SUBJECT CATEGORIES
AND SCOPE DESCRIPTIONS
(INIS/ETDE)
PREFACE

This document is one in a series of publications known as the INIS Reference Series. It defines the subject categories and provides the scope descriptions to be used for categorization of the nuclear literature for the preparation of INIS input by national and regional centres. Together with the other volumes of the INIS Reference Series it defines the rules, standards and practices and provides the authorities to be used in the International Nuclear Information System. A complete list of the volumes published in the INIS Reference Series may be found on the inside front cover of this publication.

At the 27th Consultative Meeting of INIS Liaison Officers (Vienna, Austria, 25-27 May 1999), it was recommended to adopt a simplified subject category scheme, common to the INIS and ETDE databases, which was prepared by a joint INIS/ETDE working group. The corresponding scope descriptions prepared by the same working group were endorsed by the 5th INIS/ETDE Joint Technical Committee meeting, Knoxville, TN, USA, 28-29 October 1999.

This simplified categorization scheme contains 45 one-level broad subject categories from which 42 only are within INIS subject scope. These categories have three-character alphanumeric codes.

The scope descriptions are given for both INIS and ETDE on opposite pages.

Special note should be made of the fact that the overall subject scope of INIS has not been affected by the adoption of the simplified categorization scheme.

The secretariat wishes to acknowledge the assistance, comments and suggestions received from national INIS centres in the preparation of the new revision of the present document and continues to invite comments and criticism, which should be sent to:

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CONTENTS

Editor’s Note
Preface
Introduction
Codes
Scope descriptions
Appendix 1 - Guide for elements of nuclear interest
Appendix 2 - The International Nuclear Event Scale
Appendix 3 - Correlation between the previous INIS categories and the new categories
Appendix 4 - Correlation between the new categories and the previous INIS categories
Appendix 5 - Correlation between the old ETDE categories and the new categories
Subject index
S01 COAL, LIGNITE, AND PEAT
S02 PETROLEUM
S03 NATURAL GAS
S04 OIL SHALES AND TAR SANDS
S07 ISOTOPES AND RADIATION SOURCES
S08 HYDROGEN
S09 BIOMASS FUELS
S10 SYNTHETIC FUELS
S12 MANAGEMENT OF RADIOACTIVE WASTES, AND NON-RADIOACTIVE WASTES FROM NUCLEAR FACILITIES
S13 HYDRO ENERGY
S14 SOLAR ENERGY
S15 GEOTHERMAL ENERGY
S16 TIDAL AND WAVE POWER
S17 WIND ENERGY
S20 FOSSIL-FUELED POWER PLANTS
S21 SPECIFIC NUCLEAR REACTORS AND ASSOCIATED PLANTS
S26 GENERAL STUDIES OF NUCLEAR REACTORS
S28 POWER TRANSMISSION AND DISTRIBUTION
S29 ENERGY STORAGE
S30 ENERGY PLANNING, POLICY AND ECONOMY
S32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
S33 ADVANCED PROPULSION SYSTEMS
S36 MATERIALS SCIENCE
S37 INORGANIC, ORGANIC, PHYSICAL AND ANALYTICAL CHEMISTRY
S38 RADIATION CHEMISTRY, RADIONCHEMISTRY AND NUCLEAR CHEMISTRY
S42 ENGINEERING
S43 PARTICLE ACCELERATORS
S46 INSTRUMENTATION RELATED TO NUCLEAR SCIENCE AND TECHNOLOGY
S47 OTHER INSTRUMENTATION
S54 ENVIRONMENTAL SCIENCES
S58 GEOSCIENCES
S60 APPLIED LIFE SCIENCES
S61 RADIATION PROTECTION AND DOSIMETRY
S62 RADIOLOGY AND NUCLEAR MEDICINE
S63 RADIATION, THERMAL, AND OTHER ENVIRONMENTAL POLLUTANT EFFECTS ON LIVING ORGANISMS AND BIOLOGICAL MATERIALS
S70 PLASMA PHYSICS AND FUSION TECHNOLOGY
S71 CLASSICAL AND QUANTUM MECHANICS, GENERAL PHYSICS
S72 PHYSICS OF ELEMENTARY PARTICLES AND FIELDS
S73 NUCLEAR PHYSICS AND RADIATION PHYSICS
S74 ATOMIC AND MOLECULAR PHYSICS
S75 CONDENSED MATTER PHYSICS, SUPERCONDUCTIVITY AND SUPERFLUIDITY
S98 NUCLEAR DISARMAMENT, SAFEGUARDS AND PHYSICAL PROTECTION
S99 GENERAL AND MISCELLANEOUS
INTRODUCTION

This INIS Reference Series document is intended to serve two purposes:

- to define the subject scope of the International Nuclear Information System (INIS)
- to define the subject classification scheme of INIS.

It is thus the guide to the INIS inputting centres in determining which items of literature should be reported to INIS, and in determining where the full bibliographic entry and abstract of each item should be included in INIS database.

Each category is identified by a category code consisting of three alphanumeric characters.

A scope description is given for each subject category. The scope of INIS is the sum of the scopes of all the categories. It should be noted that three categories from the common scheme, namely S32 (ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION), S33 (ADVANCED PROPULSION SYSTEMS), and S47 (OTHER INSTRUMENTATION) are not within INIS subject scope.

With most categories cross references are provided to other categories where appropriate. Cross references should be of assistance in finding the appropriate category; in fact, by indicating topics that are excluded from the category in question, the cross references help to clarify and define the scope of the category to which they are appended.

A Subject Index is included as an aid to subject classifiers, but it is only an aid and not a means for subject classification. It facilitates the use of this document, but is no substitute for the description of the scope of the subject categories. Index-based subject categorization is likely to be wrong and must be avoided.

Subject classifiers, who are expected to be subject specialists at INIS inputting centres, are requested to identify the significant topics of each item of literature and to report the item only if it contains significant information that falls within the subject scope of INIS. The main topic (from the “nuclear science” point of view for INIS) is the basis for determining the primary subject category. The INIS: Guide to Bibliographic Description (IAEA-INIS-1) requires the assignment of a primary subject category to each INIS record (in Tag 008). The primary category should be the one for which the scope description encompasses the main INIS topic discussed in the piece of literature. If there are significant secondary topics discussed in the piece of literature that fall within the scope description of a category or categories other than the one relevant to the main topics of the paper, INIS rules permit the assignment of one or more secondary categories for the piece of literature. Furthermore, in order to create subsets of the database containing references to literature that might be useful in a particular area, it has been found advantageous in certain cases to additionally assign a secondary category to indicate the field of application or area of usefulness of the information contained in the piece of literature. This is also permitted under INIS rules. Although their number is not limited, more than one or two secondary categories rarely should be needed.
INIS Scope Descriptions

S01 COAL, LIGNITE, AND PEAT

*Environmental aspects* of developing, transporting and using coal, coal products, lignite and peat for energy production, including studies on animal life, plant life, cultural resources of the affected area, land, air, surface water and groundwater pollution, site revegetation and overall effects

*Economic aspects*, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants fueled by coal, lignite, peat and gas from coal gasification, economic aspects of accidents

S02 PETROLEUM

*Environmental aspects* of the various steps in drilling, production, refining, transporting and using petroleum and petroleum products for energy production, including oil spills and studies on animal life, plant life, cultural resources of the affected area, land, air, surface water and groundwater pollution, site revegetation and overall effects

*Economic aspects*, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants fueled by petroleum, economic aspects of accidents

S03 NATURAL GAS

*Environmental aspects* of the various steps in drilling, production, processing, transporting and using natural gas, including liquefied natural gas (LNG), for energy production, production, transport, storage of LNG and LNG spills, including studies on animal life, plant life, cultural resources of the affected area, land, air, surface water and groundwater pollution, site revegetation and overall effects

*Economic aspects*, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants fueled by natural gas, economic aspects of accidents

S04 OIL SHALES AND TAR SANDS

*Environmental aspects* of developing, transporting and using oil shales and tar sands for energy production, including studies on animal life, plant life, cultural resources of the affected area, land, air, surface water and groundwater pollution, site revegetation and overall effects of disposal of spent shales, tar sand tailings, etc.

*Economic aspects*, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants using these energy sources, economic aspects of accidents
ETDE Scope Descriptions

S01 COAL, LIGNITE, AND PEAT
Includes all topics in the field of coal and coal products, including lignite and peat, such as reserves, geology and exploration; mining; preparation; processing; products and by-products; properties and composition; combustion; transport, handling and storage; waste management; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

S02 PETROLEUM
Includes all topics in the field of petroleum, such as reserves, geology, and exploration; drilling and production; processing; products and by-products; properties and composition; combustion; transport, handling, and storage; waste management; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

S03 NATURAL GAS
Includes all topics in the field of natural gas including liquefied natural gas, such as reserves, geology, and exploration; drilling, production, and processing; products and by-products (e.g., LPG); properties and composition; combustion; transport, handling, and storage; waste management; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

S04 OIL SHALES AND TAR SANDS
Includes all topics in the field of oil shales and tar sands, such as reserves, geology, and exploration; drilling, fracturing, and mining; oil production, recovery, and refining; products and by-products; properties and composition; combustion; transport, handling, and storage; waste management, environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.
INIS Scope Descriptions

S07  ISOTOPES AND RADIATION SOURCES

Isotope production, separation and enrichment: industrial methods of production, enrichment and separation of stable and radioactive isotopes (other than the isotopes of uranium), including the design, construction, operation, maintenance and safety aspects of facilities and equipment, industrial production of tritium, commercial radioisotope generators

Isotopic radiation sources: design, construction, operation and safety aspects of isotopic radiation sources such as neutron sources, gamma sources, etc., including isotopic power supplies, isotopic X-ray sources and associated facilities, regardless of their application, radiation source metrology, including activity measurement of radiation sources, calculation and measurement of dose distribution from radiation sources, radiation source standardization and calibration, standard sources, and units for radiation and activity measurements

Production of heavy water: industrial processes for the separation of deuterium from hydrogen including the design, construction, operation, maintenance and safety aspects of facilities and equipment

Industrial applications of radiation, accelerated particles, radioisotopes and fission products for measurement and control, radiation processing, including calculation and measurement of absorbed doses, radiation treatment of agricultural and biological wastes

Advances in tracer technique (with radioactive or stable isotopes) when no specific application is indicated

Environmental aspects of the use of isotopes and radiation sources and their associated facilities and equipment, including selection criteria and suitability studies for siting, environmental implications resulting from generation, on-site treatment and release of radioactive, chemical and thermal effluents, environmental consequences predicted from the analysis of design basis or hypothetical accidents, and of performance of safety systems, including those involving handling and transport of radioactive materials

Economic aspects of production and utilization of radioactive and stable isotopes and other radiation sources in power production, radiometric industrial applications, radiation processing and tracer techniques, economics of heavy water production (e.g. supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits)

Legal and regulatory aspects, including licensing procedures and inspection, for production, handling, operation, trade, transfer and supply of radioisotopes and radiation sources, legislation for national or international transport of radioactive materials or radiation sources by any means, and of accident prevention

For:
- basic physical chemistry of stable isotope exchange and separation use S37
- chemical separation of radioisotopes, or preparation of radioactive materials in non-industrial quantities use S38
- chemistry of fission fuels in connection with their processing or reprocessing, or separation of plutonium and uranium-233 in connection with fuel reprocessing, or industrial separation of uranium isotopes, or separation of stable elements in connection with fuel reprocessing use S11
- non-isotopic radiation sources see S71 or category for application
- isotope production reactors or chemonuclear irradiation reactors use S22
- accelerators and accelerator experimental facilities as radiation sources use S43
- fission reactors as radiation sources see S21, S22
- neutron generators use S43
- personnel dosimetry and monitoring use S61
- power production in fusion reactors use S70
- power production in fission reactors use S21
- direct energy conversion use S30
- nuclear techniques for testing materials use S42
- radiometric gauges use S46
- analytical applications of activation analysis use S37
- radiation processing in vaccine production, or radiation processing of food, or radiation sterilization in medicine use S60
- legal aspects concerning radioactive materials see also S11, S12, S98
S07 ISOTOPES AND RADIATION SOURCES
Includes all topics in the field of isotope and radiation source technology, such as physical isotope separation (e.g. for heavy water production); radiation sources (design, fabrication, operation; industrial applications, advances in tracers and tracer techniques, metrology), isotopic power supplies; economic, industrial, and business aspects; health and safety; environmental aspects; regulation and licensing. All industrial methods of production, enrichment and separation of stable and radioactive isotopes are included (except industrial methods in connection with fuel reprocessing)
S08  HYDROGEN

Environmental aspects of developing, transporting and using hydrogen as a fuel.

Economic aspects, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand; economics of power plants using hydrogen, economic aspects of accidents

S09  BIOMASS FUELS

Environmental aspects of developing, transporting and using energy crops and wastes directly as fuels (e.g., wood, straw, municipal wastes), fuels derived from energy crops and wastes (e.g., methane, ethanol), biogas from sanitary landfills, including pollution arising from any part of the biofuels cycle and land impoverishment caused by intensive monoculture for energy crops

Economic aspects, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants using biomass fuels, economic aspects of accidents

S10  SYNTHETIC FUELS

Environmental aspects of developing, transporting and using fuels produced by chemical synthesis, such as inorganic hydrogen compound fuels, town gas, etc.

Economic aspects, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants using these energy sources, economic aspects of accidents
ETDE Scope Descriptions

S08 HYDROGEN
Includes all topics in the field of hydrogen, such as production; properties and composition; combustion; storage, transport, and handling; products and by-products; waste management; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

S09 BIOMASS FUELS
Includes all topics in the field of biomass fuels (e.g. crops and wastes used directly as fuels, as e.g., wood, straw, municipal wastes or indirectly used as fuels, such as biogas from sanitary landfills). Aspects include resources; production; processing; products and by-products; properties and composition; combustion; storage, transport and handling; waste management; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

S10 SYNTHETIC FUELS
Includes all fuels produced by chemical synthesis, e.g., inorganic hydrogen compound fuels, town gas, etc. Aspects include production; properties and composition; combustion; products and by-products; storage, transport and handling; waste management; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.
INIS Scope Descriptions

S11 NUCLEAR FUEL CYCLE AND FUEL MATERIALS

Fission fuels processing: chemical and physico-chemical processing of ores, seawater or groundwater for recovery of uranium or thorium, including all extraction, conversion, reduction steps, analytical control, and plant and process design, performance and safety aspects

Spent fuels reprocessing: reactor fuel reprocessing, including analytical control, chemical separation of stable or radioactive elements, solvent studies, and plant and process design, performance, operation and safety aspects

Production of enriched uranium: design, construction, operation, maintenance, and safety aspects of facilities and equipment, processes for industrial separation of uranium isotopes, such as gaseous diffusion, ultracentrifugation, laser separation, etc.

Uranium and thorium ores: petrogenesis, mineralogy, reserves and resources, prospecting, mining and mechanical processing, including methods, equipment and technical aspects of safety; reserves, resources, and prospecting for uranium and thorium recovery from seawater and groundwater

Environmental aspects of various steps in nuclear fuels cycle, including selection criteria and suitability studies for siting of fission fuel cycle facilities, environmental impact theoretical studies under normal operating conditions for fission fuel cycle installations, environmental implications resulting from generation, on-site treatment and release of radioactive, chemical and thermal effluents from fission fuel cycle facilities under both normal operation and accident conditions, environmental consequences predicted from the analysis of design basis or hypothetical accidents, and of performance of safety systems, including those involving handling and transport of radioactive materials, other environmental impacts of fission fuel cycle facilities (e.g. infrastructure, noise, aesthetics, landscaping)

Nuclear fuel cycle economics: supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, cost categories of uranium resources, economics of prospecting, mining and conversion of uranium and thorium ores, economics of uranium enrichment, economics of plutonium recycling, economics of transport and reprocessing of irradiated fuel, economics of multi-fuel systems involving breeders and converters, forecasts of fission fuel requirements, fabrication costs of fission fuel elements, economics of uranium and thorium recovery from waters, economic aspects of nuclear accidents

Legal and regulatory aspects, including licensing procedures and inspection, for production, handling, operation, trade, transfer and supply of nuclear fuels and installations and equipment for nuclear fuel cycle facilities, siting, construction, operation and decommissioning of nuclear fuel cycle installations, legal aspects of national or international transport of radioactive materials by any means, and of accident prevention

For:
- structure analysis of fuels use S36
- seismological, geological, hydrological, meteorological and climatic studies of sites for fission fuel processing or reprocessing plants use

S58
- industrial separation of uranium isotopes use S07
- radioactive waste treatment and disposal use S12
- transport and interim storage of radioactive materials use S42
- safeguards and inspection, including legal aspects use S98
- nuclear instrumentation use S46
- treatment and disposal of tailings from mining and mechanical, or chemical processing of ores use S12
- engineering aspects of fuel (pellets, elements, assemblies) fabrication or reprocessing, and fuel fabrication or reprocessing plants, including decommissioning and dismantling use S22
- separation chemistry (analytical) of uranium use S37
- chemical separation of uranium isotopes (other than analytical applications and industrial methods), or chemical properties of uranium use S38
- structure, phase studies or physical properties of uranium use

S36

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S11 NUCLEAR FUEL CYCLE AND FUEL MATERIALS
Includes all information on the nuclear fuel cycle, except for fuel element design and assembly (see S22) and except waste management (see S12). It includes reserves, exploration, and mining (e.g. uranium and thorium ores); feed processing; uranium enrichment; fuels production and properties; spent fuels reprocessing; transport, handling, and storage; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.
INIS Scope Descriptions

S12 MANAGEMENT OF RADIOACTIVE WASTES, AND NON-RADIOACTIVE WASTES FROM NUCLEAR FACILITIES

Waste treatment: processing of radioactive wastes, including transmutation technology, processing of non-radioactive wastes generated by nuclear facilities, radioactive waste treatment plants, structures and equipment, tritium processing, containment and recovery, technical aspects of safety

Waste disposal: ultimate storage and disposal of radioactive wastes, disposal of non-radioactive wastes generated by nuclear facilities, structures and equipment used in connection with waste disposal, technical aspects of safety

Legal aspects of waste treatment, of temporary or ultimate storage and disposal of radioactive wastes, including licensing and inspection, of national or international transport of radioactive waste materials by any means, and of accident prevention

For:
- environmental aspects of radioactive, chemical or thermal effluents see S07, S11, S21
- studies of materials used for immobilization of radioactive wastes use S36
- seismological, geological, hydrological, meteorological and climatic studies of waste treatment plant sites and of waste disposal sites use S58

S42
- radioactive contamination of soils, waters or atmosphere use S42
S54
- radioactive contamination of man, animals, plants and microorganisms use S54
S63
- radioactive contamination of food use S60
ETDE Scope Descriptions

S12 MANAGEMENT OF RADIOACTIVE WASTES, AND NON-RADIOACTIVE WASTES FROM NUCLEAR FACILITIES
Includes the treatment, disposal, transport, storage, safety and legal aspects of radioactive wastes and spent fuels (for reprocessing of spent fuels see S11). Includes processing, disposal, interim or ultimate storage of radioactive wastes, including transmutation technology; processing and disposal of non-radioactive wastes generated by nuclear facilities; radioactive waste treatment plants, structures and equipment; tritium processing, containment and recovery.
INIS Scope Descriptions

**S13 HYDRO ENERGY**
*Environmental aspects* of developing and using hydroelectric power plants utilizing both dammed streams and undammed, free-flowing streams and ocean currents, including fish-passage facilities, land use, studies on animal and plant life, and cultural resources of the affected area

*Economic aspects*, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants using hydro energy, economic aspects of accidents

**S14 SOLAR ENERGY**
*Environmental aspects* of developing and using solar energy, including land use, pollution and resource problems associated with the large-scale production of equipment for the utilization of solar energy, studies on animal and plant life, and cultural resources of the affected area

*Economic aspects*, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants using solar energy, economic aspects of accidents

**S15 GEOTHERMAL ENERGY**
*Environmental aspects* of developing and using geothermal energy, including ground subsidence, noise, earthquakes, uncontrolled blowouts, gaseous emissions and surface water and groundwater effects, studies on animal and plant life, and cultural resources of the affected area

*Economic aspects*, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants using geothermal energy, economic aspects of accidents

**S16 TIDAL AND WAVE POWER**
*Environmental aspects* of developing and using tidal and wave power, including site environmental studies and environmental impact studies in the construction and operation of tidal power plants

*Economic aspects*, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants using tidal and wave power, economic aspects of accidents

**S17 WIND ENERGY**
*Environmental aspects* of developing and using wind energy, including effects of wind turbines on the environment (e.g. noise and the effects of site construction)

*Economic aspects*, such as supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economics of power plants using wind energy, economic aspects of accidents
ETDE Scope Descriptions

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S13 HYDRO ENERGY
Includes all aspects of hydroelectric power plants, such as retrofitting existing dams for power, hydroelectric-dam safety and environmental studies, and generating equipment. Also includes the extraction of energy from the Florida Current, Gulf Stream, or undammed, free-flowing streams. Aspects include resources and availability; site geology and meteorology; plant design and operation; power-conversion systems; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

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S14 SOLAR ENERGY
Includes conversion of solar radiation to useful amounts of electric energy, use of solar energy for heating and cooling, or any other use of solar energy that might contribute to the total energy budget. All technical aspects of the design, research and development, manufacture, testing, and operation of solar cells and solar collectors are included along with photovoltaic power systems, solar thermal power systems, ocean energy systems and solar thermal utilization (space heating and cooling; water heating; agricultural and industrial process heat for e.g. crop drying, food dehydration). Also includes materials with indicated utility in solar cells or solar converters. Aspects include resources and availability; environmental aspects; solar energy conversion (photovoltaic, thermionic, thermoelectric, photochemical, photobiological and thermochemical conversion); heat storage; health and safety; legislation and regulations economic, industrial, and business aspects.

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S15 GEOTHERMAL ENERGY
Includes all aspects of geothermal resources, such as availability; geology and hydrology of geothermal systems; geothermal exploration and exploration technology; products and by-products; geothermal power plants and components; geothermal engineering (drilling technology, well hardware, fluid transmission; corrosion, scaling, and materials development; geothermal reservoir and well performance; control systems; reservoir stimulation and extraction technology); direct energy utilization; geothermal data and theory (properties of aqueous solutions, minerals and rocks; rock-water-gas interactions; isotope and trace element studies); waste management; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

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S16 TIDAL AND WAVE POWER
Includes all aspects of tidal and wave power, such as resources and availability (site characteristics); tidal power plants and power conversion systems; wave energy converters; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

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S17 WIND ENERGY
Includes all aspects of wind energy, such as resources and availability (climatology and site characteristics); wind energy engineering including applications, turbine design and operation, power-conversion systems; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

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S20 FOSSIL-FUELED POWER PLANTS

*Environmental aspects* of using fossil fuels for power and heat generation, if the type of fossil fuel is not specified

*Economic aspects*, such as information on companies and organizations, labour factors, market trends, prices, forecasts, statistical information, R & D expenditures, economic aspects of accidents, if the type of fossil fuel is not specified

For: - environmental or economic aspects of power plants using specific fossil fuels

see S01-S04
S20 FOSSIL-FUELED POWER PLANTS
Routine aspects of power plant hardware use are not included, but new designs, developments, and technologies are appropriate. Includes design, operation and performance of fossil-fueled power plants and power generation (e.g. cooling and heat transfer equipment; power cycles; waste-fueled systems; components, heat utilization such as combined heat and power plants (cogeneration), off-peak energy storage; waste management (on-site equipment and processes for the control of emissions and effluents; processing, disposal and management of waste fuel products such as fly ashes; environmental protection measures); environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.
S21 SPECIFIC NUCLEAR REACTORS AND ASSOCIATED PLANTS

Note: This category must be assigned to the relevant literature if the reactor type is specified.

Design, construction, performance, operation, accidents, decommissioning and dismantling of specific reactors (e.g. BWR-, PWR-, PHWR-, WWER-, GCR-, AGR-, HTGR-, LMFBR-types) and reactor plants as energy sources for electricity and heat generation; research reactors, including experimental reactors, zero-power reactors and subcritical assemblies, test, training, production (of fissionable materials, tritium, other isotopes), irradiation (such as chemonuclear reactors), materials testing, and materials processing reactors; other applications, including mobile, propulsion, package, and transportable reactors.

Environmental aspects of fission power reactors, including selection criteria, suitability studies and environmental impact theoretical studies under normal operating conditions for siting fission reactors, environmental implications for ecosystems resulting from generation, on-site treatment and release of radioactive substances, chemical, and thermal effluents from fission reactors, under both normal operation and accident conditions, other environmental impacts (e.g., infrastructure, noise, aesthetics, landscaping) of fission reactors, environmental consequences predicted from the analysis of design basis or hypothetical accidents and performance of safety systems for fission reactors, including those involving handling and transport of radioactive materials.

Economic aspects of fission power reactors, including supply and demand, consumption, trade and restraints to trade, prices, market trends, forecasts, R & D expenditures, labour factors, taxes and tax credits, economic comparison of fission reactors with alternative power sources or of different reactor types, fission nuclear power growth, comparative studies of energy consumption, energy sources and their future trends; financing of fission nuclear power; methodology of comparative analysis of fission nuclear energy and other energy costs, general economic planning of fission nuclear power and its integration into regional power supply systems, impacts of policy and energy costs on households, regions, countries, impact of weather on supply and demand, economic aspects of nuclear accidents.

Legal aspects, including licensing and inspection, of siting, construction, operation and decommissioning of nuclear reactors, trade, transfer and supply of nuclear reactors and equipment, navigation and accident prevention for nuclear ships and other nuclear means of conveyance.

(for accidents or incidents at nuclear facilities see the International Nuclear Event Scale in Appendix 2)

For:  
- seismological, geological, hydrological, meteorological and climatic studies of nuclear reactor sites use S58
- environmental aspects of radioactive, chemical or thermal effluents from other nuclear facilities see S07, S11
- nuclear controversy use S29
- chemical and physico-chemical fuel processing or spent fuel reprocessing use S11
- reactor fuels where no reactor type is specified use S22
- control systems where no reactor type is specified use S22
- overall fission fuel cycle economics use S11

- legal aspects see also S11, S22, S29

- economic aspects see also S11, S29

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S21 SPECIFIC NUCLEAR REACTORS AND ASSOCIATED PLANTS
Note: This category must be assigned to the relevant literature if the reactor type is specified.
Includes the design, construction, performance, operation, accidents, decommissioning and dismantling of specific reactors (e.g. BWR-, PWR-, PHWR-, WWER-, GCR-, AGR-, HTGR-, LMFBFR-types) and reactor plants as energy sources for electricity and heat generation; research reactors (including experimental reactors, zero-power reactors, and subcritical assemblies), test, training, production (of fissionable materials, tritium, other isotopes), irradiation (such as chemonuclear reactors), materials testing, and materials processing reactors; and other applications (includes mobile, propulsion, package, and transportable reactors).
All environmental, economic, legal and reactor safety aspects are included.
(In the case of reactor accidents, please see Appendix 2 for the International Nuclear Event Scale).
S22  GENERAL STUDIES OF NUCLEAR REACTORS

Note: This category must be assigned to the relevant literature if no reactor type is specified.

Reactor theory and calculation, including in-pile experiments verifying reactor theory and calculations, and computation of in-reactor processes

Reactor components and accessories, including the design, construction, fabrication, performance (e.g., mechanical integrity, structural analysis, reliability, fracture mechanics), and safety aspects of reactor components and accessories (e.g., cooling systems, coolants, shielding, pressure vessels, loading machines), methods and equipment for in-service (recurring) inspection of reactors or reactor components and accessories

Reactor fuels, including the design, fabrication and performance of fuel pellets, fuel elements and fuel assemblies, fuel-loading procedures, fuel fabrication plants (regardless of type of fuel elements produced), including technical aspects of safety, decommissioning and dismantling

Reactor control systems, including systems for alarm and automatic shutdown and the automatic initiation of protective systems or actions, elements of reactor and reactor plants control system such as drive units, control rods and incorporated instruments, reactor and reactor plants control by on-line computers, man-machine communication problems in reactor control

Liability for nuclear damage: legal aspects of nuclear damage and risk, operator's liability, state responsibility, absolute liability, limited liability, financial security for nuclear risks, insurance for third party liability, insurance for damage to a nuclear installation, insurance for damage by a means of transport, workers' compensation schemes

For:  - physics and calculation of specific types of reactors use S21
      - fundamental studies of neutrons in macroscopic systems use S73
      - fuel elements and assemblies see also S21
      - fission reactors of specific type use S21
      - preparation and fabrication of materials use S36
      - radiation effects on chemical behaviour of materials use S38
      - radiation effects on the physical behaviour of materials use S36
      - spent fuel processing use S11
      - uranium and thorium ores, and chemical or physico-chemical processing of uranium and thorium ores, seawater and groundwater for recovery of uranium or thorium use S11
      - fuel-handling equipment use S42
      - fuel-loading machines see also S21
      - detailed fuel burnup calculations in specific environments use S21
      - fission fuel cycle economics use S11
      - chemical analysis of spent reactor fuels for burnup determinations use S37
      - interim storage of spent fuel elements use S42
      - legal aspects see also S21
      - reactor accidents see also S21
      - radiation protection procedures use S61
S22 GENERAL STUDIES OF NUCLEAR REACTORS

Note: This category must be assigned to the relevant literature if no reactor type is specified. Covers general studies of nuclear reactors, such as reactor theory, reactor physics calculations, reactor components and accessories, reactor fuels, reactor safety aspects, reactor control systems and liability for nuclear damage.
INIS Scope Descriptions

S24 POWER TRANSMISSION AND DISTRIBUTION

*Environmental aspects:* effects of high-voltage electric fields, polychlorinated biphenyles (PCB) leakage from transformers, ecological disruptions during transmission line construction, etc.

*Economic aspects,* such as information on companies and organizations, labour factors, market trends, statistical information on consumption, supply and demand, imports, exports, price trends, forecasts, R & D expenditures.

S25 ENERGY STORAGE

*Environmental aspects:* environmental implications of the methods, such as mechanical, chemical, electromagnetic, thermal, etc., and devices, such as capacitor banks, flywheels, batteries, pumped water, etc., used for storage of energy.

*Economic aspects,* such as information on companies and organizations, labour factors, market trends, prices, forecasts, statistical information, R & D expenditures of different methods, such as mechanical, chemical, electromagnetic, thermal or pumped storage and devices, such as capacitor banks, flywheels, batteries, etc., used for storage of energy.

S29 ENERGY PLANNING, POLICY AND ECONOMY

General economic, political, environmental, legal, and sociological aspects of energy planning and policy, energy analysis and modeling (only non-technical documents), including nuclear controversy, public relations aspects of nuclear energy, and social impact of nuclear accidents.

S30 DIRECT ENERGY CONVERSION

*Methods and devices for direct conversion* (without intermediate conversion into mechanical work) of *actual or simulated nuclear energy* (thermal energy and the energy of particles and radiation) into electrical energy, such as magnetohydrodynamic energy conversion and MHD generators, electrohydrodynamic energy conversion and EHD generators, thermoelectric generators, thermionic converters, fuel cells, other convertors (e.g. piezoelectric, ferroelectric, magnetothermoelectric, photoelectromagnetic or magnetorestrictive).

*Note: solar cells are excluded*

For:
- power conversion systems in fusion plant technology use S70
- applications of radioisotopes and fission products in power production use S07
- MHD phenomena in plasmas use S70
ETDE Scope Descriptions

S24  POWER TRANSMISSION AND DISTRIBUTION
Includes the design, development, and new technologies of power systems and power transmission from any source. Hardware includes transformers, switchgear, converters, and cables. Aspects include power systems; power systems networks, transmission, and distribution; power transmission lines and cables; environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

S25  ENERGY STORAGE
Covers methods for storing energy in a readily recoverable form for later use. Such methods may be mechanical, chemical, electromagnetic, or thermal. Aspects include energy storage by compressed and liquefied gas; capacitor banks; flywheels or magnetic, thermal and chemical storage or batteries (design, development, materials, components and auxiliaries). Includes all environmental aspects; health and safety; legislation and regulations; economic, industrial, and business aspects.

S29  ENERGY PLANNING, POLICY AND ECONOMY
Contains general aspects of energy planning, policy, and policy analysis (only non-technical documents). Includes planning and policy aspects of electric power and its generation; energy storage and transport (e.g. by pipelines); energy consumption, utilization, and conservation; district heating and cooling; and specific energy sources such as fossil fuels, synthetic fuels, nuclear energy, and unconventional energy sources (wind, tides, geothermal energy, etc.). Also includes sociology and economics of energy production and use, such as supply and demand, cost comparisons, and environmental, health, and safety aspects. Also includes broad, generally applicable articles on total energy systems, energy management, energy analysis and modeling, legislation and regulations, and the research, development, demonstration, and commercialization policies of governments and private institutions.

S30  DIRECT ENERGY CONVERSION
Includes methods and devices for converting heat or other forms of energy into electrical energy without intermediate conversion into mechanical work. Aspects include MHD generators; EHD generators; thermoelectric generators; thermionic converters; fuel cells; other convertors (e.g. piezoelectric, ferroelectric, magnetothermoelectric, photoelectromagnetic or magnetorestrictive conversion). For direct energy converters used in fusion technology see S70.
INIS Scope Descriptions

S32  ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

NOT WITHIN INIS SCOPE

S33  ADVANCED PROPULSION SYSTEMS

NOT WITHIN INIS SCOPE
ETDE Scope Descriptions

S32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
Includes information on equipment and methods to reduce energy consumption, increase energy efficiency, or to enable the substitution of more plentiful or environmentally favorable energy sources. The area includes energy conservation within buildings, in transportation, in industry and agriculture, and within municipalities and communities. It includes e.g. optimization of materials, equipments and processes for reducing energy consumption, waste heat recovery and utilization, waste management for energy recovery or recycling.

S33 ADVANCED PROPULSION SYSTEMS
Includes design and development of advanced propulsion systems for automobiles, buses, trucks, ships, aircraft, and trains - e.g. components and devices that promise better fuel economy, less maintenance, and increased service life; more efficient power cycles; better emission-control devices; feasibility studies on the use of alternative fuels, such as hydrogen or alcohol fuels. Aspects include internal combustion engines, external combustion engines, electric-powered systems, hybrid systems, flywheel propulsion, and vehicle design factors.
INIS Scope Descriptions

S36 MATERIALS SCIENCE
Note: metals, alloys, intermetallic compounds, metallic matrix composites, metallic glasses, ceramics and cermets (e.g., borides, carbides, hydrides, nitrides, oxides, silicides), and other materials (e.g., boron, carbon, graphite, concretes, glass, semiconductor materials, composite materials, plastics, soil, rock, cloth, fluids) if they are associated with an actual or simulated nuclear application.
(See Appendix 1 as a guide for the principal elements of nuclear interest)
Preparation, fabrication, and manufacture (e.g., annealing, bonding brazing, casting, cold working, doping, drawing, electroplating, extrusion, fastening, forging, forming, gelation, hot working, moulding, pelletization, powder metallurgy, pressing, refining, rolling, sintering, soldering, surface finishing, swaging, thin film deposition, welding), structure and phase studies (e.g., allotropy, crystal structure and microstructure, crystal-phase transformations, melting points, phase diagrams, solidification, transformation temperatures), mechanical properties (e.g., brittleness, buckling, cracking, creep, deformation, ductility, elastic properties, elongation, embrittlement, fracture, friction, hardness, plasticity, Poisson’s ratio, rupture, shear properties, strain, stress, tensile properties, toughness, wear, Young’s modulus), physical properties (e.g., damping, density, electrical properties including superconductivity and superconducting transition temperatures, magnetic properties, optical properties, specific heat, thermal conductivity, thermal diffusivity, vapor pressure, thermal expansion, other thermodynamic properties), corrosion and erosion of materials of nuclear interest, and physical radiation effects on the mechanical integrity or physical properties of all materials

For: - material studies related to fusion research
      use S70
- fabrication of components and accessories of specific nuclear facilities, plants and devices
      see category for facility
- production of enriched uranium
- fabrication of fission fuel elements
      see
S21, S22
- nuclear instrumentation
      use S46
- nuclear phenomena and techniques in solid state studies of materials
      use S75
- chemical and physico-chemical properties of materials
      see S37, S38
- basic studies in superconductivity
- superconducting devices
      see S75 or the category
- effects of corrosion or erosion on performance and operation of nuclear facilities
      see category for facility
- radiation effects in solid state and fluid physics
      use S75
- chemical radiation effects
      use S38
- radiation effects on instruments, electrical and electronic devices and their components
      use S46
- radiation effects on the performance and operation of components and accessories of nuclear facilities
      see category for facility
- fabrication of thermonuclear fuel pellets
      use S75
- production of heavy water
      use S07
- testing the particle and radiation detection capability of sensor materials
      use S46
- materials testing reactors
      use S22
S36 MATERIALS SCIENCE
Includes preparation, fabrication, structure and phase studies, mechanical properties, physical properties, corrosion, erosion of and radiation effects on metals, alloys, ceramics, cermets, refractories, and other materials, such as composite materials, polymers, plastics, boron, carbon, graphite, concrete, glass, semiconductor materials, soil, rock, cloth, textiles.
INIS Scope Descriptions

S37 INORGANIC, ORGANIC, PHYSICAL AND ANALYTICAL CHEMISTRY

Note: only if the field is of relevance for nuclear technology or of nuclear interest
(see Appendix 1 as a guide for the principal elements of nuclear interest)

Analytical and separation chemistry (activation, nuclear reaction, radiometric, and radiochemical procedures),
inorganic, organic, and physical chemistry, electrochemistry, photochemistry, combustion, pyrolysis and high-
temperature chemistry;

Isotope effects on nonnuclear chemical and physical properties of elements and compounds. (isotope effect are
not included when used only as a tool in the analysis of reaction mechanisms or in chemical structure studies).
Isotope exchange if the exchange is of primary concern or the exchange mechanism is used in isotope separation,
chemical and physicochemical methods of isotope separation.

For:
- analysis of radiolytical products use S38
- analytical control in nuclear fuel processing or in spent fuel reprocessing use S11
- detailed fuel burnup calculations in specific reactor types use S21
- industrial applications of activation analysis use S07
- nuclear instrumentation use S46
- structure and phase analysis of compounds and materials of nuclear interest use S36
- industrial methods of isotope separation use S07
- chemical separation of radioisotopes (other than analytical
  applications and industrial methods) use S38
- target preparation using ion, atomic or molecular beams use S71

S71
- target preparation by other physical methods use S36
- fusion fuel target preparation use S70
- chemical studies of corrosion use S36
- chemistry of fission fuels in connection with their processing or reprocessing use S11

S11
- physical properties of materials for nuclear technology use S36
- chemical and physico-chemical studies of radioactive elements
  and compounds use S38
- isotope effects in atomic and molecular physics use S74
- isotope effects in solid state and fluid physics use S75
S37 INORGANIC, ORGANIC, PHYSICAL AND ANALYTICAL CHEMISTRY
Includes analytical and separation chemistry (activation, nuclear reaction, radiometric, and radiochemical procedures; inorganic, organic, and physical chemistry; electrochemistry; photochemistry; combustion, pyrolysis and high-temperature chemistry.
Isotope effects on nonnuclear chemical and physical properties of elements and compounds. (isotope effect are not included when used only as a tool in the analysis of reaction mechanisms or in chemical structure studies).
Isotope exchange if the exchange is of primary concern or the exchange mechanism is used in isotope separation. Chemical and physicochemical methods of isotope separation are included. (For industrial methods of isotope separation see S07).
INIS Scope Descriptions

S38 RADIATION CHEMISTRY, RADIOCHEMISTRY AND NUCLEAR CHEMISTRY

*Hot-atom chemistry:* chemical reactions of atoms or ions of high kinetic energy (more than 1 eV) resulting from nuclear transformations, including recoil production

*Properties of radioactive materials:* chemical and physico-chemical properties of radioactive elements, compounds or materials

*Preparation of radioactively-labelled compounds:* chemical separation and preparation of radioisotopes (other than analytical applications and industrial methods of production, separation and enrichment), preparation of radioactively labelled compounds and studies of their stability

*Radiation chemistry:* radiation-induced chemical reactions, including formation of free radicals and G value determination, analysis of radiolytical products; chemical radiation effects on gases, liquids, and solids (excluding industrial applications), post-factum detection of food irradiation (nuclear radiation only, e.g., beta, gamma radiation)

*Note:* effects of ultraviolet, visible and infrared radiation as well as laser beams are excluded

For:  
- chemistry of fission fuels in connection with their processing or reprocessing  
  use S11
- physical properties of radioactive materials  
  use S36
- chemical decontamination of food and animal feed  
  use S60
- chemical decontamination of man, animals and plants  
  use S63
- chemical decontamination of materials, structures and equipment  
  use S61
- chemical decontamination of soils, water or air  
  use S54
- separation for analytical applications  
  use S37
- preparation of compounds labelled with stable isotopes  
  use S37
- isotope-labelled compounds in biological systems  
  see S62, S63
- novel tracer techniques  
  see S07 or

category for application
- enrichment of isotopes (industrial)  
  use S07

- handling and storage equipment and procedures  
  use S42
- radiation effects on organic molecules occurring in living systems  
  use S63
- industrial radiation processing  
  use S07
- chemonuclear irradiation reactors  
  use S22
- chemical dosemeters  
  use S46
- physical radiation effects on materials  
  use S36

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ETDE Scope Descriptions

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**S38  RADIATION CHEMISTRY, RADIOCHEMISTRY AND NUCLEAR CHEMISTRY**

*Hot-atom chemistry.* Chemical reactions of atoms or ions of high kinetic energy (more than 1 eV) resulting from nuclear transformations, including recoil production.

*Properties of radioactive materials.* Chemical and physico-chemical properties of radioactive elements, compounds or materials.

*Preparation of radioactively-labelled compounds.* Chemical separation and preparation of radioisotopes (other than analytical applications and industrial methods of production, separation and enrichment), preparation of radioactively labelled compounds and studies of their stability.

*Radiation Chemistry.* Radiation-induced chemical reactions, including formation of free radicals and G value determination, analysis of radiolytical products; chemical radiation effects on gases, liquids, and solids (excluding industrial applications); post-factum detection of food irradiation (nuclear radiation only, e.g., beta, gamma radiation). *Note: effects of ultraviolet, visible and infrared radiation as well as laser beams are excluded.*
INIS Scope Descriptions

S42 ENGINEERING
Design, construction, operation, safety aspects, decommissioning, dismantling, and applied mechanics studies of structures and nuclear equipment (such as floor supports, ventilation fans, air filters, off-gas systems, valves), laboratories, pilot plants and factories not covered by a more specific category.

Note: for any structure or piece of equipment whose application is identified, always use the category for the application.

Heat transfer and fluid flow studies (e.g., nucleate boiling, boiling burnout, critical heat flux, two-phase flow, flow in rod bundles, flow of liquid metals) of nuclear systems or in relation to nuclear systems, including nuclear techniques (tracers only if the application is new).

Peaceful use of nuclear explosions and their simulation.

Aspects (including safety and administrative aspects) of the transport and interim storage of radioactive materials, including fresh and spent reactor fuels.

Design, development, construction, evaluation, safety analyses and testing of shipping and storage containers for radioactive materials.

Design, construction, operation and safety aspects of equipment and facilities for handling radioactive materials such as remote-handling equipment, glove boxes, hot cells, etc. (non-reactor criticality studies are included, but reactor loading is excluded).

Materials testing (methods and equipment (destructive and non-destructive) for determining the integrity or the mechanical properties of materials of actual or potential nuclear use such as fuels, cladding, moderators, structural materials, etc.)

For:
- thermodynamic properties of materials use S36
  - industrial application of nuclear techniques in thermodynamics and fluid flow use S07
  - thermodynamics studies of fission reactors in general use S22
  - thermodynamics studies of specific fission reactor types use

S21
- thermodynamics studies in plasma physics or fusion reactors use S70
  - magnetohydrodynamics use S30
  - superfluidity use

S75
- cryogenics use S71
- hydrological studies use

S58
- thermodynamics of direct energy conversion use S30
  - studies of waste heat released into waters at existing nuclear installations see category for installation

  - decommissioning and dismantling of reactors see S21, S22
  - decommissioning and dismantling of accelerators use S46
  - nuclear instruments use S46
  - environmental aspects, including possible accidents see category for installation

  - legal aspects of nuclear explosions use

S98
- contamination and decontamination of soils, waters and atmosphere use S54
- reactor loading and fuel-loading machines see S21, S22
- waste processing or disposal use S12
- economic or legal aspects see category for equipment

- containers for waste disposal use S11
- radiation protection procedures use S61
S42 ENGINEERING
Encompasses general engineering information directly related to energy, including facilities, equipment and techniques. Includes protective structures and equipment, such as blast and fallout shelters, air-filtration systems, fire protection systems, special clothing. Handling equipment and procedures, e.g. for handling of radioactive materials not necessarily related to nuclear fuel cycle (see S11), handling equipment, such as remote-handling equipment, glove boxes, hot cells. Shipping containers for radioactive materials. Transport and storage facilities, such as tanks, pipelines, tanker vessels. Heat transfer and fluid flow studies (nucleate boiling, boiling burnout, critical heat flux, two-phase flow). Materials testing, Combustion systems (e.g. boilers, furnaces). Mining and underground engineering. Marine engineering (equipment for offshore operations). Power cycles (Brayton, Rankine, Stirling and others). Components, electron devices and circuits (including lasers and masers). Peaceful uses of Nuclear explosions for e.g. civil/engineering purposes.
S43 PARTICLE ACCELERATORS
Design, development, operation, decommissioning, dismantling, and safety aspects of particle accelerators and storage rings, including beam dynamics, field calculations, ion optics, components and auxiliaries (e.g. ion and electron sources, injection and extraction systems, magnet coils, vacuum systems, shielding, experimental facilities and equipment, such as target facilities, facilities used as a radiation source (e.g. X-ray sources, neutron sources), devices for measuring beam parameters, etc.)

For:
- accelerators or storage rings used in thermonuclear devices use S70
- seismological, geological, hydrological, meteorological and climatic studies of accelerator or storage rings sites use S58
- environmental aspects of accelerator or storage rings use S54
- production of electron, ion, atomic and molecular beams other than in accelerators use S71
- ion and electron beam sources in fusion power plants use S70
- non-isotopic ion and electron sources other than for accelerator applications see S71 or category for application

S46 INSTRUMENTATION RELATED TO NUCLEAR SCIENCE AND TECHNOLOGY
Note: for detectors and instrumentation incorporated in a larger device or system the appropriate category for that device or system should be used
Design, development, manufacture, testing, evaluation and standardization of radiation dosimeters, nuclear spectroscopic instrumentation (e.g. instruments for measurement of energy spectra of nuclear particles or radiation), high-energy physics instrumentation (e.g. bubble chambers, Cherenkov counters, gas track detectors, missing-mass spectrometers, spark chambers), other particle and radiation detection and measuring instruments (e.g. instrumentation for medical diagnosis and therapy), electronic circuits and equipment, including automated systems for measurement, control and data processing, specifically designed for incorporation with such instruments, other instrumentation and methods required in nuclear science and its applications (e.g., flow meters, pressure gauges, well logging, etc.); radiation effects on instruments, components or electronic devices (adverse or beneficial effects of radiation on the sensitivity, accuracy or performance)

For:
- channeling and sputtering in sensor materials use S75
- radiation effects on the sensor materials see S36, S38

S47 OTHER INSTRUMENTATION
NOT WITHIN INIS SCOPE
PARTICLE ACCELERATORS
Design, development, operation, decommissioning, dismantling of particle accelerators and storage rings used in energy research. Topics include beam dynamics, field calculations, and ion optics; auxiliaries and components (e.g. ion and electron sources; injection and extraction systems), experimental facilities and equipment.

INSTRUMENTATION RELATED TO NUCLEAR SCIENCE AND TECHNOLOGY
Includes radiation detectors or monitors, radiometric instruments, radiation dosemeters, nuclear spectroscopic instrumentation, high-energy physics instrumentation, particle detectors, and other nuclear-related instrumentation such as flowmeters, pressure gages and heat sensors. Radiation effects on instruments or electronic systems.

OTHER INSTRUMENTATION
Includes well logging, thermal, optical, geophysical, meteorological and other instrumentation associated with energy research.
INIS Scope Descriptions

S54 ENVIRONMENTAL SCIENCES
This category is used for pollutants/contaminants in the environment that cannot be directly connected with a particular energy source. If the source is clear, the subject category for the energy source is used.

Monitoring and transport of radioactive materials and radioisotopes, monitoring of ionizing radiations (whether natural or not) in environment (soils, groundwater, surface waters, geosphere, and the earth’s atmosphere), including contamination and decontamination, monitoring and transport of chemical and thermal effluents from nuclear facilities in the environment

Environmental aspects of nuclear installations other than fission reactors or fuel cycle installations
Measures for restoration of the land and surface waters following radioactive contamination or chemical or thermal pollution from nuclear facilities, land and water use and reclamation, measures for cleaning the atmosphere following radioactive contamination or chemical pollution from nuclear facilities

Regional and global environmental aspects of nuclear and nonnuclear energy production (e.g., acid rain, global warming), irrespective of the energy source, including studies on nuclear winter

For:
- environmental aspects of radioactive, chemical or thermal discharges from particular nuclear facilities see S07, S11, S21, S22
- radiation measuring instruments use S46
- age determination of objects use S37
- economics of nuclear methods use S07
- well-logging equipment use S46
- environmental aspects of siting of particular nuclear installations see S07, S11, S21

S22
- use of nuclear explosions in geological and seismological studies use S42
- environmental aspects of chemical or thermal discharges from particular nonnuclear energy facilities see category for facility
- radioactive waste disposal in waters of the earth use S12
- uranium and thorium ores, or chemical and physico-chemical processing of ores, seawater or groundwater for recovery of uranium and thorium, or economics of uranium and thorium recovery from waters use S11
- fuel fabrication plants use S22
- food contamination due to fallout use S60
- stack disposal of radioactive effluents use S12

S58 GEOSCIENCES
Basic seismological, geological and soil, hydrological, meteorological, climatic, and atmospheric studies of existing or potential sites used for any phase of nuclear energy development, use of nuclear methods (e.g., radiometric methods using radioisotopes or ionizing radiations) in basic terrestrial, aquatic, and atmospheric studies
Use of nuclear and isotopic techniques in studies for water resources development
S54 ENVIRONMENTAL SCIENCES
This category is used for pollutants/contaminants in the environment that cannot be directly connected with a particular energy source. If the source is clear, the subject category for the energy source is used.
Includes information on the effects of any energy-related activity on the environment (land, water or atmosphere), on methods for mitigating or eliminating adverse effects, and on technical aspects (e.g. radiometric methods using radioisotopes or ionizing radiations) of ensuring that energy-related activities are environmentally safe and socially acceptable. Includes site resource and use studies, such as seismological, geological, soil, hydrological, meteorological, climatic and atmospheric studies of existing or potential sites for any phase of energy development and use. This area covers all aspects of global climate change. Covers monitoring and transport of chemicals, radioactive materials and thermal effluents within the atmospheric, terrestrial and aquatic environment.

S58 GEOSCIENCES
This area is limited to providing information to support research in geosciences where the context of the work is energy technology. Aspects of geology, geography, seismology and geochemistry are covered when energy-related. This category should be used if an item cannot categorized elsewhere.
S60 APPLIED LIFE SCIENCES

Plant cultivation and breeding: crop and plant improvement by development of radiation-induced mutants, including use of radiomimetic substances in comparative studies, nuclear techniques (tracers only if the application is new) in plant growth and cultivation, including plant nutrition, metabolism, fertilizer utilization, and irradiation studies, assessment of seed quality by nuclear or radiographic techniques, low-dose stimulation of plant growth

Pest and disease control: nuclear techniques (tracers only if the application is new) relating to specific human, animal and plant parasitic diseases, to pathogens, including viruses, and to disease transmission, radiation procedures in vaccine production and animal reactions to irradiated pathogens, new applications of tracers in pest ecology, including host-parasite relationships, and in studying pesticides (including weed control) and insect pathogens, radiation sterilization for control of insects and other arthropods of agricultural significance (e.g. sterile insect release)

Food protection, preservation and human nutrition evaluation: irradiation procedures for, and radiation effects on, agricultural food products, fish and fish products, processed foods and food ingredients, processed animal feed, extension of storage life and sprout inhibition, radiation disinfestation of stored and packaged food products and chemical changes resulting from irradiation, radiation processing of food on an industrial scale, evaluation of wholesomeness and quality of irradiated food, contamination and monitoring of, and decontamination procedures for food, new applications of isotopic techniques in human nutrition evaluation)

Animal husbandry (new applications of tracers in nutrition, metabolism and breeding of domestic animals, nuclear techniques in veterinary science)

Other applications of radiations and radioisotopes in life sciences: irradiation sterilization in medicine, nuclear techniques and applications of radiation and stable or radioactive isotopes (tracers only if the tracer or application is new) in the life sciences

For:
- contamination and decontamination of soils use S54
- basic studies of radiation effects on plants, or contamination and decontamination of plants use S63
- radiation treatment of agricultural and biological wastes use

S07
- activation analysis of pesticide residues see S07, S37
- basic studies of radiation effects on parasites or pests use S63
- immunological effects of irradiation use S63
- radiation processing of pesticides use S07
- use of nuclear techniques in medicine use S62
- post-factum detection of food irradiation use S38
- economics of radiation processing of food use S07
- legal aspects of food irradiation, including labelling and packaging rules use S61
- effects of external or internal irradiation on animals use S63
- tissue distribution, metabolism, toxicity and removal of radioisotopes use S63
- contamination of pasture use S54
- applications of radiopharmaceuticals, radioisotopes, radiation, and nuclear techniques in medical diagnosis or therapy use S62
- preparation of radiopharmaceuticals use S38
- radioassay, including radioimmunoassay, in medical diagnosis use S62
ETDE Scope Descriptions

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S60 APPLIED LIFE SCIENCES

Comprehensive coverage is not obligatory for ETDE

- **Plant cultivation and breeding** (crop and plant improvement by development of radiation-induced mutants, including use of radiomimetic substances in comparative studies, nuclear techniques (tracers only if the application is new) in plant growth and cultivation, including plant nutrition, metabolism, fertilizer utilization, and irrigation studies, assessment of seed quality by nuclear or radiographic techniques, low-dose stimulation of plant growth)

- **Pest and disease control** (nuclear techniques (tracers only if the application is new) relating to specific human, animal and plant parasitic diseases, to pathogens, including viruses, and to disease transmission, radiation procedures in vaccine production and animal reactions to irradiated pathogens, new applications of tracers in pest ecology, including host-parasite relationships, and in studying pesticides (including weed control) and insect pathogens, radiation sterilization for control of insects and other arthropods of agricultural significance (e.g. sterile insect release))

- **Food protection, preservation and human nutrition evaluation** (irradiation procedures for, and radiation effects on, agricultural food products, fish and fish products, processed foods and food ingredients, processed animal feed, extension of storage life and sprout inhibition, radiation disinfestation of stored and packaged food products and chemical changes resulting from irradiation, radiation processing of food on an industrial scale, evaluation of wholesomeness and quality of irradiated food, contamination and monitoring of, and decontamination procedures for food, new applications of isotopic techniques in human nutrition evaluation)

- **Animal husbandry** (new applications of tracers in nutrition, metabolism and breeding of domestic animals, nuclear techniques in veterinary science)

- **Other applications of radiations and radioisotopes in life sciences** (irradiation sterilization in medicine, nuclear techniques and applications of radiation and stable or radioactive isotopes (tracers only if the tracer or application is new) in the life sciences)

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### S61 RADIATION PROTECTION AND DOSIMETRY

**Radiation protection standards:** technical standards, including definitions and units, dealing with the presence of radioactive materials, natural or artificial (e.g. radon in houses or mines), or with the operation of reactors or other nuclear equipment or facility when such standards are set to provide radiation protection for man, documents about such standards

**Radiation protection procedures:** procedures designed wholly or primarily to provide radiation protection for man (except for shielding of reactors and accelerators), prevention of contamination or procedures for decontamination, including chemical decontamination of materials, structures and equipment

**Dosimetry and monitoring:** personnel dosimetry and radiation monitoring (e.g., in nuclear facilities, industry, radiotherapy, X-ray diagnostics, nuclear medicine) for both patients and medical personnel, medical surveillance of personnel exposed to ionizing radiations in conformance with national or international radiation protection regulations or recommendations, population dose estimates, collective dose and dose commitment from natural background radiation (e.g. radon in houses or mines), or as a result of nuclear accidents, from medical or industrial use of radioisotopes and ionizing radiations or from contaminated food, calculation and measurement of absorbed doses in man, animals, plants and other biological systems at all levels, as well as in tissue-equivalent materials and phantoms

**Legal aspects** of protecting personnel, members of the public, and the environment against contamination from the operation of nuclear facilities, legal aspects of direct or indirect applications of radioisotopes and radiation to man (e.g., medical and industrial applications, food irradiation, radiation from consumer products)

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<td>- decontamination of man</td>
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<td>- wholesomeness and quality of irradiated food</td>
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<td>- calculation, estimation and measurement of dose distributions</td>
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<td>- shield fabrication</td>
<td>S36</td>
<td></td>
</tr>
<tr>
<td>- thermonuclear reactor shielding</td>
<td>S70</td>
<td></td>
</tr>
<tr>
<td>- accelerator shielding</td>
<td>S43</td>
<td></td>
</tr>
<tr>
<td>- fission reactor shielding</td>
<td>see S21, S22</td>
<td></td>
</tr>
<tr>
<td>- procedures and equipment for handling radioactive materials</td>
<td>S42</td>
<td></td>
</tr>
<tr>
<td>- measures for decontamination of the atmosphere, or measures for restoration of the land or waters from effects of radioactive contamination</td>
<td>S54</td>
<td>see category for installation S99</td>
</tr>
<tr>
<td>- emergency planning, non-legal aspects</td>
<td>use</td>
<td></td>
</tr>
<tr>
<td>- emergency planning, legal aspects</td>
<td>use</td>
<td></td>
</tr>
<tr>
<td>- external irradiation effects in life sciences</td>
<td>use</td>
<td></td>
</tr>
</tbody>
</table>

**S63**

- surface, depth and internal dose distributions in radiation therapy | use S62 |
- radiation source metrology | use S07 |
- monitoring of food | use S60 |
- calculation and measurement of absorbed doses in radiation processing | use |

<table>
<thead>
<tr>
<th>S07</th>
<th>use</th>
</tr>
</thead>
<tbody>
<tr>
<td>- calculation and measurement of absorbed doses in radiation processing</td>
<td>use</td>
</tr>
</tbody>
</table>
S61 RADIATION PROTECTION AND DOSIMETRY

Radiation Protection Standards. Technical standards, including definitions and units, dealing with the presence of radioactive materials, natural or artificial (e.g. radon in houses or mines), or with the operation of reactors or other nuclear equipment or facility when such standards are set to provide radiation protection for man; documents about such standards.

Radiation Protection Procedures. Procedures designed wholly or primarily to provide radiation protection for man (except for shielding of reactors and accelerators); prevention of contamination or procedures for decontamination, including chemical decontamination of materials, structures and equipment.

Dosimetry and Monitoring. Personnel dosimetry and radiation monitoring (e.g., in nuclear facilities, industry, radiotherapy, X-ray diagnostics, nuclear medicine) for both patients and medical personnel; medical surveillance of personnel exposed to ionizing radiations in conformance with national or international radiation protection regulations or recommendations; population dose estimates, collective dose and dose commitment from natural background radiation (e.g. radon in houses or mines), or as a result of nuclear accidents, from medical or industrial use of radioisotopes and ionizing radiations or from contaminated food; calculation and measurement of absorbed doses in man, animals, plants and other biological systems at all levels, as well as in tissue-equivalent materials and phantoms).

Legal aspects. Legal aspects of protecting personnel and members of the public; legal aspects of protecting the environment against contamination from the operation of nuclear facilities; legal aspects of direct or indirect applications of radioisotopes and radiation to man (e.g., medical and industrial applications, food irradiation, radiation from consumer products).
S62  RADIOLOGY AND NUCLEAR MEDICINE

External radiation in diagnosis: advances in the use of ionizing radiations (e.g., X-rays, bremsstrahlung, gamma radiation, neutrons, charged particles) for diagnostic purposes, advances in imaging procedures, including NMR spectroscopy and tomography

Note: sonography and routine X-ray diagnostics are excluded

Radioisotopes in diagnosis: advances in the use of radioisotopes and stable isotopes for diagnostic purposes, imaging and non-imaging procedures, radioassay, including radioimmunoassay, incorporation and elimination of radioisotopes and labelled compounds, advances in Single Photon ECT, Positron Computed Tomography

External radiation in therapy: advances in the use of ionizing radiations for therapeutic purposes (implants are included), surface and depth dose distributions, afterloading, irradiation and dose planning, use of response modifying factors in radiation therapy

Radioisotopes in therapy: advances in the use of radioisotopes for therapeutic purposes, internal dose distributions, response modifying factors, radioactivation (e.g. neutron capture therapy), incorporation and elimination of radioisotopes and labelled compounds

For:
- radiation protection standards, or
- personnel and patient dosimetry and monitoring
- design, construction, operation, metrology and performance
  of isotopic radiation sources, including technical aspects of safety
- radiation measuring instruments
- interim storage of radioactive materials
- legal aspects
- preparation of radioisotopes and labelled compounds for medical use
- preparation of radioisotopes on industrial scale for medical use

S07
- side and late effects of radioisotopes and radiation
- uptake, distribution, metabolism, kinetics, elimination and effects of
  incorporation of radioisotopes other than in diagnosis or therapy
- contamination and decontamination of man
- disposal of radioactive materials
- modification of radiation effects due to radioprotective
  or effect-enhancing substances or irradiation conditions

S63
- accelerators used in, safety aspects
- calculation and measurement of absorbed doses and dose
  distributions in tissue-equivalent materials and phantoms

S61
- calculation and measurement of absorbed doses in man for
  radiation protection
ETDE Scope Descriptions

S62 RADIOLOGY AND NUCLEAR MEDICINE

Comprehensive coverage is not obligatory for ETDE

External radiation in diagnosis (advances in the use of ionizing radiations (e.g., X-rays, bremsstrahlung, gamma radiation, neutrons, charged particles) for diagnostic purposes, advances in imaging procedures, including NMR spectroscopy and tomography)

Note: sonography and routine X-ray diagnostics are excluded

Radioisotopes in diagnosis (advances in the use of radioisotopes and stable isotopes for diagnostic purposes, imaging and non-imaging procedures, radioassay, including radioimmunoassay, incorporation and elimination of radioisotopes and labelled compounds, advances in Single Photon ECT, Positron Computed Tomography)

External radiation in therapy (advances in the use of ionizing radiations for therapeutic purposes (implants are included), surface and depth dose distributions, afterloading, irradiation and dose planning, use of response modifying factors in radiation therapy)

Radioisotopes in therapy (advances in the use of radioisotopes for therapeutic purposes, internal dose distributions, response modifying factors, radioactivation (e.g. neutron capture therapy), incorporation and elimination of radioisotopes and labelled compounds)
S63 RADIATION, THERMAL, AND OTHER ENVIRONMENTAL POLLUTANT EFFECTS ON LIVING ORGANISMS AND BIOLOGICAL MATERIALS

Effects of external irradiation on biochemicals, on cell and tissue cultures, and on microorganisms: effects of irradiations, including ultraviolet radiation and laser radiation, on living systems at the biochemical, cellular and tissue culture level, on isolated cell constituents, and on microorganisms, both animals and plants (e.g., bacteria, bacteriophages, rickettsiae, yeasts, viruses), including the relative effects of irradiation procedures, doses, dose rates, Relative Biological Effectiveness (RBE), Linear Energy Transfer (LET) and various response modifying factors.

Effects of external irradiation on plants: effects of ionizing radiations on plants or parts of plants (seeds, roots, leaves, etc.), plant growth, physiology and metabolism, including the relative effects of irradiation procedures, doses, dose rates, Relative Biological Effectiveness (RBE) and Linear Energy Transfer (LET), modification of effects of such radiation due to various response modifying factors, such as radioprotective and effect-enhancing substances or irradiation conditions.

Effects of external irradiation on animals: effects of ionizing radiations, including immunological consequences, on any animal, the relative effects of irradiation procedures, doses, dose rates, Relative Biological Effectiveness (RBE) and Linear Energy Transfer (LET), modification of effects of such radiations due to various response modifying factors, such as radioprotective or effect-enhancing substances or irradiation conditions, side effects (e.g., toxicity) of such substances, effects of radiomimetic substances and radiation in comparative studies.

Effects of external irradiation on man: effects of ionizing radiations, including immunological consequences, and acute and late effects, on man, the relative effects of irradiation procedures, doses, dose rates, Relative Biological Effectiveness (RBE) and Linear Energy Transfer (LET) and quality factors, modification of effects of such radiations due to various response modifying factors, such as radioprotective or effect-enhancing substances or irradiation conditions, side effects (e.g., toxicity) of such substances, side and late effects of such radiations in medical diagnosis and therapy, epidemiological studies of possible radiation-caused illness.

Effects of internal irradiation and various aspects of radioisotope kinetics and toxicity in man, animals, plants and microorganisms: acute and late effects of absorbed or incorporated radioactive materials (not implanted sources or afterloading), internal source evaluation, side and late effects, including toxicity, of the use of radioisotopes in bound or unbound form in diagnosis and therapy, radioisotope kinetics, localization, uptake and elimination of radioisotopes at all levels (subcellular, cellular, tissue, organ and whole organism), contamination and decontamination (both internal and external), use of chelating agents or complex forming agents, modifying factors and radioprotective substances such as EDTA (ethylenediaminetetraacetic acid), DTPA (diethylenetriaminepentaacetic acid), stable iodine, epidemiological studies of possible radioisotope-caused illness.

For: - radiation effects on organic molecules not occurring in living systems use S38
  - radiation treatment of agricultural and biological wastes use S07
    - applications in pest and disease control, or
      - applications in plant cultivation and breeding, or
        - applications in food protection and preservation, or
          - radiation sterilization in medicine, or
            - animal reaction to irradiated pathogens use S60
    - advances in the use of ionizing radiations in diagnosis or therapy use S62
    - radiation protection in radiodiagnosis and radiotherapy use S61
    - contamination and decontamination of food use S60
    - use of unsealed radioisotopes in medical diagnosis/therapy use S62
    - methods of incorporation and extraction of radioisotopes in medical diagnosis or therapy use S62
    - transmission of radioisotopes through the food chain or in an ecosystem use S54
    - techniques using radioisotopes in basic and applied life sciences use S60
ETDE Scope Descriptions

S63  RADIATION, THERMAL, AND OTHER ENVIRONMENTAL POLLUTANT EFFECTS ON LIVING ORGANISMS AND BIOLOGICAL MATERIALS

Effects of External Irradiation on Biochemicals, on Cell and Tissue Cultures, and on Microorganisms. Effects of irradiations, including ultraviolet radiation and laser radiation, on living systems at the biochemical, cellular and tissue culture level, on isolated cell constituents, and on microorganisms, both animals and plants (e.g., bacteria, bacteriophages, rickettsiae, yeasts, viruses); includes the relative effects of irradiation procedures, doses, dose rates, Relative Biological Effectiveness (RBE), Linear Energy Transfer (LET) and various response modifying factors.

Effects of External Irradiation on Plants. Effects of ionizing radiations on plants or parts of plants (seeds, roots, leaves, etc.), plant growth, physiology and metabolism; includes the relative effects of irradiation procedures, doses, dose rates, Relative Biological Effectiveness (RBE) and Linear Energy Transfer (LET); modification of effects of such radiation due to various response modifying factors, such as radioprotective and effect-enhancing substances or irradiation conditions.

Effects of External Irradiation on Animals. Effects of ionizing radiations, including immunological consequences, on any animal; includes the relative effects of irradiation procedures, doses, dose rates, Relative Biological Effectiveness (RBE) and Linear Energy Transfer (LET); modification of effects of such radiations due to various response modifying factors, such as radioprotective or effect-enhancing substances or irradiation conditions; side effects (e.g. toxicity) of such substances; effects of radiomimetic substances and radiation in comparative studies.

Effects of External Irradiation on Man. Effects of ionizing radiations (including immunological consequences, acute and late effects) on man; includes the relative effects of irradiation procedures, doses, dose rates, Relative Biological Effectiveness (RBE), Linear Energy Transfer (LET) and quality factors; modification of effects of such radiations due to various response modifying factors, such as radioprotective or effect-enhancing substances or irradiation conditions; side effects (e.g. toxicity) of such substances; side and late effects of such radiations in medical diagnosis and therapy; epidemiological studies of possible radiation-caused illness.

Effects of Internal Irradiation and Various Aspects of Radioisotope Kinetics and Toxicity in Man, Animals, Plants and Microorganisms. Acute and late effects of absorbed or incorporated radioactive materials (not implanted sources or afterloading); internal source evaluation; side and late effects, including toxicity, of the use of radioisotopes in bound or unbound form in diagnosis and therapy; radioisotope kinetics, localization, uptake and elimination of radioisotopes at all levels (subcellular, cellular, tissue, organ and whole organism); also includes contamination and decontamination (both internal and external), use of chelating agents or complex forming agents, modifying factors and radioprotective substances, e.g., EDTA (ethylenediaminetetraacetic acid), DTPA (diethylenetriaminepentaacetic acid), stable iodine; epidemiological studies of possible radioisotope-caused illness.

Effects of thermal effluents on living organisms from energy production, utilization or conservation activities. Includes effects of temperature change resulting from the energy cycle, such as decreased temperature effects from hydroelectric dams or increased temperature effects from fossil fuel burning.

Chemicals Metabolism and Toxicology. Includes effects of any element or compound (e.g., PCBs, freons) associated with an energy cycle, including resource extraction, conversion utilization, and waste processing and disposal.

Effects of other environmental pollutants, such as noise produced in energy production, conversion, or utilization; hazards from power transmission lines, Laser and microwave hazard, effects from global climate changes, and any other health hazards from energy related activities that are not covered in other categories.
S70 PLASMA PHYSICS AND FUSION TECHNOLOGY

Plasma Physics
Note: includes only plasmas related to nuclear fusion

Plasma confinement, both magnetic and inertial confinement (studies on plasma lifetime, particle and heat loss, energy balance in plasma and fusion devices, enhanced confinement concepts, alpha particle confinement, disruptions), plasma production, heating, and interactions (ohmic, radiofrequency, microwave, ICR, ECR and lower hybrid heating, plasma heating by laser or particle beams, shock waves, compression, plasma production by guns or other means, electromagnetic wave propagation and absorption, interactions with antennas, walls, probes and sheaths, current drive), plasma kinetic equations, thermodynamic properties, neoclassical theory, plasma transport, plasma impurities, plasma simulation, plasma waves (electrostatic, electrodynamic, MHD, sound, drift or other waves, linear or nonlinear), plasma oscillations, plasma instabilities (macro- and micro-instabilities), turbulence, solitons, BGK modes, shock waves, plasma fluid and MHD properties (MHD equilibria and resistive MHD effects), nuclear fusion reactions (exoenergetic fusion reactions between nuclei of light elements in plasma, beam-induced fusion, cold fusion, muon-catalyzed fusion, etc.), elementary and classical processes in plasmas (particle orbits, electron, atom, ion, molecule and heavy-particle collisions in plasmas), plasma diagnostic techniques and instrumentation (diagnostic techniques and instrumentation for rf, optical, X-ray, gamma-ray and particle measurements), other physics studies of fusion plasmas.

Fusion Technology
Note: includes hybrid reactors

Fusion devices and experiments (design and specifications of magnetic or inertial confinement devices, implosion physics, studies related to laser fusion, electron beam fusion and ion beam fusion, safety analyses of fusion devices), plasma-facing components (physics and engineering related to first wall, liners, limiters, divertors, impurity control, etc.), magnet coils and fields (experiments, design analyses and design codes related to magnets and magnetic field configurations), power supplies and energy storage (design and performance analyses for any power supply or energy storage system associated with a fusion device), blankets and cooling systems (physics and engineering studies of blankets, and studies of heat transfer or system components), other components of fusion devices (such as vacuum and exhaust systems, control systems, shielding), materials studies related to fusion research, heating and fueling systems (studies on any plasma gun, neutral beam source to be used for beam injection, or microwave or laser radiation source used for plasma heating), fusion fuels (studies on deuterium, tritium, boron-11, etc., for use as fuel, including processing, inventories and availability), power conversion systems (studies on MHD topping cycles, direct energy converters, gas turbines, etc.)

Economics of Fusion Nuclear Power and Fusion Fuel Cycle
Note: includes economic aspects of hybrid reactors
(economic aspects of fusion nuclear energy, forecasts, R & D expenditures, economic comparison of fusion reactors with alternative power sources or of different reactor types, financing of fusion nuclear power, methodology of comparative analysis of fusion nuclear energy and other energy costs, economic aspects of fusion fuel production or recovery, forecasts of fusion fuel requirements, R & D expenditures, economic aspects of waste management, economic aspects of nuclear accidents)

For: - heavy-ion fusion reactions use S73
- MHD generators and basic studies in MHD use S30
- atomic collision phenomena not taking place in plasmas use S74
- fusion devices used as neutron sources see S71 or category for application
- basic materials studies use S36
- environmental aspects of fusion installations use S54
ETDE Scope Descriptions

S70  PLASMA PHYSICS AND FUSION TECHNOLOGY

Plasma Physics (Note: includes only plasmas related to nuclear fusion). Plasma confinement, including both magnetic and inertial confinement (studies on plasma lifetime, particle and heat loss, energy balance in plasma and fusion devices, enhanced confinement concepts, alpha particle confinement, disruptions), plasma production, heating, and interactions (includes ohmic, radiofrequency, microwave, ICR, ECR and lower hybrid heating, plasma heating by laser or particle beams, shock waves, compression, plasma production by guns or other means, electromagnetic wave propagation and absorption, interactions with antennas, walls, probes and sheaths, current drive), plasma kinetic equations, thermodynamic properties, neoclassical theory, plasma transport, plasma impurities, plasma simulation, plasma waves (electrostatic, electrodynamic, MHD, sound, drift or other waves, linear or nonlinear), plasma oscillations, plasma instabilities (macro- and micro-instabilities), turbulence, solitons, BGK modes, shock waves, plasma fluid and MHD properties (includes MHD equilibria and resistive MHD effects), nuclear fusion reactions (exoenergetic fusion reactions between nuclei of light elements in plasma, beam-induced fusion, cold fusion, muon-catalyzed fusion, etc.), elementary and classical processes in plasmas (particle orbits, electron, atom, ion, molecule and heavy-particle collisions in plasmas), plasma diagnostic techniques and instrumentation (diagnostic techniques and instrumentation for rf, optical, X-ray, gamma-ray and particle measurements), other physics studies of fusion plasmas.

Fusion Technology (Note: includes hybrid reactors). Fusion devices and experiments (design and specifications of magnetic or inertial confinement devices, implosion physics, studies related to laser fusion, electron beam fusion and ion beam fusion, safety analyses of fusion devices), plasma-facing components (physics and engineering related to first wall, limiters, divertors, impurity control, etc.), magnet coils and fields (experiments, design analyses and design codes related to magnets and magnetic field configurations), power supplies and energy storage (design and performance analyses for any power supply or energy storage system associated with a fusion device), blankets and cooling systems (physics and engineering studies of blankets, and studies of heat transfer or system components), other components of fusion devices (such as vacuum and exhaust systems, control systems, shielding), materials studies related to fusion research, heating and fueling systems (studies on any plasma gun, neutral beam source to be used for beam injection, or microwave or laser radiation source used for plasma heating), fusion fuels (studies on deuterium, tritium, boron-11, etc., for use as fuel, including processing, inventories and availability), power conversion systems (studies on MHD topping cycles, direct energy converters, gas turbines, etc.).

Economics of Fusion Nuclear Power and Fusion Fuel Cycle (Note: includes economic aspects of hybrid reactors). Economic aspects of fusion nuclear energy; forecasts, R & D expenditures; economic comparison of fusion reactors with alternative power sources or of different reactor types; financing of fusion nuclear power; methodology of comparative analysis of fusion nuclear energy and other energy costs; economic aspects of fusion fuel production or recovery; forecasts of fusion fuel requirements, R & D expenditures; economic aspects of waste management; economic aspects of nuclear accidents.
S71  CLASSICAL AND QUANTUM MECHANICS, GENERAL PHYSICS
Aspects of classical mechanics of interest for nuclear science and technology, general aspects of quantum mechanics (formalism, theory of measurement, mathematical models, non-relativistic scattering theory, semiclassical theories) not applied to a specific field, general theory of scattering;

Cryogenics: (methods and equipment for low temperature application in systems of interest for nuclear science for which no more appropriate category is identifiable, basic cryogenic studies relevant to nuclear technology or in which nuclear phenomena are involved (e.g. nuclear alignment at low temperature), vacuum production and techniques at cryogenic temperatures and of interest for nuclear science and technology

Particle beam production and handling, targets: beam production and transport of electron, neutron, ion, atomic and molecular beams (not for specific applications), nonisotopic electron, neutron and ion sources not developed for specific applications), nuclear target preparation using ion, atomic or molecular beams

Other aspects of physical science of nuclear relevance
Note: restricted to physical processes or studies of systems or materials of stated nuclear relevance
(orth physical sciences such as statistical physics, dynamical systems, thermodynamics, electricity and magnetism, electrodynamics, optics, acoustics, continuum mechanics, etc., that have a relevance for nuclear science and technology)

For: - quantum field theory, or
   quantum chromodynamics, or
   quantum electrodynamics, or
   relativistic scattering theory, or
   S-matrix theory, or
   scattering of elementary particles
   use S72

For applications of quantum mechanics in:
- atomic and molecular physics
  use S74
- solid state and fluid physics
  use S75
- plasma physics
  use S70
- elementary particle physics
  use S72
- nuclear physics
  use S73

For: - nuclear instrumentation
  use S46
- superconductivity, or
  superfluidity
  use S75

For applications of cryogenics in:
- fusion technology
  use S70
- accelerators
  use S43
- fission reactors
  see S21, S22
- neutron instrumentation
  use S46

For: - fusion fuel target fabrication
  use S70
- isotopic radiation sources
  use S07
- ion and electron beam sources for accelerator applications, or
  beam dynamics and ion optics for accelerator applications, or
  injection and extraction systems for accelerator applications
  use S43
- low-energy beam techniques in nuclear instrumentation
  use

S46
- neutral beam sources in fusion technology, or
  electron and ion beam sources in fusion technology
  use S70
- nuclear target preparation by other physico-chemical methods
  use S36

For: - historical, philosophical, educational aspects relevant to nuclear science and technology
  use S99
ETDE Scope Descriptions

S71 CLASSICAL AND QUANTUM MECHANICS, GENERAL PHYSICS

Comprehensive coverage is not obligatory for ETDE

Aspects of classical mechanics of interest for nuclear science and technology, general aspects of quantum mechanics (formalism, theory of measurement, mathematical models, non-relativistic scattering theory, semiclassical theories) not applied to a specific field, general theory of scattering;

Cryogenics (methods and equipment for low temperature application in systems of interest for nuclear science for which no more appropriate category is identifiable, basic cryogenic studies relevant to nuclear technology or in which nuclear phenomena are involved (e.g. nuclear alignment at low temperature), vacuum production and techniques at cryogenic temperatures and of interest for nuclear science and technology);

Particle beam production and handling, targets (beam production and transport of electron, neutron, ion, atomic and molecular beams (not for specific applications), nonisotopic electron, neutron and ion sources not developed for specific applications), nuclear target preparation using ion, atomic or molecular beams);

Other aspects of physical science of nuclear relevance

Note: restricted to physical processes or studies of systems or materials of stated nuclear relevance (other physical sciences such as statistical physics, dynamical systems, thermodynamics, electricity and magnetism, electrodynamics, optics, acoustics, continuum mechanics, etc., that have a relevance for nuclear science and technology)
S72 PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Theory of fields and strings (axiomatic, Lagrangian and Hamiltonian approaches, renormalization, field theories in higher dimensions, such as Kaluza-Klein theories, Schwinger source theory, Bethe-Salpeter equations, relativistic wave equations, lattice gauge theory, techniques employed in field theory studies, such as strong-coupling expansions, theories of strings and other extended objects in the context of elementary particles, superstring theory, theory of quantized fields, etc.), symmetry, conservation laws, currents and their properties (Lorentz and Poincaré invariance, C, P, T and other discrete symmetries, flavor symmetries, internal symmetries, supersymmetry, spontaneous symmetry breaking, chiral symmetries, current algebras, studies concerning scalar, pseudoscalar, vector, axial vector and tensor currents, etc.), S-matrix theory (scattering matrices, dispersion relations, sum rules, bootstraps, crossing symmetries, Mandelstam representation, Regge formalism, etc.), relativistic scattering theory, unified theories and models (models of electroweak interactions, extensions of gauge or Higgs sector, quark and lepton masses and mixing, applications of electroweak models to specific processes, neutral currents in electroweak interactions, unified theories and models of strong and electroweak interactions, including those that involve gravitation, etc.), Quantum Electrodynamics (QED) (specific calculations and limits of QED, experimental tests of QED), Quantum Chromodynamics (QCD) (general properties, lattice QCD calculations, quark-gluon plasma, experimental tests), models for strong interactions (bag models, statistical models, Regge poles and cuts, peripheral, multiperipheral and multi-Regge models, duality and dual models, bootstrap model, absorptive, optical and eikonal models, potential models, vector-meson dominance, other composite models of quarks, leptons, gauge bosons, symmetry breaking, hadron mass formulas, etc.), interactions, decays and processes (interactions of leptons, i.e. neutrinos, electrons, muons, taus, and their corresponding antiparticles, among one another and with non-leptons, interactions of photons, interactions of hadrons with other hadrons (e.g., nucleon-nucleon, hyperon-nucleon, pion-baryon, kaon-baryon, meson-meson interactions), decays of mesons, baryons, leptons, intermediate bosons (W^+, W^-, Z), electromagnetic processes and properties (electromagnetic mass differences, form factors and decays, electromagnetic moments, electromagnetic corrections to strong- and weak- interaction processes, etc.), properties of particles and resonances (properties of baryons and baryon resonances, meson and meson resonances, leptons, other particles, e.g., photons, quarks, intermediate bosons, including hypothetical particles, such as gluons, Higgs bosons, magnetic monopoles, supersymmetric particles, tachyons, etc.)

For: - general quantum mechanics use S71
      - general theory of scattering use S71
      - high-energy physics instrumentation use S46
      - nucleon-nucleon interactions in nuclei use S73
S72  PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Comprehensive coverage is not obligatory for ETDE

Theory of fields and strings (axiomatic, Lagrangian and Hamiltonian approaches, renormalization, field theories in higher dimensions, such as Kaluza-Klein theories, Schwinger source theory, Bethe-Salpeter equations, relativistic wave equations, lattice gauge theory, techniques employed in field theory studies, such as strong-coupling expansions, theories of strings and other extended objects in the context of elementary particles, superstring theory, theory of quantized fields, etc.), symmetry, conservation laws, currents and their properties (Lorentz and Poincaré invariance, C, P, T and other discrete symmetries, flavor symmetries, internal symmetries, supersymmetry, spontaneous symmetry breaking, chiral symmetries, current algebras, studies concerning scalar, pseudoscalar, vector, axial vector and tensor currents, etc.), $S$-matrix theory (scattering matrices, dispersion relations, sum rules, bootstraps, crossing symmetries, Mandelstam representation, Regge formalism, etc.), relativistic scattering theory, unified theories and models (models of electroweak interactions, extensions of gauge or Higgs sector, quark and lepton masses and mixing, applications of electroweak models to specific processes, neutral currents in electroweak interactions, unified theories and models of strong and electroweak interactions, including those that involve gravitation, etc.), Quantum Electrodynamics (QED) (specific calculations and limits of QED, experimental tests of QED), Quantum Chromodynamics (QCD) (general properties, lattice QCD calculations, quark-gluon plasma, experimental tests), models for strong interactions (bag models, statistical models, Regge poles and cuts, peripheral, multiperipheral and multi-Regge models, duality and dual models, bootstrap model, absorptive, optical and eikonal models, potential models, vector-meson dominance, other composite models of quarks, leptons, gauge bosons, symmetry breaking, hadron mass formulas, etc.), interactions, decays and processes (interactions of leptons, i.e. neutrinos, electrons, muons, tauons, and their corresponding antiparticles, among one another and with non-leptons, interactions of photons, interactions of hadrons with other hadrons (e.g., nucleon-nucleon, hyperon-nucleon, pion-baryon, kaon-baryon, meson-meson interactions), decays of mesons, baryons, leptons, intermediate bosons (W, Z), electromagnetic processes and properties (electromagnetic mass differences, form factors and decays, electromagnetic moments, electromagnetic corrections to strong- and weak-interaction processes, etc.), properties of particles and resonances (properties of baryons and baryon resonances, meson and meson resonances, leptons, other particles, e.g., photons, quarks, intermediate bosons, including hypothetical particles, such as gluons, Higgs bosons, magnetic monopoles, supersymmetric particles, tachyons, etc.)
INIS Scope Descriptions

S73 NUCLEAR PHYSICS AND RADIATION PHYSICS

Nuclear Structure

General and average properties of nuclei and nuclear energy levels: masses, binding energies, mass and charge distributions, spin, parity, isospin, spectroscopic factors, static electromagnetic moments, level densities, strength functions, collective levels and giant resonances, Coulomb energies, nuclear forces, few-nucleon systems, nuclear matter, hypernuclei, etc. Nuclear structure models and methods: shell models, collective models, models based on group theory, cluster models, Hartree-Fock and random-phase approximations, etc.

Radioactivity and electromagnetic transitions: alpha decay, proton-emission decay, decay by emission of heavier composite particles, beta decay, electron and muon capture, including weak-interaction and lepton aspects of beta decay and electron and muon capture by nuclei, and the relation with nuclear matrix elements and nuclear structure, transition probabilities and lifetimes, multipole matrix elements, multipole mixing ratios, internal conversion and extranuclear effects, nuclear resonance fluorescence, angular distribution and correlation measurements of electromagnetic transitions, gamma transitions and level energies, Mössbauer effect, etc.

Nuclear reactions and scattering: nuclear reactions and scattering models and methods, resonance reactions and scattering, direct reactions, statistical reactions and fluctuations, polarization in reactions and scattering, specific nuclear reactions and scattering (photonuclear reactions and photon scattering, lepton-, nucleon-, deuteron-, triton-, helion-, and alpha particle-induced reactions and scattering, heavy-ion-induced reactions and scattering, meson and hyperon-induced reactions and scattering, fission, both spontaneous and induced)

Radiation Physics

Note: X radiation, gamma radiation, bremsstrahlung, neutrons, electrons, protons, deuterons, alpha particles, heavy ions, other particles

(interactions of radiations with bulk matter and radiation transport: scattering, absorption, diffusion of radiations as they pass through macroscopic systems, including thermalization, multiplication, and moderation of neutrons, solution of the neutron transport equation and theoretical neutron transport in matter in general geometric configurations such as spheres, cylinders, plates, etc., range-energy relations, energy loss mechanisms and absorption mechanisms, shielding calculations and experiments for which no more appropriate category is identifiable)

For:
- theory and applications of nuclear phenomena and techniques
  - to solid state and fluid physics use S75
  - nuclear phenomena and techniques in atomic and molecular physics use S74
  - muon-catalyzed fusion, or fusion reactions in plasma physics use S70
  - calculation and measurement of absorbed doses in tissue-equivalent materials and phantoms, or calculation and measurement of absorbed doses in man, animals and plants use S61
  - calculation and measurement of absorbed doses in radiation processing use

S07
- reactor physics use S22
  - accelerator shielding use

S43
- fission reactor shielding see S21, S22
  - thermonuclear reactor shielding use S70
  - neutron beams used in solid state and fluid physics study use

S75
- radiation protection standards, or radiation protection procedures use S61
- physical radiation effects on materials use S36
- radiation effects on instruments, components or electronic devices use S46
S73  NUCLEAR PHYSICS AND RADIATION PHYSICS

**Comprehensive coverage is not obligatory for ETDE**

**Nuclear Structure**

General and average properties of nuclei and nuclear energy levels (masses, binding energies, mass and charge distributions, spin, parity, isospin, spectroscopic factors, static electromagnetic moments, level densities, strength functions, collective levels and giant resonances, Coulomb energies, nuclear forces, few-nucleon systems, nuclear matter, hypernuclei, etc.), nuclear structure models and methods (shell models, collective models, models based on group theory, cluster models, Hartree-Fock and random-phase approximations, etc.)

Radioactivity and electromagnetic transitions (alpha decay, proton-emission decay, decay by emission of heavier composite particles, beta decay, electron and muon capture, including weak-interaction and lepton aspects of beta decay and electron and muon capture by nuclei, and the relation with nuclear matrix elements and nuclear structure), transition probabilities and lifetimes, multipole matrix elements, multipole mixing ratios, internal conversion and extranuclear effects, nuclear resonance fluorescence, angular distribution and correlation measurements of electromagnetic transitions, gamma transitions and level energies, Moessbauer effect, etc.

Nuclear reactions and scattering (nuclear reactions and scattering models and methods, resonance reactions and scattering, direct reactions, statistical reactions and fluctuations, polarization in reactions and scattering, specific nuclear reactions and scattering (photonuclear reactions and photon scattering, lepton-, nucleon-, deuteron-, triton-, helium-, and alpha particle-induced reactions and scattering, heavy-ion-induced reactions and scattering, meson and hyperon-induced reactions and scattering, fission, both spontaneous and induced)

**Radiation Physics**

Note: X radiation, gamma radiation, bremsstrahlung, neutrons, electrons, protons, deuterons, alpha particles, heavy ions, other particles

(Interactions of radiations with bulk matter and radiation transport: scattering, absorption, diffusion of radiations as they pass through macroscopic systems, including thermalization, multiplication, and moderation of neutrons, solution of the neutron transport equation and theoretical neutron transport in matter in general geometric configurations such as spheres, cylinders, plates, etc., range-energy relations, energy loss mechanisms and absorption mechanisms, shielding calculations and experiments for which no more appropriate category is identifiable)
S74 ATOMIC AND MOLECULAR PHYSICS

Theory of electronic structure of atoms and molecules: general theory of electronic structure and transitions, specific calculations and results for atoms relevant to nuclear physics or technology, such as hydrogen, deuterium, tritium, helium, fission products, lanthanides, scandium, technetium, yttrium, and elements with \( Z \) greater than 83, and for molecules of hydrogen, deuterium, tritium, helium, fission products, and compounds of technetium and elements with \( Z \) greater than 83, effects of molecular interactions on electronic structure of the atoms and molecules specified above, corrections to electronic structure, e.g., hyperfine interactions, isotope effects, radiative and relativistic effects, for the atoms specified above, excited states of the atoms and molecules specified above.

Atomic and molecular spectra, interactions with photons: Zeeman and Stark effects, electron paramagnetic resonance (EPR) and relaxation, optical activity, dichroism, magneto-optical and electro-optical effects, and photon collisions with atoms of hydrogen, deuterium, tritium, helium, fission products, lanthanides, scandium, technetium, yttrium, and elements with \( Z \) greater than 83, molecules of hydrogen, deuterium, tritium, helium, fission products, compounds of technetium and elements with \( Z \) greater than 83, and elements of interest for thermonuclear fusion, such as lithium, beryllium, boron, carbon, oxygen, neon, magnesium, aluminium, silicon, argon, titanium, vanadium, chromium, iron, nickel, copper, gallium, krypton, niobium, molybdenum, xenon, tantalum and tungsten, fluorescence and phosphorescence of promethium and its compounds and the atoms and molecules specified above, use of nuclear phenomena and techniques in studies of any aspects of atomic and molecular properties and structure, e.g., nuclear magnetic resonance (NMR), nuclear quadrupole resonance (NQR), multiple resonances (DNMR, ENDOR, etc.), Moessbauer effect for the atoms or molecules specified above.

Collision phenomena: general theories and models, experimental and theoretical studies of elastic scattering, excitation, de-excitation, excitation transfer, ionization, dissociation, charge exchange, electron capture, electron loss, electron attachment, or electron detachment in electron-ion, electron-atom, electron-molecule, ion-ion, ion-atom, ion-molecule, atom-atom, and atom-molecule collisions, involving atoms, molecules or ions of nuclear relevance or of interest for thermonuclear fusion. Experimentally derived information on atomic and molecular properties: masses, abundances, moments, polarizability, fine- and hyperfine-structure constants, ionization potentials, electron affinities, bond strengths, dissociation energies, rotation, vibration and vibration-rotation constants, etc., of atoms of hydrogen, deuterium, tritium, helium, fission products, lanthanides, scandium, technetium, yttrium, and elements with \( Z \) greater than 83, molecules of hydrogen, deuterium, tritium, helium, fission products, compounds of technetium and elements with \( Z \) greater than 83, and for elements of interest for thermonuclear fusion. Special atoms and molecules: positronium, muonium, muonic and mesic atoms and molecules, hyperonic atoms and molecules, i.e. atoms in which the nucleus is a positron or muon, or which have one or more particles other than electrons in the electronic structure, quantum properties of macromolecules and atomic and molecular clusters, other special atoms and molecules.

For:
- electronic structure and transitions in condensed matter use S75
- electron-electron interactions use S72
- nuclear reactions use S73
- thermonuclear reactions, or collisions in fusion plasmas, or muon-catalyzed fusion use S70
- positron annihilation as a tool for studies in condensed matter use S75
ETDE Scope Descriptions

S74 ATOMIC AND MOLECULAR PHYSICS

Comprehensive coverage is not obligatory for ETDE

Theory of electronic structure of atoms and molecules (general theory of electronic structure and transitions, specific calculations and results for atoms relevant to nuclear physics or technology, such as hydrogen, deuterium, tritium, helium, fission products, lanthanides, scandium, technetium, yttrium, and elements with Z greater than 83, and for molecules of hydrogen, deuterium, tritium, helium, fission products, and compounds of technetium and elements with Z greater than 83, effects of molecular interactions on electronic structure of the atoms and molecules specified above, corrections to electronic structure, e.g. hyperfine interactions, isotope effects, radiative and relativistic effects, for the atoms specified above, excited states of the atoms and molecules specified above);

Atomic and molecular spectra, interactions with photons (Zeeman and Stark effects, electron paramagnetic resonance (EPR) and relaxation, optical activity, dichroism, magneto-optical and electro-optical effects, and photon collisions with atoms of hydrogen, deuterium, tritium, helium, fission products, lanthanides, scandium, technetium, yttrium, and elements with Z greater than 83, molecules of hydrogen, deuterium, tritium, helium, fission products, compounds of technetium and elements with Z greater than 83, and elements of interest for thermonuclear fusion, such as lithium, beryllium, boron, carbon, oxygen, neon, magnesium, aluminium, silicon, argon, titanium, vanadium, chromium, iron, nickel, copper, gallium, krypton, niobium, molybdenum, xenon, tantalum and tungsten, fluorescence and phosphorescence of promethium and its compounds and the atoms and molecules specified above, use of nuclear phenomena and techniques in studies of any aspects of atomic and molecular properties and structure, e.g., nuclear magnetic resonance (NMR), nuclear quadrupole resonance (NQR), multiple resonances (DNMR, ENDOR, etc.), Moessbauer effect for the atoms or molecules specified above);

Collision phenomena (general theories and models, experimental and theoretical studies of elastic scattering, excitation, de-excitation, excitation transfer, ionization, dissociation, charge exchange, electron capture, electron loss, electron attachment, or electron detachment in electron-ion, electron-atom, electron-molecule, ion-ion, ion-atom, ion-molecule, atom-atom, and atom-molecule collisions, involving atoms, molecules or ions of nuclear relevance or of interest for thermonuclear fusion);

Experimentally derived information on atomic and molecular properties (masses, abundances, moments, polarizability, fine- and hyperfine-structure constants, ionization potentials, electron affinities, bond strengths, dissociation energies, rotation, vibration and vibration-rotation constants, etc., of atoms of hydrogen, deuterium, tritium, helium, fission products, lanthanides, scandium, technetium, yttrium, and elements with Z greater than 83, molecules of hydrogen, deuterium, tritium, helium, fission products, compounds of technetium and elements with Z greater than 83, and for elements of interest for thermonuclear fusion).
INIS Scope Descriptions

S75 CONDENSED MATTER PHYSICS, SUPERCONDUCTIVITY AND SUPERFLUIDITY

Nuclear techniques in condensed matter physics: advances in the use of nuclear techniques or measurement methods in studies of the structure, including electronic structure, of solids and liquids (e.g., neutron diffraction and scattering, spin-polarized electron scattering, synchrotron -source X-ray scattering, nuclear magnetic resonance and relaxation, including ENDOR, DNMR), muon spin rotation and relaxation, Moessbauer effect and other gamma -ray spectroscopy, positron annihilation

Solid-state plasma, physics of surfaces, interfaces and thin films: studies of solid-state plasma in bulk matter, surfaces, interfaces and thin films, including electron-hole droplets, physics studies of surfaces, interfaces and thin films of indicated interest for nuclear science and technology

Interactions between beams and condensed matter: effects, including channeling, blocking, ion implantation and generation of crystal defects, from bombardment with laser radiation, X-rays, gamma rays, electrons, positrons, neutrons, ions, atoms, and molecules where the interest is in the effect itself at the microscopic level and not in the material in which it takes place, impact phenomena, Auger emission, secondary emission, sputtering, etc., from the collisions of electrons, ions, atoms and molecules with surfaces

Quantum physics aspects of condensed matter such as superconductivity (both low-temperature and high-temperature superconductivity) (basic superconductivity studies relevant to nuclear technology, basic theory, review studies, general properties, such as magnetization curves, thermodynamic properties, response to electromagnetic fields, nuclear magnetic resonance, flux pinning, critical currents), superconducting devices (application of superconductivity in magnets or other devices of use in nuclear science, including devices using superconductors or superconducting junctions as components; routine applications are excluded), superfluidity (phenomenology, hydrodynamics, transport processes, models, etc., of superfluid helium-4 (He II), superfluid helium-3 and He II-He -3 mixtures), other quantum aspects of condensed matter (e.g. studies of phenomena relying on quantum statistics, electron-phonon coupling, spin-lattice relaxation, energy bands)

For:
- nuclear techniques in studies of atomic and molecular properties use S74
- Moessbauer effect in nuclear physics use S73
- physical properties and structure of materials of nuclear interest, or processing and fabrication of materials of nuclear interest using radiations or particle beams (including plasma processing) use S36
- energy loss and range relations use S73
- radiation effects on mechanical integrity or physical properties of specific materials use S36
- radiation effects on chemical properties of fluids and solids use S38
- radiation effects on instruments, components or electronic devices use S46
- superconducting properties of materials see also S36
- superconducting devices that are components of larger devices see category for the larger device

-------------------------------------------------------------------------------
S75  CONDENSED MATTER PHYSICS, SUPERCONDUCTIVITY AND SUPERFLUIDITY

Comprehensive coverage is not obligatory for ETDE

Nuclear techniques in condensed matter physics (advances in the use of nuclear techniques or measurement methods in studies of the structure, including electronic structure, of solids and liquids (e.g., neutron diffraction and scattering, spin-polarized electron scattering, synchrotron-source X-ray scattering, nuclear magnetic resonance and relaxation, including ENDOR, DNMR), muon spin rotation and relaxation, Mössbauer effect and other gamma-ray spectroscopy, positron annihilation);

Solid-state plasma, physics of surfaces, interfaces and thin films (studies of solid-state plasma in bulk matter, surfaces, interfaces and thin films, including electron-hole droplets, physics studies of surfaces, interfaces and thin films of indicated interest for nuclear science and technology);

Interactions between beams and condensed matter (effects, including channeling, blocking, ion implantation and generation of crystal defects, from bombardment with laser radiation, X-rays, gamma rays, electrons, positrons, neutrons, ions, atoms, and molecules where the interest is in the effect itself at the microscopic level and not in the material in which it takes place, impact phenomena, Auger emission, secondary emission, sputtering, etc., from the collisions of electrons, ions, atoms and molecules with surfaces);

Quantum physics aspects of condensed matter such as superconductivity (both low-temperature and high-temperature superconductivity) (basic superconductivity studies relevant to nuclear technology, basic theory, review studies, general properties, such as magnetization curves, thermodynamic properties, response to electromagnetic fields, nuclear magnetic resonance, flux pinning, critical currents), superconducting devices (application of superconductivity in magnets or other devices of use in nuclear science, including devices using superconductors or superconducting junctions as components; routine applications are excluded), superfluidity (phenomenology, hydrodynamics, transport processes, models, etc., of superfluid helium-4 (He II), superfluid helium-3 and He II-He-3 mixtures), other quantum aspects of condensed matter (e.g. studies of phenomena relying on quantum statistics, electron-phonon coupling, spin-lattice relaxation, energy bands)
S98  NUCLEAR DISARMAMENT, SAFEGUARDS AND PHYSICAL PROTECTION

**Legal aspects** of nuclear disarmament, all nuclear safeguards issues, non-proliferation of nuclear weapons and nuclear-weapon free zones, including the monitoring of nuclear materials derived from arms reduction and conversion, comprehensive nuclear weapons test ban, national arms control policy and aspects of treaty compliance and verification, physical protection, peaceful nuclear explosions, peaceful uses of sea-bed and space, nuclear weapons tests

**Safeguards** (those measures designed to guard against the diversion of material, such as source and special nuclear material, from uses permitted by law or treaty, and to give timely indication of possible diversion or credible assurance that no diversion has occurred):

**Technical aspects of safeguards**: research, development and implementation of systems, techniques, instrumentation and inspection procedures to detect diversion of nuclear material or materials of special interest, such as heavy water from peaceful nuclear activities, including monitoring nuclear materials derived from arms reduction and conversion; development of nuclear materials accounting systems covering the physical security of materials in transit, in use or in storage

**Non-technical aspects of safeguards**: administrative, political, economic, organizational and other aspects of the development and application of safeguards, including implementation of safeguards to the verification arrangements for regional nuclear-weapon-free-zones and the monitoring of nuclear materials derived from arms reduction and conversion

For:  - non-legal aspects of nuclear explosions use S42  
- particular instruments use S46

S99  GENERAL AND MISCELLANEOUS

**Organization and administration of nuclear activities**: general relevant documents dealing with organization, administration, financing and general description of nuclear institutes and programmes (e.g., directories, reference books, manuals, lists of publications, general bibliographies, training programmes), constitution of competent authorities, legal aspects of governmental bodies, international organizations, public and semi-public undertakings, private corporations, legislation on research and development, patent regimes, state security, legal aspects of emergency planning

**Nuclear documentation, data and literature handling**: descriptions and evaluations of systems, both manual and computer-based, for collecting, analysing, evaluating and publishing data, literature and bibliographic information relating to nuclear science and its applications; nuclear libraries, standardization of nuclear terminology

**Nuclear computation and simulation**: mathematical methods and models, computer codes and programs especially developed for solving problems in nuclear science and technology

**Miscellaneous**: historical, philosophical, educational aspects of relevance to nuclear science and technology, progress reports covering several scientific disciplines of relevance to nuclear science and technology, if bibliographic subdivision is not possible or warranted

For:  - non-legal aspects of emergency planning see category for installation  
- data collections on particular topics, or mathematical models appropriate to specific subjects, or bibliographies on particular topics see appropriate  
- electronic and other instrumentation for data acquisition use categories

S46
S98 NUCLEAR DISARMAMENT, SAFEGUARDS AND PHYSICAL PROTECTION

Legal aspects of nuclear disarmament, of all nuclear safeguards issues, non-proliferation of nuclear weapons and nuclear-weapon-free zones, including the monitoring of nuclear materials derived from arms reduction and conversion; comprehensive nuclear weapons test ban; national arms control policy and aspects of treaty compliance and verification; legal aspects of physical protection; legal aspects of peaceful nuclear explosions, peaceful uses of sea-bed and space; legal aspects of nuclear weapons tests.

Safeguards (those measures designed to guard against the diversion of material, such as source and special nuclear material, from uses permitted by law or treaty, and to give timely indication of possible diversion or credible assurance that no diversion has occurred). Legal aspects of all nuclear safeguards issues. Technical aspects (research, development and implementation of systems, techniques, instrumentation and inspection procedures to detect diversion of nuclear material or materials of special interest, such as heavy water from peaceful nuclear activities, including monitoring nuclear materials derived from arms reduction and conversion; development of nuclear materials accounting systems covering the physical security of materials in transit, in use or in storage). Non-Technical Aspects (administrative, political, economic, organizational and other aspects of the development and application of safeguards, including implementation of safeguards to the verification arrangements for regional nuclear-weapon-free-zones and the monitoring of nuclear materials derived from arms reduction and conversion).

S99 GENERAL AND MISCELLANEOUS

This section is intended to support research interests by organizations in the disciplines of mathematics, computing and information science, data and literature handling and general law. Includes relevant documents dealing with organizations, administration, financing, general descriptions of institutions and programs, directories, reference books, lists of publications, historical, philosophical and educational aspects. This category should be used if an item cannot categorized elsewhere.
Appendix 1

Guide for elements of nuclear interest

This list is provided as a guide to the principal elements of nuclear interest. In addition to the elements mentioned explicitly it also includes all fission products. Literature on elements not listed should only be included if positively identified as of nuclear interest. Even for the elements listed, judgment must be used. The study of a large molecule which incidentally includes an element of interest as a minor constituent seldom contributes to the knowledge of the properties of that element, and thus would be outside the scope of INIS.

<table>
<thead>
<tr>
<th>Element</th>
<th>Symbol</th>
<th>Element</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTINIUM</td>
<td>Ac</td>
<td>NEPTUNIUM</td>
<td>Np</td>
</tr>
<tr>
<td>AMERICIUM</td>
<td>Am</td>
<td>NIOBIUM</td>
<td>Nb</td>
</tr>
<tr>
<td>ASTATINE</td>
<td>At</td>
<td>NOBELIUM</td>
<td>No</td>
</tr>
<tr>
<td>BERKELIUM</td>
<td>Bk</td>
<td>PLUTONIUM</td>
<td>Pu</td>
</tr>
<tr>
<td>BERYLLIUM</td>
<td>Be</td>
<td>POLONIUM</td>
<td>Po</td>
</tr>
<tr>
<td>BORON</td>
<td>B</td>
<td>PRASEODYMIUM</td>
<td>Pr</td>
</tr>
<tr>
<td>CADMIUM</td>
<td>Cd</td>
<td>PROMETHIUM</td>
<td>Pm</td>
</tr>
<tr>
<td>CALIFORNINIUM</td>
<td>Cf</td>
<td>PROTACTINIUM</td>
<td>Pa</td>
</tr>
<tr>
<td>CERIUM</td>
<td>Ce</td>
<td>RADIUM</td>
<td>Ra</td>
</tr>
<tr>
<td>CESIUM</td>
<td>Cs</td>
<td>RADON</td>
<td>Rn</td>
</tr>
<tr>
<td>CURIUM</td>
<td>Cm</td>
<td>RHENIUM</td>
<td>Re</td>
</tr>
<tr>
<td>DYSPROSIUM</td>
<td>Dy</td>
<td>RUTHENIUM</td>
<td>Ru</td>
</tr>
<tr>
<td>EINSTEINIUM</td>
<td>Es</td>
<td>SAMARIIUM</td>
<td>Sm</td>
</tr>
<tr>
<td>ERBIUM</td>
<td>Er</td>
<td>SCANDIUM</td>
<td>Sc</td>
</tr>
<tr>
<td>EUROPIUM</td>
<td>Eu</td>
<td>STRONTIUM</td>
<td>Sr</td>
</tr>
<tr>
<td>FERMIUM</td>
<td>Fm</td>
<td>TANTALUM</td>
<td>Ta</td>
</tr>
<tr>
<td>FRANCIUM</td>
<td>Fr</td>
<td>TECHNETIUM</td>
<td>Tc</td>
</tr>
<tr>
<td>GADOLINIUM</td>
<td>Gd</td>
<td>TELLURIUM</td>
<td>Te</td>
</tr>
<tr>
<td>HAFNIUM</td>
<td>Hf</td>
<td>TERBIUM</td>
<td>Tb</td>
</tr>
<tr>
<td>HOLMIUM</td>
<td>Ho</td>
<td>THORIUM</td>
<td>Th</td>
</tr>
<tr>
<td>INDIUM</td>
<td>In</td>
<td>THULIUM</td>
<td>Tm</td>
</tr>
<tr>
<td>IODINE</td>
<td>I</td>
<td>TUNGSTEN (WOLFRAM)</td>
<td>W</td>
</tr>
<tr>
<td>LANTHANUM</td>
<td>La</td>
<td>URANIUM</td>
<td>U</td>
</tr>
<tr>
<td>LAWRENCIUM</td>
<td>Lr</td>
<td>VANADIUM</td>
<td>V</td>
</tr>
<tr>
<td>LITHIUM</td>
<td>Li</td>
<td>YTTERBIUM</td>
<td>Yb</td>
</tr>
<tr>
<td>LUTETIUM</td>
<td>Lu</td>
<td>YTTRIUM</td>
<td>Y</td>
</tr>
<tr>
<td>MENDELEVIUM</td>
<td>Md</td>
<td>ZIRCONIUM</td>
<td>Zr</td>
</tr>
<tr>
<td>MOLYBDENUM</td>
<td>Mo</td>
<td>ALL ELEMENTS WITH Z&gt;103</td>
<td></td>
</tr>
<tr>
<td>NEODYMIUM</td>
<td>Nd</td>
<td>ALL FISSION PRODUCTS</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix 2
### THE INTERNATIONAL NUCLEAR EVENT SCALE
**for prompt communication of safety significance**

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>DESCRIPTOR</th>
<th>CRITERIA</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCIDENTS</td>
<td>7</td>
<td>MAJOR ACCIDENT</td>
<td>• External release of a large fraction of the radioactive material in a large facility (e.g. the core of a power reactor). This would typically involve a mixture of short and long-lived radioactive fission products (in quantities radiologically equivalent to more than tens of thousands terabecquerels of iodine-131). Such a release would result in the possibility of acute health effects; delayed health over a wide area, possibly involving more than one country; long-term environmental consequences.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>SERIOUS ACCIDENT</td>
<td>• External release of radioactive material (in quantities radiologically equivalent to the order of hundreds to thousands of terabecquerels of iodine-131). Such a release would be likely to result in full implementation of countermeasures covered by local emergency plans to limit serious health effects.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>ACCIDENT WITH OFF-SITE RISK</td>
<td>• External release of radioactive material (in quantities radiologically equivalent to the order of hundreds to thousands of terabecquerels of iodine-131). Such a release would be likely to result in partial implementation of countermeasures covered by emergency plans to lessen the likelihood of health effects.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Severe damage to the nuclear facility. This may involve severe damage to a large fraction of the core of a power reactor, a major criticality accident or a major fire or explosion releasing large quantities of radioactivity within the installation.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>ACCIDENT WITHOUT SIGNIFICANT OFF-SITE RISK</td>
<td>• External release of radioactivity resulting in a dose to the most exposed individual off-site of the order of a few millisievert.* With such a release the need for off-site protective actions would be generally unlikely expect possibly for local food control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Significant damage to the nuclear facility. Such an accident might include damage to nuclear plant leading to major on-site recovery problems such as partial core melt in a power reactor and comparable events at non-reactor installations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Irradiation of one or more workers which results in an overexposure where a high probability of early death occurs.</td>
</tr>
<tr>
<td>INCIDENTS</td>
<td>3</td>
<td>SERIOUS INCIDENT</td>
<td>• External release of radioactivity above authorized limits, resulting in a dose to the most exposed individual off-site of the order of tenths of millisievert.* With such a release, off-site protective measures may not be needed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• On-site events resulting in doses to workers sufficient to cause acute health effects and/or an event resulting in a severe spread of contamination for example a few thousand terabecquerels of activity released in a secondary containment where the material can be returned to a satisfactory storage area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Incidents in which a further failure of safety systems could lead to accident conditions, or a situation in which safety systems would be unable to prevent an accident if certain initiators were to occur.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>INCIDENT</td>
<td>• Incidents with significant failure in safety provisions but with sufficient defence in depth remaining to cope with additional failures.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• An event resulting in a dose to a worker exceeding a statutory annual dose limit and/or an event which leads to the presence of significant quantities of radioactivity in the installation in areas not expected by design and which require corrective action.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>ANOMALY</td>
<td>• Anomaly beyond the authorized operating regime. This may be due to equipment failure, human error or procedural inadequacies. (Such anomalies should be distinguished from situations where operational limits and conditions are not exceeded and which are properly managed in accordance with adequate procedures. These are typically &quot;below scale&quot;).</td>
</tr>
<tr>
<td>BELOW SCALE / ZERO</td>
<td>DEVIATION</td>
<td>NO SAFETY SIGNIFICANCE</td>
<td></td>
</tr>
</tbody>
</table>

* The doses are expressed in terms of effective dose equivalent (whole body dose). Those criteria where appropriate can also be expressed in terms of corresponding annual effluent discharge limits authorized by National Authorities.
Appendix 3

Correlation between the previous INIS categories and the new categories

<table>
<thead>
<tr>
<th>B00.00 CHEMISTRY, MATERIALS AND EARTH SCIENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>B10.00 Chemistry ..................................................</td>
</tr>
<tr>
<td>B11.00 Chemical and Isotopic Analysis ............</td>
</tr>
<tr>
<td>B11.10 Nuclear Methods in Chemical and Isotopic Analysis</td>
</tr>
<tr>
<td>B11.20 Nonnuclear Methods in Chemical and Isotopic Analysis</td>
</tr>
<tr>
<td>B11.30 Separation Procedures in Chemical and Isotopic Analysis</td>
</tr>
<tr>
<td>B12.00 Inorganic, Organic and Physical Chemistry</td>
</tr>
<tr>
<td>B12.10 Chemical and Physico-Chemical Studies ...</td>
</tr>
<tr>
<td>B12.20 Isotope Effects, Isotope Exchange and Isotope</td>
</tr>
<tr>
<td>B13.00 Radiochemistry and Nuclear Chemistry ........</td>
</tr>
<tr>
<td>B13.10 Hot-Atom Chemistry ..................................</td>
</tr>
<tr>
<td>B13.20 Properties of Radioactive Materials ..........</td>
</tr>
<tr>
<td>B13.30 Preparation of Radioactively-Labelled Compounds</td>
</tr>
<tr>
<td>B14.00 Radiation Chemistry .................................</td>
</tr>
<tr>
<td>B16.00 Fission Fuels ............................................</td>
</tr>
<tr>
<td>B16.10 Fuel Processing .........................................</td>
</tr>
<tr>
<td>B16.20 Spent Fuel Reprocessing .............................</td>
</tr>
<tr>
<td>B20.00 Materials ..................................................</td>
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<tr>
<td>B22.00 Metals and Alloys .......................................</td>
</tr>
<tr>
<td>B22.10 Preparation and Fabrication ....................</td>
</tr>
<tr>
<td>B22.20 Structure and Phase Studies ....................</td>
</tr>
<tr>
<td>B22.30 Mechanical Properties ..............................</td>
</tr>
<tr>
<td>B22.40 Superconducting and Other Physical Properties</td>
</tr>
<tr>
<td>B22.50 Corrosion and Erosion ...............................</td>
</tr>
<tr>
<td>B22.60 Physical Radiation Effects on All Metals and Alloys</td>
</tr>
<tr>
<td>B23.00 Ceramics and Cermets ...............................</td>
</tr>
<tr>
<td>B23.10 Preparation and Fabrication ....................</td>
</tr>
<tr>
<td>B23.20 Structure and Phase Studies ....................</td>
</tr>
<tr>
<td>B23.30 Mechanical Properties ..............................</td>
</tr>
<tr>
<td>B23.40 Superconducting and Other Physical Properties</td>
</tr>
<tr>
<td>B23.50 Corrosion and Erosion ...............................</td>
</tr>
<tr>
<td>B23.60 Physical Radiation Effects on All Ceramics and Cermets</td>
</tr>
<tr>
<td>B24.00 Other Materials .........................................</td>
</tr>
<tr>
<td>B24.10 Preparation and Manufacture ....................</td>
</tr>
<tr>
<td>B24.20 Structure and Phase Studies ....................</td>
</tr>
<tr>
<td>B24.30 Mechanical Properties ..............................</td>
</tr>
<tr>
<td>B24.40 Superconducting and Other Physical Properties</td>
</tr>
<tr>
<td>B24.50 Corrosion, Erosion and Degradation ............</td>
</tr>
<tr>
<td>B24.60 Physical Radiation Effects on All Other Materials</td>
</tr>
<tr>
<td>B30.00 Earth Sciences ..........................................</td>
</tr>
<tr>
<td>B31.00 Land ..........................................................</td>
</tr>
<tr>
<td>B31.10 Radioactive Materials – Monitoring and Transport</td>
</tr>
<tr>
<td>B31.20 Nuclear Methods ..........................................</td>
</tr>
<tr>
<td>B31.30 Uranium and Thorium Ores ..........................</td>
</tr>
<tr>
<td>B31.40 Site Studies ...............................................</td>
</tr>
<tr>
<td>B31.50 Chemical Effluents – Monitoring and Transport</td>
</tr>
<tr>
<td>B31.60 Thermal Effluents – Monitoring and Transport</td>
</tr>
<tr>
<td>B32.00 Water ...........................................................</td>
</tr>
<tr>
<td>B32.10 Radioactive Materials – Monitoring and Transport</td>
</tr>
<tr>
<td>B32.20 Nuclear Methods ..........................................</td>
</tr>
<tr>
<td>B32.30 Uranium and Thorium in the Waters of the Earth</td>
</tr>
<tr>
<td>B32.40 Site Studies ...............................................</td>
</tr>
<tr>
<td>B32.50 Chemical Effluents – Monitoring and Transport</td>
</tr>
<tr>
<td>B32.60 Thermal Effluents – Monitoring and Transport</td>
</tr>
<tr>
<td>B33.00 Atmosphere ..................................................</td>
</tr>
<tr>
<td>B33.10 Radioactive Materials – Monitoring and Transport</td>
</tr>
<tr>
<td>B33.20 Nuclear Methods ..........................................</td>
</tr>
</tbody>
</table>
B33.40 Site Studies........................................................................................................S54, S58
B33.50 Chemical Effluents – Monitoring and Transport............................................S54
B33.60 Thermal Effluents – Monitoring and Transport............................................S54

C00.00 LIFE AND ENVIRONMENTAL SCIENCES

C10.00 Effects and Various Aspects of External Irradiation in Biology.....................S63
C11.00 Effects of External Irradiation on Biochemicals and on Cell and Tissue
Cultures.....................................................................................................................S63
C12.00 Effects of External Irradiation on Microorganisms........................................S63
C13.00 Effects of External Irradiation on Plants......................................................S63
C14.00 Effects of External Irradiation on Animals...................................................S63
C15.00 Effects of External Irradiation on Man.........................................................S63
C20.00 Effects and Various Aspects of Internal Irradiation and .........................S63
C21.00 Effects of Internal Irradiation, Radioisotope Kinetics..................................S63
C21.10 Effects of Internal Irradiation and Various Aspects of Radioisotope
Kinetics and Toxicity in Man.................................................................................S63
C21.20 Effects of Internal Irradiation and Various Aspects of Radioisotope
Kinetics and Toxicity in Animals, Plants and Microorganisms..........................S63
C40.00 Applied Life Sciences ..................................................................................S60
C41.00 Plant Cultivation and Breeding.................................................................S60
C42.00 Pest and Disease Control.............................................................................S60
C43.00 Food Protection, Preservation and Human Nutrition Evaluation................S60
C44.00 Animal Husbandry.....................................................................................S60
C45.00 Other Applications of Radiations and Radioisotopes in............................S60
C50.00 Radiation Protection and Environment....................................................S54, S61
C51.00 Real Accidents............................................................................................S20, S21, S22
C52.00 Environmental Aspects (Impact on Ecosystems) of Nuclear Installations....S54
C52.10 Environmental Aspects of Siting of Nuclear Installations........................S54
C52.11 Environmental Aspects of Siting of Fission Reactors...............................S21, S22
C52.12 Environmental Aspects of Siting of Fission Fuel Cycle Facilities...............S11
C52.13 Environmental Aspects of Siting of Other Nuclear Installations and
Facilities....................................................................................................................S54
C52.20 Environmental Aspects of Radioactive Releases from Nuclear Installations....S54
C52.21 Environmental Aspects of Radioactive Releases from Fission Reactors......S21, S22
C52.22 Environmental Aspects of Radioactive Releases from Fission Fuel Cycle
Facilities..................................................................................................................S11
C52.23 Environmental Aspects of Radioactive Releases from Other Nuclear
Installations and Facilities......................................................................................S54
C52.30 Environmental Aspects of Chemical and Thermal Releases from Nuclear
Installations and Other Environmental Impacts of Nuclear Installations..........S54
C52.31 Environmental Aspects of Chemical and Thermal Releases from Fission
Reactors and Other Environmental Impacts of Fission Reactors.....................S21, S22
C52.32 Environmental Aspects of Chemical and Thermal Releases from Fission
Fuel Cycle Facilities and Other Environmental Impacts of Fission Fuel
Cycle Facilities.........................................................................................................S11
C52.33 Environmental Aspects of Chemical and Thermal Releases from Other
Nuclear Installations and Facilities Facilities and Other Environmental
Impacts of Nuclear Installations...........................................................................S54
C52.40 Environmental Aspects of Design Basis and Hypothetical Accidents at
Nuclear Installations..............................................................................................S54
C52.41 Environmental Aspects of Design Basis and Hypothetical Accidents at
Fission Reactors....................................................................................................S21, S22
C52.42 Environmental Aspects of Design Basis and Hypothetical Accidents at
Fission Fuel Cycle Facilities..................................................................................S11
C52.43 Environmental Aspects of Design Basis and Hypothetical Accidents at
Other Nuclear Installations...................................................................................S54
C53.00 Radiation Protection Standards.....................................................................S61
C54.00 Radiation Protection Procedures..................................................................S61
C55.00 Dosimetry and Monitoring..........................................................................S61
C56.00 Environmental Aspects of Nonnuclear Energy............................................S54
C56.10 Environmental Aspects of Fossil Fuels.......................................................S01-S04
C56.11 Environmental Aspects of Coal, Lignite and Peat....................................S01
C56.12 Environmental Aspects of Petroleum.......................................................S02
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>E32.00</td>
<td>Power Reactors, Non-Breeding, Light-Water Moderated</td>
<td>S21</td>
</tr>
<tr>
<td>E33.00</td>
<td>Power Reactors, Non-Breeding, Graphite-Moderated (GCR)</td>
<td>S21</td>
</tr>
<tr>
<td>E34.00</td>
<td>Power Reactors, Non-Breeding, Heavy-Water or Otherwise</td>
<td>S21</td>
</tr>
<tr>
<td>E35.00</td>
<td>Power Reactors, Breeding</td>
<td>S21</td>
</tr>
<tr>
<td>E36.00</td>
<td>Research, Test, Training, Production, Irradiation and</td>
<td>S21</td>
</tr>
<tr>
<td>E38.00</td>
<td>Mobile, Propulsion, Transportable and Package Reactors</td>
<td>S21</td>
</tr>
<tr>
<td>E39.00</td>
<td>Process Heat Reactors</td>
<td>S21</td>
</tr>
<tr>
<td>E40.00</td>
<td>Instrumentation</td>
<td>S46</td>
</tr>
<tr>
<td>E41.00</td>
<td>Particle and Radiation Detection and Measuring</td>
<td>S46</td>
</tr>
<tr>
<td>E41.10</td>
<td>Radiation Dosemeters</td>
<td>S46</td>
</tr>
<tr>
<td>E41.20</td>
<td>Nuclear Spectroscopic Instrumentation</td>
<td>S46</td>
</tr>
<tr>
<td>E41.30</td>
<td>High-Energy Physics Instrumentation</td>
<td>S46</td>
</tr>
<tr>
<td>E41.40</td>
<td>Other Particle and Radiation Detection and Measuring</td>
<td>S46</td>
</tr>
<tr>
<td>E42.00</td>
<td>Other Nuclear Instrumentation and Methods</td>
<td>S46</td>
</tr>
<tr>
<td>E43.00</td>
<td>Radiation Effects on Instruments, Components or</td>
<td>S46</td>
</tr>
<tr>
<td>E50.00</td>
<td>Waste Management</td>
<td>S12</td>
</tr>
<tr>
<td>E51.00</td>
<td>Waste Treatment</td>
<td>S12</td>
</tr>
<tr>
<td>E52.00</td>
<td>Waste Disposal</td>
<td>S12</td>
</tr>
</tbody>
</table>

**F00.00 OTHER ASPECTS OF NUCLEAR AND NONNUCLEAR ENERGY**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>F10.00</td>
<td>Economics and Sociology</td>
<td>S29</td>
</tr>
<tr>
<td>F11.00</td>
<td>Nuclear Power Economics</td>
<td>S29</td>
</tr>
<tr>
<td>F11.10</td>
<td>Fission Nuclear Power Economics</td>
<td>S21</td>
</tr>
<tr>
<td>F11.20</td>
<td>Fusion Nuclear Power Economics</td>
<td>S70</td>
</tr>
<tr>
<td>F12.00</td>
<td>Nuclear Fuel Cycle Economics</td>
<td>S11</td>
</tr>
<tr>
<td>F12.10</td>
<td>Fission Nuclear Fuel Cycle Economics</td>
<td>S11</td>
</tr>
<tr>
<td>F12.20</td>
<td>Fusion Nuclear Fuel Cycle Economics</td>
<td>S70</td>
</tr>
<tr>
<td>F13.00</td>
<td>Economics of Isotopes and Radiation Applications</td>
<td>S07</td>
</tr>
<tr>
<td>F14.00</td>
<td>Social Impact of Nuclear Science and Technology</td>
<td>S29</td>
</tr>
<tr>
<td>F15.00</td>
<td>Economic Aspects of Nonnuclear Energy</td>
<td>S29</td>
</tr>
<tr>
<td>F15.10</td>
<td>Economic Aspects of Fossil Fuels</td>
<td>S01-S04</td>
</tr>
<tr>
<td>F15.11</td>
<td>Economic Aspects of Coal, Lignite and Peat</td>
<td>S01</td>
</tr>
<tr>
<td>F15.12</td>
<td>Economic Aspects of Petroleum</td>
<td>S02</td>
</tr>
<tr>
<td>F15.13</td>
<td>Economic Aspects of Natural Gas</td>
<td>S03</td>
</tr>
<tr>
<td>F15.14</td>
<td>Economic Aspects of Oil Shales and Tar Sands</td>
<td>S04</td>
</tr>
<tr>
<td>F15.15</td>
<td>Economic Aspects of Fossil-Fueled Power Plants</td>
<td>S20</td>
</tr>
<tr>
<td>F15.20</td>
<td>Economic Aspects of Renewable Energy Sources</td>
<td>S09, S13-S17</td>
</tr>
<tr>
<td>F15.21</td>
<td>Economic Aspects of Hydro Energy</td>
<td>S13</td>
</tr>
<tr>
<td>F15.22</td>
<td>Economic Aspects of Solar Energy</td>
<td>S14</td>
</tr>
<tr>
<td>F15.23</td>
<td>Economic Aspects of Geothermal Energy</td>
<td>S15</td>
</tr>
<tr>
<td>F15.24</td>
<td>Economic Aspects of Tidal and Wave Power</td>
<td>S16</td>
</tr>
<tr>
<td>F15.25</td>
<td>Economic Aspects of Wind Energy</td>
<td>S17</td>
</tr>
<tr>
<td>F15.26</td>
<td>Economic Aspects of Biomass Fuels</td>
<td>S09</td>
</tr>
<tr>
<td>F15.30</td>
<td>Economic Aspects of Synthetic Fuels</td>
<td>S10</td>
</tr>
<tr>
<td>F15.31</td>
<td>Economic Aspects of Hydrogen Fuel</td>
<td>S08</td>
</tr>
<tr>
<td>F15.32</td>
<td>Economic Aspects of Other Synthetic Fuels</td>
<td>S10</td>
</tr>
<tr>
<td>F15.40</td>
<td>Economic Aspects of Energy Storage</td>
<td>S25</td>
</tr>
<tr>
<td>F15.50</td>
<td>Economic Aspects of Power Transmission and Distribution</td>
<td>S24</td>
</tr>
<tr>
<td>F20.00</td>
<td>Legal Aspects</td>
<td>S99</td>
</tr>
<tr>
<td>F21.00</td>
<td>Radioactive Materials and Radiation Sources</td>
<td>S07</td>
</tr>
<tr>
<td>F22.00</td>
<td>Nuclear Installations</td>
<td>S21, S22</td>
</tr>
<tr>
<td>F23.00</td>
<td>Radiation Health</td>
<td>S61</td>
</tr>
<tr>
<td>F24.00</td>
<td>Management, Transport and Storage of Radioactive Materials and WasteS07, S11, S12</td>
<td>S22</td>
</tr>
<tr>
<td>F25.00</td>
<td>Liability for Nuclear Damage</td>
<td>S22</td>
</tr>
<tr>
<td>F26.00</td>
<td>Nuclear Ships and Other Nuclear Means of Conveyance</td>
<td>S21</td>
</tr>
<tr>
<td>F27.00</td>
<td>Organization and Administration of Nuclear Activities</td>
<td>S99</td>
</tr>
<tr>
<td>F28.00</td>
<td>Nuclear Disarmament, Non-proliferation, Safeguards and Physical</td>
<td>S98</td>
</tr>
<tr>
<td>F30.00</td>
<td>Nuclear Documentation</td>
<td>S99</td>
</tr>
<tr>
<td>F31.00</td>
<td>Data Handling</td>
<td>S99</td>
</tr>
<tr>
<td>F32.00</td>
<td>Literature Handling</td>
<td>S99</td>
</tr>
<tr>
<td>F40.00</td>
<td>Safeguards</td>
<td>S98</td>
</tr>
<tr>
<td>F41.00</td>
<td>Technical Aspects</td>
<td>S98</td>
</tr>
<tr>
<td>Code</td>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>F42.00</td>
<td>Non-Technical Aspects</td>
<td>S98</td>
</tr>
<tr>
<td>F50.00</td>
<td>Mathematical Methods and Computer Codes</td>
<td>S99</td>
</tr>
<tr>
<td>F51.00</td>
<td>Nuclear Computation and Simulation</td>
<td>S99</td>
</tr>
<tr>
<td>F60.00</td>
<td>Miscellaneous</td>
<td>S99</td>
</tr>
<tr>
<td>G00.00</td>
<td>PHYSICS</td>
<td></td>
</tr>
<tr>
<td>G10.00</td>
<td>General Physics of Nuclear Relevance</td>
<td>S71</td>
</tr>
<tr>
<td>G11.00</td>
<td>Classical and Quantum Mechanics</td>
<td>S71</td>
</tr>
<tr>
<td>G12.00</td>
<td>Techniques of General Use in Physics Applicable in Nuclear</td>
<td>S71</td>
</tr>
<tr>
<td>G12.10</td>
<td>Cryogenics</td>
<td>S71</td>
</tr>
<tr>
<td>G12.20</td>
<td>Particle Beam Production and Handling; Targets</td>
<td>S71</td>
</tr>
<tr>
<td>G13.00</td>
<td>Other Aspects of Physical Science of Nuclear Relevance</td>
<td>S71</td>
</tr>
<tr>
<td>G20.00</td>
<td>Physics Of Elementary Particles and Fields</td>
<td>S72</td>
</tr>
<tr>
<td>G21.00</td>
<td>General Theory of Particles and Fields</td>
<td>S72</td>
</tr>
<tr>
<td>G21.10</td>
<td>Theory of Fields and Strings</td>
<td>S72</td>
</tr>
<tr>
<td>G21.20</td>
<td>Symmetry, Conservation Laws, Currents and their</td>
<td>S72</td>
</tr>
<tr>
<td>G21.30</td>
<td>S-Matrix Theory, Relativistic Scattering</td>
<td>S72</td>
</tr>
<tr>
<td>G22.00</td>
<td>Specific Theories and Interaction Models; Particle</td>
<td>S72</td>
</tr>
<tr>
<td>G22.10</td>
<td>Unified Theories and Models</td>
<td>S72</td>
</tr>
<tr>
<td>G22.20</td>
<td>Quantum Electrodynamics</td>
<td>S72</td>
</tr>
<tr>
<td>G22.30</td>
<td>Quantum Chromodynamics</td>
<td>S72</td>
</tr>
<tr>
<td>G22.40</td>
<td>Models for Strong Interactions</td>
<td>S72</td>
</tr>
<tr>
<td>G23.00</td>
<td>Specific Interactions, Decays and Processes</td>
<td>S72</td>
</tr>
<tr>
<td>G23.10</td>
<td>Weak and Electromagnetic Interactions of Leptons</td>
<td>S72</td>
</tr>
<tr>
<td>G23.20</td>
<td>Neutrino Interactions</td>
<td>S72</td>
</tr>
<tr>
<td>G23.30</td>
<td>Photon and Charged-Lepton Interactions with Hadrons</td>
<td>S72</td>
</tr>
<tr>
<td>G23.40</td>
<td>Hadron Interactions</td>
<td>S72</td>
</tr>
<tr>
<td>G23.50</td>
<td>Decays of Mesons</td>
<td>S72</td>
</tr>
<tr>
<td>G23.60</td>
<td>Decays of Baryons</td>
<td>S72</td>
</tr>
<tr>
<td>G23.70</td>
<td>Decays of Leptons</td>
<td>S72</td>
</tr>
<tr>
<td>G23.80</td>
<td>Decays of Intermediate Bosons</td>
<td>S72</td>
</tr>
<tr>
<td>G23.90</td>
<td>Electromagnetic Processes and Properties</td>
<td>S72</td>
</tr>
<tr>
<td>G24.00</td>
<td>Properties of Specific Particles and Resonances</td>
<td>S72</td>
</tr>
<tr>
<td>G24.10</td>
<td>Properties of Baryons and Baryon Resonances</td>
<td>S72</td>
</tr>
<tr>
<td>G24.20</td>
<td>Properties of Mesons and Meson Resonances</td>
<td>S72</td>
</tr>
<tr>
<td>G24.30</td>
<td>Properties of Leptons</td>
<td>S72</td>
</tr>
<tr>
<td>G24.40</td>
<td>Properties of Other Particles Including Hypothetical</td>
<td>S72</td>
</tr>
<tr>
<td>G30.00</td>
<td>Nuclear Physics (Theoretical and Experimental)</td>
<td>S73</td>
</tr>
<tr>
<td>G31.00</td>
<td>Nuclear Structure</td>
<td>S73</td>
</tr>
<tr>
<td>G31.10</td>
<td>General and Average Properties of Nuclei and Nuclear</td>
<td>S73</td>
</tr>
<tr>
<td>G31.20</td>
<td>Nuclear Structure Models and Methods</td>
<td>S73</td>
</tr>
<tr>
<td>G32.00</td>
<td>Radioactivity and Electromagnetic Transitions</td>
<td>S73</td>
</tr>
<tr>
<td>G32.10</td>
<td>Ground-State Radioactivity</td>
<td>S73</td>
</tr>
<tr>
<td>G32.20</td>
<td>Electromagnetic Transitions</td>
<td>S73</td>
</tr>
<tr>
<td>G33.00</td>
<td>Nuclear Reactions and Scattering, General</td>
<td>S73</td>
</tr>
<tr>
<td>G34.00</td>
<td>Specific Nuclear Reactions and Scattering</td>
<td>S73</td>
</tr>
<tr>
<td>G34.10</td>
<td>Photonuclear Reactions and Photon Scattering</td>
<td>S73</td>
</tr>
<tr>
<td>G34.20</td>
<td>Lepton-Induced Reactions and Scattering</td>
<td>S73</td>
</tr>
<tr>
<td>G34.30</td>
<td>Nucleon-Induced Reactions and Scattering</td>
<td>S73</td>
</tr>
<tr>
<td>G34.40</td>
<td>2H-, 3H- and He-Induced Reactions and Scattering</td>
<td>S73</td>
</tr>
<tr>
<td>G34.50</td>
<td>Heavy-Ion-Induced Reactions and Scattering</td>
<td>S73</td>
</tr>
<tr>
<td>G34.60</td>
<td>Meson and Hyperon-Induced Reactions and Scattering</td>
<td>S73</td>
</tr>
<tr>
<td>G34.70</td>
<td>Fission</td>
<td>S73</td>
</tr>
<tr>
<td>G35.00</td>
<td>Nuclear Mass Ranges</td>
<td>S73</td>
</tr>
<tr>
<td>G35.10</td>
<td>Nuclear Mass Ranges A=1-5</td>
<td>S73</td>
</tr>
<tr>
<td>G35.20</td>
<td>Nuclear Mass Ranges A=6-19</td>
<td>S73</td>
</tr>
<tr>
<td>G35.30</td>
<td>Nuclear Mass Ranges A=20-38</td>
<td>S73</td>
</tr>
<tr>
<td>G35.40</td>
<td>Nuclear Mass Ranges A=39-58</td>
<td>S73</td>
</tr>
<tr>
<td>G35.50</td>
<td>Nuclear Mass Ranges A=59-89</td>
<td>S73</td>
</tr>
<tr>
<td>G35.60</td>
<td>Nuclear Mass Ranges A=90-149</td>
<td>S73</td>
</tr>
<tr>
<td>G35.70</td>
<td>Nuclear Mass Ranges A=150-189</td>
<td>S73</td>
</tr>
<tr>
<td>G35.80</td>
<td>Nuclear Mass Ranges A=190-219</td>
<td>S73</td>
</tr>
</tbody>
</table>

64
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>G35.90</td>
<td>Nuclear Mass Ranges $A=220$ and above</td>
<td>S73</td>
</tr>
<tr>
<td>G36.00</td>
<td>Radiation Physics</td>
<td>S73</td>
</tr>
<tr>
<td>G36.10</td>
<td>Interactions of Neutrons with Bulk Matter and Neutron Transport</td>
<td>S73</td>
</tr>
<tr>
<td>G36.20</td>
<td>Interaction with Bulk Matter and Transport of Radiations Other</td>
<td>S73</td>
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<td>Atomic and Molecular Physics of Nuclear Relevance</td>
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<td>Theory of Electronic Structure of Atoms and Molecules</td>
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<td>Spectra of Atoms and Molecules and their Interactions</td>
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</tr>
<tr>
<td>G43.00</td>
<td>Collision Phenomena</td>
<td>S74</td>
</tr>
<tr>
<td>G44.00</td>
<td>Experimentally Derived Information on Atomic and</td>
<td>S74</td>
</tr>
<tr>
<td>G45.00</td>
<td>Special Atoms and Molecules</td>
<td>S74</td>
</tr>
<tr>
<td>G50.00</td>
<td>Plasma Physics and Fusion</td>
<td>S70</td>
</tr>
<tr>
<td>G51.00</td>
<td>Plasma Physics and Fusion Research</td>
<td>S70</td>
</tr>
<tr>
<td>G51.10</td>
<td>Plasma Confinement</td>
<td>S70</td>
</tr>
<tr>
<td>G51.20</td>
<td>Plasma Diagnostic Techniques and Instrumentation</td>
<td>S70</td>
</tr>
<tr>
<td>G51.30</td>
<td>Plasma Kinetics, Transport and Impurities</td>
<td>S70</td>
</tr>
<tr>
<td>G51.40</td>
<td>Plasma Waves, Oscillations and Instabilities</td>
<td>S70</td>
</tr>
<tr>
<td>G51.50</td>
<td>Plasma Production, Heating, Current Drive and</td>
<td>S70</td>
</tr>
<tr>
<td>G51.60</td>
<td>Fusion Reactions</td>
<td>S70</td>
</tr>
<tr>
<td>G51.70</td>
<td>Plasma Fluid and MHD Properties</td>
<td>S70</td>
</tr>
<tr>
<td>G51.80</td>
<td>Elementary and Classical Processes in Plasmas</td>
<td>S70</td>
</tr>
<tr>
<td>G51.90</td>
<td>Other Plasma Physics Studies</td>
<td>S70</td>
</tr>
<tr>
<td>G52.00</td>
<td>Thermonuclear Fusion Technology</td>
<td>S70</td>
</tr>
<tr>
<td>G52.10</td>
<td>Specific Fusion Devices and Experiments</td>
<td>S70</td>
</tr>
<tr>
<td>G52.11</td>
<td>Specific Inertial Confinement Devices</td>
<td>S70</td>
</tr>
<tr>
<td>G52.12</td>
<td>Specific Magnetic Fusion Confinement Devices</td>
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</tr>
<tr>
<td>G52.20</td>
<td>Plasma-Facing Components</td>
<td>S70</td>
</tr>
<tr>
<td>G52.30</td>
<td>Magnet Coils and Fields</td>
<td>S70</td>
</tr>
<tr>
<td>G52.40</td>
<td>Power Supplies, Energy Storage</td>
<td>S70</td>
</tr>
<tr>
<td>G52.50</td>
<td>Blankets and Cooling Systems</td>
<td>S70</td>
</tr>
<tr>
<td>G52.60</td>
<td>Heating and Fueling Systems; Fuels</td>
<td>S70</td>
</tr>
<tr>
<td>G52.70</td>
<td>Power Conversion Systems</td>
<td>S70</td>
</tr>
<tr>
<td>G52.80</td>
<td>Component Development; Materials Studies</td>
<td>S70</td>
</tr>
<tr>
<td>G60.00</td>
<td>Condensed Matter Physics of Nuclear Relevance</td>
<td>S75</td>
</tr>
<tr>
<td>G61.00</td>
<td>Nuclear Techniques in Condensed Matter Physics</td>
<td>S75</td>
</tr>
<tr>
<td>G62.00</td>
<td>Solid-State Plasma; Physics of Surfaces, Interfaces and Thin Films</td>
<td>S75</td>
</tr>
<tr>
<td>G63.00</td>
<td>Interactions Between Beams and Condensed Matter</td>
<td>S75</td>
</tr>
<tr>
<td>G64.00</td>
<td>Quantum Physics Aspects of Condensed Matter</td>
<td>S75</td>
</tr>
<tr>
<td>G64.10</td>
<td>Superconductivity</td>
<td>S75</td>
</tr>
<tr>
<td>G64.11</td>
<td>Basic Superconductivity Studies</td>
<td>S75</td>
</tr>
<tr>
<td>G64.12</td>
<td>Superconducting Devices</td>
<td>S75</td>
</tr>
<tr>
<td>G64.20</td>
<td>Superfluidity</td>
<td>S75</td>
</tr>
<tr>
<td>G64.30</td>
<td>Other Quantum Aspects of Condensed Matter</td>
<td>S75</td>
</tr>
<tr>
<td>G65.00</td>
<td>Direct Energy Conversion</td>
<td>S30</td>
</tr>
<tr>
<td>G65.10</td>
<td>Magnetohydrodynamic Direct Energy Conversion</td>
<td>S30</td>
</tr>
<tr>
<td>G65.20</td>
<td>Other Methods of Direct Energy Conversion</td>
<td>S30</td>
</tr>
</tbody>
</table>
### Appendix 4

**Correlation between the new categories and the previous INIS categories**

<table>
<thead>
<tr>
<th>New Category</th>
<th>Previous Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>S01 <strong>COAL, LIGNITE AND PEAT</strong></td>
<td>C5611, F1511</td>
</tr>
<tr>
<td>S02 <strong>PETROLEUM</strong></td>
<td>C5612, F1512</td>
</tr>
<tr>
<td>S03 <strong>NATURAL GAS</strong></td>
<td>C5613, F1513</td>
</tr>
<tr>
<td>S04 <strong>OIL SHALES AND TAR SANDS</strong></td>
<td>C5614, F1514</td>
</tr>
<tr>
<td>S07 <strong>HYDROGEN</strong></td>
<td>C5631, F1531</td>
</tr>
<tr>
<td>S09 <strong>BIOMASS FUELS</strong></td>
<td>C5626, F1526</td>
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<tr>
<td>S10 <strong>SYNTHETIC FUELS</strong></td>
<td>C5630, C5632, F1530, F1532</td>
</tr>
<tr>
<td>S11 <strong>NUCLEAR FUEL CYCLE AND FUEL MATERIALS</strong></td>
<td>B1600-B1620, B3130, B3230,C5212, C5222, C5232, C5242, D1100, F1210, F2100 F2400, E5000-E5200, F2400</td>
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<tr>
<td>S12 <strong>MANAGEMENT OF RADIOACTIVE WASTES, AND NON-RADIOACTIVE WASTES FROM NUCLEAR FACILITIES</strong></td>
<td>C5621, F1521</td>
</tr>
<tr>
<td>S13 <strong>HYDRO ENERGY</strong></td>
<td>C5622, F1522</td>
</tr>
<tr>
<td>S15 <strong>GEOTHERMAL ENERGY</strong></td>
<td>C5623, F1523</td>
</tr>
<tr>
<td>S16 <strong>TIDAL AND WAVE POWER</strong></td>
<td>C5624, F1524</td>
</tr>
<tr>
<td>S17 <strong>WIND ENERGY</strong></td>
<td>C5625, F1525</td>
</tr>
<tr>
<td>S20 <strong>FOSSIL-FUELED POWER PLANTS</strong></td>
<td>C5615, F1515</td>
</tr>
<tr>
<td>S21 <strong>SPECIFIC NUCLEAR REACTORS AND ASSOCIATED PLANTS</strong></td>
<td>C5211, C5221, C5231, C5241, E3000-E3500, E3800, E3900, F1110, F2200, F2600, E2000-E2400, E3600, F2500</td>
</tr>
<tr>
<td>S22 <strong>GENERAL STUDIES OF NUCLEAR REACTORS</strong></td>
<td>E1000-E1530, E1700</td>
</tr>
<tr>
<td>S24 <strong>POWER TRANSMISSION AND DISTRIBUTION</strong></td>
<td>E1600-E1640</td>
</tr>
<tr>
<td>S25 <strong>ENERGY STORAGE</strong></td>
<td>E4000-E4300</td>
</tr>
<tr>
<td>S29 <strong>ENERGY PLANNING, POLICY AND ECONOMY</strong></td>
<td>E1800</td>
</tr>
<tr>
<td>S30 <strong>DIRECT ENERGY CONVERSION</strong></td>
<td>none</td>
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<td>S31 <strong>ENERGY CONSERVATION, CONSUMPTION AND UTILIZATION</strong></td>
<td>none</td>
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<tr>
<td>S32 <strong>ADVANCED PROPULSION SYSTEMS</strong></td>
<td>B2200-B2260, B2300-2360, B2400-B2460</td>
</tr>
<tr>
<td>S36 <strong>MATERIALS SCIENCES</strong></td>
<td>B1100-B1220</td>
</tr>
<tr>
<td>S37 <strong>INORGANIC, ORGANIC, PHYSICAL AND ANALYTICAL CHEMISTRY</strong></td>
<td>B1300-B1330, B1400</td>
</tr>
<tr>
<td>S38 <strong>RADIATION CHEMISTRY, RADIOCHEMISTRY AND NUCLEAR CHEMISTRY</strong></td>
<td>B1300-B1330, B1400</td>
</tr>
<tr>
<td>S42 <strong>ENGINEERING</strong></td>
<td>E1000-E1530, E1700</td>
</tr>
<tr>
<td>S43 <strong>PARTICLE ACCELERATORS</strong></td>
<td>E1600-E1640</td>
</tr>
<tr>
<td>S46 <strong>INSTRUMENTATION RELATED TO NUCLEAR SCIENCE AND TECHNOLOGY</strong></td>
<td>E4000-E4300</td>
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<tr>
<td>S47 <strong>OTHER INSTRUMENTATION</strong></td>
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<tr>
<td>S54 <strong>ENVIRONMENTAL SCIENCES</strong></td>
<td>B3000-B3120, B3140-B3160, B3200-B3220, B3240-B3260, B3300-B3360, C5000, C5200, C5210, C5213, C5220, C5222, C5230, C5233, C5240, C5243, C5600, C5610, C5620, C5700</td>
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<td>S58 <strong>GEO SCIENCES</strong></td>
<td>none (B3120-40, B3220-40, B3330-40)</td>
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<tr>
<td>S60 <strong>APPLIED LIFE SCIENCES</strong></td>
<td>C4000-C4500</td>
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<tr>
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<tr>
<td>S61</td>
<td>RADIATION PROTECTION AND DOSIMETRY</td>
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<tr>
<td>S62</td>
<td>RADIOLOGY AND NUCLEAR MEDICINE</td>
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<tr>
<td>S63</td>
<td>RADIATION, THERMAL, AND OTHER ENVIRONMENTAL POLLUTANT EFFECTS ON LIVING ORGANISMS AND BIOLOGICAL MATERIALS</td>
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<tr>
<td>S70</td>
<td>PLASMA PHYSICS AND FUSION TECHNOLOGY</td>
</tr>
<tr>
<td>S71</td>
<td>CLASSICAL AND QUANTUM MECHANICS, GENERAL PHYSICS</td>
</tr>
<tr>
<td>S72</td>
<td>PHYSICS OF ELEMENTARY PARTICLES AND FIELDS</td>
</tr>
<tr>
<td>S73</td>
<td>NUCLEAR PHYSICS INCLUDING RADIATION PHYSICS</td>
</tr>
<tr>
<td>S74</td>
<td>ATOMIC AND MOLECULAR PHYSICS</td>
</tr>
<tr>
<td>S75</td>
<td>CONDENSED MATTER PHYSICS, SUPERCONDUCTIVITY AND SUPERFLUIDITY</td>
</tr>
<tr>
<td>S98</td>
<td>NUCLEAR DISARMAMENT, SAFEGUARDS AND PHYSICAL PROTECTION</td>
</tr>
<tr>
<td>S99</td>
<td>GENERAL AND MISCELLANEOUS</td>
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Appendix 5
Correlation between the old ETDE categories and the new common categories

In general the first two digits of the former six-digit ETDE categories are identical with the new common ETDE/INIS category beginning with the letter S. Deviations are due to the splitting of single ETDE-categories into two or more categories.

The list below contains the deviations written in bold letters.

<table>
<thead>
<tr>
<th>Old Category</th>
<th>New</th>
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<tbody>
<tr>
<td>01...</td>
<td>S01</td>
<td>400000 to 400500</td>
<td>S37</td>
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<tr>
<td>02...</td>
<td>S02</td>
<td>400600 to 400703</td>
<td>S38</td>
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<tr>
<td>03...</td>
<td>S03</td>
<td>400800</td>
<td>S37</td>
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<tr>
<td>04...</td>
<td>S04</td>
<td>42...</td>
<td>S42</td>
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<td>050000 to 051000</td>
<td>S11</td>
<td>43...</td>
<td>S43</td>
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<tr>
<td>052000 to 052002</td>
<td>S12</td>
<td>440000 to 440200</td>
<td>S46</td>
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<td>S11</td>
<td>440400 to 440800</td>
<td>S47</td>
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<td>S98</td>
<td>54...</td>
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<td>056000</td>
<td>S11</td>
<td>550000 to 550501</td>
<td>S60</td>
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<tr>
<td>07..</td>
<td>S07</td>
<td>5506..</td>
<td>S62</td>
</tr>
<tr>
<td>08..</td>
<td>S08</td>
<td>550700 to 553006</td>
<td>S60</td>
</tr>
<tr>
<td>09..</td>
<td>S09</td>
<td>560000</td>
<td>S60</td>
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<tr>
<td>10..</td>
<td>S10</td>
<td>560100</td>
<td>S63</td>
</tr>
<tr>
<td>13..</td>
<td>S13</td>
<td>560101</td>
<td>S61</td>
</tr>
<tr>
<td>14..</td>
<td>S14</td>
<td>560120 to 560162</td>
<td>S63</td>
</tr>
<tr>
<td>15..</td>
<td>S15</td>
<td>560180 to 560190</td>
<td>S61</td>
</tr>
<tr>
<td>16..</td>
<td>S16</td>
<td>560200 to 560400</td>
<td>S63</td>
</tr>
<tr>
<td>17..</td>
<td>S17</td>
<td>570000</td>
<td>S60</td>
</tr>
<tr>
<td>20..</td>
<td>S20</td>
<td>570100</td>
<td>S22</td>
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<tr>
<td>21..</td>
<td>S21</td>
<td>58..</td>
<td>S58</td>
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<tr>
<td>220000 to 220504</td>
<td>S22</td>
<td>660000</td>
<td>S71, S72</td>
</tr>
<tr>
<td>220600</td>
<td>S21</td>
<td>or S75</td>
<td></td>
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<td>220900 to 220901</td>
<td>S22</td>
<td>661..</td>
<td>S71</td>
</tr>
<tr>
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<td>S24</td>
<td>662..</td>
<td>S72</td>
</tr>
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<td>S25</td>
<td>663..</td>
<td>S73</td>
</tr>
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<td>S29</td>
<td>664..</td>
<td>S74</td>
</tr>
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<td>S30</td>
<td>665..</td>
<td>S75</td>
</tr>
<tr>
<td>32..</td>
<td>S32</td>
<td>70..</td>
<td>S70</td>
</tr>
<tr>
<td>33..</td>
<td>S33</td>
<td>99..</td>
<td>S99</td>
</tr>
<tr>
<td>35..</td>
<td>S98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36..</td>
<td>S36</td>
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<td></td>
</tr>
</tbody>
</table>
This index is included to assist the user in quickly locating keywords or phrases in the category titles or category scope notes. It should not be used when assigning categories or when searching; the text should always be consulted before performing either function.

Abnormal reactor operations, S21
Absorbed dose, S61, S62
AC power transmission, S24
Accelerator shielding, S43
Accelerators, particle, S43
Accident liability
nuclear reactor, S22
Accidents
fuel processing cycle, S11
nuclear reactor, S22
radiation source technology, S07
real accidents, S22
Acid mine drainage, S01, S54
Acid rain
abatement, S29
aquatic aspects, S54
atmospheric aspects, S54
biological effects, S63
corrosive effects on
building materials, S36, S54
cultural resources, S54
deposition, S54
health hazards, S63
legislation, S29
monitoring, S54
planning and policy aspects, S29
regulations, S29
terrestrial aspects, S54
transport, S54
Acidification, ecological effects, S36, S54
Acoustics, S71
Actinides
analysis and determination, S37
chemical separation studies, S38, S11
Activation analysis, S37
Administration
of (nuclear) institutes and programs, S99
Advanced automotive propulsion systems, S33
Age determination (isotope dating)
objects, S37
terrestrial or extraterrestrial material, S58
AGR-type reactors, S21
Agreements
safeguards, S98
Agriculture, S60
energy conservation, S32
hot water use, S20
solar process heat, S14
Air conditioning
solar, S14
Air pollution, S54
baseline studies, S54
biological effects, S63
biomass use and production, S09, S54
coal use and processing, S01, S54
corrosive effects on environmental materials, S54
effects on building materials, S36, S54
effects on service life, S54
environmental transport, S29, S54
flue gas, purification, S01, S02, S20, S54
fusion energy production and use, S54
geothermal energy production and use, S15, S54
materials effects, S36, S54
monitoring methods, S54
monitors, design and testing, S54
natural gas production and use, S03, S54
nuclear fuel production and use, S11, S54
nuclear reactors, S22, S54
oil shale production or use, S04, S54
petroleum use and production, S02, S54
policy, S29
radioactive contaminants, S54
radioactive effluents, S11, S22, S54
radiometric techniques, S54
regulations, S29
sampling, S54
site surveys, S54
socioeconomic aspects, S29
tar sands processing and use, S04, S54
thermal, S54
tracer techniques, S54
transport, S54
waste use and production, S09, S54
Air pollution control, S54
automobiles, S33, S54
clean, S01, S54
flue gas, S01, S20, S54
fossil-fueled power plants, S20, S54
natural gas, S03, S54
oil shales, S04, S54
tar sands, S04, S54
Air quality, S29
Air transportation
energy conservation, S32
Aircraft propulsion reactors, S21
Alcohol fuels, S09, S10
biosynthesis, S09
chemical synthesis, S01, S10
economics, S09, S10
properties, S09, S10
safety, S09, S10
from wastes or biomass, S09
Allocations, S29
Alloys, S36
Alpha decay, S73
Alpha particle confinement (plasma), S70
Americium
analysis and determination, S37, S11
design and operation of radiation sources, S07
radiochemical behavior, S38, S11
separation techniques, S38, S11
Ammonia
biological effects, S63
biosynthesis, S09
business aspects, S09
by-products, S09
combustion, S09
composition, S09
economic aspects, S09
environmental aspects, S09
handling, S09
health, S09
industrial aspects, S09
legislation, S09
processing, S09
production, S09
products, S09
properties, S090
regulations, S09
resources, S09
safety, S09
storage, S09
transport, S09
waste management, S09
Biomedical radiography, S62, S61
Biomedical sciences, S60
agriculture, S60
behavior, S60
biochemistry, S60
biological radiation effects, S63
chemicals metabolism and toxicology, S63
cytology, S60
electricity effects, S63
electromagnetic radiation effects, S63
environmental pollutants, S63
food technology, S60
genetics, S60
laser radiation effects, S63
medicine, S62
metabolism, S60
microbiology, S60
microwave radiation effects, S63
morphology, S60
noise effects, S63
pathology, S60
photosynthesis, S60
physiology, S60
public health, S60
thermal effects, S54, S63
toxicity of chemicals, S63
ultraviolet radiation effects, S63
Biomimetic processes
solar energy conversion, S14
Biosynthesis
hydrogen production, S08
Biotechnology
applied studies, S09
basic studies, S60
Blanket engineering
for fission reactors, S21, S22
for fusion power plants, S70
Body burden, S63, S61
Boiling water reactors, S21
Boom towns, S29
Bootstrap theory, S72
Bosch process
hydrogen production, S08
Brayton power cycles, S42
Breeder reactors, S21
Breeding animals, S60
Breeding blankets, S70
Building codes and standards, S32
Building materials
energy efficiency, S32
life cycle, S54
properties, S36
Buildings
energy conservation, S32
energy consumption, S32
energy efficiency, S32
retrofitting, S32
BWR-type reactors, S21
By-products
biomass, S09
coal, S01
geothermal energy, S15
hydrogen fuel, S08
natural gas, S03
nuclear fuel, S11
oil shale, S04
petroleum, S02
synthetic fuels, S10
tar sands, S04
Cl processes, S01
Californium
analysis and determination, S37, S11
design and operation of radiation sources, S07
radiochemical behavior, S38, S11
separation techniques, S38, S11
Cancer, S63, S62
CANDU-type reactors, S21
Carbon corrosion, S36
Carbon dioxide
environmental effects, S54
greenhouse effect, S54
Carbon monoxide control, S33, S54
pollution control, S33, S54
Carbonization
ccoal, S01
Cells
cell culture techniques, S60
chemical effects on, S63
morphology, S60
radiation effects on, S63
radioisotopes in, S63
Central receiver power systems, S14
Ceramics, S36
Cermets, S36
Charcoal, S09
Charged particle transport, S73
Chemical effluents
air, S54
diffusion, S54
ecological concentration, S54,
metabolism, S63
nuclear reactors, S22, S54,
soil, S54
toxicity, S63
water, S54
experimental and theoretical techniques, S75
interactions with beams, S75
quantum aspects, S75
surface studies, S75
Congressional hearings, S29
Conservation, S32
energy policy, S29
implementation effects, S29
natural resources, S29
services, S32
socioeconomic aspects, S29
Conservation laws (physics), S72
Construction economics
nuclear power plant, S21
Consumer motivation, S29, S32
Consumer products, S32
Containers
radioactive materials, S42
Contamination, radioactive
monitoring of, in soils, S54
monitoring of, in surface waters, S54
monitoring of, in earth atmosphere, S54
of food and animal feed, S60
of food chain, S54
of man, animals, plants, microorganisms, S63
of materials, structures, equipment, prevention
of, S61
of the environment as consequence of accidents, S11, S21, S54
Control systems
coal mining, S01
fusion, S70
nuclear reactor, S22
vehicle emission, S33
Cooling
solar, S14, S14
Cooling systems
buildings, S32
nuclear reactors, S22
thermonuclear reactors, S70
Cooling towers
thermal plumes, S20, S54
Corrosion
alloys, S36
carbon, S36
ceramics, S36
cermets, S36
composites, S36
metals, S36
refractories, S36
Corrosive effects on materials in environment, S54
Cost benefit studies, S29, S54
CP invariance, S72
CPT theorem, S72
Criticality studies
nonreactor, S42
Criticality accidents, S21, S22
Crops, S60
Cryogenic devices, S71
Cryogenic equipment, S71
Cryogenic power transmission, S24
Cryogenic storage
hydrogen, S08
Cryogenics, S71
Cultural objects
degradation, S29, S36, S54
Curium
analysis and determination, S37
chemical separation studies, S38, S11
Current algebra, S72
Current drive
plasma, S70
Cytology, S60
Dams
hydropower, S13
Daylighting, S32
DC power transmission, S24
Decommissioning, S98
Decontamination
chemical, S38, S54
of earth atmosphere, S54
of food and animal feed, S60
of man, animals, plants, microorganisms, S63
of materials, structures, equipment, S61
of soils, S54
of surface waters, S54
Degradation
composites, S36
cultural objects, S36, S54
materials, S36
plastics, S36
Denitrification
flue gas, S01, S20, S54
natural gas, S03
shale oil, S04
tar sands, S04
Desulfurization
coal, S01
flue gas, S01, S02, S20, S54
natural gas, S03
petroleum, S02
shale oil, S04
tar sands, S04
Deuterium
heavy water production, S07
isotope separation, S07
Deuteron reactions, S73
Diagnostic techniques
plasma, S70
Diesel engines
automobile, S33
Direct energy conversion
EHD generators, S30
fuel cells, S30
in fusion power plants, S70
MHD generators, S30
physics, S75
thermoelectric generators, S30
thermionic converters, S30
Direct energy utilization
geothermal energy, S15
Diseases
basic studies of human, by external irradiation, S63, S60
basic studies of human, by radioisotopes, S63, S60
basic studies of non-human, by external irradiation, S63
diagnosis of human, by external irradiation, S62
diagnosis of human, by radioisotopes, S62
new applications of tracers in study of non-human, S63, S60
therapy of human, by external irradiation, S62
therapy of human, by radioisotopes, S62
Disinfestation by radiation techniques, S60
Dispersion relations
   elementary particles, S72
Dissociation
   atomic, S74
Distributed collector solar power systems, S14
District cooling
   public utilities, S32
District heating
   policy, S29
Diverters (fusion energy), S70
Documentation
   nuclear, S99
Dosemeters, S46
Dosimetry, S61
Drilling
   equipment, S42
   facilities, S42
   geothermal, S15
   natural gas, S03
   petroleum, S02
Dry storage
   spent fuel, S11
Drying
   solar, S14
Ducts
   MHD generators, S30
Earth atmosphere
   circulation models, S54
Earthquakes
   predictions, S58
Earth-sheltered buildings, S29
Economics, S29
   air transport, S32
   alcohol fuels, S09, S10
   batteries, S25
   biomass fuels, S09
   coal industry, S01
   electric power, S20, S29
   energy industry, S29
   energy storage, S25
   fossil-fueled power plants, S20
   fossil fuels, S29
   fusion technology, S70
   geothermal energy, S15, S29
   hydroenergy, S13
   hydrogen economy, S08, S29
   land transport, S32
   marine transport, S32
   natural gas, S03
   natural gas industry, S03
   nuclear power plants, S21, S29
   AGR-type, S21
   BWR-type, S21
   GCFI-type, S21
   GCR-type, S21
   heavy water type, S21
   HGTR-type, S21
   LMFBR-type, S21
   LWBR-type, S21
   molten soft type, S21
   MSBR-type, S21
   PWR-type, S21
   SNAP-type, S21
   WWER-type, S21
   nuclear safeguards, S98
   oil shale industry, S04
   oil shales, S04
   petroleum industry, S02, S29
   pipeline transport, S32
   planning, S29
   plutonium recycling, S11
   policy, S29
   radiation sources, S07, S29
   radioactive waste disposal, S11, S12
   rail transport, S32
   renewable energy sources, S29
   resource development, S29
   solar energy, S14, S29
   spent fuels, S11
   synthetic fuels, S10, S29
   tar sand industry, S04
   tar sands, S04
   tidal power, S16, S29
   uranium enrichment, S11
   wind power, S17
Education
   energy conservation, S32
   manpower preparation, S29
Elastomers, S36
Electric batteries
   application, S25
   automobiles, S25, S33
   components, S25
   design, S25
   economics, S25
   safety, S25
Electric energy storage
   capacitors, S25
Electric generators, S20
   superconducting, S75
Electric motors
   superconducting, S75
Electric power
   biological effects, S63
   coal mines, S01
   consumption, S32
   consumption statistics, S29
   demand, S29
   distribution, S24, S29
   economics, S20, S29
   generation, S20, S29
   hazards, S63
   market, S29
   policy, S29
conservation, S29
development, S29
industry, S32
Energy storage, S25
  business aspects, S25
capacitors, S25
chemical, S25
compressed gases, S25
economic aspects, S25
electric batteries, S25
environmental aspects, S25
flywheels, S25
fusion energy, S70
health, S25
heat, S25
industrial aspects, S25
legislation, S25
liquefied gases, S25
magnetic, S25
off-peak, S20
planning and policy, S29
policy, S29
pumped water, S13
regulations, S25
safety, S25
Energy substitution, S29
Energy supply, S29
Energy transmission
hydrogen, S08
Energy transport
policy, S29
Energy utilization, S29
Engineering
  equipment, S42
  facilities, S42
  marine, S42
  underground, S42
Engines
  external combustion, S33
  internal combustion, S33
  solar heat, S14
Enhanced recovery, S02
Enriched uranium
  economics, S11, S29
  forecasting, S11, S29
  market, S11, S29
  supply and demand, S11, S29
Environment
  acidification, S54
  aquatic ecosystems, S54
  atmospheric chemistry, S54
  deposition, dry or wet, S54
  mathematical models, S54
  terrestrial ecosystems, S54
  tracer techniques, S54
Environmental aspects policy, S29
  use and production
alcohol fuels, S09, S10, S54
  coal, S01, S54
  fusion fuels, S54
  geothermal, S15, S54
  hydrocarbon fuel, S09, S10, S54,
inorganic hydrogen compound fuels, S10
  natural gas, S03, S54
  nuclear fuel, S11, S54,
nuclear fuel cycle, S11
  oil shale, S04, S54
  petroleum, S02, S54
  solar energy, S14, S54
tar sands, S04, S54
  tidal power, S16, S54
  wind power, S17, S54
  water resources, S54
Environmental assessment
  any facility, S54
Environmental impact statements, S29
Environmental legislation, S29
Environmental materials, S36
Environmental policy, S29
Environmental quality, S29
Environmental regulations, S29
  air pollution, S29
can industry, S01, S01
electric power plants, S20, S20, S29
  energy planning, S29
  fossil-fueled power plants, S20, S20, S29
  geothermal energy, S15, S15
  hydroelectric power, S13, S13, S29
  land pollution, S29
  natural gas industry, S03, S03
  nuclear fuels, S11, S11
  nuclear power plants, S21, S22
  nuclear ships, S21
  oil shale industry, S04, S04
  petroleum industry, S02, S02
  solar industry, S14, S14
tar sands industry, S04, S04
  tidal power, S16, S29
  water pollution, S29
  wind power, S17, S17, S29
Environmental standards, S29
Environmental surveys, S54
  nuclear reactors, S22
  oil shale, S04
  oil shale mining, S04
tar sand industry, S04
  tar sands, S04
  tidal power, S16
  wind power, S17
Environmental transport, S54
Erosion
  alloys, S36
ceramics, S36
cermets, S36
  composite materials, S36
  cultural resources, S54
  metals, S36
  plastics, S36
  refractories, S36
Ethane
  biosynthesis, S09
Ethanol
  biosynthesis, S09
Exhaust gases
air pollution control, S33, S54
Exhaust systems (fusion), S70

Exploration
coal, S01
geothermal, S15
natural gas, S03
oil shale, S04
petroleum, S02
tar sands, S04
thorium ores, S11
uranium ores, S11

External combustion engines, S33
Rankine cycle, S33
Stirling cycle, S33

Extraction
particle beam, S43

Extraterrestrial material
exposure ages, S37

Families and equipment
engineering, S42
Federal research, S29
Feed materials plants, S11
Field theories, S72
First wall, S70
Fischer-Tropsch synthesis, S01

Fission
theory, S73

Flames, S37
Florida current, S13
Flue gas
denitrification, S01, S20, S54
desulfurization, S01, S02, S20, S54
environmental aspects, S20, S54
fossil-fueled power plants, S20
purification, S01, S20, S54
radioactivity, S01, S54

Fluid dynamics, S75, S71
Fluid flow, S42
Fluid physics, S75, S71
Fluidized-bed combustion coal, S01

Fluorescence, S37, S74
Fly ash
clean up
control
electric power plants, S20, S54
waste management, S01, S20, S54

Flywheels
energy storage, S25
propulsion, S33

Food chains
chemical toxicants, S54
environmental transport, S54
radionuclide kinetics, S54
radionuclide migration, S54

Food preservation, S60

Food processing
evergreen conservation, S32

Fossil-fueled power plants, S20
business aspects, S20
combined cycle, S20
components, S20
cooling systems, S20
economics, S20
environmental aspects, S20, S29, S54
environmental impact statements, S20, S29, S54
fuels, S20
health, S20
industrial aspects, S20
land use, S20, S54
legislation, S20
pollution control, S20, S54
power generation, S20, S29
regulations, S20
safety, S20
site selection, S20, S54
thermal effluents, S20, S54

Fossil fuels
energy policy, S29
handling in power plants, S20
policy, S29
power plants, S20

Fuel cells, S30
applications, S30
development, S30
electrochemistry, S30
materials, S30
performance, S30

Fuel conservation, S32
Fuel consumption, S32
agriculture, S32
buildings, S32
coal, S01
end use sectors, S29
industries, S32
natural gas, S03
oil shales, S04
petroleum, S02
tar sands, S04
transportation, S32

Fuel gas
properties, S01

Fuel oils
production, S02, S10

Fuel pellets
fusion energy, S70

Fuel reprocessing plants, S11
Fuel slurries
crude oil, S01, S01

Fuel substitution
cars, S33
power plants, S20

Fueling systems
fusion energy, S70

Fuels, S09, S10
automotive, S33
biomass, S09
crude oil, S01
fusion, S70
hydrocarbon, S09, S10
inorganic hydrogen, S10, S08
natural gas, S03
shale oils, S04
synthetic, S10
tar sands, S04

Fusion energy, S70
Fusion fuel cycle economics, S70
Fusion fuels, S70
economics, S29, S70
environmental aspects
use and production, S54
fabrication, S70
inventories, S70
policy, S70, S29
processing, S70
properties, S70
regulations, S29, S70
reprocessing, S70
safety, S70
sources, S70
storage, S70
transportation, S70
waste management, S70

Fusion power plants (see Thermonuclear power plants)
Fusion reactions (plasma), S70
Fusion technology, S70
economics, S70

Gamma decay, S73
Gamma-ray spectroscopy (condensed matter), S75
Gamma spectroscopy, S37
Gamma transitions, S73
Gamma transport theory, S73
Gas flow, S42
Gas spills, S03
Gaseous diffusion process, S11
Gaseous wastes, S20, S54
Gasification
biomass, S09
coil, S01
Gauge bosons
properties, S72
GCFR-type reactors, S21
GCR-type reactors, S21
General relativity, S71
Genetic engineering, S60
Genetics, S60
Geochemical surveys, S15, S58
Geochemistry, S58
geochemical survey methods, S58
geothermal theory, S15
Geochronology, S58
Geological materials
weathering, S54
Geology, S58
coil, S01
geothermal systems, S15
hydroelectric, S13
natural gas, S03
oil shale, S04
petroleum, S02
radioactive waste disposal, S12
tar sands, S04
thorium ores, S11
uranium ores, S11
Geophysical surveys, S58
Geophysics, S58
geophysical survey methods, S58
Geosciences, S58

Geothermal energy, S15
by-products, S15
direct energy utilization, S15
economic aspects, S15, S29
electric power generation, S15
environmental aspects
use and production, S15, S54
health, S15
legal aspects, S15, S29
policy, S15, S29
safety, S15
waste management, S15, S15, S54
Geothermal engineering, S15
corrosion and scaling, S15
drilling technology, S15
fluid transmission, S15
materials development, S15
reservoir performance, S15
reservoir stimulation, S15
safety, S15
Geothermal exploration, S15
exploratory drilling, S15
gochemical techniques, S15
geophysical techniques, S15
well logging, S15
Geothermal fields, S15
site surveys, S15, S54
Geothermal power plants, S15
design and operation, S15
systems and components, S15
Geothermal resources, S15, S29
Geothermal systems, S15
gochemistry, S15
hydrology, S15
Geothermal theory, S15
fluid properties, S15
geochemistry, S15
geothermometry, S15
mineral and rock properties, S15
rock-water-gas interactions, S15
Geothermometry, S15
Giant resonance, S73
Gluons
properties, S72

Government policies
coil, S01, S29
environmental, S29
government energy, S15, S29
hydroenergy, S13, S29
hydrogen economy, S08, S29
isotope technology, S11, S29
natural gas, S03, S29
nuclear fuels, S11, S29
nuclear weapons, S98, S29, S98
oil shales, S04, S29
petroleum, S02, S29
radiation source technology, S11, S29
synthetic fuels, S10, S29
tar sands, S04, S29

Graphite, S36
Graphite-moderated reactors, S21
Gravitation theory, S71
Gravitational collapse, S71
oil shales, S04
petroleum, S02
policy, S29
radioisotopes, S07
shale oil, S04
solar energy, S14
synthetic fuels, S10
tar sands, S04
tidal power, S16
wave power, S16
wind energy, S17

Material systems
surface properties
general, S75

Materials, S36
agriculture, S32
building systems, S32
ceramic, S36
cermet, S36
composite, S36
conservation, S32
electric batteries, S25
fusion devices, S70, S32
MHD generators, S30
plastic, S36
refractory, S36
thermionic converters, S30
thermoelectric generators, S30

Materials handling, S42
coil, S01

Materials recovery
industrial wastes, S32
municipal wastes, S32
Materials studies (fusion), S70
Materials testing, S42
Materials testing reactors, S21

Mathematics, S99

Medical diagnostics, S62
external radiation, S62
unsealed radionuclides, S62

Medical physics
general, S61

Medical therapy, S62
external radiation, S62
unsealed radionuclides, S62

Medicine, S62

Mercury
biological effects, S63
environmental chemistry, S54,
Mesic atoms, S74

Mesons
decay, S72
interactions, S72
properties, S72
reactions, S73

Metabolism, S60, S63
Metals and alloys, S36
liquid, S36

Meteorology
basic studies, S54, S58
radioactive contaminants, S54,
site surveys, S54
wind availability, S17, S54

Methane
biosynthesis, S09
chemical preparation, S10
properties, S09, S10

Methanol
automotive fuel, S33
biosynthesis, S09
Cl processes, S01
chemical preparation, S10
coal products, S01
properties, S09, S10
MHD equilibrium (plasma), S70
Microbiology, S60
Microwave radiation
biological effects, S63
Mine acid drainage, S01, S54
Mine shafts, S01
Mineral properties geothermal science, S15
Mineralogy, S58
Minerals
resource management, S29

Mining
coil, S01
oil shale, S04
radioactive ores, S11
tar sands, S04

Mining equipment, S42
Mining facilities, S42
Moessbauer effect (condensed matter), S75
Molecular beams, production, S71
Molecular biology, S60
Molecular physics, S74
Molecular properties
experimental, S74
Molecular spectra, S74
Molecular theory, S74
Monitoring
air pollution, S54
Morphology, S60
MSBR-type reactors, S21
Municipal power systems, S32
Municipal waste management
energy recovery, S32
environmental aspects, S54
Muon-catalyzed fusion, S70

Muonic atoms, S74

Mutations
agricultural, S60
animals, S63
cells, S63
in vitro, S63
man, S63
microorganisms, S63
plants, S63

N/D method, S72

Natural gas, S03
artificial stimulation, S03
business aspects, S03
by-products, S03
combustion, S03
composition, S03
<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear reactor technology, S22</td>
<td></td>
</tr>
<tr>
<td>Nuclear reactors</td>
<td></td>
</tr>
<tr>
<td>air pollution, S22, S54</td>
<td></td>
</tr>
<tr>
<td>components</td>
<td></td>
</tr>
<tr>
<td>AGR-type, S21</td>
<td></td>
</tr>
<tr>
<td>BWR-type, S21</td>
<td></td>
</tr>
<tr>
<td>GCFR-type, S21</td>
<td></td>
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<tr>
<td>GCR-type, S21</td>
<td></td>
</tr>
<tr>
<td>heavy water type, S21</td>
<td></td>
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<tr>
<td>HGTR-type, S21</td>
<td></td>
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<tr>
<td>LMFBR-type, S21</td>
<td></td>
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<tr>
<td>molten salt type, S21</td>
<td></td>
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<tr>
<td>MSBR-type, S21</td>
<td></td>
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<tr>
<td>PWR-type, S21</td>
<td></td>
</tr>
<tr>
<td>SNAP-type, S21</td>
<td></td>
</tr>
<tr>
<td>unspecified reactor type, S22</td>
<td></td>
</tr>
<tr>
<td>WWER-type, S21</td>
<td></td>
</tr>
<tr>
<td>control systems, S22</td>
<td></td>
</tr>
<tr>
<td>environmental surveys, S22</td>
<td></td>
</tr>
<tr>
<td>fuel elements</td>
<td></td>
</tr>
<tr>
<td>AGR-type, S21</td>
<td></td>
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<tr>
<td>BM-type, S21</td>
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<td>GCFR-type, S21</td>
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<td>GCR-type, S21</td>
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<tr>
<td>heavy water type, S21</td>
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<td>HGTR-type, S21</td>
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<td>LMFBR-type, S21</td>
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<td>molten salt type, S21</td>
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<td>MSBR-type, S21</td>
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<td>PWR-type, S21</td>
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<tr>
<td>SNAP-type, S21</td>
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<tr>
<td>unspecified reactor type, S22</td>
<td></td>
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<tr>
<td>WWER-type, S21</td>
<td></td>
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<tr>
<td>licensing, S21</td>
<td></td>
</tr>
<tr>
<td>propulsion, S21</td>
<td></td>
</tr>
<tr>
<td>radioactive effluents, S22</td>
<td></td>
</tr>
<tr>
<td>regulations, S21</td>
<td></td>
</tr>
<tr>
<td>research and test, S21</td>
<td></td>
</tr>
<tr>
<td>site surveys, S22</td>
<td></td>
</tr>
<tr>
<td>theory, S22</td>
<td></td>
</tr>
<tr>
<td>thermal pollution, S22, S54</td>
<td></td>
</tr>
<tr>
<td>water pollution, S22, S54</td>
<td></td>
</tr>
<tr>
<td>Nuclear scattering</td>
<td></td>
</tr>
<tr>
<td>general, S73</td>
<td></td>
</tr>
<tr>
<td>Nuclear ships</td>
<td></td>
</tr>
<tr>
<td>licensing and regulation, S21</td>
<td></td>
</tr>
<tr>
<td>Nuclear spectrometers, S46</td>
<td></td>
</tr>
<tr>
<td>Nuclear spectroscopic instrumentation, S46</td>
<td></td>
</tr>
<tr>
<td>Nuclear spin</td>
<td></td>
</tr>
<tr>
<td>theory, S73</td>
<td></td>
</tr>
<tr>
<td>Nuclear structure, S73</td>
<td></td>
</tr>
<tr>
<td>models, S73</td>
<td></td>
</tr>
<tr>
<td>Nuclear techniques (condensed matter), S75</td>
<td></td>
</tr>
<tr>
<td>accountability, S98</td>
<td></td>
</tr>
<tr>
<td>government policies, S29</td>
<td></td>
</tr>
<tr>
<td>nonproliferation policies, S29</td>
<td></td>
</tr>
<tr>
<td>proliferation, S29, S98</td>
<td></td>
</tr>
<tr>
<td>safeguards, S98</td>
<td></td>
</tr>
<tr>
<td>Nucler boiling, S42</td>
<td></td>
</tr>
<tr>
<td>Nuclei</td>
<td></td>
</tr>
<tr>
<td>properties, S73</td>
<td></td>
</tr>
<tr>
<td>Nucleon reactions, S73</td>
<td></td>
</tr>
<tr>
<td>Nuclide kinetics, S63</td>
<td></td>
</tr>
<tr>
<td>Ocean thermal gradient power systems, S14</td>
<td></td>
</tr>
<tr>
<td>Oceanography, S58, S54Off -peak energy storage, S20</td>
<td></td>
</tr>
<tr>
<td>Offshore operations, S42</td>
<td></td>
</tr>
<tr>
<td>Oil sands, S04</td>
<td></td>
</tr>
<tr>
<td>policy, S29</td>
<td></td>
</tr>
<tr>
<td>Oil shale industry, S04</td>
<td></td>
</tr>
<tr>
<td>business aspects, S04</td>
<td></td>
</tr>
<tr>
<td>economics, S04</td>
<td></td>
</tr>
<tr>
<td>health and safety, S04</td>
<td></td>
</tr>
<tr>
<td>legislation, S04</td>
<td></td>
</tr>
<tr>
<td>pollution, S04</td>
<td></td>
</tr>
<tr>
<td>pollution control, S04</td>
<td></td>
</tr>
<tr>
<td>regulations, S04</td>
<td></td>
</tr>
<tr>
<td>safety, S04</td>
<td></td>
</tr>
<tr>
<td>technology assessment, S29</td>
<td></td>
</tr>
<tr>
<td>waste management, S04</td>
<td></td>
</tr>
<tr>
<td>Oil shale mining</td>
<td></td>
</tr>
<tr>
<td>environmental aspects, S04</td>
<td></td>
</tr>
<tr>
<td>Oil shale products</td>
<td></td>
</tr>
<tr>
<td>combustion, S04</td>
<td></td>
</tr>
<tr>
<td>Oil shale use</td>
<td></td>
</tr>
<tr>
<td>environmental aspects of use and production, S04, S54</td>
<td></td>
</tr>
<tr>
<td>environmental regulations, S29, S04</td>
<td></td>
</tr>
<tr>
<td>pollution, S04, S54</td>
<td></td>
</tr>
<tr>
<td>pollution control, S04, S54</td>
<td></td>
</tr>
<tr>
<td>waste management, S04, S54</td>
<td></td>
</tr>
<tr>
<td>Oil shales</td>
<td></td>
</tr>
<tr>
<td>by-products, S04</td>
<td></td>
</tr>
<tr>
<td>combustion, S04</td>
<td></td>
</tr>
<tr>
<td>denitrification, S04</td>
<td></td>
</tr>
<tr>
<td>desulfurization, S04</td>
<td></td>
</tr>
<tr>
<td>economics, S04, S29</td>
<td></td>
</tr>
<tr>
<td>energy planning and policy, S04, S29</td>
<td></td>
</tr>
<tr>
<td>environmental aspects, S04, S54, S29</td>
<td></td>
</tr>
<tr>
<td>exploration, S04</td>
<td></td>
</tr>
<tr>
<td>geology, S04</td>
<td></td>
</tr>
<tr>
<td>government policies, S04</td>
<td></td>
</tr>
<tr>
<td>handling, S04</td>
<td></td>
</tr>
<tr>
<td>hydrology, S04</td>
<td></td>
</tr>
<tr>
<td>in-situ processing, S04</td>
<td></td>
</tr>
<tr>
<td>legislation, S04, S29</td>
<td></td>
</tr>
<tr>
<td>marketing, S04, S29</td>
<td></td>
</tr>
<tr>
<td>mining, S04</td>
<td></td>
</tr>
<tr>
<td>oil recovery, S04</td>
<td></td>
</tr>
<tr>
<td>oil yields, S04</td>
<td></td>
</tr>
<tr>
<td>policy, S04, S29</td>
<td></td>
</tr>
<tr>
<td>processing, S04</td>
<td></td>
</tr>
<tr>
<td>properties, S04</td>
<td></td>
</tr>
<tr>
<td>purification, S04</td>
<td></td>
</tr>
<tr>
<td>refining, S04</td>
<td></td>
</tr>
<tr>
<td>regulations, S04, S29</td>
<td></td>
</tr>
<tr>
<td>reserves, S04</td>
<td></td>
</tr>
<tr>
<td>retorting, S04</td>
<td></td>
</tr>
<tr>
<td>storage, S04</td>
<td></td>
</tr>
<tr>
<td>surface processing, S04</td>
<td></td>
</tr>
<tr>
<td>transport, S04</td>
<td></td>
</tr>
<tr>
<td>Oil spill effects, S02, S54</td>
<td></td>
</tr>
<tr>
<td>Oil spills, S02, S02, S02</td>
<td></td>
</tr>
<tr>
<td>Oil wells, S02</td>
<td></td>
</tr>
<tr>
<td>Oil yields</td>
<td></td>
</tr>
</tbody>
</table>
Physics
atomic physics, S74
condensed matter physics, S75
cryogenics, S71
elementary particles, S72
general physics, S71
general techniques, S71
molecular physics, S74
nuclear physics, S73
particle beam production, S71
plasma physics, S70
radiation physics, S73
target preparation, S71

Physiology, S60
Pionic atoms, S74

Pipelines
coil, S01
design, S42
development, S42
natural gas, S03
petroleum, S02
testing, S42
transportation, S32

Planning and policy, S29
Plant breeding, S60
population dynamics, S54
radioresistance, S63
 revegetation, S54, S60
tracer techniques, S60

Plants
baseline ecology, S54

Plasma
solid state, S75
Plasma disruption, S70
Plasma-facing
components, S70
Plasma fluid (thermonuclear), S70
Plasma heating systems, S70
Plasma impurity control, S70
Plasma phenomena
low energy, S71
Plasma physics, S70
Plasma research, S70
atomic processes, S70
collisions, S70
confinement, S70
current drive, S70
diagnostics, S70
heating, S70
impurities, S70
instabilities, S70
interactions, S70
kinetics, S70
oscillations, S70
production, S70
simulation, S70
transport, S70
wave phenomena, S70

Plastics, S36
Plutonium recycling
economics, S11
Policy
coil, S29
district heating, S29
electric power, S29
energy conservation, S29
energy storage, S29
energy transport, S29
fossil fuels, S29
geothermal energy, S29
hydrogen, S29
natural gas, S29
nuclear energy, S29
oil shales, S29
petroleum, S29
plants, S29
public, S29
renewable energy sources, S29
solar energy, S29
synthetic fuels, S29
tar sands, S29
tides, S29
waste heat utilization, S29
wastes, S29
winds, S29
wood, S29

Political aspects, S29
Pollutants
biological effects, S63
ecosystem effects, S54
environmental transport, S54, removal, S54
sampling, S54

Pollution
coil, S01, S54
Pollution control
air pollution, S54
biomass fuels, S09
coil, S01
fossil-fueled power plants, S20
industrial plants, S54
natural gas, S03
oil shales, S04
petroleum, S02
soil pollution, S54
water pollution, S54

Pollution control equipment
basic engineering, S54
design for industrial plants, S32, S54
environmental use, S54
industrial plants, S32, S54,
methods, S54
technology assessment, S29

Polymers, S36
Positron collisions, S74, S75
Positronium, S74
Potentiometry, S37
Power conversion systems
fusion energy, S70
hydroelectric, S13

Power cycles, S42
Brayton, S42
external combustion engines, S33
internal combustion engines, S33
power plants, S20
Rankine, S42
chemical, S38
ceramics, S36
composites, S36
electronics, S46
instruments, S46
metals, S36
other materials, S36
physicochemical, S38
refractories, S36
Radiation instruments, S46
Radiation physics, S73
Radiation protection standards, S61
Radiation shielding (excluding neutrons), S73
Radiation sources
calibration standards, S07
design and fabrication, S07
health, S07
safety, S07
Radiation transport (excluding neutrons), S73
Radiative transitions
theory, S74
Radioactivation analysis, S37
Radioactive contaminants
air, S54
aquatic ecosystems, S54
ecological effects, S11, S54,
food chains, S54
health effects, S11, S63
waste disposal, S12, S54
Radioactive decay, S73
Radioactive effluents
air, S54
nuclear reactors, S22
soil, S54
water, S54
Radioactive isotope production, S11, S07, S38
Radioactive materials, S11
chemistry, S38
handling, S42
safeguards, S98
shipping containers, S42
transport, S11
Radioactive waste disposal, S12
economics, S11
environmental aspects, S12
health and safety, S11
Radioactive wastes
decommissioning, S12
disposal, S12
management, S12
policy, S29
processing, S12
storage (interim), S11
storage (ultimate), S12
transport, S11
Radioactivity
environmental, S54
physics, S73
Radiochemical analytical procedures, S37
Radiochemistry, S38
Radiography, S37
biomedical, S62
Radioimmunoassay, S62
Radioisotope
production, S38
uses, S07, S07
Radiolysis, S38
Radiometric analysis, S37, S54
Radiometry, S37
Radionuclide effects, S63
animals, S63
cells, S63
ecological, S54
environmental, S54
man, S63
microorganisms, S63
plants, S63
Radionuclide kinetics, S63
animals, S63
cells, S63
food chains, S54
man, S63
microorganisms, S63
plants, S63
Radionuclide migration
air, S54
fuel cycle, S11
geological materials, S12
soil, S54
water, S54
Radiopharmaceuticals, S62
Rankine cycle, S42
automobile, S33
Reactor safety, S22
Reactors
bioreactors, S09
licensing and regulation, S21
nuclear, S22
Reclamation
land, S54
water, S54
Recreational facilities
energy consumption, S32
Recycling
conservation aspects, S32
economics, S32
environmental aspects, S54
policy, S29
Refining
petroleum, S02
shale oil, S04
Refractory materials, S36
Refuse-derived fuels, S20
Regge formalism, S72
Regge models, S72
Regulations, S29
biomass fuels, S09, S29
carbon dioxide, S01, S29
dams, S13
energy storage, S25
environmental, S29
fossil-fueled power plants, S20
geochemistry, S15
hydrogen fuel, S08, S29
hydropower plants, S13
natural gas industry, S03, S29
nuclear fuels, S11, S29
nuclear-powered ships, S21
oil shale industry, S04, S29
petroleum industry, S02, S29
planning or policy, S29
power transmission and distribution, S24, S29
solar energy, S14, S29
synthetic fuels, S10, S29
tar sands industry, S04
tidal power, S16, S29
wave power, S16, S29
wind power, S17, S29
Relativistic wave equation, S72
Relativity
general theory, S71
Remedial action, S11, S54
Renewable energy sources policy, S29
Reprocessing
environmental aspects, S11
spent fuels, S11
Research and test reactors, S21
Reserves
coil, S01
environmental aspects, S11
natural gas, S03
oil sands, S04
oil shales, S04
petroleum, S02
tar sands, S04
thorium ores, S11
uranium ores, S11
Reservoir engineering
oil shales, S04
petroleum, S02
Reservoir performance
geothermal, S15
Reservoir rock
drilling
oil shales, S04
petroleum, S02
géology
oil shales, S04
petroleum, S02
mechanical properties, S36
Reservoir stimulation
géothermal engineering, S15
Resources
biomass, S09
géothermal, S15, S29
hydro energy, S13
solar energy, S14, S29
tidal power, S16, S29
wave power, S16, S29
wind energy, S17, S29
Retrofitting
buildings, S32
power plants, S20
Revegetation, S54
Reversed-field pinch, S70
Risk nuclear reactor accidents, S22
Risk assessment studies, S29, S54
Roads and streets, S32
design, S32
land use, S54
lighting systems, S32
maintenance, S32
operation, S32
pollution, S54
Robotics, S32, S99
Rock bursts
coal mining, S01
Rock mechanics, S36, S58
Rock-water-gas interactions, S15
Rotary engines
automobile, S33
Rutherford scattering, S71, S73
chemical analysis, S37
S-matrix theory, S72
Safeguards
nontechnical aspects, S98
technical aspects, S98
Safety, S60
biomass fuels, S09
coil industry, S01
energy storage, S25
fossil-fueled power plants, S20
géothermal engineering, S15, S15
hydro energy, S13
hydrogen, S08
natural gas industry, S03
nuclear fuels, S11
nuclear reactor, S22
oil shale industry, S04
petroleum industry, S02
power transmission and distribution, S24
radiation sources, S07
radioisotopes, S07
solar energy, S14
synthetic fuels, S10
tar sand industry, S04
tidal power, S16
wave power, S16
wind energy, S17
Salinity gradient power systems, S14
Sanitary landfills, S54
landfill gas recovery, S09
Scattering matrices, S72
Scattering theory, S71
relativistic, S72
Schwinger source theory, S72
Seawater
uranium recovery, S11
Seismicity, S58
dam sites, S13
Seismology, S58
earthquake prediction, S58
géothermal surveys, S15
Separation procedures, S37
Sewer systems, S32
Shale oil
biological effects, S63
business aspects, S04
by-products, S04
combustion, S04
composition, S04
denitrification, S04
desulfurization, S04
economics, S04
energy planning and policy, S04, S29
environmental aspects, S04, S54,
handling, S04
health and safety, S04
industrial aspects, S04
legislation, S04, S29
marketing, S04
production, S04
properties, S04
purification, S04
refining, S04
regulations, S04, S29
site surveys, S04, S54
storage, S04
supply and demand, S04
transport, S04
waste management, S04, S54
Shell models, S73
Shielding (fusion), S70
Ship propulsion reactors, S21
Shipping containers
radioactive materials, S42
safety, S42
Ship site surveys, S54
nuclear-powered, S21
Site surveys thermionic conversion, S14
coal mines, S01
fossil-fueled power plants, S20
geothermal fields, S15
meteorology, S54
natural gas fields, S03
nuclear reactors, S22
oil fields, S02
soil mechanics, S54
tarsands, S04
thermal power plants, S20
tidal power plants, S16
wind power, S17
Slurry pipelines
coil, S01
Socioeconomic aspects
nuclear power, S29
Sociology agriculture, S14
energy policy, S29, S32
Soil chemistry, S54
Soil contamination
composition, S54
monitoring chemical, S54
monitoring radioactive, S54
radiometric techniques, S54
regulations and implementation, S29
remediation, S11
removal, S54
Solar absorbers, S14
Solar air conditioning, S14
Solar cells, S14
Solar collectors, S14
Solar concentrators, S14
Solar cooking, S14
Solar drying, S14
Solar energy, S14
biomass production and conversion, S14
biomimetic processes, S14
economics, S14
energy conversion, S14
environmental aspects, S14, S54
health and safety, S14
heat storage, S14
hybrid systems, S14
legislation, S14
photobiological conversion, S14
photochemical conversion, S14
photoelectrochemical conversion, S14
photosynthesis, S09
policy, S29
regulations, S14
resources, S14
safety, S14
thermal power, S14
thermochemical conversion, S14
thermoelectric conversion, S14
thermoelectrochemical conversion, S14
total energy systems, S14
utilization, S14
Solar heat engines, S14
Solar heating
domestic water heating, S14
Solar power systems
central receiver, S14
distributed collector, S14
thermal, S14
Solar process heat
industrial, S14
Solar sea power systems, S14
Solar space heating, S14
Solar thermal power systems, S14
Solid-state physics, S75
Solid-state plasma, S75
Solid-state properties, S36
Solid-state techniques
beam effects, S75
nuclear, S75
Solid wastes
disposal, S54
environmental aspects, S54
fuels, S09
pollution control, S54
Solvated extractions, S38
Solvent extraction
spent fuels, S11
Space heating, S32
solar, S14
Space power reactors, S21
Space power systems, S24
Space propulsion reactors, S21
Space vehicles, S42
Spark-ignition engines
automobile, S33
Spectrochemical analysis, S37
Spectrometers
nuclear, S46
Spectroscopic analysis, S37
Spent fuels

90
economics, S11
reprocessing, S11
storage, S11
transport, S11
Spontaneous fission, S73
Sputtering, S75
SQUID devices, S75
Stable isotopes, S37
labeling techniques, S37
separations processes, S37
Standard model, S72
Standards
environmental, S29
Stark effect, S74
State government research, S29
Statistical physics, S71
Statistics, S99
Steam-iron process
hydrogen production, S08
Stellarators, S70
Stirling cycle, S42
automobile, S33
Stockpiles
coil, S01
petroleum, S02
Storage facilities, S11, S12, S42
Storage rings, S43
Strata control
coil mining, S01
proliferation, S98
Street lighting systems, S32
String theory, S72
Strong interaction models, S72
Structures underground, S42
Sulfur dioxide
atmospheric chemistry, S54
biological effects, S63
environmental transport, S54
health hazards, S63
pollution control, S01, S20, S33, S54
Supercomputers, S99
Superconducting
devices, S75
equipment, S75
magnets, S75
materials, S36, S75
motors, S75
power transmission, S24
Superconductivity, S36, S75
Superfluidity, S75
Superstring theory, S72
Supersymmetry, S72
Supersymmetry particles properties, S72
Supply and demand, S29
biomass fuels, S09, S29
coil, S01, S29
electric power, S20
geothermal energy, S15, S29
hydro energy, S13, S29
hydrogen fuel, S08, S29
natural gas, S03, S29
nuclear fuels, S11, S29
petroleum, S02, S29
shale oil, S04, S29
solar energy, S14, S29
synthetic fuels, S10, S29
tidal power, S16, S29
wave power, S16, S29
weather effects, S29
wind energy, S17, S29
Supply disruption, S29
Surface mining
coil, S01
land reclamation, S54
Surface processing, S04
oil shales, S04
tar sands, S04
Symmetry breaking, S72
Symmetry principles, S72
Symmetry violations, S72
Synthetic fuels
business aspects, S10
by-products, S10
combustion, S10
composition, S10
economic, S10
environmental aspects, S10
handling, S10
health, S10
industrial, S10
legislation, S10
policy, S29
production, S10
products, S10
properties, S10
regulations, S10
safety, S10
storage, S10
transport, S10
waste management, S10, S54,
T invariance, S72
Tachyons
properties, S72
Tanker vessels, S42
Tanks, S42
radioactive waste storage, S12
Tar sand industry, S04
air pollution, S54
business aspects, S04
economics, S04
environmental aspects, S04
legislation, S04, S29
regulations, S04, S29
safety, S04
soil pollution, S54
waste management, S04
water pollution, S54
Tar sand use
environmental aspects, S04
environmental regulations, S04, S29
pollution, S04, S54
pollution control, S04, S54
waste management, S04, S54
Tar sands
air pollution, S54
by-products, S04
denitrification, S04
desulfurization, S04
economics, S04
energy planning and policy, S29, S04
environmental aspects, S04
exploration, S04
geology, S04
handling, S04
health and safety, S04
hydrology, S04
in-situ processing, S04
marketing, S04
mining, S04
oil yields, S04
policy, S29, S04
pollution, S04, S54
pollution control, S04
processing, S04
properties, S04
purification, S04
regulations, S04, S29
reserves, S04
storage, S04
supply and demand, S04, S29
surface processing, S04
transport, S04
Target facilities, S43
Tax credits, S29
Taxes, S29
Technology assessment, S29
Technology transfer, S29
Technology utilization, S29
Tectonics, S58
Test methods
materials, S42
Test reactors, S21
Thermal effects
biological, S63
Thermal effluents
diffusion, S54
fossil-fueled power plants, S20
Thermal physics, S71
Thermal pollution
biological effects, S63
diffusion, S54
environmental aspects, S54
nuclear reactors, S22
Thermionic conversion
solar energy, S14
Thermionic converters, S30
applications, S30
design, S30
materials, S30
performance, S30
Thermionic emission, S75
Thermochemical conversion
solar energy, S14
Thermochemical processes, S09
hydrogen production, S08
Thermodynamic cycles, S42
automobiles, S33, S33
fusion energy, S70
Thermodynamic properties
ceramics, S36
composites, S36
metals, S36
Thermodynamics, S71
Thermoelectric effect, S75
Thermoelectric generators, S30
applications, S30
design, S30
materials, S30
performance, S30
Thermonuclear devices (general), S70
Thermonuclear fuel injection, S70
Thermonuclear power plants, S70
blanket engineering, S70
component development, S70
cooling systems, S70
energy storage, S70
fueling systems, S70
heating systems, S70
inertial confinement, S70
magnet coils and fields, S70
magnetic confinement devices, S70
materials testing, S70
plasma-facing components, S70
power conversion systems, S70
power supplies, S70
Thermonuclear reactions, S70
Thermonuclear reactor materials, S70
Thorium ores
chemical processing, S11
feeding, S11
Tidal power, S16
availability, S16
business aspects, S16
economics, S16
environmental aspects, S16
health, S16
industrial aspects, S16
legislation, S16
policy, S29
regulation, S16
resources, S16
safety, S16
water wave energy conversion, S16
Tidal power
design, S16
energy conversion, S16
environmental surveys, S16, S54
operation, S16
regulations, S16, S29
site surveys, S16, S54
storage facilities, S42
Titration, S37
Tokamak devise, S70
Total energy systems, S29
solar energy, S14
Tower focus power systems, S14
Tracer techniques
advances in, S38
agriculture, S60
animal husbandry, S60
behavior, S60
biochemistry, S60
coal, S01
cytology, S60
ecology
air, S54
soils, S54
water, S54
embryology, S60
food technology, S60
genetics, S60
horticulture, S60
irradiation effects, S60
medicine, S62
metabolic studies, S60
metabolism, S60
microbiology, S60
molecular biology, S60
morphology, S60
pathology, S60
pest control, S60
photosynthesis, S60
physiology, S60
preservation, S60
psychology, S60
public health, S60
technology advancement, S38
vaccine sterilization, S60

Trade
biomass fuels, S09
coal, S01
foreign, S29
hydrogen fuel, S08
natural gas, S03
nuclear fuels, S11
petroleum, S02
shale oil, S04
synthetic fuels, S10

Transport
biomass, S09
coal, S01
coal mines, S01
environmental, S54
facilities, S42
hydrogen, S08
natural gas, S03
oil shales, S04
petroleum, S02
radioactive materials, S11
radioactive wastes, S11
synthetic fuels, S10
tar sands, S04

Transportation
air and aerospace, S32
land and roadway, S32
pipeline, S32
railway, S32
sea and water, S32

Tribology
components, S32
materials, S32
Tritium
processing, S70
properties, S70
Triton
reactions, S73
Tunnels
drainage, S01
drivage, S01
Turbinies
automobile, S33
wind, S17

Unconventional energy sources
policy, S29
Underground engineering, S42
construction, S42
economics, S42
equipment, S42
facilities, S42
methods, S42
structures, S42
Underground mining
coal, S01
Unified models, S72
Uranium
depleted, S12
mining, S11
reserves, S11
resources, S11
Uranium deposits
identification, S11
prospecting, S11
Uranium enrichment
centrifugation, S11
economics, S11
gaseous diffusion, S11
laser excitation, S11
Uranium minerals, S11
Uranium ores
chemical processing, S11
conversion, S11
extraction, S11
feed processing, S11
geology, S11
mineralogy, S11
petrogenesis, S11
properties, S11
reduction, S11
Uranium recovery
from phosphoric acid, S11
from seawater, S11
Uranium resources
cost categories, S11
Uranium 235
centrifugation separation, S11
gaseous diffusion separation, S11
laser isotope separation, S11
Vaccine sterilization, S60
Vacuum systems (fusion), S70
Vegetable oil fuels, S09
Ventilation
  buildings, S32
c  coal mines, S01
  houses, S54
  indoor air pollution control, S54
Verification
  arms control, S98
Vertebrates
  baseline ecology, S54
Veterinary science, S60
Volcanology, S58
Voltametry, S37
Waste conversion to fuel, S09
Waste energy policy, S29
Waste fuels
  power plants, S20
Waste heat utilization
  energy conservation, S32
  policy, S29
Waste management
  biomass fuels, S08
  coal industry, S01
  fossil-fueled power plants, S20
  geothermal energy, S15
  hydrogen fuel, S08
  natural gas industry, S03
  nuclear fuels, S12
  oil shale industry, S04
  petroleum industry, S02
  solid wastes, S54
  synthetic fuels, S10
  tar sand industry, S04
Waste oil reclamation, S02
Waste recycling
  industrial, S32
  municipal, S32
  power generation, S20
Water chemistry, S54
Water gas processes
  hydrogen production, S08
Water hearing
  energy conservation, S32
  solar domestic, S14
Water pollution, S54
  chemical, S54
  coal use and production, S01
  ecosystems, S54
  geothermal energy, S15
  legislation, S29
  nuclear fuels, S11
  nuclear reactors, S22
  oil shale, S04
  petroleum use and production, S02
  radioactive effluents, S22, S54
  regulations, S29
  site surveys, S54
  tar sand use and production, S04
  thermal, S20, S22
Water pollution
  abatement and control coal, S01
  environmental aspects, S54
  oil shale, S04
  petroleum, S02
  tar sands, S04
  Water quality, S29
  Water resources, S29
  hydroelectric power, S13, S54
  policy aspects, S29
  Water-rock-gas interactions, S15
  Water treatment plants, S32
  Water wave energy conversion, S16
  Wave energy converters, S16
  Wave power, S16
    availability, S16
    business aspects, S16
    economic aspects, S16
    environmental aspects, S16
    health and safety, S16
    industrial aspects, S16
    legislation, S16
    regulations, S16
    resources, S16
    safety, S16
  Weak interaction models, S72
  Weatherization, S32
  policy, S29
  social impacts, S29
Well logging
  geothermal exploration, S15
  instrumentation, S47
Wind energy
  health, S17
  safety, S17
Wind power, S17
  applications, S17, S29
  availability (climatology), S17, S54
  business aspects, S17
  economics, S17
  electric power generation, S17
  engineering, S17
  environmental aspects, S17, S54
  health, S17
  health and safety, S17
  industrial aspects, S17
  legislation, S17
  policy, S29
  power conversion, S17
  regulations, S17, S29
  resources, S17
  safety, S17
  site surveys, S17, S54
  turbines, S17
Wind turbines, S17
Winterization, S32
Wood
  fuels, S09
  policy, S29
  production, S09
Wood energy
  policy, S29
Wood-burning appliances
  environmental aspects, S54
WWER-type reactors, S21
X-ray fluorescence analysis, S37
Zeeman effect, S74