



Joint Energy Charter/NEMA Workshop on Energy Efficiency Goods in Support of the EGA Negotiations

WTO, Geneva
29 January 2015

Workshop outline

- Welcome: Energy Charter and NEMA
- What is energy efficiency?
- Global electricity usage
- Super-efficient motors and motor-driven systems
- Controls and heat pumps
- Smart Grid
- Vehicles
- HS Codes for EGA



Energy Charter Constituency



- 1. Signatories of the European Energy Charter (and members of the Treaty):

Afghanistan, Albania, Armenia, Australia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, European Union, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Indonesia, Ireland, Italy, Japan, Jordan, Kazakhstan, Kyrgyzstan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Mauretania, Moldova, Mongolia, Montenegro, Morocco, Netherlands, Norway, Pakistan, Palestine, Poland, Portugal, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, The Former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, United Kingdom, United States of America, Uzbekistan, Yemen

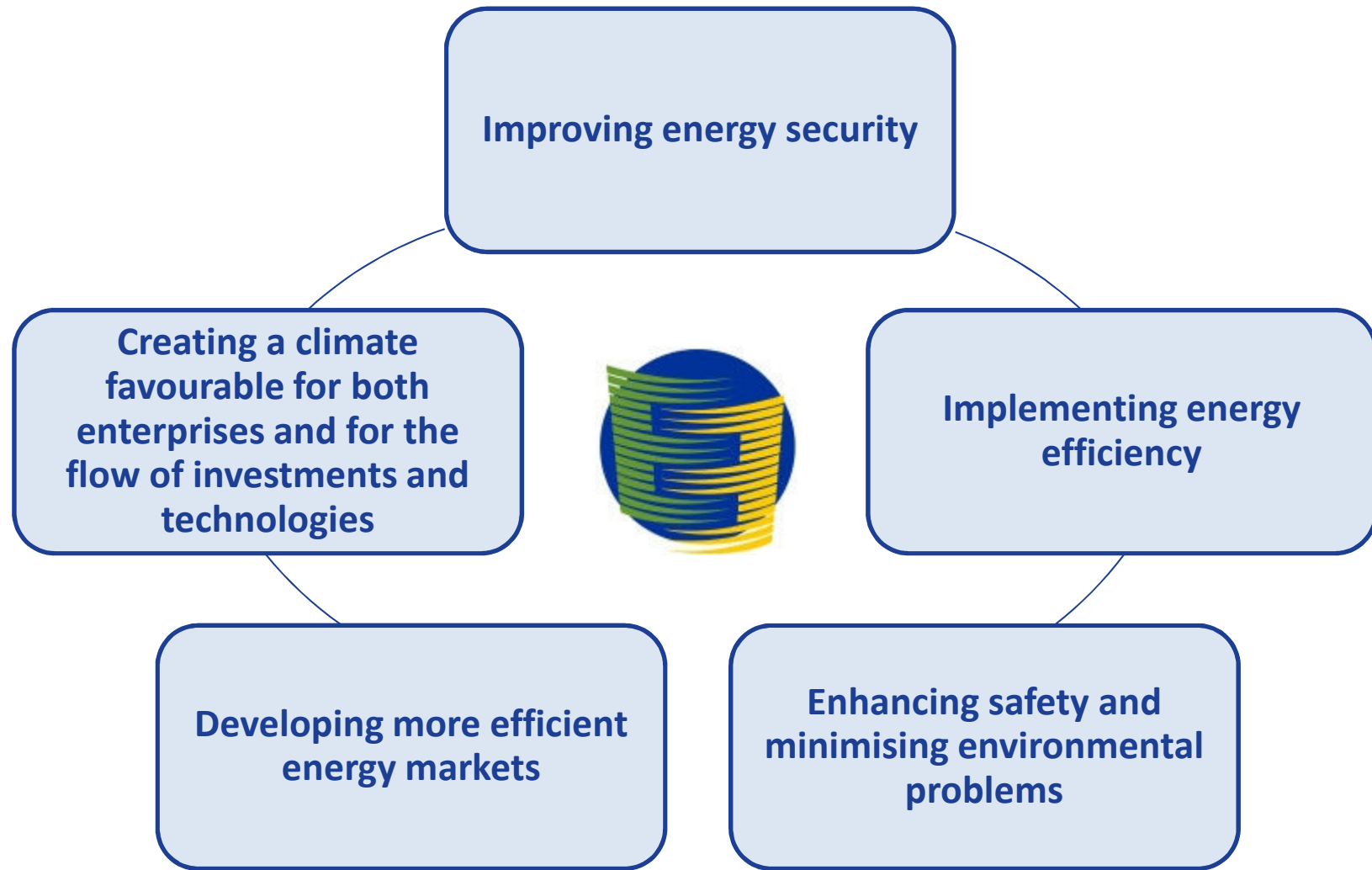
- 2. Observers to the Energy Charter Conference by invitation:

Algeria, Bahrain, China, Egypt, Iran, Korea, Kuwait, Nigeria, Oman, Palestine, Qatar, Saudi Arabia, Tunisia, United Arab Emirates, Venezuela, Yemen

- 3. Other states (Participants in the negotiations on the International Energy Charter):

Argentina, Bangladesh, Bhutan, Brazil, Brunei Darussalam, Cambodia, Chile, Colombia, India, Iraq, Israel, Lao PDR, Lebanon, Libya, Malaysia, Maldives, Mauritania, Mexico, Mozambique, Myanmar, Nepal, Niger, Philippines, Singapore, South Africa, South Sudan, Sri Lanka, Sudan Tanzania, Thailand, Vietnam

Principles of the 1991 Energy Charter





Main Focus of the 1994 Treaty

- More than 50 members; open to any exporting, transit or importing country
- National sovereignty over energy resources
- Investment protection and technology transfer
- WTO based trade provisions, including freedom of transit and mandate to negotiate plurilateral agreement
- Investor-to-state and state-to-state dispute settlement procedures
- Protocol on Energy Efficiency and Related Environmental Aspects PEEREA
- Model Agreements facilitating construction of cross-border infrastructure



Policy of Expansion and Outreach

- International Energy Charter (political document)
- Signature 20-21 May 2015 in The Hague
- 100 members and potential observer countries participate

Window of opportunity





Energy Efficiency

- “Improving Energy Efficiency” means acting to maintain the same unit of output (of a good or service) without reducing the quality or performance of the output, while reducing the amount of energy required to produce that output. (Article 2(6) EE Protocol)
- Charter Efficiency Projects: protection of EE investments by the investment provisions of the Energy Charter Treaty



■ Synoptic table of three goods lists

- Energy Charter Annexes EM I (energy materials and products) and EQ I (energy-related equipment)
- WEC Proposed List of Goods for Inclusion under an Environmental Goods Agreement
- APEC List of Environmental Goods

<u>HS (2012)</u>	<u>TEXTHS 2012</u>	<u>APEC</u>	<u>ECT</u>	<u>WEC</u>	<u>Explanations APEC</u>	<u>Explanations WEC</u>
2503	Sulphur of all kinds, other than sublimed sulphur, precipitated sulphur and colloidal sulphur			2503		Necessary for EE/CCS/FGR processes and value chains. Technology: EE, CCS
26.12	Uranium or thorium ores and concentrates		26.12			



NEMA



- USA association of electrical equipment manufacturers
- 400 companies, 56 sections
 - power transmission, distribution, and storage
 - factory automation and control systems
 - lighting systems
 - medical diagnostic imaging systems
- Industrial, commercial, residential
- Safety, interoperability, efficiency, control



What is “energy efficiency”?

- “Using less energy to provide the same service”

Lawrence Berkeley Natl. Lab, USA

- “Something is more energy efficient if it delivers more services for the same energy input, or the same services for less energy input”

International Energy Agency

- “A resource that can displace need for electricity generation”

American Council for an Energy Efficient

Economy



Key Global Electricity Usage

- Motor-driven systems and processes
 - ☐ Industry
 - ☐ Infrastructure (Water)
 - ☐ Commercial Buildings (Water and HVAC)
 - ☐ Residential (HVAC)
- Lighting
 - ☐ Buildings
 - ☐ Infrastructure (Outdoor)
 - ☐ Residential



There will be 3.8 billion new consumers of electricity in the world by 2050, in addition to the billions already on the grid.

The 1.3 billion people who currently don't have access to electricity, and the 2.5 billion new people coming into the world by then, will increase the importance of innovative solutions for energy.

Eirik Waerness, Chief Economist
Statoil

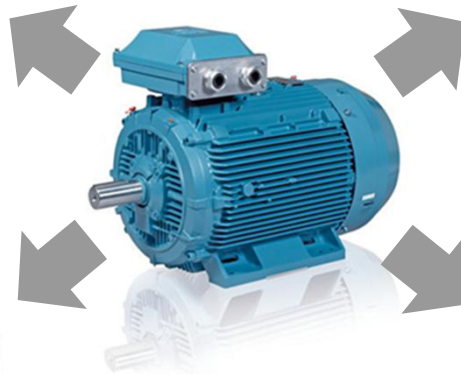


2014-12-01 Hannu Väänänen

Industrial Electric Motor Efficiency WTO EGA Briefing Geneva 2015

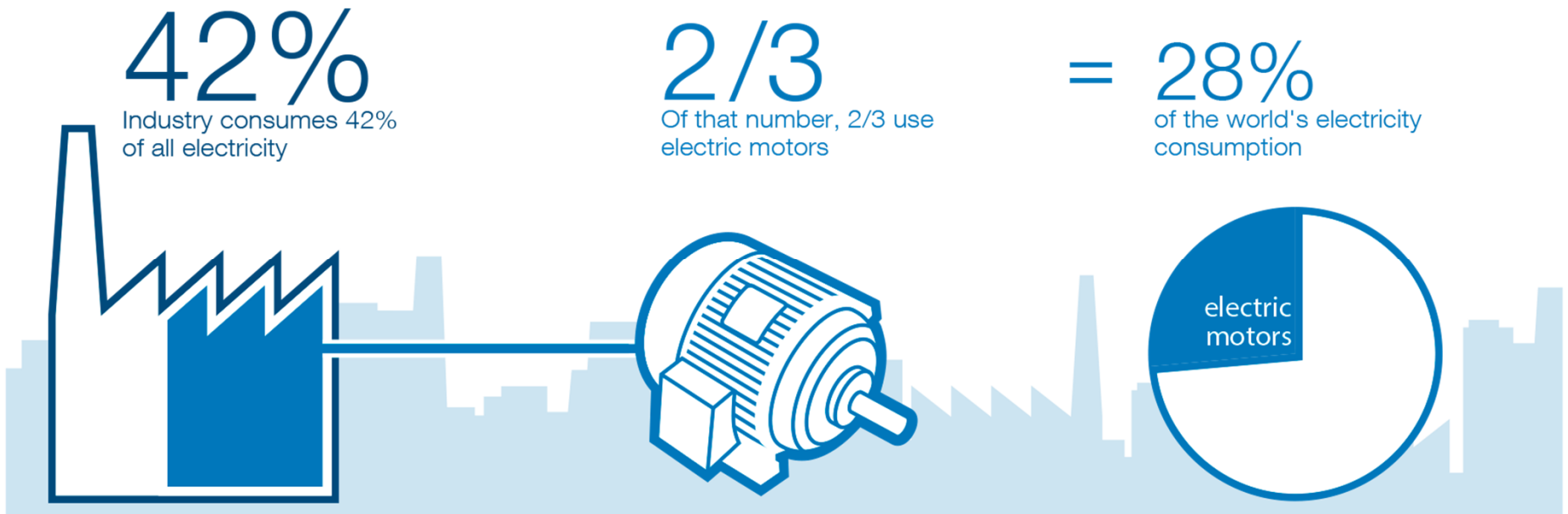
Industrial Electric Motors

Where are they? Everywhere.



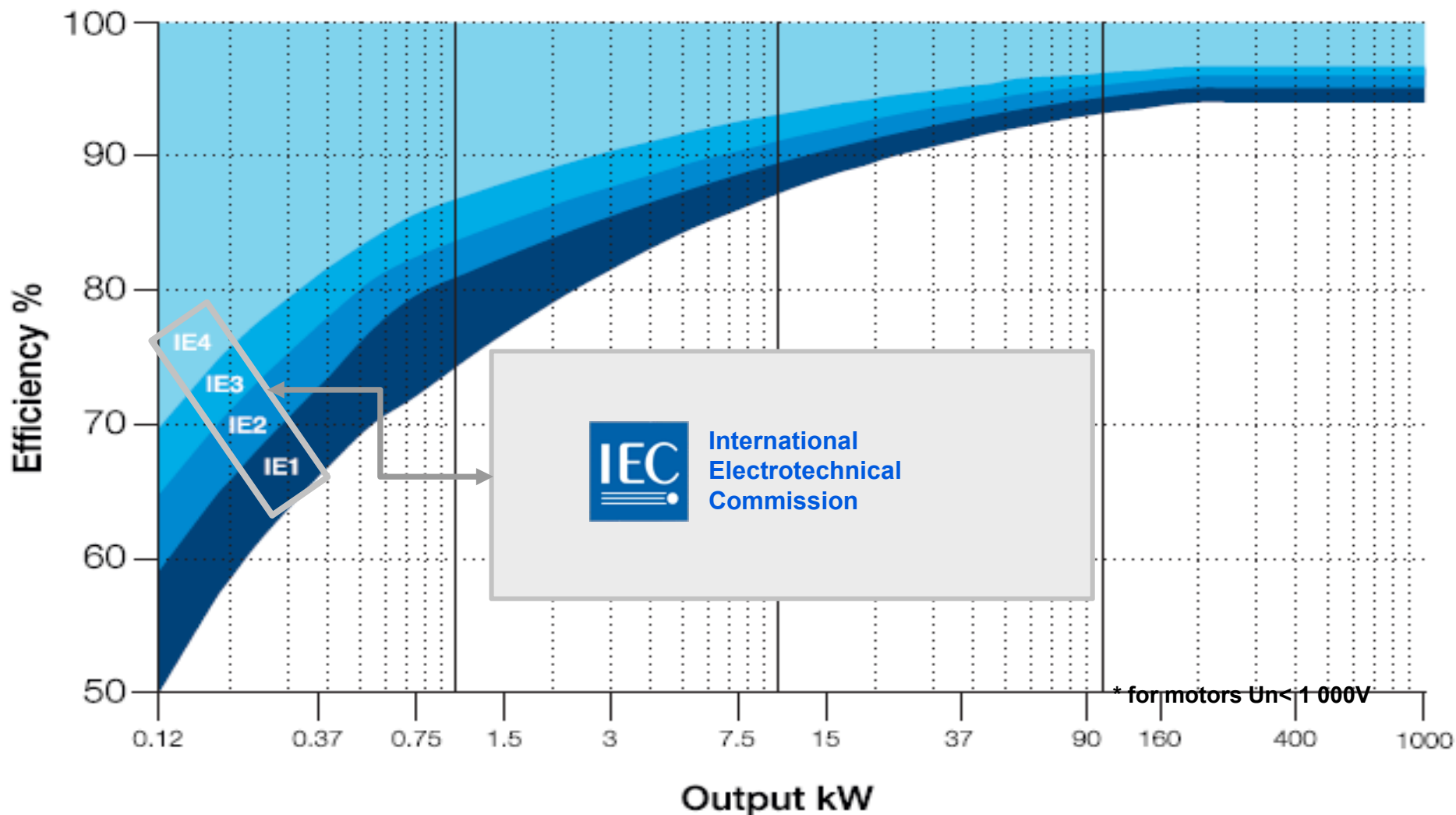
Industrial Electric Motors

The single largest consumer of energy worldwide



Industrial Electric Motors

Opportunities for significant energy savings



Industrial Electric Motors

Parties utilizing IEC efficiency standards

 AUSTRALIA	✓	 KOREA	✓
 CANADA	✓	 NEW ZEALAND	✓
 CHINA	✓	 NORWAY	✓
 COSTA RICA		 SINGAPORE	✓ *
 THE EUROPEAN UNION	✓	 SWITZERLAND	✓
 HONG KONG	✓	 CHINESE TAIPEI	✓
 Israel	✓	 Turkey	✓
 Japan	✓	 UNITED STATES	✓

* Under preparation

Industrial Electric Motors

Achieving motor efficiency under the EGA

ABB Oy, Motors and Generators Vaasa, Finland						
3~ Motor		M3BP 315SMB 4 IMB3/IM1001				
		654321-30				
IE2 - Alto Rendimento		2011				
		No. 3GF11012347				
		ISOL F IP 55				
V	Hz	kW	r/min	A	cos ϕ	REG
440 D	60	150	1785	238	0.87	S1
FS 1.0		REND 95.0%		CAT N		Ip/In 6.7
Tempo máx. de rotor bloqueado 6 s						
Método de resfriamento TFVE						
Cod. Produto 3GBP312220-ADG542						
6319/C3		6316/C3		980 kg		
NBR 17094-1		ABB		IEC 60034-1		

BALDOR			
Super Efficient Motor			
BALDOR ELECTRIC CO. PE SMITH, PA. MADE IN U.S.A.			
CAT NO.			
SPEC.			
HP			
VOLTS			
AMPS			
R.P.M.			
FRAME	HC	PH	
SER. F	COOL	DES	CLASS
NTM NO. EFF.	S.P.F.		
BASE. W. EFF.	W.E.C.		
RATING	NEMA Premium		
STARTER	BE	DBE	
ENCL	SH		
Complies with IEEE Std 841-2001			
NEMA			
UL			

Industrial Electric Motors

Too important to ignore



Why Industrial Electric Motors?

- Use 28% of global electricity
- Installed base of electric motors is inefficient but will remain in use absent incentives to change
- Best Available Technologies dramatically improve efficiency

International Standards Support Inclusion

- International IEC standards cover efficiency classification and verification
- Efficiency regulation based on IEC standards is in use in all participating nations but one
- Motor efficiency labeling is already ubiquitous
- Countries can adopt two-digit HS suffix/subheadings while the WCO expedites a universal HS identifier

Industrial Electric Motors

Additional Information

- [IE4 Motor Case Study](#) - ABB
- [IEC.ch](#) - International Electrotechnical Commission
- [IECEE.org](#) - IEC Conformity Testing and Certification
- [MotorsMatter.org](#) - Motor Decisions Matter
- [MotorSummit.ch](#) – Motor Summit
- [EEmods2013.org](#) - Energy Efficiency in Motor Driven Systems Conference
- [ACEEE.org/topics/motors](#) - American Council for an Energy-Efficient Economy

Power and productivity
for a better world™



Variable Speed Drives

Making motor-driven systems even more efficient

NEMA event at WTO Green Goods negotiations

Geneva 29. January 2015

Aksel Jepsen, Head of Industry Affairs
Danfoss Power Electronics

What is a Variable Speed Drive (VSD)?



Function: speed control of electric motors

Also known as:

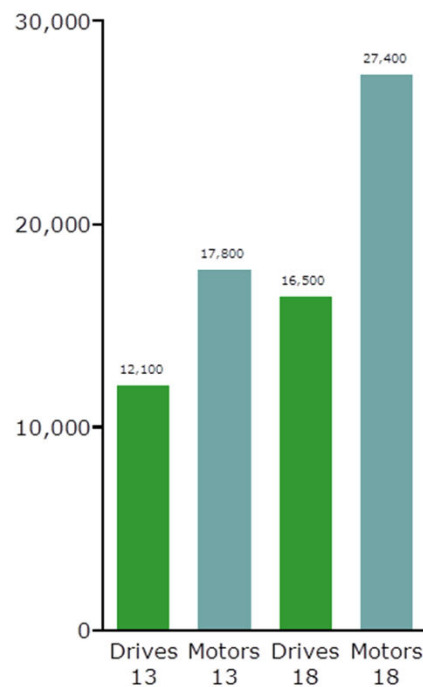
- Variable frequency drive (VFD)
- Frequency converter
- Static converter



Value of the Motor & Drives market.

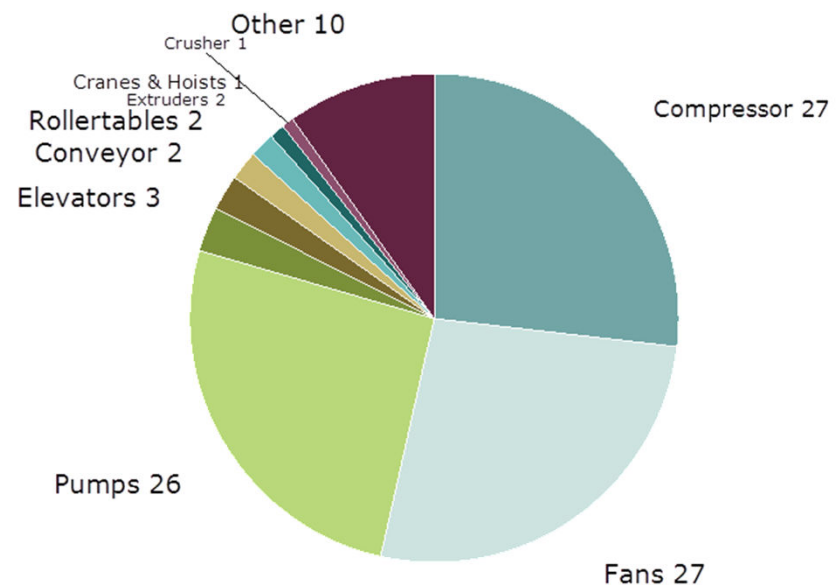
Compressors, Fans and Pumps cover approximately 80% of motor applications.

Million USD



Source: IMS AC & DC drives 2014. IMS Low voltage motors 2014. Estimates of Fractional HP motors added based on IHS presentation of Motor & motor control 2012.

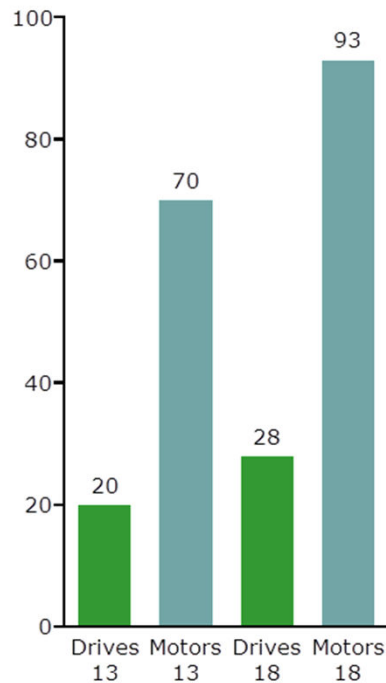
Motor market split by application



Source: IMS Low voltage motors 2014.

70-80% of motors are not controlled by Variable Speed Drives. Potential energy savings 15-40%.

Million Units



Source: IMS AC & DC drives 2014. IMS Low voltage motors 2014. Estimates of Fractional HP motors added based on IHS presentation of Motor & motor control 2012.

70-80% of new installed motors are not equipped with Variable Speed Drives.

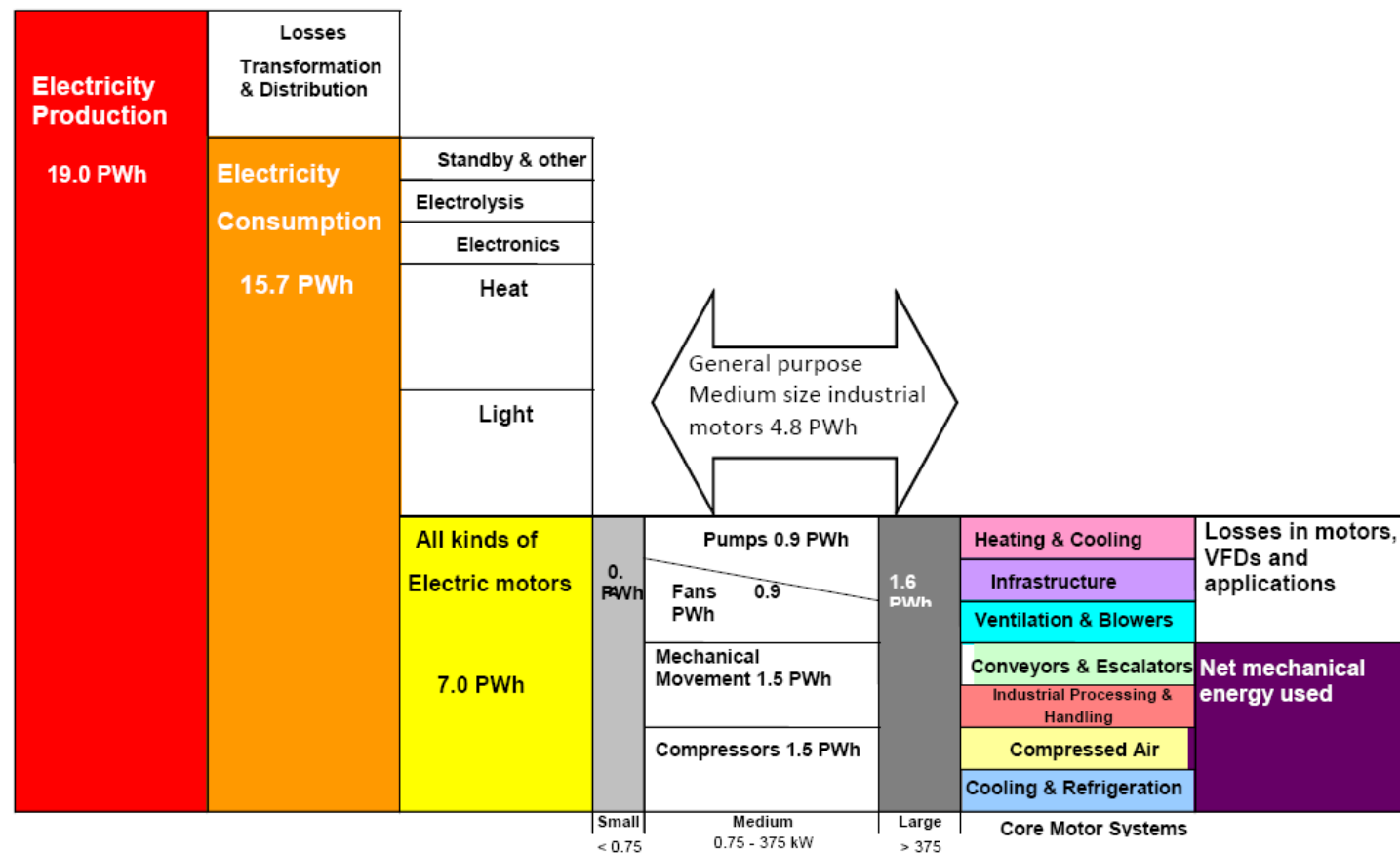
- With 70-80% of new motor installations not controlled by drives and a 10-15 years lifetime of motors, the installed base of motors not controlled by drives – provides a large energy savings potential.
- 80% of all applications would benefit from Variable Speed Drives

Energy savings potential.

- Variable Speed Drives typically save 15-40% of energy in motor driven systems.
- **New installations:** 70-80% of new motors installed without drives represent a huge energy savings potential.
- **Retrofit installations:** More than 80% of installed base of motors are not controlled by Variable Speed Drives

IEA 2011: Global electricity use

Figure 13: Estimated overall efficiency and electricity use for all types of electric motor systems



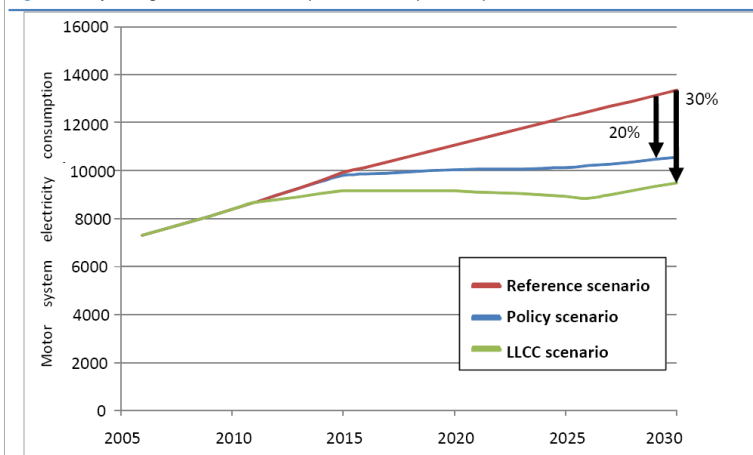
Source: A+B International, 2009.

Potential energy savings by Variable Speed Drives

"The variable speed drive (VSD), which alters the motor speed to finely adjust the system output in response to instantaneous demands, probably offers the largest energy-saving potential of any single measure in EMDS with variable loads".

International Energy Agency

Figure 1: Projected global electric motor-system electricity consumption



Abbreviation: LLCC = least life-cycle cost.

Notes:

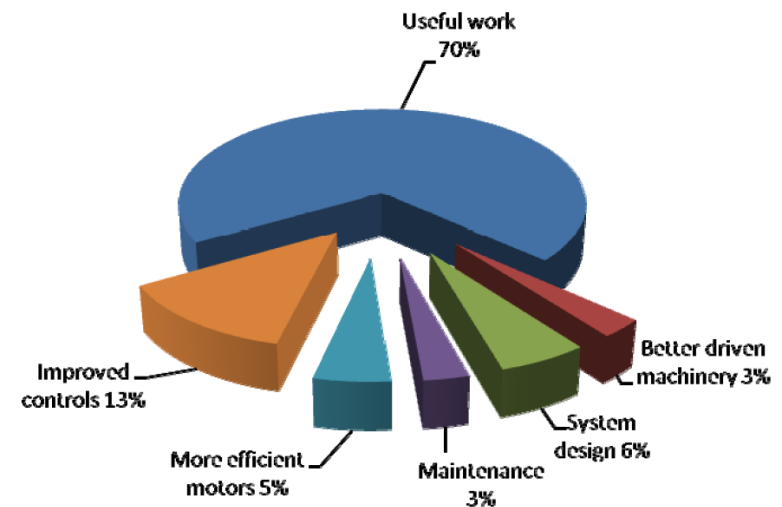
Reference scenario: when the current situation is maintained without additional policy measures.

Policy scenario: when all countries adopt a broad-based and rigorous policy package on EMDS.

LLCC scenario: when all EMDS are moved toward the least life-cycle cost level.

Source: IEA estimate.

Figure 1: Potential for energy savings in EMDS



Source: IEA estimates.

Case story:

Boiler-house renovation at Unilever Rotterdam
saves 25% energy with VLT® AQUA Drive

- Hot water distribution pumps
- Cascaded pump control
- SCADA control and Variable Speed Drives
- **25% energy savings**



Case story:

Chester Zoo, England

Pump and fan applications



- **Total energy savings of up to 78 %** was recorded for Chester Zoo in England
- **55% of the savings** are directly attributable to the **Variable Speed Drives**



References

- IEA working paper 2011: Energy-Efficiency Policy Opportunities for Electric Motor-Driven Systems
- IEA information paper 2011: WALKING THE TORQUE
- Danfoss Power Electronics A/S: Case Stories
- Danfoss VLT® Drives website: <http://vlt-drives.danfoss.com>
- Chester Zoo video case story:
https://www.youtube.com/watch?v=xJ_zUc2XxXA



ENERGY SAVING PRODUCTS

29 January 2015

Theo Kuijper van der Duijn
Director, EMEA International
Key Accounts

Honeywell

Environmental and Combustion
Controls

Combustion: Gas Valves

■ SMARTLINK Valve System

- Valve system that provides high precision flow control and air/fuel ratio control to optimize combustion
- Application: Any commercial/industrial process requiring heating with oil or gas
- Reduces fuel consumption and emissions
- **HTS CODE: 8481.80.90**



■ SMARTFIRE Combustion Management System

- Combustion Management System
- Industrial burners, Furnaces, Kilns, Ovens
- Reduces waste
- **HTS CODE: 8481.80.90**



Gas Valves that Reduce Fuel Consumption, Waste, and Emissions

Buildings: Controls & Meters

■ T775 Stand Alone Building Control

- Small to mid-sized building control that does not require networking
- Applications: Small to midsize buildings, humidity control for swimming pool areas, farms and outdoor locations
- Energy savings by scheduling and adjusting the boiler temperature based on outside air conditions
- **HTS CODE: 9032.89.60**



■ Communicating Submeters

- Monitor energy usage and integrate with Building Automation Systems for advanced energy management
- Applications: Tenant billing, cost allocation and equipment monitoring for office and retail, multi-family residential, healthcare and industrial/manufacturing facilities
- Provide insight into energy usage to implement energy management programs and support green building initiatives
- **HTS CODE: 9028.30**



Controls and Meters to Enable Energy Measurement & Savings

Homes: Thermostats

- Programmable and Internet Connected Thermostats
 - HVAC is generally about 40% of consumers' home energy costs
 - Lowering indoor temperature when house is empty in winter saves energy
 - Increasing indoor temperature when house is empty in summer saves energy
 - **HTS CODE: 9032.10**



Thermostats that Reduce Energy Usage

Heat Pumps & District Energy

Energy Charter/NEMA Workshop
WTO, Geneva 29 January 2015

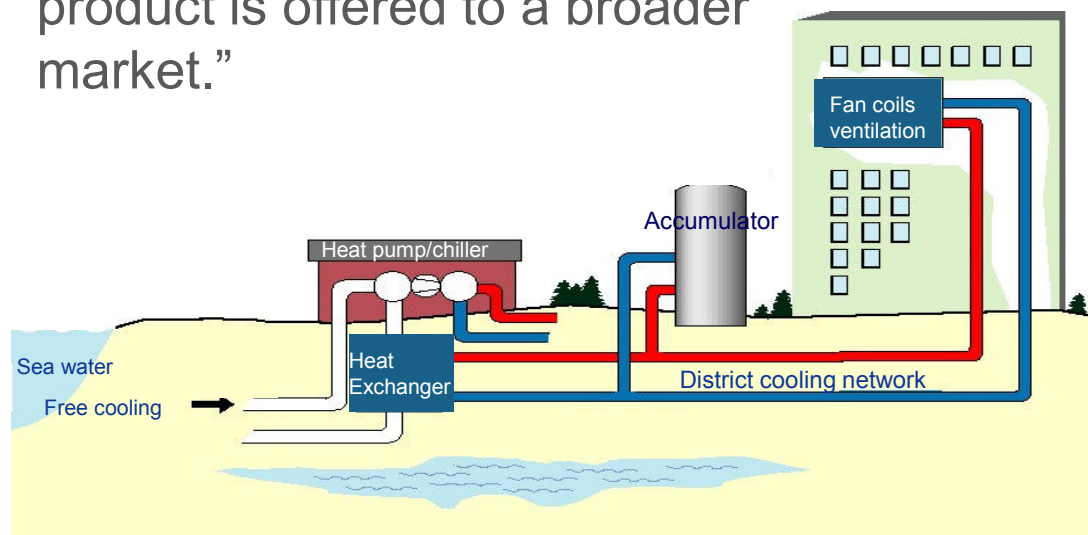
Per Jonasson
Swedish Refrigeration & Heat Pump Association
Heating and Cooling United



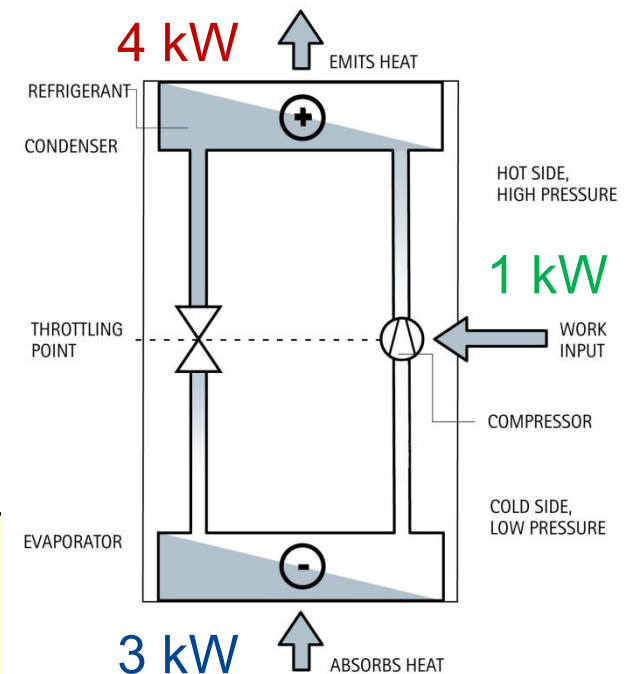
What is....

District Energy Energy system

“District energy is considered to be all forms of cooling or heating in which the production is centralized, and the product is offered to a broader market.”



Heat Pump Energy producer



Heat Pumps....

Comes in all sizes
From 1 kW to 20+ MW



Various types
air/air, air/water, liquide/water

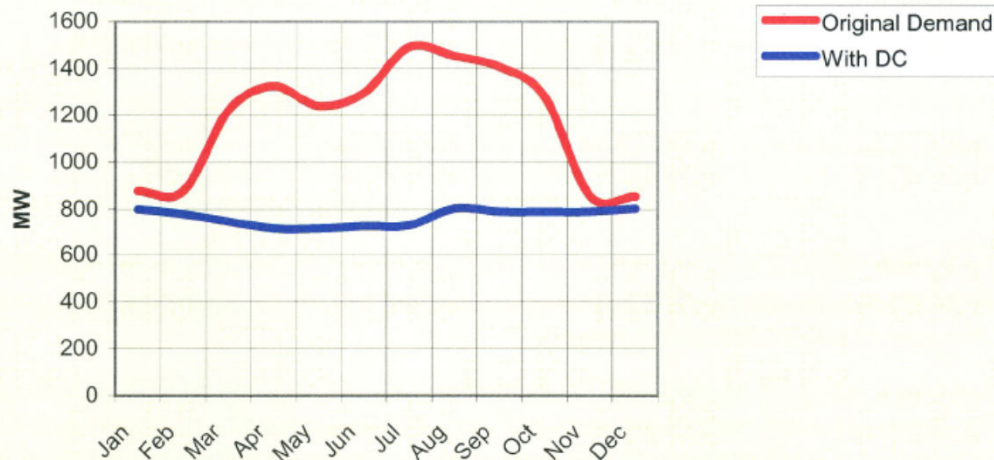


Broad temperature range
from +30°C to +85°C

Why....

Heat Pumps

- Sustainable energy source
- Very high energy efficiency - CO₂ savings
- Reliable and well known technology
- Easy to install
- The local alternative



District Energy

- Efficient production – CO₂ savings - simultaneity
- Waste energy or sustainable energy sources
- Infrastructure savings
- Corporate Social Responsibility, (CSR)
- Improved building value
- Security of supply

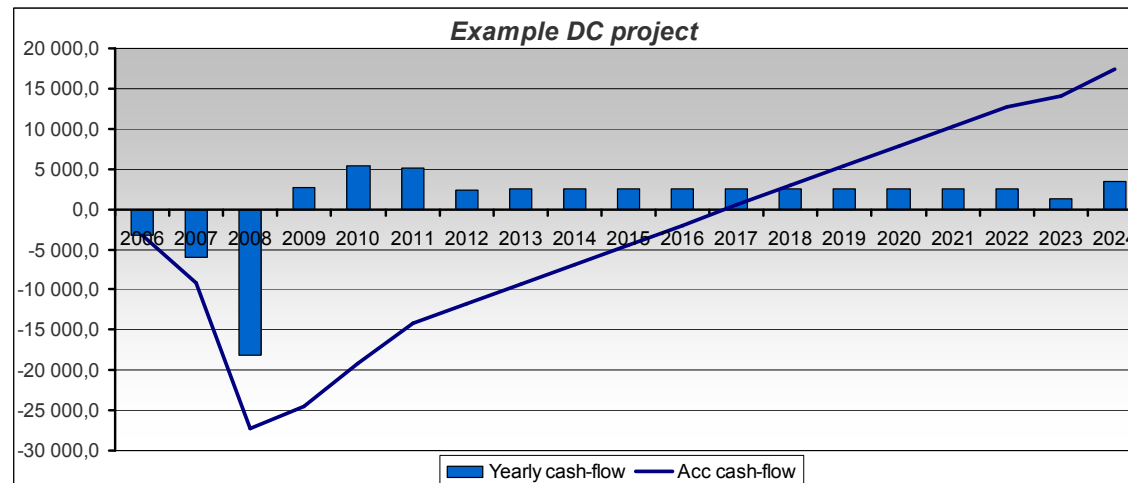
Considerations....

Heat Pumps

- Reliable heat source
- Energy prices
oil, gas, Electricity

District Energy

- Sustainable energy sources
- Customer density
- Investment costs
Green field or Existing area



Additional information

Refrigeration and Heat Pumps

- AREA – European RACHP contractors association – www.area-eur.be
- EHPA – European Heat Pump Association – www.ehpa.org
- EPEE – European Partnership for Energy and the Environment - www.epeeglobal.org

District Energy

- Euro Heat & Power – www.euroheat.org



SVENSKA
KYL&VÄRMEPUMP
FÖRENINGEN

References to HS 2012

- 73.06, 73.07, 73.11
- 84.02, 84.03, 84.13, 84.18, 8419.50
- 9028.20, 9028.30

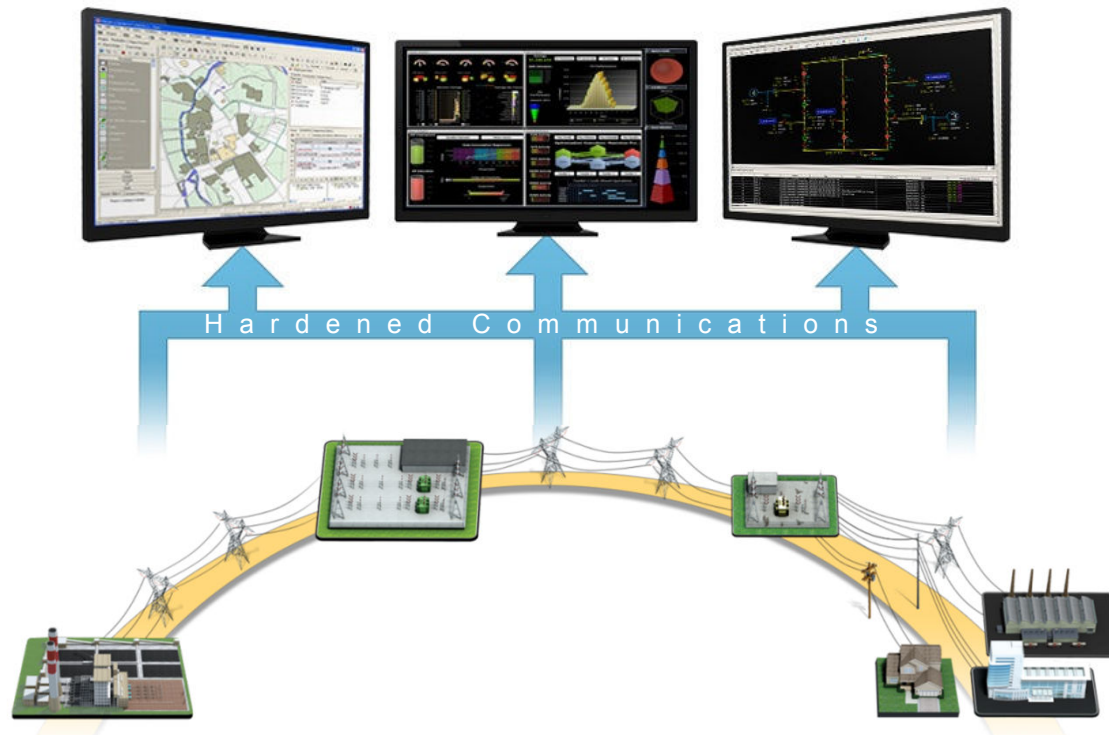


Smart Meter Environmental Benefits

January 29, 2015

Imagination at work

What is Smart Grid



**Visualization,
analytics and control**

+

**Secure
communications**

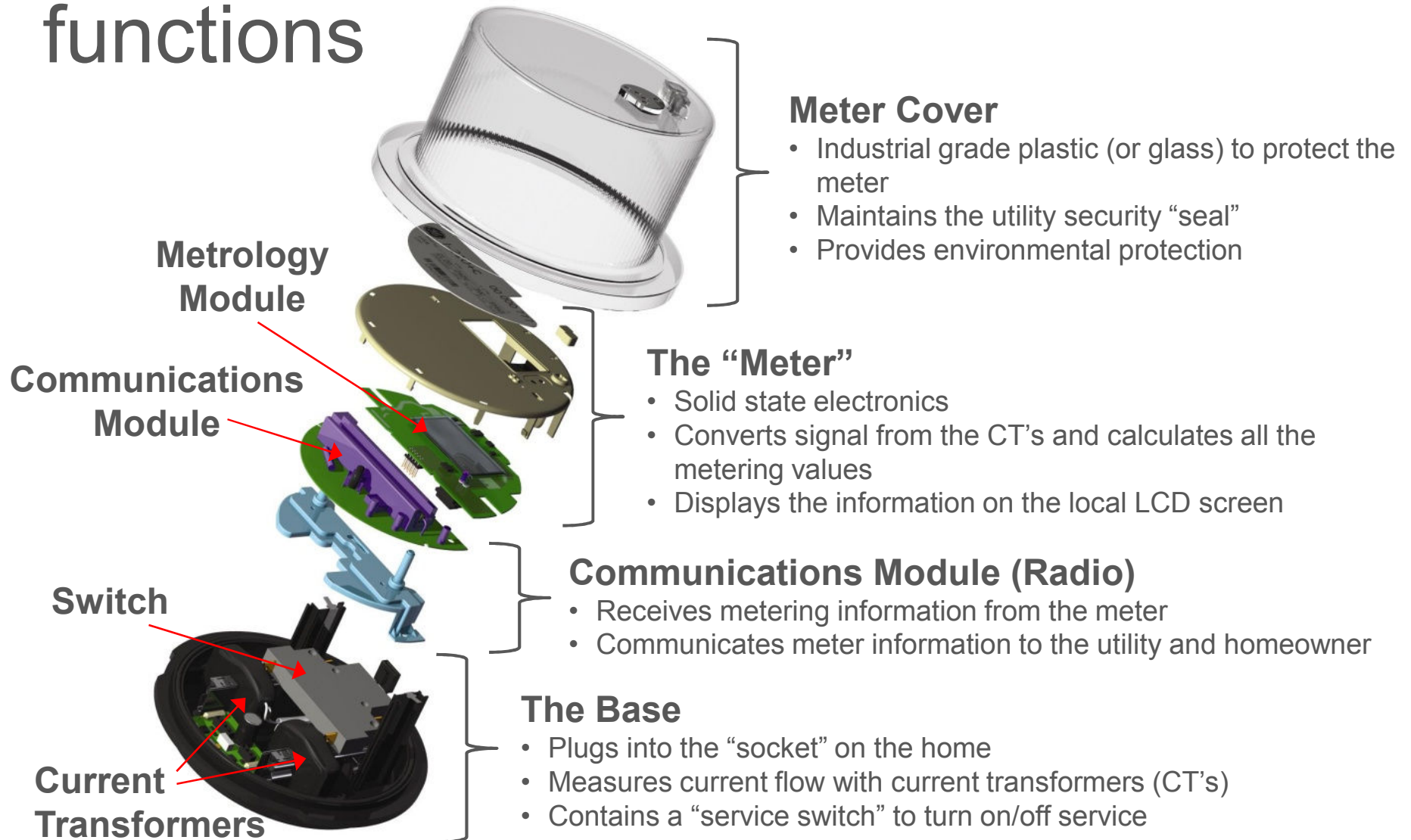
+

**Intelligent
devices**

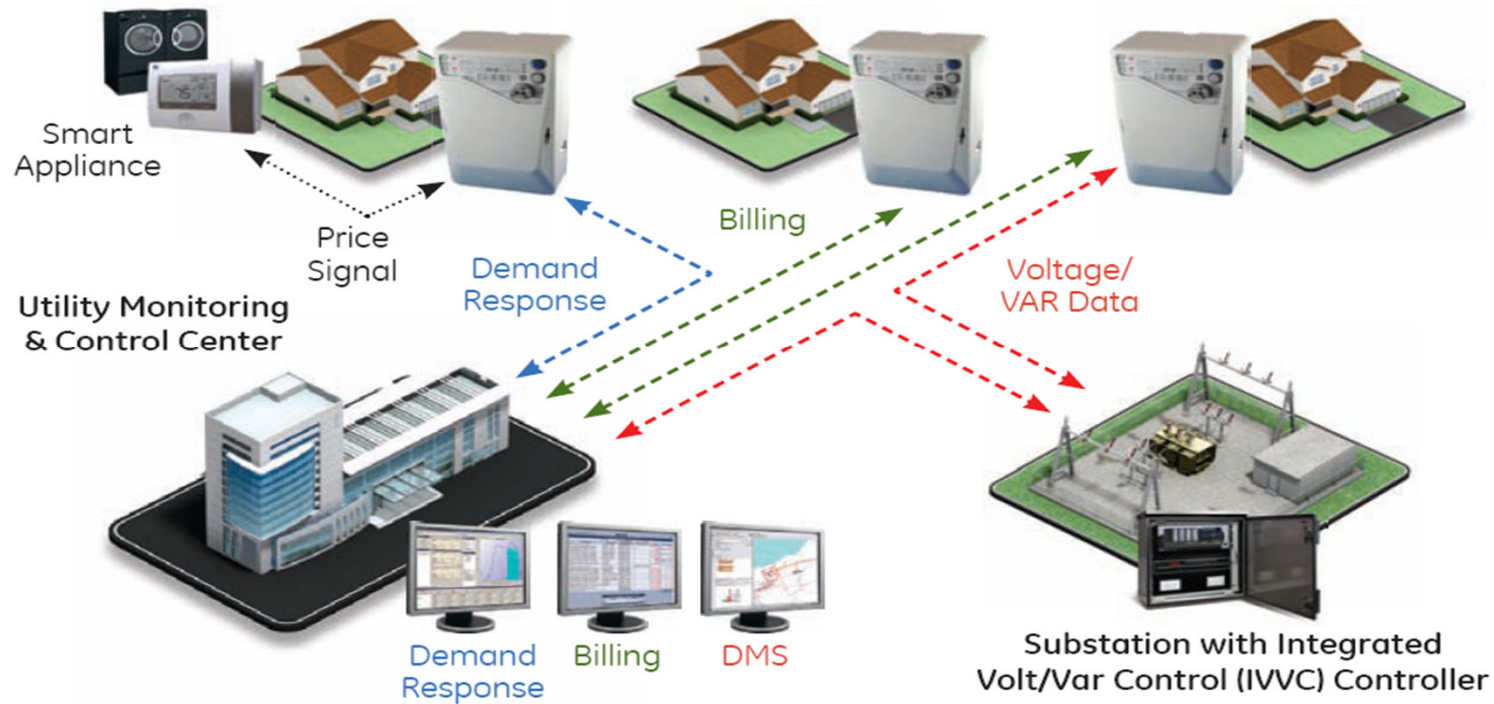
- ✓ Higher reliability
- ✓ Increased efficiency
- ✓ Greater flexibility and control
- ✓ Improved asset utilization



Smart meter: components & functions



Smart meter-enabled applications



- Consumer empowerment (through usage data and price signals)
- Outage notification and response (with utility Outage Management System)
- Coordinated load control, load shedding and load deferral (with utility Demand Response Management System)
- Centralized and decentralized Volt/VAR applications (with utility Distribution Management System)



Remote communications



Annual Benefits*

Operational

Enable automated meter reading, faster identification of outages and power restoration, and real-time load research, resulting in USD1.8M of savings annually

Environmental

Optimize fleet efficiency by eliminating truck rolls, hence reducing fleet fuel consumption by approximately 7,000 gallons and CO2 emissions by 45 metric tons annually.

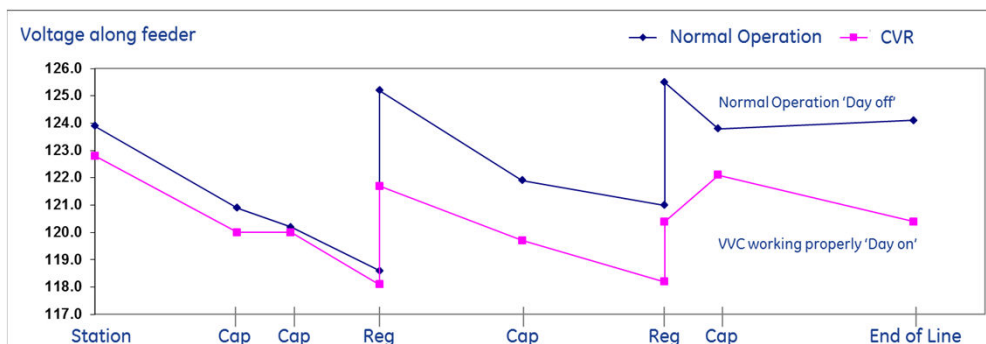
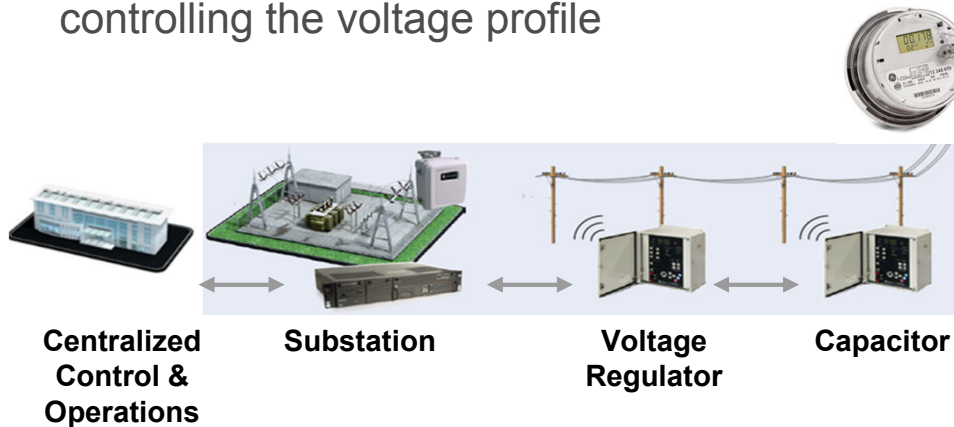
* Typical electric utility that serves a million customers would save USD1.50 per meter per month compared to electromechanical



Volt-VAR optimization

Technology

Advanced software application enabling utilities to increase their efficiency by reducing losses along the feeder and controlling the voltage profile



Annual Benefits*

Operational

- Reduce voltage by as much as 2%
- Reduce peak load by as much as 6 MWh per substation/yr
- Reduce generation and maintenance costs by over \$20 million annually

Environmental

- Reduce CO2 emission by 200,000 Metric Tons equivalent to taking 39,000 cars off the roads.
- Reduce electricity consumption equivalent to the consumption of 29,500 US homes per

* Typical electric utility that serves 500,000 customers with 160 distribution substations

Demand Response

Technology

Changes in electric usage by demand-side resources from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized



Annual Benefits*

Operational

- Studies show that DR can reduce peak load by 5% to 15%. Assuming a USD70 per kW-yr peak generation capacity value and an average peak load reduction of 5%, GE modeling projects that DR could save a utility approximately \$38 million per year.

Environmental

- Assuming the average U.S. grid emission rate and an average peak load reduction of 5%, GE modeling projects that DR could avoid the emission of over 18,500 metric tons of CO₂ per year. This is equivalent to the annual CO₂ emissions of approximately 3,600 cars on U.S. roads.

*Assumes help a utility with 1M consumers and 25% consumer participation in dynamic pricing programs





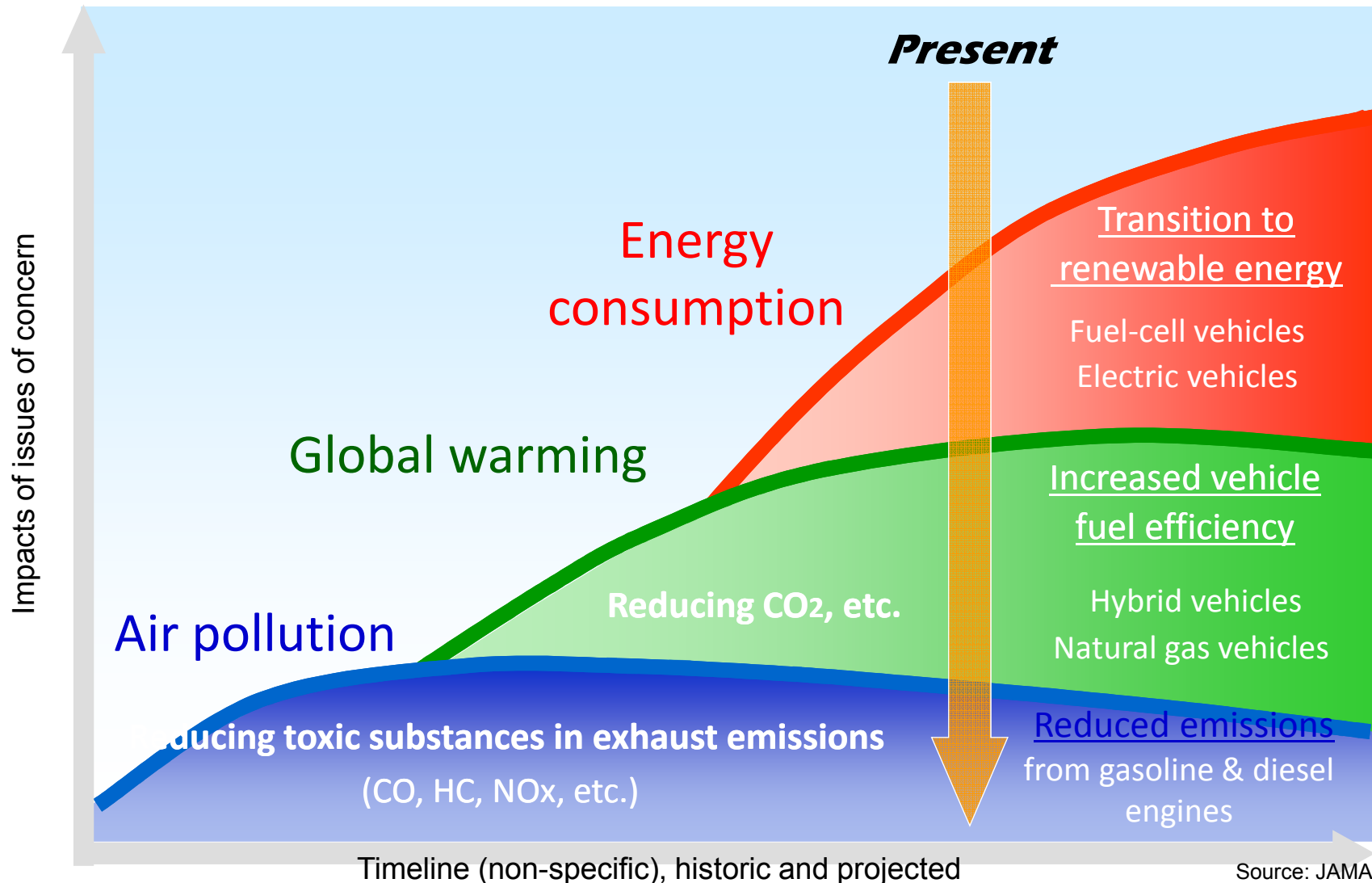
Next-Generation Vehicles

Yoshihiro YANO
Vice President for International Affairs
Japan Automobile Manufacturers Association, Inc.

Joint Energy Charter / US National Electric Manufacturers Association
Workshop on Energy Efficiency (EE) Goods
Geneva, January 29, 2015

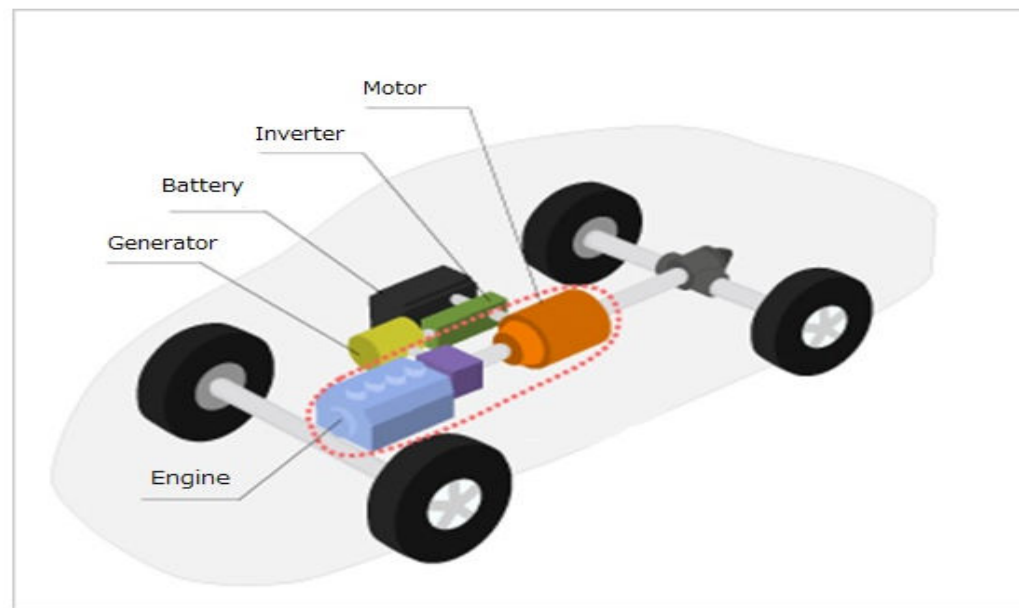
1. Global Warming and the Depletion of Oil Resources

- Governments and industries in all countries must work on a cooperative basis to tackle global warming and the depletion of oil resources.



2-1. Hybrid Vehicles (HS8702, 8703, 8704, 8705, 8711 Ex-out)

Through their use of both a conventional engine and an electric motor, hybrid vehicles (HEVs) can keep the engine efficient as well as store energy in the battery during deceleration. HEVs have a significant impact on energy saving and CO₂ emissions reduction.

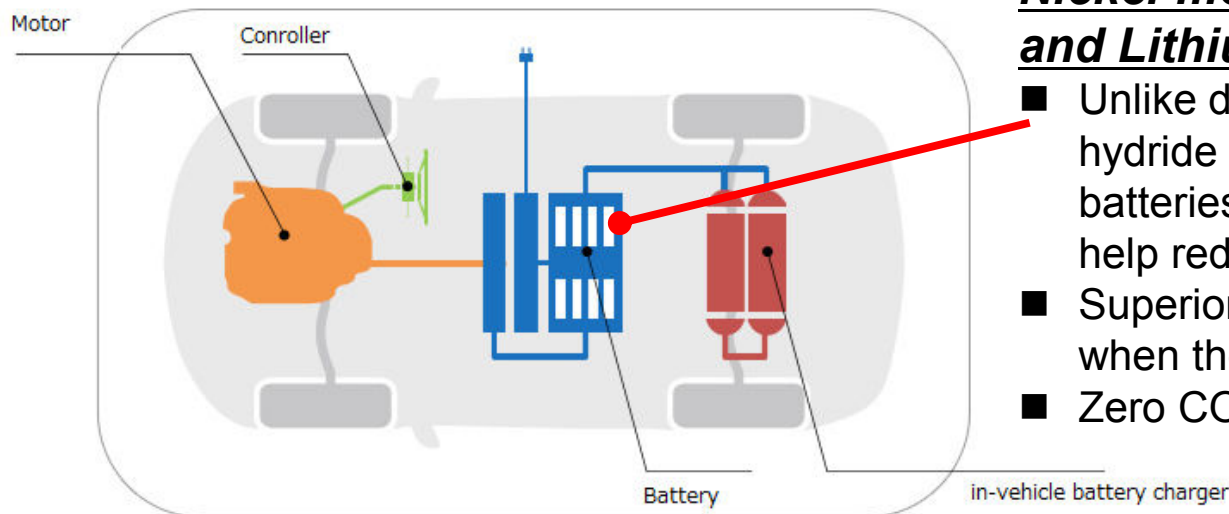


◇ Outlook

- Number of hybrids in use is expected to continue to rise. While commercial vehicles will increase, passenger vehicles will remain the prevailing vehicle type in use.
- By the amendment of HS codes (Harmonized Commodity Description and Coding System), HS code for HEVs will be established in 2017.

2-2. Electric Vehicles (HS8702, 8703, 8704, 8705, 8711 Ex-out)

Electric vehicles (EVs) are powered by an electric motor. EVs have a significant impact on energy saving and CO2 emissions reduction, because they have no tailpipe emissions.



Electric accumulators **Nickel-metal hydride (HS850750)** **and Lithium-ion (HS850760):**

- Unlike dry cell batteries, nickel-metal hydride batteries and lithium-ion batteries can be recharged, and thus help reduce waste.
- Superior fuel efficiency is achieved when they are used in automobiles.
- Zero CO2 emissions.

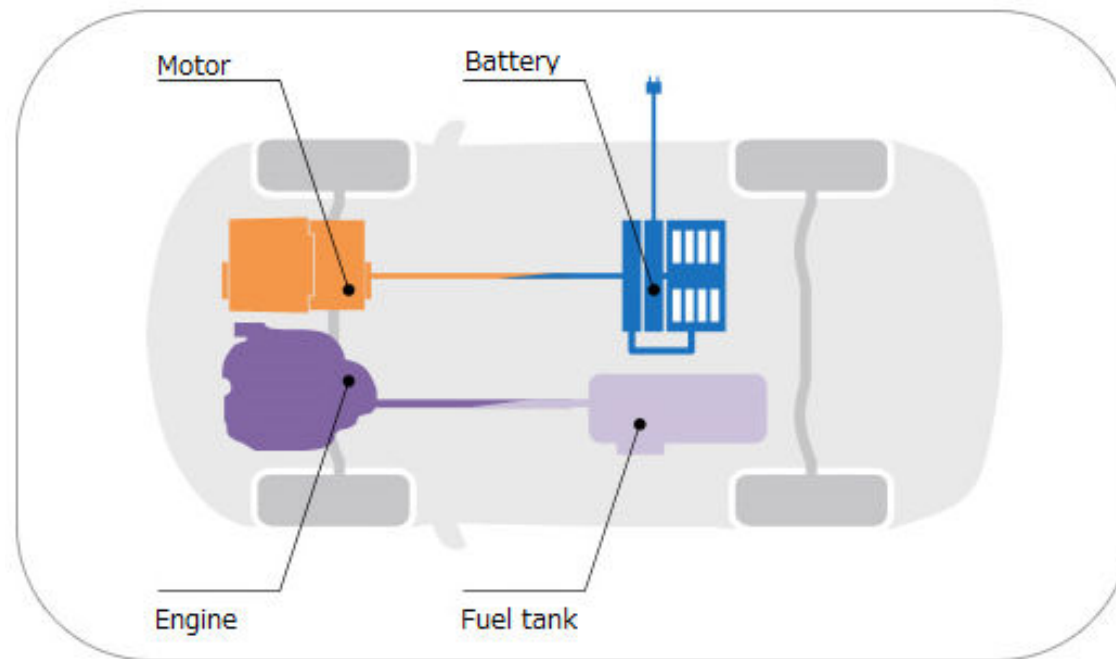
◇ **Outlook**

- The introduction of lithium-based batteries has helped reduce the number of problems.
- By the amendment of HS codes, HS code for EVs will be established in 2017.



2-3. Plug-In Hybrid Vehicles (HS8702, 8703, 8704, 8705, 8711 Ex-out)

Plug-in hybrid vehicles (PHEVs) operate on batteries that can be recharged by hooking up to the electrical power grid. PHEVs offer the combined merits of electric vehicles (zero CO2 emissions) and hybrid vehicles (enabling long-distance driving when the internal combustion engine takes over from the electric motor).



◇ Outlook

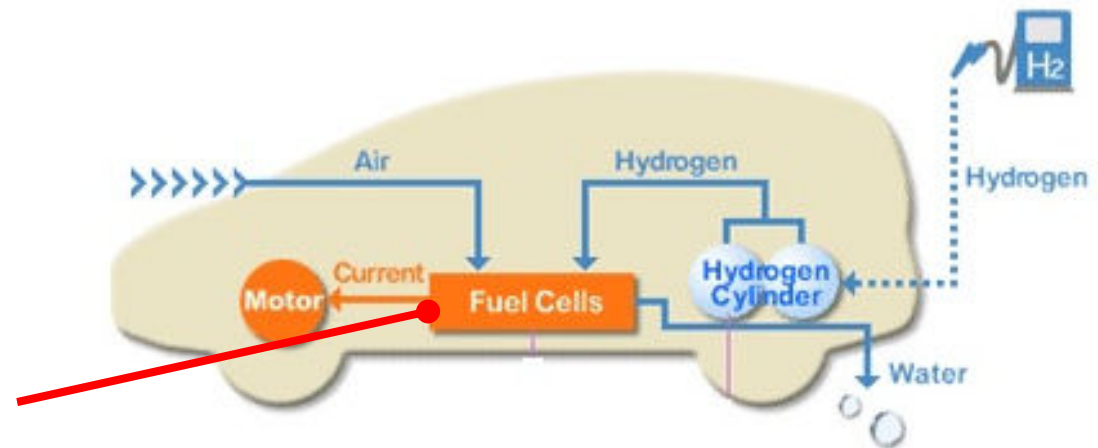
- By the amendment of HS codes, HS code for PHEVs will be established in 2017.

2-4. Fuel Cell Vehicles (HS8702, 8703, 8704, 8705, 8711 Ex-out)

Fuel-cell vehicles (FCVs) incorporate fuel cells which create electricity by means of a chemical reaction that uses hydrogen gas and oxygen. This electricity powers an electric motor in the vehicle.

Fuel cell (HS850680 Ex-Out):

- Fuel cells create electricity through a chemical process that uses only hydrogen gas and oxygen from the air.
- A major merit of fuel cells is their energy efficiency. The cells generate electricity without burning hydrogen gas, making them twice more efficient (currently) than gasoline engines.



2-5. Others (HS8702, 8703, 8704, 8705, 8711 Ex-out)

Natural Gas Vehicle

Since natural gas is a clean energy which does not contain pollutants such as sulfur, natural gas vehicles (NGVs) release fewer NOx emissions and no soot, resulting therefore in reduced particulate matter (PM) emissions. NGVs also release fewer CO2 emissions.

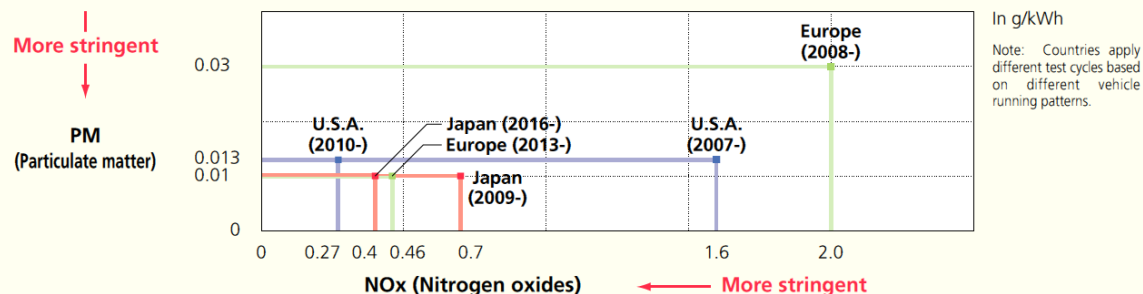
Hydrogen-fuelled Vehicle

Hydrogen-fuelled vehicles are powered by hydrogen that is subjected to combustion. The hydrogen combustion process generates only water and some nitrogen oxides (NOx); no CO2, carbon monoxide, hydrocarbons or sulfur compounds are released.

Clean diesel Vehicle

Clean diesel vehicles comply with stringent emissions control standards such as “Post-new long-term regulations in Japan (2009-)” and “EURO VI (2013-)”, and release fewer CO2, NOx and PM emissions than conventionally-powered vehicles. They also have superior fuel efficiency.

● COMPARISON OF HEAVY-DUTY DIESEL TRUCK EMISSIONS REGULATIONS (PM and NOx)

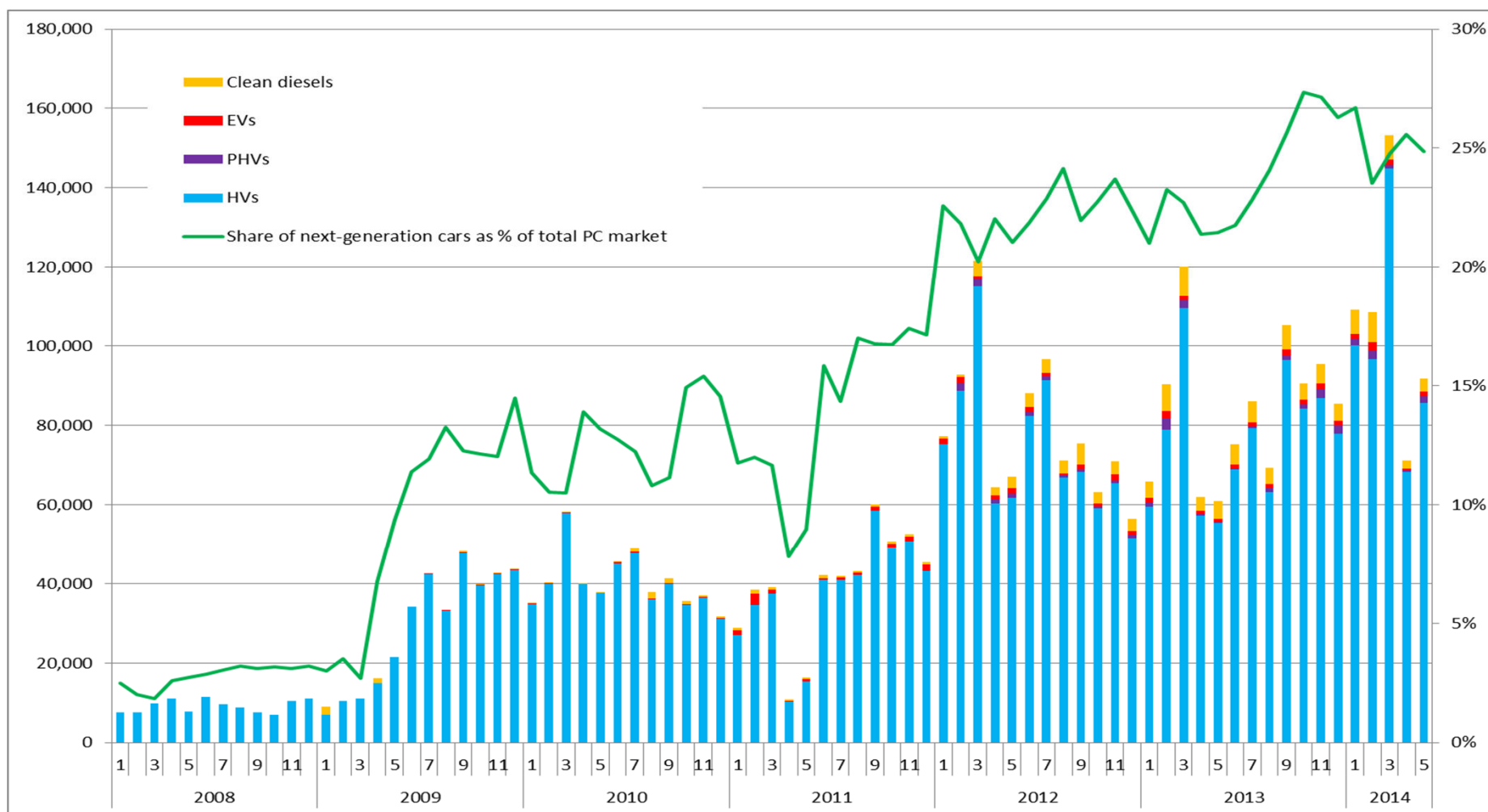




3. Sales of Next-generation Passenger Cars in Japan

- Sales of next-generation passenger cars have expanded to a more than 20% share of Japan's new passenger car market.

In units

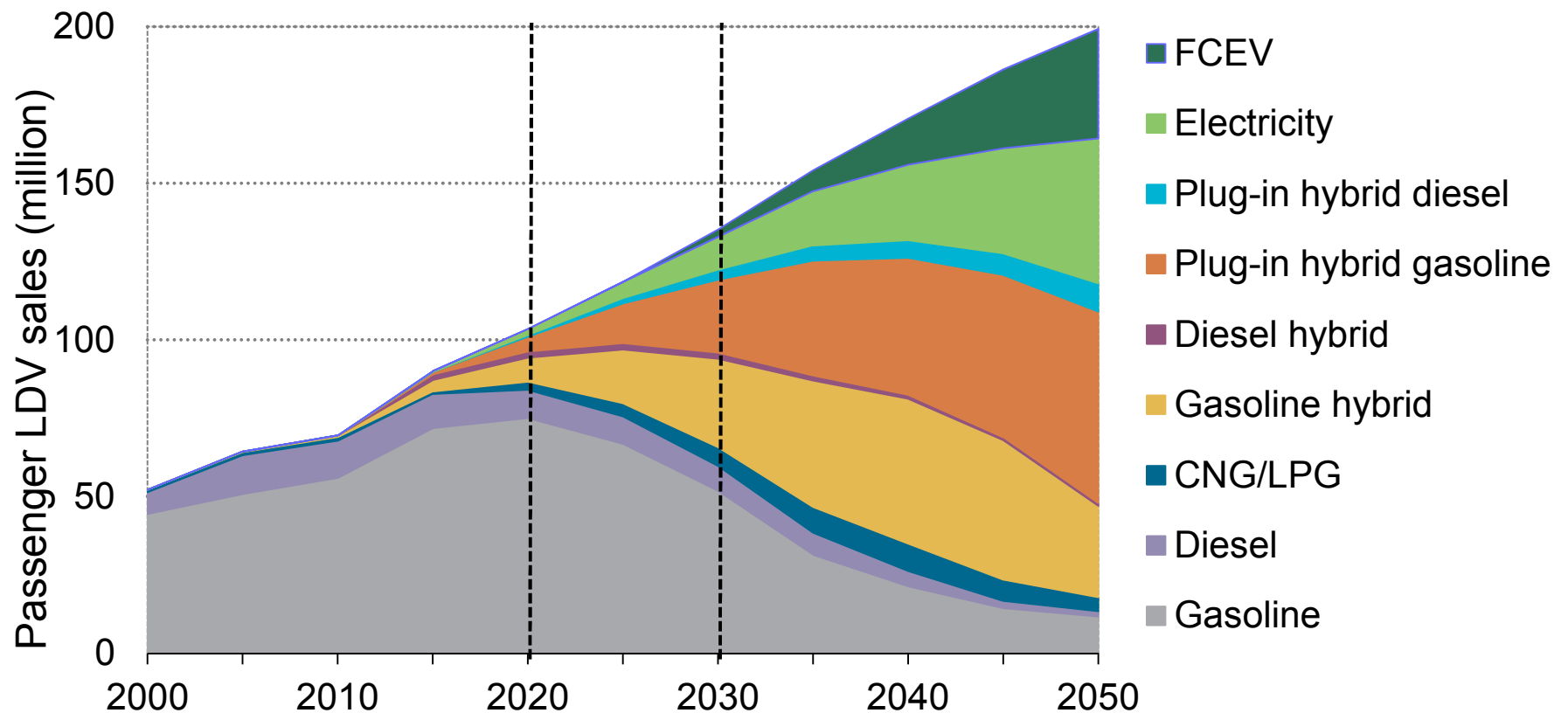


Source: JAMA



4. IEA “Energy Technology Perspectives 2012”

- IEA estimates that Next-Generation Vehicles will spread in the future.



HS2012 Codes

Motor-Driven Systems

8501	“Super-premium efficiency” (IE4) electric motors
8504.40	Variable frequency drives for electric motor-driven systems
8504.90	Parts of variable frequency drives

Process Controls

8481.80	Valve and combustion management systems
9032.10	Programmable thermostats
9032.89	Building process control systems

Heat Pumps and District Heating and Cooling

73.06, 73.07, 73.11	Tubes/pipes of iron/steel; Iron/steel containers for compressed gas
84.02, 84.03, 84.13, 84.18, 8419.50	Boilers; Pumps for liquids; Heat pumps; Heat exchange units
9028.20, 9028.30	Liquid meters; electricity meters

HS2012 Codes

Smart Grid

8536.30	Electric vehicle charging stations/equipment
9028.30	Smart electricity meters
9028.90	Parts and accessories of smart electricity meters

Next-Generation Vehicles

8702	Motor vehicles for transport of 10 or more persons
8703	Motor cars and other motor vehicles principally designed for the transport of persons
8704	Motor vehicles for the transport of goods
8705	Special purpose motor vehicles
8711	Motorcycles (including mopeds) and cycles fitted with an auxiliary motor

Thanks and Contact Info

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Questions, Please!