Sudan University of Science and Technology

College of Graduate Studies

A comparative Study of the Types of Light-Water Reactors

أنواع مفاعلات الماء الخفيف(دراسة مقارنة)

A thesis Submitted in A partial Fulfillment of the Requirement for the Degree of Master of Science in Nuclear Physics

By

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قال تعالى:

(وَيَسْأَلُونَكَ عَنِ الرُّوحِ قُلِ الرُّوحُ مِنْ أَمْرِ رَبِّي وَمَا أُوتِيتُم مِّن الْعِلْمِ إِلاَّ قَلِيلاً) صدق الله العظيم

(الإسراء : 85)

Dedication

I dedicate this thesis

To my Parent,

My Family And

All my friends for their love,

Support and long-term

Sacrifices.

Morteda

Acknowledgement

- Praise to Allah who gave me health and patience to accomplish this work.
- I am so grateful to Dr: Ibrahim Elfaki for his comments and suggestions during the revision of this thesis.
- I wish to express my sincere appreciation to Dr: Rahama Osman in the Administration of the Educational Development in Gabbas Schools for his helpful, suggestions and encouragement.
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ABSTRACT

The main purpose of this project is the study of light water reactors (LWR) and the comparison between its types the pressurized water reactor and the boiling water reactor.

The research aims to study the future of nuclear power and its development besides the effective factors that affect its progress. The study covers briefly the usage of electric power in Sudan and future plans for its development.

The comparison presents the advantages and dis advantages of the pressurized water reactor and the boiling water reactor.

The research showed the importance of nuclear power as one of the most essential sources of future of energy and plans for its development.

الخلاصة

الهدف من هذه الأطروحة هو دراسة مفاعلات الماء الخفيف والمقارنة بين نوعيها مفاعل الماء المضغوط ومفاعل الماء المغلي, كما تهدف لدراسة مستقبل الطاقة النووية والعوامل المؤثرة عليها .أيضا تطرقت الأطروحة بإيجاز إلى الطاقة الكهربية المستخدمة في السودان والخطط المستقبلية لتطويرها.

إن المقارنة التي قام بها الباحث أوضحت ايجابيات وسلبيات مفاعل الماء المضغوط و مفاعل الماء المغلي .

كما أوضحت الأطروحة أهمية الطاقة النووية كواحدة من أهم مصادر الطاقة في المستقبل والخطط التي وضعت لتطويرها.

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List of Abbreviation

No.	Abbreviation	Meaning
1	LWR	Light Water Reactor
2	PWR	Pressurized Water Reactor
3	BWR	Boiling Water Reactor
4	HTGR	High Temperature Gas-Cooled Reactor
5	CANDU	Canadian Deuterium Uranium
6	LMFBR	Liquid Metal Fast Breeder Reactor
7	ABWR	Advanced Boiling Water Reactor
8	LOCA	Loss-of Coolant Accident
9	ESBWR	Economic Simplified BWR
10	IC	Isolation Condensers
11	PCCS	Passive Containment Cooling System
12	GDCS	Gravity Driven Cooling System
13	PCS	Primary Cooling System
14	SCS	Secondary Cooling System
15	SG	Steam Generator
16	MCP	Main Coolant Circulation pump
17	RPV	Reactor Pressure Vessel
18	GE	General Electric
19	KWU	Kraft Work Union
20	URD	Utility Requirements Document
21	PSA	Probabilistic Safety Assessment

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