IRENA WORKSHOP ON ADDRESSING THE GEO-SPATIAL ASPECTS OF VARIABLE RENEWABLE ENERGY IN LONG-TERM PLANNING

Country experience
CROATIA

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Introduction

- EIHP founded in 1994
  - 87 employees
  - Various areas of activities:
    - Strategic planning in the energy sector
    - Development of electric, gas, petroleum and heating systems
    - Market, legal framework, restructuring of the energy sector
    - Energy efficiency
    - RES, environmental and climate protection
    - Energy balances and statistics
    - In-service trainings and promotional activities

Overview of analyses

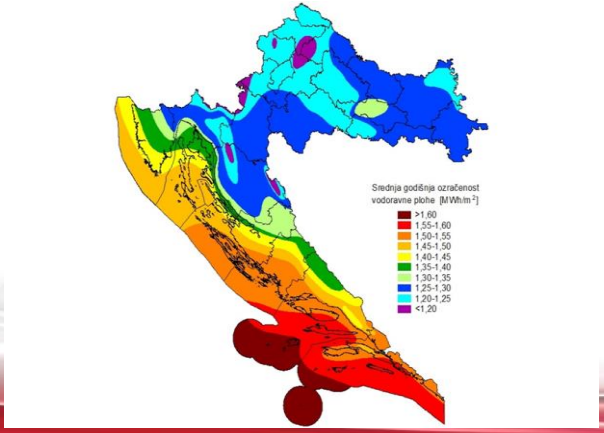
National Energy Strategy until 2030/2050

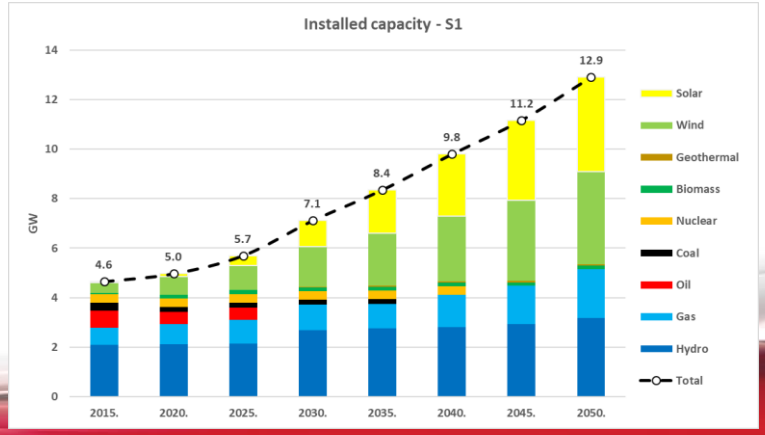
- Major objective of the strategy was the identification of possible pathways towards joint EU target of 80% GHG emission reduction
  - Energy and electricity demand analysis (MAED)
    - Structure of overall energy demand and share of electricity
  - Electricity supply options (MESSAGE)
    - National case study
    - Results on competitiveness of various electricity supply options
  - Green book
    - Results of an analysis of possible energy development scenarios by 2050
    - Based on projection of demographic and economic development of Republic Croatia, made in previous period as an analytical platform to prepare an energy strategy
  - White book
    - Second step towards creating the Strategy
    - Deals with the issues of implementation of energy sector transition

Overview of analyses (2)

National Energy Strategy until 2030/2050

- Demand projections for two regions, continental and Mediterranean
- RES potential was determined and divided into those two regions
  - Wind atlas
    - Resource maps are compared to environment protection plans, populated areas, etc.
    - It is done using GIS tools
  - Solar potential





Overview of analyses (4)

Integrated Resource Plan for Botswana

Objectives

- **Diversification** of sources of electricity generation
- **Competitiveness** in electricity sector
- **Security** of electricity supply
- **Self-sufficiency** in electricity generation and becoming a net **electricity exporter**
- Mitigation of environmental impact, mostly by using **low carbon technologies**

Overview of analyses (5)

Integrated Resource Plan for Botswana

Methodological approach

- Model of Botswana power system developed in MESSAGE tool
- **Data collection** on the existing power system
- Analysis of **available resources** and identification of **expansion power plant candidates**
- Analysis of seasonal and intraday **demand and generation variabilities**
- Modelling **demand forecasts** (results of MAED model)
- Regional electricity market analysis
- Development of **supply scenarios** combined with demand scenarios
- Analysis of results

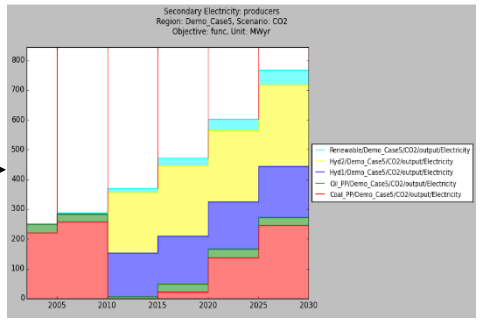
Overview of analyses (6)

MESSAGE: **M**odel for **E**nergy **S**upply **S**ystem **A**lternatives and their **G**eneral **E**nvironmental impacts

INPUT

- *Energy system structure (including vintage of plant and equipment)*
- *Base year energy flows and prices*
- *Energy demand projections (MAED)*
- *Technology and resource options & their techno-economic performance profiles*
- *Technical and policy constraints*

OUTPUT

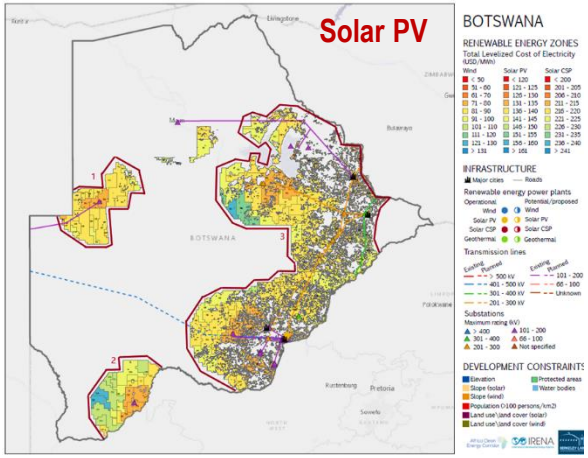


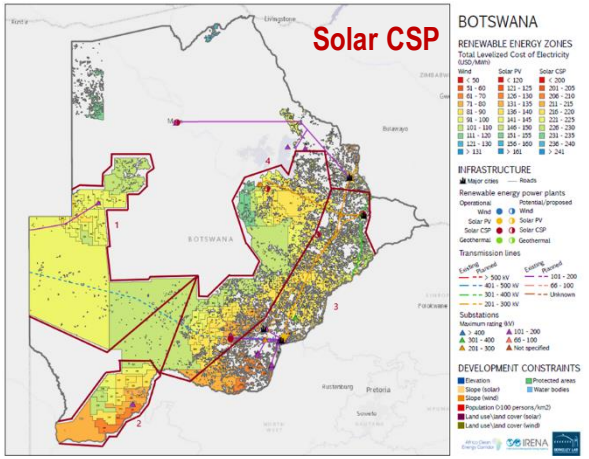
- *Primary and final energy mix*
- *Emissions and waste streams*
- *Environmental impacts*
- *Resource use*
- *Land use*
- *Import dependence*
- *Investment requirements*

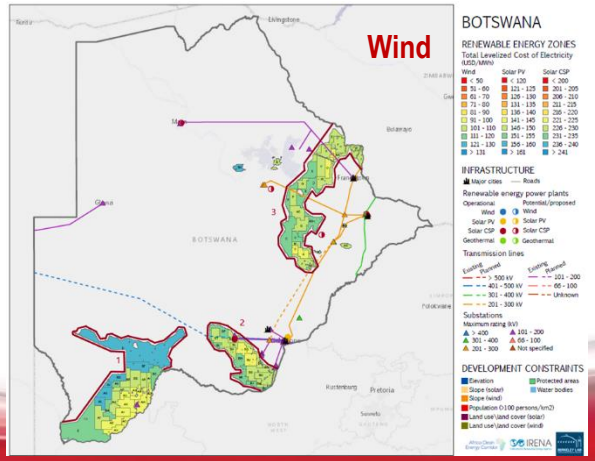
Overview of analyses (7)

Integrated Resource Plan for Botswana

Expansion project candidates





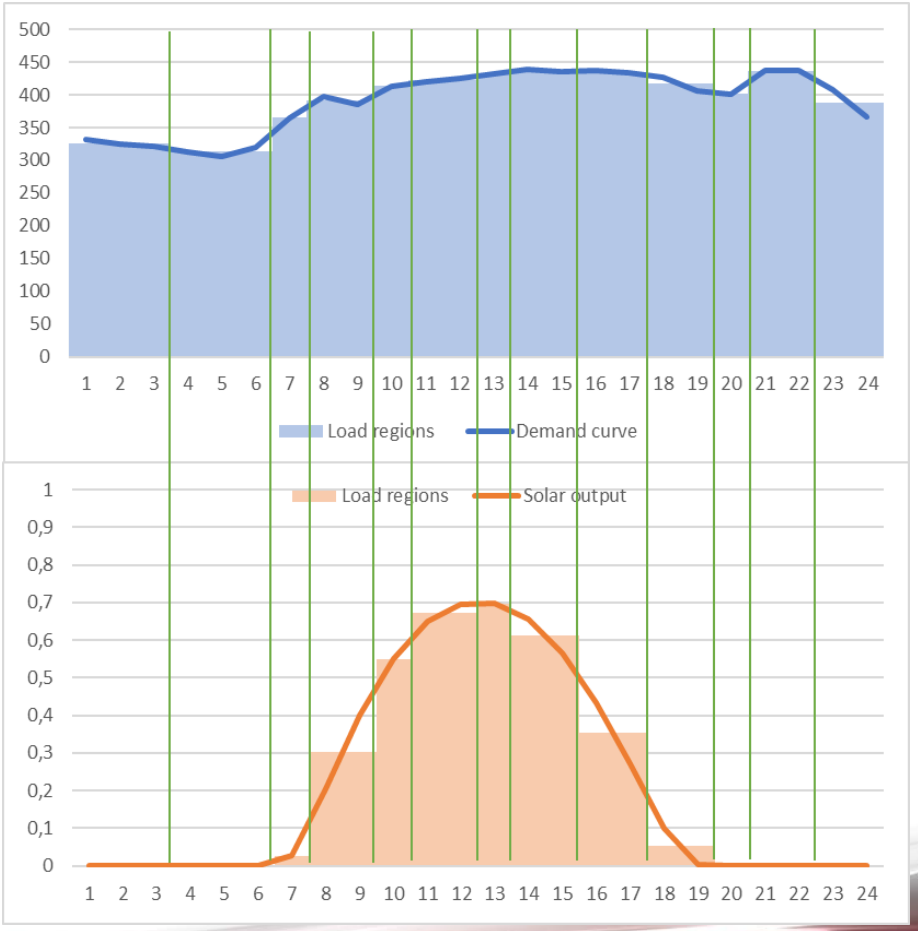


Overview of analyses (8)

Integrated Resource Plan for Botswana

Modelling demand and generation variations

- Hourly data analysed
- Seasonal variations in electricity consumption minimal and variations in solar irradiation somewhat higher – three seasons in a year were distinguished
  - Season 1: January – April
  - Season 2: May – August
  - Season 3: September – December
- Intraday variations of demand and renewable energy generation



Q & A

Thank You for Your attention!

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