ENGINEERING AND THE FUTURE ENERGY SCENARIO

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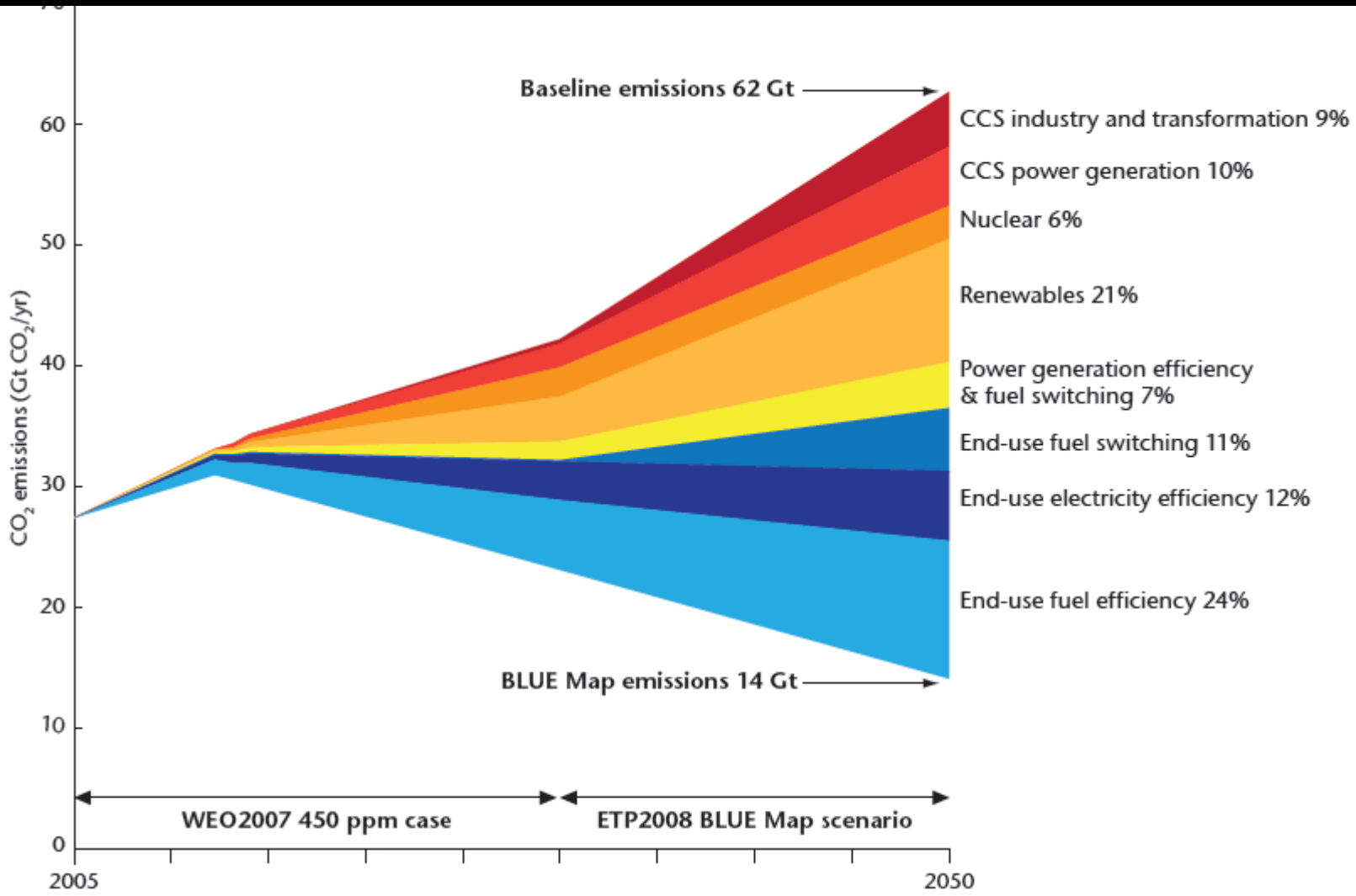
"PREDICTING THE FUTURE IS A HOPELESS, THANKLESS TASK, WITH RIDICULE TO BEGIN WITH AND, ALL TOO OFTEN, SCORN TO END WITH."

Isaac Asimov, Science Digest, 1965

CONTRIBUTIONS OF TECHNOLOGIES IN THE BLUE SCENARIO



Source: International Energy Agency, *Energy Technology Perspectives* (2008)

R & D and D IN EMISSION REDUCTION

- ADVANCED TECHNOLOGY VEHICLES.
- BIOENERGIES
- CO2 CAPTURE AND STORAGE.
- ENERGY EFFICIENCY IN BUILDINGS
- ENERGY EFFICIENCY IN THE INDUSTRY.
- BURNING COAL WITH HIGH EFFICIENCY AND LOW EMISSIONS
- SOLAR ENERGY
- WIND ENERGY
- SMART GRIDS
- NUCLEAR ENERGY.

RD & D GAP ANALYSIS OVERVIEW

(MILLIONS USD / YEAR)

	ANNUAL NEEDS	ANNUAL SPENDING	ANNUAL GAPS
ADVANCED VEHICLES	24.900	1.543	23.357
BIOENERGY	705	590	115
CARBON CAPTURE AND STORAGE	8.250	884	7.366
ENERGY EFFICIENCY (INDUSTRY)	6.750	411	6.339
HIGHER EFFICIENCY COAL	2.250	544	1.706
SMART GRIDS	8.330	420	7.910
SOLAR	2.460	665	1.795
WIND ENERGY	1.950	186	1.764
TOTALS	**55.595**	**5.243**	**50.352**

Note: Values represent 80% attributes to MEF contries.

Source: International Energy Agency (2009)

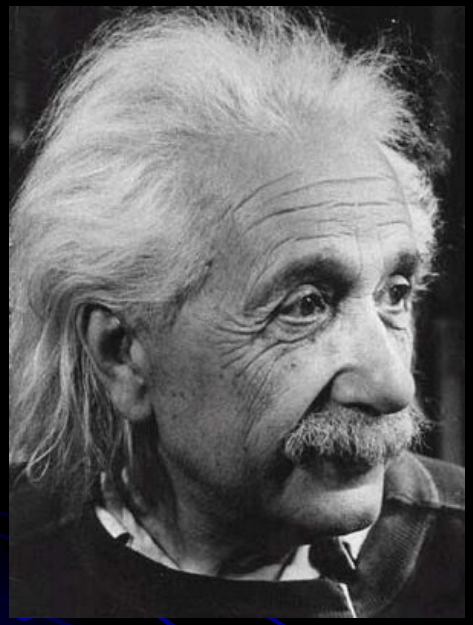
20TH WORLD PETROLEUM CONGRESS
DOHA, QATAR, DECEMBER 4 – 8, 2011

BLOCK I. "NATURAL GAS. THE ENERGY THAT MAKES THE DIFFERENCE ."

FORUM 1: LIQUEFIED NATURAL GAS PRODUCTION. LATEST DEVELOPMENTS IN LIQUEFACTION AND TRANSPORTATION

FORUM 3: IMPROVING EFFICIENCY, SAFETY AND ECONOMICS FOR GAS TO LIQUID PROCESSES (GTL)

FORUM 5: NON CONVENTIONAL NATURAL GAS RESOURCES



“WE CAN’ T SOLVE PROBLEMS BY USING THE SAME KIND OF THINKING WE USED WHEN WE CREATED THEM".

Albert Einstein