

# Evaluation the contribution of using geothermal energy (renewable energy) for air conditioning in decreasing electric energy consumption

تقويم مساهمة استخدام طاقة باطن الارض ( طاقة متجددة) في تكييف الهواء  
بتقليل استهلاك الطاقة الكهربائية

Seminar presented by

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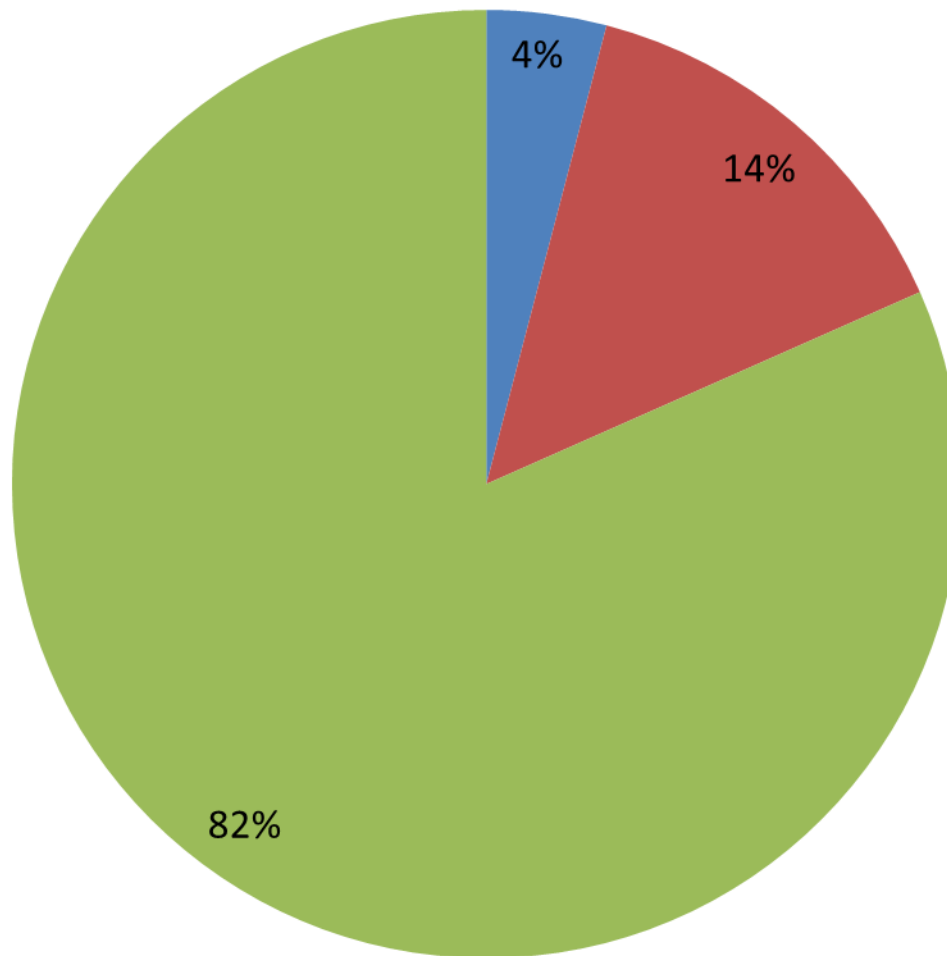
Mechanical Engineering Department/ Engineering College/ Diyala University

المؤتمر الطلابي

11/5/2017

# Electric consumptions for a conventional house in Baqubah city

■ Lighting   ■ Equipments   ■ Air conditioning

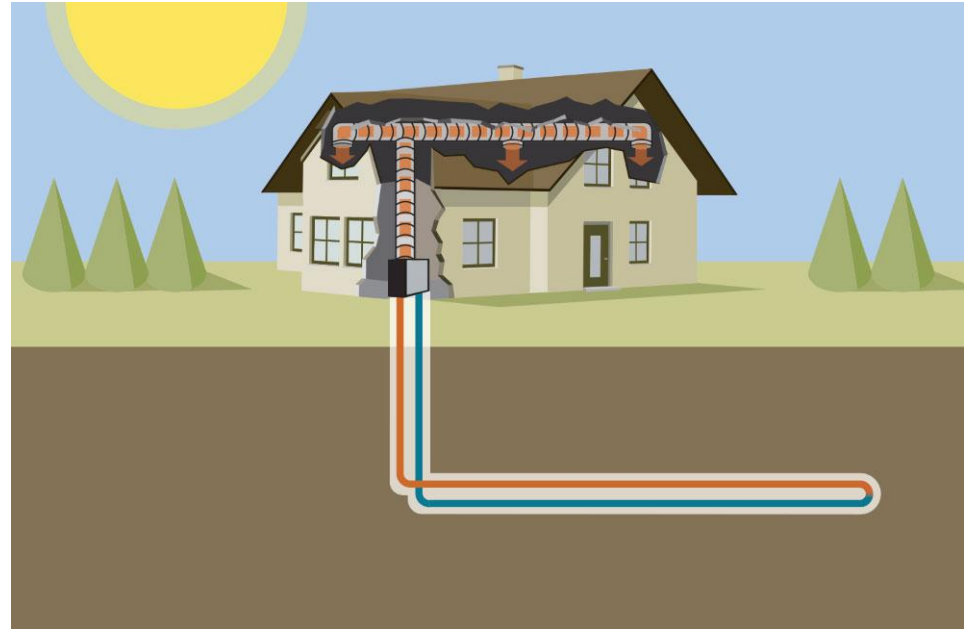


# What is geothermal energy?

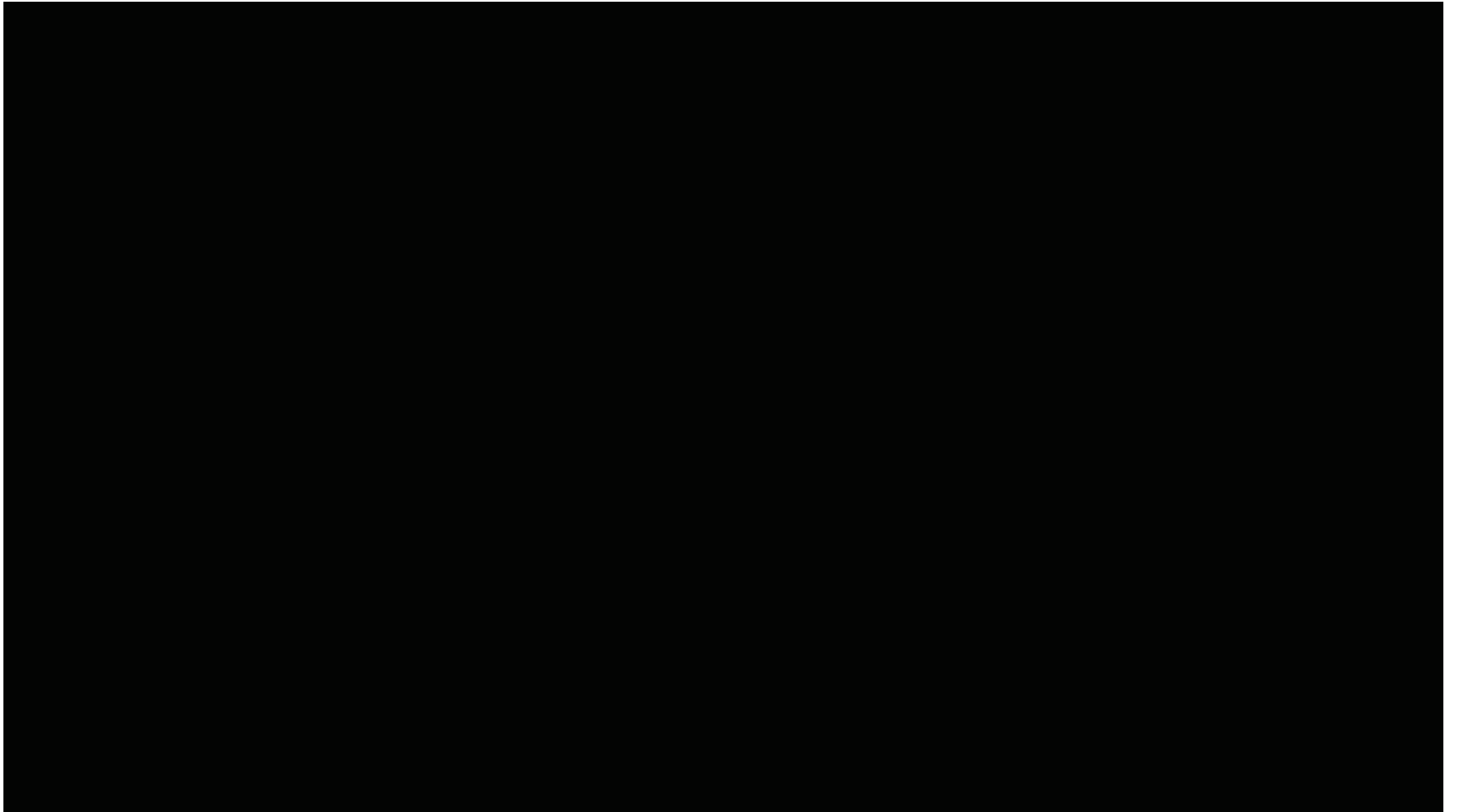
- 1- Water temperature under ground is constant due to huge heat storage capacity of the ground
- 2- This advantage can be used in A/C applications.
- 3- The electric power needs to circulate water between the conditioned space and under ground is pretty much low in comparison to electric power needs to operate a conventional compression refrigeration system.

# How does it work ?

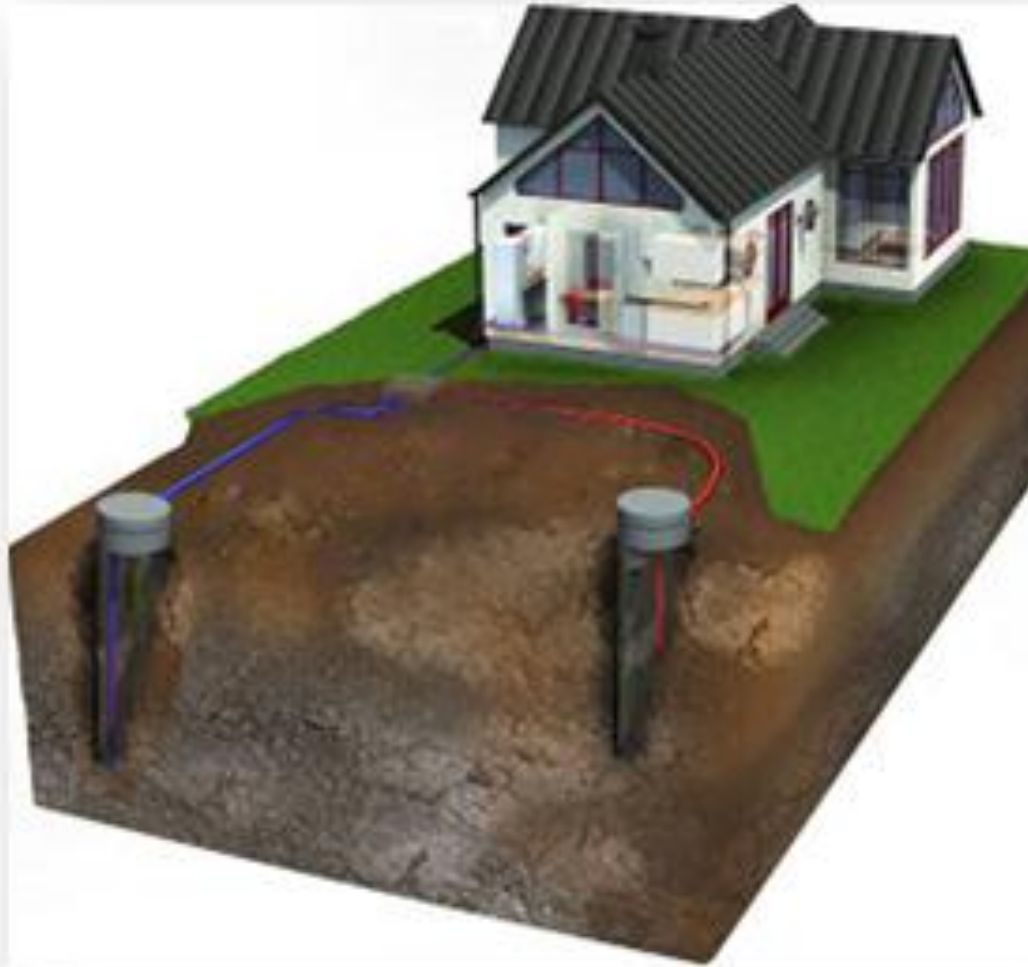
- 1 At the ISB's new campus in Mahall (in left, shows one of the buildings), cold water from a 'chiller plant' circulates through the building, absorbs heat, reaches high temperature
- 2 The heated water passing again through the chiller plant, reaches the heat exchanger
- 3 The geothermal exchanger cools the water as it flows through an underground network of pipes
- 4 Cooled water goes back into the building



# How does it work?

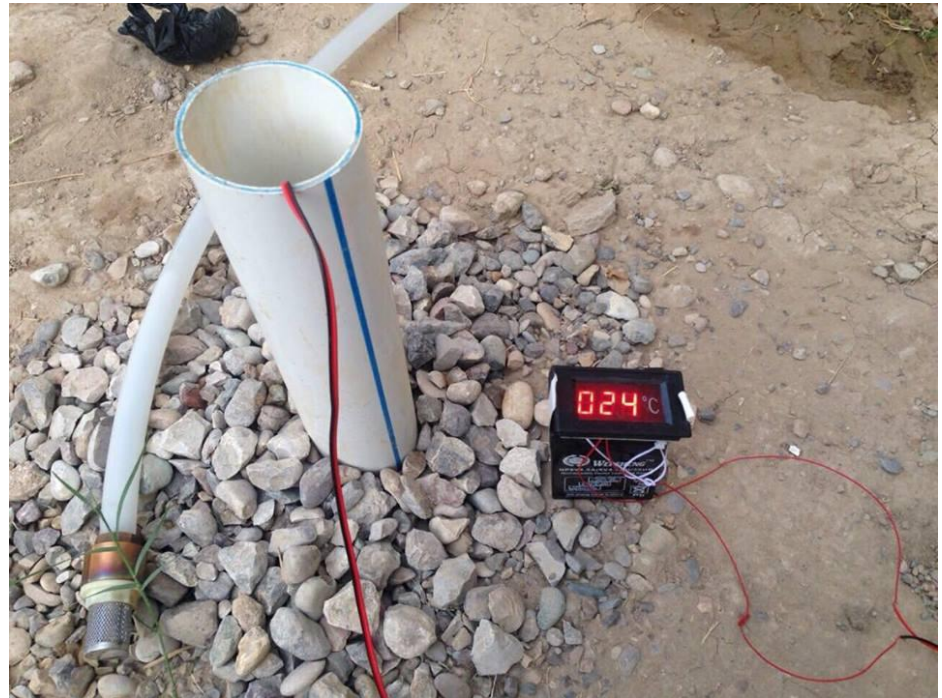


# Proposed A/C system



# Experimental setup

## 1- Well (borehole) drilling



# Experimental setup

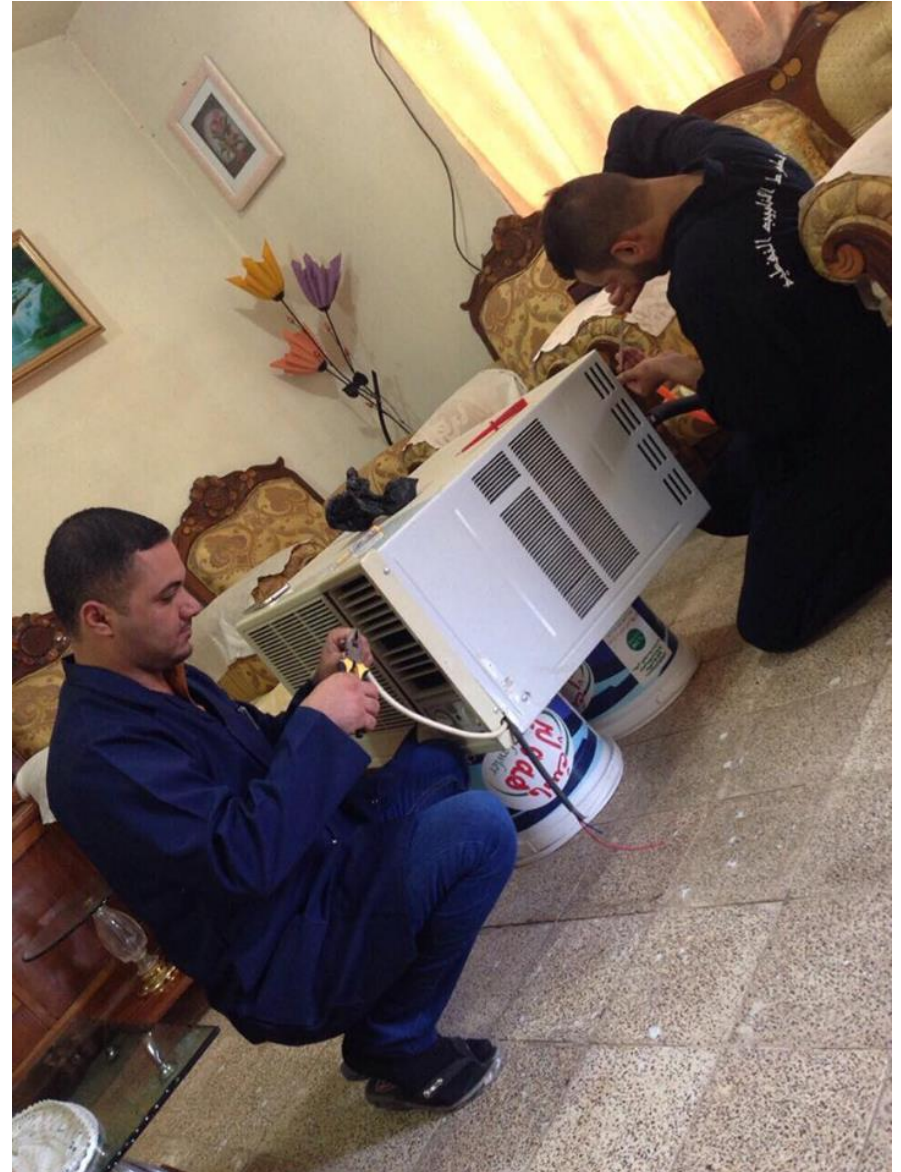
## 2- A/C system preparations





# Experimental setup

## 2- A/C system preparations



# Data collection



# Preliminary results

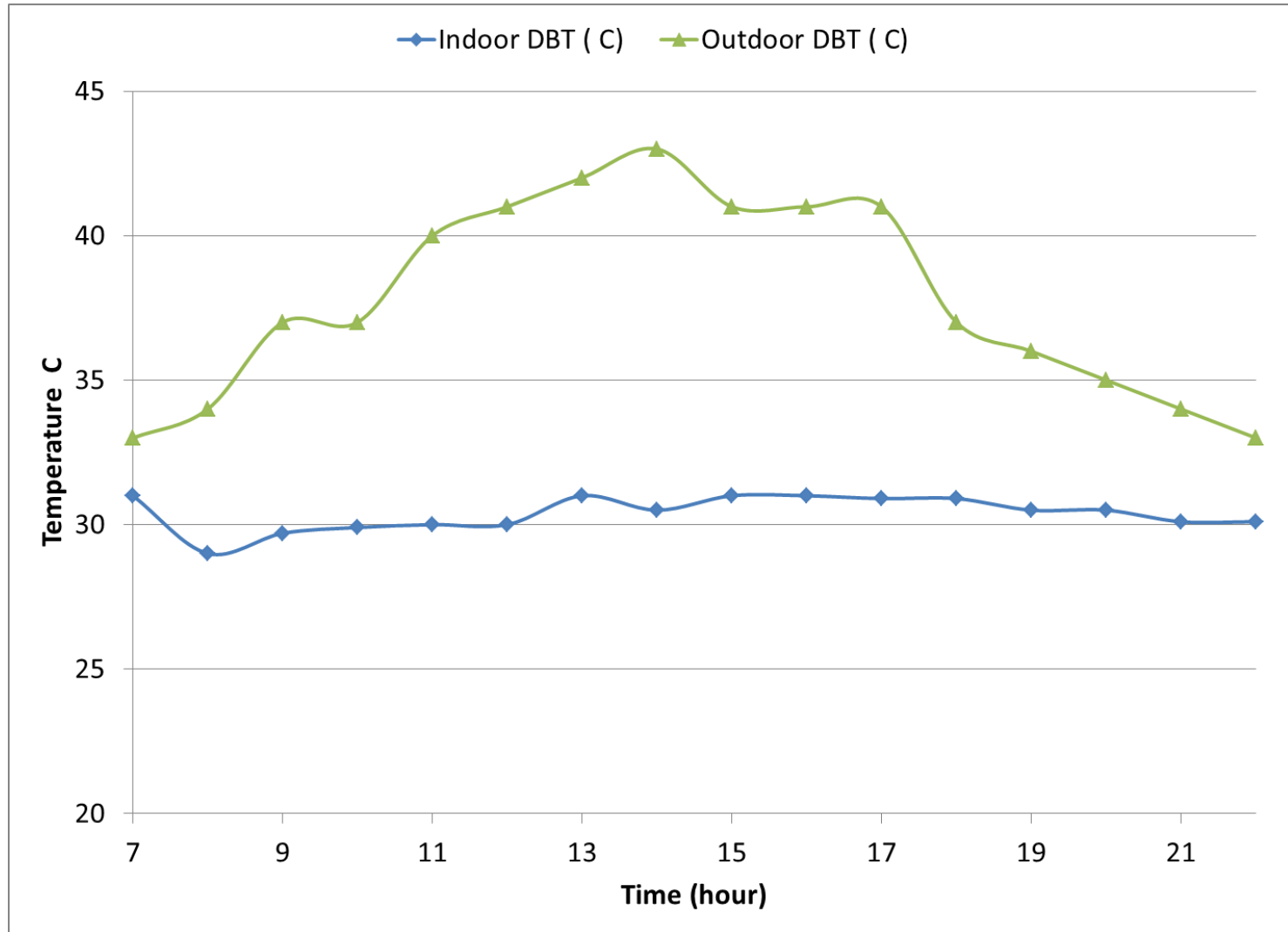


Figure (1) Temperature reading for indoor and outdoor at Aug/10/2016 Summer

# Preliminary results

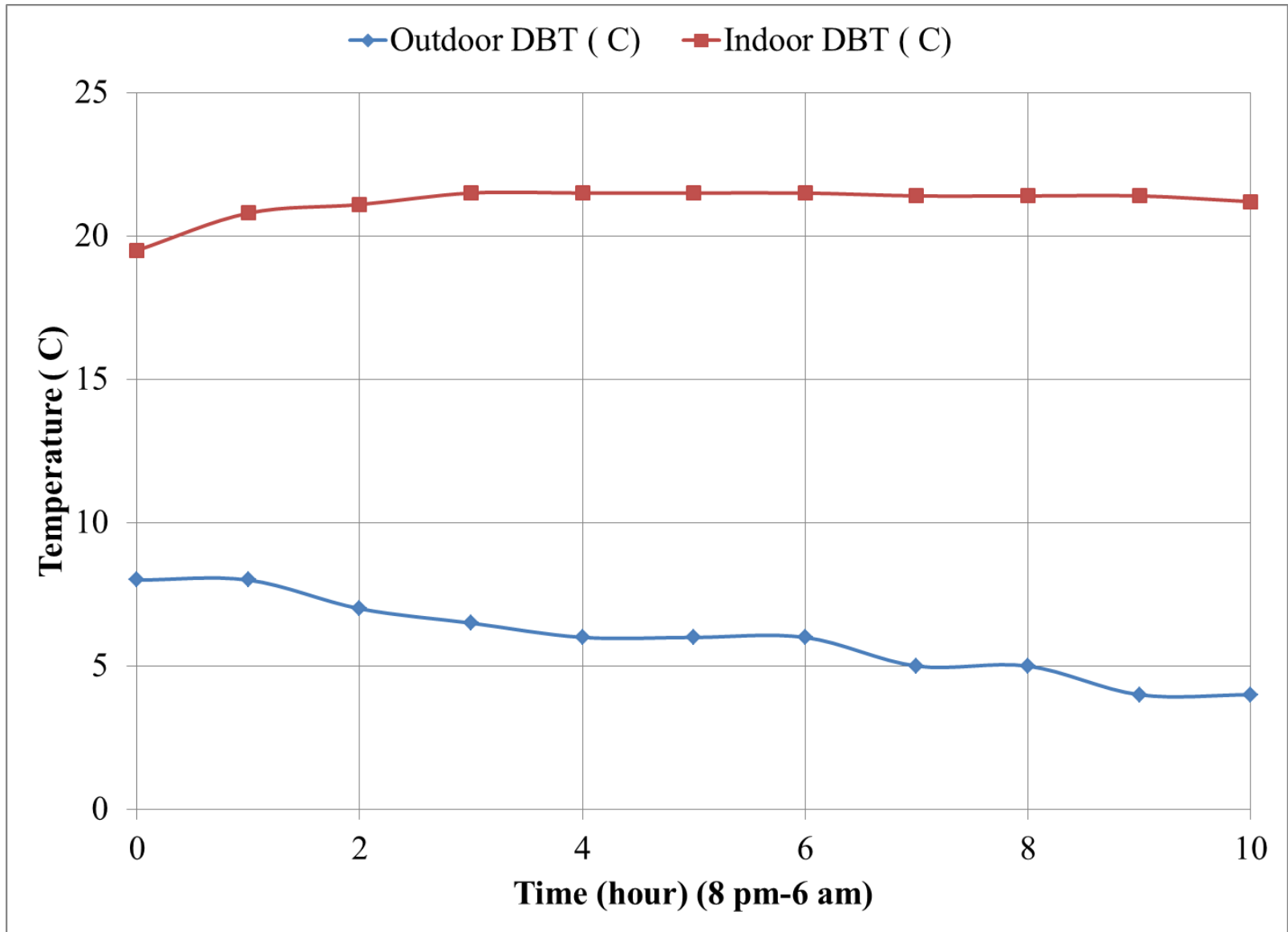


Figure (2) Temperature reading for indoor and outdoor at December/15/2016 Winter

# Preliminary results

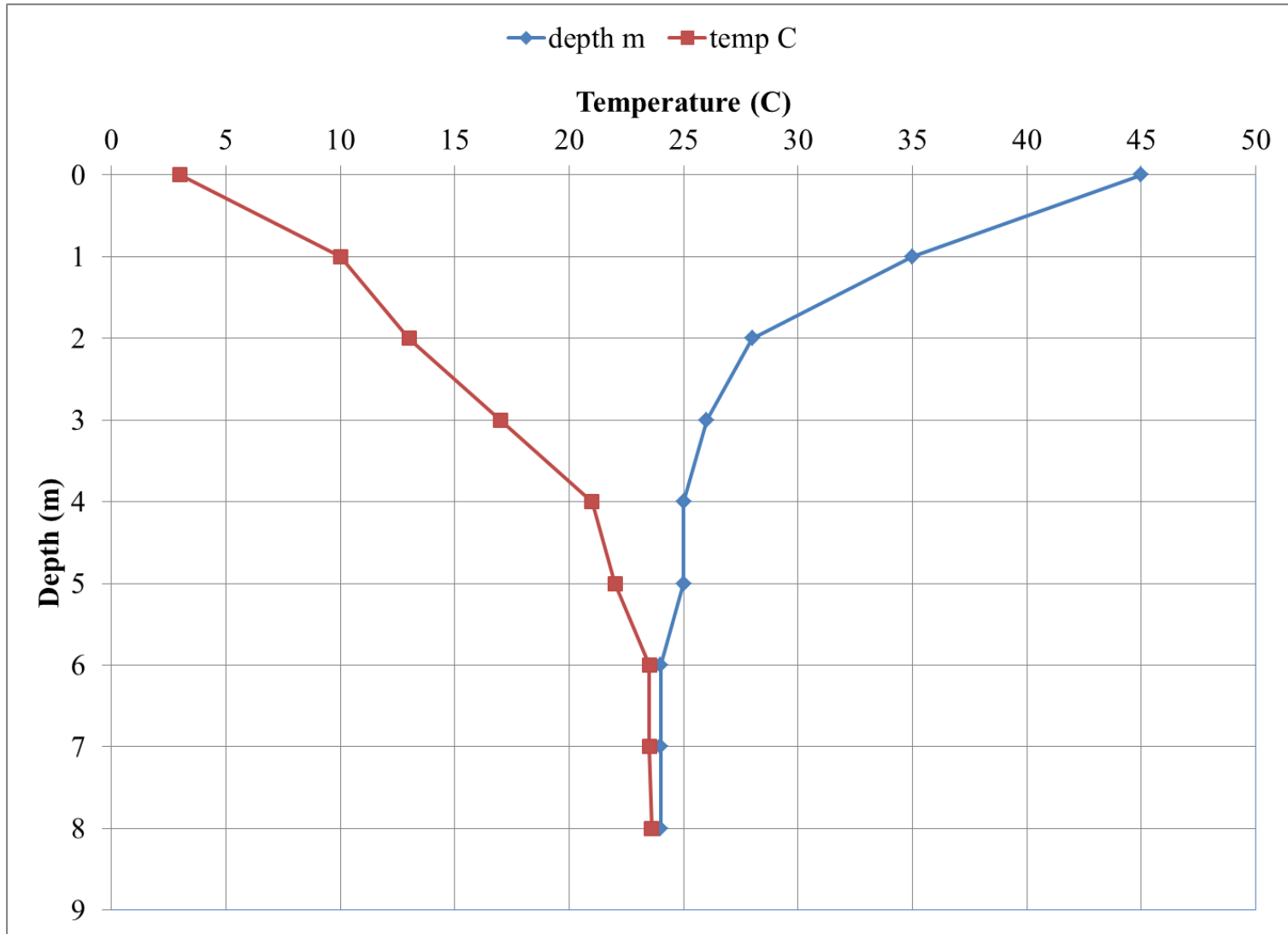


Figure (3) Variation of well water temperature with depth at Aug and December

# Preliminary results

ت	الاستهلاك للوحدة بالكيلو واط / ساعة	سر وحدة الكيلوواط / ساعة بالدينار العراقي	مايعادله بالامبيرية	المبلغ بالدينار لشهر كامل	الأجهزة التي تعمل ضمن هذه الفئة
.1	500-1	10	5	5000	جميع الأجهزة الأساسية + مبردة هواء
.2	1000-501	10	10	10000	جميع الأجهزة الأساسية + مبردة هواء + مكيف عدد 1 صغير
.3	1500-1001	20	15	20000	جميع الأجهزة الأساسية + مبردة هواء + مكيف عدد 1 كبير + مكيف عدد 1 صغير
.4	2000-1501	40	20	40000	جميع الأجهزة الأساسية + مبردة هواء + مكيف عدد 2

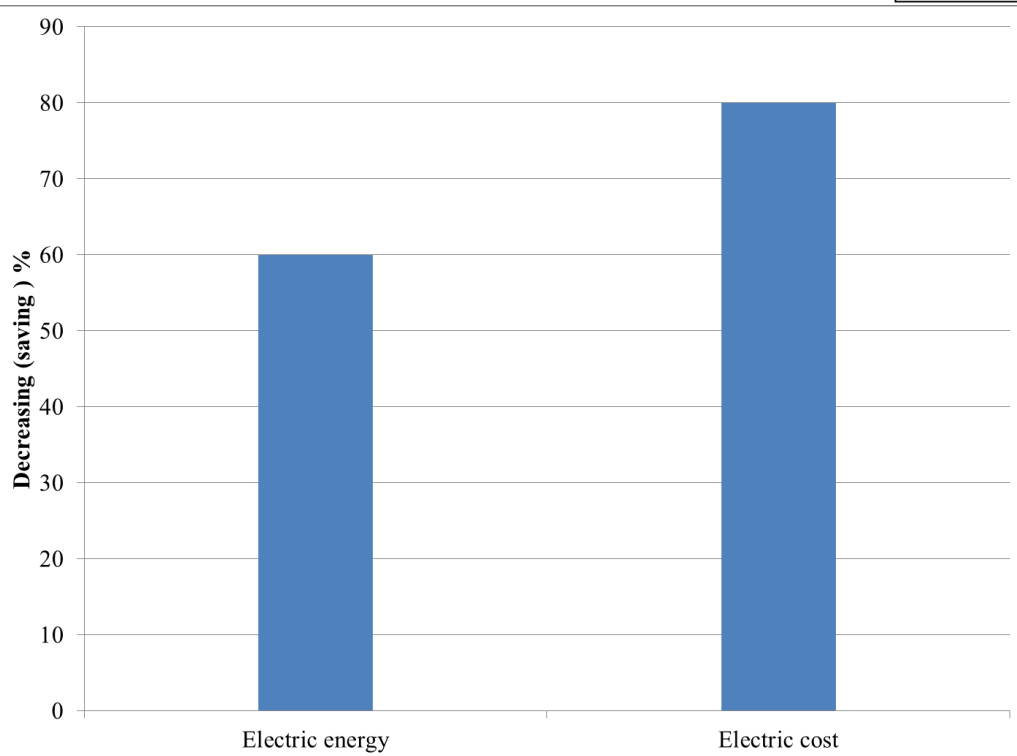


Figure (5) energy and cost saving percentage in comparison to conventional AC

# Limitations and challenges

1- The geothermal energy can't insure occupation's satisfaction and that because of the well water temperature. The well water temperature was always more than dew point temperature. Therefore, to guarantee comfort conditions, the AC may still needed but much lower from before (about 60-70 % less)

2- There is a challenge of corrosion because of using open cycle and the potential of salt in the well water. Therefore, the next study going to concern about this matter.

Thanks for your attention!!!



questions ????