MINING IN KENTUCKY: Past, Present & Future

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Kentucky can be defined by its mineral resources; Coal fields, Fluorspar District, Limestone
Kentucky’s Historic Mining Resources
To look forward, sometimes we need to take a look back.

Saltpeter
Iron Ore
Fluorspar
Clay / Shale
Sandstone
Limestone / Dolomite
Sand / Gravel
Lead
Phosphates
Zinc

Headframe from abandoned Zinc mine, WKY
Kentucky Mineral Resources

Limestone / Dolomite

KY has the most Underground Quarries in the U.S.
Kentucky Mineral Resources

Fluorspar / Barite / Calcite / Lead / Zinc

FLUORSPAR

Kentucky led the nation in production until World War II. Presently there is none mined in the US.
Coal: The Public Perception -
Death, Despair & Destruction
“… Britain, the first nation to be thoroughly transformed by releasing the genie of coal. …became the most powerful force on the planet, and created an industrial society the like of which the world had never seen.”

“… the United States,… Coal transformed a virtual wilderness into an industrial super power with astonishing speed.”

-Powerful observations from Barbara Freese,

“Coal – A Human History”
Strategic locations of US Coal Fields key to the rise in world prominence
Take a Look Forward by Looking Back
Brief History of KENTUCKY COAL
Formative Events By The Decades

1750  Dr. Thomas Walker, an early KY explorer records his discovery of coal.

1820  1st Commercial Mine – the "Mclean Drift Bank" Muhlenberg County – 328 Tons

1850  Coal exported back to Great Britain "The King’s Coal"

1879  1 Million Tons Produced – primarily from W. KY
COAL

1880

Mechanical Stokers

1st Coke Ovens Western Kentucky

Coal Mining Machines Come into General Use
COMMUNITY OF COAL

1900s

“The Golden Age of Coal Mining.

Coal Camp’s Contrasting Life Styles, many are model communities

Kentuckians have strong sense of Place

Miners are fiercely proud of their Heritage
COAL – Western KY Coalfield

Led the state in production until 1912

1914 World War I increases demand in KY - 20 Million Tons in production
COAL

1920  42.1 Million Ton production
1923  1st Large scale excavators in Mining
1930  Union wars “Bloody Harlan”  - Depression

Shovel moved from Panama Canal construction
COAL

1940
World War II KY Production 72.4 Million tons

1942 Continuous Miners Developed
Auger Mining introduced

More Mechanization necessary due to miners in service

Development of mobile equipment for war led to adaptation in small scale surface mining
COAL

1950  82.2 Million Tons
      Roof Bolting Introduced
      Another Down Cycle in Coal

1960s  RR’s begin using Unit Trains
       First Longwall Mining

1963  100 Million Tons Production
COAL

1970s marked by new Regulatory initiatives

1969  Federal Coal Mine Health & Safety Act forms MESA - Now MSHA

1970  Federal Clean Air Act

1972  Clean Water Act

the first women coal miners in US
Pike County

1973  OPEC Oil Embargo
Coal Production & Price
Skyrockets

1976  Scotia Mine Disaster – Letcher Co.

1977  Federal Surface Mining Control & Reclamation Act (SMCRA)
1988  Wyoming Becomes Leading U.S. Producer

1989  PYRO Mine Disaster – First woman killed underground

1990  KY Record Production 179.4 Million Tons U.S. Coal Production Exceeds 1 Billion Tons

1998  Mountaintop Mining Controversy begins
COAL – THE PRESENT

Issues for Kentucky Coal

- Environment
- Miner Health & Safety
- Community Health
EPA ?- Which Law Applies?
New interpretations of long standing programs

STATE PROGRAMS?

CWA - 1972

SMCRA - 1977

Corps of Engineers
The mining tragedies of 2006 – 2007 & then 2010 - Upper Big Branch
Is Coal Mining Bad for Your Health?
Whose science do you believe?

“The problem is that the theory that this is due to coal and coal pollution is politically attractive but scientifically not defensible,” says Jonathan Borak, a physician and epidemiologist at Yale.
Modern Mining Methods

- Surface
  - Area & MTR
  - Contour - Highwall/Auger
- Underground Mining
  - Room & Pillar and Longwall
Mountaintop Removal or Mountaintop Mining

- Fig. 1 Mountaintop Mining, Skelley and Loy, 1975
EPA 2005 EIS Definition “Mountaintop mining”

- was defined in the FPEIS as coal mining by ... *surface methods (e.g., contour mining, area mining, and mountaintop removal mining) in the steep terrain of the central Appalachian coalfields.*

- This definition by its very nature includes virtually all surface mining.
Coal Preparation Plants & Refuse Disposal

Refuse areas have mistakenly been directly associated with Mountaintop Removal by many activist groups.

Underground mined coal has to be processed. In many mines 50% of material mined is rock that must be placed in refuse areas.
Mine Health & Safety

- What has changed in mine safety law?

- But first, historical perspective on mine safety
MSHA says 2012 safest year on record in US mines
Primary Causes of Mine Accidents

- Roof Falls
- Equipment Accidents
- Fires and Explosions
- Human Errors!
Look at how perceptions change.

We Want to Mine 1,000,000 Tons of Coal Per Fatality.
By Being Careful—Keeping Timbers Up—Taking bad Slate Down Obeying The Company Rules, We Can Do This.

- **MINER Act designed to prevent a repeat of Sago**

- Phased in over three years

- Has spurred new technologies
  - Shelters
  - Communications
  - Seal design
Everyone’s Goal - Come home safe!
THE FUTURE OF COAL?
“WE USED TO THINK THIS WAS THE CASE UNTIL THERE ACTUALLY WAS A REALISTIC, AFFORDABLE ALTERNATIVE TO COAL”

A Coal-Free World?

“Something’s just not right—our air is clean, our water is pure, we all get plenty of exercise, everything we eat is organic and free-range, and yet nobody lives past thirty.”
Kentucky Total Coal Production, 1960-2012
Underground Production vs. Surface Production

Kentucky Energy Database, EEC-DEDI, 2013
2012

Gas = Coal

U.S. Electricity Generation, by Source
(Billion KiloWatt-Hours)

U.S. monthly net electric power generation, January 2007 – April 2012
million megawatthours

2004
WHAT CHANGED FOR COAL?
New gas supplies due to Horizontal Drilling and Fracking

How many really predicted?
Reinterpretation of regulatory programs

Building a Stream Protection Rule
Study: The coal industry is in far more trouble than anyone realizes

That’s according to a new peer-reviewed study by three researchers at Duke’s Nicholas School of the Environment

• Cheap natural gas is crowding out coal

• And new pollution rules could accelerate that shift

PLUS THE EPA REINTERPRETATION OF CWA PRIMARILY IMPACTING APPALACHIAN MINING
Coal's Future Is Rocky at Best

Coal's Darkest Hour

Once the mainstay of U.S. power plants, coal is being replaced by abundant natural gas unlocked through widespread fracking.

- Powder River Basin coal price change
- Appalachian coal price change
- Natural gas price change

Cheap natural gas and environmental regulations have lowered demand for coal, pushing prices down.


-25%
0%
25%

-50%
-24%
-45%
-56%

Graphic by Bloomberg Businessweek
Data: New York Mercantile Exchange, IntercontinentalExchange
WHAT HAPPENS IN KENTUCKY?

- Less Coal Production in EKY
- Electricity gets more expensive??
- Manufacturing moves out of KY?
The end of Appalachia? Illinois Basin coal makes comeback

- Illinois Basin region most affected by the Clean Air Act and subsequent amendments
- advance of technology now allows burning of high-sulphur coal
Chris Cline: The New King of Coal?

Illinois' recoverable reserves of coal are larger than those of any state east of the Mississippi River and the third largest in the country, behind only Montana and Wyoming. IL Geological Survey
Why were Bill Gates & Warren Buffett in Gillette Wyoming?
Buying the Burlington Northern Railroad which hauls all of the coal out of Wyoming.
WHAT ABOUT THE REST OF THE WORLD?

BRICSI COUNTRIES
Brazil, Russia, India, China, S. Africa, Indonesia

COAL PRODUCTION IN THE REST OF THE WORLD RISING DRAMATICALLY
OVER HALF OF THE WORLD STILL LIVES IN ENERGY POVERTY WITH NO ELECTRICITY
Future Hope for Kentucky Coal?

Metallurgical Coal & Exports

- Exports have increased – Nationally approximately 100,000,000 tons

Recent Headlines:

- Kentucky, W.Va., To Ship Coal To India For 25 Years
  August 16, 2012 (still hasn’t happened almost a year later)

Predictions:

- WKY production will increase
- Exports will increase, but will not make up EKY production losses
- EKY production will continue to decline
- Surface mining in EKY will decline more dramatically
- Underground mining will increase somewhat
NEW OPPORTUNITIES FOR MINING IN KENTUCKY?
Western KY-Illinois Fluorspar District
WE MAY SEE THIS TYPE OF MINING AGAIN IN A FEW YEARS
Kentucky’s Rich Mining Heritage

The Ben E. Clement Mineral Museum
205 North Walker Street, Marion, Kentucky, 42064
Portal 31 - Kentucky’s First Exhibition Coal Mine

Lynch, Harlan County, Kentucky

Client:
Southeast Education Foundation, Inc.
Cumberland, Kentucky

Firm:
Engineering Consulting Services, Inc.
Lexington, Kentucky

Innovative Engineering Techniques:
All potential hazards of taking the public into an underground mine were considered for this project. A system of sump pumps was designed to drain water outside the mine. New seals were constructed throughout utilizing Omega Blocks (lightweight foam/fly ash blocks). The mine fan was rehabilitated for circulation of fresh air. Multiple roof control measures were utilized including installation of high-strength fiber mesh on the roof and ribs of the tunnels, resin roof bolts, concrete cribs, and application of an experimental high-tenacity sealant (Tekflex).

Future Value to Engineering Practice:
Portal 31 preserves the heritage and historical value for future generations. It serves as a classroom for engineering and mining students and a public education tool on energy and the environment.

Social, Economic, Sustainable Design:
ECSI and the client applied adaptive reuse to Portal 31 which will provide an income stream to the local community and provide jobs for local residents.

Complexity:
The complexity of this project began with obtaining the necessary permits for the mine portal to remain open for rehabilitation and continued throughout the design process. Funding issues and political considerations also complicated the project.

Exceeding Client Needs:
ECSI worked with the client over a 10 year period. We provided a feasibility analysis and engineering design, offered our expert opinions, and represented client interests and public safety. ECSI ensured accuracy of underground exhibits, obtained mining equipment, helped secure state and federal funding, negotiated contractor cost overruns, provided C/A services, and established a project website.
ON A POSITIVE NOTE - KENTUCKY DID WIN ONE NATIONAL CHAMPIONSHIP IN 2013 - UK Norwood Chapter Named SME Outstanding Student Chapter

Kentucky’s Team at the International Intercollegiate Mining Competition 2012