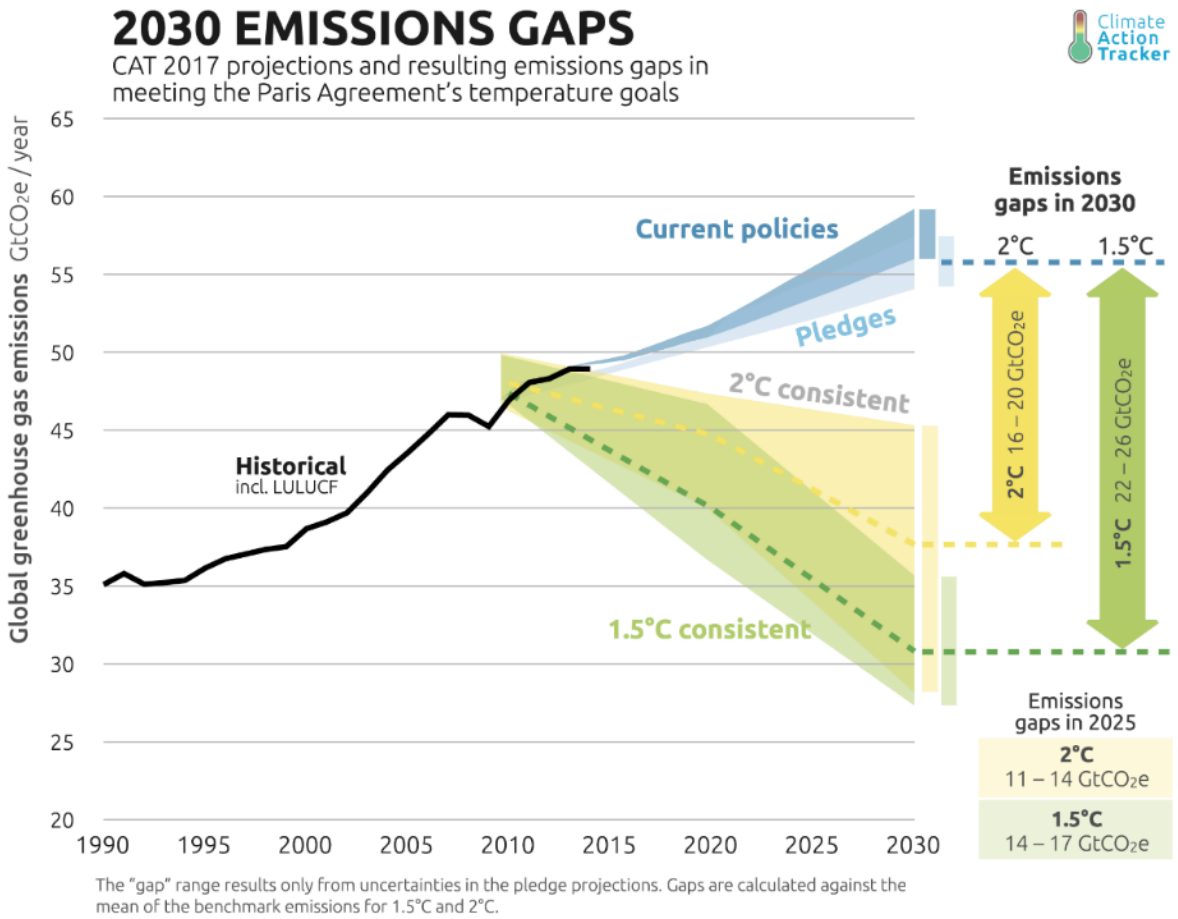
SWAC Technology

VALUE PROPOSITION

Agenda

1. ***Sustainability and Tourism***
2. SWAC principle
3. Bardot Ocean

Climate change clock is ticking…

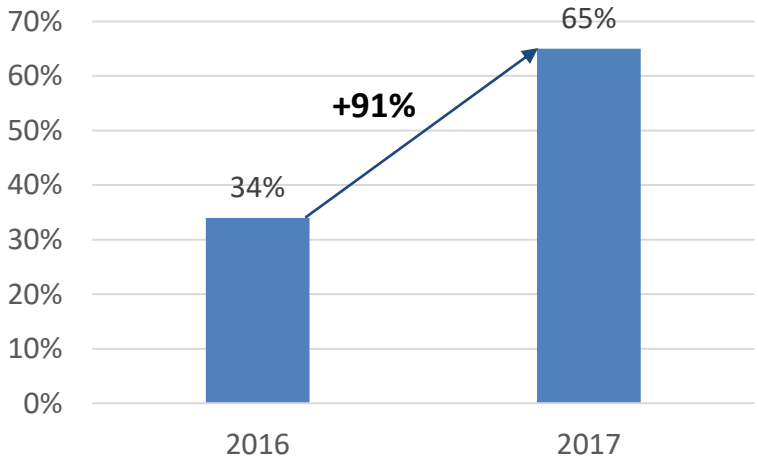


- Nearly all the countries gathered in Paris for COP21 agreed to significantly decrease their greenhouse gases emissions.
- Nevertheless, the pledges taken by the international community are far beyond what is needed to keep global warming below +2°C.
- Strong efforts are ahead of us to boost renewable energies and energy efficiency.

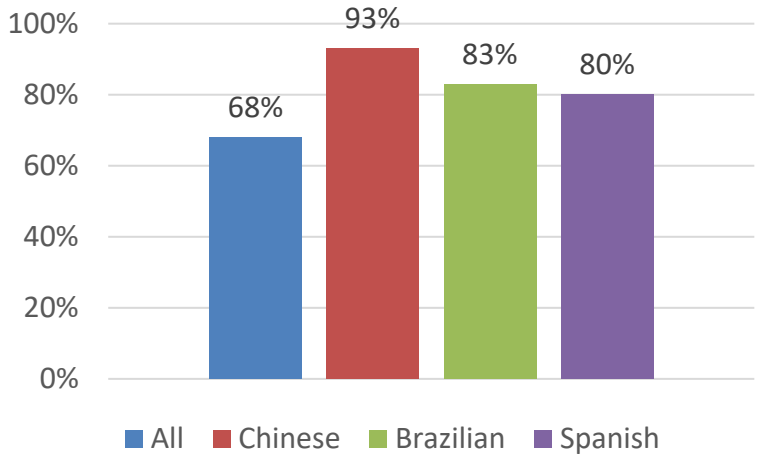
COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

A growing demand for sustainability (1/2)

According to Booking.com in its Sustainable Travel Report 2017:



The number of travelers staying in an eco-friendly or 'green' accommodation at least once could double this year with 65% of global travelers expressing this intention versus 34% who stayed in one or more last year.



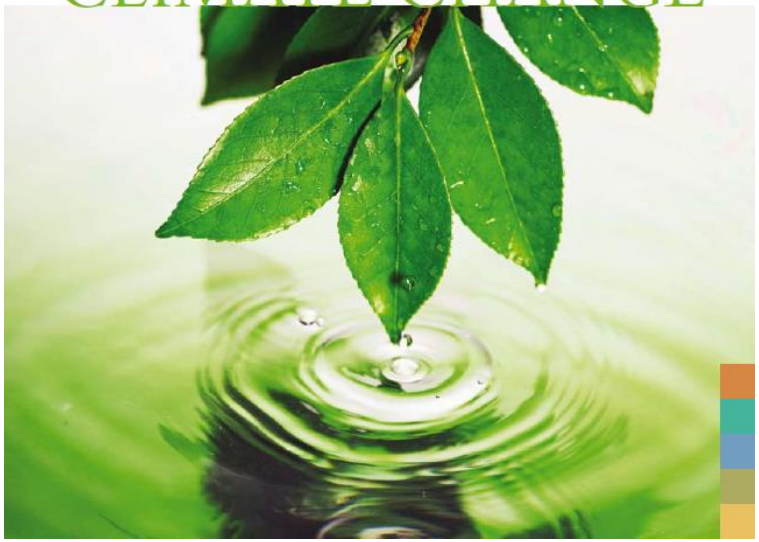
68% of travelers confirm they are more likely to consider choosing an accommodation knowing that it was eco-friendly, with Chinese (93%), Brazilian (83%) and Spanish (80%) travelers the most likely.

A growing demand for sustainability (2/2)

The WTTC set ambitious target for the whole sector…

WORLD TRAVEL & TOURISM COUNCIL

LEADING THE CHALLENGE ON CLIMATE CHANGE



ACTION ITEM

Reduce CO_2 emissions **by 50% by 2035**

"We aspire to achieve a target of 50% reduction of CO2 emissions across the industry by 2035 by learning from others and sharing examples of best practice across our industry that reduce energy use, improve energy efficiency and increase the use of renewable energy. We set ourselves the interim target, in terms of CO2 emission reduction, of 30% by 2020 with an international agreement on global emission reduction, or 25% by 2020 in the absence of such an agreement."

Source: World Travel &Tourism Council, Leading the challenge on Climate Change, 02/2009

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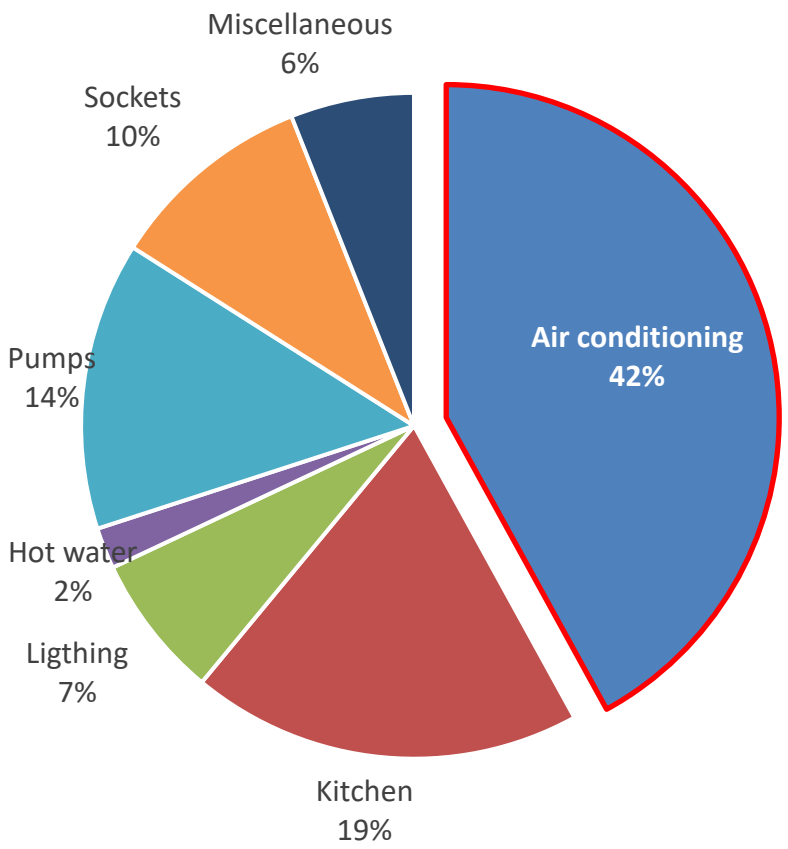
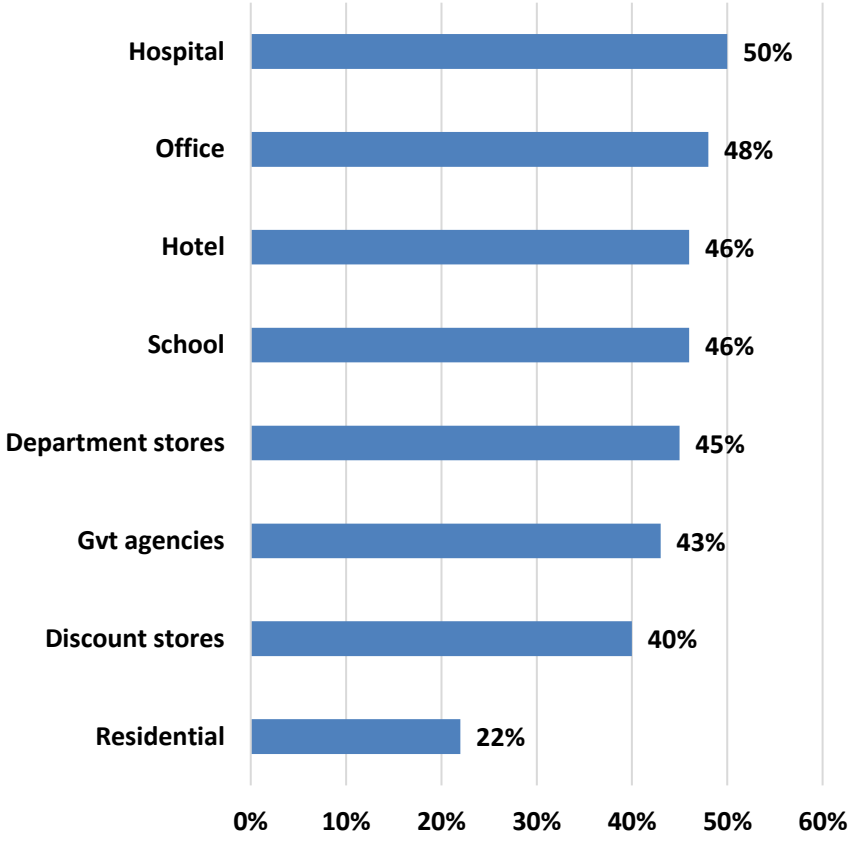
In tropical areas, cooling represents a lot of electricity

Breakdown of energy consumption over 23 hotels in Mauritius



Source: PNEE – Project feedback and best practices, Business Mauritius

Share of electricity for air conditioning in Taiwan



Source: Taiwan Research Institute (2015), Taiwan Green Productivity Foundation (2015)

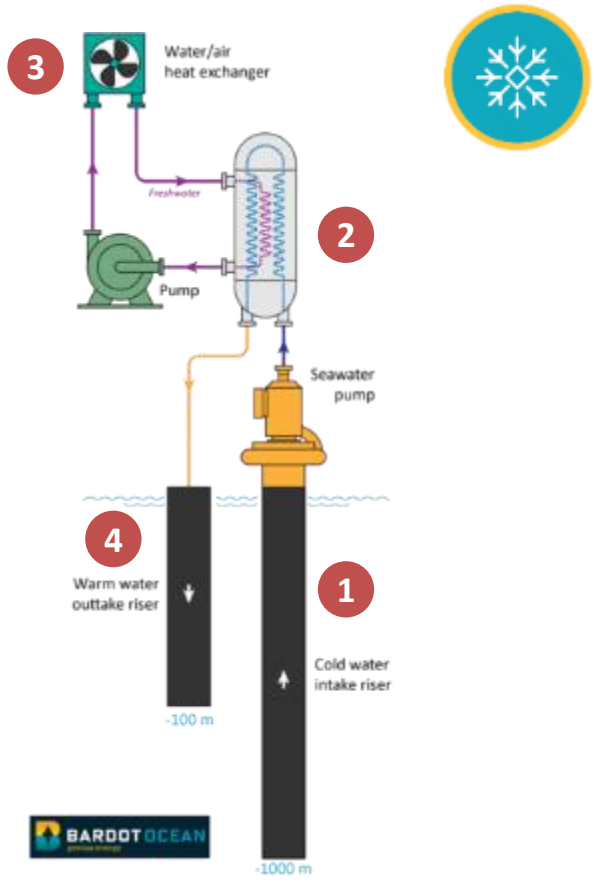
SWAC – Renewable cooling

Use DEEP sea water temperature to supply cooling

1. Cold deep water (**5-7°C**) is pumped to the process through a HDPE pipe.
2. Its cooling content is transferred to the chilled water loop through heat exchangers.
3. The chilled water loop provides cooling to the connected buildings through water/air heat exchangers.
4. The heated-up sea water (11-12°C) is then released back into the ocean **without any change in its chemical and biological content**.

No refrigerant are needed in the process

Sea Water Air Conditioning (SWAC)



SWAC has many advantages over chillers

Efficient

- **Uses 10 times less electricity than average chiller**

Predictable

- Foreseeable cooling price, unlike oil-based electricity

Kigali-ready

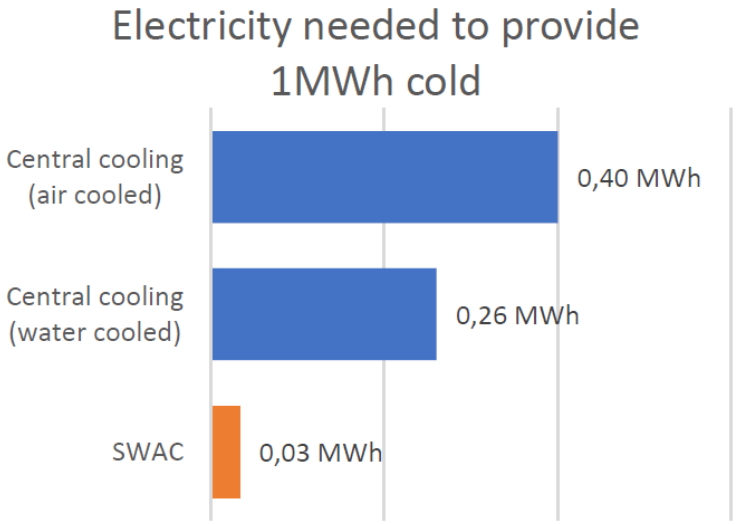
- No fluorated gases that will be phased out in the coming years

Environmental friendly

- No environmental impact

Very resilient

- Up to 50 years lifetime



-90% on 50% of the electricity consumption means an overall saving of 45%

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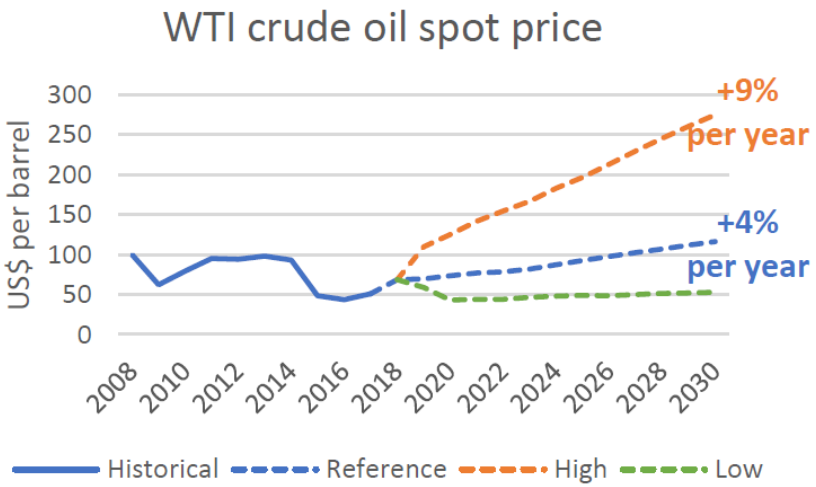

Source: Annual Energy Outlook 2019, U.S. Energy Information Administration

According to US Energy Information Administration, oil price could increase up to 9% per year until 2030.

SWAC has many advantages over chillers

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- **No HFC gases that will be phased out in the coming years**

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Very resilient

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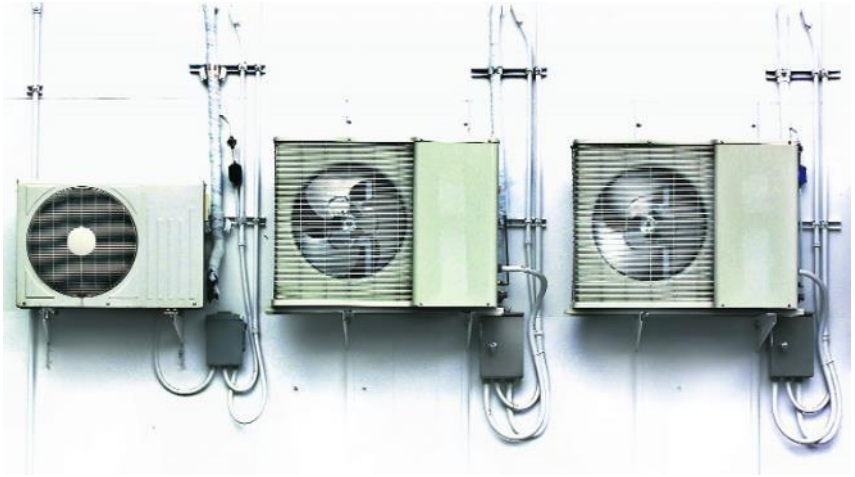

HFC gases will be progressively phased out from 2029.

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Final Environmental Impact Statement for the Proposed Honolulu Seawater Air Conditioning Project, Honolulu, Hawai'I

		Short-term impact	Long-term impact
Archeological, historic and cultural ressources			
Built resources and human uses	Harbors, Shipping and Navigation		
	Pipelines, Outfalls and Dump Sites		
	Ocean Recreation		
	Ocean Research		
	Commercial Fishing		
	Military Activities		
	Utilities		
	Ambient Noise		
	Hazardous and Toxic Materials		
	Roadways and Traffic		
	Human Health and Safety		
Social and economic resources			
Visual resources			
Natural hazards			
Marine resources	Bathymetry, Geology and Sediments		
	Tides and Currents		
	Marine Water Quality		
	Marine Biota		
Terrestrial resources	Topography, Geology and Soils		
	Climate		
	Air Quality		
	Surface Waters		
	Groundwater		
	Terrestrial Biota		

Legend:

Less than significant adverse effect

Beneficial effect

SWAC has many advantages over chillers

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Very resilient

- **Up to 50 years lifetime**

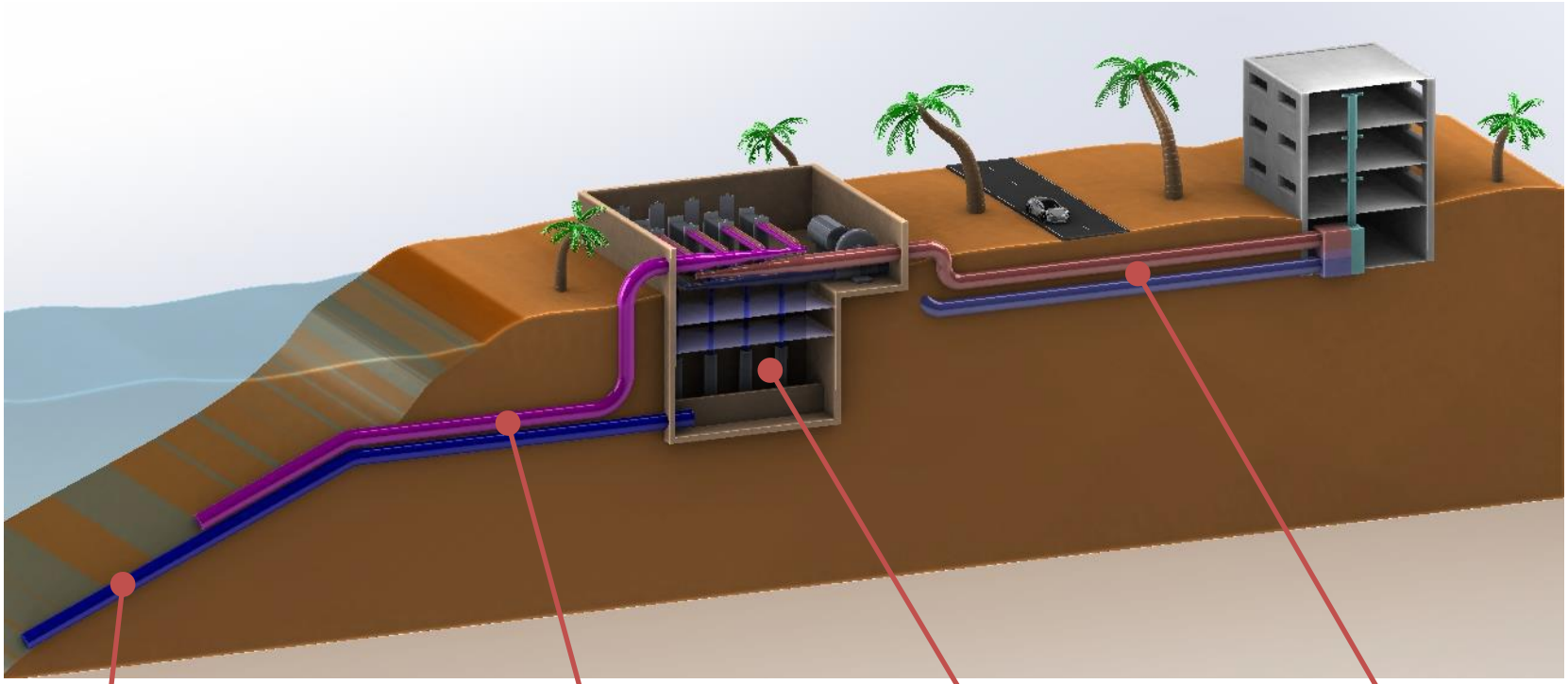
Natural Energy Laboratory of Hawaii Authority

NELHA

« After **26 years of uninterrupted operations**, the lifetime of the 40'' deep sea water pipeline was further increased by replacing pipeline anchors at 500 ft depth. It is estimated that this work **extended the pipeline life by approximately 20 more years**. »

BARDOT OCEAN
genius energy
a Value-Park Brand

Typical installation



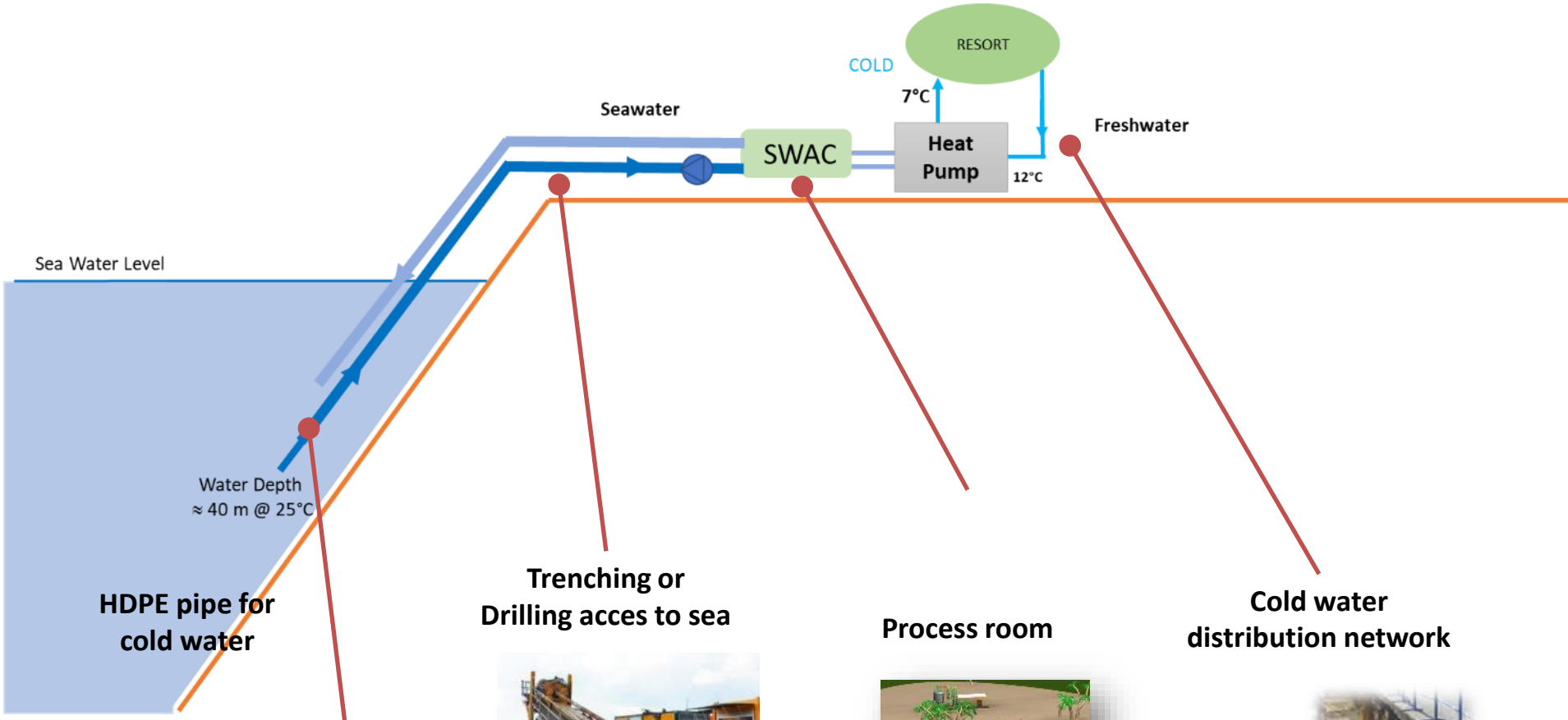
HDPE pipe for cold water

Trenching or drilling acces to sea

Process room

Cold water distribution network

Hybrid SWAC installation



On top of that, Deep ocean water offers potential additional benefits

Thalassotherapy and spa
Already experienced at the InterContinental Bora Bora Resort & Thalasso Spa (French Polynesia) or Utoco Deep Sea Therapy Center and Hotel (Japan), using pristine and mineral-rich water from the ocean's depths can increase spa and hotel occupancy and rates.

Cosmetics
Already developed by Dalton or Shu Uemura, mineral-rich deep water can be used in cosmetics and are alleged to better moisturize skins and increase collagen production compared to regular cosmetics. Offering such products can also increase attractiveness and generate additional revenues, including after their stay.

Bottled water
Bottled deep-ocean water is getting more and more popular, with several brands expanding on asian and north-american markets. Providing local deep-ocean water to clients can enrich their experience and generate additional revenues, including after their stay.

Aquaculture
Deep ocean water contains high concentrations of the dissolved inorganic nutrients essential to plant growth, while the near total absence of pathogens, plants and particulates makes the water particularly well suited for the culture of sensitive organisms and also for the development of pure culture strains.

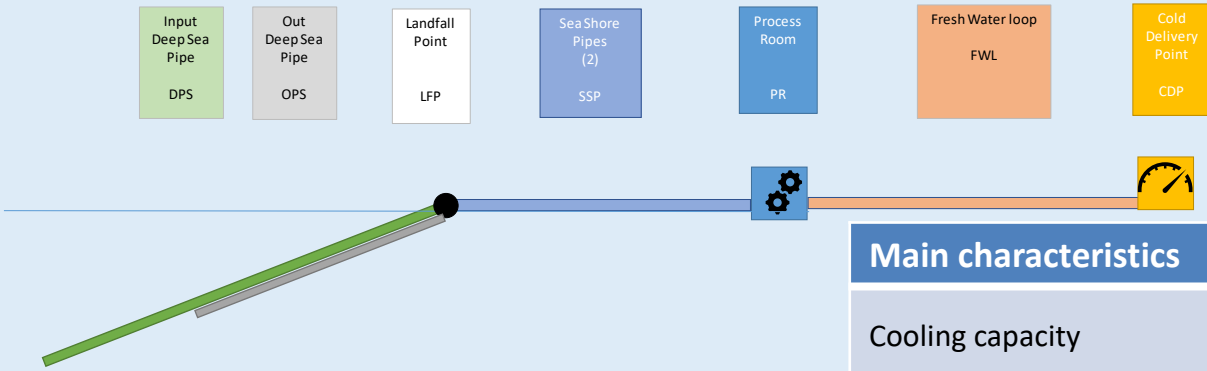
Irrigation
After the heat exchanger, ocean water is still cold and can be used to foster natural condensation, providing fresh water for irrigation.

SWAC proposed preliminary design

Project Name Park Hotel Kaafu

Project Number 190105
Author PGU
Date 14/05/2019

SWAC DESIGNER



Item	Value	Unit	Input	Default Value
DPS Length	4000	m	Mandatory	None
Deep sea T°	5,5	°C	Mandatory	None
DPS Depth	1000	m	Optional	None
OPS Length	1000	m	Mandatory	None
Shore Pipe Length	0	m	Optional	0
T° @ PR	6,5	°C	Optional	6,5
PR Shaft	-0,2	m	Optional	0
FWL Length	100	m	Optional	10

Deep Sea T° + 1,5°C
Below SWL

Bardot Group : Version SW/DS/1,11

	RT	MWc
	2500	8,8

Item	Value	Unit	Input	Default Value
Cold Power Requested	8,8	MWc	Mandatory	None
	2500	RT		
COP	32	Adim	Optional	32
Fresh Water to CDP	7	°C	Optional	7
Fresh Water @ CDP	12	°C	Optional	12
Load Factor	29,2%	%	Optional	29%

Main characteristics

Cooling capacity	8.8 MW_c 2,500 RT
Cooling demand	22.5 GWh_c
Load factor	29.2%
Resort chilled water loop	7°C – 12°C
Deep sea pipe characteristics	Length: 4,000m Outside diameter: 900mm Depth: 1,000m Water temperature: 5.5°C
Outer pipe characteristics	Length: 1,000m Outside diameter: 900mm
Process room characteristics	Shaft: -1m (from sea level) Typical area: ~100m^2
EER	32

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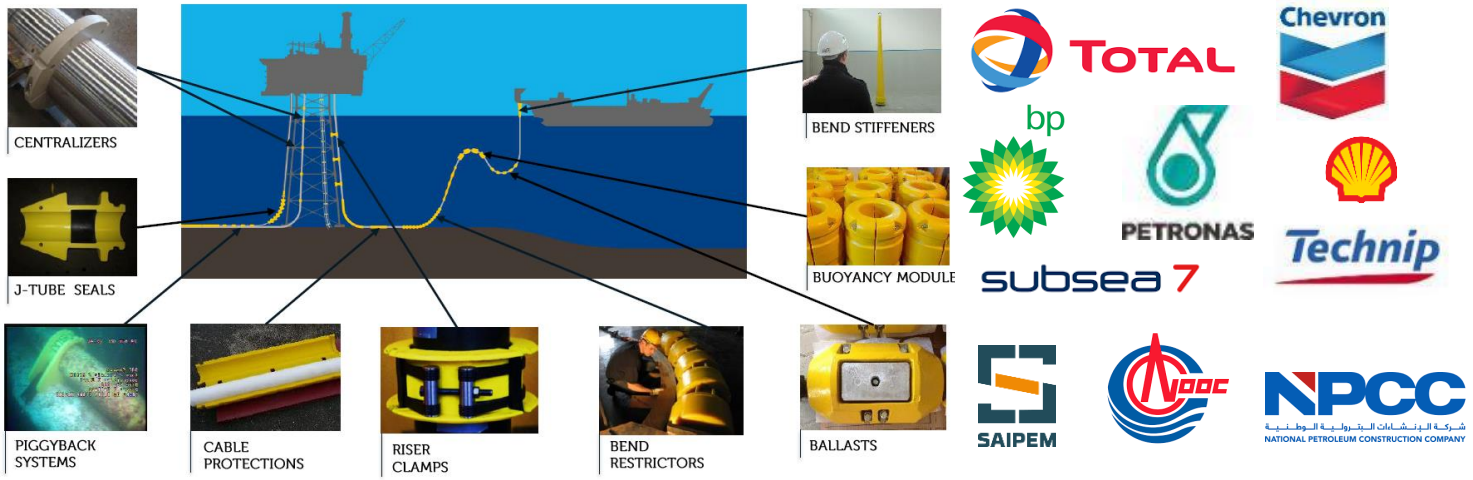
3. **Bardot Ocean**

Why Bardot Ocean?

Bardot Group has a 14 years successful track record in oil & gas offshore projects, developing subsea solutions for more than 60M€ revenues.



En 2015, Bardot a livré avec succès 6 risers de prise d'eau en haute mer à SAIPEM/TOTAL pour améliorer le processus de FPSOS de KAOMBO.

Bardot Group decided to capitalize on this success and invest in ocean renewable energy.

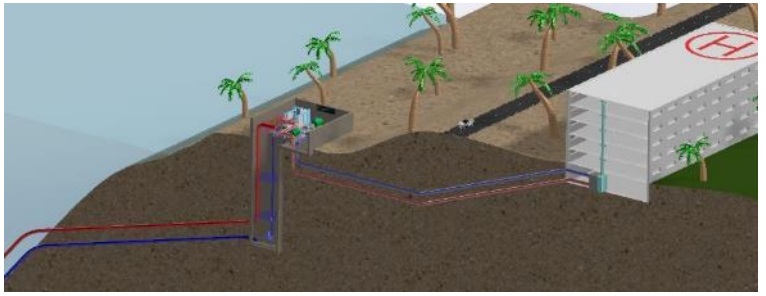
SWAC major reference

- **Bardot has entered into an exclusive commercial negociation for a SWAC development for a large hospital in La Réunion island.**

- Client: Groupe Hospitalier Sud Réunion (GHSR)

- Project details
  - Deep Sea SWAC (high performance)
  - Capacity: 6.6MW$_c$ (1900RT)
  - Pipe length : 6 – 8 km
  - Expected benefits : 90% of electricity saving

- Bardot Ocean offer
  - Project finance
  - EPCI
  - Operation and maintenance for 20 years with a cooling purchase agreement.



OTEC Labs In the world

OTEC around the World

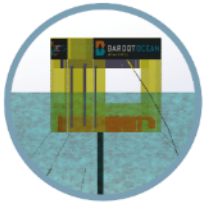
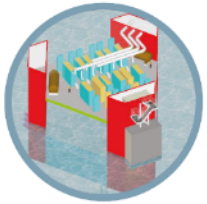
1) 105 kW OTEC, Hawaii, US
2) Lab-scale OTEC, Netherlands
3) 15 kW OTEC, La Réunion
4) 100 kW OTEC, Kumejima, Japan
5) 30 kW OTEC, Saga, Japan
6) 20 kW OTEC, Korea

5kW radial hermetic turbo-generator

Bardot Ocean SWAC offer

Areas	TEMPERATE & SHALLOW SEAS	TROPICAL SEAS	LAKES
Cold Power (Ton)	0 to 10+++	1 to 10	0 to 10 ++
Technology	Hybrid	High Performance deep water Cooling	Direct Pumping
COP	7	30	30
BARDOT SOLUTIONS	**TAKU** **Worldwide** **HYBRID SOLUTION** WATER T° : 15°C Water Depth : 50m Low Capex Mid Opex	**UPSALA** **Tropical area** **HIGH PERFORMANCE** WATER T° : 5 To 7°C Water Depth : 600m – 1000m High Capex Very Low Opex	**PERITO** Lakes area HIGH PERFORMANCE WATER T° : 7°C Water Depth : 20m Low Capex Low Opex

Bardot Ocean OTEC offer

Net power	0,3 Mw	1 Mw	2,5 Mw	>10 Mw
Solution	Onshore	Floating		Cluster
				
	SAKTI	**ZION**	**INTI**	**MAKALU**
Production				
- daily	7,2 Mwh	24 Mwh	60 Mwh	>240 Mwh
- yearly	2,6 Gwh	8,7 Gwh	21,9 Gwh	>87,6 Gwh
System	EIS	Stand alone	Stand alone	Cluster INTI
Turbine	200 Series x2	400 Series x3	600 Series x6	600 Series x6
Pipeline/Riser	500 Series	1000 Series	1000 Series	1000 Series

SWAC / OTEC synergies and differences

ITEM	SWAC	OTEC	Resources Pooling
Pumping System			
A deep sea water pipe	✓	✓	Yes But Otec Increase Pipe Diameter
A deep sea outake pipe	✓	✓	Yes But Otec Increase Pipe Diameter
A surface Intake water pipe	✗	✓	NO
Seawter Pumps	✓	✓	Yes But Otec Increase Pumps Capacity
Process room			
Process room	✓	✓	Yes But Otec Increase PR Size
Shaft	✓	✓	Yes But Otec Increase Shaft Depth
Double Deck	✗	✓	For Condensors
Heat Exchanger Sea Water / Fresh Water	✓	✗	NO
Heat Exchanger Sea Water / Frio Fluid	✗	✓	NO
OTEC Turbine	✗	✓	NO
Distribution			
Cold fresh Water loop	✓	✗	Depending on Hotel design
Cooling storage bottles	✓	✗	Depending on Hotel design
Satellite Cooling storage bottles	✓	✗	Depending on Hotel design
Power cables loop	✗	✓	Depending on Hotel design

Contacts

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