NYSERDA ON-SITE POWER CONFERENCE
December 7, 2016
New York, New York

David M. Sweet
Executive Director - World Alliance for Decentralized Energy
President – Natural Gas Roundtable

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WADE Mission

- WADE Research activities
  - Reports, market surveys and studies
  - WADE Economic Model
- WADE Advocacy activities
  - Policy advise for governments
  - Participation in legislative and regulatory proceedings
  - Cooperation with International Organisations, Institutions and NGOs
- WADE Promotion activities
  - WADE Conferences and events
  - WADE Newsletters

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Natural Gas Roundtable

Non-profit organization started over 40 years ago to educate government officials, media and industry about natural gas issues

US natural gas industry is highly segmented

The Natural Gas Roundtable serves as an umbrella organization bringing together all industry segments from the wellhead to the burnertip

NATURAL GAS ROUNDTABLE of WASHINGTON

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What is Decentralized Energy (DE)?

Electricity production *at the point of use*, irrespective of size, fuel or technology – on-grid or off-grid:

- High efficiency cogeneration (CHP)
- On-site renewable energy
- Industrial energy recycling and On-site power

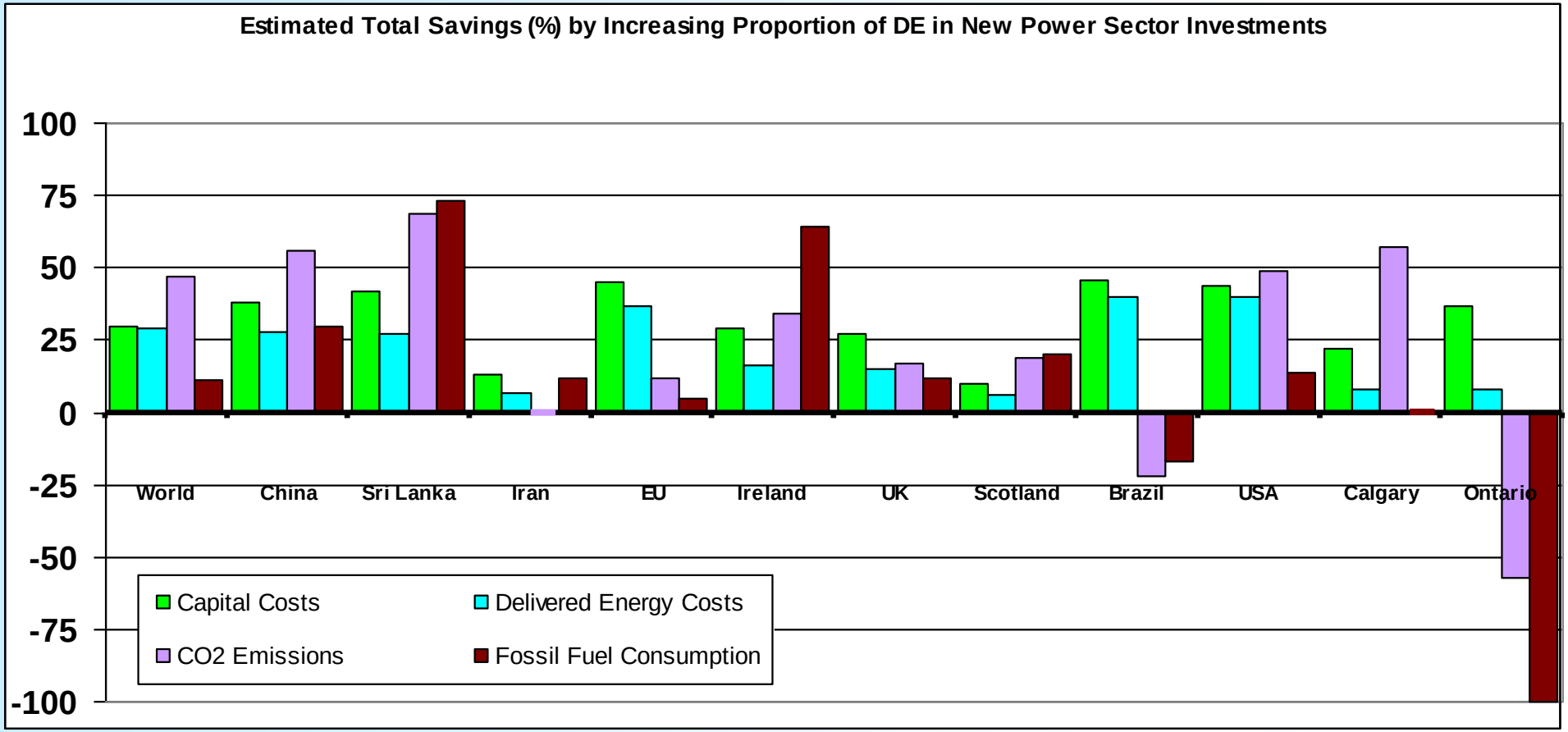
- Otherwise known as:
  - CCHP (Combined Cooling Heat and Power), Distributed Generation, Captive Power, Embedded Generation, Microgeneration, CHP, Trigeneration, Recycling Energy, etc.

Why is DE better?

Benefits of DE compared to centralised generation

- DE is more efficient
- DE is delivers less expensive power
- DE is cleaner
- DE is more reliable
- DE is more secure
- DE provides access to electricity in remote areas
- DE can be sited quicker and with less opposition
- DE can help support intermittent renewables

DE Benefits – WADE Economic Model – Selected Past Results



(Source: WADE various)
Note: Proportion of total investment that is DE varies from region to region and from scenario to scenario-(ie in some cases savings are resultant from all new capacity being DE compared to baseline and in other cases only 25% of new capacity is DE compared to baseline)

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WADE model

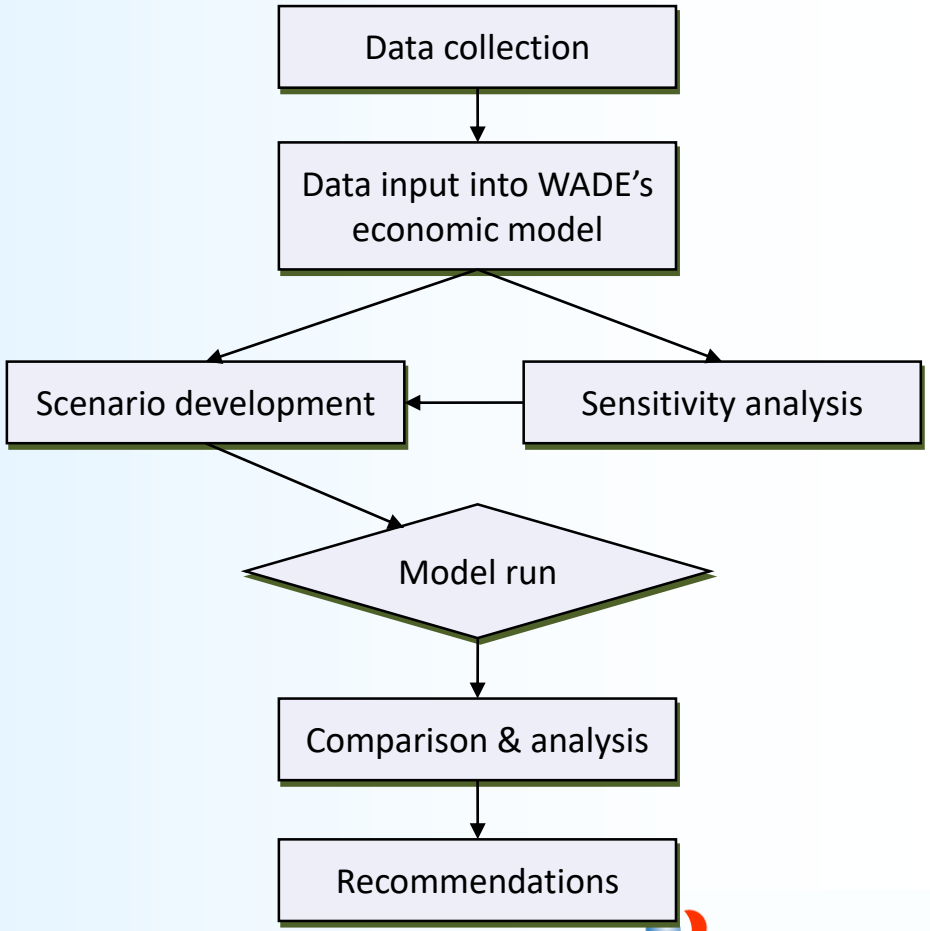
INPUT OUTPUT MODEL

INPUT

Capacity & Generation	- Existing capacity & generation - Load factor
Pollution level	- Pollution level (NOx, SOx, PM10, CO2) - Heat rate
Cost	-Investment cost - O&M cost - Fuel cost
Growth Properties	- System growth properties - Capacity retirement - Future generation

OUTPUT : Total capital cost, Retail cost, Fuel used, Emission level

METHODOLOGY USED



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Asia Pacific Partnership Study

- Task 1 – Identify 5 target province/municipal districts
  - Shanghai
  - Liaoning
  - Shandong
  - Jiangsu
  - Sichuan
- Task 2 – Assess current market conditions, drivers, challenges and stakeholders for CHP/Clean DG
- Task 3 – Quantify the technical potential for CHP/Clean DG and estimate potential energy, greenhouse gas emissions and economic benefits

Study Conclusions

- The Opportunity

Municipality/ Province	Installed New DG/CHP GW	Additional Central Station GW Saved	Percent Energy Savings	Percent CO_2 Reduction	Macro Economic Savings in ¥
Sichuan	**15,410**	**2,473**	**28.1**	**45.7**	73,108,000,000
Shanghai	**19,962**	**4,792**	**22.9**	**41.8**	128,315,000,000
Liaoning	**21,494**	**3,296**	**19.6**	**34.4**	62,855,000,000
Shandong	**49,103**	**11,044**	**19.5**	**33.8**	134,888,000,000
Jiangsu	**37,696**	**11,310**	**15.2**	**27.4**	198,378,000,000
Total	143,665	32,915	19%	33%	597,544,000,000

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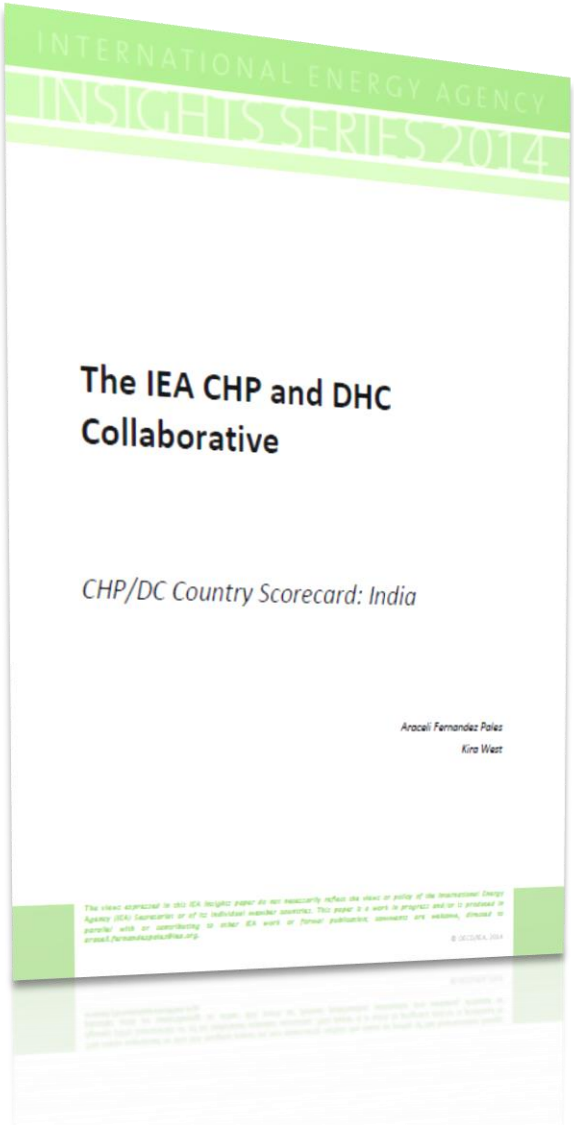
The IEA CHP and DHC Collaborative



CHP / DC Challenges

Barriers and Constraints

Economic and financial constraints

- High Capital Cost of CHP equipment and DC infrastructure
- Complex pricing policies for natural gas

Legislative and policy constraints

- CHP is limited to bagasse-based
- DC and its benefits is little known in India

Technological constraints

- Lack of local expertise on technology

Summary Policy Recommendations

Policy Recommendations
Central and state government support
• Develop a national database • Promote strategic planning on commercial / residential complexes, industrial parks
Private sector initiatives
• Framework for data collection and technology assessment
Enhanced cooperation
• Between public and private sector • With other countries

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Policies can Drive the Market

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August 30, 2012

Executive Order

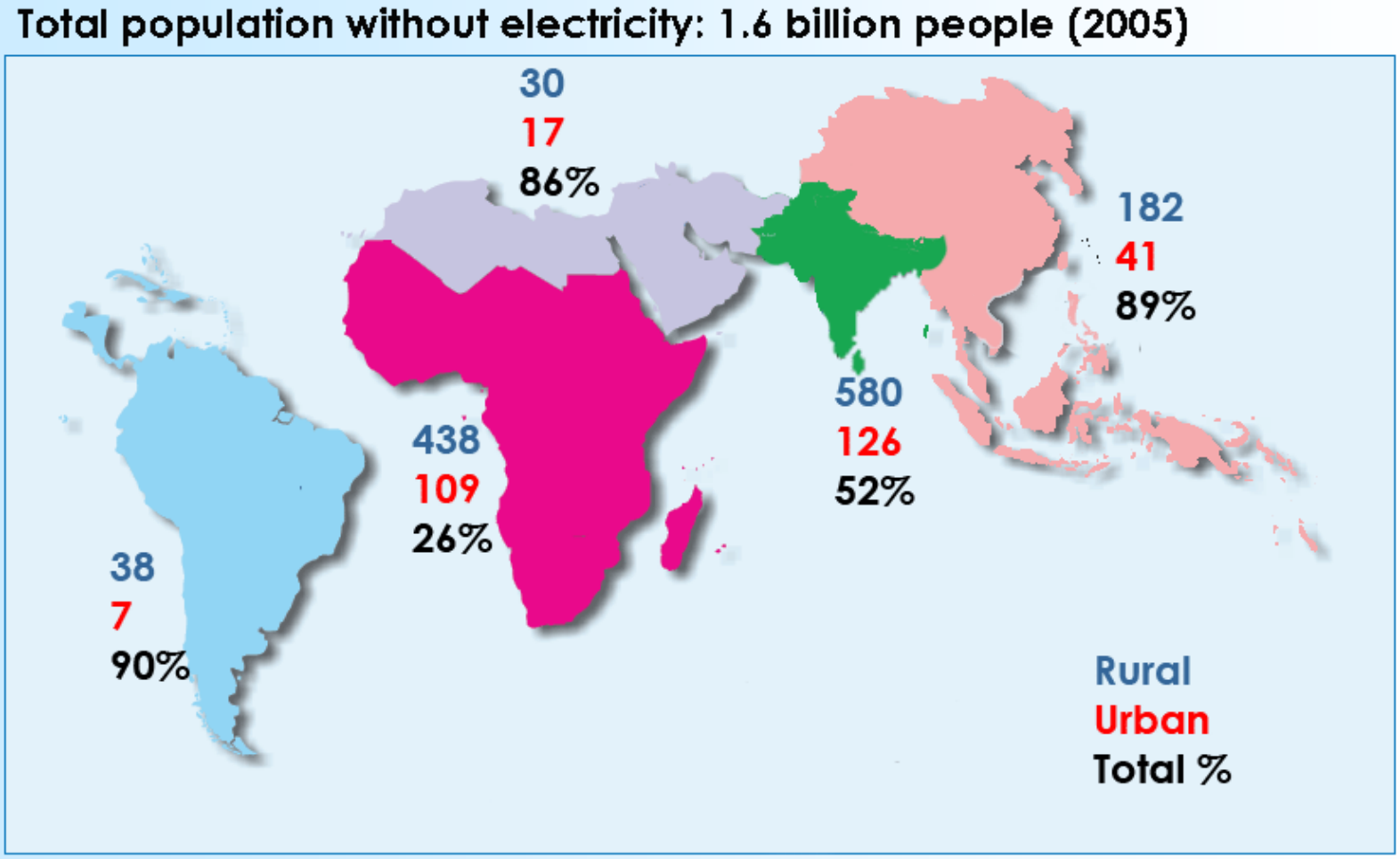
Accelerating Investment in Industrial Energy Efficiency

WASHINGTON, DC -- President Obama signs an Executive Order calling for the deployment of 40 gigawatts of new, cost-effective industrial combined heat and power (CHP) capacity in the United States by 2020.

- Policy: To formalize and support the close interagency coordination that is required to accelerate greater investment in industrial energy efficiency and CHP, this order directs certain executive departments and agencies to convene national and regional stakeholders to identify, develop, and encourage the adoption of investment models and State best practice policies for industrial energy efficiency and CHP; provide technical assistance to States and manufacturers to encourage investment in industrial energy efficiency and CHP; provide public information on the benefits of investment in industrial energy efficiency and CHP; and use existing Federal authorities, programs, and policies to support investment in industrial energy efficiency and CHP.

- Encouraging Investment in Industrial Efficiency: The Departments of Energy, Commerce, and Agriculture, and the Environmental Protection Agency, in coordination with the National Economic Council, the Domestic Policy Council, the Council on Environmental Quality, and the Office of Science and Technology Policy, shall coordinate policies to encourage investment in industrial efficiency in order to reduce costs for industrial users, improve U.S. competitiveness, create jobs, and reduce harmful air pollution.

DE Potential - Access



Source: Based on IEA World Energy Outlook 2006

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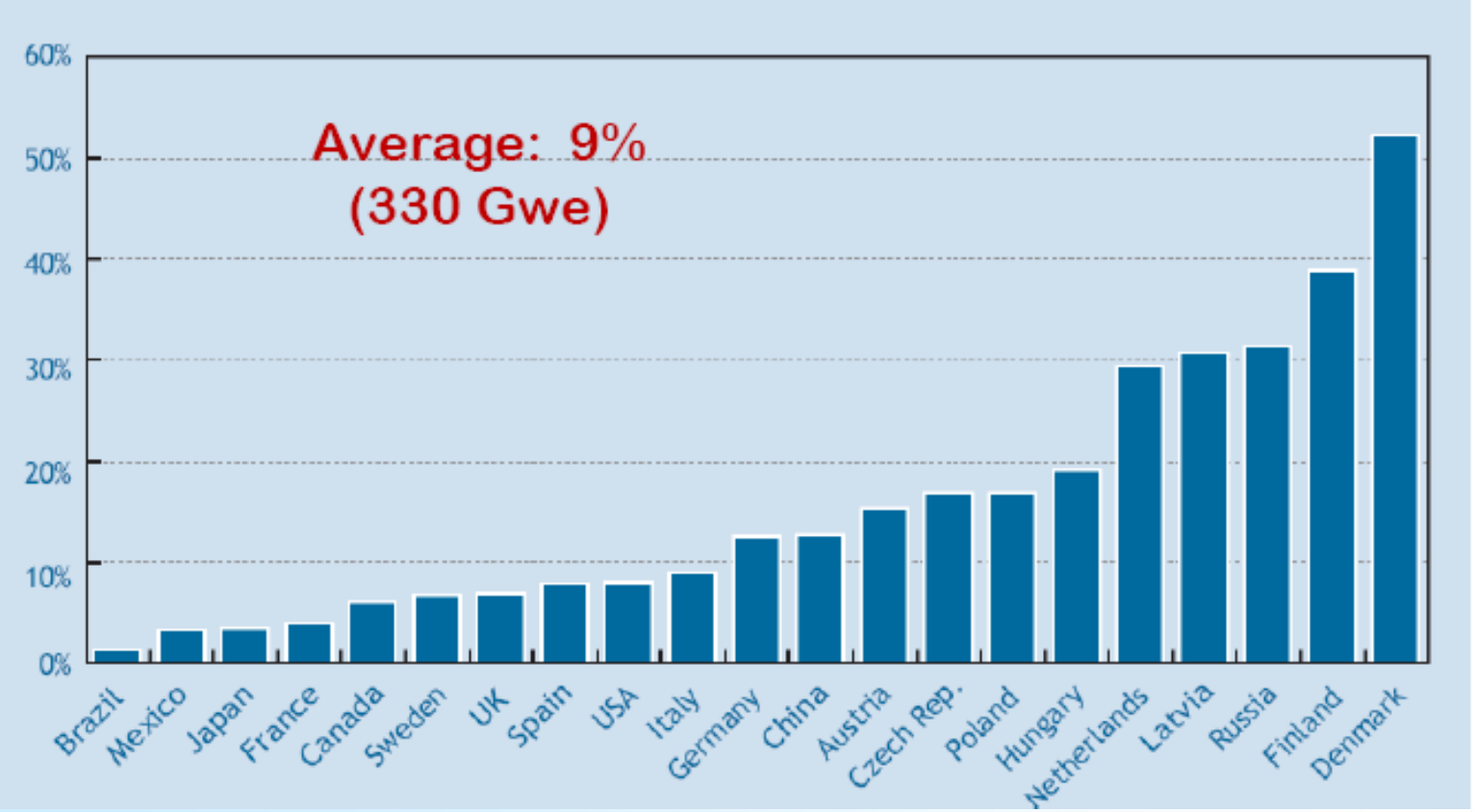
DE Benefits – Health and Quality of Life

Indicator of Human Welfare	Commercial Share of Total Energy		
	0-20 %	21-40 %	41-100 %
Life Expectancy (Years)	59.8	69.0	69.5
Probability of not surviving to 40	21.7	9.4	9.1
School Enrollment (%)	52.4	65.4	76.9
Children Underweight (%)	40.9	15.1	11.9
No Access to Clean Water (%)	20.9	22.8	12.8

CHP share national power generation



Sources:IEA, CHP: Evaluating Benefits of Greater Global Investment, 2008

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Thank you!

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