



Tulane Engineering Forum

15 April, 2011

- **Nucor**
- **Nucor Steel Louisiana LLC**
- **DRI Technology**

Nucor Overview

- Steel Mills 26.7 Million Tons
 - Hot rolled sheet, bars, structural, plate
- Steel Products 4.7 Million Tons
 - Steel Joists, Steel Deck, Cold Finished Bars, Steel Buildings, Rebar Fabrication, Mesh & Metal Grating, Fasteners
- Raw Materials

Nucor Steel Mills



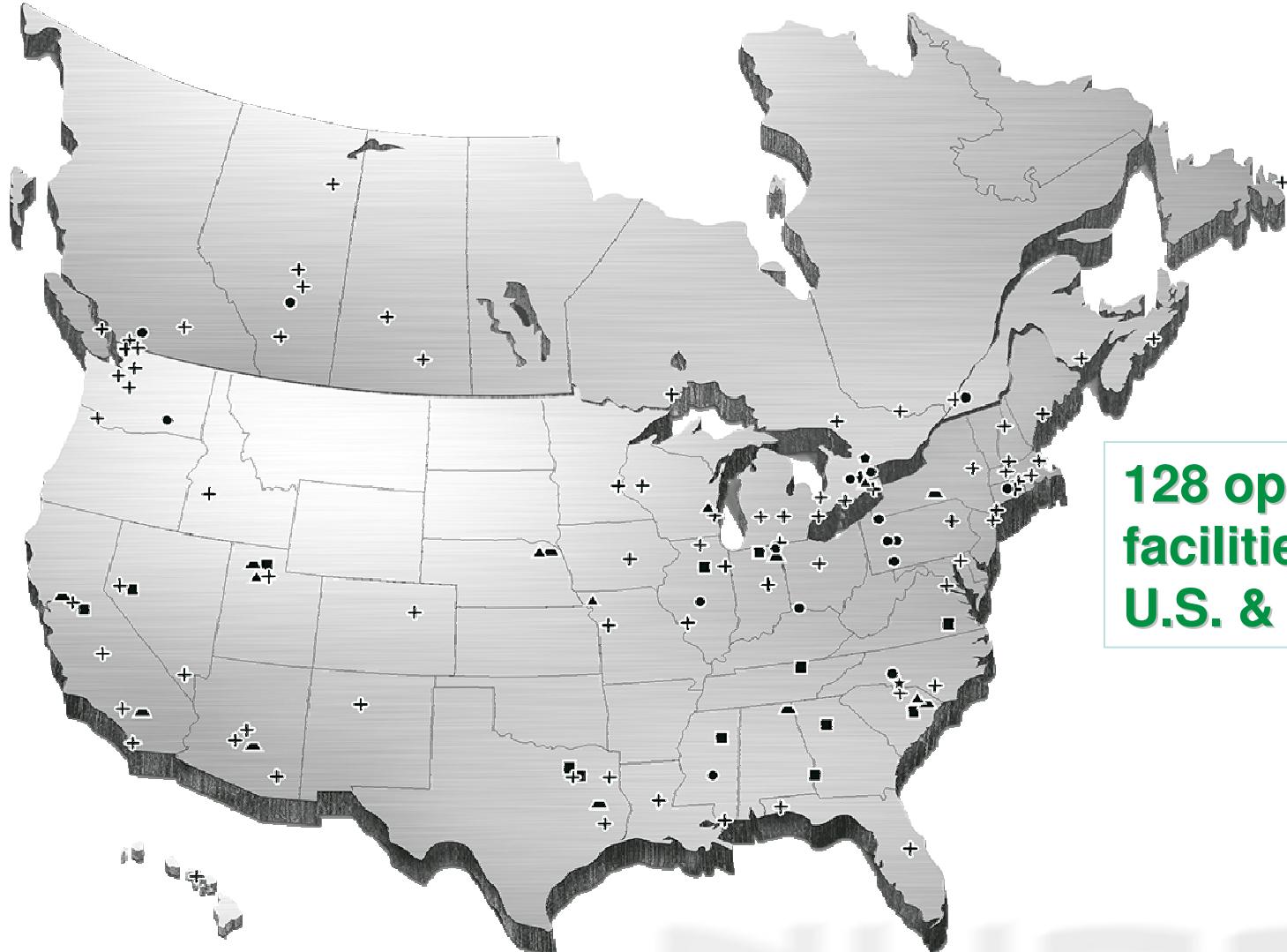
13 Bar Mills
4 Sheet Mills
2 Structural Mills
2 Plate Mills
2 Castrip Plants

Growth Platform – International

Duferdofin-Nucor beams & long products joint venture



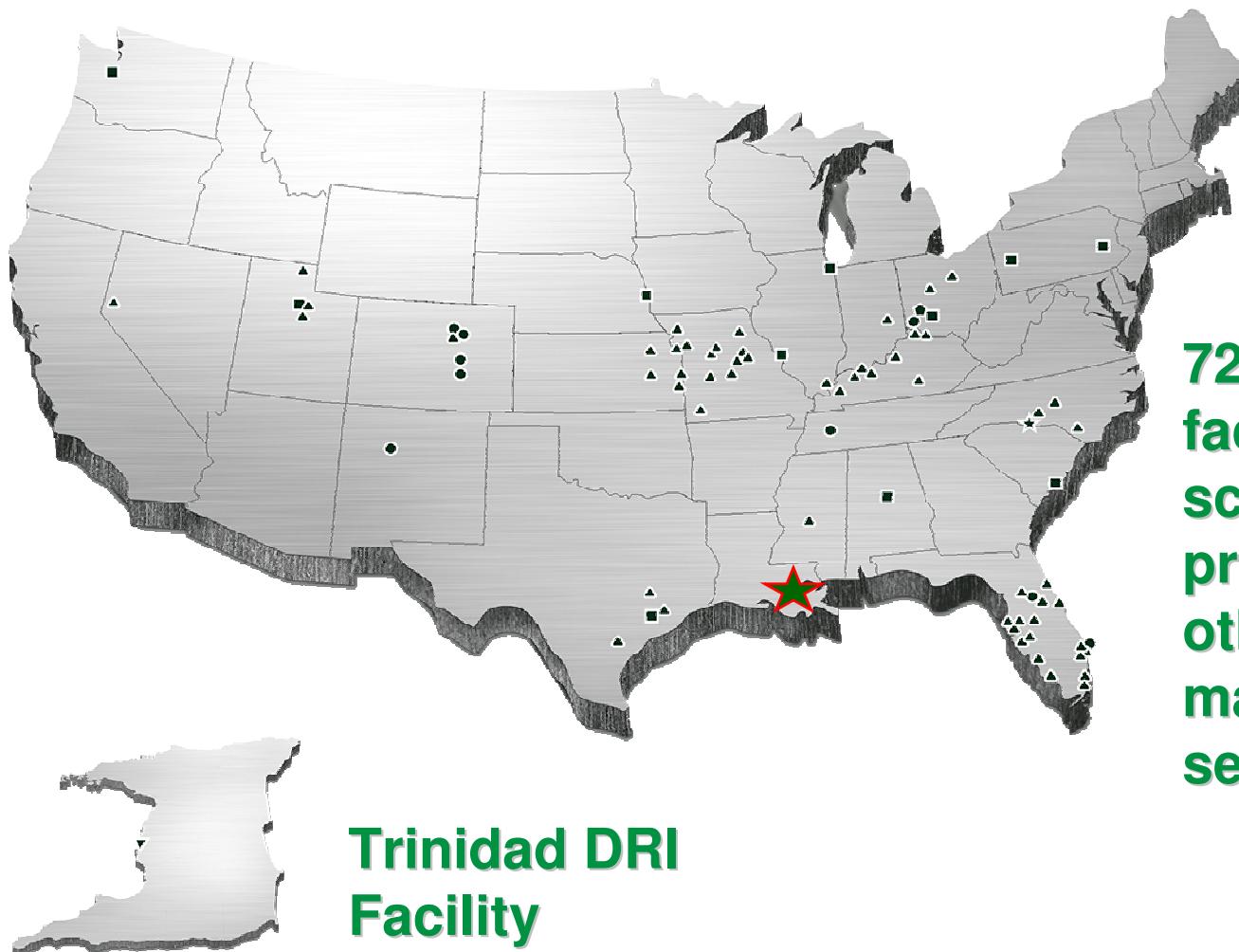
Nucor Steel Products



**128 operating
facilities in the
U.S. & Canada**

NUCOR

Nucor Raw Materials



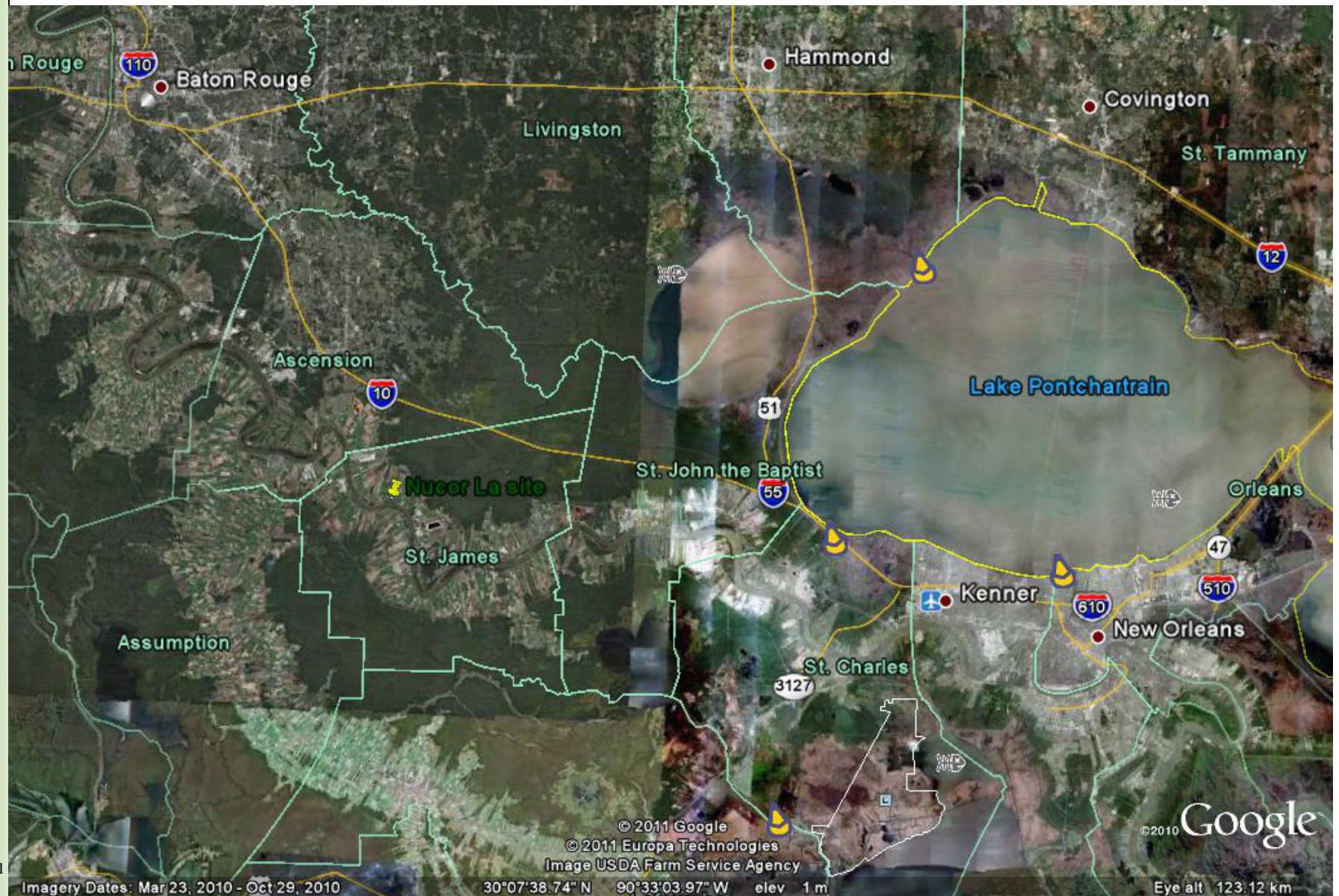
72 operating facilities – scrap processing & other raw materials services

Trinidad DRI Facility

Nucor Steel Louisiana LLC

- **\$750 million direct reduced iron (DRI) facility**
- **2.75 million tons annual capacity**
- **First phase of a multi-phase plan**
- **Next step in implementation of raw materials strategy**
- **Leverages strong skill set established by our Nu-Iron Team at our 1.8 million-tonnes-per-year DRI plant in Trinidad**
- **Long-term supply of attractive-cost natural gas secured**

Plant Location – St. James Parish La



NSLA Layout



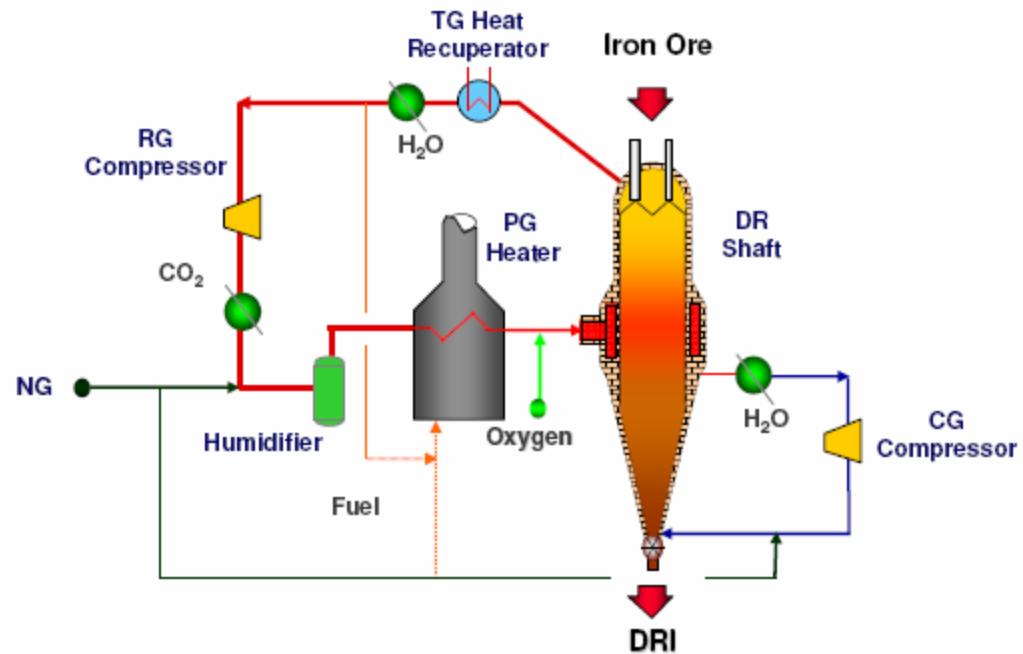
Engineering

- Port – floating dock
- Material Handling – pipe conveyor
 - 3.75 M tpy iron ore pellets
 - 2.5 M tpy DRI out
- DRI Process – HYL

- Construction Engineering
 - Reactor vessel 900 metric tons
 - Soil condition

DRI Technology

ZR Process **General scheme configuration**



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ENERGIRON
THE INNOVATIVE DIRECT REDUCTION TECHNOLOGY

DRI Technology

ZR Process Scheme Basic Principles

- The ZR process allows the reduction of iron ores without the use of a reformer by taking advantage of the fact that metallic Iron is a very good catalyst for natural gas reforming.
- The reduction zone of the DR shaft is used to perform simultaneously the Reduction of the Iron Ore and the reforming of natural gas.
- When natural gas reforming takes place under a limited amount of steam, some carburization of the catalyst will occur.
- In the case of the ZR, since the catalyst is the DRI, carburization is intentional and controlled.
- The rate of carburization can be controlled by adjusting the content of steam (humidity) present in the gas stream.
- In the ZR process the carburization of the catalyst (DRI) takes place at high temperature resulting in the formation of Iron Carbide Fe_3C .

DRI Technology

ZR Process Scheme **Features: “In-situ” Reforming and Reduction**

IN-SITU Reforming:

- **Conditions for natural gas reforming:**

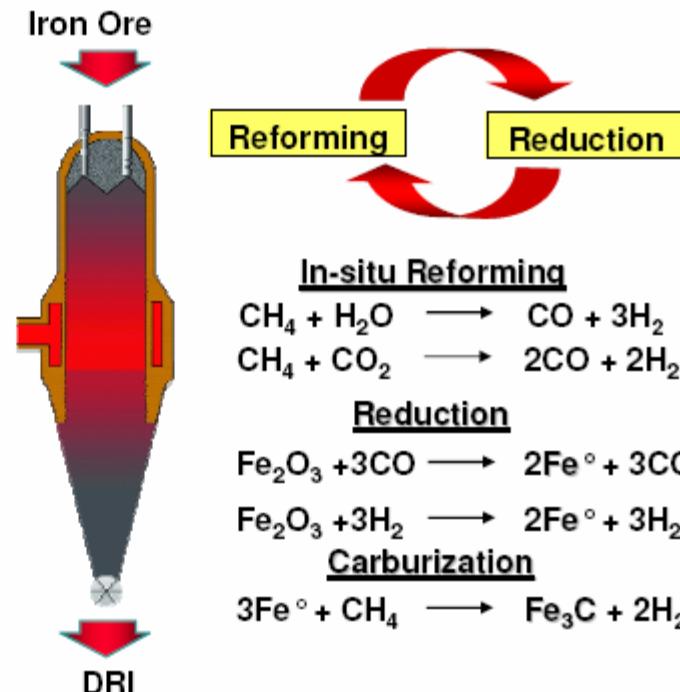
- ✓ presence of Oxidants and hydrocarbons ($H_2O + CO_2 + C_nH_{2n+2}$)
- ✓ high temperature
- ✓ presence of catalyst

Iron Oxides Reduction:

- **The conditions for the reduction of iron oxides are:**

- ✓ presence of reductants
- ✓ $(H_2 + CO)/(H_2O + CO_2) >> 1$
- ✓ high temperature
- ✓ presence of iron oxides

In the reactor reduction zone all these conditions are present, making possible the “in-situ” reforming and reduction simultaneously.



Nucor Steel Louisiana LLC

- Mission
- 150 Teammates
- Start-up 2013



Thank You!