Green communications in 5G

Tim Van Den Driesschen
Rodrigo Arias Mallo

Universitat Politècnica de Catalunya

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Introduction

- In the next decade, the number of connected devices is expected to increase 100 times and the data volume by 1000 times
- Operators are already facing significant power bills
- Moving towards green communications is important both for **environmental** and **economic** reasons

Network planning and deployment

Harvesting renewable energy resources

In order to power the Base Stations (BS), energy can be obtained from renewable sources:

- Natural sources: Sun, wind, vibration
- External: Batteries, fuel cells

User-centric designs

Smaller frame overhead

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Green metrics

Power consumption

Open problems

- Power control in green communications
- Energy efficient hardware
- Energy efficient network architecture
- Battery technology enhancement: sugar bio-batteries

Sugar bio-batteries [183]

- The typical density of energy of a Lithium cell is around $0.54\,\mathrm{MJ\,kg^{-1}}$
- But the combustion energy of glucose can release up to $15.5\,\mathrm{MJ\,kg^{-1}}$
- Sugars are non toxic, safe and carbon neutral