

# CLEANER AIR WITH LOW-NO<sub>x</sub> COMBUSTION TECHNOLOGY



## TECHNOLOGY PRESENTATIONS

Tuesday, 9 April 2019

**Venue:**  
The Leela Palace,  
Africa Ave, Diplomatic  
Enclave, Chanakyapuri,  
New Delhi, 110023

Thursday, 11 April 2019

**Venue:**  
Hotel SOFITEL,  
C57, Bandra Kurla Complex,  
Bandra East, Mumbai 400 051

FORTUM eNEXT'S  
TAILOR-MADE COMBUSTION  
SOLUTIONS REDUCE EMISSIONS  
EFFECTIVELY AT LOW COST AND  
HELP YOU TO MEET REGULATORY  
REQUIREMENTS. COMPLY EASILY  
WITH THE NO<sub>x</sub> EMISSION LIMITS  
BY CHOOSING OUR SOLUTIONS.

We can guarantee that the desired emission levels are met, regardless of the current set up at your site. An optimal combustion technology is designed to fit Fortum eNext's low-NO<sub>x</sub> solution and any original equipment manufacturer's (OEM) technology with a minimum capital expenditures. To guarantee the success and satisfaction of your investment, remote monitoring and technical support for the warranty period are always included.

### Achieve significant NO<sub>x</sub> emission reductions in a cost-effective way

NO<sub>x</sub> emission level of 300 mg/Nm<sup>3</sup> can be met with our primary NO<sub>x</sub> reduction methods without increasing operational expenditures. Furthermore, combining our state-of-the-art low-NO<sub>x</sub> combustion technology with a secondary NO<sub>x</sub> reduction system, substantial NO<sub>x</sub> emission reductions can be achieved in an economical way.

#### Primary NO<sub>x</sub> reduction

NO<sub>x</sub> emissions down to 250 - 300 mg/Nm<sup>3</sup>

#### Primary + Secondary NO<sub>x</sub> reduction

NO<sub>x</sub> emissions below 200 mg/Nm<sup>3</sup>

Our low-NO<sub>x</sub> burners and other combustion technology related modifications are built in order to achieve a high combustion efficiency as well as minimise slagging, high-temperature corrosion and unburnt carbon.

Join the  
change

fortum

**Fortum India Pvt. Ltd.,**

Level 7, Tower A, Building 5, DLF Cyber City, Gurugram, India  
[www.fortum.in](http://www.fortum.in)

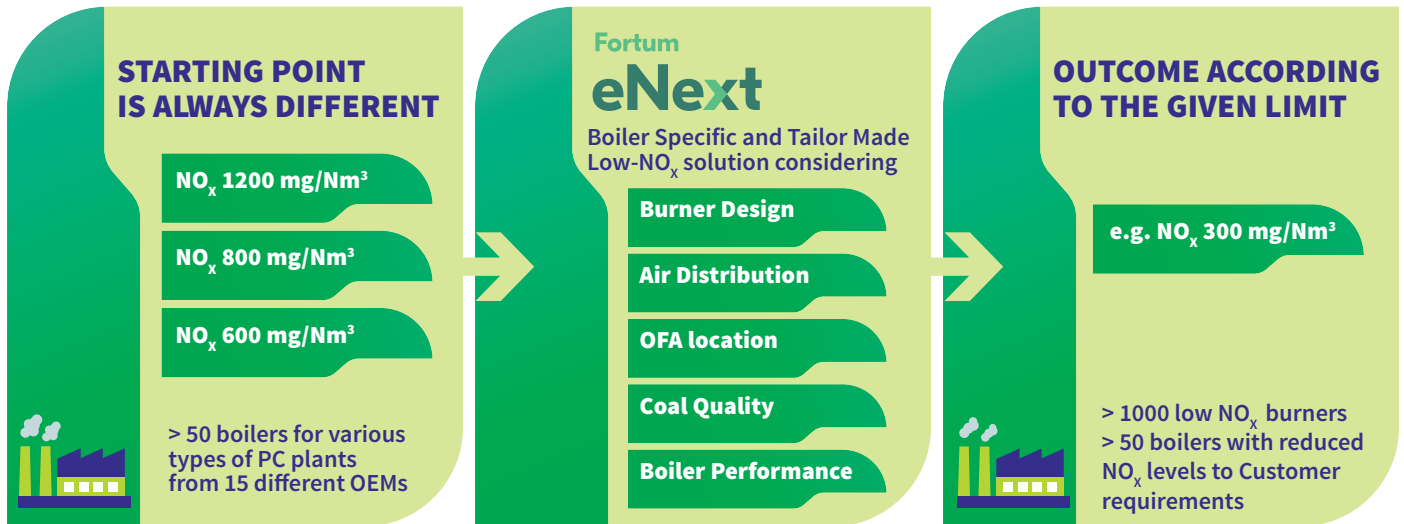


**City Solutions Fortum eNext  
Fortum Power and Heat Oy**

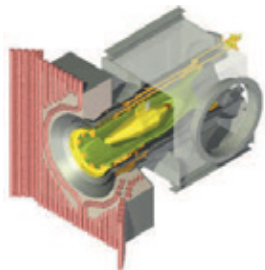
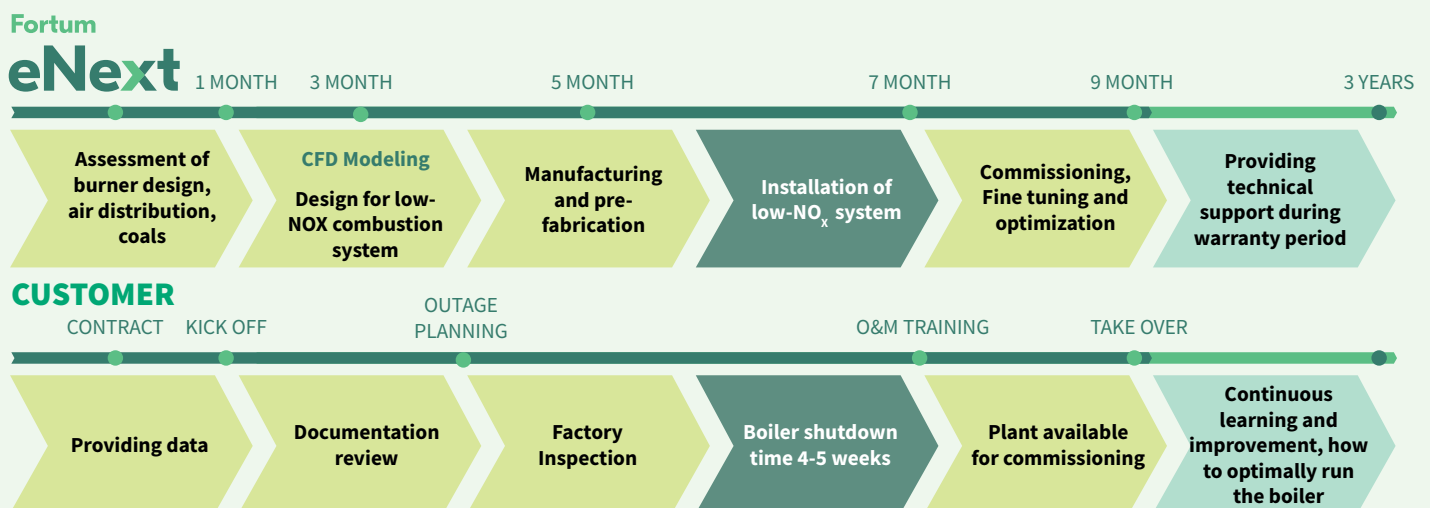


Keilalahdentie 2- 4, 02150, Espoo, Finland  
[www.fortum.com](http://www.fortum.com)

# FORTUM LOW-NO<sub>x</sub> SOLUTION GUARANTEES THE NEEDED OUTCOME REGARDLESS OF THE CURRENT SET UP AND COAL CHARACTERISTICS AT YOUR SITE



## Fortum eNext low-NO<sub>x</sub> delivery efficient turnkey project with short production downtime



### LOW-NO<sub>x</sub> BURNER FOR TANGENTIAL FIRING

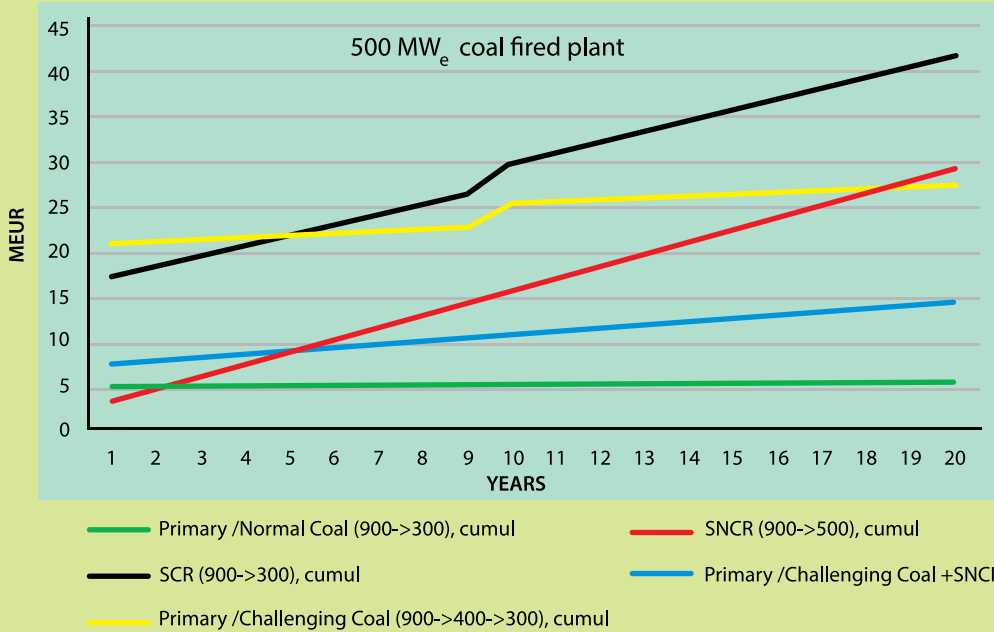
An unique low-NO<sub>x</sub> technology of rapid ignition flame for corner and tangentially fired boilers. Ultra-stable flame makes it possible also to reduce the boiler minimum load. The technology is patented by Fortum.



### LOW-NO<sub>x</sub> BURNER FOR WALL FIRING

NR burner invented and further developed by Mitsubishi-Hitachi Power Systems in Japan. The NO<sub>x</sub> reduction mechanism of the NR burner is based on high flame temperatures. The high temperature and stable flame are achieved by a Flame Stabilizing Ring.

## COMPARISON OF NO<sub>x</sub> REDUCTION TECHNOLOGIES (CapEx vs OpEx)



Note: Doesn't meet 300 mg/Nm<sup>3</sup> target without primary method

Note: Fortum's Technology Solutions  
**Fortum eNext**

## SELECTED LOW-NO<sub>x</sub> PROJECT REFERENCES (<300 mg/Nm<sup>3</sup>)

- **Hemweg low-NO<sub>x</sub> + SCR in Netherlands**  
650 MW<sub>e</sub> boiler (*Wall*) owned by NUON (Vatten fall)
- **Meri-Pori Low-NO<sub>x</sub> + SCR**  
560 MW<sub>e</sub> boiler (*Wall*) owned by Fortum
- **Dětmárovice Low-NO<sub>x</sub> in Czech**  
Four boilers (*Tangential*) 200 MW<sub>e</sub> owned by ČEZ
- **Jaworzno low-NO<sub>x</sub> + SNCR in Poland**  
Six boilers (*Wall*) of 225 MW<sub>e</sub> owned by Tauron
- **Narva low-NO<sub>x</sub> project in Estonia**  
Eight 100 MW<sub>e</sub> pulverized oil shale boilers owned by Eesti Energia
- **Kraków Co-firing / low-NO<sub>x</sub> in Poland**  
Four 120/135 MWe boiler (*Tangential*) owned by EdF Polska (now PGE)

## NO<sub>x</sub> Calculator

Converting NO ppm to NO<sub>2</sub> mg/Nm<sup>3</sup> (6% O<sub>2</sub>)

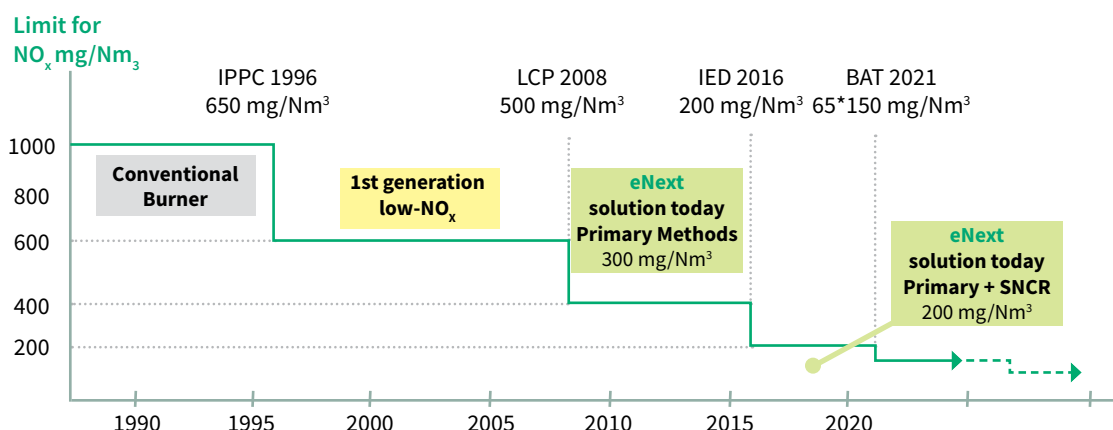
- NO<sub>x</sub> emissions are typically expressed as NO<sub>2</sub>, even if most of the NO<sub>x</sub> measured just after the boiler is NO (97-99 %).
- NO<sub>2</sub> is only stable compound in atmosphere and NO will react very fast in the stack and after the stack to NO<sub>2</sub>
- O<sub>2</sub> has to be measured at same place than NO<sub>x</sub> emission (O<sub>2</sub> correction)
- NO<sub>x</sub> emission expressed as NO<sub>2</sub>:

$$\text{NO mg/Nm}^3 \times 1.53 \times \left[ \frac{(21 - \text{ref } O_2)}{(21 - O_2)} \right] + \text{NO}_2 \text{ mg/Nm}^3 \left[ \frac{(21 - \text{ref } O_2)}{(21 - O_2)} \right] = \text{NO}_2 \text{ mg/Nm}^3$$

$$* M_{\text{NO}_2} / M_{\text{NO}} = \frac{(14+32)}{(14+60)} = 1.53$$

## Fortum eNext can help you leap over several inevitable development steps

NO<sub>x</sub> Emission regulation for coal fired power plants in EU v/s Development of NO<sub>x</sub> reduction technologies



IPPC = International Plant Protection Convention LCP = Large Combustion Plants IED = Industrial Emission Directive  
BAT / LCP BREF = Best Available technology / Reference Document on BAT techniques for LCP

## TECHNICAL SEMINAR COVERAGE

<ul style="list-style-type: none"> <li>◆ Fortum in India- Introduction of Fortum India Pvt. Ltd. (100% owned subsidiary of Fortum NV)</li> </ul>		<p><b>Mr. Sanjay Aggarwal</b> Managing Director, Fortum India Pvt. Ltd.</p>
<ul style="list-style-type: none"> <li>◆ Introduction of Fortum and Fortum eNext</li> </ul>		<p><b>Mr. Juha Suomi</b> Area Director, Asia &amp; Middle East</p>
<ul style="list-style-type: none"> <li>◆ NO<sub>x</sub> reduction through Primary Methods (Combustion Optimization and Retrofits)</li> <li>◆ Walk through various combustion modification retrofit projects (Subcritical to Supercritical power plants) by Fortum- since 1990</li> <li>◆ CapEx and OpEx (Low compared to other options)</li> </ul>		<p><b>Mr. Kari Lahti</b> Head of Performance</p>
<ul style="list-style-type: none"> <li>◆ Introduction of NO<sub>x</sub> Reduction – Technology and Options               <ul style="list-style-type: none"> <li>◇ Primary Means (Combustion Optimization)- OFA + Low NO<sub>x</sub> Burners</li> </ul> </li> <li>◆ Combustion Optimization – Issues and Challenges:               <ul style="list-style-type: none"> <li>◇ Behavior of Indian Coals</li> <li>◇ UBC</li> <li>◇ OFA and SOFA</li> <li>◇ Replacement by LNBs or modification of burners</li> <li>◇ Need for wind box modification</li> <li>◇ Overall Guarantees</li> </ul> </li> </ul>		<p><b>Mr. Antti Heinolainen</b> Product Manager</p>
<ul style="list-style-type: none"> <li>◆ Combustion Modification, Installation and Construction Management on Turnkey basis</li> </ul>		<p><b>Mr. Stanislaw Borawski</b> Sales Director Fortum eNext Poland</p>
<ul style="list-style-type: none"> <li>◆ Fortum’s Business and Cooperation model</li> <li>◆ Guarantee Technical &amp; Support Warranty</li> </ul>		<p><b>Mr. Jyrki Holappa</b> General Manager Business Development, Asia &amp; Middle East</p>
<ul style="list-style-type: none"> <li>◆ Case Study Discussion on Fortum’s experience in India:               <ul style="list-style-type: none"> <li>◇ CFD Studies on NTPC RSTPP Boilers 1x 500 MW + 1x200 MW)</li> <li>◇ Combustion Optimization of an IPP 2x 660 MW Supercritical Boilers (Work in Progress)</li> </ul> </li> </ul>		<p><b>Mr. Antti Heinolainen</b> Product Manager</p>
		<p><b>Mr. Vinod Kumar</b> (Business Consultant- Fortum) Managing Director &amp; CEO Almond Solutions Pvt. Ltd.</p>



**Through eNext, we help improve Thermal Power Plant’s operations and reduce emission to bring down NO<sub>x</sub> emissions without compromising existing boiler performance parameters**

Indian Power Management Academy, located at Bhopal (M.P.) is recognized by CEA for imparting training in power sector. IPMA has installed latest state of the art simulators for training courses at Bhopal. The simulator APROS ([www.apros.com](http://www.apros.com)) has been supplied by FORTUM, Finland which has also installed at NTPC EOC Noida, Engineering Simulator under Steam Generating Package for Sipat 2X660 MW STPP. IPMA has associated with Fortum to organize series of high level technical seminars in India on several Fortum eNext expert power solutions such as NO<sub>x</sub> reduction of thermal power plants for benefit of utility engineers & enhancing their competence in the area of energy & environment. **Visit [www.ipma-cfbc.com](http://www.ipma-cfbc.com) / [jg@ipma.in](mailto:jg@ipma.in)**

**For Business and further information write to**

**Jyrki Holappa [Jyrki.Holappa@fortum.com](mailto:Jyrki.Holappa@fortum.com) and Vinod Kumar [vkumar@anmolsolutions.in](mailto:vkumar@anmolsolutions.in)**