



Nuclear Energy – Understanding Risks

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IRP2010

- **The South African government has approved the Integrated Resource Plan for Electricity 2010 (IRP 2010) on March, 17th 2011.**
- **The IRP 2010 is an ambitious and exciting plan. It demonstrates South Africa's willingness and determination to develop clean energy, including nuclear power, and also displays the magnificent goal and prospect of South African nuclear power development in the future.**



Reasons for renewed interest in nuclear

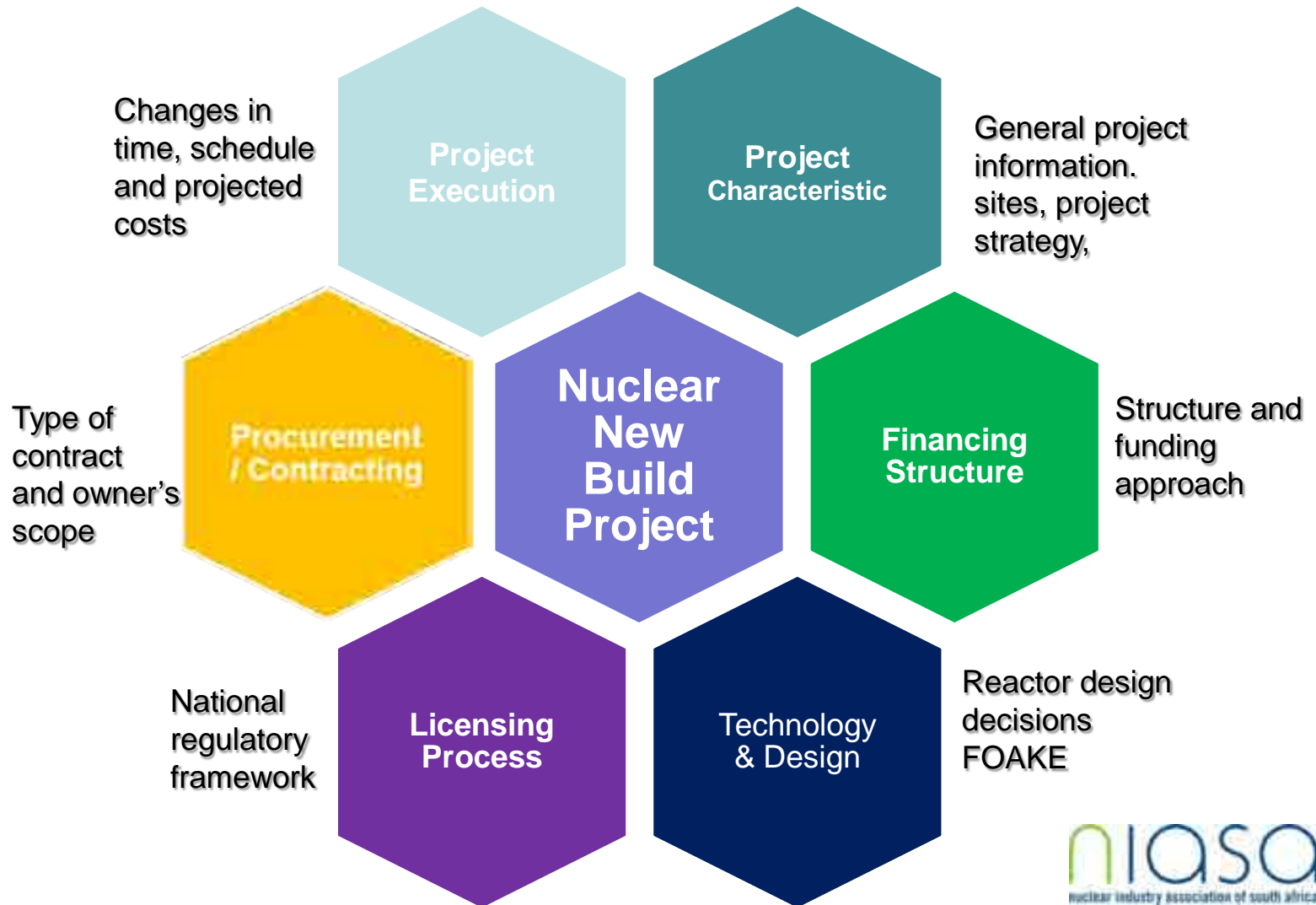
- **Contribution to a country's energy security of supply**
- **Improved nuclear economics**
- **Environmental advantages –particularly low carbon characteristic**
- **Good safety record since Chernobyl & Fukushima**

The key risks are in the following areas

- Regulatory
- Finance
- Localisation of manufacture
- Schedule
- Skills
- Public acceptance



Key Element of Nuclear New Build Projects



Project Characteristics

- The investment needed to secure nuclear power plants and make a commitment to building a fleet of stations is vast. This confidence, stability and reason will need an experience of a large utility and Government commitment.
- The cost of nuclear power generation is already competitive compared to other forms of low-carbon energy technologies such as wind power and coal fired generation with carbon capture and storage, but nuclear power has additional advantages of providing base load power and also being a fully proven technology; generation.
- It is important to secure qualified nuclear sites and avoid encroaching of housing developments
- Stakeholder participation is a key to addressing legitimate concerns about waste management and the safety and security of nuclear installations. Public hearings and debate are sound means for improving dialogue

Financing Structure

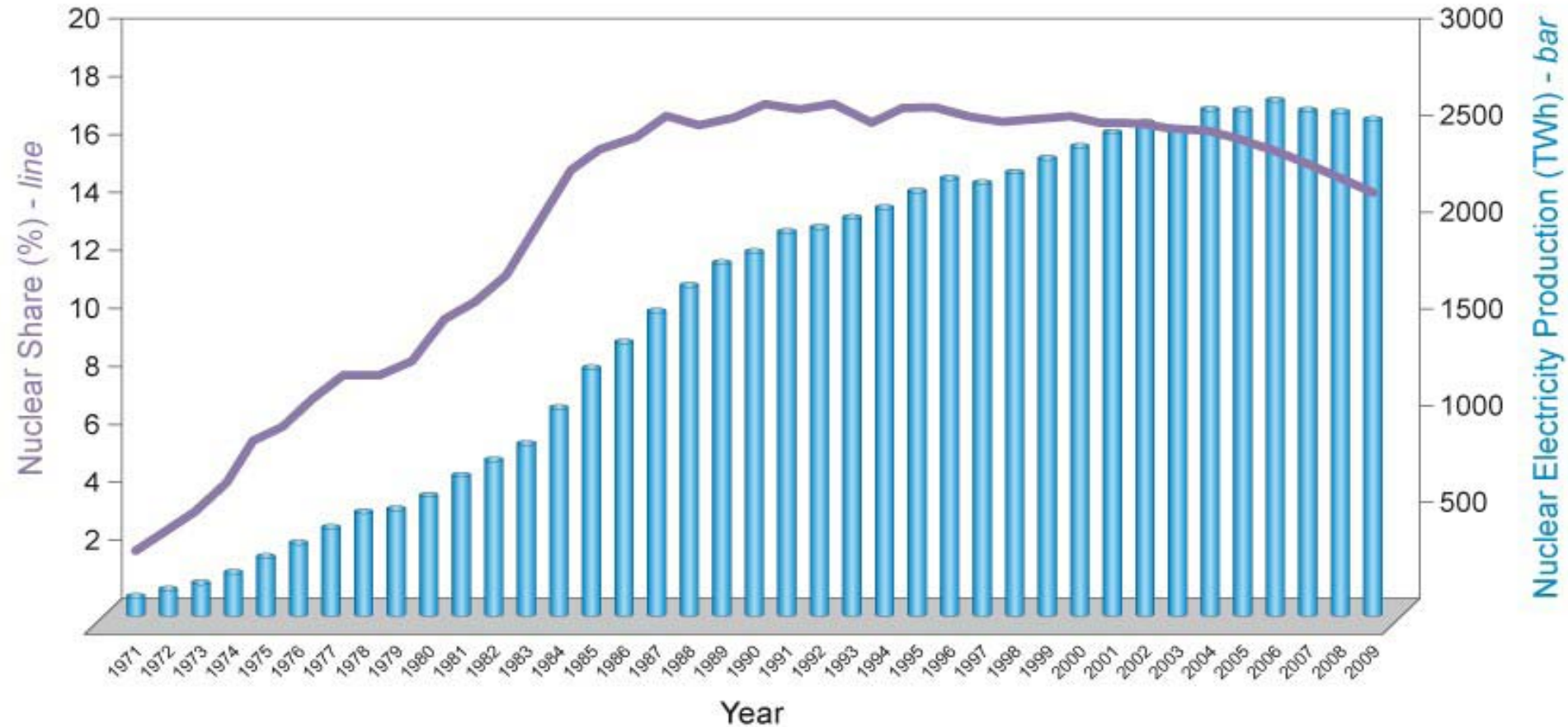
- Most nuclear power plants operating today were financed and built in regulated utility markets, and thus can be guaranteed both future customers and tariffs to ensure a profitable rate of return.
- The successful financing of nuclear construction will therefore, depends on the project structure with the lowest possible financing costs.
- A large part of government's role in nuclear power financing is to reduce finance risks, therefore political risk is a major concern for investors and lenders. Stable and efficient regulatory and tax regimes are essential elements of political stability.
- Within complex structures, financial institutions can be innovative and creative but there are limitations on what they can achieve.
- The 42 - 60 months construction period can lead to very high Interest during construction (IDC) costs

Technology and Design

- The nuclear power plant should be of proven technology and established design.
- Key licensing issues should be resolved prior to construction
- An efficient and auditable design change process must be put in place to ensure exact replica nuclear plants.
- Follow-on replica nuclear plants will benefit from the lessons learned from the construction of a first-of-class design in any country and so are cheaper and quicker to build. This will encourage localization and investments in manufacturing facilities and nuclear skills training.
- After Fukushima Daiichi incident, increased awareness and understanding of the earthquake and tsunami risk to be incorporated in seismic design and qualification of buildings.

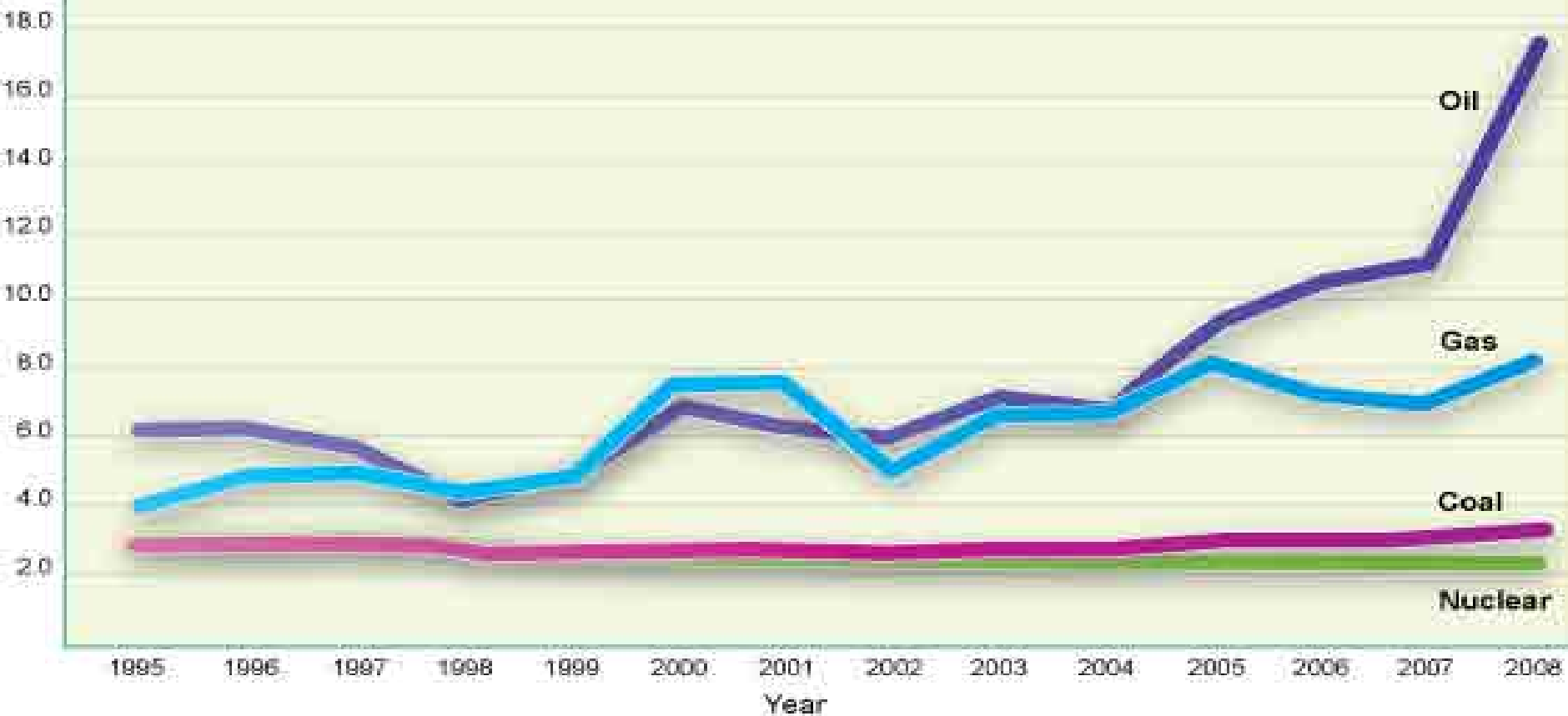
Improved operating performance of nuclear

Nuclear Electricity Production and Share of Total Electricity Production



US Electricity Production Costs 1995-2008

in 2008 cents per kilowatt-hour



Production Costs = Operations & Maintenance + Fuel. Production costs do not include indirect costs or capital.

Source: Ventyx Velocity Suite, via NEI

Licensing Process

- Safety is of utmost importance in nuclear operations. Regulatory power is significant and concerns can cause construction delays or halt nuclear plant operations.
- The nuclear industry has come to recognize that it can contribute to stability and smoothness in the regulatory process by achieving greater constancy in reactor designs.
- The new approach moves all design, technical, regulatory and licensing issues to the front of the licensing process. Before construction begins and any significant capital spending occurs, safety and environmental issues can be fully addressed.
- Delays which can be caused by public intervention are now managed by enforcing strictly defined time-frames for public hearings and consultations.
- Adequate staffing of the National Nuclear Regulator is important to ensure timely decisions.

Procurement and Contracting

- To ensure the smooth progress of the project, the vendor needs to understand and take national regulatory practice seriously.
- Various risks during the construction can be covered by contractual arrangements among the utility/owner, EPC contractor and vendors.
- Utilities can assume greater risk in exchange, perhaps, for the opportunity to benefit from a lower overall cost.
- Constraints in terms of the bottlenecks in the manufacturing of long-lead items (e.g. heavy forgings), though the present capacity can meet demand, timely slot reservation is important.
- A highly critical issue , already prevalent – is the lack of suitably qualified and experienced personnel to support the nuclear programme.

Project Execution

- New-build risks include costly delays due to problems with designs, equipment supply, project management, construction and commissioning.
- Building reactors using pre-fabrication, pre-assembly and modularisation along with 3-D modelling, open-top construction and other advanced construction techniques can further control project risks.
- Nuclear projects are especially capital-intensive, effective project management is essential to manage risks, contain costs and meet set schedules.
- Nuclear operations have benefited from the sharing of information and technical assistance through international professional associations.
- Plant decommissioning, as well as the management of waste and used fuel, to be managed within a sound regulatory framework.

Schedule example

- **V.C Summer (USA) AP1000 schedule**

	Delivered	Purchase order	Reserved
Pressure Vessel	2.5 years	8 years	9+ years
Steam generators	2.5 years	7.5 years	
Coolant pumps	3.5/2.25 years	7.5 years	
CA20	5 years	7 years	
Turbines	2.5 years	6.5 years	

Points to close with

- **The drivers for nuclear are strong**
- **There are opportunities for local suppliers to join the international supply chain**
- **Standardisation of reactor design requirements is good for safety and economics**
- **Industry needs to cooperate on areas of common interest, and maintain a strong safety and economic performance.**
- **Leadership of government is key**



Thank You!!!

