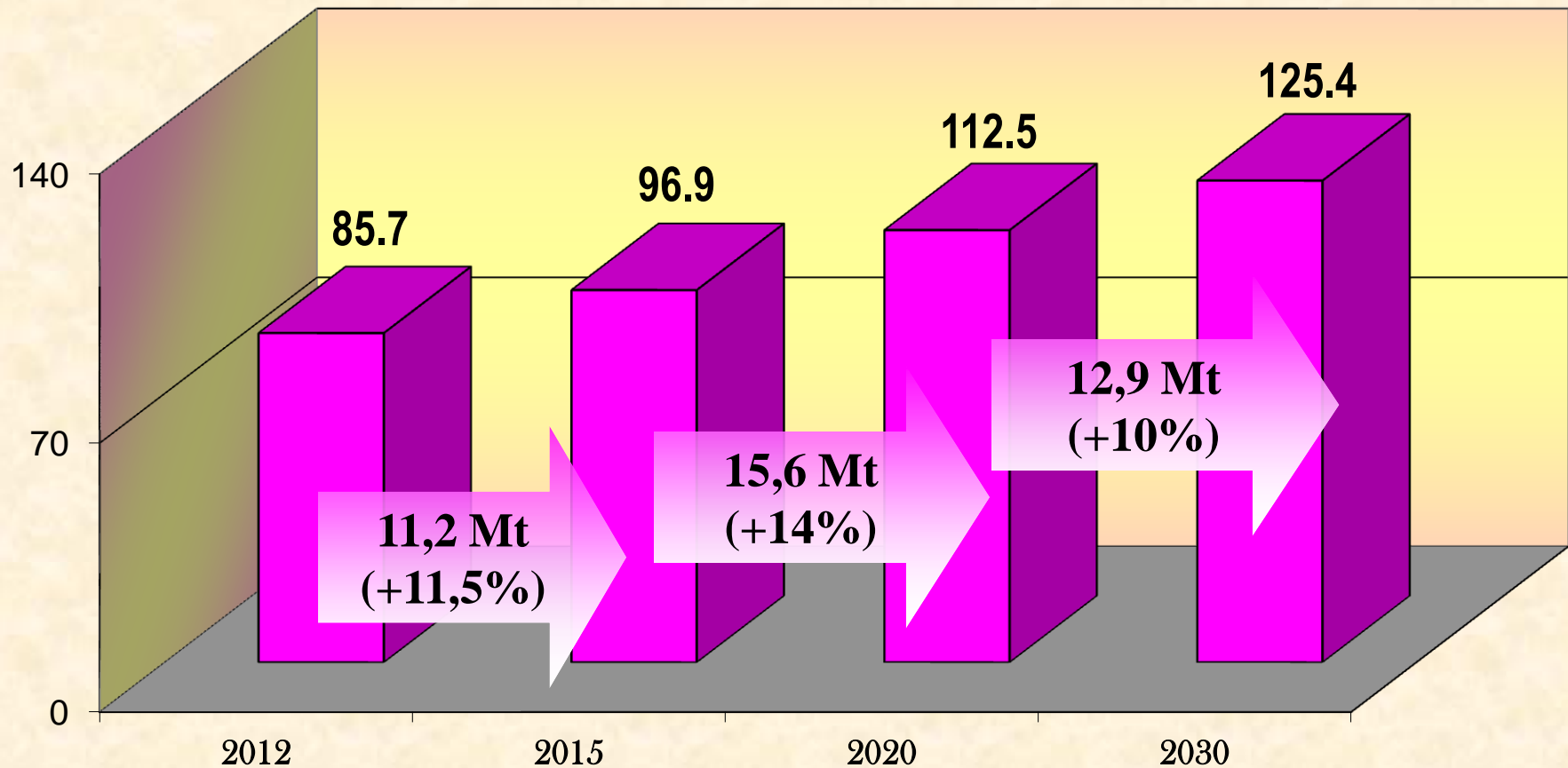


**STATUS OF COAL MINE METHANE
DEGASIFICATION AND UTILIZATION
IN UKRAINE**

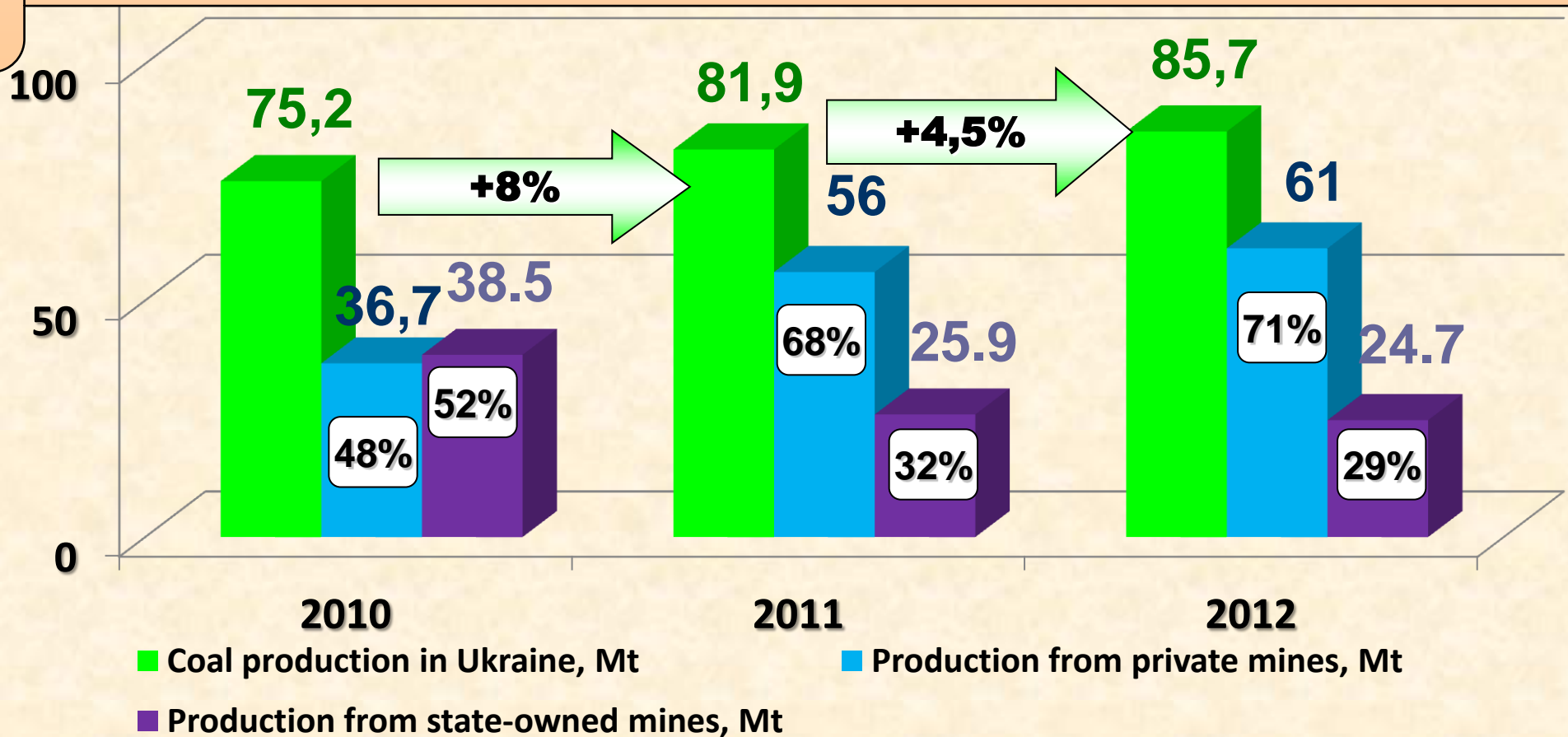
IGOR YASHCHENKO
MINISTRY OF ENERGY AND COAL INDUSTRY OF UKRAINE

***METHANE EXPO 2013,
Vancouver, Canada, 12-15 March 2013***

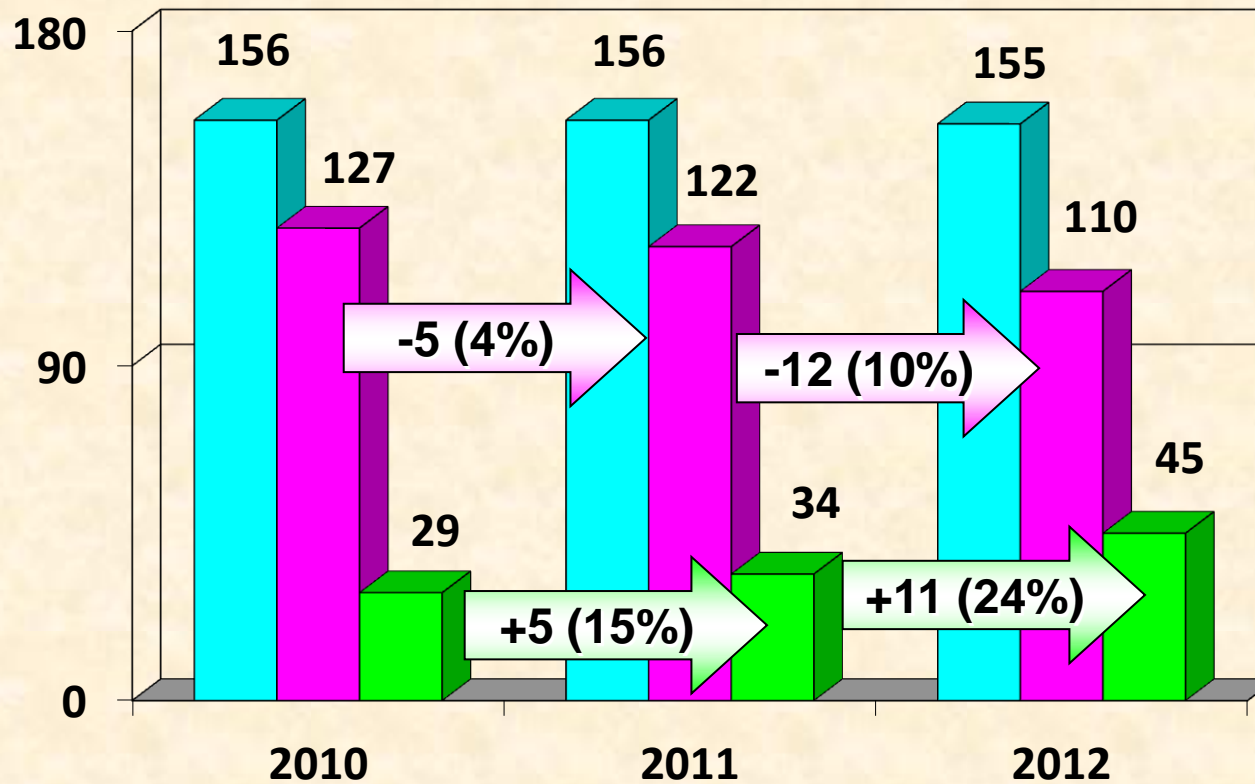
Ministry of Energy and Coal Industry of Ukraine has developed Coal Industry Development Program Until 2030, which sets an objective of increasing coal production by 1.5 times to 2030, from 85 Mt to 125 Mt. Currently the program is being considered by the Cabinet of Ministers of Ukraine



Coal production from Ukrainian mines has grown steadily over the recent years. In 2012 level of production totaled 85.7Mt. Production from the mines which are not owned by the state is increasing with each year and now accounts for 71% in total coal production balance, while that from state-owned mines – for 21%



Coal Industry Development Program Until 2030 determines a direction to further reduction of state share in coal mining and transfer of coal mines to private ownership, leasing or concession. Thus, over the last two years the number of private mines has grown by 36% (from 29 to 45), and number of state-owned ones has reduced by 13% (from 127 to 110)

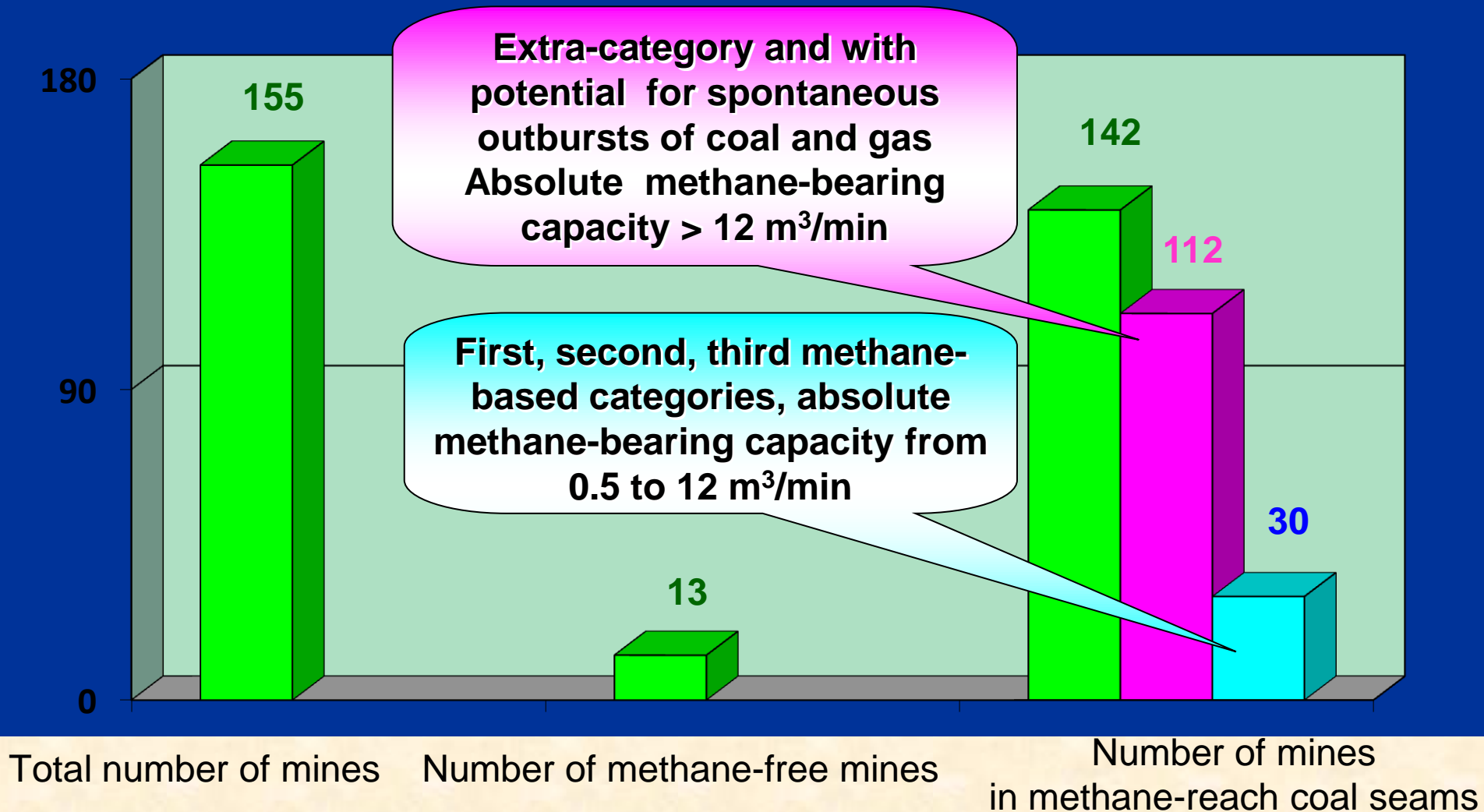


■ Total number of mines

■ State-owned mines

■ Private mines

Coal in Ukraine is produced by 155 large mines, including 142 (91%) in methane-reach coal seams (for 30 mines absolute methane emissions are between 0.5 and 12 m³/min, and for 112 – higher than 12 m³/min and with potential for spontaneous outbursts). These mines in 2012 produced more than 60 Mt of coal (68% of total production)



Geological reserves of gas methane in Ukraine exceed 12 trillion m^3 , 1.1 trillion m^3 of which are recoverable ones, including 150 billion m^3 in operating mines

Total:

12 trillion m^3

including:

**1.1 trillion m^3 –
potential for the extraction**

including: 150 billion m^3

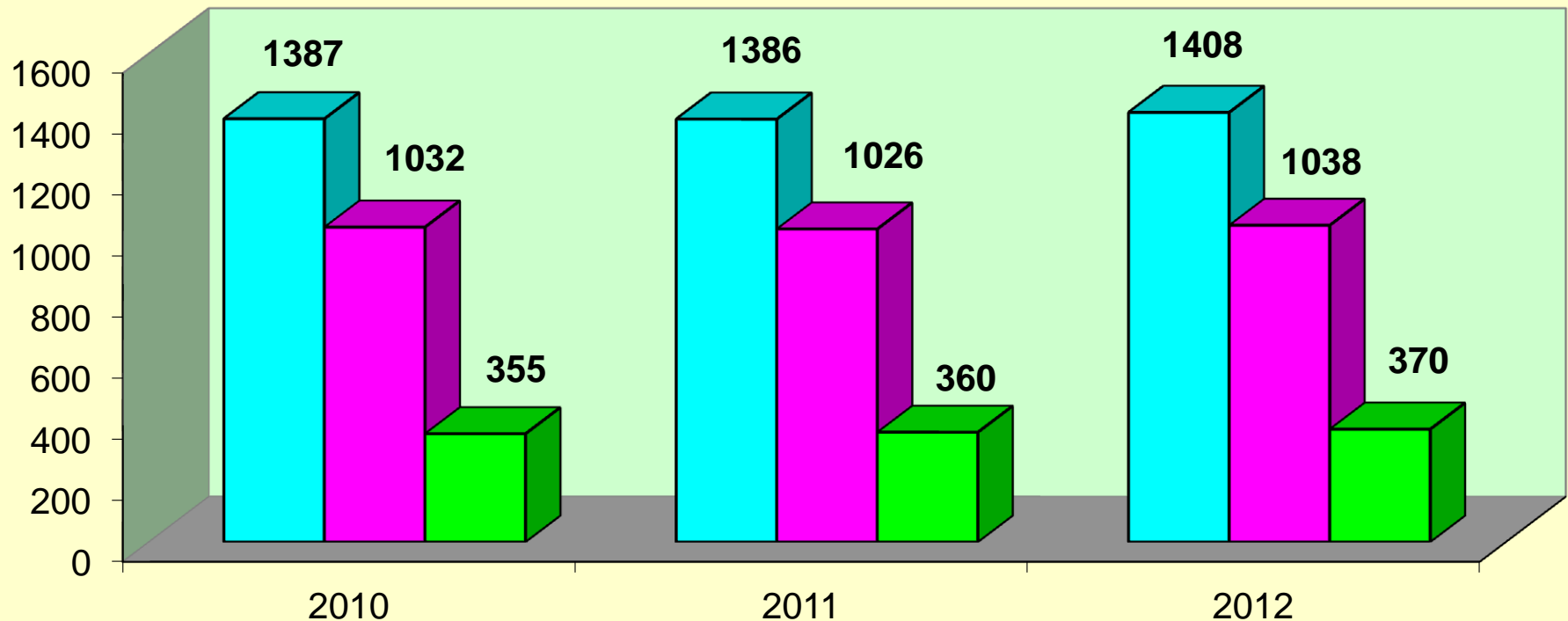
– reserves at operating mines

Volume of methane emissions from mines is about 1400 million m³/year. Coal production process is accompanied by natural methane gas emissions into mine ventilation system in approximate amount of 1000 million m³/year. Degasification recovers 370 million m³/year, or about 25% of total methane emissions

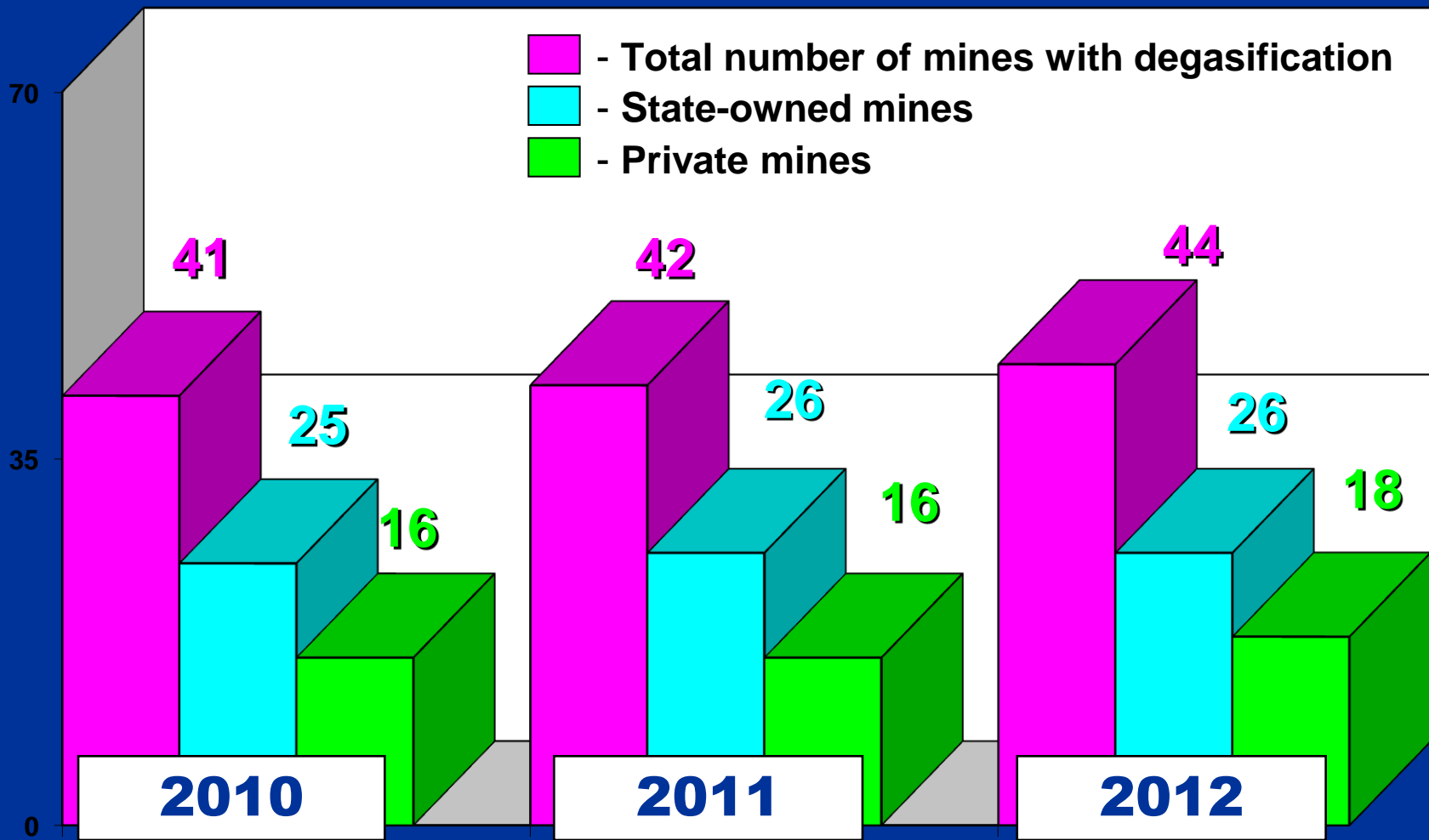
■ Total amount of gas methane, million m³

■ Emissions with ventilation air, million m³

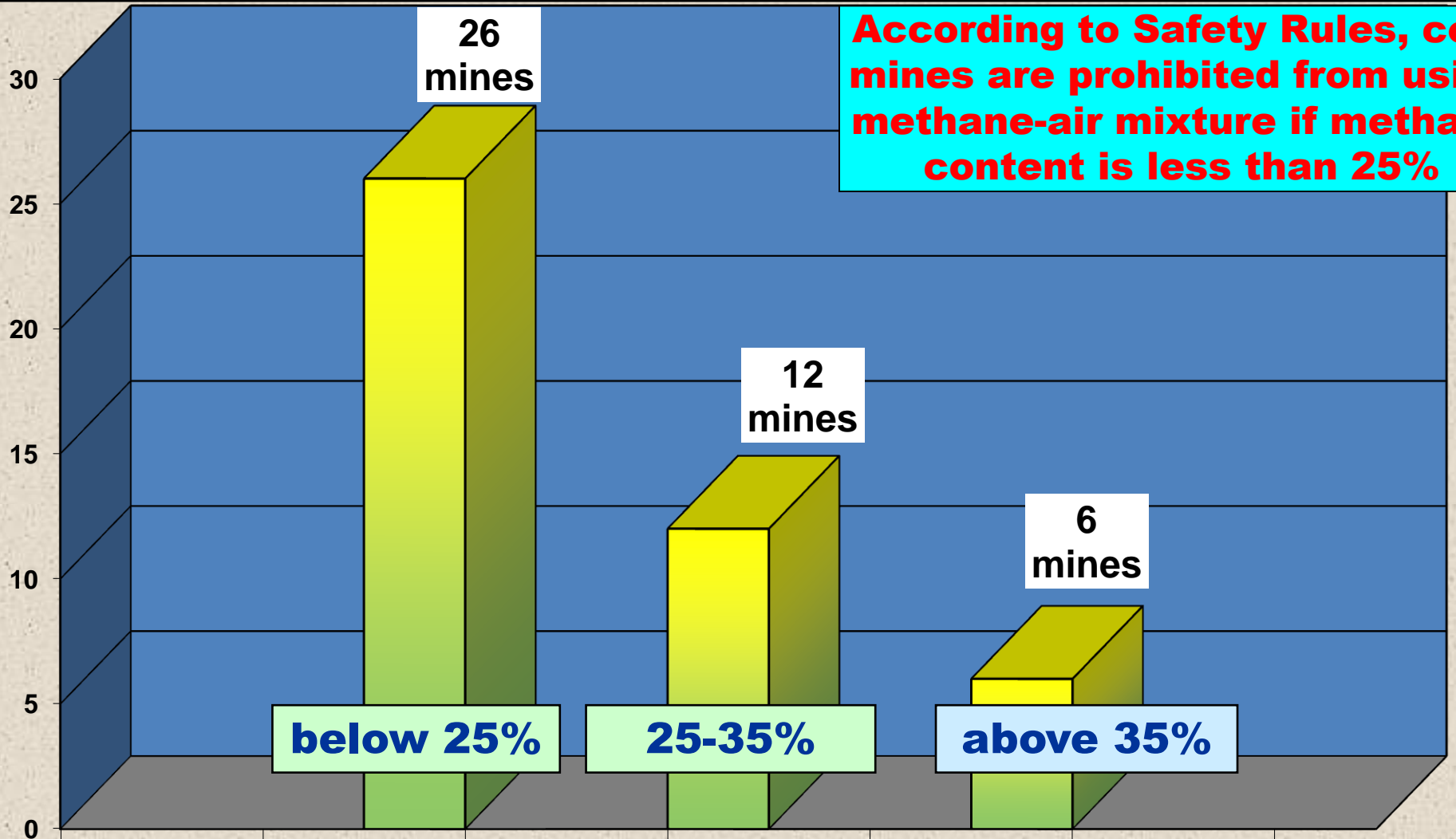
■ Capture by degasification systems, million m³



Today degasification is performed at 44 mines with production of 39.1 Mt of coal (46% of total production in Ukraine), including 18 mines not owned by the state, with annual production at 28.6 Mt, and 26 state mines with annual production at 10.5 Mt



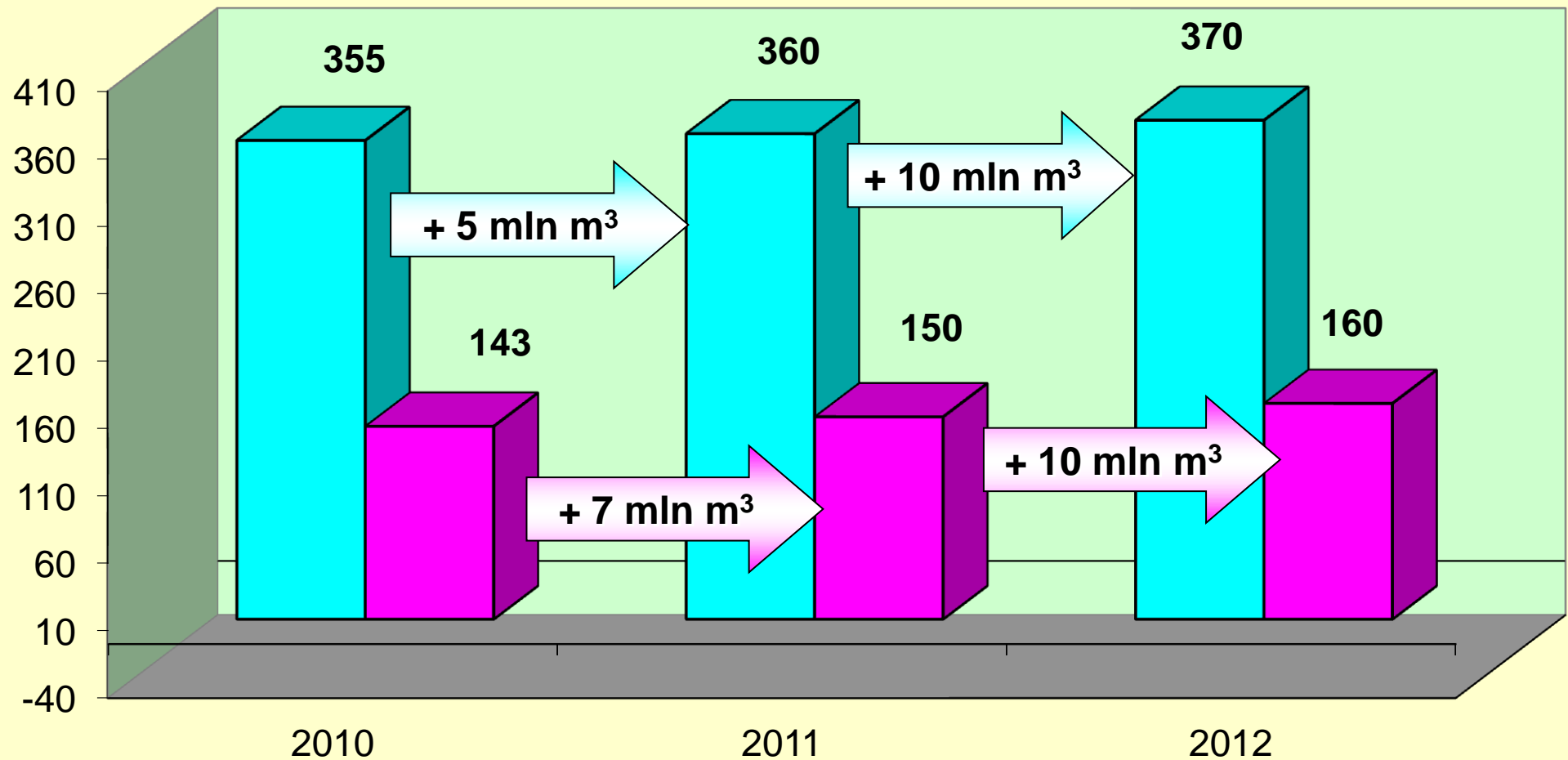
Only for 18 mines of 44 mines that perform degasification, methane content in the mixture exceeds 25%, while for 26 mines it is less than 25%, which prevents further use of methane



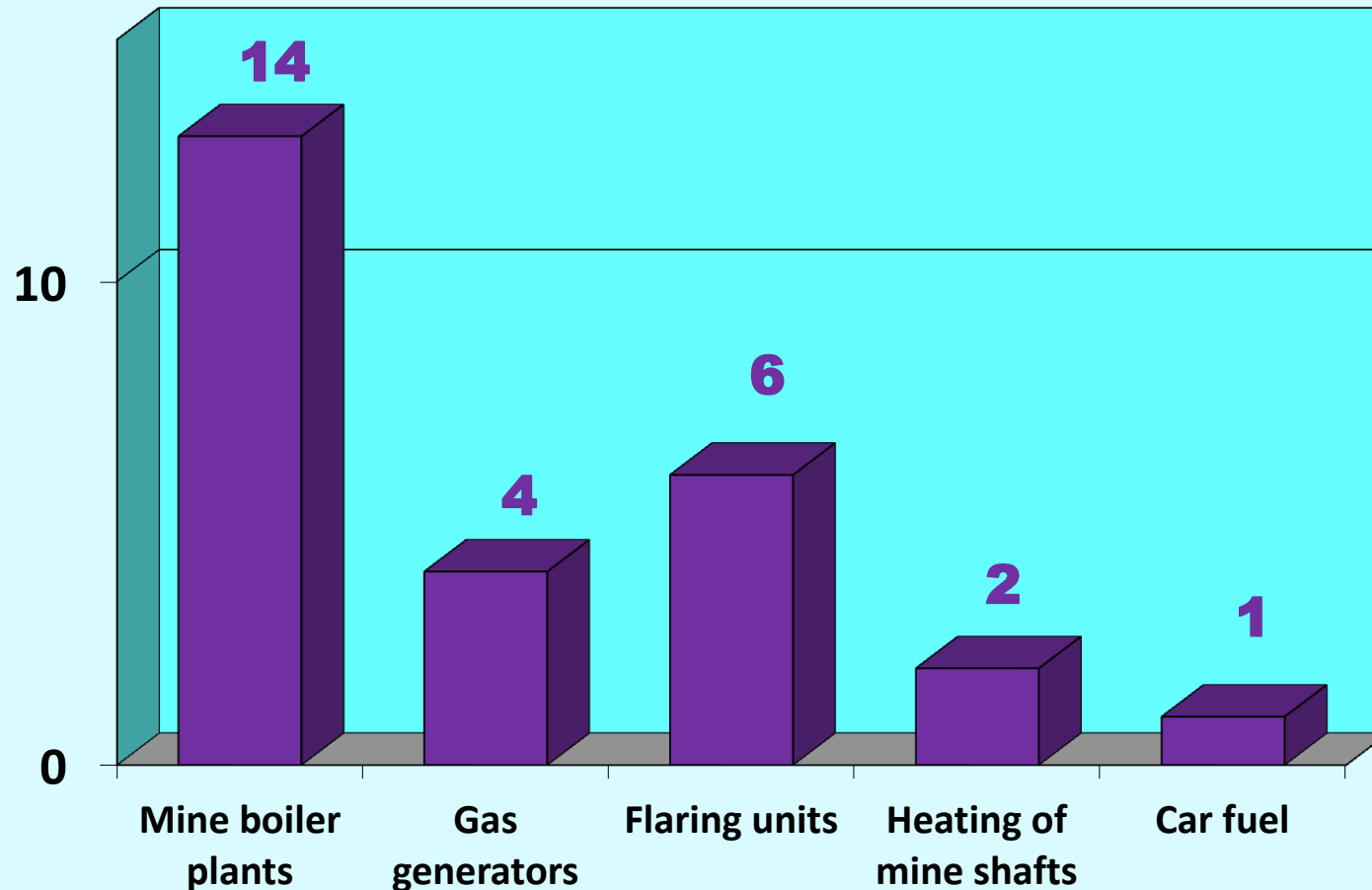
Out of 370 mln m³ of gas methane captured annually by degasification systems, about 130-160 mln m³, or 40-50%, are further utilized. In 2012 this figure was 160 mln m³

■ Capture by degasification systems, mln m³

■ Utilization, mln m³



Captured methane gas is utilized in the following way: for mine boiler plants – 14 mines, for gas generators – 4 mines, flared – 6 mines, for heating of mine shaft – 2 mines, as a car fuel – 1 mine



■ Mine boiler plants ■ Gas generators ■ Flaring units ■ Heating of mine shafts ■ Car fuel

The table presents data on implementation of methane degasification and utilization projects in 2012 for major coal mining companies of Ukraine

| Company | Methane emissions from degasification and ventilation systems, m ³ | Captured methane, m ³ | Utilized methane, m ³ | Methane degasification and utilization project results | | |
|--------------------------------------|---|----------------------------------|----------------------------------|--|-----------------------|---|
| | | | | Electricity production, million kWh | Heat production, Gcal | GHG emissions reduction (in CO ₂ -equivalent), 1000 tonnes |
| JSC A.F.Zasiadko mine | 56 129 760.0 | 20 291 040.0 | 20 317 776.0 | 65.7 | 31 836.1 | 340.4 |
| JSC Mine head office Pokrovsky | 187 685 960.0 | 47 685 960.0 | 7 583 072.0 | 22.2 | 20 845.2 | 99.088 |
| JSC Mine head office Donbass | 22 077 704.0 | 37 896 000.0 | 32 896 000.0 | 17.23 | 79 373.0 | 499.9 |
| JSC DTEK , Komsomolets Donbassa mine | - | 31 100 000.0 | 14 170 000.0 | - | - | - |

**LEGISLATIVE AND NORMATIVE ACTS
THAT REGULATE PRODUCTION,
DEGASIFICATION AND UTILIZATION OF COAL
MINE METHANE GAS**

- **Code of Ukraine «About the subsoil» (*from 27.07.1994 from 16-10-2012*);**
- **Law of Ukraine «On coalbed methane» (*from 21.05.2009*);**
- **Law of Ukraine «On Alternative energy sources» (*from 20.02.2003*);**
- **Tax Code of Ukraine (*from 01.04.2012*);**
- **Coal Mine Safety Rules (*from 22.03.2010*).**

Insufficient level of both degasification and further utilization of gas methane is determined by the following reasons:

- 1. Lack of proven technologies for preliminary coalbed degasification by means of surface-based drilling and hydraulic fracturing.**
- 2. Low storage capacity of coal-surrounding rocks. Permeability of sandstones is less than 0.1 mD (millidarcy), porosity of sandstones is on average 5-6%.**
- 3. Low production speed in mine faces (less than 1000 tones/day), leading to slow mine face progress.**
- 4. Insufficient use of advanced technologies and equipment for underground degasification.**
- 5. Inadequate capacity of the majority of mine degasification systems due to low pipeline diameters (250 – 350 mm).**
- 6. Lack of operating degasification control equipment needed for maintaining degasification parameters, first of all, methane content (higher than 25%) and production rate.**
- 7. Gaps in legislative and regulatory acts related to promotion of investments and preferential taxation.**

EXPECTED RESULTS

**from implementation of methane degasification
and utilization projects in Ukraine:**

- **Lower number of accidents and improved labor **safety** for miners;**
- **Greater use of alternative fuels;**
- **Improved basis for coal production growth;**
- **Established opportunity for getting cheaper electricity and heat by mines;**
- **Additional financial resources as a result of joint activities of mines (mining companies) and investors in the area of degasification and utilization of coal mine methane;**
- **Significant reduction of greenhouse gas emissions;**
- **Additional employment.**

Thank you for your attention!

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<http://mpe.kmu.gov.ua>