TURKISH COAL MINING SECTOR

*Current State, Strategy for the Future*

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UNECE EG CMM, GMI & MENR

Workshop on Best Practices in Coal Mine Methane Capture and Utilisation

10 June 2019, TKI, Ankara
OUTLINE

- Overview of Turkish Mining Sector
- Turkish Coal Mining Sector
  - Key Drivers of Coal Policy of Turkey
  - Coal in Domestic Energy Production
  - Coal Basins and Resources
  - Coal Producers & Production
  - Role of Coal in Turkey's Energy Mix
  - Role of Coal in Turkey's Electricity Generation
  - Future strategies & Planned Main Coal –Based Capacity
- Short Introduction of TKI
Overview of Mining Sector in Turkey

- Turkey produces more than 50 mineral commodities
- **Major minerals**: Coal, boron, chromium, copper, iron, gold, marble, bentonite, feldspar, trona (Turkey owns 72% of the World’s boron reserves)

- **Trade**
  - Mineral export share in total (2018): 2.7% (İMİB)
    - *Natural stone highest share*
  - Mineral import share in total: 3%
    - *Hard Coal import*: 4.4 Billion $
    - *Highest value in total mineral import*: 6.8 Billion $

- **Size of mining**
  - **Number of mining companies (2017)**: 6219- *(Coal: 436)*
    - *(State: 53; Private: 6166)*
  - **Number of Workforce**: 130,523 *(Coal: 37596)*
    - *(State: 12600; Private: 117,923)*
**Current State of Turkish Coal Mining Sector - Key Drivers of Coal Policy:**

- **ENERGY SECURITY** - Growing energy demand & High dependency on foreign energy resources

- **ENVIRONMENT** - Commitments for efficient use of coal to protect environment & combat climate change

- **RTD** - High dependency on technology

- **PRODUCTIVITY & VALUE ADDED** - Requirement to increase productivity and value-added by high efficient technologies & Establishing transparent and competitive market through privatization

- **SAFETY** - Requirement to improve work health and safety
Current State of Turkish Coal Mining Sector
- ENERGY SECURITY - Objectives

Domestic Energy Production (2017) : 35.4 Mtoe

Foci to increase use of domestic resources by using clean energy tech.
- To increase coal exploration studies
- To increase coal production
- To increase productivity & efficiency
- To accelerate deployment new cleaner domestic lignite-based power plants by selecting high efficient technologies
- Improve incentives for lignite-based PP.
- To maintain the momentum at RTD studies on Clean Coal Technologies (to promote domestic techn. development)

Total Coal Share: 43%

Raw Data: 2017 Energy Balance Table of MENR

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Lignite Reserves: 17,46 Billion ton (about 9 Bt reserve increase 2005-2018)
Hardcoal reserves: 1.3 Billion ton (512 Mt proved)
In 2018
- 20% increase in TKI’s coal production (30 Mt)

Turkey:
- 3rd biggest Lignite producer country
- 8th biggest coal importer country

(Ref: IEA Coal Information)
Target is to increase productivity and value-added by high efficient technologies.

Establishing transparent and competitive market through privatization.

<table>
<thead>
<tr>
<th>Producer</th>
<th>2011</th>
<th>%</th>
<th>2017</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lignite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TKİ</td>
<td>41,5</td>
<td>50</td>
<td>23,3</td>
<td>28</td>
</tr>
<tr>
<td>EUAS</td>
<td>31,5</td>
<td>38</td>
<td>15,2</td>
<td>18</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td>0,1</td>
<td>0</td>
</tr>
<tr>
<td>State total</td>
<td>73</td>
<td>89</td>
<td>38,5</td>
<td>46</td>
</tr>
<tr>
<td>Private Sector</td>
<td>9,4</td>
<td>11</td>
<td>45,7</td>
<td>54</td>
</tr>
<tr>
<td>Total</td>
<td>82,4</td>
<td>100</td>
<td>84,2</td>
<td>100</td>
</tr>
</tbody>
</table>

Run of mine - Million ton

- **COAL POLICY- Privatization**
- **- Change in Owner of Production (2011-2017)**

Source: MAPEG

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Role of Coal
- Comparison with EU and World Average (2017)

Coal Share in Energy Mix

- World: BP Statistical Review of World Energy 2018
- Turkey: 2017 Energy Balance Table of MENR
Role of Coal
- Comparision with EU and World Average (2017)

Coal Share in Electricity Generation, 2017

Electricity Generation, Turkey, 2018


Total Coal share: 37.2%
TKI (State Economic Enterprise) major lignite producer in Turkey since 1957

By the end of 2018:

- Reserve amount: 2,13 Bt (23% of Total Lignite Reserves)
- Production (r.o.m.): 30 Mt
  - Open Pit: 16 Mt
  - Underground: 14 Mt
- Sales: 20 Mt
  - Power Plants: 12.6 Mt
  - Industry+Household: 7.4 Mt
- Personnel: 17313
  - TKI: 4,386
  - Contractor: 12,927

LEADING ROLE in initiating, supporting, development of RTD Projects on COAL
TKI has a wide international network to collaborate with coal-related research institutes, organisations, boards, universities, companies:

- Membership to IEA-CIAB, EURACOAL, Vice-Chair at Bureau of UNECE CEP
Current State of Turkish Coal Mining Sector
- TKI and Its Contractors’ Main Underground Mines

Tuncbilek Region:

Ömerler U/G Mine (GLİ)
Producer: TKİ (State)
Production Cap: 1 Mt
Workforce: 600
Mining Method: Longwall
Gas Content: low (ITU Report)

Soma Eynez Region

Soma Eynez
Producer (IMBAT - private (contractor of TKI)
Production Prog(2019): 6.8 Mt
Workforce: 5600
Methane Amount: 1 ton/m3 (ventilation air)
Mining Method: MSL Longwall

Soma Eynez East
Producer (Demirexport-Fernas private -contractor of TKI)
Production Cap: 4.2 Mt
Workforce: 1054
Methane Amount: 0.78 ton/m3 (ventilation air)
Mining Method: Longwall

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R&D PROJECT - Underground coal & CBM determination by integrated (Reflection & WVSP) seismic in the miocene Soma Basin (Western Turkey)

PROJECT DURATION: 2009-2012

PROJECT PARTNERS: TUBITAK Geo-Science Institute (koordinator), TKI, TPAO, Universities

FUNDING: TUBITAK

PURPOSE: To develop Integrated Seismic method for estimating underground coal and investigating coal methane potential

PROJECT AREA: Soma Region

PROJECT RESULTS:
• Determination of gas content of coal samples by canister desorption test: low (only some of 23 drillings: 4 m3/ton)
• Bacterial origin of gas (geochemical analysis result)
• Integrated Seismic Method can be used for coal estimation (fast, cheap comparing to drillings)
**Aim:** is productivity measurement and improvement by effective usage of existing resources and innovative ways

**By:** R&D Department of TKI  
Project Coordinator: (M. Ersoy)  
Company-wide working group

**In 2018**
- Company-wide awareness conferences
- **Trainings** on «productivity measurement» and «work-study techniques including field applications»
- Determining **productivity indicators** for whole activities (indicators prepared),

**In 2019**
- Brain storming meeting on finalizing indicators 12 March 2019),
- Reporting and evaluation last five years’ indicators: measurement of productivity
- Establishing employee suggestion system
- Designing and implementation of application provide productivity enhancement
- Establishing monitoring system
• Coal upgrading technologies - Increase in capacity of coal washing & enrichment of washing Plant’s coal fines
• Involvement of RTD studies on CCT by coal producers’s own budget, the support of national (TUBITAK) and EU (Framework Programmes) funding
  — to reduce also dependence on foreign imports of high technology.
RTD PROJECTS - Pilot -Scaled Coal Gasification Projects

250 t/h ENTRAINED BED GASIFIER, Tuncbilek, TKI, Turkey
Target: Methanol Production (including CO2 capture)

1.1 MWth CBTL Plant, Soma, TKI, Turkey
Target: Liquid Production (including CO2 capture)

EU 7.FP Project-
1-MW_{th} CFB pilot plant,
THERMAX, Pune, India, Target: IGCC

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SOME ENVIRONMENTAL PROJECTS
TKI’s Reclamation, Olive Oil Production, recycling of waste & u/g water

Olive Oil Production at post mining area

Zero Waste Project

Recycling of Underground Water Project, TKI’s Tuncbilek Mine (GLI)

By 2018: 8.5 Million plants (5133 he)

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**HIGH LEVEL STRATEGIES for FUTURE**

- Energy Security
- Changes in fuel shares in electricity generation

**ELECTRICITY MARKET and SECURITY of SUPPLY STRATEGY PAPER (2009)**

- **Targets for Electricity:**
  - Priority to usage domestic energy resources

To use **all** existing the domestic coal reserves by 2023 by using clean coal technologies

- To increase renewables share to **30%** by 2023

- To decrease n.gas share to **30%**.

- To add nuclear power with min. **5%**

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2018</th>
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<tbody>
<tr>
<td>Fossil fuels share (%)</td>
<td>80.3</td>
<td>68.7</td>
</tr>
<tr>
<td>Renewables energy share(%)</td>
<td>19.7</td>
<td>31.2</td>
</tr>
<tr>
<td>(including Hydro)</td>
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Turkish Coal Mining Sector: Strategies for the Future - Existing and Planned Coal Capacity

2018 Tot. Installed Cap. by Fuel = 88,894 MW

Total Coal Cap.: 19,197,4 MW, 22%
Domestic Coal Cap.: 10,403,5 MW
(2680 MW TKI’s coal)

Planned Coal Based Capacity by EUAS

<table>
<thead>
<tr>
<th>Region</th>
<th>Reserve (Mt)</th>
<th>LCV (Kcal/kg)</th>
<th>Planned Cap. (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afşin-Elbistan C</td>
<td>1.344</td>
<td>1158</td>
<td>1800</td>
</tr>
<tr>
<td>KONYA-Karapınar</td>
<td>1.832</td>
<td>1374</td>
<td>~1000</td>
</tr>
<tr>
<td>ESKİŞEHİR-Alpu</td>
<td>568</td>
<td>2240</td>
<td>900-1100</td>
</tr>
<tr>
<td>AFYON-Dinar</td>
<td>941</td>
<td>1855</td>
<td>1000</td>
</tr>
<tr>
<td>ANKARA-Çayırhan</td>
<td>190</td>
<td>2617</td>
<td>800</td>
</tr>
<tr>
<td>TEKİRDAĞ-Malkara</td>
<td>617</td>
<td>2317</td>
<td>1000</td>
</tr>
<tr>
<td><strong>Total/Avg</strong></td>
<td><strong>5492</strong></td>
<td><strong>1642</strong></td>
<td><strong>6700</strong></td>
</tr>
</tbody>
</table>

Source: EUAS

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Source: TEIAS
Increasing of energy demand and dependency to foreign energy resources and technologies are the main issues of Turkey.

Coal, particularly lignite & renewables are the most important energy resource in Turkey to decrease energy dependence of Turkey.

Continue of usage of domestic coal, particularly for electricity generation requires promotion of more efficient, clean coal Technologies to comply with environmental legislation and climate change commitments.

There is good progress on installing more efficient coal based power plants & improving environmental legislation & also renewables deployment in Turkey.

More importance are given to RTD Projects on Clean Coal Technologies particularly on lignite gasification in cooperation with national and international Research Institutions and Universities,
Thank you for your Attention

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