CEPM, Dominica

Background

This project is a very famous district energy project in eastern tourist area of Punta Cana, Dominica. BROAD provided 8 units single stage hot water chiller, using waste heat from exhaust. The total cooling capacity is 19MW.

By using the waste heat through heat exchanger from 5 units Wartsila generators in a heavy oil power plant, energy company CEPM got 120℃ pressurized hot water and sent it to A/C machine room of 5 hotels 4 km away to drive BROAD chillers. The hotel requires A/C supply in a whole year because of the high temperature in topical area. Also, it has strict requirements on chiller's cooling capacity and stability. BROAD received high praise from CEPM company and users because of the chiller's stability.

Not only the project is well-known in Caribbean and Latin American, but also attracts concerns from the national energy companies of the United States and other developed countries, and therefore BROAD got many new opportunities on project cooperation in the United States and Latin America.

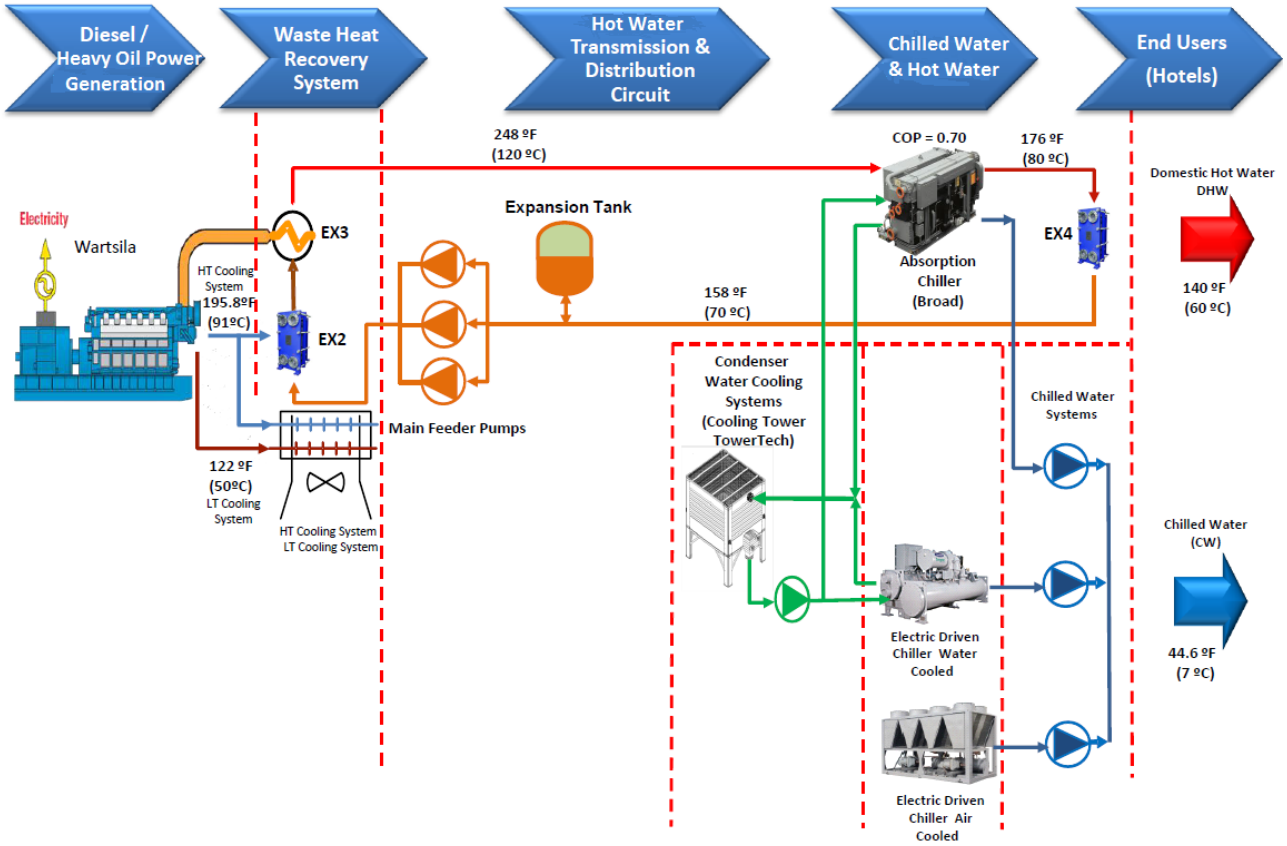
项目背景

该项目是在多米尼加东部旅游地区 Punta Cana 的一个非常有名的区域能源项目。远大为其提供了 8 台热水型非电空调，利用烟气废热，总制冷量 19MW。

能源公司 CEPM 利用其在该地区的一个重油电厂的 5 台瓦锡兰发电机废热通过换热产生 120℃的加压热水，然后通过管道运送到 4 公里之外的 5 个酒店的远大非电空调的机房，做为远大热水型非电空调的驱动能源，来为酒店提供空调服务。因其属于热带地区，气温高，常年 365 天都需要空调服务，所以，对机组的出力和稳定性要求极高。远大空调，稳定的运行，得到了 CEPM 公司和最终客户的一致认可和好评。

该项目不仅在加勒比和拉美地区声名远播，在其运行后，还得到了美国等发达国家能源领域的公司的关注。远大也因此得到了很多美国及拉美其他公司的项目和合作意向。

System design concept
系统设计理念



This system provides 5,000 RT of chilled water and domestic hot water (DHW) to hotels located near to CEMP's power plant. Waste heat comes from the exhaust gases and cooling water of diesel engines (6 MWe each) that consume heavy fuel oil (HFO).

该系统为CEPM电厂附近的酒店提供5,000冷吨的供冷需求和卫生热水需求。重油发电机（每台6兆瓦）的废气和冷却水提供该系统所需的热量。

Cooling is provided by locally based absorption chillers and the heat exchanger used to produce DHW. The HTHW (High Temperature Hot Water) is produced in the power plant with a temperature of 248° F(120℃). At the hotel this HTHW supplies the thermal energy to drive single stage absorption chiller units.

吸收式非电空调用来制冷，换热器用来提供卫生热水。来自于电厂的120摄氏度的高温热水则用来作为酒店非电空调的驱动热源。

The HTHW output after being used to provide chilled water via the absorption chillers is then connected to an additional set of heat exchangers to produce DHW, and the "spent" HTHW loop temperature water is then sent back to the power plant with a temperature of ±158° F(70℃).

高温热水在经过空调制冷后的回水再经过额外的换热器来制取卫生热水，最终卫生热水约70摄氏度的回水被送回电厂。

In this way a large delta T 90° F(50℃) can be effected by using the single loop to serve two purposes, first high quality heat to run the chillers, and second the lower temperature resulting water out of the chillers used for all or part of domestic hot water generation. Energy was used in cascade.

这样，通过简单的循环来服务两个目标可以实现大温差（50℃）。首先，高品味的热源用来驱动空调，其次，从空调出来的次一极的热源用来全部或部分制取卫生热水。实现了能源的高效综合利用。

HVAC scheme
空调主机参数如下

Model 机型	Quantity 数量	Capacity 发电量
Absorption chiller 烟气型吸收式空调	8 units 8 台	4MW/unit 4MW/台
Brand 品牌：BROAD 远大		
Heat input 能源输入：Hot water 热水		
Origin 原产地：China 中国		

Economy Analysis

Reduction of 25% of the electrical energy (kWh) consumed by the resorts versus the option of not cogeneration, this is because about these resort group consumed 34% of the electrical bill to produce chilled water before the district project energy was implemented. This implies that the utility consume 25% less fuel to supply electric power to these resort group and can delay the expansion of electrical transmission and distribution networks.

The base demand for chilled water of the resorts was covered by BROAD absorption chillers plus reuse of limited amount of existing peak cooling with the current older electric chillers.

All demand for domestic hot water was supplied to the resorts group by the district energy, therefore the fuel consumption in the domestic hot water boilers was reduced to zero. This is meaningful given that all were operated from Diesel or GLP, which is very expensive.

This project demonstrated that you can use waste energy to produce thermal energies (chilled water and domestic hot water) required in the resorts for the comfort of its customers, in such a way that both the resorts benefit through total cost reduction as compared to the previous all electric load case, and the utility wins through actually increasing net revenues in a cost effective way which helps to cement a long term relationship with large key customers. This then becomes truly a win-win situation for all, which is one of the avowed goals of any third party cogeneration project.

With this cogeneration approach, about 25% of thermal energy is recovered to drive absorption chillers and DWH heat exchangers and reduce the Fuel consumption by 35,740 Bbl/year of HFO and 32,881 Bbl/year of LPG. The Greenhouse gas emission is reduced by over 28,872 metric tons CO_2/year.

经济性分析

相较于传统模式，冷热电联产使得度假村减少了25%的电能消耗。在区域能源实施之前，这些酒店消耗了 34%的电来制冷。这意味着这些度假村少用了 25%的公众用电，而且能够节省电力输配网络的投资。

度假村的基本制冷需求由新安装的远大非电空调来提供，已有的电冷机仅作为调峰备用。

度假村所有的卫生热水的需求都由区域能源系统提供，不再需要安装锅炉。由于供锅炉的燃料柴油或液化气价格昂贵，更使得该系统意义非凡。

该工程向人们展示了废能是能够用来给度假村的客户提供制冷和卫生热水需求的，也使得度假村经营方和大众都有受益。相比之前全部用电力承担负荷，度假村方面通过整体费用节省而获利。同时，费用的节省使得大众实际净收入增加，从而进一步巩固了和大批重要客户的长期关系。最终，该工程真正实现了多方面的共赢，这也是所有第三方冷电联产项目公开要实现的目标之一。

在该系统下，约 25%的热能被用来制冷和卫生热水换热，每年减少重油消耗 35,740 桶，减少液化石油气消耗 32,881 桶，每年减少二氧化碳排放超过 28,872 公吨。

Conclusion

This project represents the most innovative energy arrangement in the Caribbean. The use of the residual thermal energy as well as cascade energy use represents the new development creating of the country.

Comparing with others in this area, the hotels will benefit significantly in operating costs and increasing their competitiveness, moreover, it helps them to contribute to environmentally friendly consumption.

The optimization and use of the available thermal energy allows having better chance to meet future power demands of the area since the electrical energy do not consumed by the hotels can be distributed to other new facilities.

The implementation of this project will strengthen the growth of the region that will also maintain a sustainable development in the economic growth of the region.

项目总结

该项目是加勒比海地区最具创新性的能源项目。废热的梯级综合利用代表了多米尼加在能源发展领域的最新开拓。

同该区域的其它地方相比，这里极大降低了运营成本，提升了竞争力，因而酒店获益明显。同时，也为环境保护做出了贡献。

热能的优化利用有利于更好的满足该地区未来的电力需求，因为那些原本要被酒店消耗的电能则可以更好的分配给该地区的新增设施。

该项目的实施将巩固该地区的经济增长，并将为维持该地区的经济可持续发展做出贡献。

What is district energy?

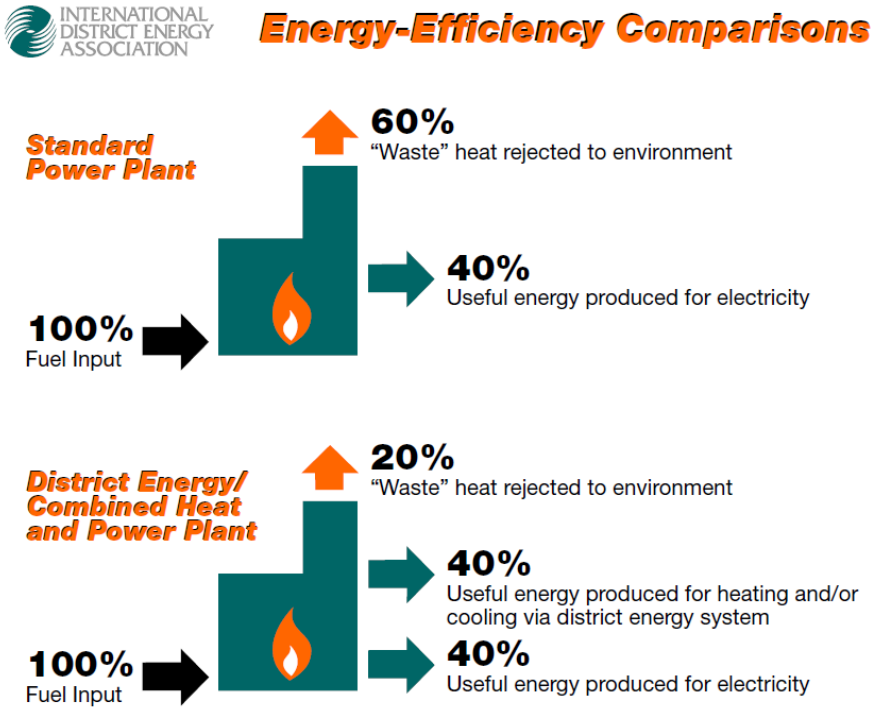
什么是区域能源?

District energy systems produce steam, hot water or chilled water at a central plant. The steam, hot water or chilled water is then piped underground to individual buildings or factory for space heating, domestic hot water heating, air conditioning or industrial process use. As a result, individual buildings served by a district energy system don't need their own boilers or furnaces, chillers or air conditioners. The district energy system does that work for them, providing valuable benefits including:

区域能源系统通常在某个区域的集中生产蒸汽，热水或者冷水，并通过地下管道将这些蒸汽和冷热水送至周边的单个建筑或工厂，提供建筑的空间制冷制热及卫生热水需求或生产工艺用途。因而单独的建筑便不需要再安装锅炉或是空调。区域能源系统能够提供所有这些需求，并带来以下

Improved energy efficiency; Enhanced environmental protection; Fuel flexibility; Ease of operation and maintenance Reliability; Comfort and convenience for customers; Decreased life-cycle costs; Decreased building capital costs Improved architectural design flexibility

✓提高能源效率
✓燃料更加灵活
✓运行稳定可靠
✓减少运行费用
✓建筑设计灵活
✓加强环境保护
✓操作维护简便
✓客户舒适方便
✓减少建筑投资



From the data of International District Energy Association (IDEA), It is easy to know that the energy efficiency of a standard power plant is only 40%, and that of 60% is wasted as the waste. However, with the same fuel input, the energy efficiency can be 80% if the power plant combined heat and cooling. Obviously it will benefit a lot not only in saving energy cost but also to the environmental protection.

District energy is the best application of CCHP system, which is widely accepted around the world as it can maximize the energy efficiency.

从国际区域能源协会公布的数据看，传统的发电厂的能效为 40%，而 60%被当作废气/水被排放到大气中。然而，相同的能源输入，冷热电三联供的能效可以达到 80%。无论是在节省能源费用方面，还是在环境保护方面，该系统都将带来巨大的利益。

在全球范围内看，区域能源都作为冷热电三联供系统最好的应用而被广泛接受，因为它是能源利用效率最大化最好的方式。