Desalination Units powered by RES
Opportunities & Challenges

"Successful Desalination RES plants Worldwide"

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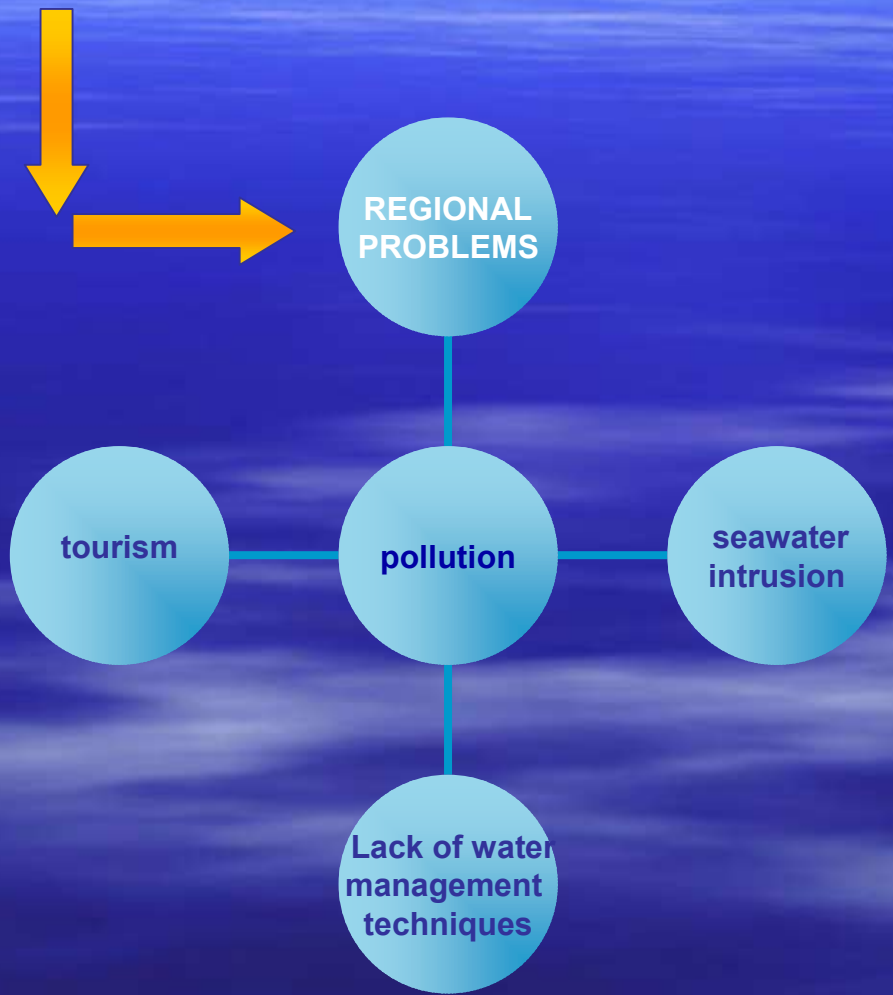
ΚΑΠΕ
CRES

the water problem (1)

the water problem (2)



the solution

- water management
- waste water exploitation
- conventional & RES desalination

conventional desalination

- ✓ Thermal processes
- ✓ Membrane processes

- feed water quality
- product water quality
- unit size
- energy requirements
- energy availability
- cost
- labor availability

selection guidelines

desalination res coupling

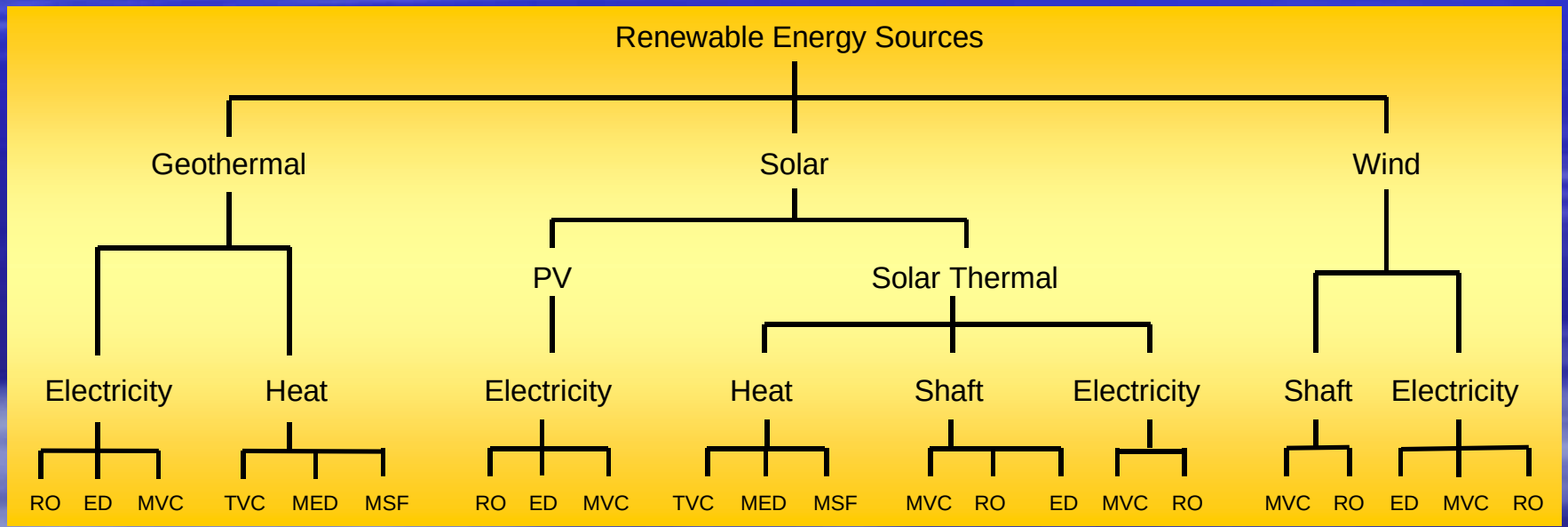
- Technical feasible
- No significant technical problems have been encountered
- Alternative for the production of fresh water in areas with lack of electric grid
- Economical competitive in remote areas
- Suitable for small and medium scale applications
- Several applications exist
- The majority are pilot/demonstration plants

desalination with res

Why now ?

- increased demand for water
- falling cost of desalination
- falling cost of RE systems
- increase of fuel cost
- lack of fuel resources
- increase of environmental concern
- need for small systems in areas without electric grid

desalination powered by res

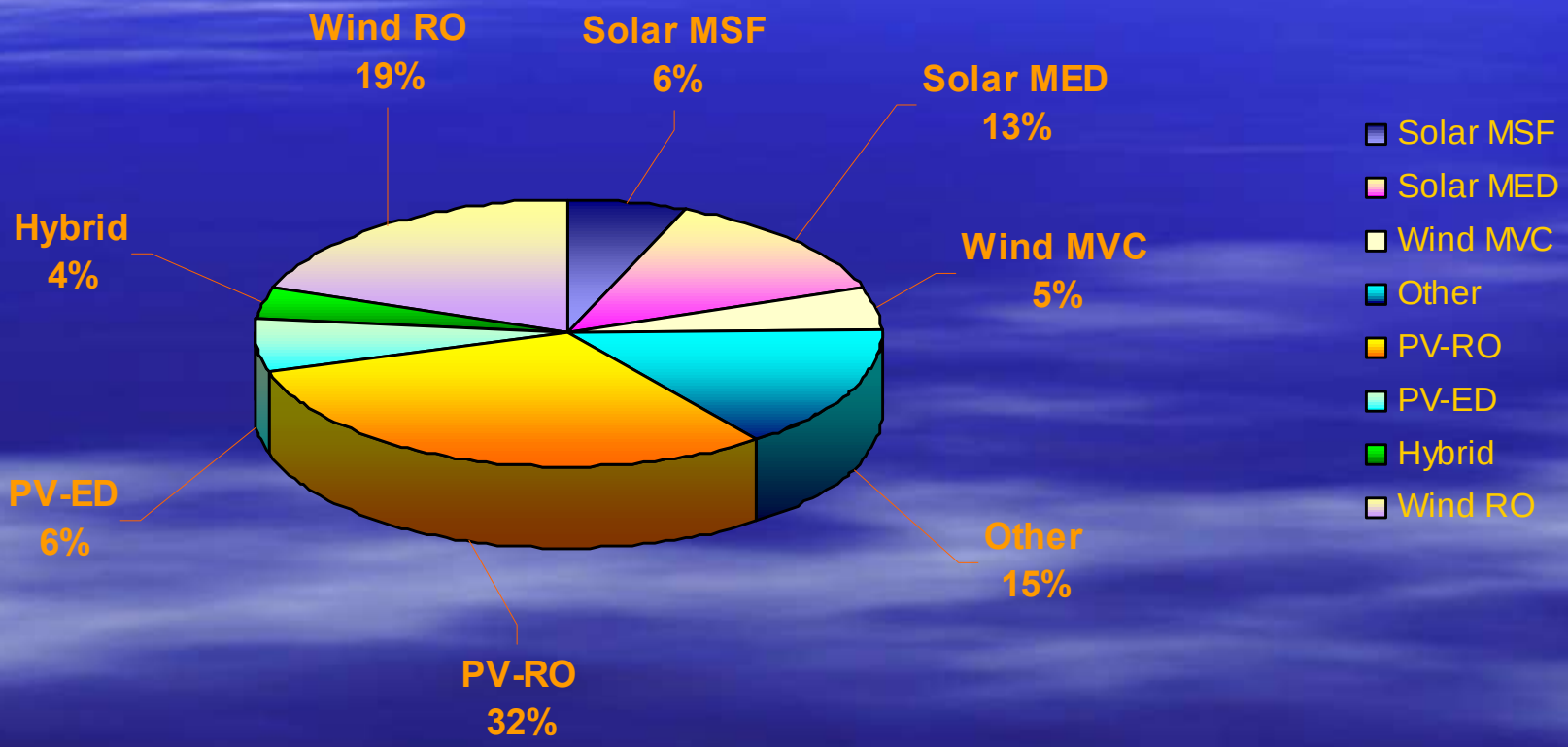


promising desalination res combinations

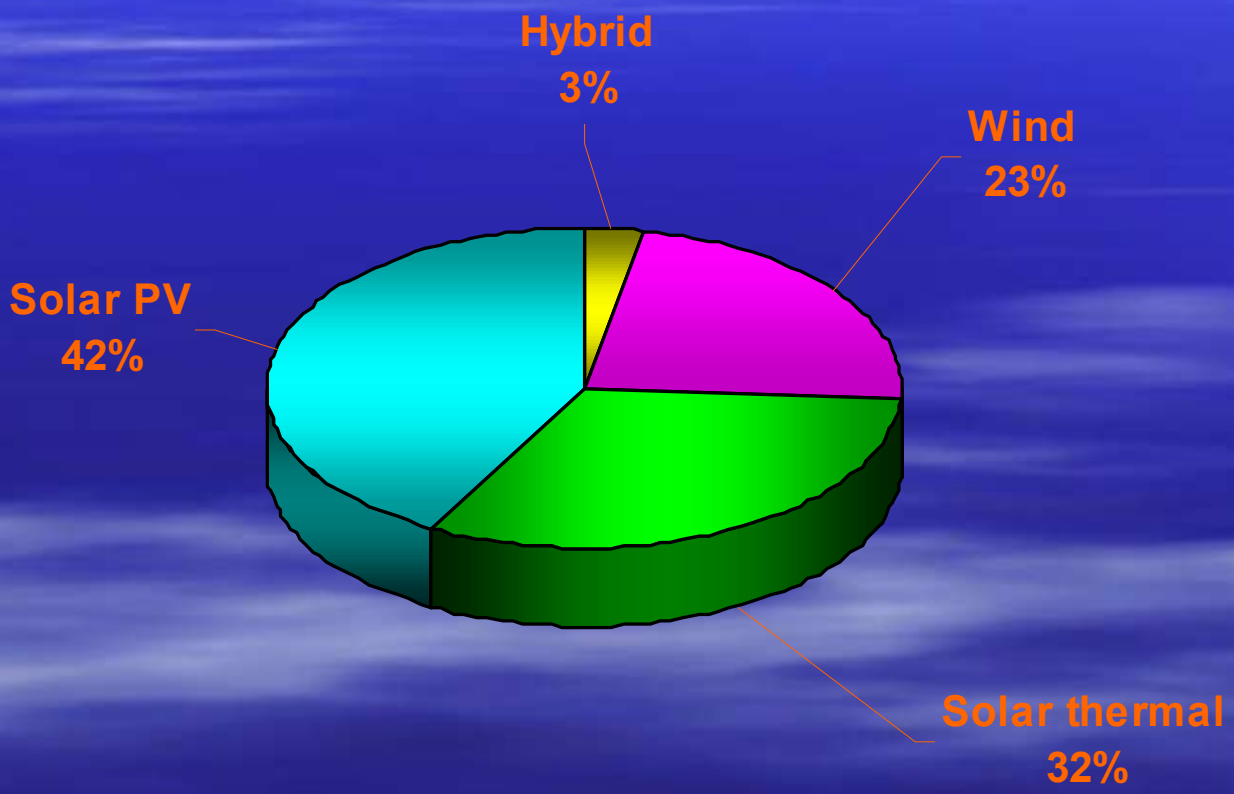
RES	MSF	MED	VC	RO	ED
WEC			√	√	
PV				√	√
Solar collectors	√	√			
Geothermal	√	√			

desalination res progress

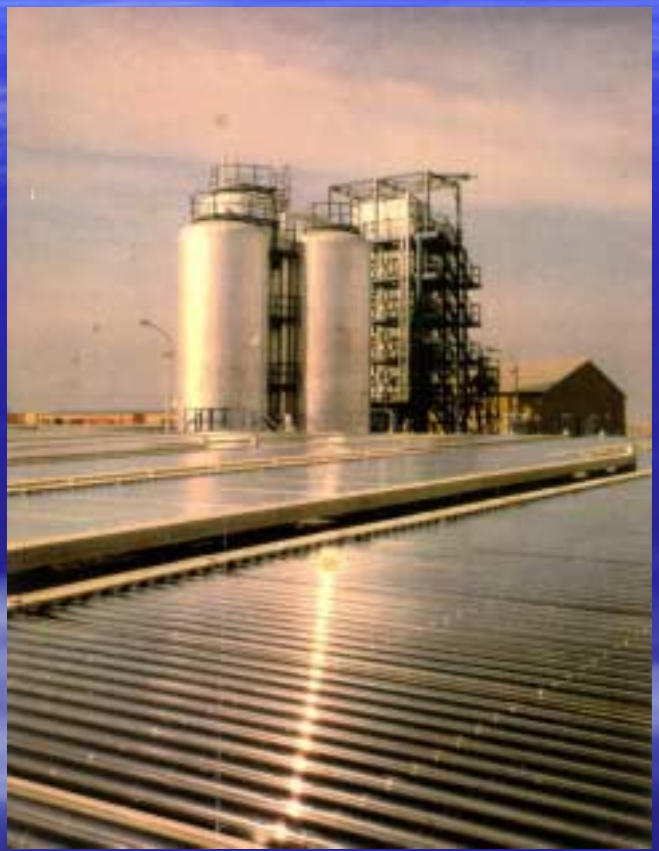
desalination res installations



re sources for desalination



desalination res installations (1)



Solar MED Plant (1)

Capacity: 80 m^3/d, 18 effects

Feed water: seawater

Collectors area: 1862 m^2

Number of collectors: 1064

Unit water cost: 7-8 €/m^3

Umm Al Nar, Abu Dhabi, UAE (1984)

desalination res installations (2)

Almeria, Spain (1993)
CIEMAT, Spain

Solar MED Plant (2)

Capacity: 72 m^3/d, 14 effects

Feed water: seawater

Collectors area: 2672 m^2

Number of collectors: 480

Unit water cost: 2.5-3 €/m^3

desalination res installations (3)

Wind MVC Plant (1)

Capacity: 50 m^3/d

Feed water: seawater

Nominal Power: 2×230kW W/T, flywheel

Unit Water Cost: not available

Pozo Izquierdo,Gran Canaria
ITC, Spain (1999)

desalination res installations (4)

PV / RO Plant (1)

Capacity: 3+2 m^3/h (120m^3/day)

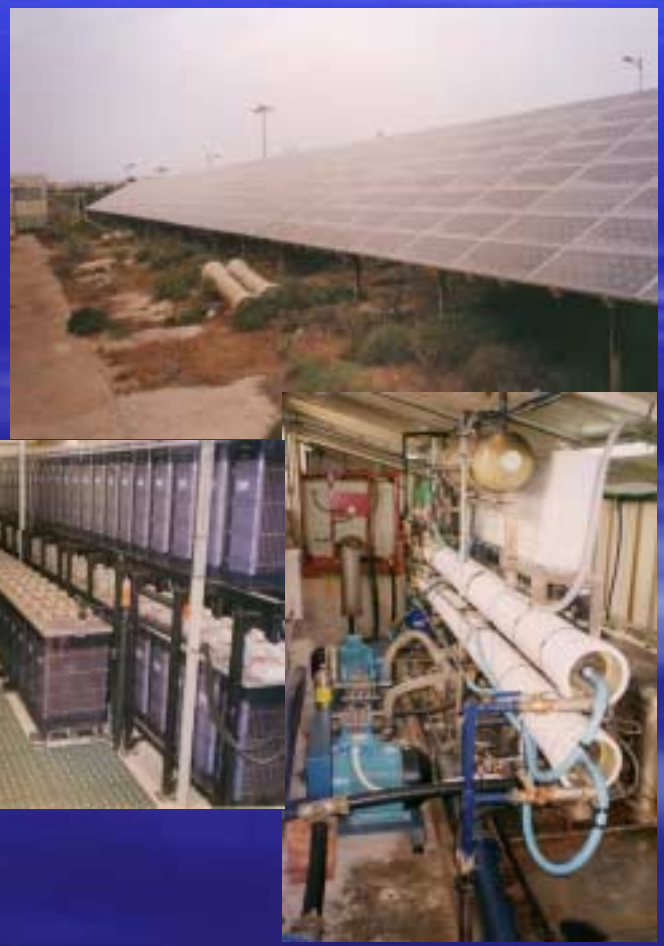
Feed water: seawater

Nominal power: 100 kWp

No of modules: 2,272

Battery Capacity: 2×2000 Ah

Unit Water Cost: 6.0 €/m^3



Lampedusa island, (1990)
ANIT, Italy

desalination res installations (5)

PV / RO Plant (2)

Capacity: 0.25 m^3/hr, (6 m^3/day)

Feed water: brackish water

Nominal power: 1.1 kWp

No of modules: 20

Battery Capacity: 100 Ah

Unit Water Cost: 10.32 €/m^3

Ceara, Brazil,
DEE-UFC, Brazil (2000)

desalination res installations (6)

PV / RO Plant (3)

Capacity: 0.4 m^3/h (9.6 m^3/day)

Feed water: seawater

Nominal power: 4.80 kWp PV

No of modules: 64

Battery Capacity: 19 kWh

Unit Water Cost: 9.0 €/m^3

Pozo Izquierdo, Gran Canaria
ITC, Spain (1998, 2000)

desalination res installations (7)

Wind / RO Plant (1)

Capacity: 0.8 m^3/h (19.2 m^3/day)

Feed water: seawater

Nominal power: 15 kW W/G,

Battery Capacity: 190 Ah

Unit Water Cost: 3-5 €/m^3

Pozo Izquierdo, Gran Canaria
ITC, Spain (2004)

desalination res installations (8)

Wind / RO Plant (2)

Capacity: 0.5 m^3/h (12 m^3/day)

Feed water: seawater

Nominal power: 2.5 kW W/G,

Battery Capacity: no battery

Unit Water Cost: 1.78 €/m^3

Loughborough Univ., U.K.
CREST, U.K. (2003)

desalination res installations (9)

Hybrid RO Plant (1)

Capacity: 0.13 m^3/hr, (3.12 m^3/day)

Feed water: seawater

Power Supply: 900 W W/T, 3.96 kWp PV

No of modules: 36

Battery Capacity: 1800 Ah/100h

Unit Water Cost: 23 €/m^3

Lavrio, Greece

CRES, Greece (2001)

desalination res installations (10)

Hybrid RO Plant (2)

Capacity: 0.125 m^3/hr, (3 m^3/day)

Feed water: brackish

Power Supply: 600 W W/T, 3.5 kWp PV

No of modules: 32

Battery Capacity: 1500 Ah

Unit Water Cost: 7.53 €/m^3

Maagan, Israel (1999)

what we learned ?

- Preferred renewable energy: PHOTOVOLTAIC
- PVs are reliable but still of high cost
- Preferred desalination technology: REVERSE OSMOSIS
- The main problem on the technologies coupling is the intermittent operation
- Special care on the design and equipment selection
- Need for systems automation
- Need for further reduction of the energy consumption of the desalination units

what should be done ?

More work on the intermittent operation of the desalination res systems

Development of efficient small energy recovery systems

Strong effort of R&D organizations and manufacturers cooperation

Need for commercially available desalination res plants

More desalination res installations

Financing of the “after project” period

Acceleration of education, training and information dissemination

do not turn your face to the problem

provide fresh water to improve life conditions and make people happier