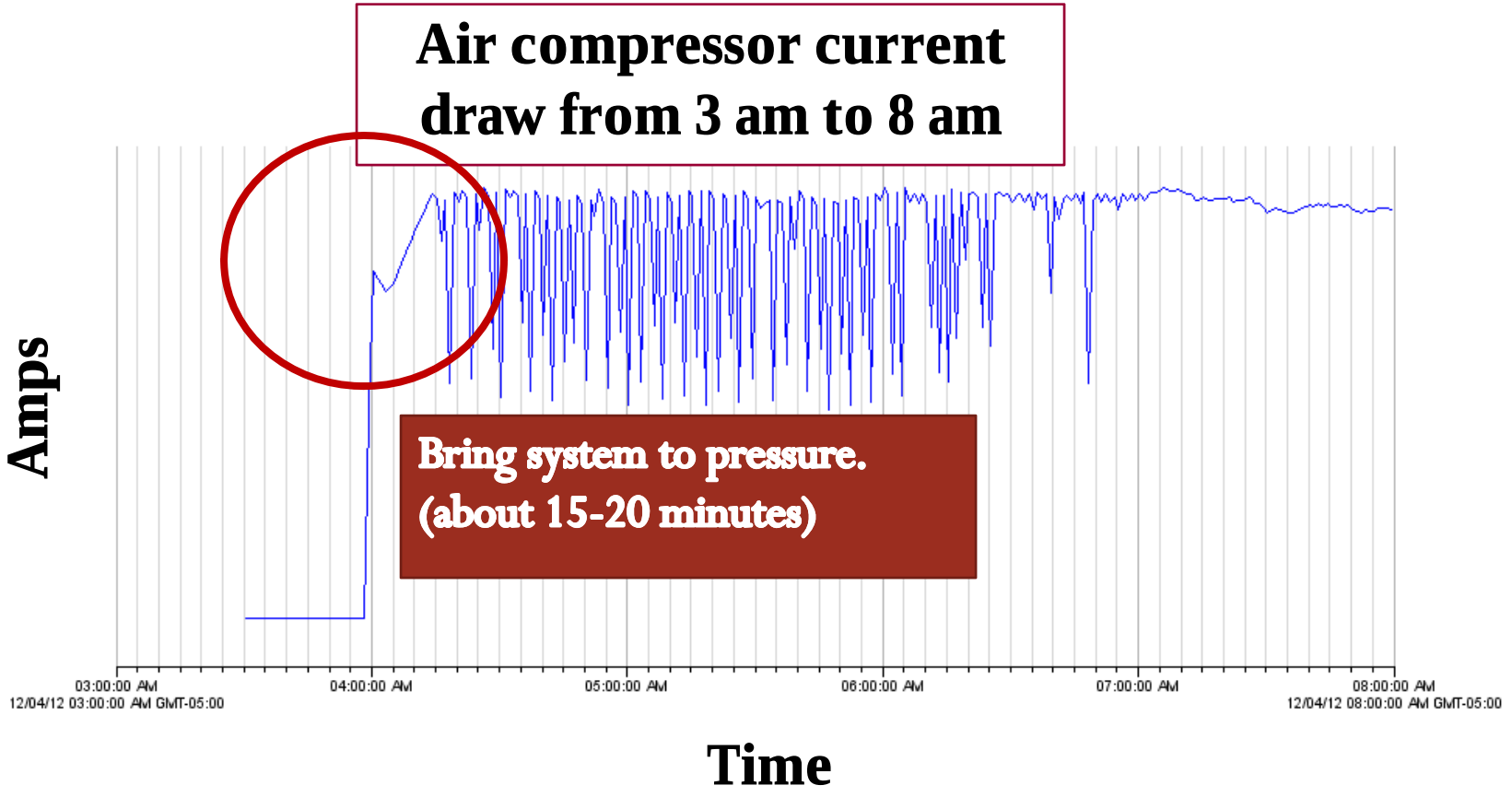
Data logging: Air compressor



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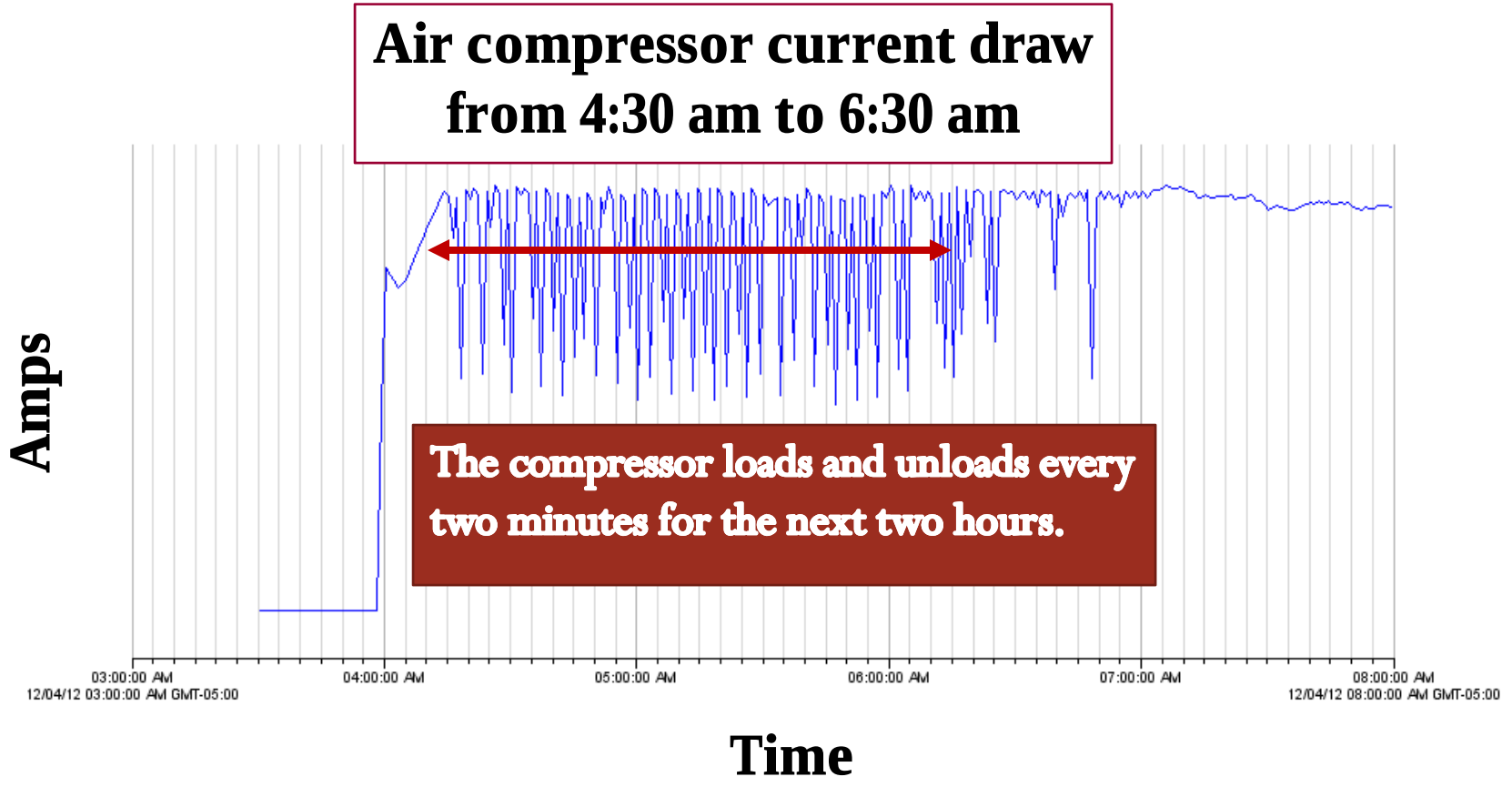
Data logging: Air compressor



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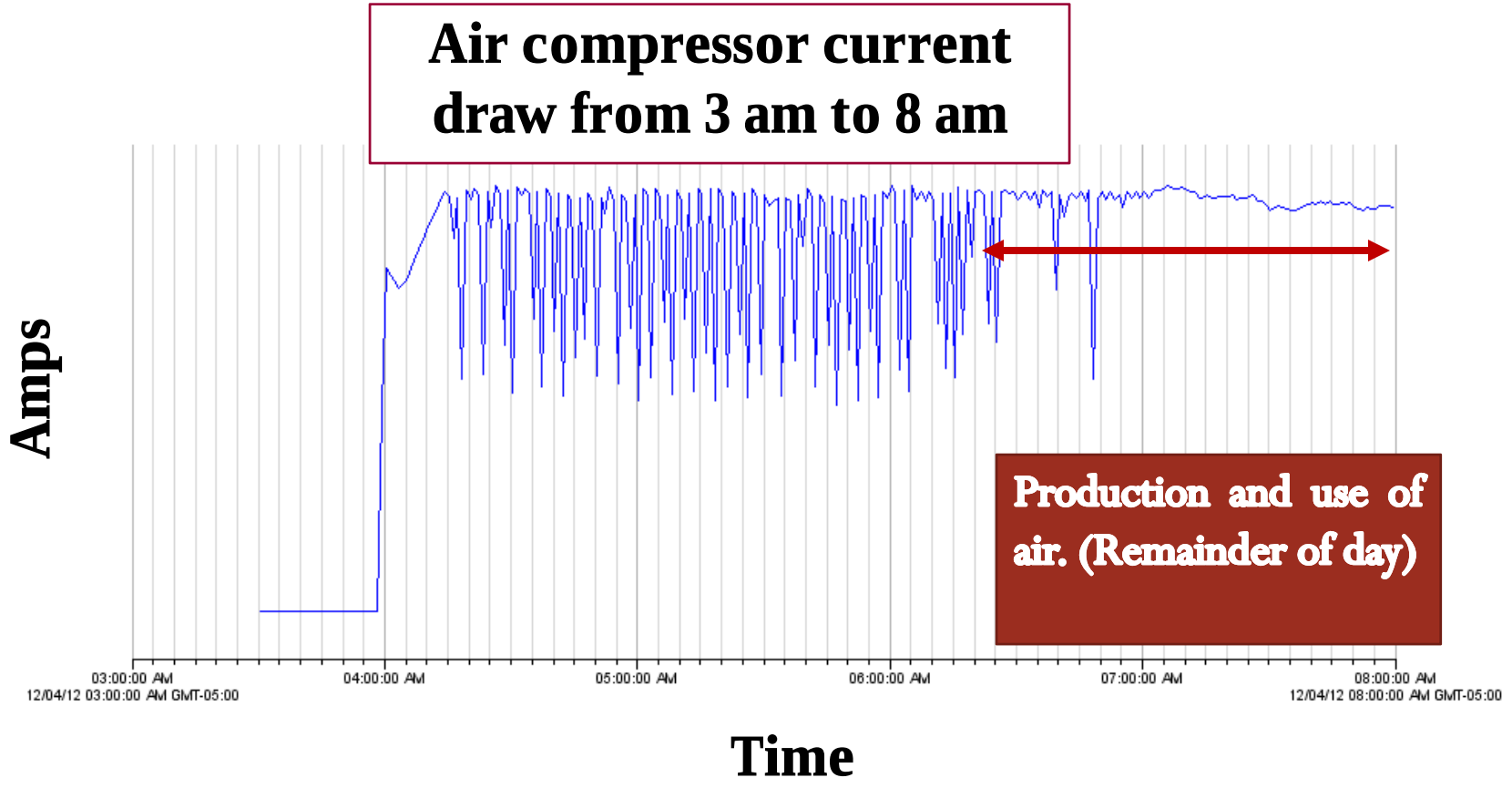
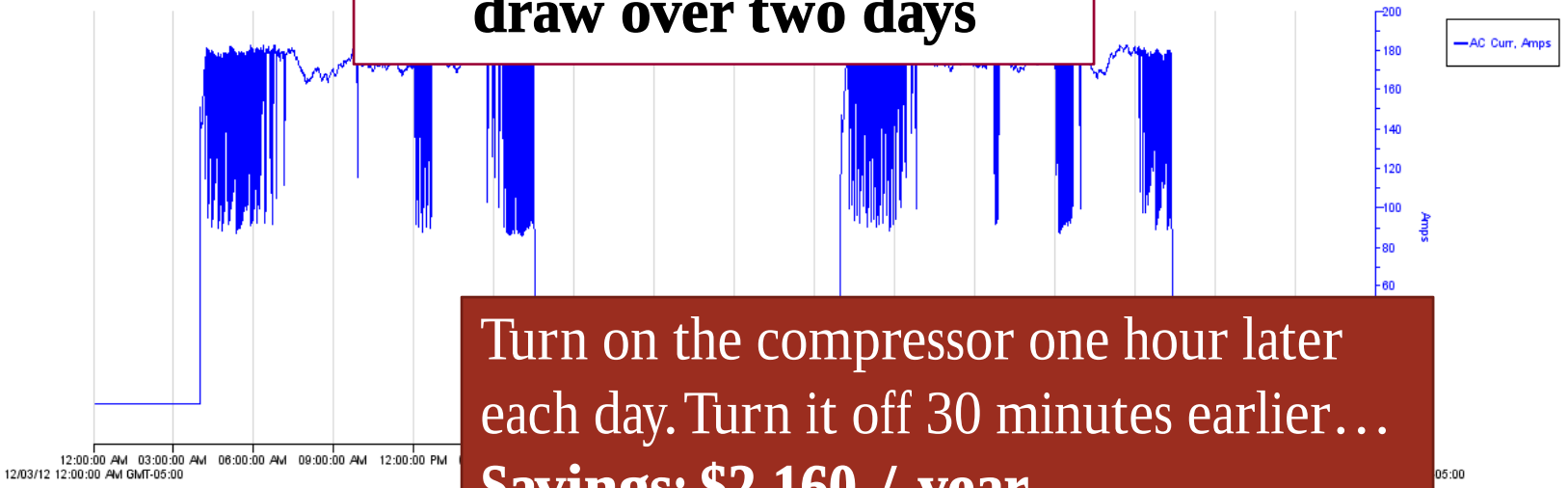
Data logging: Air compressor



E3: Economy, Energy, and Environment

Data logging: Air compressor

Air compressor current draw over two days



Turn on the compressor one hour later each day. Turn it off 30 minutes earlier…

Savings: $2,160 / year

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Ultrasonic leak detection

Repairing compressed air leaks is an unglamorous but vital role in reducing the cost of compressed air.

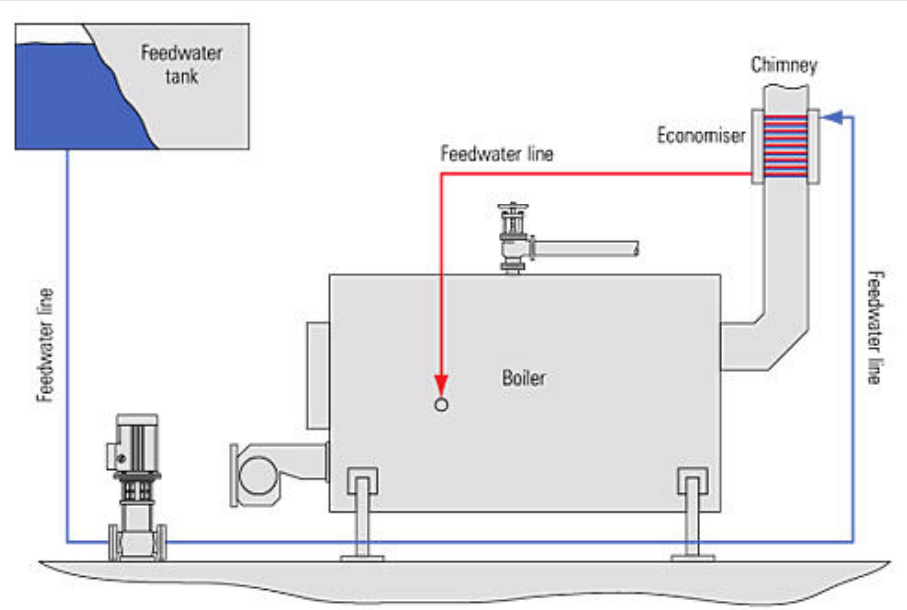
Many various lighting items

A typical vending machine has lights and ballasts of about 180 watts. Multinational beverage companies do not reimburse you for their advertising. Delamping one machine can save about $100 per year.

Plant an evergreen north windbreak

The fully heated facility has an exposed north facing wall with 1960s casemate windows.
Recommendations:

- Cover the windows with insulating film.
- Plant a vee-shaped line of trees to divert north wind
- Estimated savings: 20-50% of heating costs.



- A rule of thumb is that boiler efficiency will increase 1% for every 10 degrees of increase in feedwater temperature from an economizer
- Feedwater temp rise = 260 – 220 = 40°F
- Expected increase in efficiency – (40/10) (1%) = 4%
- The heat output of the 350hp boiler) is:
- Q_0 = (350 Bhp)(33,472) = 11,715,200 Btu/hr
- Q_i = =14,644,000 Btu/hr input
- $H_{220°F}$ = 188.2 But/lb
- $H_{260°F}$=228.8 Btu/lb
- Q_r = (12075 lb / hr) (228.76 – 188.22) Btu/lb = 489,520 Btu/hr
- The percent reduction in fuel consumption
- = 4.2%

Steam exhaust economizer

A boiler's economizer was worn out and the client wanted to know if it would be worthwhile to replace it.

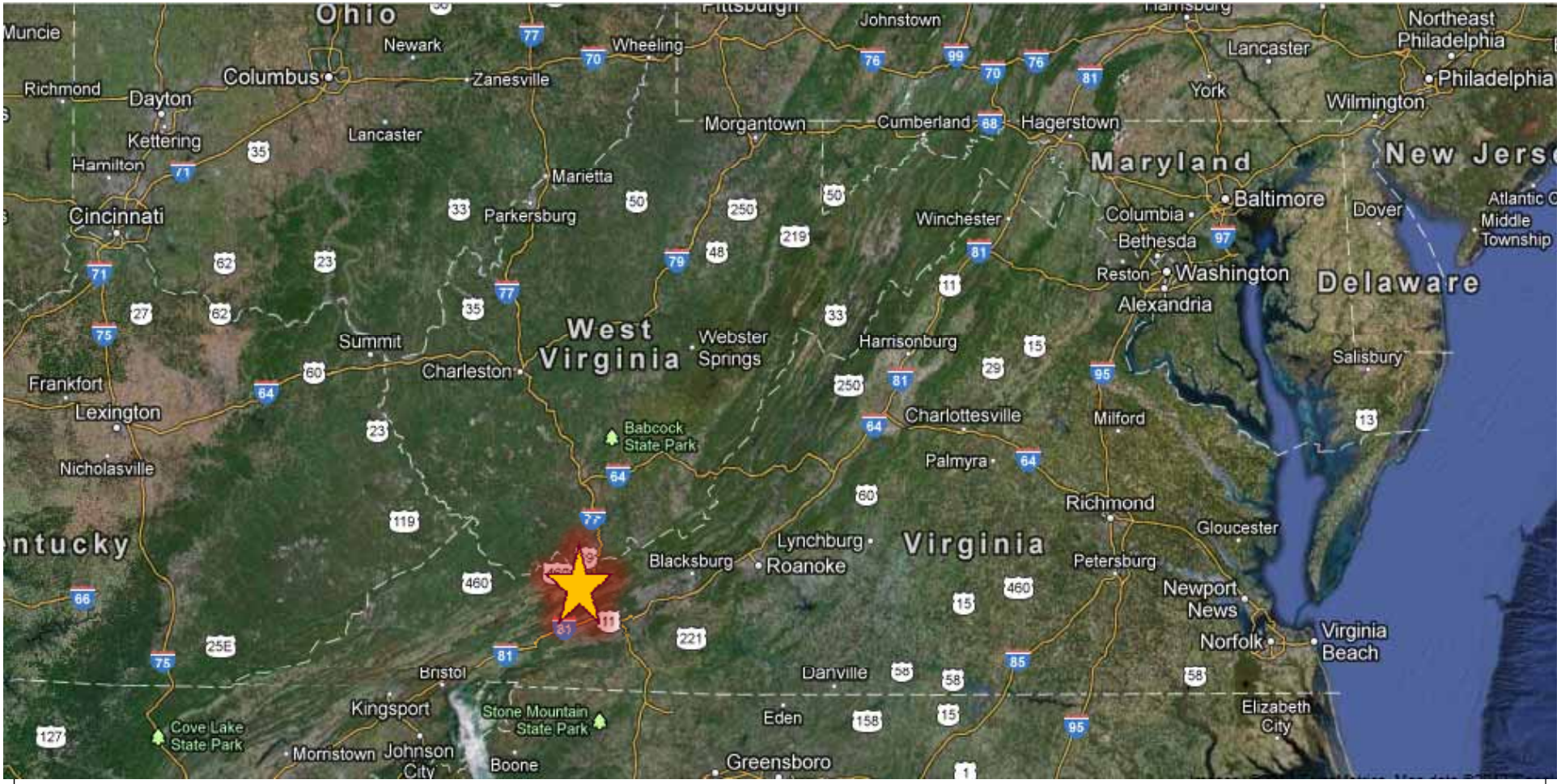
Right sizing motors

Acme operates two identical boilers in parallel. The assessors noted that the North Boiler has a 15hp blower motor, but the South Boiler blower motor has been replaced at some point with a 25 hp. It is probable that the 25 hp motor is oversized.

- 10 hp (.746 kW/hp) (8460 hours / year) (.5 load factor)
- Annual savings = $3,500

Technical Assessment

Environment



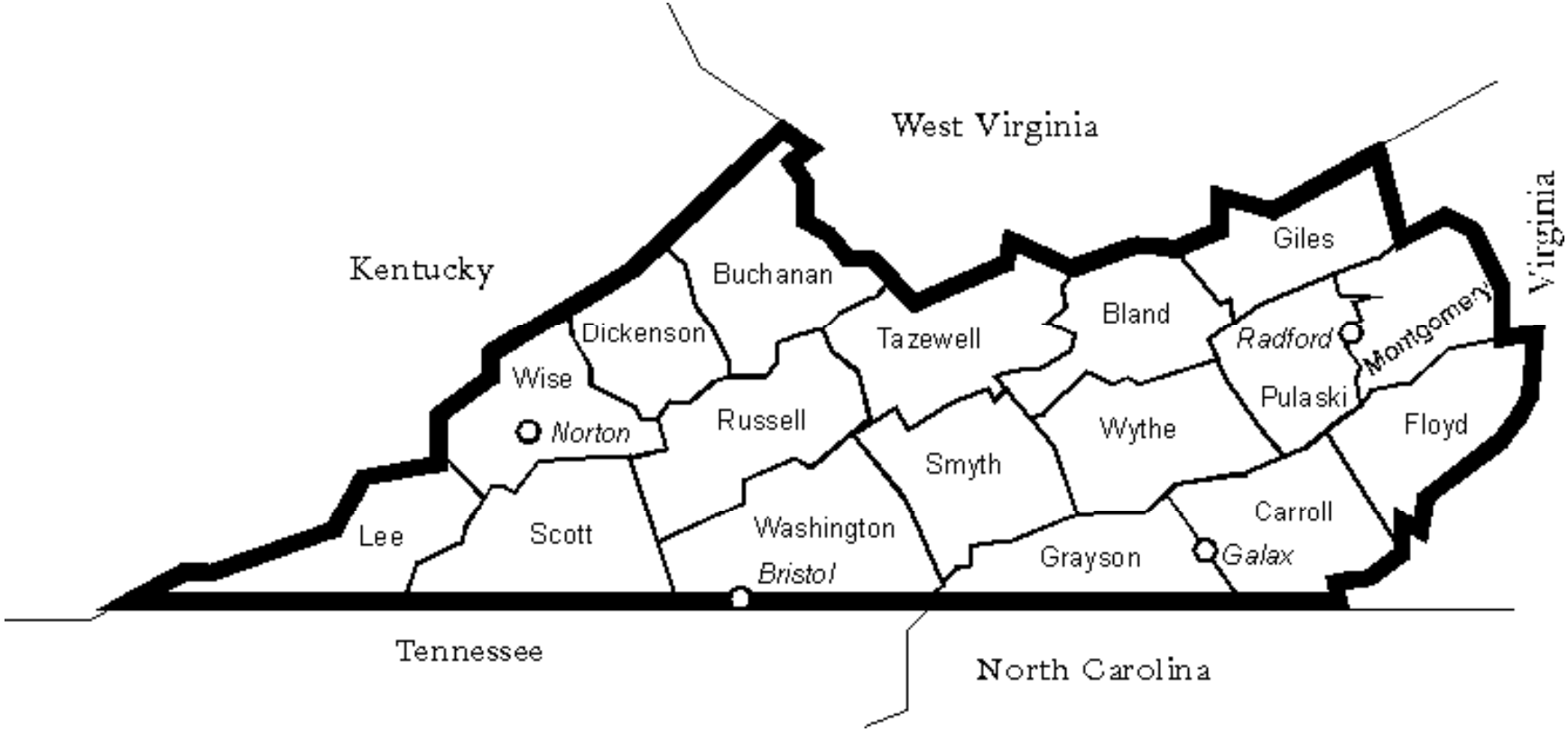
The Center of the Known Universe

Old Stage Road, Crockett Virginia

The Great Wagon Road

MTC SERVICE REGION

COMMUNITY COLLLEGES: Mt. Empire, New River, Southwest Virginia, Virginia Highlands, Wytheville



E3: Economy, Energy, and Environment

MTC Mission

The Center will foster **economic growth** by being a catalyst for the advancement of **Southwestern Virginia's business community**.

The Center accomplishes its mission by providing ***direct assistance, demonstration projects, and training*.**

Direct Service Staff

- **Nelson Teed,** Executive *Director*
- **Shawn Wildman,** Senior *Project Manager*
- **Herb Bird,** *Project Manager*
- **Keith Litz,** *Environmental and Energy Specialist*

Engineering Direct Service Program

Core Services

- **Lean-Six Sigma Implementation & Training**
- **ISO Quality Systems Implementation**
- **Workflow Design**
- **Process / Product Development**
- **Environmental & Regulatory Compliance Assistance**
- **Specialty training (project mgmt, CAD, SPC, GT&D)**
- **Contract engineering services**
- **Comprehensive Technical Assessments**

Two Unique E3 Attributes (E3 Initiative)

1. The current state of manufacturing in Virginia requires plant staff to assume multiple responsibilities "wear many hats". Their day seldom has the time to search for improvement opportunities. Our program allows us to search for these opportunities in many facilities, develop solutions, report these to plant staff and management and assist with implementation resources.

2. The "bottom line" in many cases does not allow for a trained environmental professional on-site. During pollution prevention and compliance review we have identified many issues and recommended solutions. This prevents future landfill contamination and possible fines for our manufacturers.

Without all three components of an E3 assessment which allows environmental performance review, these issues may have never been identified unless an environmental regulator discovered them.

E3: Economy, Energy, and Environment

MTC GENEDGE alliance

MTC Confidentiality Commitment

- All work with our clients is confidential. Our funding and state technical assistance agency are not provided names of client sites and they do not ask for them.
- We work for our clients.

Southwest VA Assessment Results To Date

18 Completed Assessments in Southwest Virginia:

• 10 P2 projects additional	$121,399,	$174,573
• 15 Energy projects additional	$79,807,	$81,049
• 36 Economy projects additional	$1,241,486,	$1,458,646

- Total recommended improvements: $7,075,515

E3: Economy, Energy, and Environment

MTC "E3" Website

E3 Website

http://www.e3.gov/about/index.html

E3 Southwest Virginia

http://www.e3.gov/accomplish/sw_virginia.html

Technical Assessment: Environmental

Pollution Prevention

Environmental Compliance

Technical Assessment:

Environmental

- Pollution Prevention
  - Reduced air emissions
  - Reduce landfill impact
  - Minimize stormwater pollutants and protect surface water
  - Protect wastewater plant operation and water quality

Technical Assessment:

Environmental

- Environment
  - Environmental Compliance
  - Air permitting
  - Stormwater and Industrial discharge
  - Hazardous waste, Universal waste, Used oil

- **Action:** Client discharges high suspended solids
- **Results:** Surcharges result in expenses for facility
- **Solution:** Utilize existing tank in order to settle solids and prevent surcharge cost.
  - Our client installed an exhaust unit to address emissions from a laser unit.
  - Results: Particulates entering their stormwater, significant heat loss from the shop and negative pressure.
  - Solution: Install a fabric filter unit to remove particulates and return warm air to the work area.

Pollution Prevention - Air

- Action: Client uses solvent to rinse coating machine
- Results: Large Quantity Generator of hazardous waste
- Solution: Contract with distillation company to reclaim solvent for reuse

Pollution Prevention - Land

- **Action:** Client discharges high suspended solids
- **Results:** Surcharges result in expenses for facility
- **Solution:** Utilize existing tank in order to settle solids and prevent surcharge cost

Pollution Prevention - Water

Environmental compliance

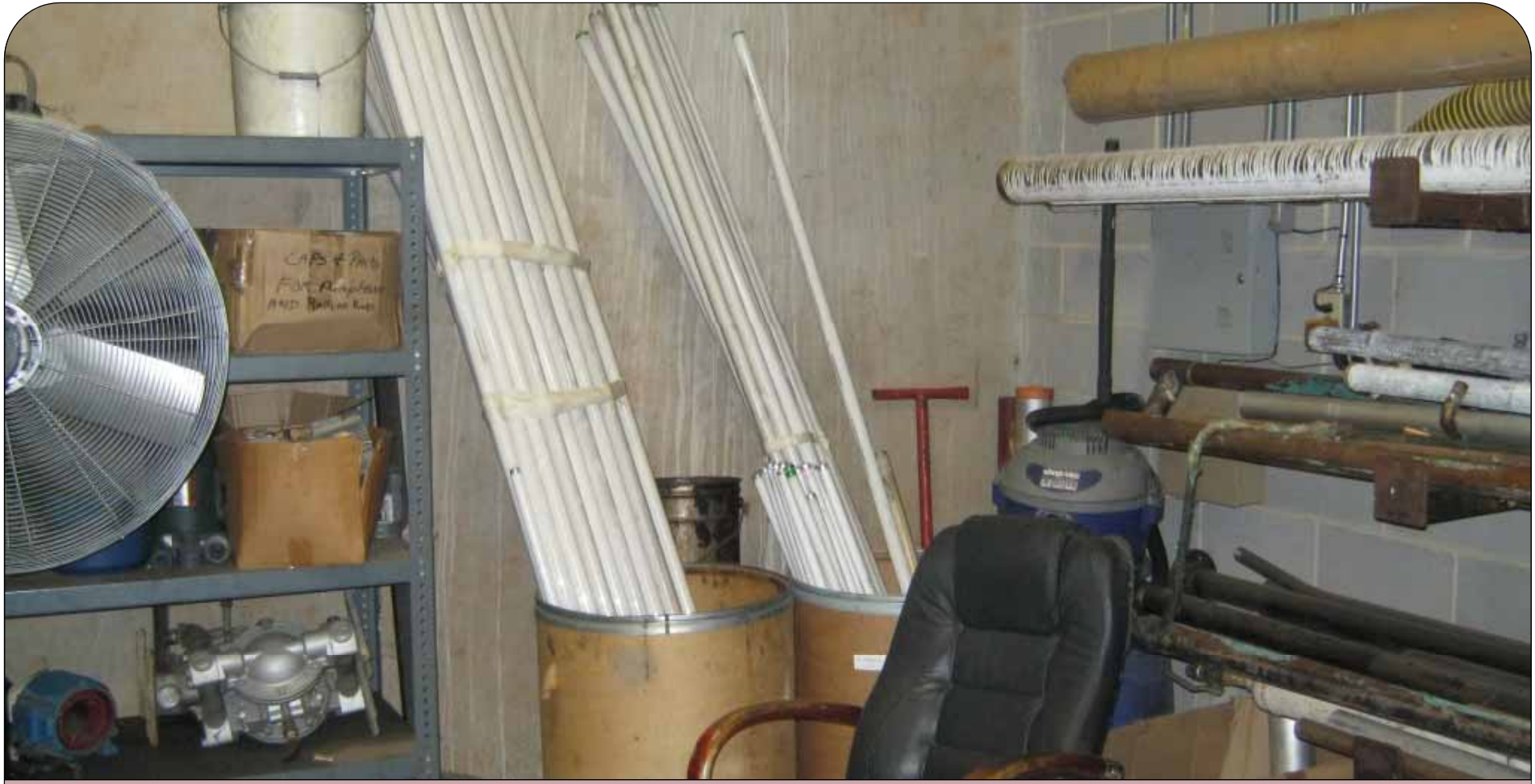
Improper situation for air emissions

Environmental compliance

Hazardous Waste storage, good and bad

Environmental compliance

Improper storage



Environmental compliance

Light tube storage issue

Environmental compliance

Used oil storage

Environmental compliance

Obsolete chemicals

Environmental compliance

Stormwater violation

Environmental compliance

Stormwater Violation

Environmental compliance

- Stormwater Violation

Environmental compliance

Unlabeled Containers

Technical Assessment

Economy

Technical Assessment:

Economy

- Some or all of these tools deployed
  - Lean Assessment
  - Process Flow Diagram
  - Interviews
  - Data Collection and Analysis
  - Plant tour & Observations

Economy:

Lean Assessment

- Ten Categories
- Six to eight questions / observations per category
- Scored 0 – 4, for each entry
- Total scores / category, converted to percentage
- Scores compared to world class in summary
- Detailed review by category
- Recommendations for improvements

Economy Assessment:

Traditional Process Improvement

- Install a stretch wrapper at the end of the stacker on the main line.
- Currently 3-4 operators strap and wrap the units after they are stacked.
- The fork truck driver transports the unit to the wrapping station.
- Anew stretch wrapper would automatically take the units off the exit conveyor; wrap them, where they would be ready for transport to shipping or the warehouse. T
- Potential labor reduction is two operators per shift or a total of four people.

Economy Assessment:

Innovate New Products

- ACME's product mix is 98% military, with the remaining portion going to a new low volume line and some custom made, high end, product. ACME has untapped capacity that they would like to fill by:
  - Expand the market for the current military product
  - Innovate into more high end, low volume product
- To this end GENEDGE recommends that ACME investigates Innovation and Growth Coaching services. These would include a multi step, facilitated approach used to: (1) Create, (2) Communicate, and (3) Commercialize new products through a series of technology acceleration cycles of learning that are: Define–Discover–Develop–Deliver.

Economy Assessment: "Hot Seat" Production

- Currently all personnel in the slitting area are taking their breaks together and shutting down the operation for 100 minutes per day.
- The E3 assessment recommended a "hot seat" where as operators stagger their breaks and the equipment stays running.
- This allows the lines to produce an additional ** rolls of *** meter product per day, and about $30,000 in additional annual revenue.

Economy Assessment:

Succession Planning

- Most positions at ACME are one person deep with little or no backup. Probably the most glaring example is that of Don Juan the CEO of the company.
  - Don is the most knowledgeable person in the facility having over 50 years experience designing and engineering the product.
  - Most, if not all, product designs cross Don's desk for design, engineering, advice or approval.
  - Steve, the Operations Manager can back Don up for most needs, but in the event that one or both of them is not at work, projects wait for their return, possibly delaying a customer.
  - Don is near retirement age and even though he enjoys his work, one day he will leave the company taking all the undocumented knowledge he has accumulated with him.
- The E3 assessment suggested an aggressive documentation process be undertaken with the goal to capture as much of Don's knowledge for use by his successors.

Economy Assessment:

Succession Planning

- Additionally there are other key jobs in the company that need to be included in the succession plan.
- The assessment recommended a simple management structure be established, job descriptions be written, and planning be made for backup personnel identification and training to take place for these key positions.
- The **long term** future of this company will depend on how well these plans are put in place.

E3: How do I participate?

- In you are in one of the counties covered by our current grants, just call.
- If you not in that area…

E3: How to Get Started

Four Steps to Progress:

Step 1

Select areas with available resources

Step 2

Establish team

Step 3

Secure funding streams

Step 4

Engage manufacturers

Step 1: Select Areas with Available Resources

- Consider current E3 activities in Columbus and San Antonio
- Locate areas with existing local Technical Assistance Providers (TAPs) such as:
  - Manufacturing Extension Partnership (MEP) centers
  - Industrial Assessment Centers (IACs)
  - State Pollution Prevention (P2) programs
  - Small Business Development Centers (SBDC)
  - State Energy Offices

Step 2: Form the Team

- TAP (MEP, IAC, State P2, SBDCs, State Energy Offices)
- Representative from the local government (i.e. city, county, state)
- Other municipal and regional organizations
- Utilities

Step 3: Secure Funding Streams

- Develop E3 Charter:
  - Federal contributions
  - DOE's Energy Efficiency and Conservation Block Grants (EECBG)
  - Manufacturer, utility, and city contributions

Step 4: Engage Manufacturers

- Select manufacturers:
  - Utilities develop list of suppliers that are significant energy users. Stakeholders and/or other organizations identify businesses with significant water usage and/or waste disposal.

- Schedule assessments:
  - Utilities and/or local organizations work with MEP centers and IACs to approach organizations and schedule assessments from those interested in participating.

Questions & Answers

Supporting Manufacturing Leadership Through Sustainability

E3: Economy, Energy, and Environment