### MEDIA ATERIAIS



Multi-Pollutant Emissions Control Systems









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#### Eco Power Solutions

In the U.S. alone, Power Generators will invest over \$50B in technology to control emissions from coal in the next 10 years. By 2020, 100% of U.S. based coal plants will be controlled for SO2, Mercury, Particulate Matter and 70% for NOx.

Eco Power Solutions' innovative technology is changing the game by reducing multiple pollutants with an all-in-one system delivering *superior performance, value and compliance.* 

We make fossil fuels clean at the *lowest cost* on the market today.

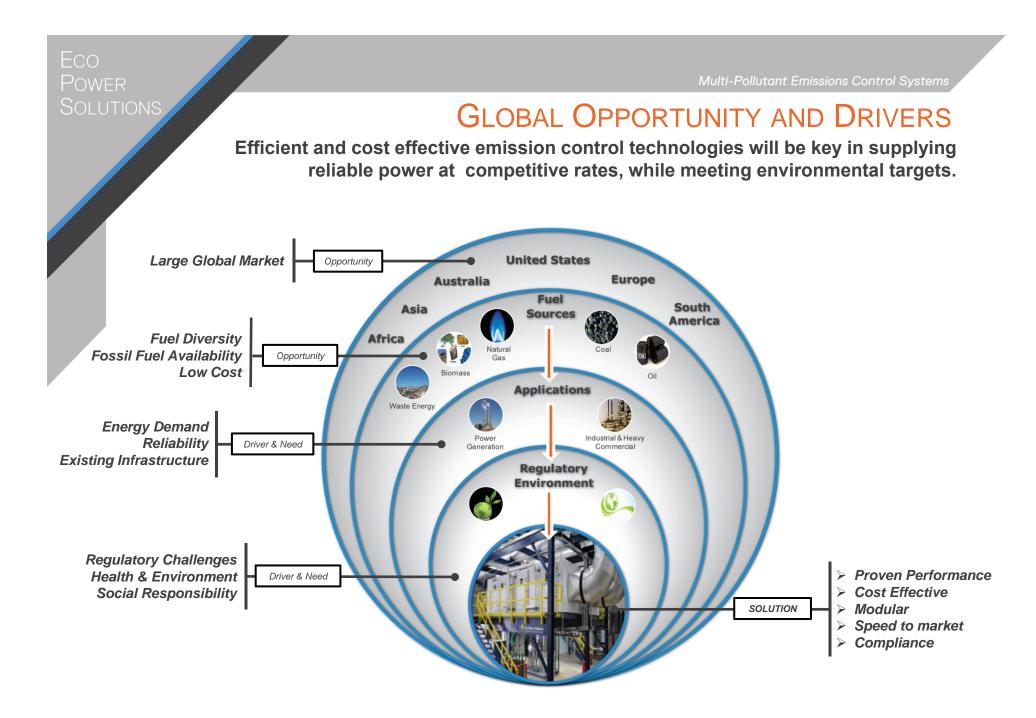
### OVERVIEW

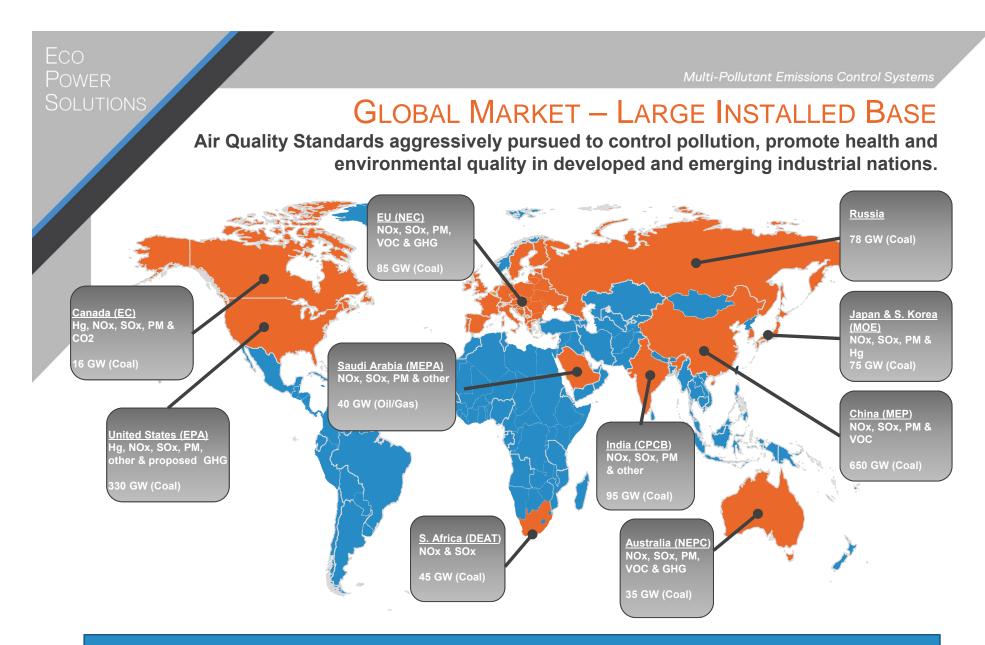
## Eco Power Solutions is dedicated to the ongoing development of advanced, clean energy technologies.

Company	<ul> <li>Privately Held - Headquartered in Boston, Massachusetts</li> <li>Original Equipment Manufacturer (OEM) of patented air quality control system (AQCS) technology</li> <li>Engineering and R&amp;D operations in Louisville, KY</li> <li>Experienced management team</li> </ul>
Market	<ul> <li>Power Generation (Coal, Natural Gas, Oil, Biomass, and Municipal Waste) – U.S. Coal 330 GW</li> <li>Heavy Industrials (Steel &amp; Aluminum, Glass &amp; Cement, Paper &amp; Pulp, Petro Chemical) – U.S. 45 GW</li> <li>Heavy Commercial (Hospitals &amp; Universities) – U.S. 30 GW</li> </ul>
Proven Technology	<ul> <li>COMPLY 2000<sup>™</sup> – Advanced 'all-in-one' Multi-Pollutant control product</li> <li>High multi-pollutant removal rates (Hg, PM2.5, CO2, NOx, SOx, HCl, and other heavy metals)</li> <li>5 MW units(Coal &amp; Gas) operating since June 2010</li> <li>Performance &amp; economics validated by multiple 3<sup>rd</sup> parties including EPRI and URS</li> </ul>
Strong Value Proposition	<ul> <li>Lowest Levelized Cost solution on the market today for widest spectrum of pollutants removed</li> <li>Smaller footprint, shop-assembled modules, and shortest cycle time from engineering to operation</li> <li>Applicable to all fossil fuels and Energy from Waste fuel stock</li> <li>Ideal for retrofit and new build applications</li> <li>Potential expansion of primary fuel options for owner</li> <li>Downstream byproduct revenue stream</li> </ul>

SOLUTIONS

#### **HISTORY & TIMELINE COMPLY 2000 Technology Center** patent issued opened June 2010 in Louisville, KY Initial technology concept **EPRI Supplemental project** Eco Power Solution (U.S.A.) developed as answer to notice for 25 MW slipstream operations begin 1990 Clean Air Act commercial deployment -----2010 2011 2012 2001 2004 2008 1994 1997 2006 Initial angel funding round closed **EPRI Level II technical &** economic evaluation **COMPLY** bench scale testing conducted at Brookhaven National Laboratory CO2 Conversion to Alcohol patent issued Series A round of investment lead by Altira Group





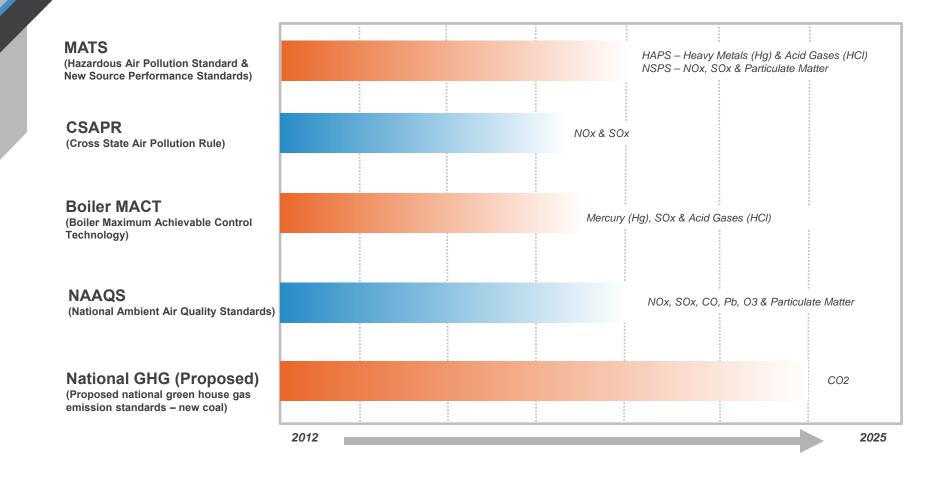
Huge addressable market on a global scale in coal fired power generation alone even with planned retirements Global drivers from the emergence of regulations to reduce criteria pollutants and Green House Gases

Source: World Research Institute, Environment Canada, European Commission, EPA, India CPCB, Australia NEPC, S. Africa DEAT, China – Ministry of Environmental Protection, Japan – Ministry of Environment, The McIlvaine Company, Energy Information Agency Eco Power <u>Solutions</u>

Multi-Pollutant Emissions Control Systems

### U.S. REGULATORY LANDSCAPE

EPA regulations have created a compliance driven market environment for Power Generators and Industrial Manufacturers.



Source: ScottMadden, EPA, N. W. Bernstein & Associates

### **PROVEN REMOVAL RATES**

The COMPLY 2000<sup>™</sup> offers efficient removal rates of multiple criteria pollutants in an 'all-in-one' system.

Multi-Pollutant Removal Rates		Criteria Pollutants Removed			
POLLUTANT	COMPLY 2000	COMPLY 2000	FGD	SCR	ESP/BH
Mercury (Hg)	95%	$\checkmark$	N/A	N/A	N/A
Particulate Matter (PM10 & PM2.5)*	99%	$\checkmark$	N/A	N/A	$\checkmark$
Heavy Metals (Cd, Cr, Ni, Be, As)	99%	$\checkmark$	N/A	N/A	N/A
Halogens (F, Cl, Br)	99%	$\checkmark$	N/A	N/A	N/A
NOx	98%	$\checkmark$	N/A	$\checkmark$	N/A
SOx	99%	$\checkmark$	$\checkmark$	N/A	N/A
CO <sub>2</sub> * Downstream of primary particulate collection device.	30%	$\checkmark$	N/A	N/A	N/A

\* Downstream of primary particulate collection device.

Removal rates as demonstrated at the Eco Power Technology Center

Unsurpassed "multi-pollutant" removal efficiencies

Sustaining fossil fuel generating assets requires disruptive technology to reduce multiple pollutants Demonstrated performance for 2+ years

#### ECO POWER SOLUTIONS

#### U.S. COAL FIRED ADDRESSABLE MARKET (2012-2017)

Generation Capacity at risk due to regulatory environment. Co-ops and public power at greatest risk.

U.S. Power Generation – Coal Fired Fleet	330 GW
Coal Fired Generation > 30 years old	222 GW
Post Fleet Retirement Available Market	150 GW
Multi-Pollutant AQCS	60 GW
2017 EPS Market Share	2 GW

- EPA puts the annual industry cost of compliance for power generators at \$9.6 billion.
- Industry analysts estimate compliance cost of \$50 -\$70 billion over next decade.
- 50 70 GW are at risk of retirement because of regulations, heat rate or age of unit.
- EPA estimates 60% of affected units meet some part of rules while 40% of affected units do not have advanced emissions controls installed.

#### **Initial Target Client Profile**

- Fuel: Fossil (Coal, Natural Gas, Oil, Biofuel and Waste Energy)
- Retrofit applications for generation capacity of less than 300 MW (Initial 3-5 years)
- Investor Owned Utilities, Independent Power Generators, Electric Cooperatives, Publically Owner Utilities and District Heating/Campus.

Source: SNL Energy , ICF International, The Brattle Group, Edison Electric Institute , NERC, EPA NEEDS Database, EPS Internal Analyses

### **KEY ADVANTAGES**

Start up, testing

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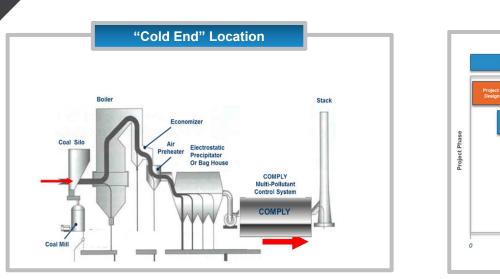
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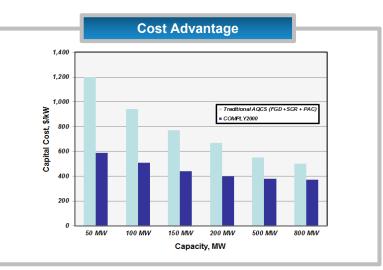
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COMPLY 2000<sup>™</sup> is the solution to meet existing air quality regulations with minimal downtime and plant integration.

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**Speed to Market** 

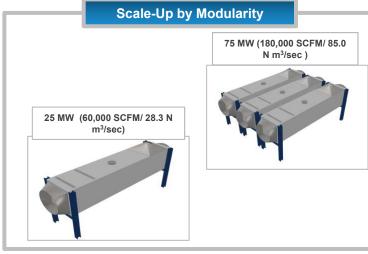
Eco Power Solutions - COMPLY 2000 - (100 MW - 26 months)

Equipment Installation Phase (16 months)

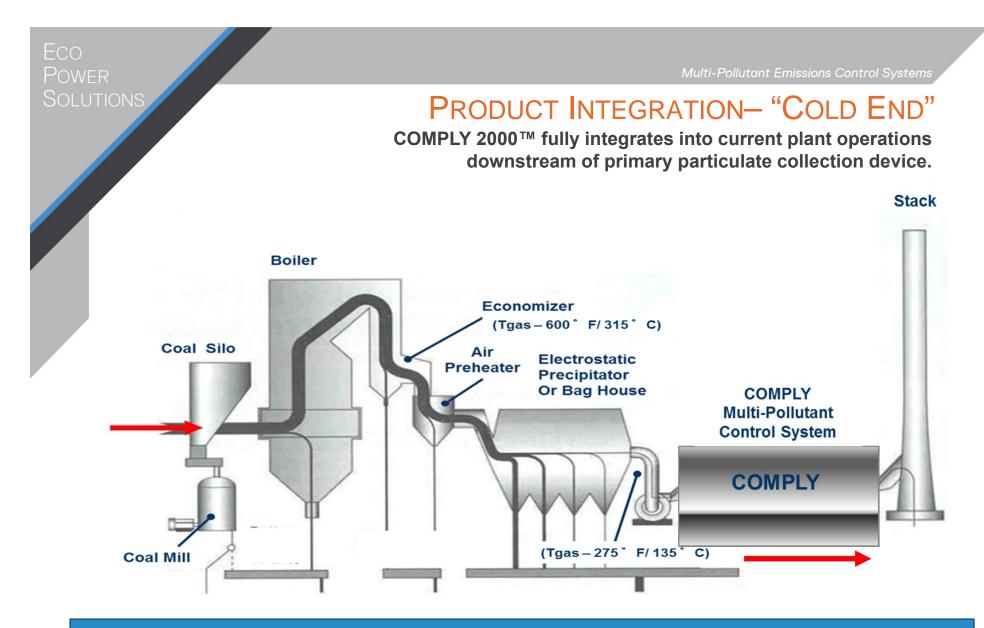
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Project Timeline (months)

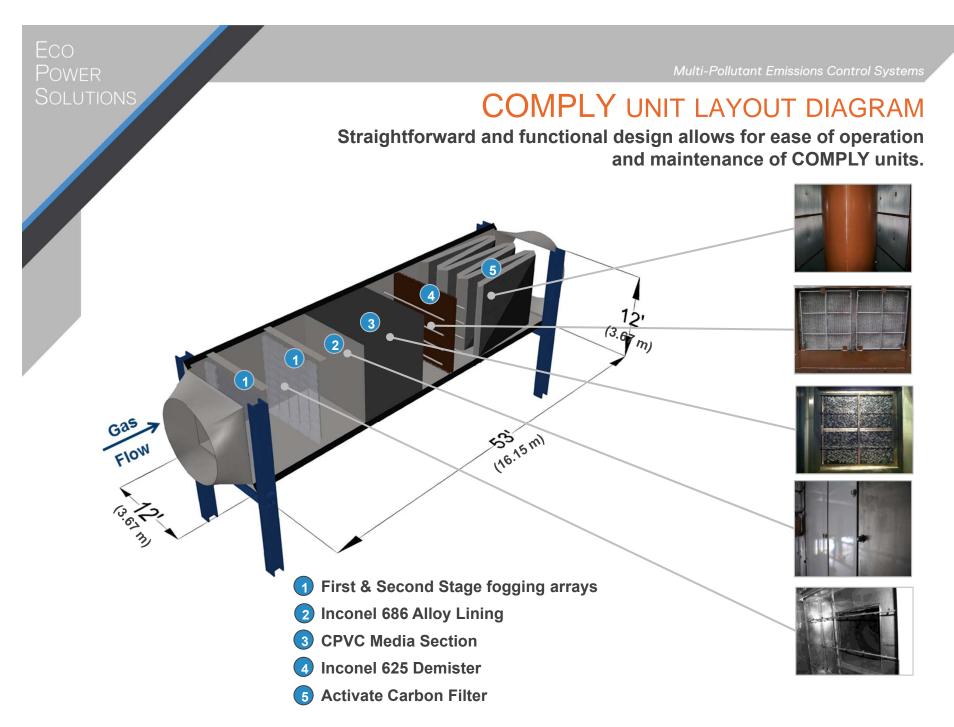
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SOLUTIONS



Avoided Costs: No modifications to boiler and/or 'hot flue gas' equipment. Preserved Flyash Treatment: No flyash impact thereby preserving current disposal options and revenue streams. Integration Advantage: Cold application means less gas volume translating to compact footprint.



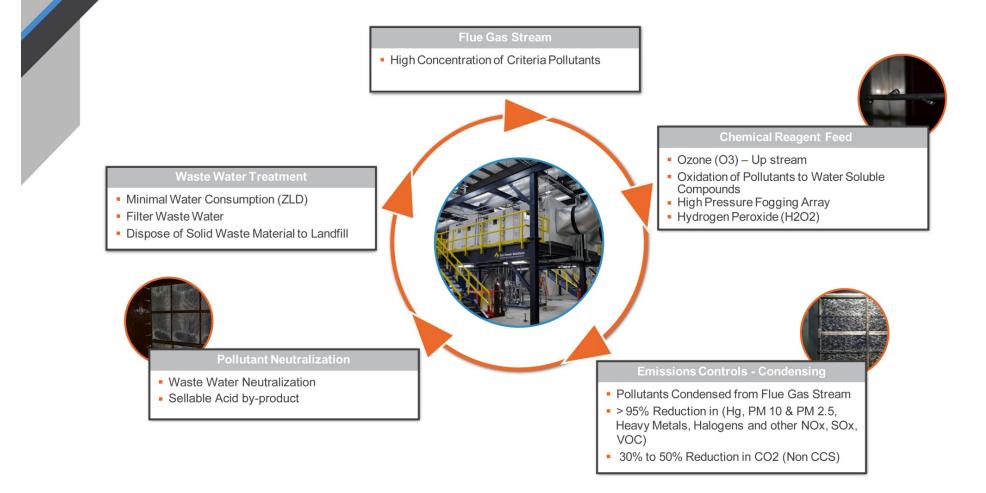
Multi-Pollutant Emissions Control Systems **DESIGNED FOR SCALE-UP & FLEXIBILITY** Modular design philosophy provides for short cycle times and scale up capabilities. 25 MW Single Module (60,000 SCFM/ 75 MW (180,000 SCFM/ 85.0 N m<sup>3</sup>/sec ) 28.3 N m<sup>3</sup>/sec)

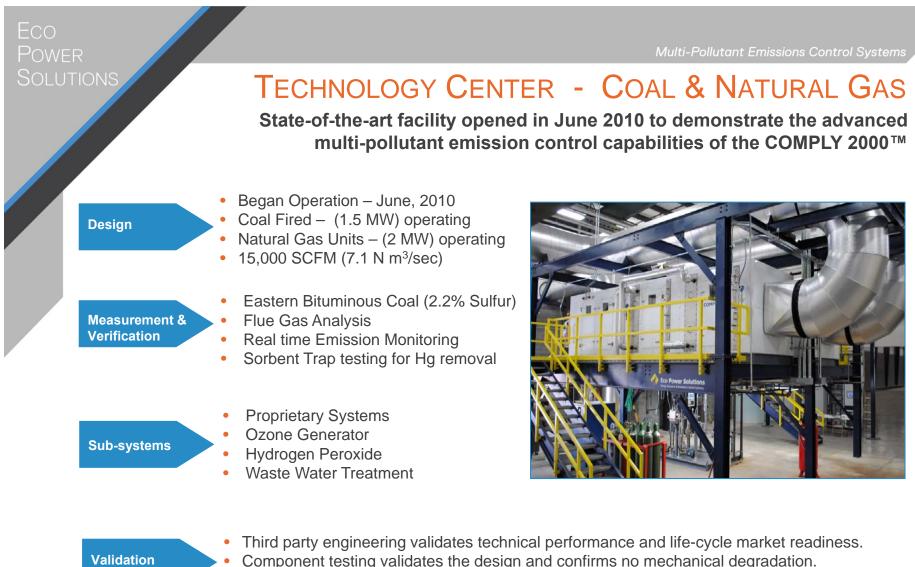
- Proven Scale up
- Short Cycle time (Fabrication thru Installation)
- Operational flexibility- Maximum integration potential for retrofit applications
- Shop assembled module units of 25 MW (projects up to 100 MW)
- Field erected module units for projects > 100 MW.

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### MULTI-POLLUTANT REMOVAL PROCESS OVERVIEW

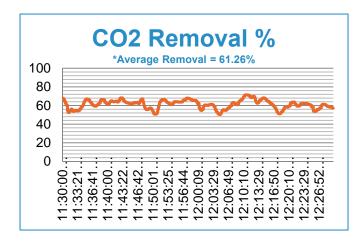
The COMPLY 2000<sup>™</sup> process is a closed-loop process that is reliable, flexible and effective.





- Component testing validates the design and confirms no mechan
   EDDL confirmation of commonstal readingsed
- EPRI confirmation of commercial readiness.

Multi-Pollutant Emissions Control Systems PROVEN PERFORMANCE: **COAL FIRED** As demonstrated at Eco Power Technology Center Firing Eastern Bituminous Coal. **SO2 Removal % NOx Removal %** \*Average Removal = 99.47% \*Average Removal = 99.70% 100 100 80 80 60 60 40 40 20 20 0 0 12:06:49. 12:06:49. 12:10:10. 12:16:50. 12:20:10. 12:106:49. 12:10:10. 12:13:29. 12:16:50. 12:23:29. 12:23:29. 12:23:29. 1:56:44. 2:00:09. :46:42. :50:01. :53:25. 56:44 :23:29 30:00 :40:00 :46:42 53:25 40:00 43:22 2:00:09 36:41 43:22 2:03:29 30:00 50:01 33:2, 30: N N



Pollutant	Inlet (ppm)	Outlet (ppm)	
NOx	42.33 (ppm)	0.18 (ppm)	
SO2	301.34 (ppm)	0.85 (ppm)	
CO2	18,315 (ppm)	7,045 (ppm)	

Operating Conditions (Transport

Eastern Bituminous		
Ultimate Analysis		
Carbon	67.7%	
Hydrogen	4.9%	
Nitrogen	1.2%	
Sulfur	3.8%	
Oxygen	6.7%	
Ash	9.4%	
Moisture	6.4%	

\*As demonstrated July 13, 2012 - Coal

### COMPETITIVE LANDSCAPE

**Multi-pollutants and traditional AQCS** 

Company	Target Pollutants	Target Industry	Status
Multi-Pollutant AQCS			
Airborne Clean Energy	SO <sub>2</sub> , SO <sub>3</sub> , NOx Hg	Power Generators	Early
Cansolv Technologies	SO <sub>2</sub> , CO <sub>2</sub>	Power Generators & Industrials	Commercial Demo
CEFCO	SOx, NOx, CO <sub>2</sub> , heavy metals & PM2.5	Power Generators & Industrials (Cement)	Early
Hamon Research Cotrell	SOx, NOx, Hg and particulate	Power generators, metals, cement	Commercial Demo
Lextran	SOx, NOx, Hg & other toxic heavy metals	Power generators	Commercial Demo
Nalco Mobotec	NOx, SOx, Hg and particulate	Power generators & industrials	Commercial
Neumann Systems Group	SOx, NOx, CO <sub>2</sub>	Coal Fired Utilities	Commercial Demo
Traditional AQCS			
FGD (B&W, Als, Hit, BPI, MET, HRC, Siemens, Advatech)	SO <sub>2</sub>	Power Generators/Industrials	Commercial
SCR (B&W, Als, BPI, Hit, FW)	NOx	Power Generators/Industrials	Commercial
Sorbent Inject (Numerous)	Hg, SO <sub>2</sub> and SO <sub>3</sub>	Power Generators/Industrials	Commercial
ESP (Alstom, Siemens, Hitachi, et. al.)	Particulate Control	Power Generators/Industrials	Commercial
Fabric Filter (B&W, Alstom, Siemens, Hamon, Hitachi)	Particulate Control	Power Generators/Industrials	Commercial

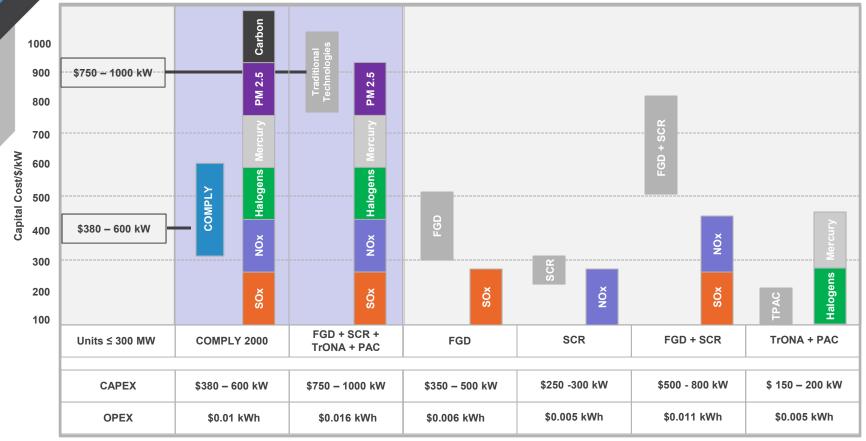
#### EPS competitive advantage on total levelized cost basis for multi-pollutants addressed EPS has demonstrated performance at for 2+ years

Source: Edison Electric Institute, EPRI, EPS Internal Analyses

Power Solutions

#### ECONOMIC COMPARISON-ECO POWER VS. TRADITIONAL OPTIONS

The COMPLY 2000<sup>™</sup> system offers the most attractive compliance cost/performance value on a true multi-pollutant \$/MPTon\* basis.



\* MPTon= Multi-Pollutant Ton (multi-pollutants - NOx, SOx, PM2.5, Hg, Halogens, etc.)

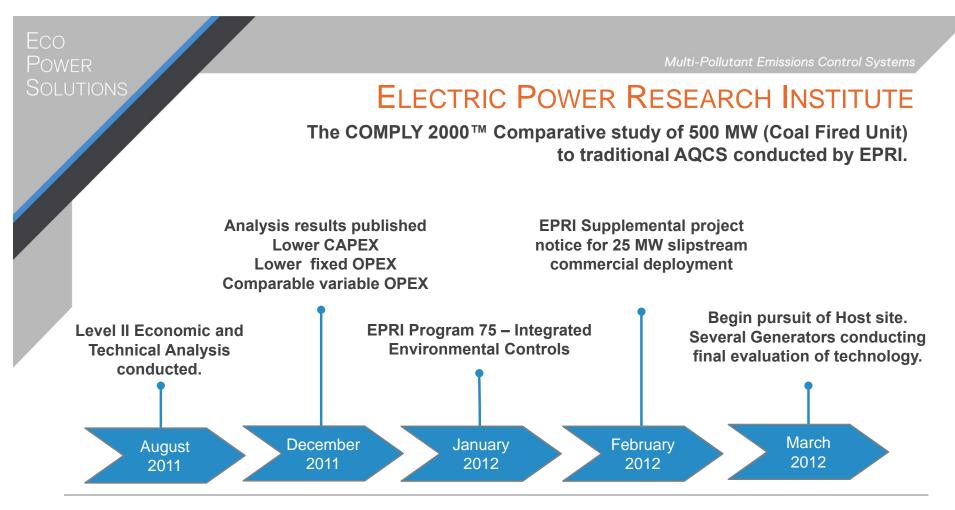
COMPLY 2000 is economically more attractive than traditional AQCS technologies on CAPEX and OPEX and controls/reduces a broader range of regulated and unregulated pollutants.

Source: Credit Suisse: Impact of EPA Rules on Power Markets, Bernstein Research, Midlothian Associates, EPRI, EPS Internal Analyses

Air Quality Emissions Controlled

Multi-Pollutant Emissions Control Systems SOLUTIONS, **TACTICAL TEAMING - SALES & PROJECT EXECUTION Engineering, Procurement, Construction firms** targeted for project execution. ZACHRY •OEM multi-pollutant Technology technology & core URS Provider balance of plant Burns & SINCE 1898 • Project construction ar Constructor installation services ₽⁄ **BLACK & VEATCH** lant **CH2MHILL**  Project engineering, Integrator balance of plant and integration and supply Designer **WorleyParsons** resources & energy

Bankable approach and execution team to mitigate risks and deliver project on-time, on-budget and to-contract.



"The COMPLY 2000 technology has the ability to accomplish multi-pollutant (SO2, SO3, NOx, Hg, halogens and residual particulate matter) removal at very high efficiencies in a single absorber vessel. The economic analysis of the COMPLY 2000 system indicates that the system has a lower capital cost and fixed operating costs than the combination of traditional air quality control systems that would be required to achieve similar performance."

- EPRI Report - 2011 Status of Multi-Pollutant Process Development: Low-Temperature Multi-Pollutant Control System and COMPLY 2000 Technical Review and Cost Projections



ELECTRIC POWER RESEARCH INSTITUTE

### RECAP

## Eco Power Solutions is dedicated to the ongoing development of advanced, clean energy technologies.



• Original Equipment Manufacturer (OEM) of patented air quality control system (AQCS) technology

Privately Held - Headquartered in Boston, Massachusetts

- Engineering and R&D operations in Louisville, KY
- Experienced management team
- Market
- Power Generation (Coal, Natural Gas, Oil, Biomass, and Municipal Waste) U.S. Coal 330 GW
- Heavy Industrials (Steel & Aluminum, Glass & Cement, Paper & Pulp, Petro Chemical) U.S. 45 GW
- Heavy Commercial (Hospitals & Universities) U.S. 30 GW
- COMPLY 2000<sup>™</sup> Advanced 'all-in-one' Multi-Pollutant control product
- High multi-pollutant removal rates (Hg, PM2.5, CO2, NOx, SOx, HCl, and other heavy metals)
- 5 MW units(Coal & Gas) operating since June 2010
- Performance & economics validated by multiple 3<sup>rd</sup> parties including EPRI and URS
- Lowest Levelized Cost solution on the market today for widest spectrum of pollutants removed
- Smaller footprint, shop-assembled modules, and shortest cycle time from engineering to operation

#### Strong Value Proposition

Proven Technology

- Ideal for retrofit and new build applications
- · Potential expansion of primary fuel options for owner
- Downstream byproduct revenue stream

Applicable to all fossil fuels and Waste from Energy fuel stock

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