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Review of Renewable Energy Opportunities for Island Tourism

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1a. Objectives

The study aims to assess the business case for the deployment of Renewable Energy Technologies (RET) in island tourism facilities.

The technologies analyzed include:

- Solar Water Heaters (SWH)
- Solar Air Conditioning (SAC)
- Sea Water Air Conditioning (SWAC)
- Solar Photovoltaic (PV)

1b. Structure of the study

1. **Review energy trends** in the island tourism sector.
2. **Assess RE technologies**, considering required investments, avoided costs and added benefits.
3. **Identify barriers** to RET deployment.
4. **Select key policies** and **best practices**.
5. **Engage stakeholders**, determining what works (when, where and why).
6. **Analyze relevant case studies** of RET adoption in island hotels.

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2

ISLANDS CONTEXT

2a. Relevance

- Tourism is an important energy consuming sector worldwide
  - Of higher than average relevance for islands
- Energy cost account for a high share of total expenses for an island holiday
- Energy cost account for a significant share of hotel operating cost
- Transportation sector energy use accounts for about three quarters of total energy use
  - Aviation, road and marine
  - Limited options so far
- Electricity use for A/C, water heating, lighting, desalination, electric appliances etc
- Cooking

2b. Some figures

- Tourist arrivals in small islands have increased by over 30% in the last decade.
- Over the last decade, energy prices have increased dramatically
- Energy consumption in island hotels is represented primarily by air conditioning, lighting and refrigeration.

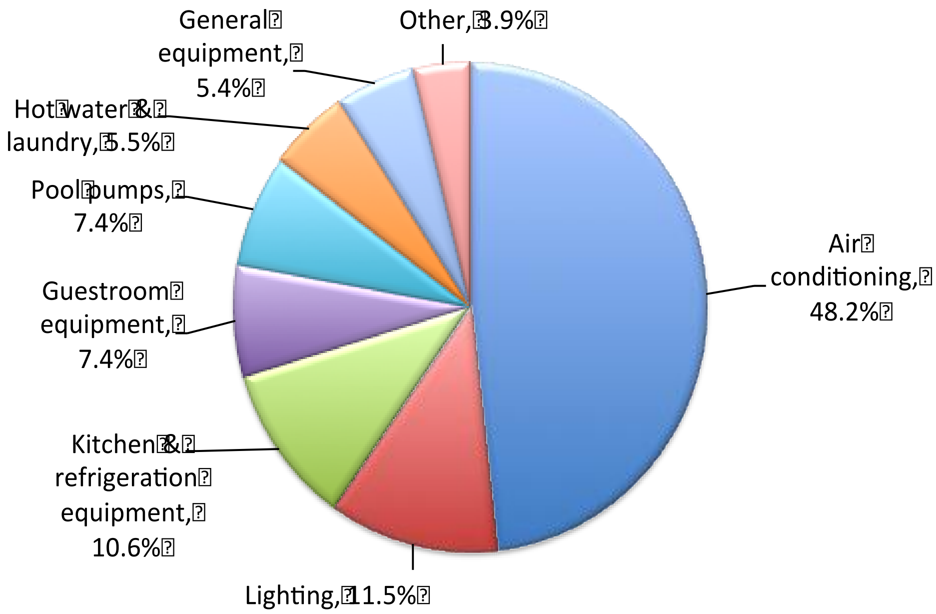
Average commercial electricity tariffs in 2012

Islands

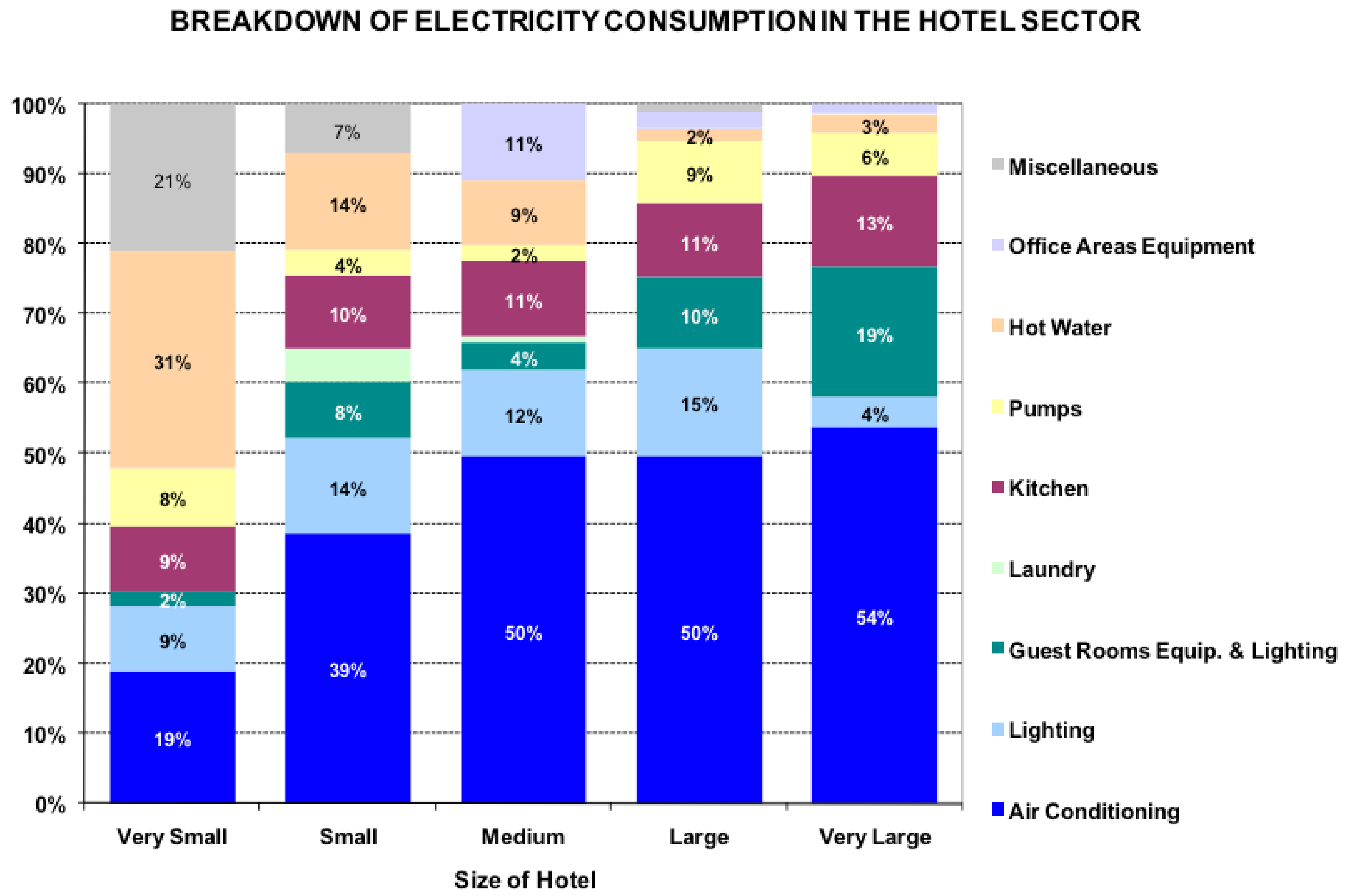
- US$ 0.33/kWh in Caribbean islands
- US$ 0.43/kWh in Hawaii
- US$ 0.33/kWh in Mauritius
- US$ 0.39 - 0.44/kWh in Pacific islands

Others

- US$ 0.26/kWh in EU member states
- US$ 0.09/kWh in China and Canada



2c. Typical electricity use pattern



Source: Chenact, 2010

3. Barriers to RET deployment

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Competitiveness of RET options

Technical and economic barriers

Access to capital and cost of financing

Financial and ownership barriers

Institutional and technical capacity

Knowledge gaps

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4

RET OPTIONS FOR ISLAND HOTELS

4a. RETs – Solar Water Heater

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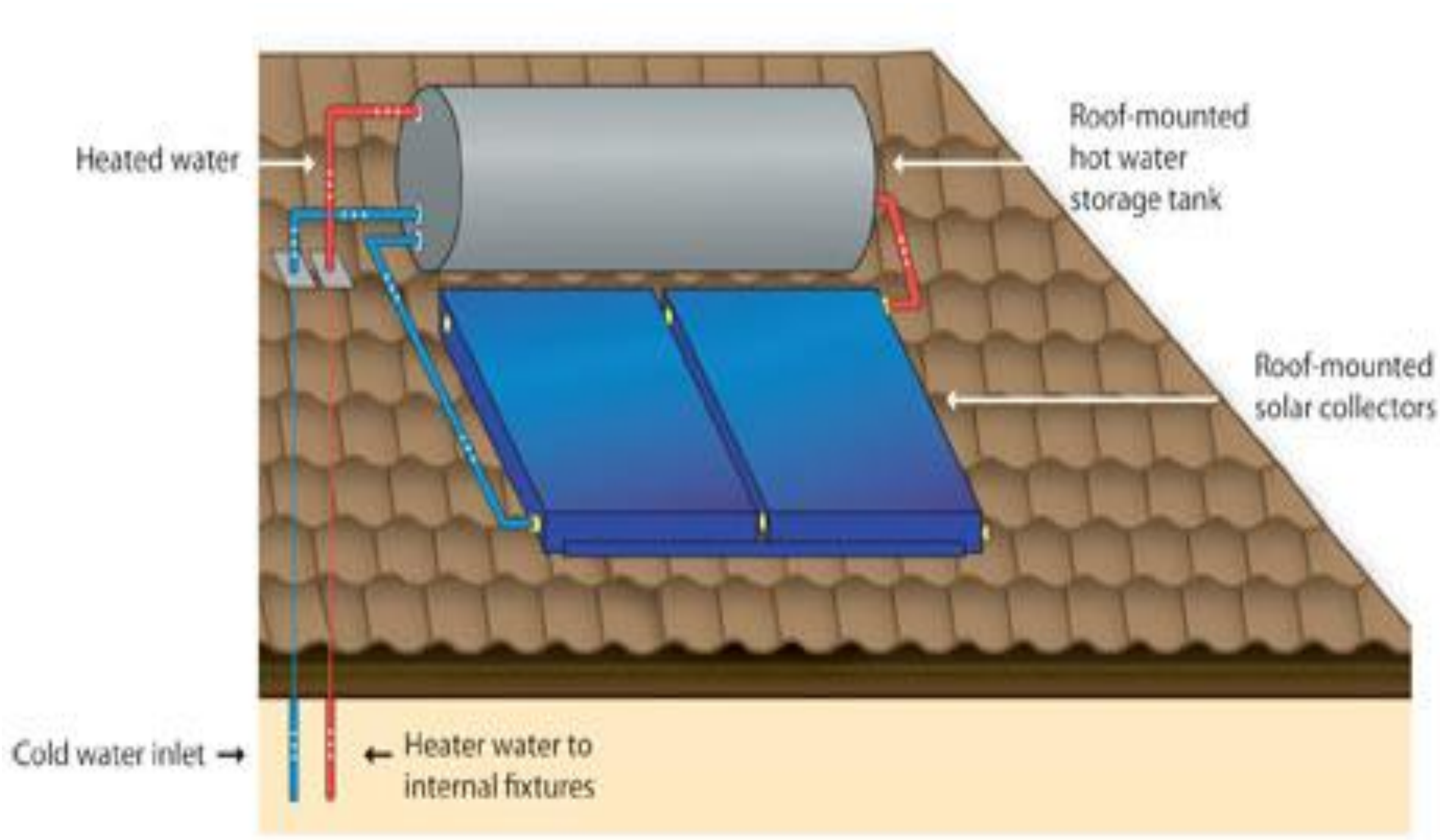

4a. RETs – Solar Water Heater

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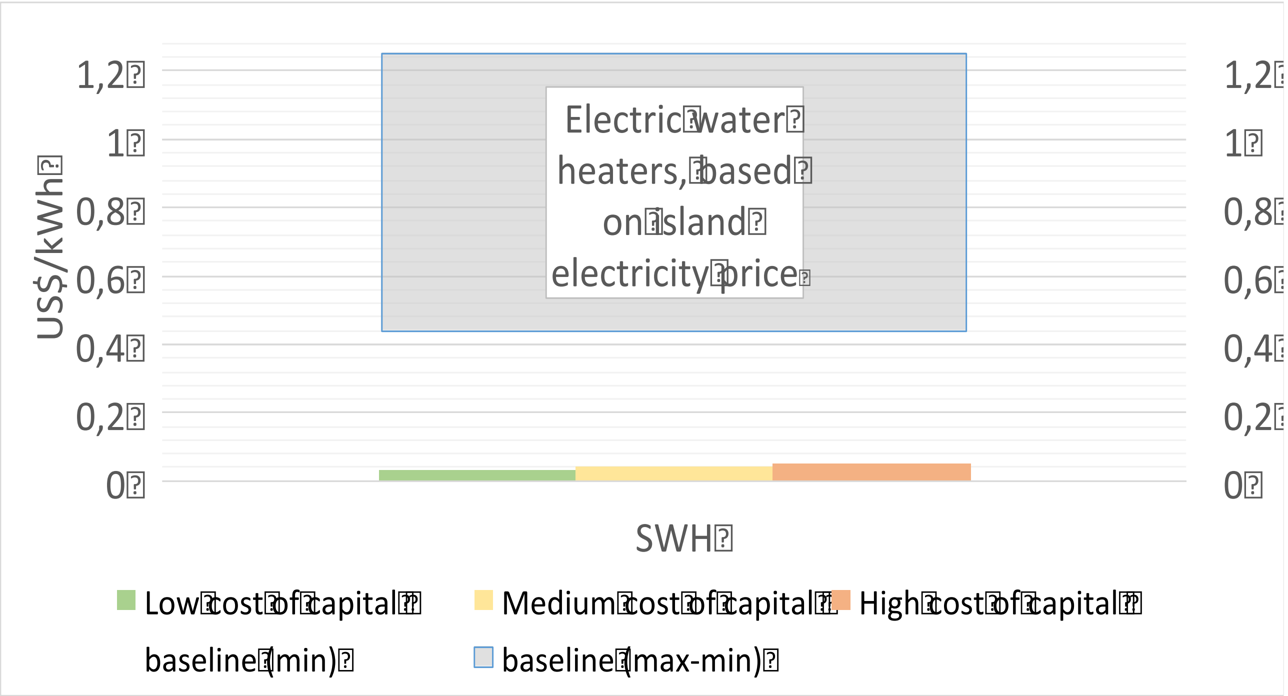
In islands, the cost of producing hot water using solar water heating systems is an order of magnitude lower than using electric water heaters



4a. RETs – Solar Water Heater

Case Study: Turtle Beach Resort, Barbados

- **Hotel size**: 167 suites
- **RET**: SWH system with total capacity of 7,800 gallons (40 gallons of water per room plus 1,120 gallons for ancillary services)
- **Capital cost**: US$ 200,000.
- **Payback time**: 8 years between 1997 and 2013 (less than 2 years at present electricity price)
- **Savings**: US$ 1,484,811 between 1997 and 2013.

4b. RETs – Solar Air Conditioning

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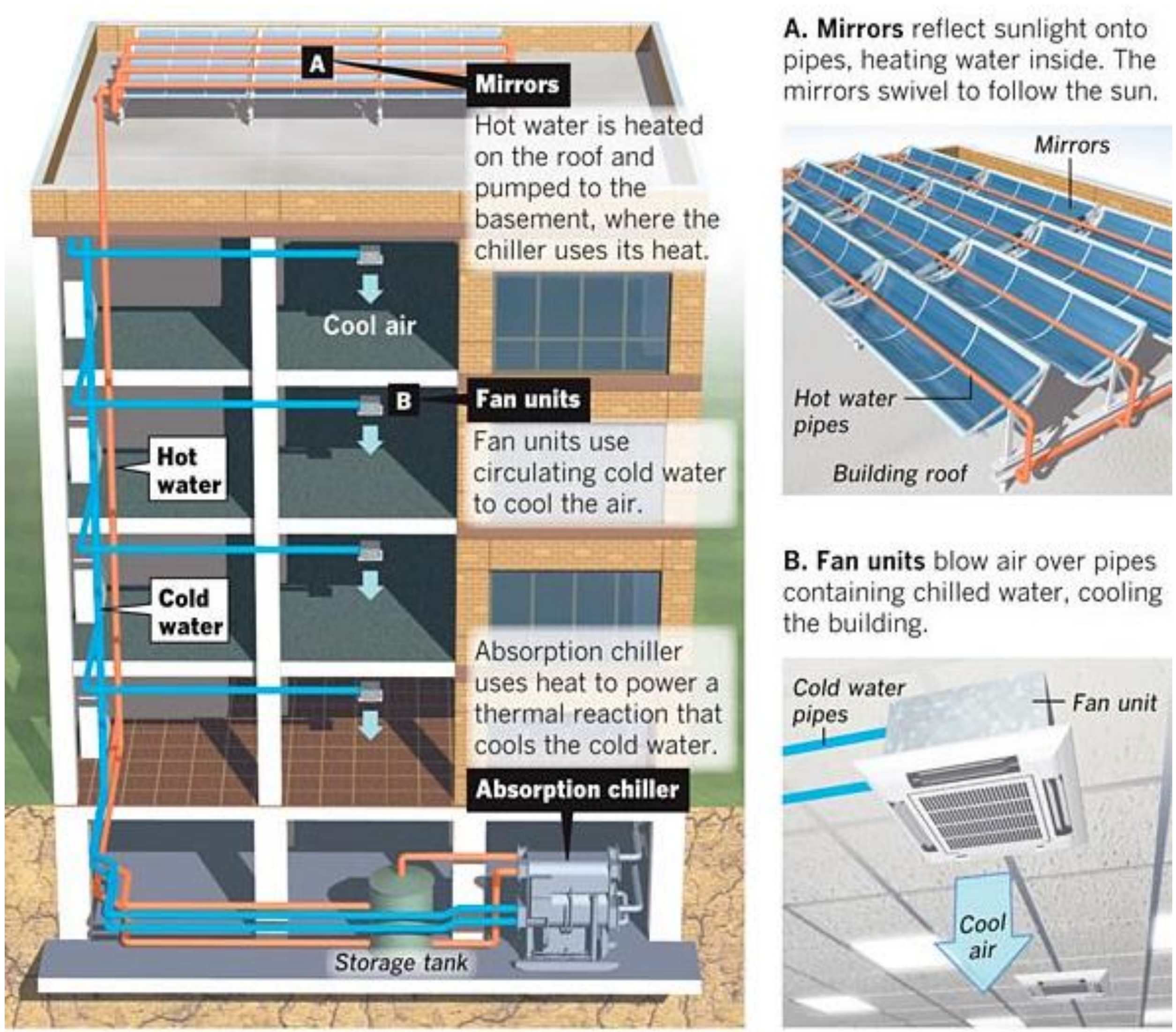

4b. RETs – Solar Air Conditioning

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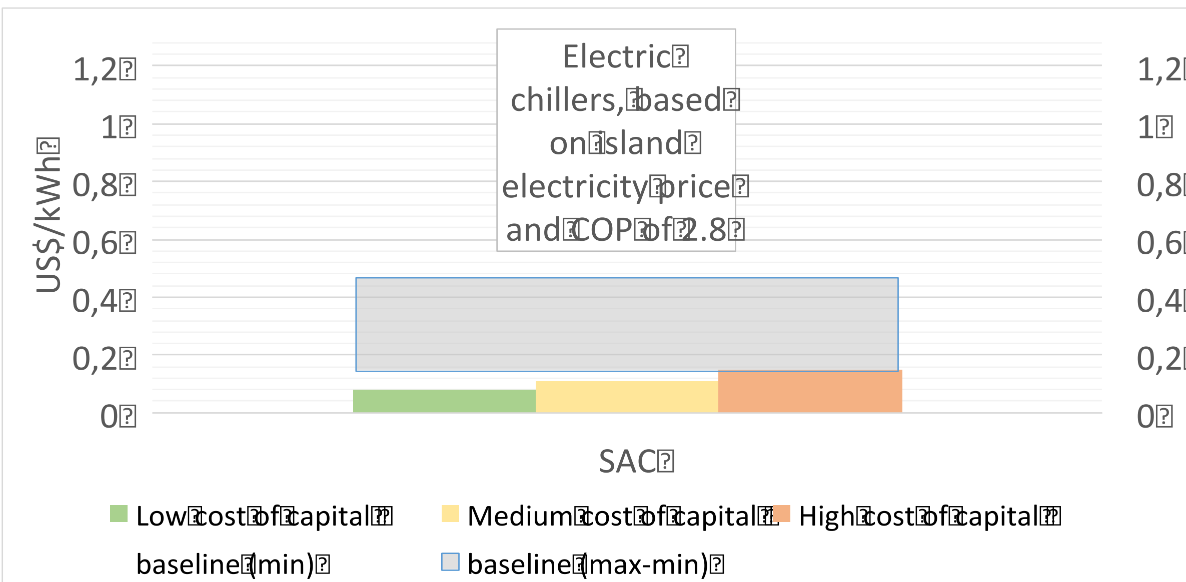
In islands, the LCOE of a SAC system powered with evacuated tubes, and with capacity factor of 30%, is comprised between 0.08 and 0.15 US$/kW, compared to 0.14-0.45 US$/kWh for electric chillers. *A valid alternative would be to install highly efficient electric chillers and produce electricity using solar PV*



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Case Study: Rethymno Village Hotel, Crete

- **Hotel size**: 110 rooms
- **RET**: SAC system with total capacity of 105 kW, powered by 450m^2 of rooftop mounted solar thermal collectors,
- **Capital cost**: US$ 146,000
- **Payback time**: 5 years
- **Electricity savings for cooling**: 70,000 kWh/year
- **Diesel oil savings for heating**: 20,000 liters per year

4c. RETs – Sea Water Air Conditioning

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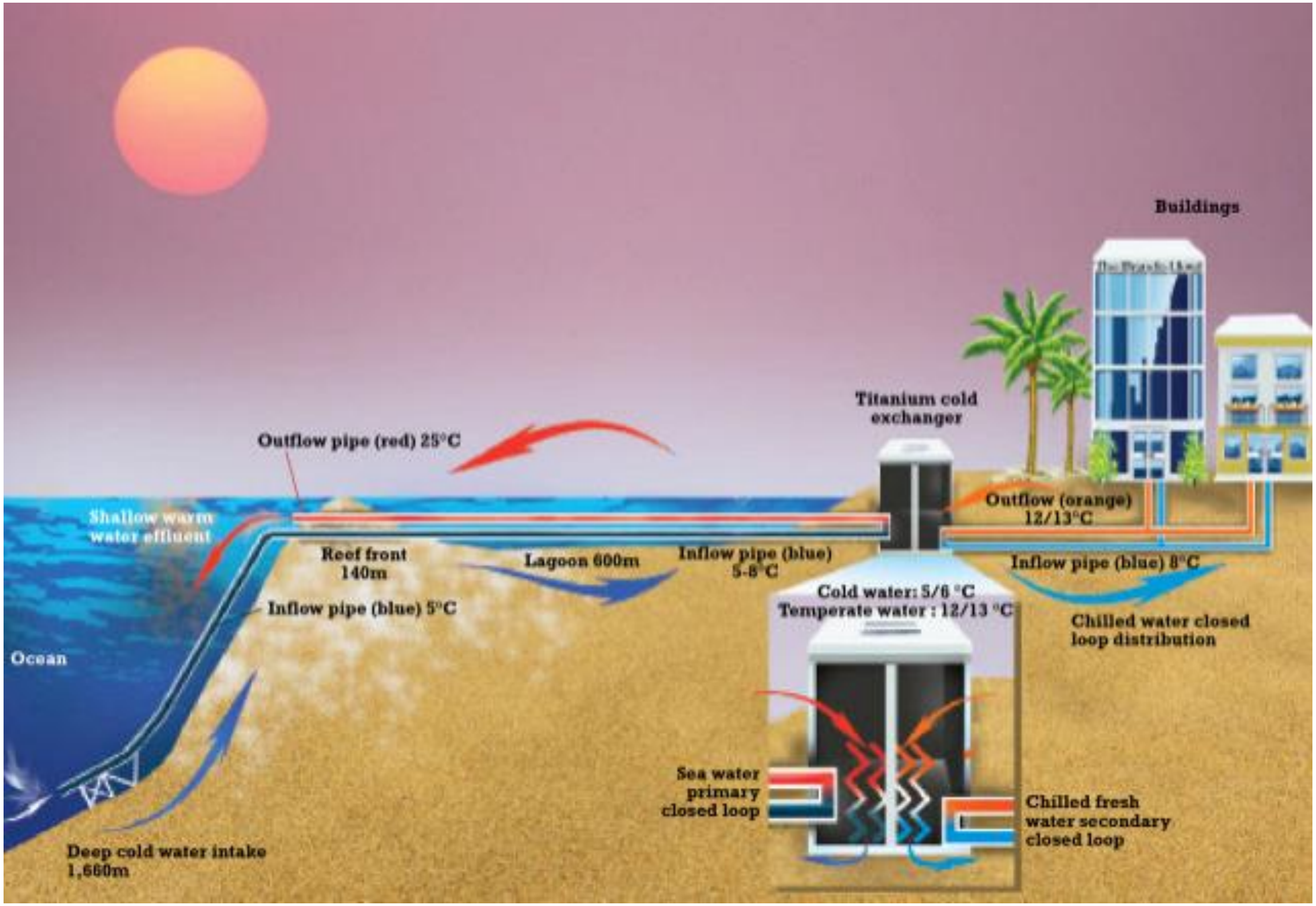
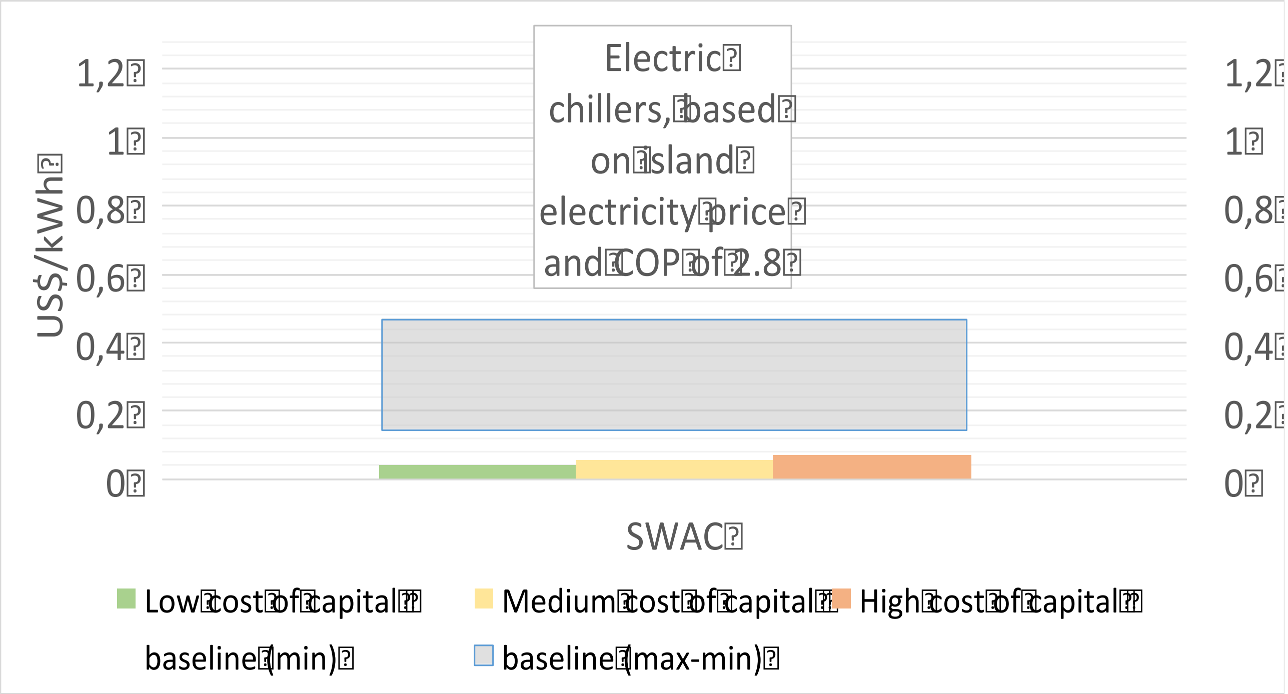


4c. RETs – Sea Water Air Conditioning

In islands, the LCOE of a SWAC system is comprised between 0.04 and 0.07 US$/kW, compared to 0.14-0.45 US$/kWh for electric chillers.



Case Study: InterContinental Bora Bora Resort & Thalasso Spa, Bora Bora

- **Hotel size**: 83 large villas
- **RET**: SWAC system with 2,000 m long pipeline
- **Capital cost**: US$ 7.9 million
- **Payback time**: 8 years (5 years considering incentives)
- **Savings from avoided electricity consumption** : US$ 720,000/year

4d. RETs – Solar PV

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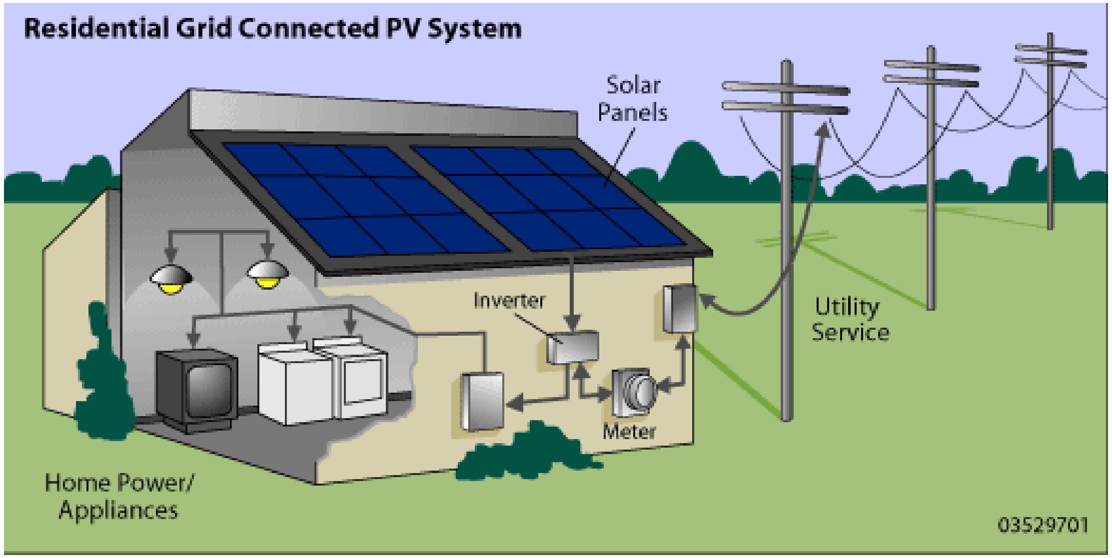
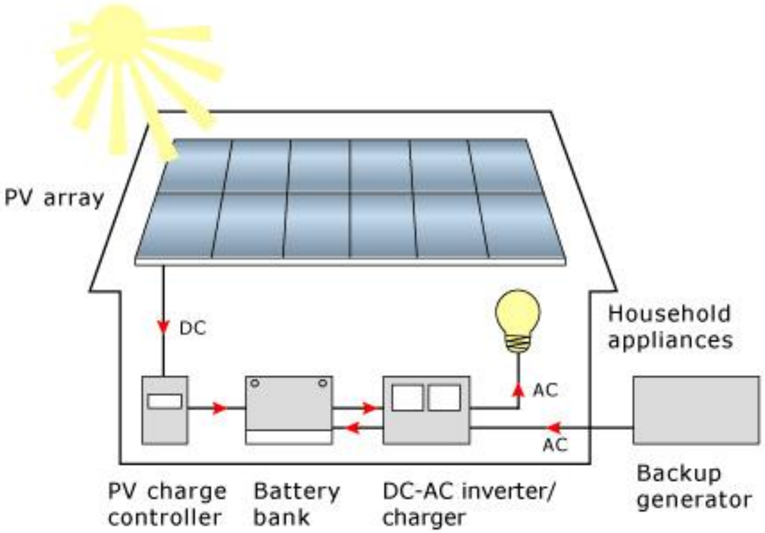


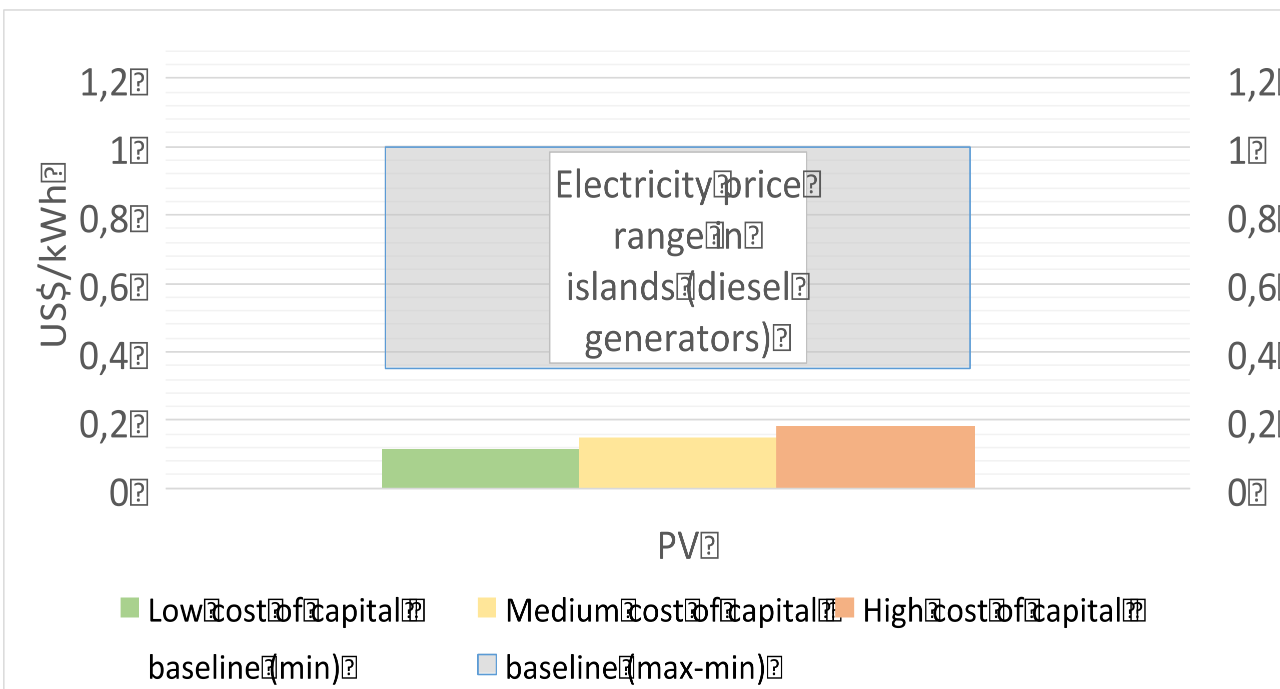
On-grid

Off-grid



4d. RETs – Solar PV

In islands, the LCOE of a solar PV rooftop system with a capacity factor of 15% is comprised between 0.12 and 0.18 US$/kW, compared to an average electricity price of 0.35 -1 US$/kWh (oversized diesel in small island resorts). PV can generate electricity cheaper than the short-run marginal cost of most islands generators



4d. RETs – Solar PV

Case Study: Turtle Island Resort, Fiji

- **Hotel size**: 14 cottages
- **RET**: Off-grid solar PV system with 240 kW of capacity and battery storage
- **Capital cost**: US$ 1.5 million
- **Payback time**: 6 years
- **Savings from avoided diesel cost**: US$ 250,000/year

5

POLICY OPTIONS

5. Policy options

1. Capital investments
   - Grants, equity and hybrid financing
2. Incentives and disincentives
   - Tax credit (*e.g. RETITC in Hawaii),* tax rebates *(e.g. exemption on Land Conversion Tax in Mauritius),* feed-in tariffs *(e.g. pilot feed-in tariff in Cayman islands), n*et metering *(e.g. Palau Net Metering Act)*
3. Targets and other regulatory measures
   - RE targets *(e.g. Majuro Declaration),* emission limits
   - Mandatory energy audits, energy management standards etc.
4. Institutional and technical capacity building
   - Technical capacity, *e.g. IRELP,* Institutional capacity for the design and implementation of RE policies, international cooperation (*e.g. IRENA's Global Renewable Energy Islands Network - GREIN).*

6

BEST PRACTICES

6. Best Practices

- Several policies and initiatives have been already implemented in small islands to support the deployment of renewable energy technologies in tourism facilities.
- **Four best practices** have been selected based on their actual impact on overcoming the barriers in different island and hotel contexts. These are:
    1) Net metering policies
    2) Leasing schemes
    3) Power Purchase Agreements (PPAs)
    4) Awareness raising programmes

6a. Net metering policies

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- **Barriers addressed**: Improve the competitiveness of RETs by creating the enabling conditions for hotel owners to rapidly recuperate their upfront investments.
- **Ideal island context**: Islands where cost of electricity is higher than LCOE of RETs.
- **Relevant examples**: GRENSOL (Grenada); WAPA (Virgin Islands)

6a. Net metering policies

Example: **GRENSOL, Grenada**

Best practice: Since 2007, the company has implemented a 1:1 metering policy at retail rates for systems less than 10kW.

Results: The introduction of this policy has contributed to the success of GRENSOL, which is now a leading solar PV company in the Eastern Caribbean. In 2009, only two years after the implementation of the net metering policy, GRENSOL had installed 25 grid-tied systems in the island of Grenada, including in hotels and resorts.

6b. RET Leasing Schemes

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- **Barriers addressed**: Lower financial barriers by eliminating the burden of upfront investments for the purchase of RETs.

- **Ideal island context**: Leasing schemes are particularly useful for small hotels that have limited financial resources, as well as for addressing the principal-agent problem.

- **Relevant examples**: Sunetric (Hawaii); Solar Island Electric (Prince Edward Island, Canada).

6b. RET Leasing Schemes

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Example: **Sunetric, Hawaii**

Best practice: System installation, maintenance and insurance are provided at low monthly payments with a zero down payment option, and with flexible end of lease options, including the possibility of further expanding the system.

Results: Sunetric provided 40% of solar PV systems in Hawaii, including a 1.2 MW roof-mount PV system at the **Wyndham Kona Coast Resort**, and a 200 kW roof-mount system at the **Kukui Plaza Apartments and Condos**.

6c. PPAs

- **Barriers addressed**: Overcomes the problems related to financing for upfront investment since they can work at cost, rather than market price.

- **Ideal island context**: All islands with high electricity costs.

- **Relevant examples**: PPA between Starwood Hotels and Resorts Worldwide and NRG Energy.

6c. PPAs

Example: **Starwood & NRG Energy**

Best practice: Partnership announced in 2013. NRG will own the solar arrays while Starwood will be the enabling partner through a multi-year agreement to purchase electricity from the solar arrays.

Results: The PPA will begin with NRG building and operating a 1.3 MW solar PV system at **Westin Saint John Resort & Villas** in the U.S. Virgin Islands. Then, it will apply also to other Starwood properties located in Arizona and Hawaii.

6d. Awareness raising & Capacity building

- **Barriers addressed**: Devising awareness raising and capacity building strategies is an effective method to overcome the skepticism of tourism operators with regard to renewable energy.

- **Ideal island context**: The specific focus of each campaign and training program would need to be adapted to local specificities and knowledge gaps.

- **Relevant examples**: Samsø Renewable Energy Island Project; CIDA's RE workshops, Saint Lucia.

6d. Awareness raising & Capacity building

Example: **Samsø, Denmark**

Best practice: Raising awareness and capacity building through RE training of local energy service providers; free energy audits; demonstrative projects.

Results: The island, whose economy is largely based on tourism, was able to convert all of its energy supply to renewable energy within 10 years (1997-2007). This success helped increase the tourism attractiveness of Samsø.

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Renewables are increasingly competitive, but more needs to be done to fulfill their potential…

…IRENA is part of the solution

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