

BULATOM 2012



Nucleon Consulting Agency

**THE FUTURE OF
BULGARIAN NUCLEAR SECTOR**

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DRIVING FACTORS IN BULGARIAN NUCLEAR ENERGY SECTOR

**NEED FOR LONGTERM NATIONAL STRATEGY
IN ENERGY SECTOR – UP TO 2050**

**NEED FOR TRANSPARANCY IN
THE INVESTMENT PROCESS**

**THE NUCLEAR FUEL CYCLE AND URANIUM STOCKS
SHOULD BE TAKEN INTO CONSIDERATION**

THE EMERGING NUCLEAR TECHNOLOGIES

THE PROBLEMS OF NUCLEAR ENERGY SECTOR:

Enormous size of the initial investment that is out of proportion to the size of in small economies like Bulgarian

Repayment of loans could stretch up to 25 years at cost of produced electricity that will not be competitive

The size of the present-day NPP causes problems in selling of produced energy , especially in small economies like Bulgarian

Hard to balance the grid – too much base load power, and Pumped Water Storage is needed to level the daily load

THE PROBLEMS OF NUCLEAR ENERGY SECTOR:

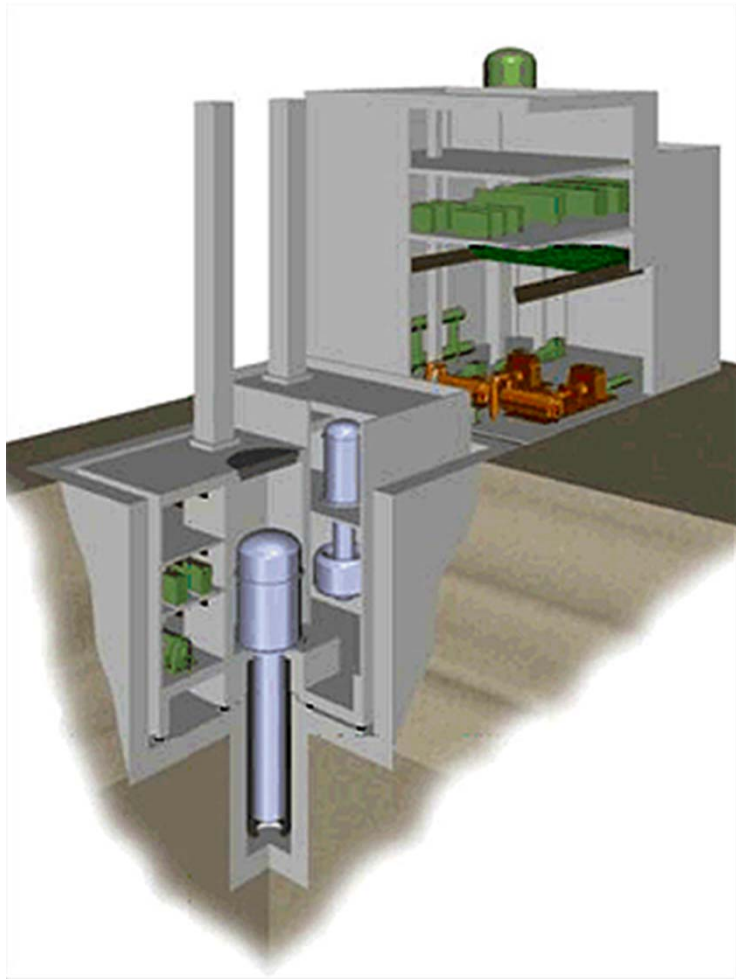
The management of spent nuclear fuel is costly, and the present-day NPP do not address this issue in long-term perspective

In Bulgaria new big NPP could create problems in effective utilization of the NPP Kozloduj or major TPPs with negative social outcomes

There is a considerable uncertainty about the future dynamics of Bulgarian energy sector, and how a new big NPP will fit in them

WHAT TO DO?

CHANGE OF THE PARADIGM:



**SMALL
MODULAR
REACTORS
(SMR)
GENERATION IV**

PRESENT-DAY NPP PROBLEMS:

SMR SOLUTIONS:

Expensive active security systems that are prone to human errors

Entirely passive security systems that are inexpensive and human non-dependable

Complicated safety infrastructure that can not exclude major accidents with people replacements

Even in most severe Beyond Basic Accidents people evacuations will not be necessary

The cost of energy from NPP is affected by spent fuel facilities, new fuel loads, and big size of the staff

Low cost of produced energy due to lack of spent fuel facilities, new fuel loads, and smaller staff

Spent nuclear fuel which creates long-term financial and environmental problems

SMR will use the spent nuclear fuel from present-day LWR which is cardinal solution for the nuclear wastes

PRESENT-DAY NPP PROBLEMS:

SMR SOLUTIONS:

Enormous size of the initial investment that is out of proportion to the size of Bulgarian economy

The size of the initial investment is affordable even for present day GDP of Bulgaria

There are not available funds to cover the investment – need for outside financing

The size of the initial investment allows not only direct state funding, but entirely private investments

Repayment of loans could stretch up to 25 years at cost of produced electricity that will not be competitive

Self-financing scheme “module by module” – repayment in 7 to 10 years of NPP comparable to the size of NPP Belene

Hard to balance the grid – too much base load power which creates problems for the grid operators

Potential to work in load follow regime which makes them flexible to current grid conditions

PRESENT-DAY NPP PROBLEMS:

SMR SOLUTIONS:

The size and work regime of NPP creates problems for the design of the whole grid system – need for balancing and backup power facilities

The potential to work in load follow regime and modularity of the SMR does not affect the design and operation of the whole grid

NPP are enormous power facilities that requires huge lands faraway from the consumers and cities

Small footprint and inherent security of SMR allow they to be located nearby cities and industrial consumers

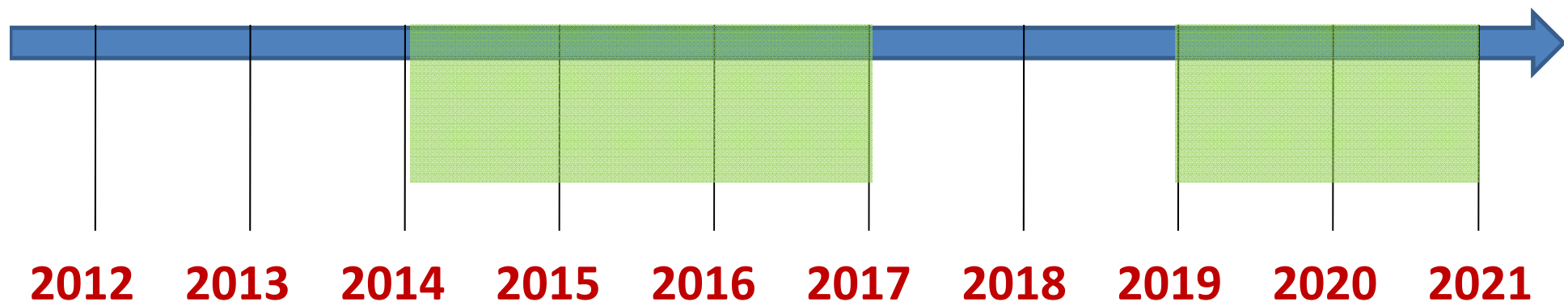
The licensing and construction period of NPP is too long and creates problems for the investors

The licensing and construction period of SMR is about 1-2 years which is comparable to every industrial project

WHEN THEY WILL BE READY FOR DEPLOYMENT?

More than 60 projects for SMR worldwide

**Up to 5 commercial prototypes
between 2014-2017**



Serial production from 2019

PRIORITIES OF NUCLEAR ENERGY SECTOR IN BULGARIA:

EXTENSION OF LIFE FOR UNITS 5 AND 6 IN NPP KOZLODUJ

ESTABLISHING OF CONTACTS WITH PRODUCERS OF SMR

LONG-TERM STRATEGY FOR BULGARIAN ENERGY SECTOR



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Thank you for your attention