

The 6th International Maritime Transport and logistics Conference

GLOBAL INTEGRATION IN PORTS

FUTURE OPPORTUNITIES



19-21 March 2017 Alexandria - Egypt



Energy Efficient and Renewable energy in Marine Application

Dr. Mostafa Abdelgeliel



Agenda

- 1- Introduction
- 2- Energy Problems and regulations
- 3- Energy Management and solutions
- 4- Examples
- 5- Renewable energy and its applications



Energy research unit Mission

- ربط بحوث الطاقة بخدمة المجتمع وذلك لإيجاد حلول علمية قابلة للتطبيق لحل مشاكل الطاقة مع تقديم الدعم العلمي والفنى داخل وخارج الأكاديمية.
- Link the energy research with the community needs in order to find an implementable solution for energy problems, in addition to deliver the technical support in AAST and community



Objectives

1. Link the researches related to energy with the current needs and future plan of the AAST and community
2. Integrate and support the research through the encouragement of multi- discipline project to deliver an innovative solution
3. Make AAST as a center of excellence in the field of energy



Energy Crisis

Problem:

- Increasing demand
- Decreasing of conventional resources
- Environmental impact

Solution?

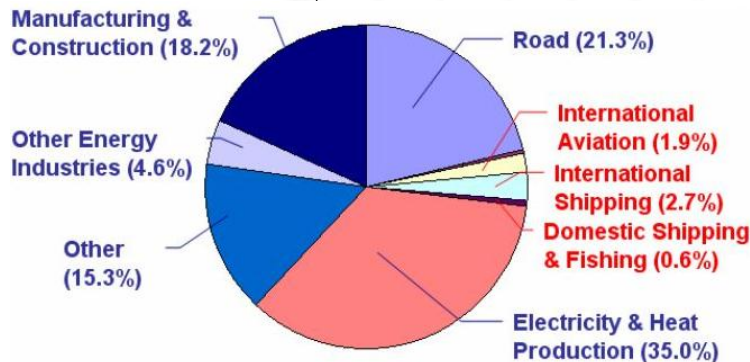
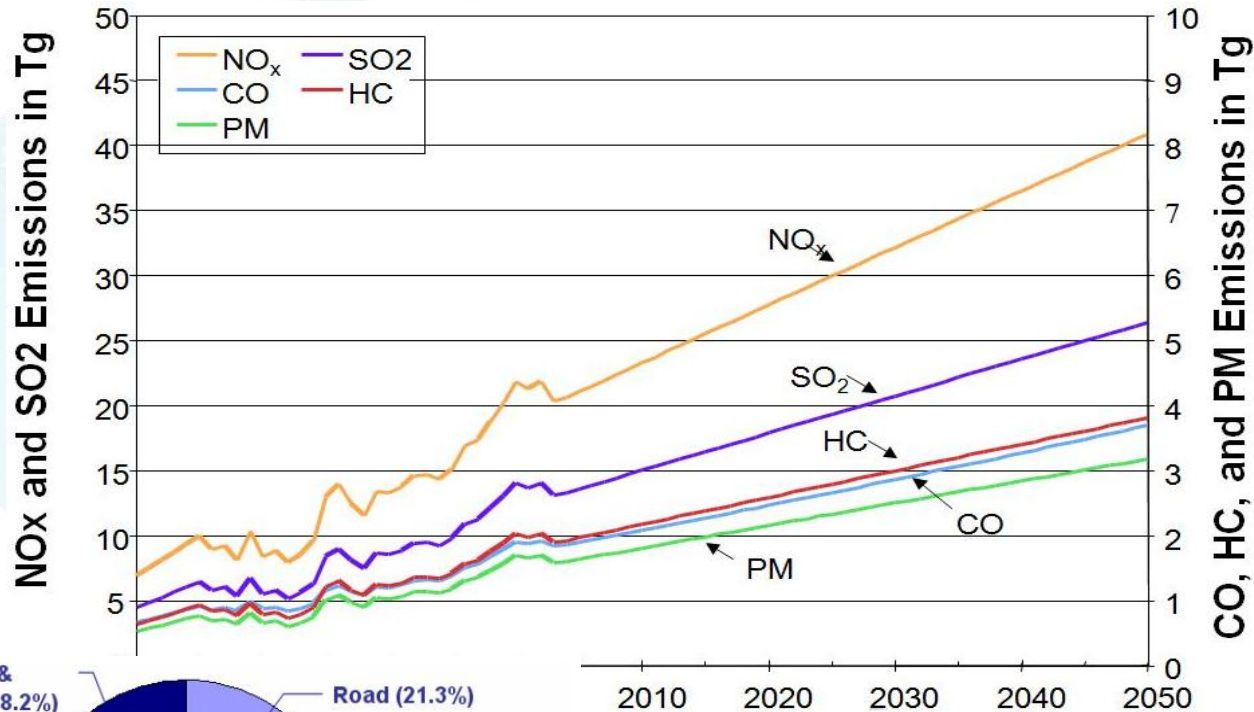
Regulations

Energy Managements

-



World Ships Emission Inventory



GLOBAL CO2 EMISSIONS BY SECTOR

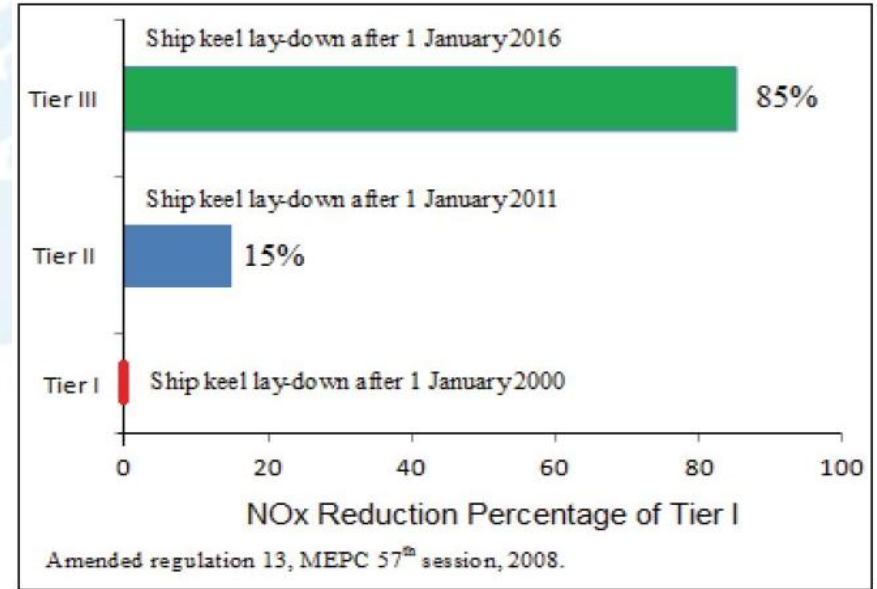
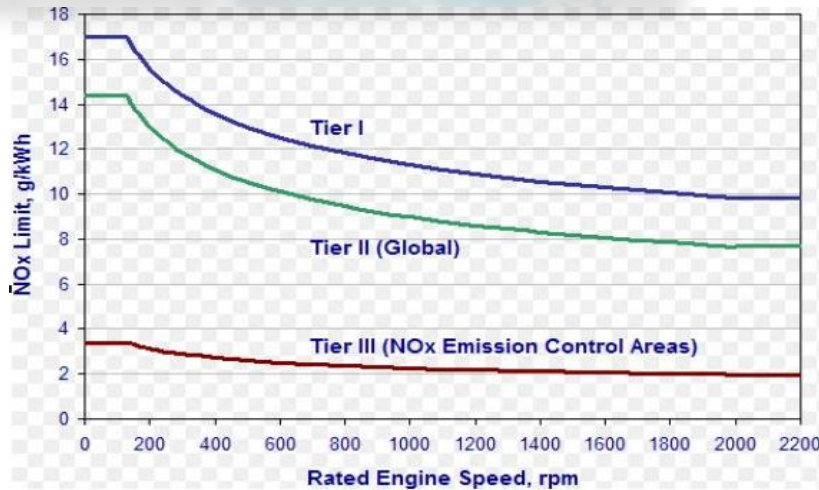
Ship responsible of

- 4-9% of global SO₂ emissions
- 2.7 % of global CO₂ emissions



Emission Regulations Marpol Annex VI

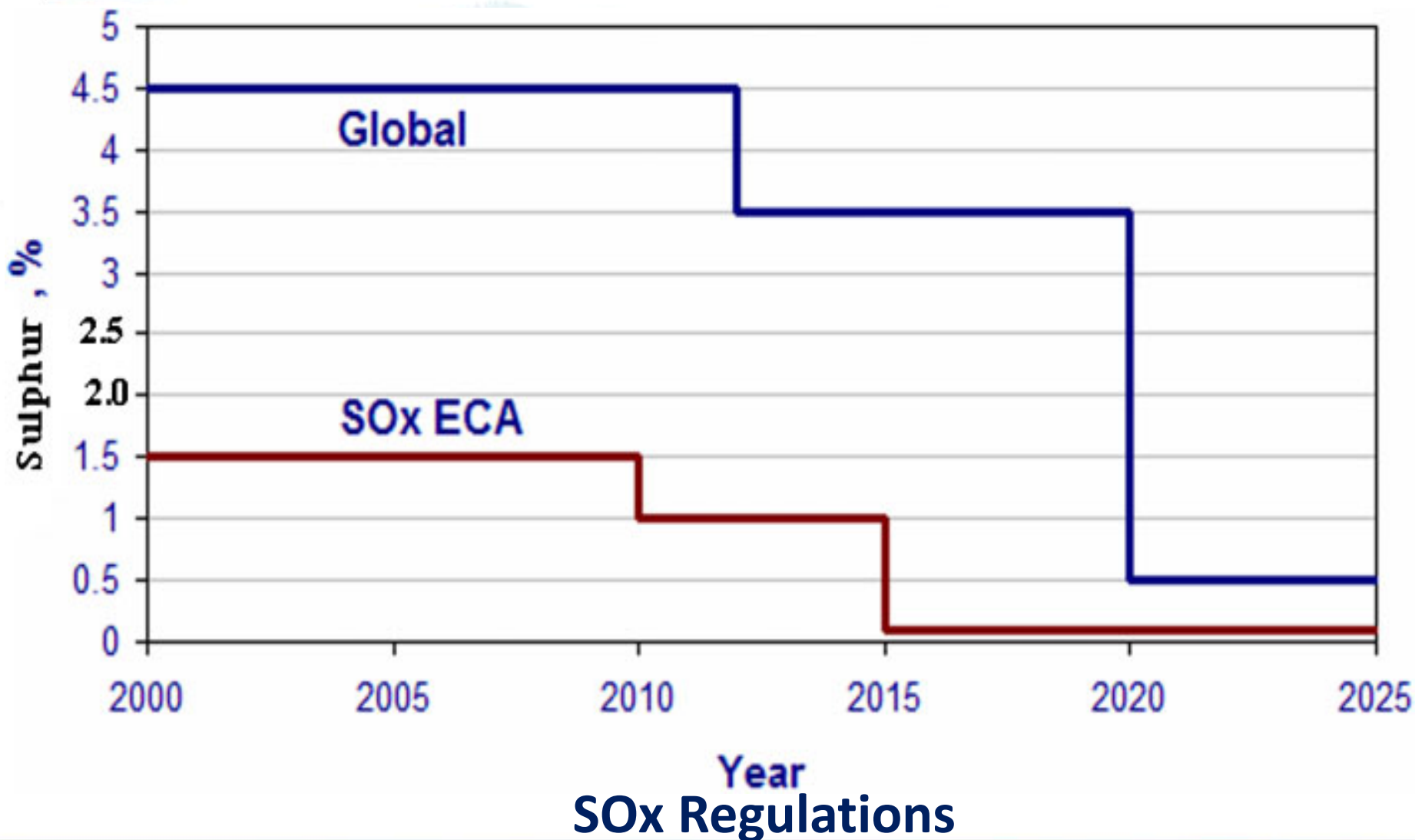
International Maritime Organization



NOx Regulations



Marpol Annex VI





Indoor and outdoor Air Quality standards



EPA

The Environmental Protection Agency (EPA)



DOE

The U.S. Department of Energy (DOE)



WHO

World Health Organization (WHO)



*Occupational Safety and Health
Administration*



*American Society of Heating, Refrigerating and
Air-Conditioning Engineers*



Energy Management

- According to the ISO 50001, the definition of an Energy Management System (EMS) is a
- *"set of interrelated or interacting elements to establish an energy policy and energy objectives, and processes and procedures to achieve those objectives"*



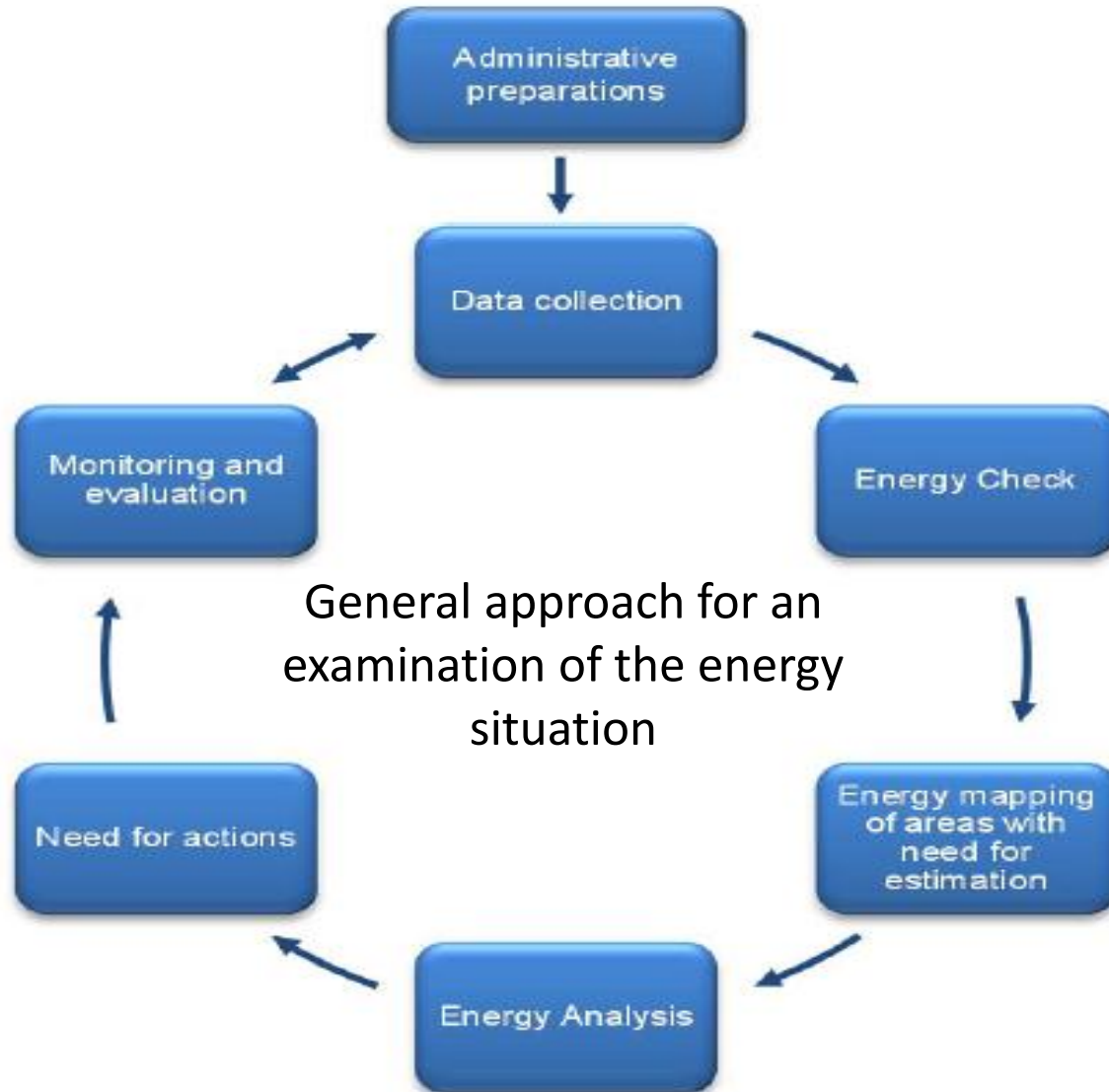
Benefits Energy Management

- Reduces consumption
- Increases comfort & safety
- Reduces pollution
- Save money
- Increases energy security and sustainability



Main Steps for Energy Management

- (1) Identify ALL your opportunities.
- (2) Prioritize your actions rationally.
- (3) Accomplish your activities successfully.
- (4) Maintain your activities.





Solution Methods of Energy problem

- Energy Efficient
- Energy Conservation
- Renewable energy sources
- Applying advanced control strategies and smart technology
- Optimize system operation

The energy management system is the responsible for selecting the most suitable solution.



Energy Efficiency vs. Conservation

Energy Efficiency

- It involves the use of technology which requires less energy to perform the same function.
- Applications:
 - Led Lighting
 - Solar Heater
 - Solar Pump
 - Solar Air Conditions using Absorption Schiller

Energy Conservation

- It includes any behavior that results in the use of less energy.
- Applications:
 - use daylighting through windows rather than turning on the lights
 - using Building Automation System (BAS)

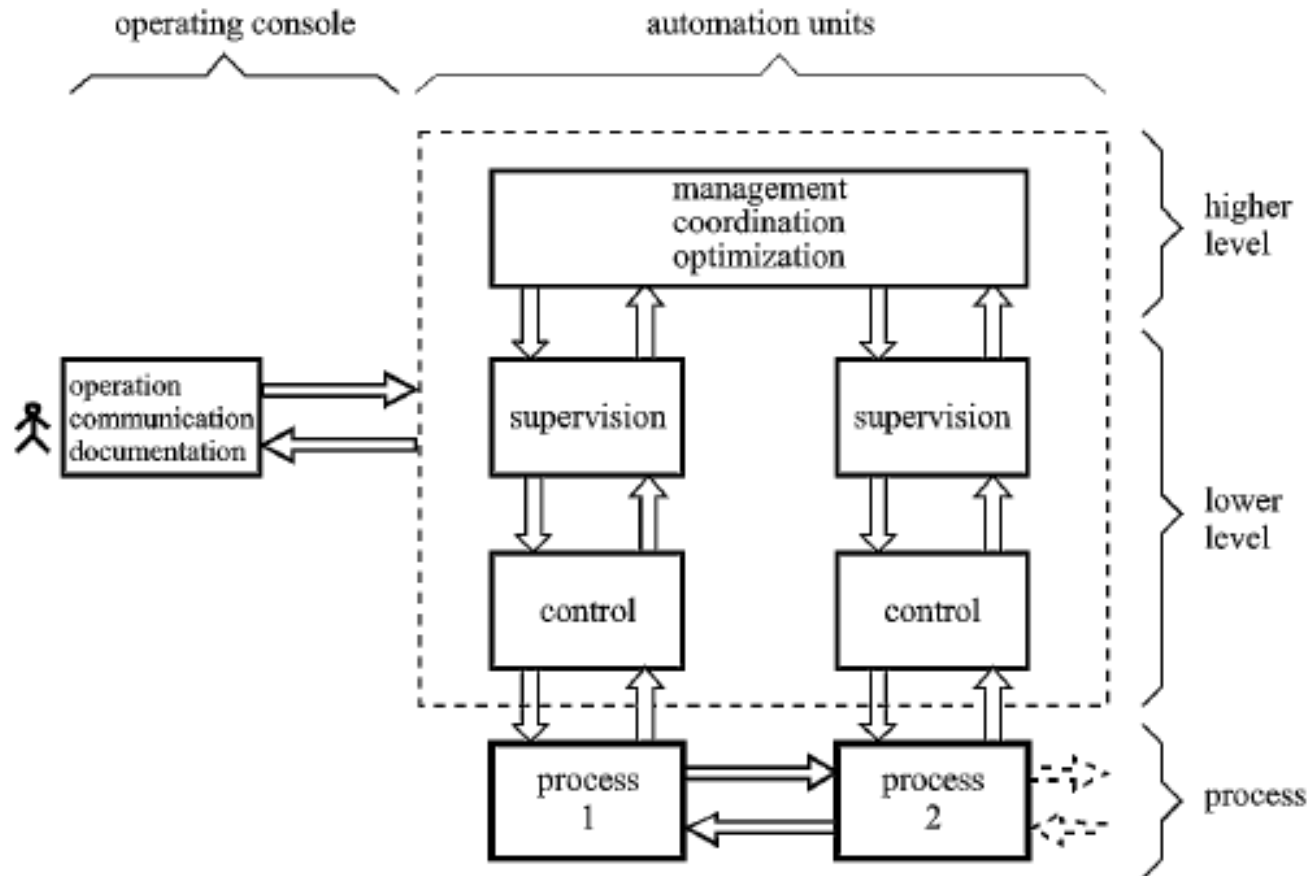


Fig. 1.1. Simplified scheme of process automation

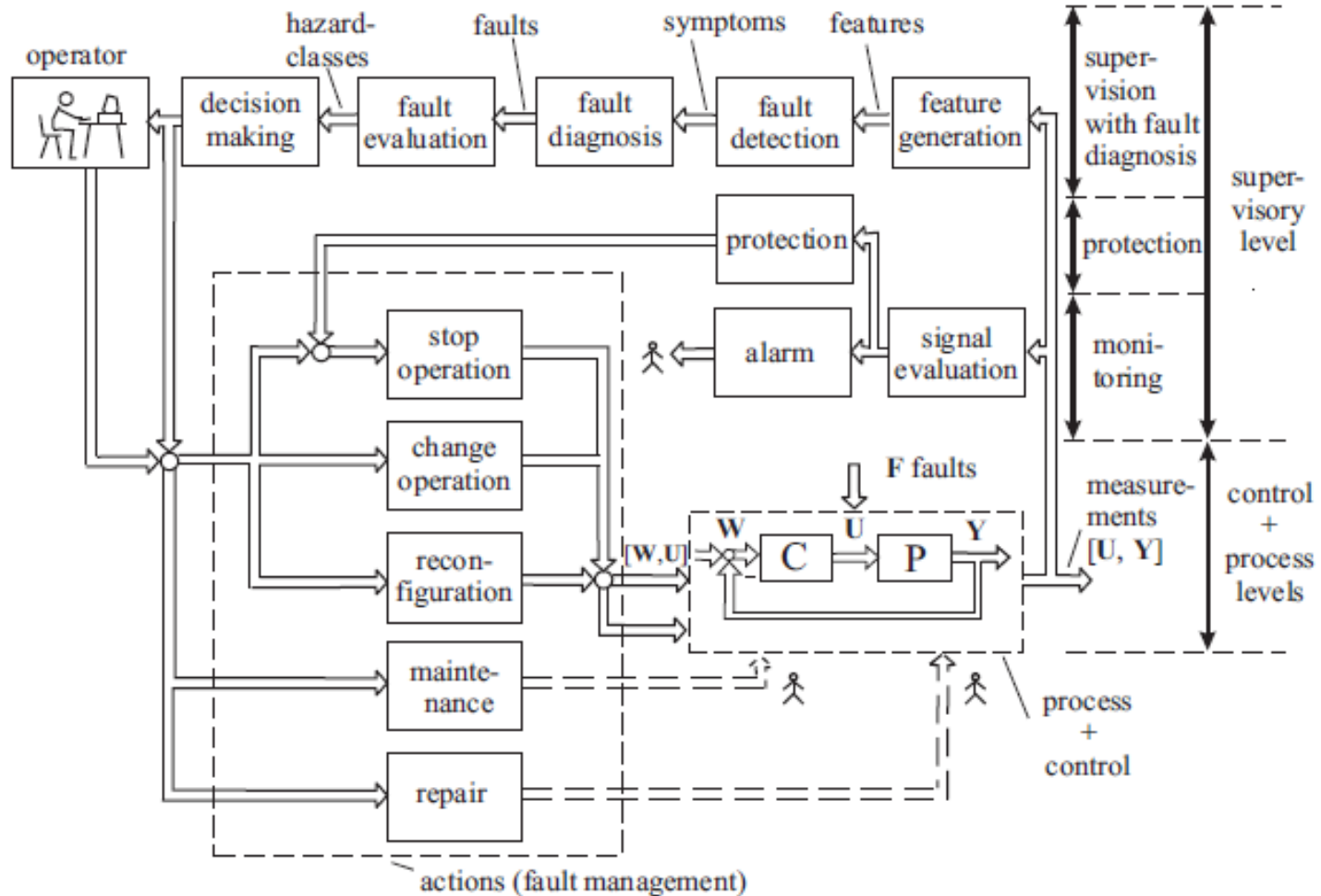
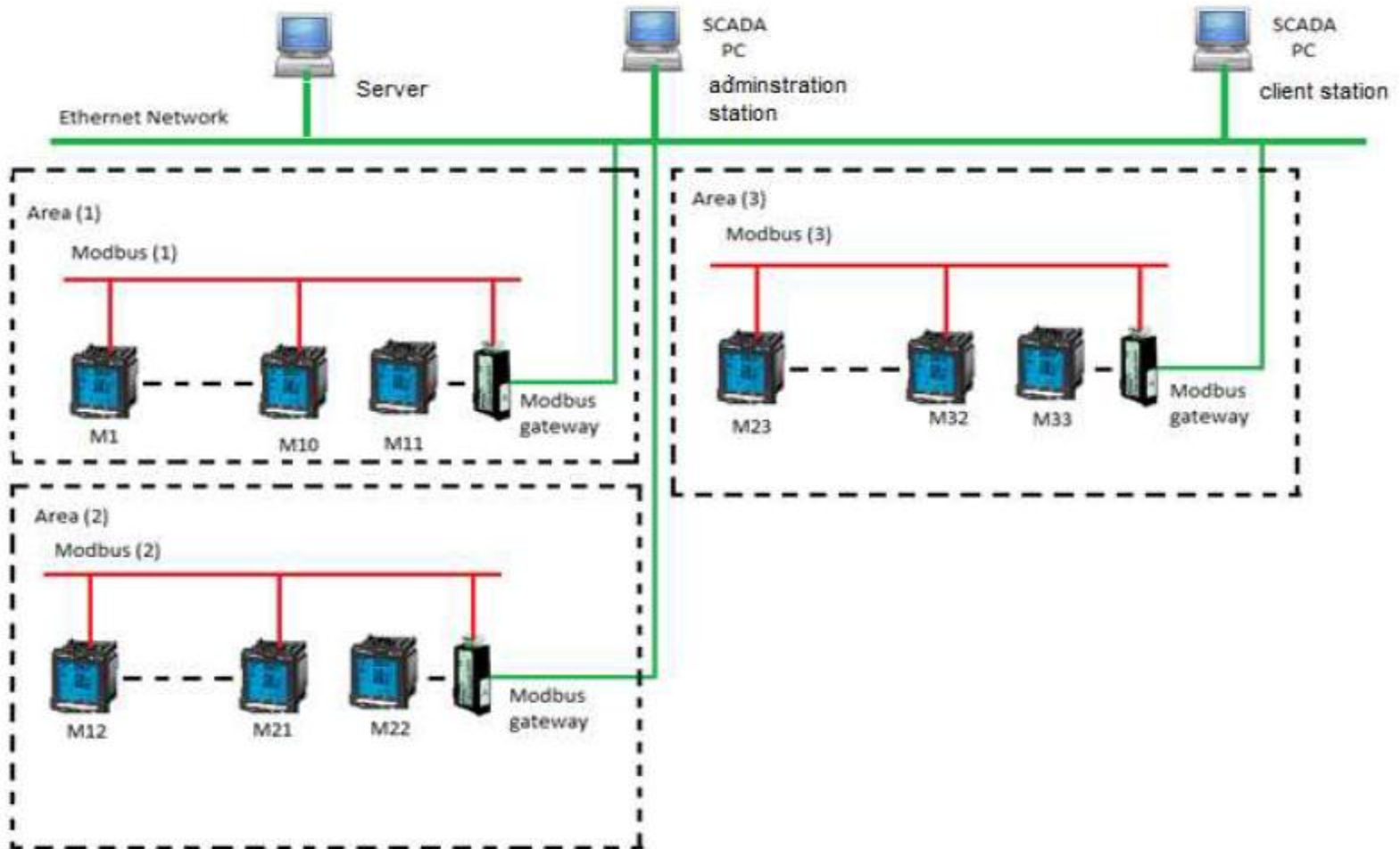


Fig. 2.4. General scheme of advanced supervision methods with fault management (supervisory loop)

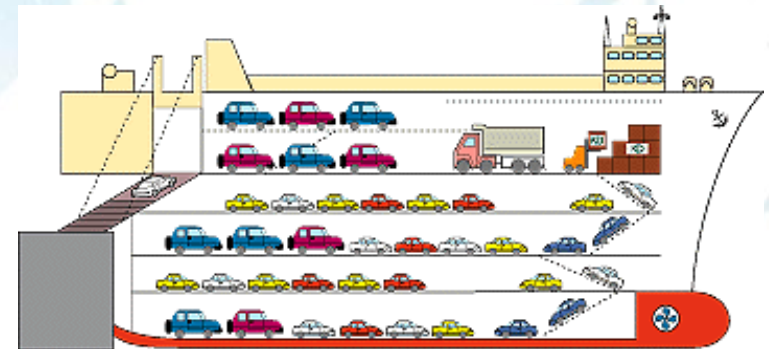


System monitoring and control through smart metering



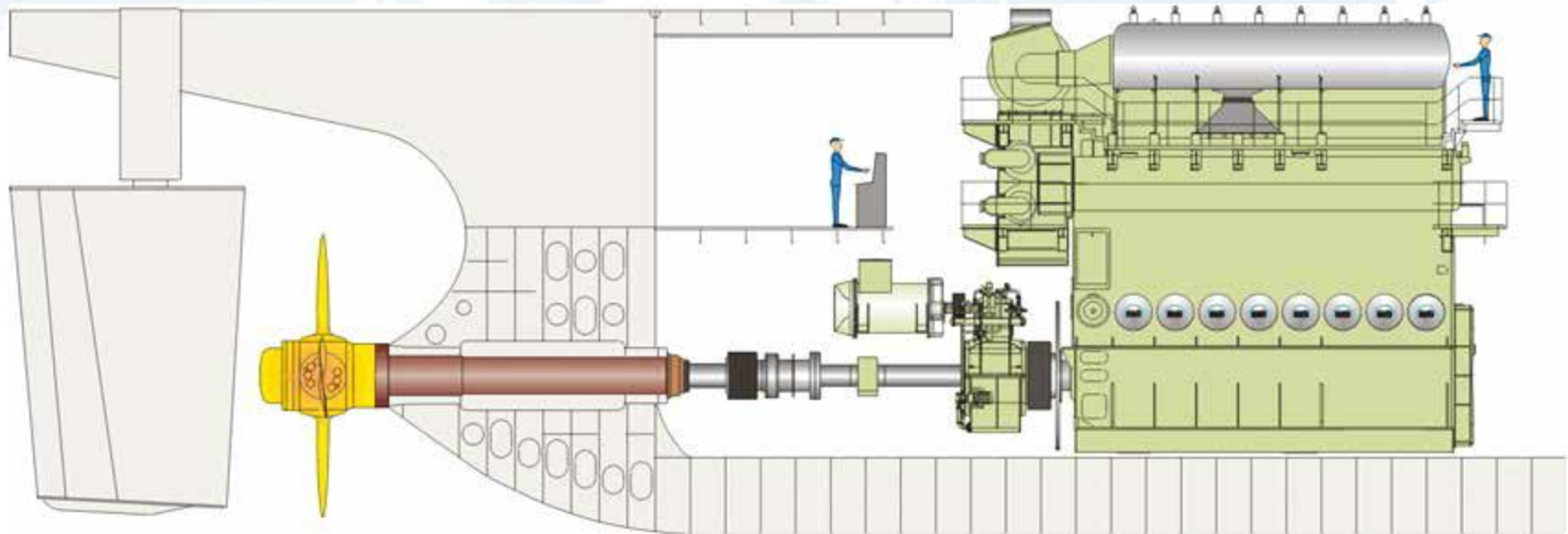


- Example 1.
- Applying a proper control strategy is able to **improve** the **performance** of systems in order to ensure **better energy efficiency** while maintaining **comfortable and health indoor environment** in ship application





Example 2: Shaft generator system in marine



- Using PMSG in marine application, in particular, as a shaft generator became popular due to its advantages over the conventional diesel generator.



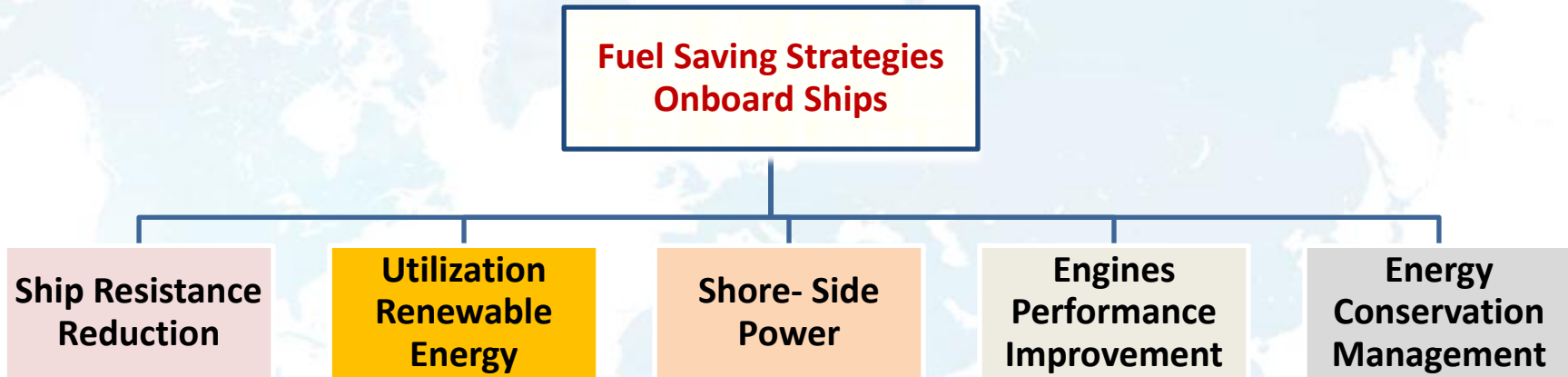
Example 2: Shaft generator system in marine

- Advantages of SGs are:
 - Small space requirement
 - Economical power production by utilizing the ship's main engines
 - Low installation cost
 - Low noise levels comparing with conventional Generators
 - High reliability
- However, SGs do not produce any electric power generation in the harbor.



Example 3: Ship energy and emissions reduction,
using for example:

- Fuel saving strategies and/or
- Alternative fuels.



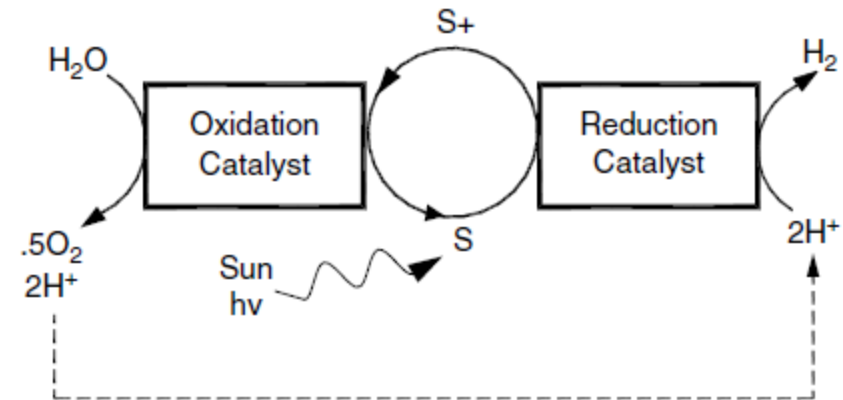
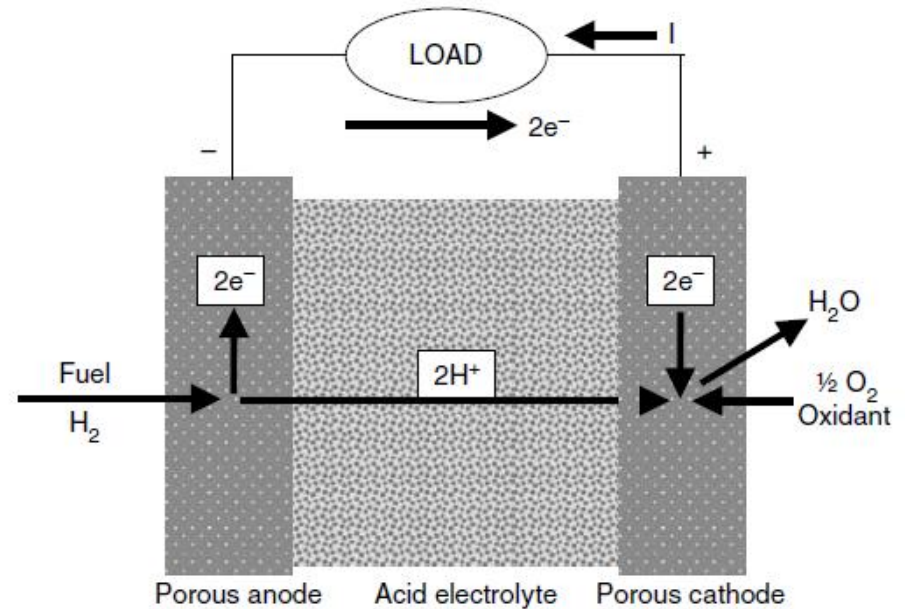


USING OF ALTERNATIVE FUELS

	LNG	Propane	Bio-diesel	Alcohol	F-T diesel	H ₂
Renewability	Fairly good	Fairly good	Good	Very good	good	Excellent
Performance	Excellent	Very good	Very good	Good	Very good	Good
Cost	Excellent	Excellent	good	good	good	Fairly good
Adaptability	Excellent	Very good	Excellent	Good	excellent	Good
Availability	Very good	Very good	Very good	Very good	good	Excellent
Safety	Excellent	Very good	Excellent	Very good	excellent	Fairly good
Environmental Impact	Excellent	Very good	good	good	Very good	Excellent

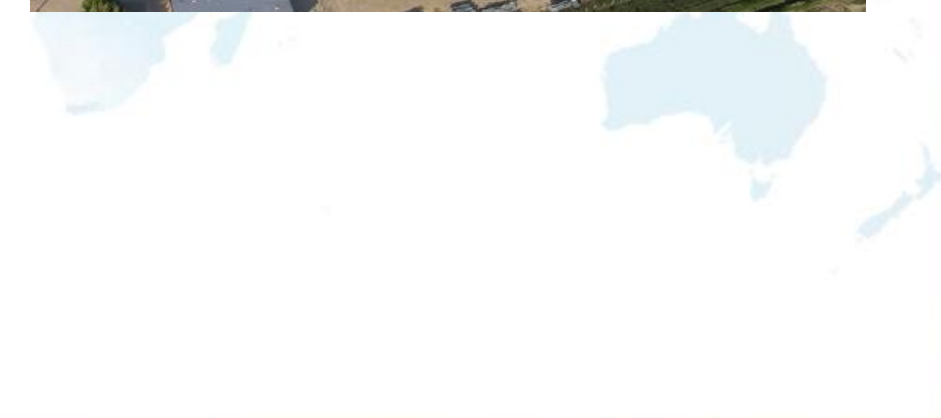
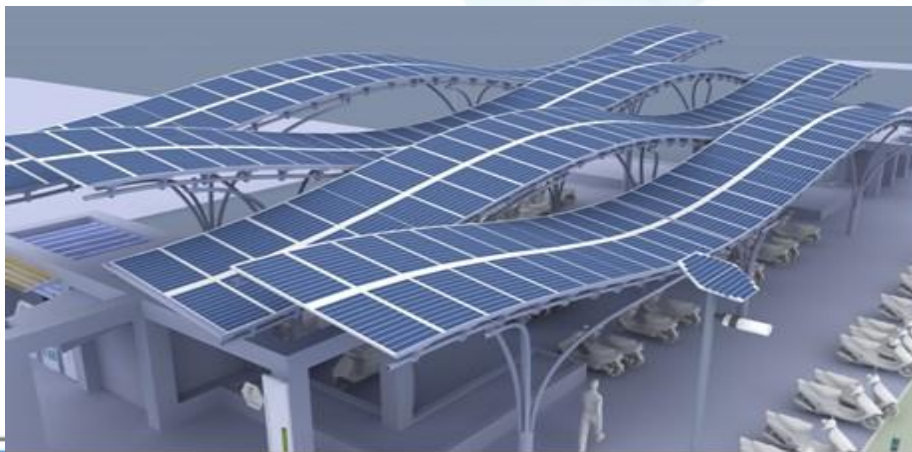


Example 4: On-board HHO
 injection in diesel engine : Save
 fuel and reduce exhaust emissions





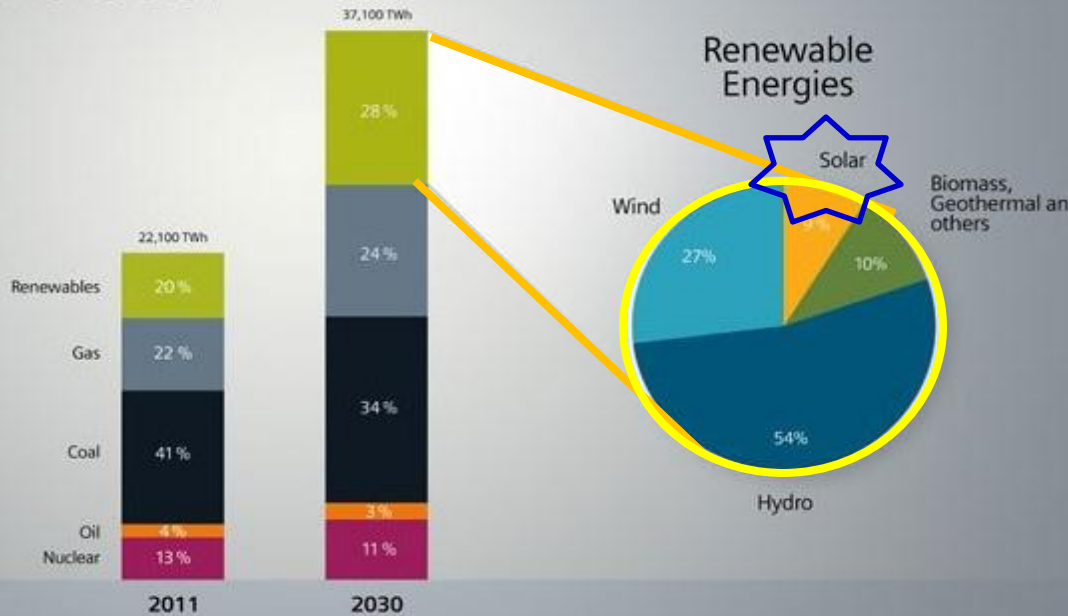
What will be the future of energy ?



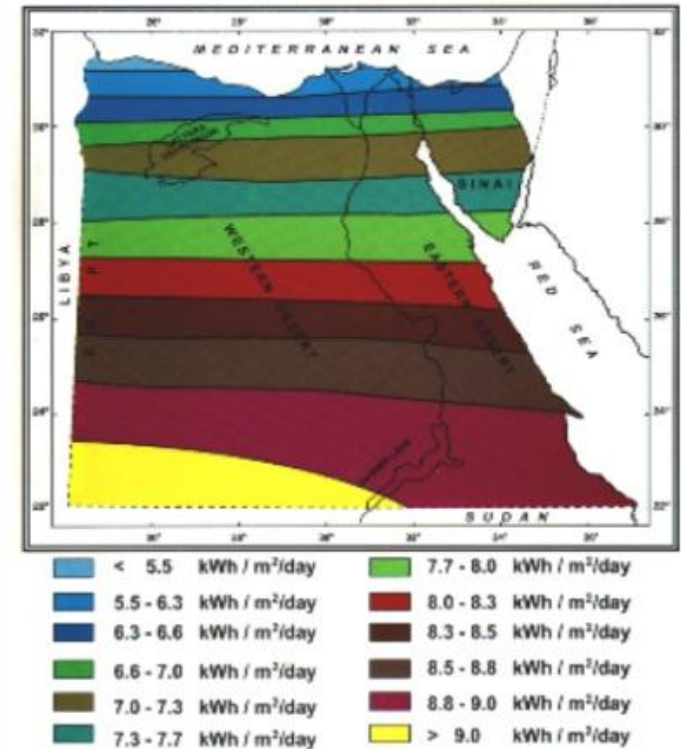


Renewable Energy growing

World Electricity Generation



Egypt Annual Average Of
 Direct Solar Radiation

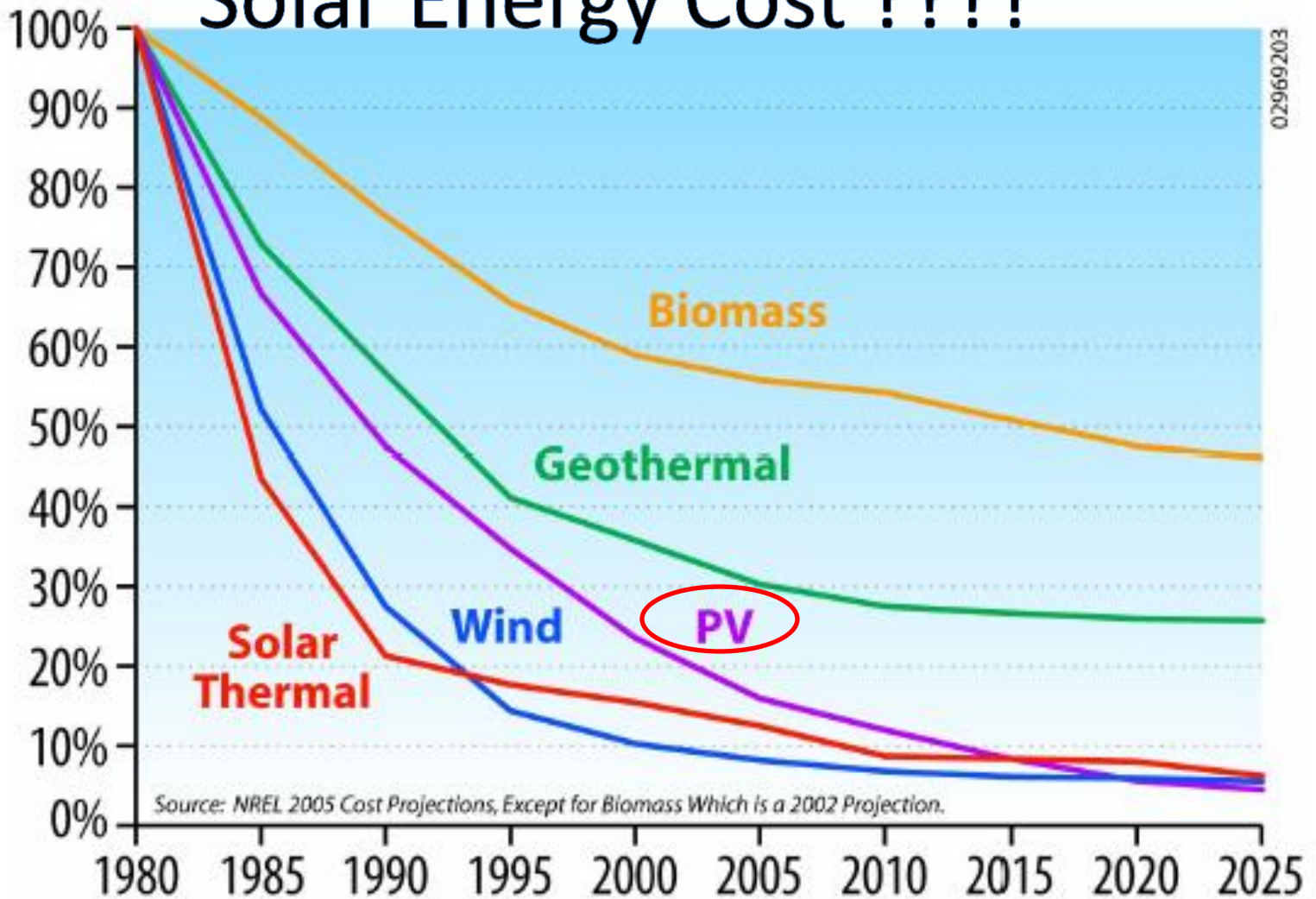


Map (40) The annual average of the direct solar radiation (normal incidence) over Egypt in kWh/m²/day.



Solar Energy Cost ????

Renewable Energy Electricity Generation Costs as
Percentage of 1980 Levels



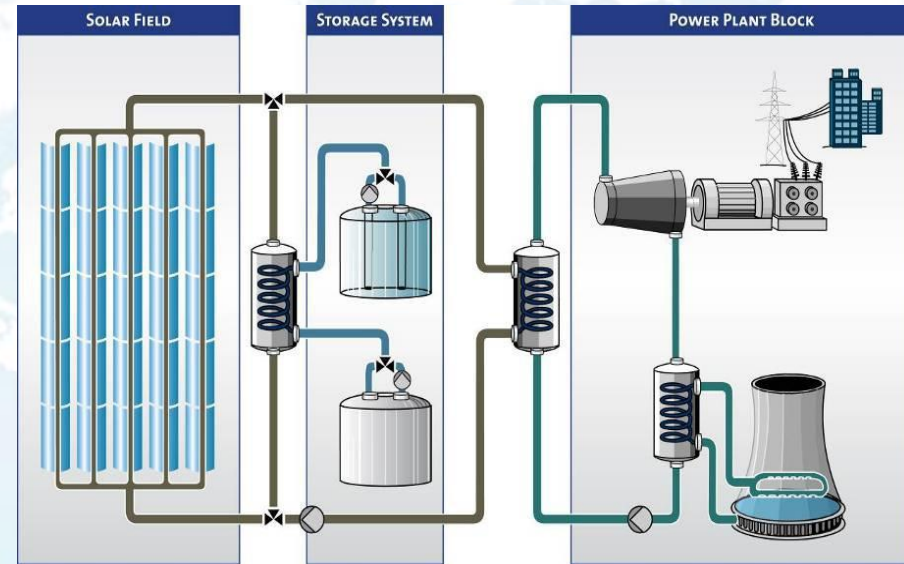
Source: NREL 2005 Cost Projections, Except for Biomass Which is a 2002 Projection.

02969203



Solar Energy Application

- 1- Electrical energy generation
 - Direct (Photo-Voltic:PV)
 - Indirect (Concentrated Solar Power: CSP)
 - 2- Solar Heating
 - 3- Dryer
 - 4- Air conditioning (direct –indirect)
 - 5- Pumping system
 - 6- water treatment and desalination
- etc..

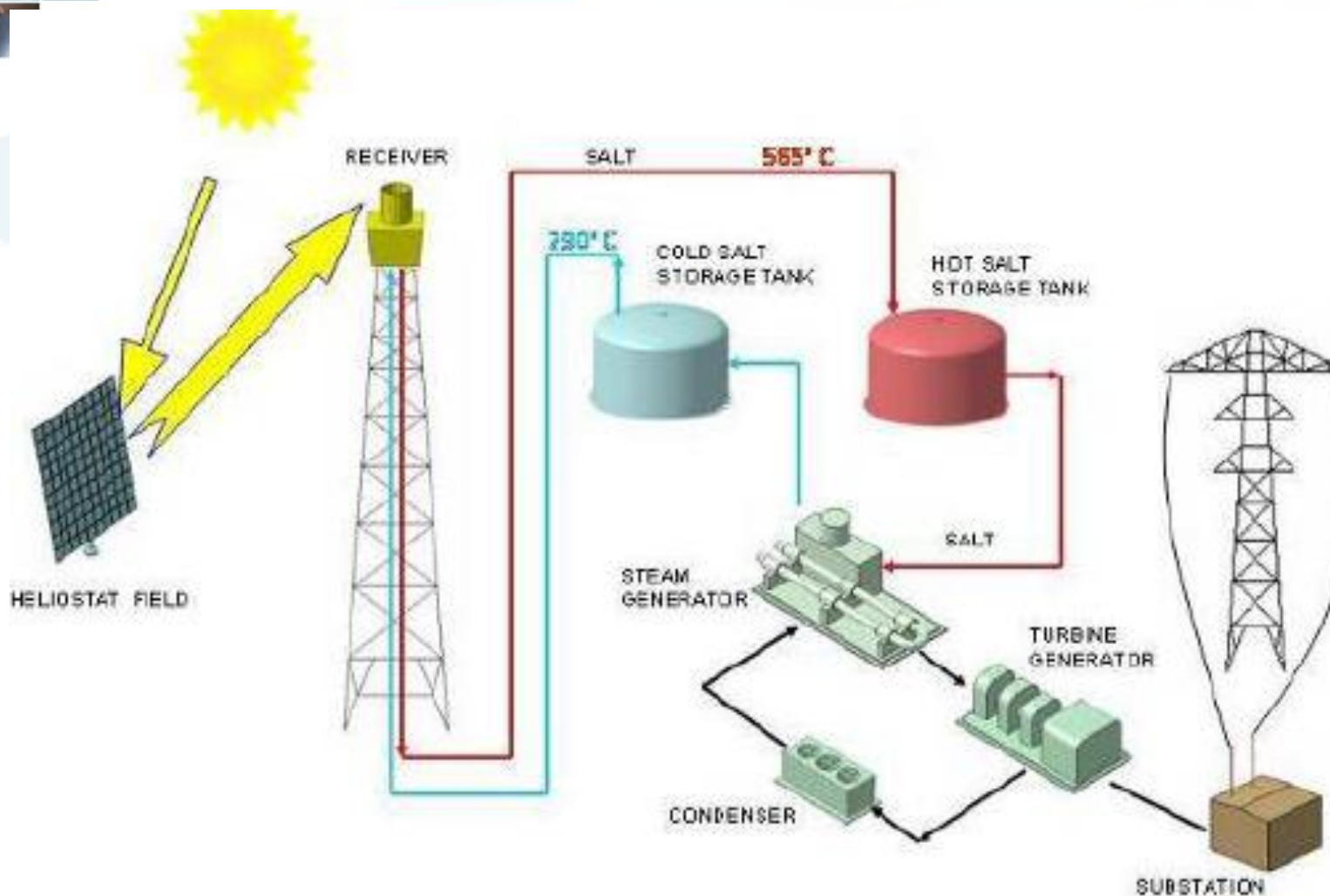




The 6th International Maritime Transport and Logistics Conference
GLOBAL INTEGRATION IN PORTS
FUTURE OPPORTUNITIES



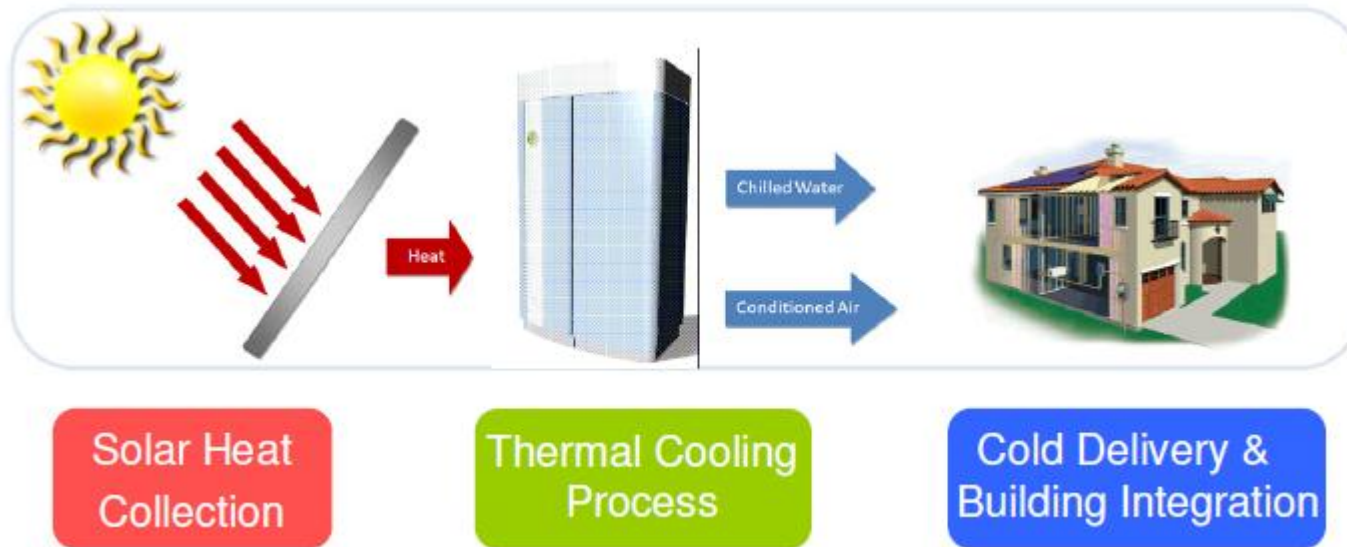
6 2017
Marl g





State of the Art in Solar Cooling

Key Elements of Solar Cooling





The 6th International Maritime Transport and logistics Conference
GLOBAL INTEGRATION IN PORTS
FUTURE OPPORTUNITIES



Thank you
??