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VIETNAM CEMENT INDUSTRY CORPORATION

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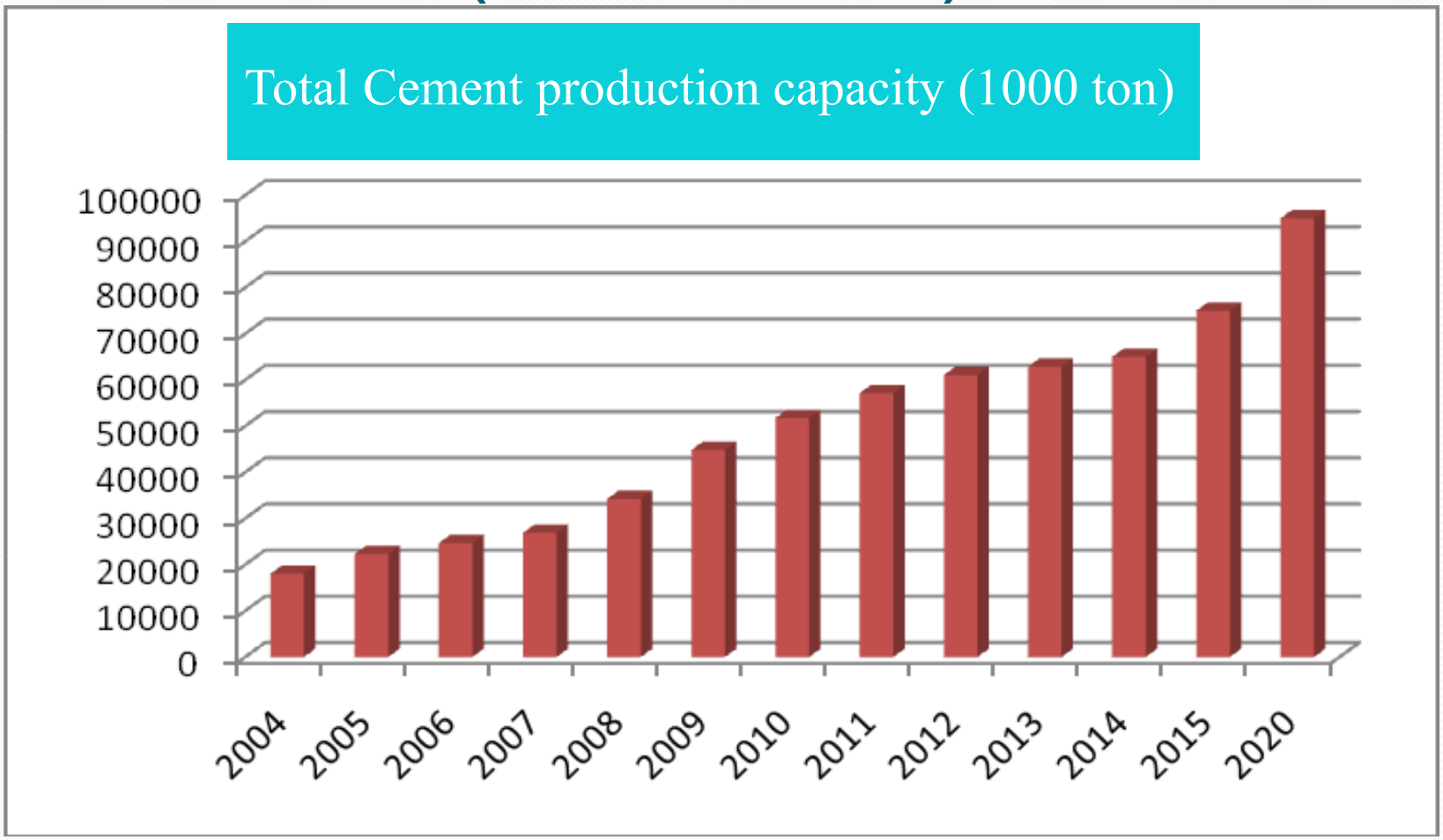
Opportunities and Demand of Carbon emission reduction

Presented by:
Vietnam Cement industry corporation (VICEM)

Content

- Overview
- Technological features and energy consumption
- The potential for energy saving and emission reduction
- Challenges
- Recommendations

Cement production in Viet Nam (2004-2020)



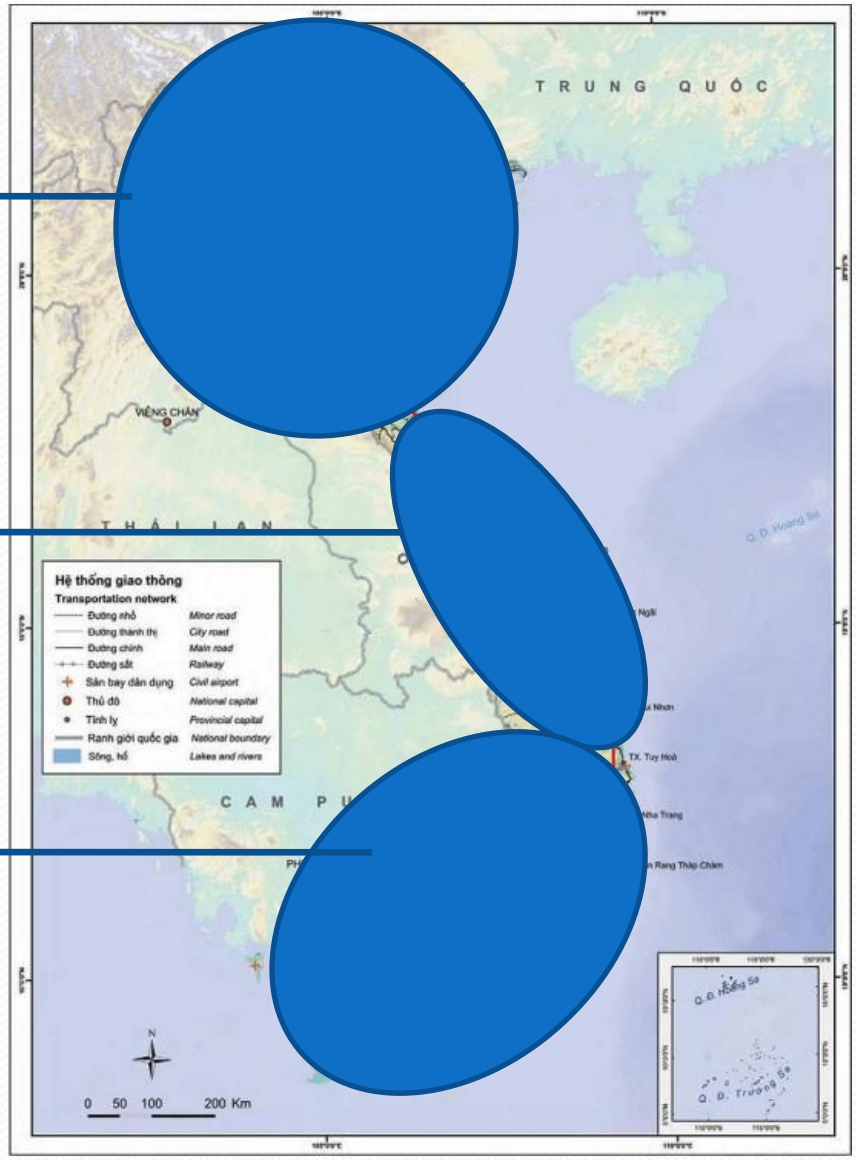
(Source: Master Plan of Vietnam Cement industry)

Design Capacity of Vietnam Cement industry

- 70% clinker capacity
- 40% Cement grinding capacity (mostly attached with the process of cement grinding)

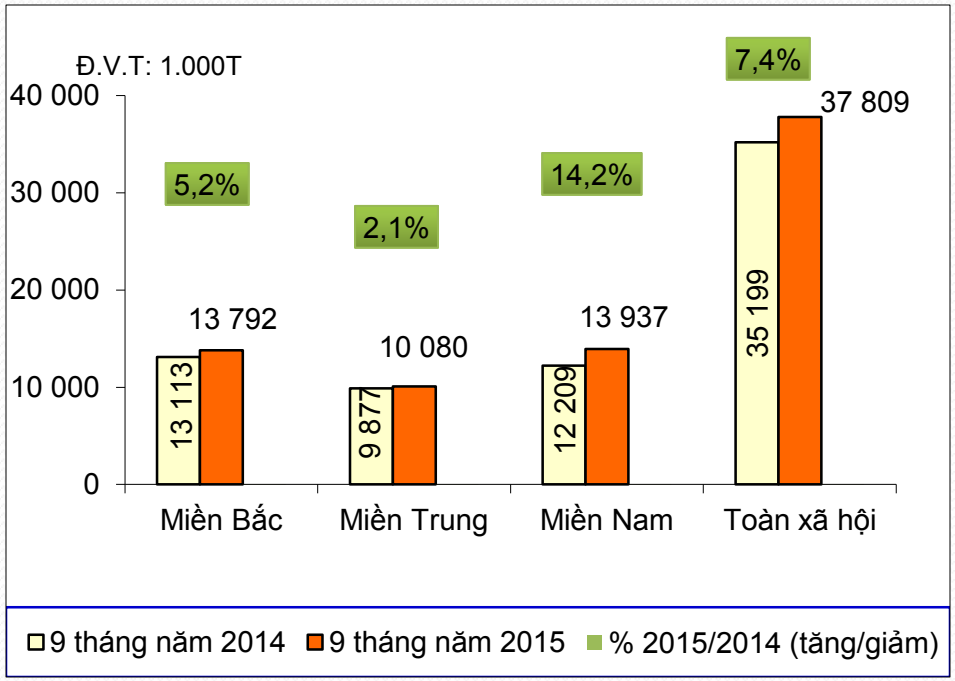
- 7% clinker capacity
- 15% cement grinding capacity (independent grinding station, receiving clinker from North)

- 23% clinker capacity
- 45% cement grinding capacity (many independent grinding stations, receiving imported clinker)



(Source: VICEM, Cement association)

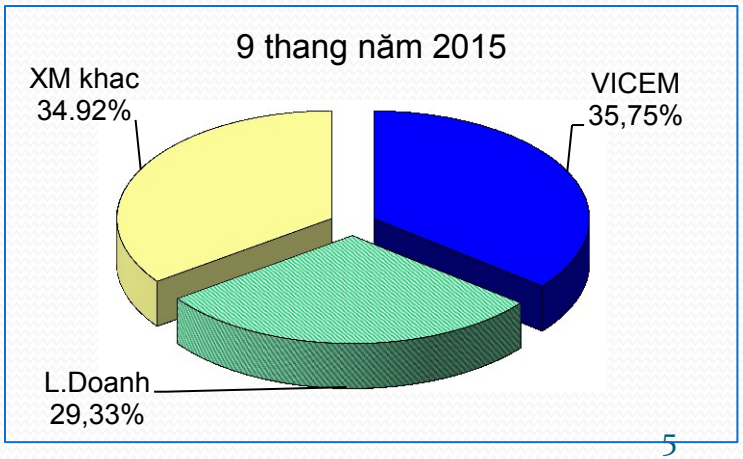
Comsumed correlation on 9 months, 2015



Content	9 months,2014	9 months, 2015	Comparison (%)	Market share (%)
1. Vicem	12.533	13.515	107,8	35,75
2. Joint venture	10.358	11.090	107,1	29,33
3. Others	12.308	13.204	107,3	34,92
Total	**35.199**	**37.809**	**107,4**	**100**

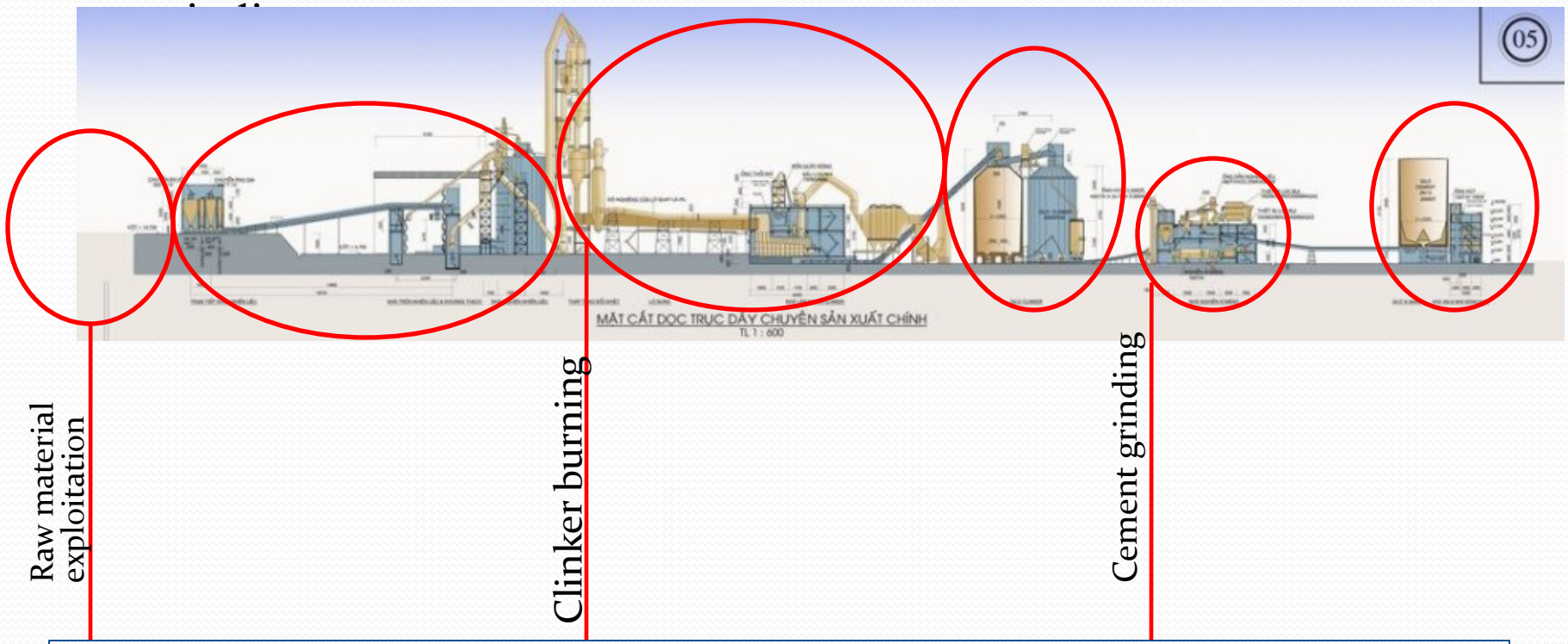
- There is consumption growth over the same period in 2014.
- The South market has growth most strongly.

(Source: VICEM)



Production Technologies of Vicem

- Basically, it includes clinker production line with dry technology (preheater and rotary kiln). 02 rotary kilns with kind of planetary cooler.
- 5% design capacity of cement grinding process is Vertical Roller Mill;
- 25% design capacity of cement grinding process is a ball mill with pre-



The potential of energy saving is at the main production process

Energy waste in clinker production

Tên công ty	Nhiệt năng QĐ (MWh)	Suất TT điện kWh/T-cl	Điện năng (MWh)	Năng lượng qui đổi (MWh)	Năng lượng tg. đương (TOE)
1.Hoàng Thạch	3.261.169	73,5	233.940	3.495.109	539.295
2.Bỉm Sơn	2.625.013	56,9	153.257	2.778.270	428.687
3.Hải Phòng	1.047.321	69,0	72.252	1.119.574	172.750
4.Bút Sơn	2.683.800	59,4	153.499	2.837.299	437.795
5.Tam Điệp	1.264.883	63,9	80.718	1.345.601	207.626
6.Hoàng Mai	1.486.186	65,3	86.833	1.573.018	242.717
7.Bình Phước	1.612.111	73,2	128.602	1.740.713	268.592
8.Kiên Lương	2.064.289	73,8	152.140	2.216.429	341.995
9.Hải Vân	497.403	79,0	37.583	534.986	82.548
Tổng cộng:	**16.542.176**	**68,2**	**1.098.825**	**17.641.000**	**2.722.006**

(Source:Energy audit report, 2013)

Investment demand for emission reductions: improve technology and small-scale energy efficiency

- Upgrading and renovation of a ball mill system to reduce energy waste, improving the drying performance.
- Reconstruction and improving the efficiency of the heat recovery to clinker cooler; combine with upgrading kiln system
- Installation of the inverter
- Renovating the internal transport system.
- Upgrading the monitor system and control to optimize fuel usage.

Investment demand for emission reductions: Utilizing waste heat for generator

Project / Index	Hai Phong Cement Plant	Hoang Thach Cement Plant	But Son Cement Plant	Tam Diep Cement plant	Bim Sơn Cement plant	Hoang Mai Cement plant		Kien Luong Cement plant
Heat Recovery (MWt)	12,36	28,04	46,35	19,38	53,31	26,92	22,01	17,26
Installed power (MW)	3	6,5	10	6	12	6,5	6	4
Output power (MW)	2,63	5,96	9,43	4,12	11,32	5,72	4,67	3,67
Investment (bil dong)	259,844	425,949	588,244	248,419	563,515	366,961	329,534	278,249
-USD (mil)	8,419	13,314	19,532	8,522	18,982	12,423	10,862	9,634
-VNĐ (bil)	80,836	142,894	172,978	67,227	159,955	102,837	98,596	73,417
NPV (1000đ)	-76.676.135	-26.309.228	69.822.494	17.768.749	149.050.689	25.493.651	-489.081.316	-34.938.410
IRR (%)	2,77	6,83	10,17	9,30	12,53	9,22	7,97	6,51
Payback period (year)	12,122	8,885	7,328	7,636	6,469	10,900	11,600	9,290
Break event point(%)	88,98	49,95	54,38	42,80	46,05	59,47	65,05	66,44
ROI (%)	0,80	4,95	5,16	6,76	7,40	4,77	3,77	3,12
Investment rate (mil USD/MW)	4,647	3,361	2,912	2,836	2,409	3,007	3,312	3,566

- Total installed power : 54 MW.
- Total investment : 3060,7 billion Dong

Investment demand for emission reductions: using alternative fuels and recycled raw materials

- Using alternative fuel for clinker burning , target to use 20% alternative energy by 2018 (industrial waste, domestic and agricultural semi-finished products).
- Using industrial waste, industrial semi-finished products from the chemical industry (synthetic gypsum, fertilizer industrial residues).
- Using ash, slag , sintered materials from the chemical process, steel and electric heat.
- Hazardous Waste treatment (solvents, waste oils ....)

Challenges

- Capital and Investment efficiency:
  + Being in stage of return on investment, while difficulty in product consumption. In short, it is difficult to arrange capital for energy efficiency projects.
  + The economic efficiency of the these projects are not attractive enough.

- Technical and technological level:
  + Requiring the intensive research for some improvement program, using new materials.
  + Monitor systems for controlling of energy consumption that are incomplete or unreliable.
  + Limited access to energy saving solutions for production staffs.

Challenges

- Awareness of using energy efficiency:
  + Inconsistent awareness between the operating management and staffs.
  + Meet obstacles in local communities during transport, waste treatment.

- Policy Mechanism:
  + No access to financial support mechanism powerfully enough for manufacturers to invest in energy saving solutions.
  + No clear effect on Responsibility and sanctions in the energy saving activities

Recommendation

- There is a financial support mechanism for manufacturers to invest in energy saving solutions (income tax exemption, preferential loans ....)
- There are penalties for manufacturers with no using energy saving solution and / or encouragement for good contribution.
- Combining with environmental improvement projects to gather funds for more concentrated and effective.
- Strengthen training and workshop to access technology knowledge for those direct parties that involved in the production.

Thank you!