POWERGEN SERIES
#POWERGENPlus

ENERCON

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About ENERCON
ENGINEERING | ENVIRONMENTAL

ENERCON
Excellence—Every project. Every day.

Power Generation | Industrial | Power Delivery | Government | Critical Power

2019 ENR TOP 500
#2 Nuclear Power Engineering
Pure Design | Power
Fossil Fuel | Pipelines

VERIFORCE ISN JPEC BROWZ Avetta

37 *Years of Experience*
21 *US Offices*
1,100+ *Employees*

Entergy
Customer Since 1983

2

ENERCON + LR

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ENERCON has a presence on 90% of the reactors across the US Nuclear Fleet

Focus on minimizing impact on existing utilities organization

5 **SLR Feasibility Studies**

2 **Of the first SLRs in the US**

EPRI Reports for Long Term Operation


POWER
NRC Issues First Subsequent License Renewals, Extends Nuclear Reactor Life to 80 Years

Supporting License Renewals Through:

- Feasibility Studies
- Application Development
- Lifecycle Management Plans
- Implementation
- Probabilistic Risk Assessments
- Environmental Reports
- Support during NRC Review
- Capital Improvement Assessments & Cost Estimates

3

LR in the US Nuclear Fleet

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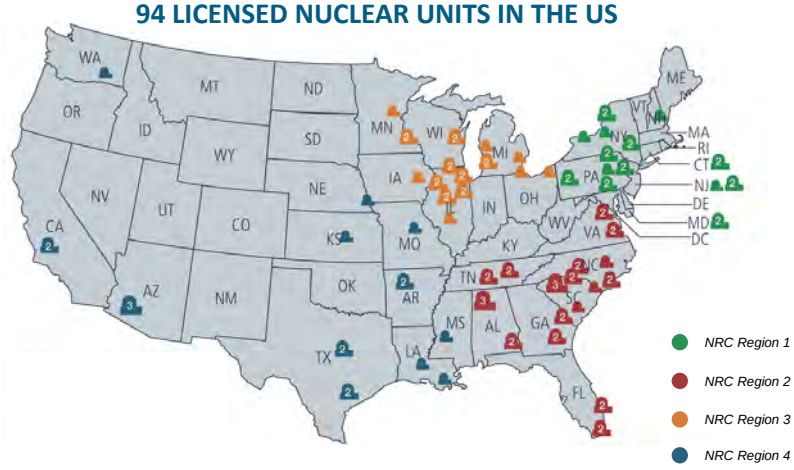
94 LICENSED NUCLEAR UNITS IN THE US



SLR Application / Approval Status

8 40-year licenses

82 60-year licenses

4 80-year licenses

6 SLR Units Under Review

4

LR Timeline

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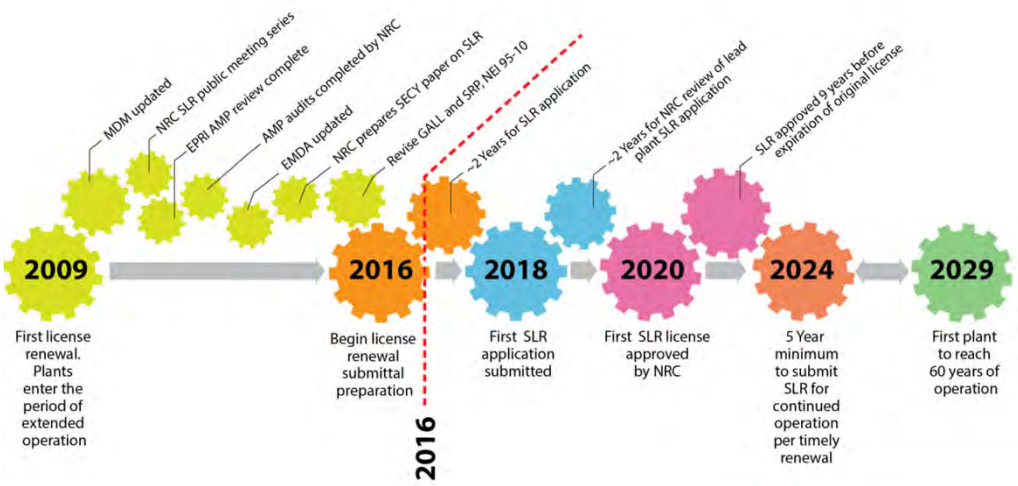

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Life Extension vs New Development

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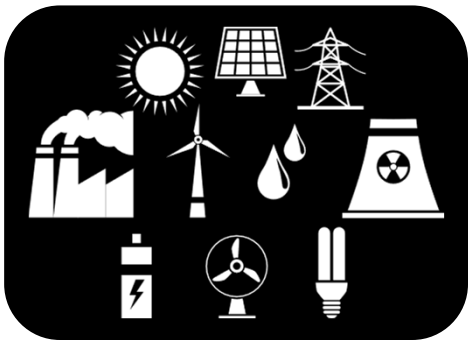
Access to Alternative Fuel



Transportation Access

Population Density

Land Availability

Water Availability

7

1

What We Do

- **Renewable Waste-to-Energy -** *Waste-to-Energy combustion and steam generation*
- **Renewable Biomass –** *Biomass combustion and steam generation*
- **Environmental Technologies -** *Integrated, custom solutions for utility/industrial emissions control*
- **Ash and Material Handling -** *Bottom and fly ash material handling*
- **Cooling Systems -** *Custom engineered wet, dry and hybrid cooling solutions for power plants*
- **Steam Generation Technologies -** *Boilers to burn any fuel, from small package boilers to high-capacity boilers*
- **Boiler Auxiliary Equipment -** *Reliable components for cleaner, more efficient operations*
- **Technical Services and Parts -** *Solutions for modifying, improving, operating and maintaining equipment*
- **Construction -** *Field construction, construction management and maintenance services*

Delivering value to our customers through technology-driven products and services
Continual product improvement and research and development to support future needs, including carbon capture

2

Key Technologies: Steam Generation Technologies

Utility Boilers

High pressure, high efficiency, high capacity, low emissions
Fuel: Coal, oil, natural gas, multi-fuel

Waste-to-Energy Boilers

Reduces dependency on landfills and reduces methane gas emissions
Fuels: MSW, RDF

Natural Gas-Fired and Other Industrial Water-Tube Boilers

Bottom- or top-supported, shop- or field-assembled
Fuel: Natural gas, oil, CO, waste heat and gases

Biomass-Fired Boilers

Carbon-neutral technology
Fuels: Wood, wood waste, straw, sludge

Process Recovery Boilers

Single-drum, industry-standard unit for improved mill operation
Fuels: Black liquor

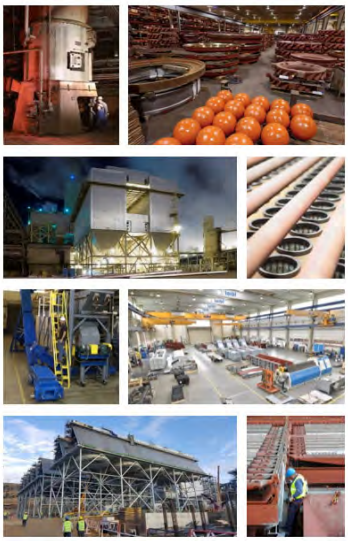
B&W RENEWABLE BABCOCK & WILCOX

B&W THERMAL BABCOCK & WILCOX

3

Key Services

Upgrades & Retrofits	**Improving plant operation:** Projects for extending the life of power, process and environmental equipment
Replacement Parts	**Supplying components for system reliability:** High-quality standard or custom-engineered pressure and non-pressure parts
Optimization Systems	**Enhancing efficiency with proven technology:** Diagnostic, monitoring, tuning and control systems for combustion, cleaning and cooling equipment
Engineering Services	**Evaluating options for improved performance:** Expert people, tools and processes to measure, model, design, deliver, train and project manage
Construction	**Adding value through constructability:** Safe execution of new installation, retrofits, system maintenance/repair, plant modifications



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Life Extension: Clean Coal & Carbon Capture Retrofit Solution

Oxy-Fired Combustion

- Oxy-coal combustion technology
- "Near-zero" emissions
- 30 MW demonstration complete
- Full-scale design ready

RSAT™ *(Regenerable Solvent Absorption Technology)*

- Post-combustion technology
- Proprietary amine-based solvent process
- Pilot commissioning completed at NCCC
- Installed base retrofit application

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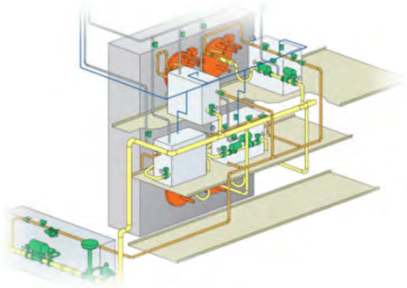
Carbon Capture Technology for retrofit the 1000 GW of Global Coal Installed Base

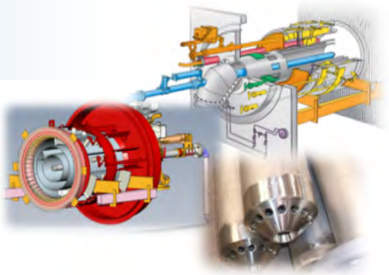
5

Economic Life Extension: Coal to Natural Gas Boiler Conversions

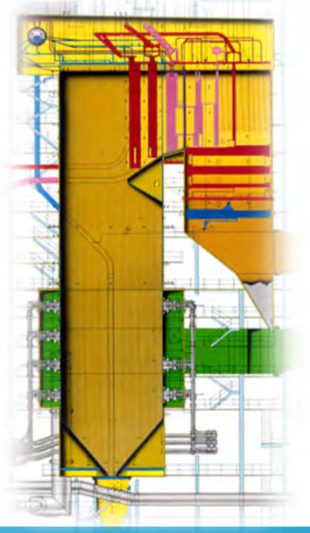
Coal to gas conversions can extend the economic life of many coal units and dramatically reduce emissions

- Immediate CO2 reduction
- Eliminates SO2, PM, acid gas, and Hg emissions
- Improved ramp performance and reliability





B&W BABCOCK & WILCOX THERMAL



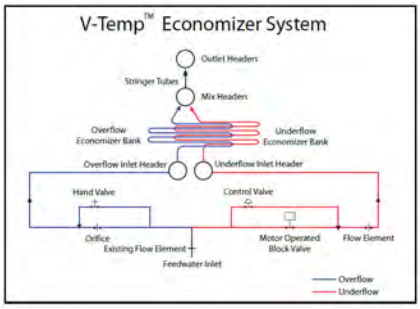
Converting to gas where it makes sense can extend coal plant economic life

6

Economic Life Extension: Variable Temperature Economizer

Designed to dramatically improve turndown for coal units with SCR's

- Can improve coal unit turndown by up to 60%
- Lower cost than water or gas bypasses
- Improved efficiency over water or gas bypasses



An innovative solution to dramatically extend unit turndown

7

Regulatory Life Extension: Submerged Grind Conveyor Ash Handling

Designed to meet current and future U.S. regulatory requirements for ash handling with:

- Lower equipment cost
- Lower installation cost
  - Utilize existing hoppers and gate valves
  - No modification to hopper
- Short outage required
- Short lead time
- Available redundancy under the boiler
- Lower O&M costs

An innovative solution to eliminate ash ponds

8

Advanced Tech: Fuel Direct Chemical Looping (FDCL) Ready f Large Pilot

- Advanced process for steam, hydrogen, or syngas generation with inherent, 97%+ CO_2 capture
- A flameless, oxy-combustion process using particle based oxidation-reduction reactions to process fuel
- Produces a concentrated CO_2 stream that can be captured, cleaned and compressed for use or permanent storage
- Lower cost than post combustion CO_2 capture
- Working in collaboration with The Ohio State University

THE OHIO STATE UNIVERSITY

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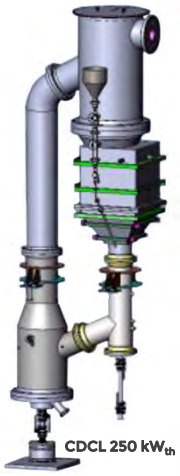

A system that goes beyond steam generation

Process can convert any carbon-based fuel – coal, pet coke, natural gas, and biomass to blue hydrogen, syngas, or other liquid fuels

9

Advanced Technology: Eos Energy Storage

October 2020 partnership with Eos Energy Storage, LLC to sell and service Eos' innovative, patented Eos Znyth® zinc battery solution for industrial and utility-scale energy storage adds a new clean energy technology capability to B&W's range of renewable energy solutions.

- B&W will market Eos' battery storage solutions globally
- B&W is exclusive preferred installer in U.S. and Canada
- Eos Znyth® zinc battery technology is:
  - Scalable
  - Modular
  - Low Cost
  - Durable
  - High Energy Efficiency
  - Safe
  - Non-flammable
  - Flexible
- Applications
  - Industrial
  - Commercial
  - Power Utilities

B&W BABCOCK & WILCOX RENEWABLE

eos

Innovative Battery Storage System Solution

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Wind Project Partial Repower Background

- In December 2015, Congress extended Production Tax Credits (PTCs) and made repowered wind projects eligible
- How do PTCs for repowered projects work?
  - If full PTC received, project eligible for $0.023 per kWh for the first 10 years of operation
  - Repowering project eligibility: "80/20 Rule" $\frac{Cost\ of\ new\ components}{Value\ of\ repowered\ facility} \geq 80\%$
  - For reference, a typical 100-MW wind project will generate approximately $10 million of income PTCs per year

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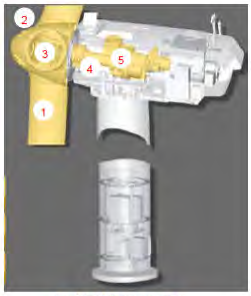
Wind Project Partial Repower Background

- Many projects utilizing "partial repowering"
  - Reuse the following:
    - Electrical balance of plant
      - Collection system
      - Project substation and transmission line
    - Wind turbine tower
    - Wind turbine foundation
- Replace or upgrade the following wind turbine components:
  - Blades
  - Hub
  - Gearbox
  - Main shaft and bearing assemblies
  - Overhauled generator
  - Control system upgrades



Replaced Components:
1 Blade
2 Hub
3 Variable Pitch System
4 Bearing & Main Shaft
5 Gear Box & Oil Cooler

Source: Renewable Energy Wind Services GE SLE Repower Overview

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Wind Project Partial Repower Due Diligence

- Task 1: Wind Turbine Foundations
- Task 2: Electrical Balance-of-Plant
- Task 3: Wind Turbine Towers
- Task 4: Wind Resource Assessment
- Task 5: Wind Turbine Technology and Site Suitability
- Task 6: Commercial and Permitting
- Task 7: Operations and Maintenance Cost Assessment

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Sargent & Lundy Wind Project Partial Repower Experience

- **Number of Projects:** 67
- **Total Capacity:** ~7,950 MW
- **Initial CODs**: 1985 – 2013
- **Locations:** KS, ND, NM, OK, TX, IL, ID, CA, CO, SD, KA, IA, MT, WV
- **Foundation Inspections:** 4,300
- **Wind Turbine Climbs:** 200+

- **Wind Turbine Manufacturers:**
  - Bonus
  - Clipper
  - GE
  - Siemens
  - Vestas
  - Mitsubishi
  - Nordex

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